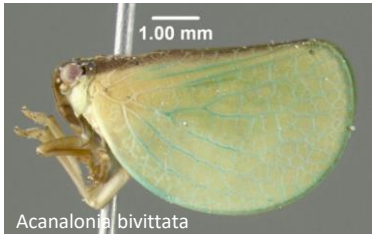
Digitizing Collections Worldwide

in support of 22nd century entomology (sooner)

AntWeb

NMNH



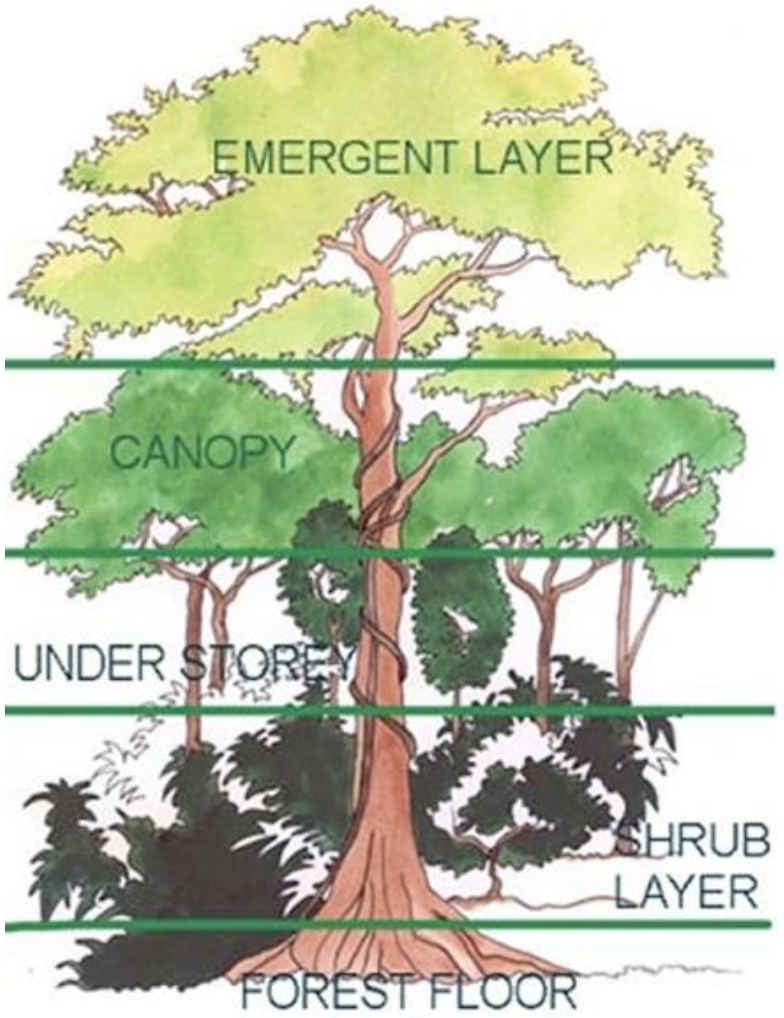
MCZ

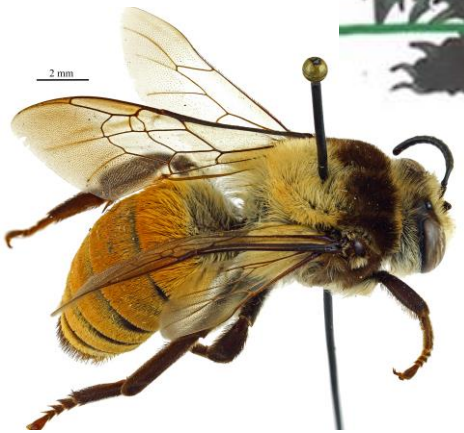
AntWeb

Deborah L. Paul, Florida State University, iDigBio
Eastern Entomological Society of America Meeting
Symposium: The Digital Future of Entomology
10 March 2019

iDigBio is funded by grants from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program [DBI-1115210 (2011-2018) and DBI-1547229 (2016-2021)]. 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.

@GoodStickLtd





Overview of this talk

Your part in helping entomology specimens, data, and people take 22nd century journeys

