

AIM-UP!

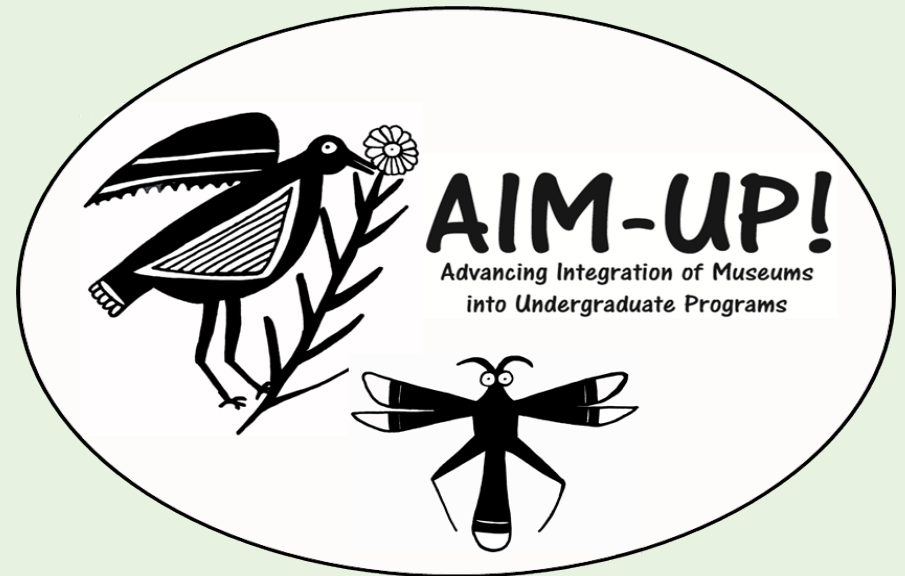
Bringing big data to educators at
small institutions

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Northern Michigan University

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Museum of Southwestern
Biology



Traditional Roles for Museums in Education



Student
experiences in
field work and
specimen curation



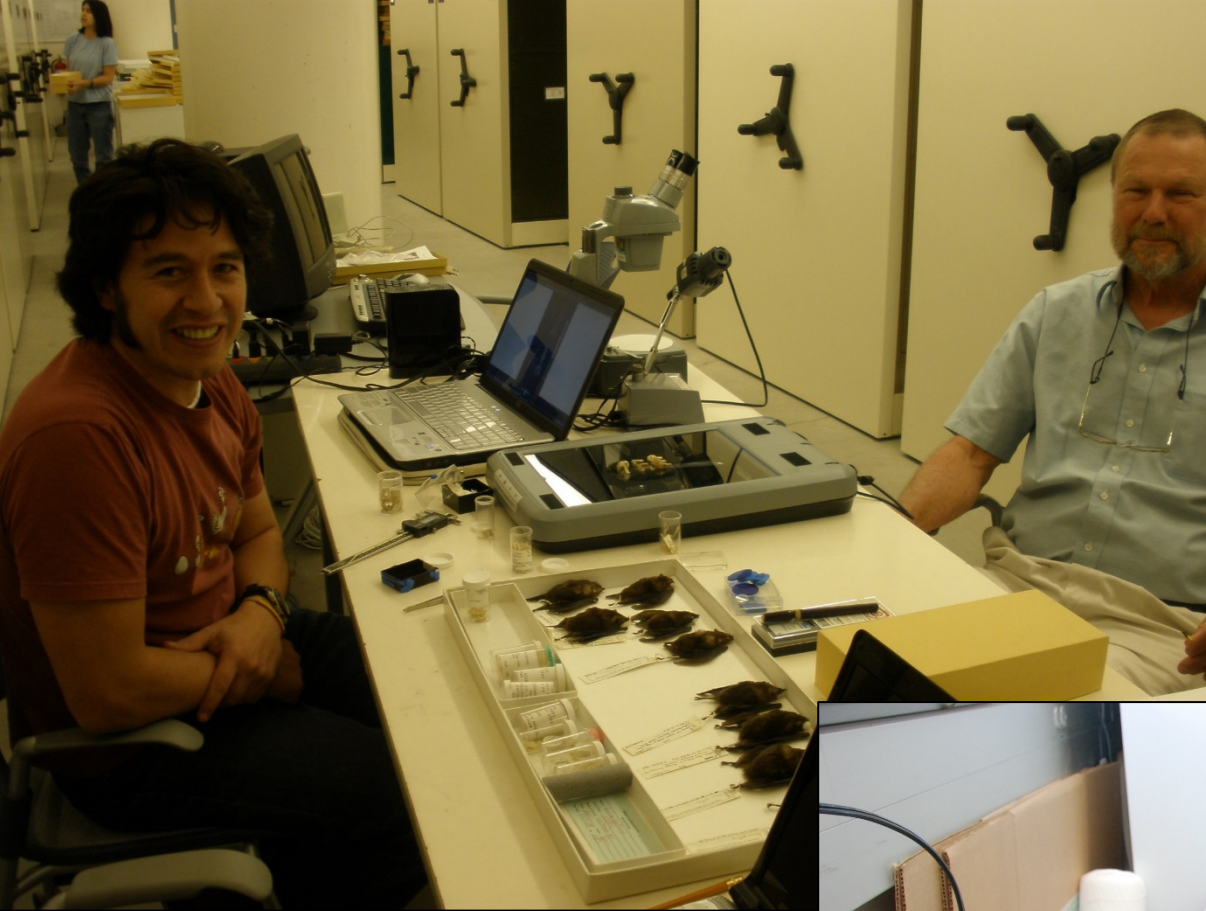
Traditional Roles for Museums in Education