4 main areas

- worldwide
- skills and literacy
- data use
- metrics

Acanthagrion quadratum

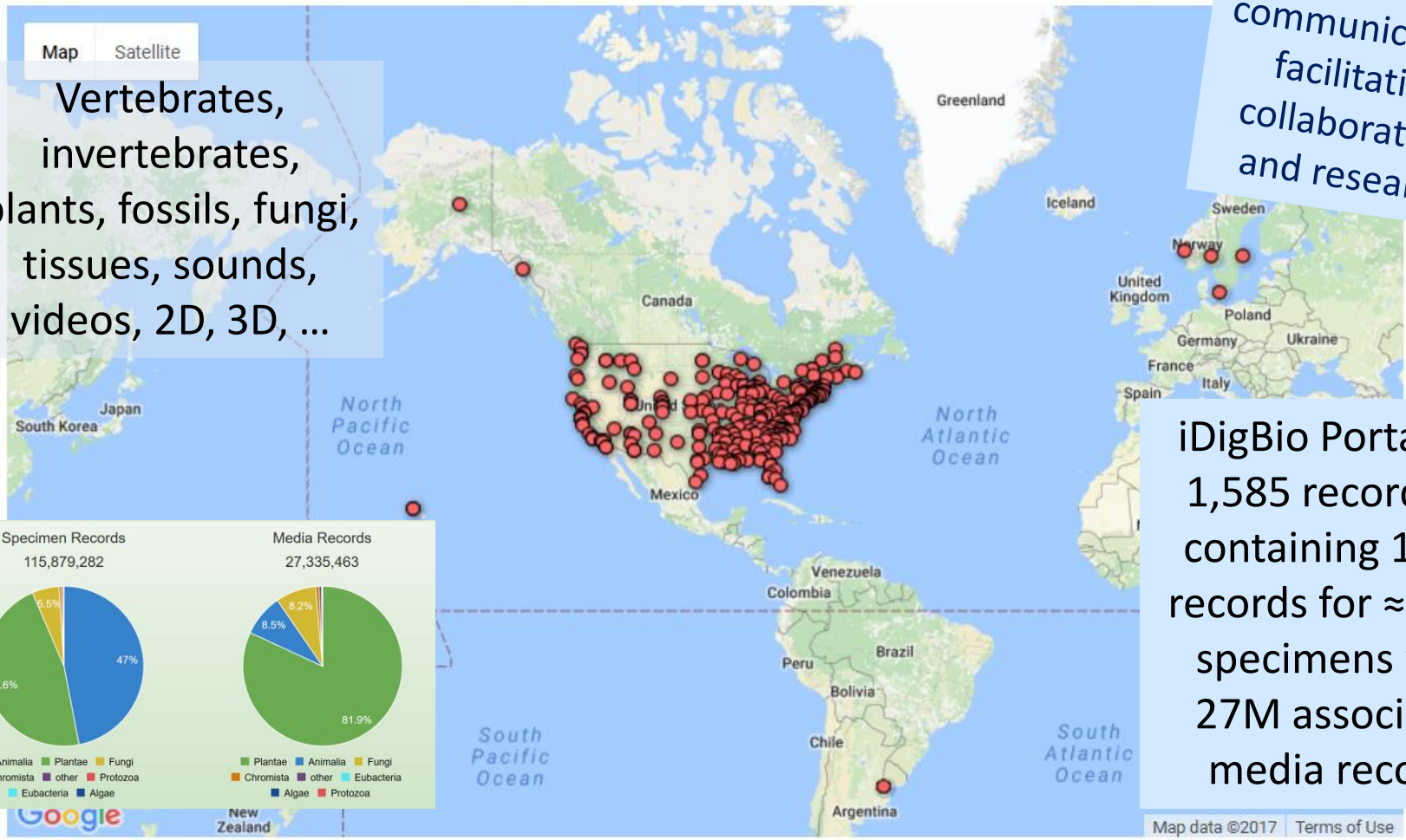
3 main points

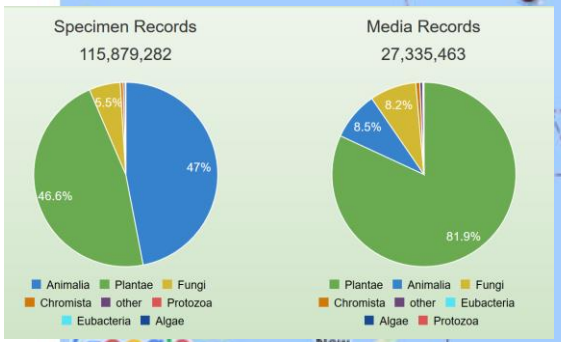
- local to global change
  - in practice and in policy
  - collecting, citation, workflows, access, …
  - contribute and be prepared
- capacity building needs
  - how can you be part of the solution
  - share
- foster use of the data
  - GBIF Science Ambassadors

Advancing Digitization of Biodiversity Collections (ADBC)
National Digitization Network
iDigBio and the Thematic Collection Networks (TCNs)

Developing networks, enhancing communication, facilitating collaboration, and research

Vertebrates, invertebrates, plants, fossils, fungi, tissues, sounds, videos, 2D, 3D, …





iDigBio Portal has 1,585 recordsets containing 115M records for ≈345M specimens with 27M associated media records

750 participating collections in 411 institutions (23 TCNs + 29 PENs)

DiSSCo

Distributed System of Scientific Collections

115 National Facilities

21 Countries

a new business model: ONE EUROPEAN COLLECTION

- **Largest ever formal agreement** between natural science collection facilities
- **A system of distributed facilities**
- **Centralised shared governance** model in place
- Supporting network of **working groups**

- **One European Collection** of scientific assets
- **Common Collections development** strategy
- **Economies of scope and scale**
- **Monitoring impact** of collections (documenting ROI)
- **Specialisation strategies** (e.g. in alignment with national priorities, e.g. Smart Specialisation Strategies)
- **Joint Research Agendas**

Find out more at www.dissco.eu

ESFRI

2018 Roadmap Launch

About SYNTHESYS+ an EU NH Consortia

Synthesis of systematic resources

Who

- NHM Leads:
  - Vince Smith, SYNTHESYS Coord.
  - Kristina Gorman, Project Mgr.
- since 2004 €28.2m
- SYNTH+ €10m Aug. 2018
- Goals aligned with DiSSCo
- 3 commercial partners
  - Picturae, Digirati, A2ia

What

- Common themes
  - **Access, Networking, Research**
- examples
  - collections digitization dashboard
  - Specimen Data Refinery - AI toolkit to automate extraction of specimen data & traits
  - ELViS
  - DoD

Linked with DiSSCo goals & supported by CETAF, GGBN, TDWG & GBIF

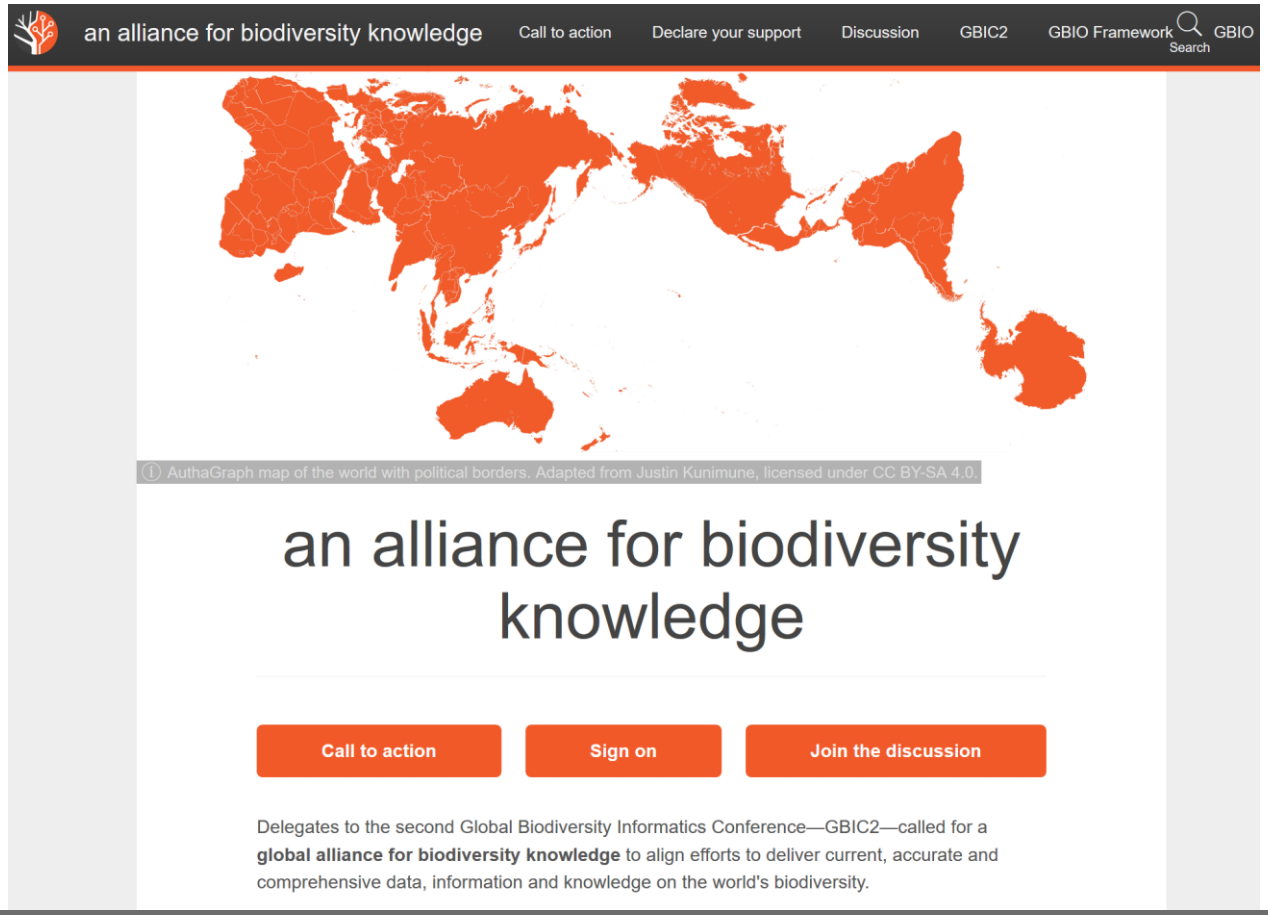
3 upcoming meeting opportunities

…on the future of biodiversity data and research

- SPNHC 2019 Making the Case for Natural History Collections
  - May 2019, Chicago, IL

- Digital Data Biodiversity Research Conference III. *Focus*: Methods, Protocols, and Analytical Tools for Specimen-based Research in the Biological Sciences
  - June 2019, New Haven, CT

- Biodiversity *Next*
  - October 2019, Leiden, Netherlands https://biodiversitynext.org/



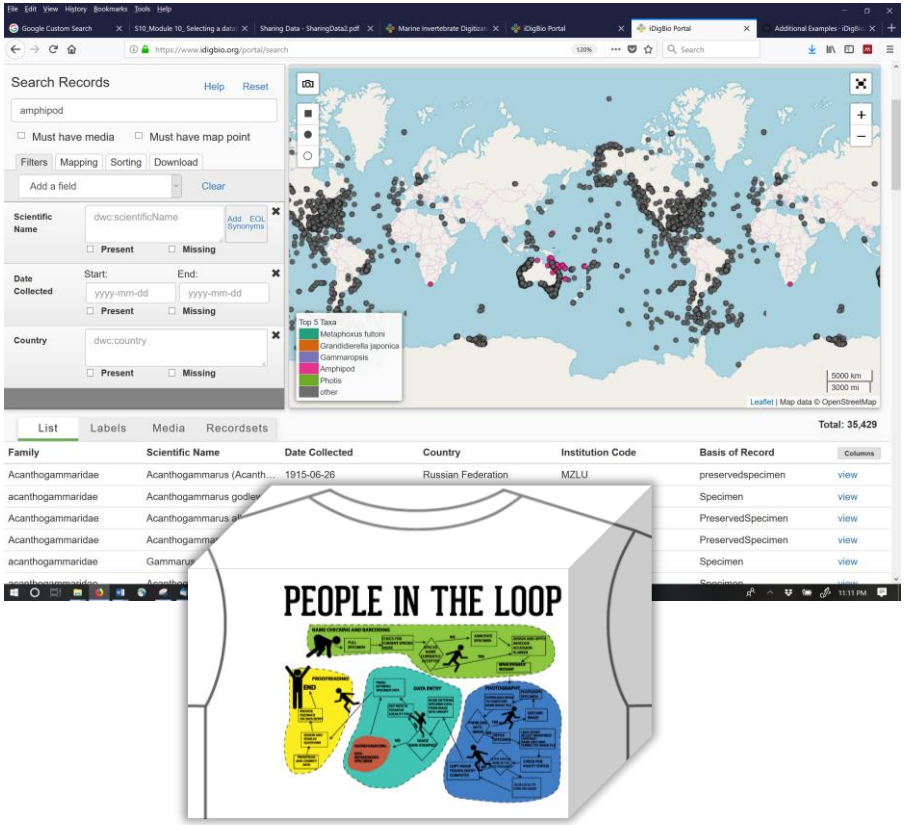
https://www.biodiversityinformatics.org/

ADBC Community building

Digitization
Workflows & Protocols
Task Clusters
Dissemination

Research Use
Tool collaboration
Portal development
ENM workshop
Research Spotlight
Data quality

Training
Biodiversity data skills
Data literacy
Collections software
Imaging
Project Management



Education Outreach
Citizen Science
K-12 materials
Undergraduate
Fossil Clubs
Mentor teachers

Methods
Workshops
Webinars
Symposia
Conferences
Working Groups
Short Courses
Adobe Connect
Listservs
Publications
Social Media

"Arguably the highest resource requirement of research infrastructure development is human capacity and capability."

"2016 National Research Infrastructure Roadmap Capability Issues Paper." CSIRO. Toni Moate, Director, National Collections and Marine Infrastructure. *On building National Biological eCollections*

people graphic by Dorothy Allard

@iDigBio: many resources for digitization, data mobilization, and data use

Recommendations for the Acquisition, Processing, and Archiving of Digital Media

iDigBio has created recommendations for capturing, processing, and storing digital media.