Classroom/lab
demonstrations
and public
exhibits



Traditional Roles for Museums in Education



Specimen-based
student research
experiences



What does collections-based teaching add to undergraduate education?

- Inspiration!
- Fundamental skills
 - Natural history
 - Manipulating data
 - Scientific process
- Integration...
 - across time and space
 - between biotic and abiotic
 - from genomes to organisms to ecosystems



Obstacles to collections-based teaching

Educators often...

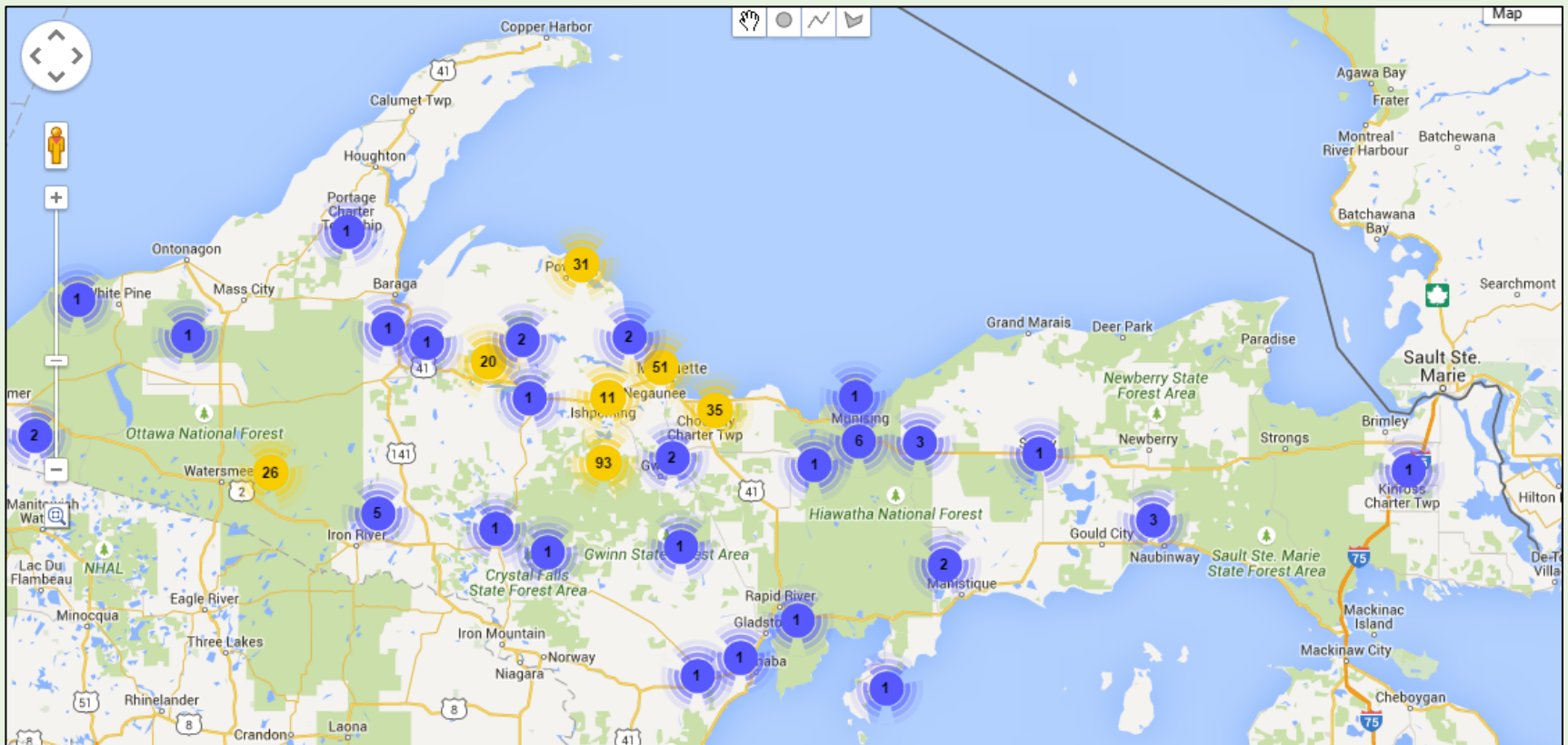
- don't understand how museums contribute to science and society
- don't have access to robust natural history collections
- don't know how to access museum data