Recommendations for the Acquisition, Processing, and Archiving of Digital Media

Interest/Working Groups

The following links take you to Interest/Working Groups focused on Digitization. For other working groups please use the follo

- International Whole-Drawer Digitization Interest Group
- NANSH Working Group (North American Network of Sma
- Fluid-preserved Arthropod and Microscopic Slide Imaging
- Paleontology Digitization Working Group
- Small Collections Network Working Group
- Vertebrate Digitization Intererst Group
- Field Station Interest Group

Digitization Avenue

The following links provide information on the task clusters th
clusters please read the following Five task clusters that enab

- Pre-digitization Curation and Staging
- Specimen Image Capture
- Specimen Image Processing
- Electronic Data Capture
- Georeferencing Locality Descriptions
- Digitization Workflows and Protocols
- More on digitization

Digitization Resources

This page provides resources and information for the series of digitization tra
as well as a plethora of digitization information and resources. Included is a g
videos, presentations, and other important information related to biological co

Contents [hide]

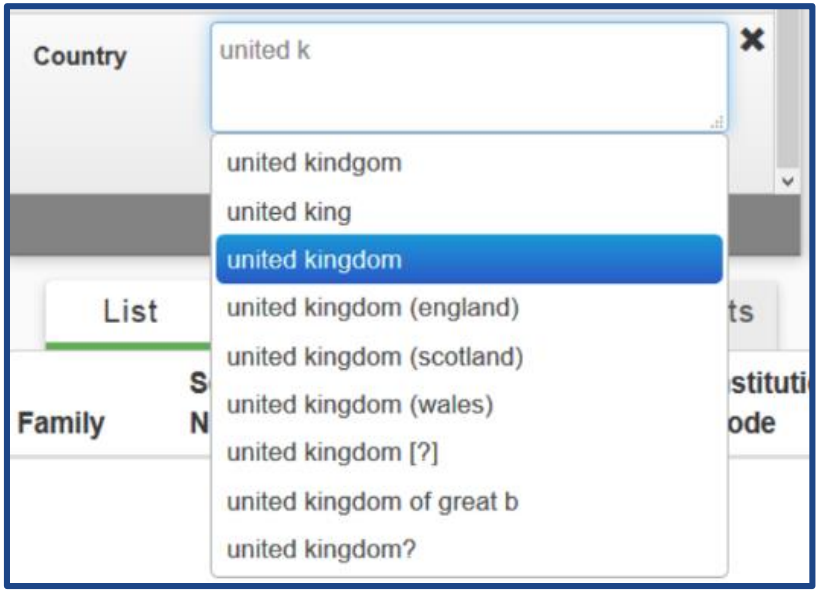
1 iDigBio Introduction
2
3 Recommendations for the Acquisition, Processing, and Archiving of Digital Media
4 Interest/Working Groups
5 Digitization Avenue
6 iDigBio Workshops, Reports, and Wikis
7 Videos- Digitization Resources and Workflows

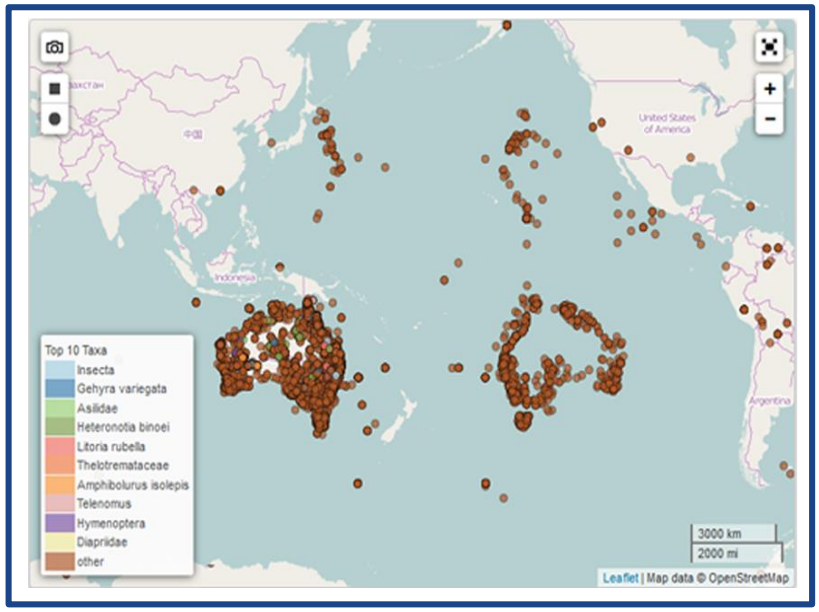
Researchers
Browse our specimen portal

Collections Staff
Learn how your collection can benefit from our work

Teachers & Students
Learning resources & opportunities to engage

Workshops and data aggregation reveal skills needs and knowledge gaps





Workshops and data aggregation reveal skills needs and knowledge gaps

Capacity building needs

- software
- standards
- data cleaning and management
- spreadsheets, text files
- data visualization and synthesis
- recognizing automatable tasks
- small community with the necessary skills
- no systematic program to supply capacity needs

Some actions

- Data Carpentry, now THE CARPENTRIES
- Biodiversity Informatics Workshop Series at iDigBio
  - Data Carpentry
  - Managing NHC Data
  - Demystifying Data Standards and the IPT
  - Field to Database
- Partner
  - Biodiversity Informatics 101 (SPNHC)
  - Biodiversity Next 101
  - Darwin Core Hour
- Biodiversity Literacy in Undergraduate Education (BLUE)

Collections Biodiversity Data – expected and emerging uses

Important Human Issues

- Evolutionary medicine,
- Disease discovery, tracking, and treatment
- Food security,
- Biodiversity conservation and sustainability,
- Computation,
- Design,
- Evolution and justice,
- Development of new types of biodiversity theories that accommodate newly emerging data streams.

next a few examples, …

Emerging Research Angles

- Supplementing existing datasets with digital layers to enhance niche and species distribution modeling,
- Use of 3D/CT data for generating and testing new hypotheses,
- Implementation of convolutional neural networks (CNN) and deep learning in the analysis of image,
- Data for taxonomic determination and specimen curation,
- Delineation of traits in specimen images,
- Determination and identification to genus or species from, sediment-deposited pollen grains.