Problems are especially acute at small institutions



E. g., Northern Michigan University

- ~7800 students; ~750 student biology majors
- Small collections with limited resources



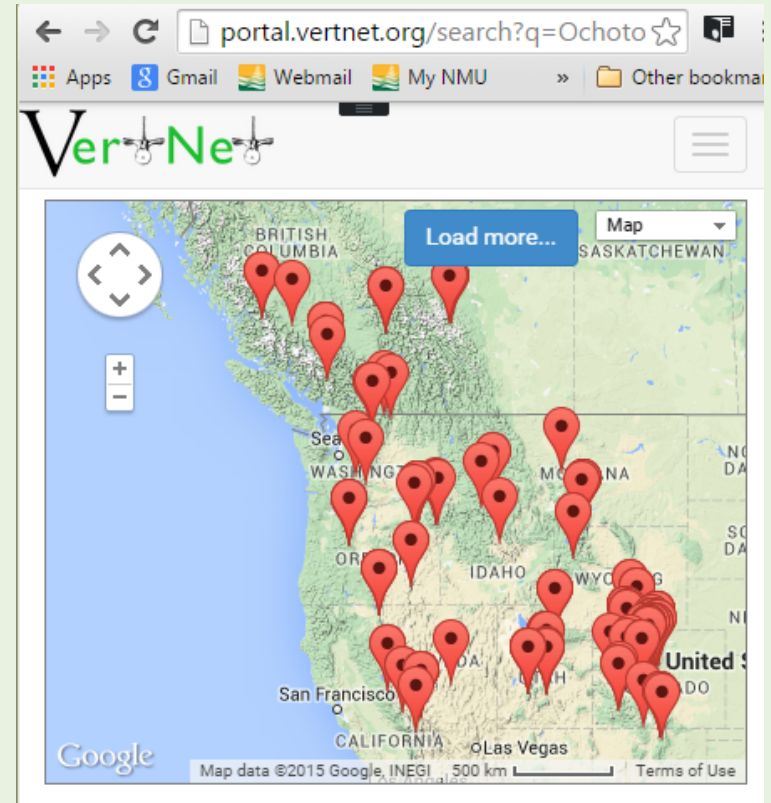
Mammal collection currently has <500 specimens.

What can be accomplished with this?

Improvements to data accessibility offer potential to engage a broader audience...

E. g., VerNe

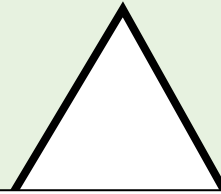
- 17,727,066 records
- 276 collections
- 87 publishers
- user-friendly search and mapping tools



... but alone fall short of educational tools.