Nelson G, Ellis S. 2018. The history and impact of digitization and digital data mobilization on biodiversity research. 374. Philosophical Transactions of the Royal Society B: Biological Sciences http://doi.org/10.1098/rstb.2017.0391

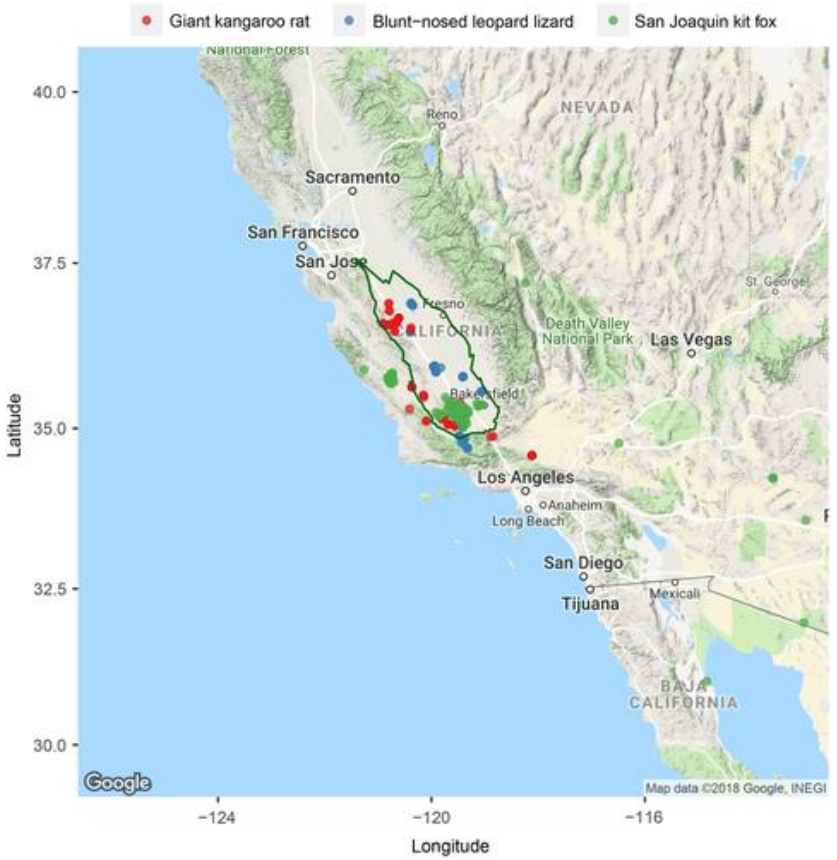
13

Better late than never: a synthesis of strategic land retirement and restoration in California

Lortie, C. J., A. Filazzola, R. Kelsey, A. K. Hart, and H. S. Butterfield. 2018. *Ecosphere* 9(8):e02367. 10.1002/ecs2.2367

Historic range maps for each of three species from the Data Basin Repository, The Vegetation Type Mapping project and the Endangered Species Recovery Program Resources and …

incorporating historic occurrences from GBIF providing another valuable mechanism to examine reported occurrences for a region and by time.



Spring- and fall-flowering species show diverging phenological responses to climate in the Southeast USA

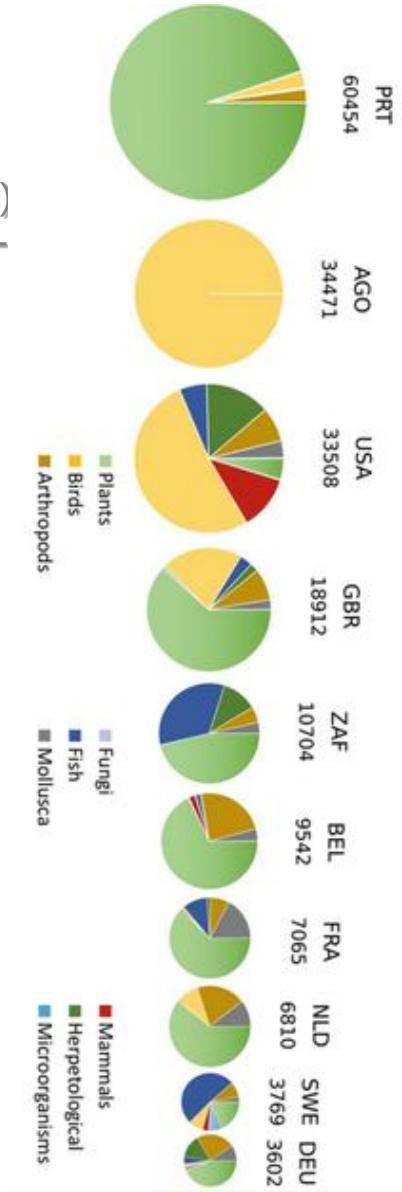
Pearson, K.D. International Journal of Biometeorology (2019). https://doi.org/10.1007/s00484-019-01679-0

Fig. 1
US Southeastern Coastal Plain region selected for sampling of herbarium specimen records (outlined in black). Note the relatively flat topography. Although it is not generally considered within the SECP, south Florida was included to maximize sample size. The northernmost regions of the SECP, including Virginia, Maryland, New Jersey, New York, Connecticut, Rhode Island, and Massachusetts were excluded to reduce the effect of latitude on statistical results. Map created by DEMIS BV and made available via https://commons.wikimedia.org/wiki/File:Map_of_USA_topological.png

Museum and Herbarium Collections for Biodiversity Research in Angola

Figueira R., Lages F. (2019). In: Huntley B., Russo V., Lages F., Ferrand N. (eds) Biodiversity of Angola. Springer, Cham https://doi.org/10.1007/978-3-030-03083-

- helping nations to aggregate their own biodiversity resources currently distributed outside their borders (justice)
- taxonomy
- chaos prevention
- preserving and documenting biodiversity
- detecting changes in species distributions and in the environment
- biodiversity conservation
- supporting sustainable food production
  - weed identification, crop wild relatives conservation, control of damage caused by insects and fungi, seed bank collections, and wood samples
- connecting biodiversity to society through education



150 years in the making: first comprehensive list of the ants (Hymenoptera: Formicidae) of Virginia, USA

Kaloyan Ivanov, Liberty Hightower, Shawn T. Dash, Joe B. Keiper

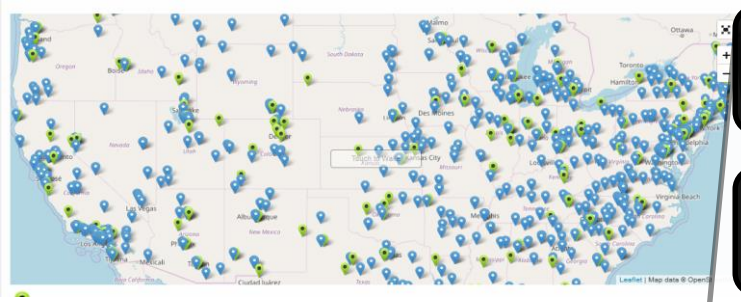
http://dx.doi.org/10.11646/zootaxa.4554.2.8

Abstract

Due to Virginia's geographic location, topographic variability, and diversity of physiographic provinces, the state ranks as one of the most biodiverse areas in the US. Virginia's myrmecofauna, however, has been insufficiently studied and is not well known. Here we present the first comprehensive list of the ants of Virginia and provide county-level distributions for all taxa. With taxonomic updates taken into account, review of published records revealed that 130 species have been reported from the state. We add another 34 species based on newly collected materials, review of museum and personal collections, and online databases. At present, 164 species and morphospecies, including 15 ant exotics, are known to occur in the state. Another 12 species are provisionally excluded from the list as they represent distribution anomalies, or are based on erroneous records. The work presented here is an initial step towards a more complete treatment of the identification, taxonomy, and natural history of the ant fauna of Virginia.

Metrics

current and future



- Who needs metrics?
  - administrators, researchers, funders, policy makers, managers, directors
- What can we expect?
  - GBIF – GRBio
  - FishfindR.net
  - DiSSCo Digitization Dashboard
  - US Collections …
- How to contribute

Data | Flags | Raw

Type	Descri
dwc_taxonrank_added	Darwi
dwc_family_replaced	Darwi Backb
dwc_taxonid_replaced	Darw GBIF
gbif_canonicalname_added	GBI
dwc_taxonomicstatus_added	Dar pro
gbif_genericname_added	GB
dwc_scientificnameauthorship_replaced	
dwc_datasetid_added	D
idigbio_isocountrycode_added	iD
gbif_taxon_corrected	A t
dwc_continent_added	D
dwc_parentnameusageid_added	D

global

journal

aggregator

institution

collection

identification

collector

Shining a New Light on the World's Collections

Vince Smith (NHM), Deborah Paul (iDigBio), Matt Woodburn (NHM), Sharon Grant (FM), Randy Singer (iDigBio), Kevin Love (iDigBio)

- Picture looking online anytime to see the state of the world's collections and get access to them.

https://www.idigbio.org/content/shining-new-light-world%E2%80%99s-collections

bloodhound-tracker.net

or why use identifiers (people, names, specimens, …)

Home Profiles Organizations Agents Integrations Feedback About Deborah Paul Logout

Anne Elizabeth Howden

(July 19, 1927 – September 09, 2016)

Also known as

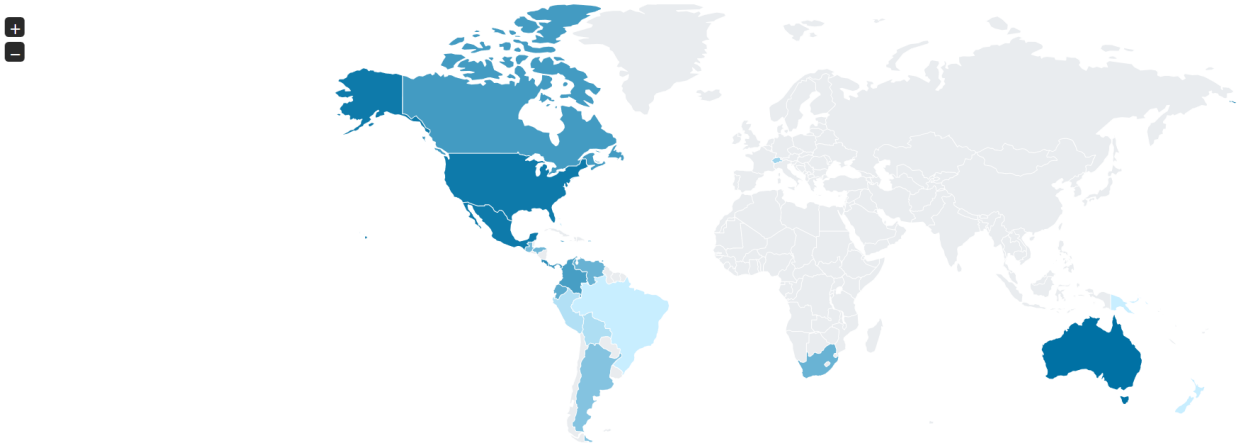
Anne E. Howden; Anne Elizabeth Howden; Anne T. Howden; Anne Thompson

https://www.wikidata.org/wiki/Q61857482

1 Field note

Overview Specialties Co-collectors Identified For Identifications By Deposited At Citations Specimens

Identified 334 specimens. Collected 4,157 specimens from at least 25 countries.



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or why use identifiers – added value for everyone