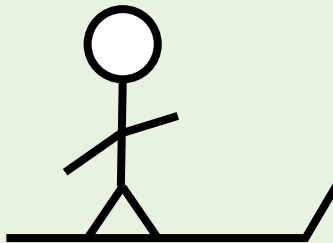
The challenge educators face:

Educational Goal



- What's the question?
- What data do I need?
- Where do I get data from?
- How do I use the database?
- How do I manipulate the data so that they are useful to me?
- How do I analyze the data?
- How do I interpret the results?
- What concepts will not be taught to make time during the semester?
- Did I achieve the educational goal?

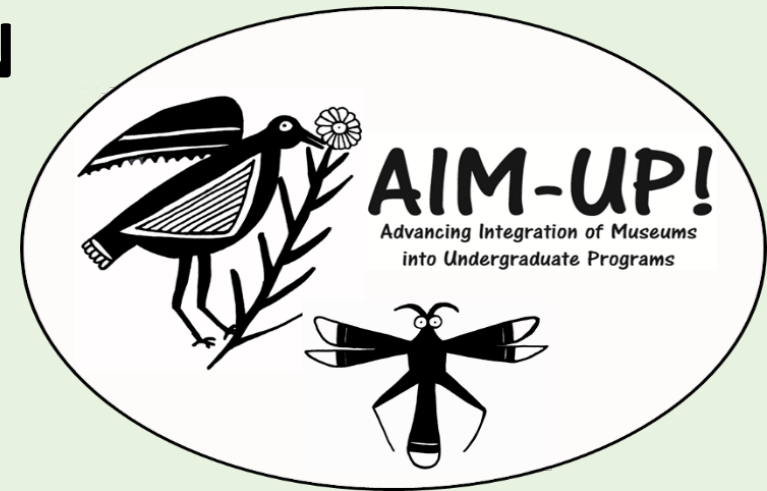
Student



AIM-UP! NSF-funded RCN

Expanding beyond traditional museum experiences by...

- promoting museum literacy
- increasing accessibility of natural history collections to educators/public
- developing tools to facilitate database use by educators/students
- partnering with non-traditional museum users (e.g., Behavior, Geography, Art)



AIM-UP! – the network

Universities, Community Colleges and Tribal Colleges: U Alaska, UC Berkeley, Harvard U, U New Mexico*, U Michigan, Texas A&M, U Texas, U Colorado, U Arizona, U Kansas, CNM, NM Highlands University, Ohio State U, Occidental College, Northern Arizona U, U of Florida, Massachusetts College of Liberal Arts, U of Idaho, Arizona State U, U of Florida, Tulane, Idaho State U, Northern Michigan U, Central Michigan U, U Nebraska, College of Southern Nevada, U of Hawai'i, City U of New York, U of Oklahoma, U Nevada, Michigan State U