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Also known as

Anne E. Howden; Anne Elizabeth Howden; Anne T. Howden; Anne Thompson

https://www.wikidata.org/wiki/Q61857482

1 Field note

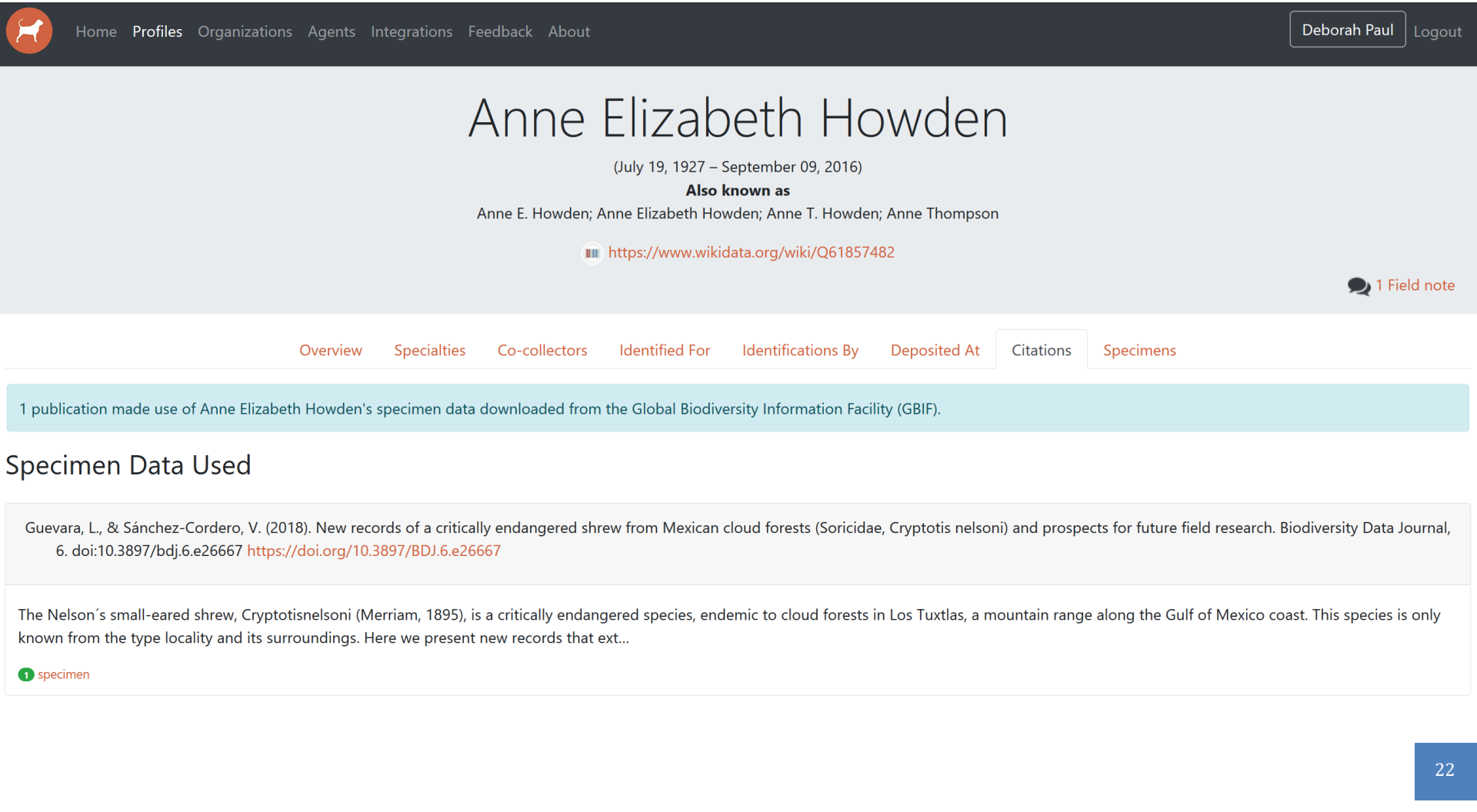
Overview Specialties Co-collectors Identified For Identifications By Deposited At Citations Specimens

collected or identified 4,463 specimens

Scientific Name	Collected By	Identified By	Date Collected	Date Identified	Institution	Catalog Number	Type Status
Stereodermus denisi Mantilleri & Sforzi, 2006	Howden H. & Howden A.	Mantilleri A. & Sforzi A.	1990-05-31		MNHN	EC1911	paratype(s)
Thalycra orientalis	Howden, Henry F.; Howden, Anne T.; Malt		1954-05-22		CMN	CMNEN 00014397	paratype
Thalycra orientalis	Howden, Henry F.; Howden, Anne T.; Malt		1954-10-20		CMN	CMNEN 00014398	paratype
Thalycra orientalis	Howden, Henry F.; Howden, Anne T.; Malt		1955-06-10		CMN	CMNEN 00014399	paratype
Bolborhachium hollowayi	Howden, Henry F.; Howden, Anne T.		1981-09-30		CMN	CMNEN 00017737	paratype
Eucatops (Eucatops) spiralis	Howden, Henry F.; Howden, Anne T.		1979-02-23		CMN	CMNEN 00010063	paratype
Coelocephalapion goldilox	Howden, Henry F.; Howden, Anne T.		1977-06-01 - 1977-06-07		CMN	CMNEN 00007184	paratype
Bolborhachium nanum	Howden, Henry F.; Howden, Anne T.		1975-07-16		CMN	CMNEN 00017665	paratype
Levites angustus	Howden, Henry F.; Howden, Anne T.		1993-06-11		CMN	CMNEN 00016222	paratype
Stenaspidius spatuliferus	Howden, Henry F.; Howden, Anne T.		1981-08-27 - 1981-08-28		CMN	CMNEN 00017789	paratype

bloodhound-tracker.net

or why use identifiers (people, names, specimens, …)



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or why use identifiers (people, names, specimens, …)

Home Profiles Organizations Agents Integrations Feedback About Deborah Paul Logout

Torsten Dikow

Country
United States of America

Organization
Smithsonian Institution, Washington, DC, US

https://orcid.org/0000-0003-4816-2909

Field notes

Overview Specialties Co-collectors Identified For Identifications By Deposited At Citations Specimens

2 publications made use of Torsten Dikow's specimen data downloaded from the Global Biodiversity Information Facility (GBIF).

Specimen Data Used

Figueira, R., & Lages, F. (2019). Museum and Herbarium Collections for Biodiversity Research in Angola. Biodiversity of Angola, 513–542. doi:10.1007/978-3-030-03083-4_19 https://doi.org/10.1007/978-3-030-03083-4_19

The importance of museum and herbarium collections is especially great in biodiverse countries such as Angola, an importance as great as the challenges facing the effective and sustained management of such facilities. The interface that Angola represents between tropical humid climates and semi-dese...

11 specimens

Park, D. S., & Razafindratsima, O. H. (2018). Anthropogenic threats can have cascading homogenizing effects on the phylogenetic and functional diversity of tropical ecosystems. Ecography, 42(1), 148–161. doi:10.1111/ecog.03825 https://doi.org/10.1111/ecog.03825

Determining the mechanisms that underlie species distributions and assemblages is necessary to effectively preserve biodiversity. This cannot be accomplished by examining a single taxonomic group, as

from bloodhound to GBIF

added value for everyone

Get data Share Tools Inside GBIF Login

Synced 3 months ago

OCCURRENCE | 25 FEBRUARY 1972

Prytanomyia kochi Lindner, 1973

Collected in Angola

Animalia › Arthropoda › Insecta › Diptera › Asilidae › *Prytanomyia*

Collected By

Torsten Dikow https://orcid.org/0000-0003-4816-2909

Cited By

Figueira, R., & Lages, F. (2019). Museum and Herbarium Collections for Biodiversity Research in Angola. Biodiversity of Angola, 513–542. doi:10.1007/978-3-030-03083-4_19 https://doi.org/10.1007/978-3-030-03083-4_19

Species: Prytanomyia kochi Lindner, 1973

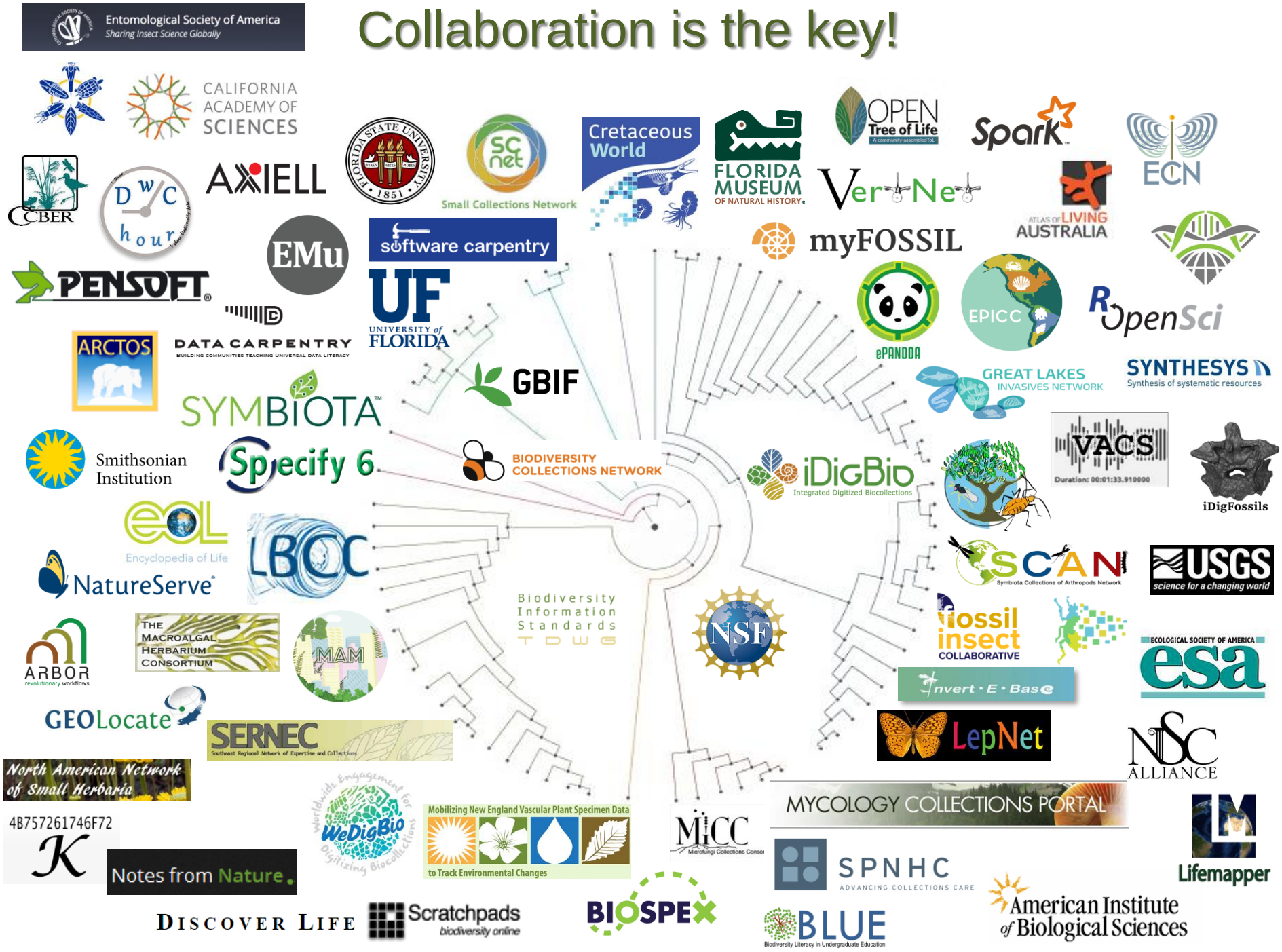
Location: Angola

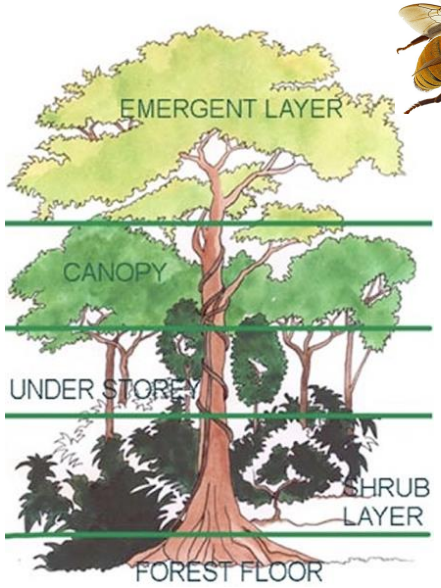
Basis of record: Preserved specimen

Dataset: Occurrence data of Prytanomyia (Diptera: Asiloidea: Asilidae)

Publisher: National Museum of Natural History, Smithsonian Institution

Collaboration is the key!





Imagine yourself doing entomology into the 22nd century with everything that you need. What's possible? How do we get there?

facebook.com/iDigBio

twitter.com/iDigBio

vimeo.com/idigbio

idigbio.org/rss-feed.xml

webcal://www.idigbio.org/events-calendar/export.ics

www.idigbio.org

iDigBio is funded by grants from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program [DBI-1115210 (2011-2018) and DBI-1547229 (2016-2021)]. 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.