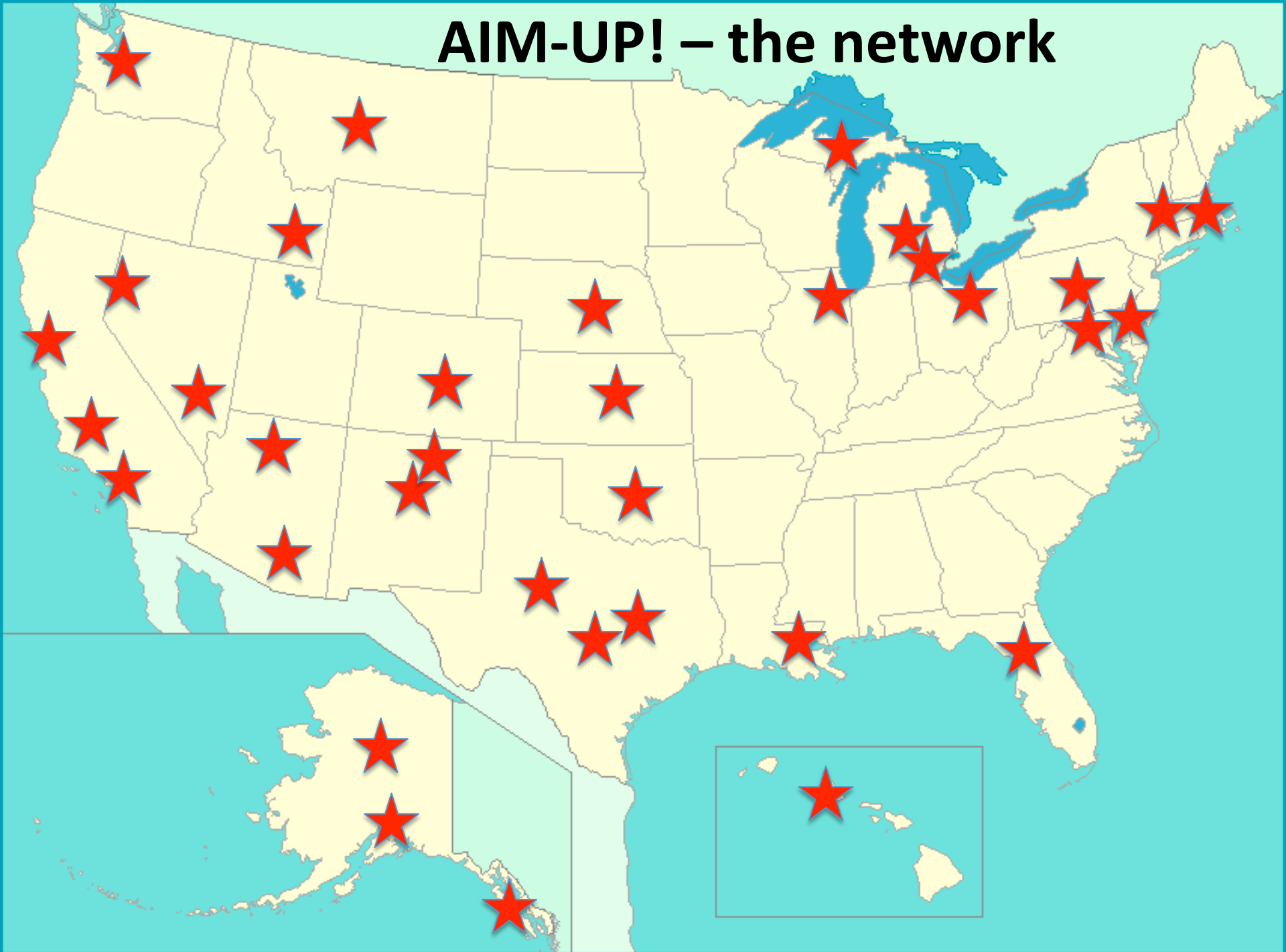
Agencies and Free-standing Museums: USDA National Parasite Lab, USGS Molecular Ecology Lab, US NMNH, Denver Museum of Nature & Science, NY State Museum, NPS, Florida MNH, NMMNH

International: U Guelph, U Nacional de la Republica (Montevideo)

High Schools: Highland High (urban) and Sitka High (rural)

*original network participants

AIM-UP! – the network



Building the network – promoting dialogue around annual conceptual themes:

- 1) Integrative Inventories: Exploring Complex Biotic Associations Across Space and Time (MSB)
- 2) Making Sense of Geographic Variation (UAM)
- 3) Evolutionary Dynamics of Genomes (MCZ)
- 4) Biotic Response to Climate Change (MVZ)
- 5) Coevolving Communities and the Human Dimension (MSB)

Natural History Collections as Emerging Resources for Innovative Education

JOSEPH A. COOK, SCOTT V. EDWARDS, EILEEN A. LACEY, ROBERT P. GURALNICK, PAMELA S. SOLTIS, DOUGLAS E. SOLTIS, COREY K. WELCH, KAYCE C. BELL, KURT E. GALBREATH, CHRISTOPHER HIMES, JULIE M. ALLEN, TRACY A. HEATH, ANA C. CARNAVAL, KIMBERLY L. COOPER, MARK LIU, JAMES HANKEN, AND STEFANIE ICKERT-BOND

BioScience
2014
64: 725–734

AIM-UP! Educational Modules

- online resources to help educators use museum specimens and/or data to enhance their teaching

[Educational Modules & Tutorials](#) >


Island Biogeography


Island Biogeography Module

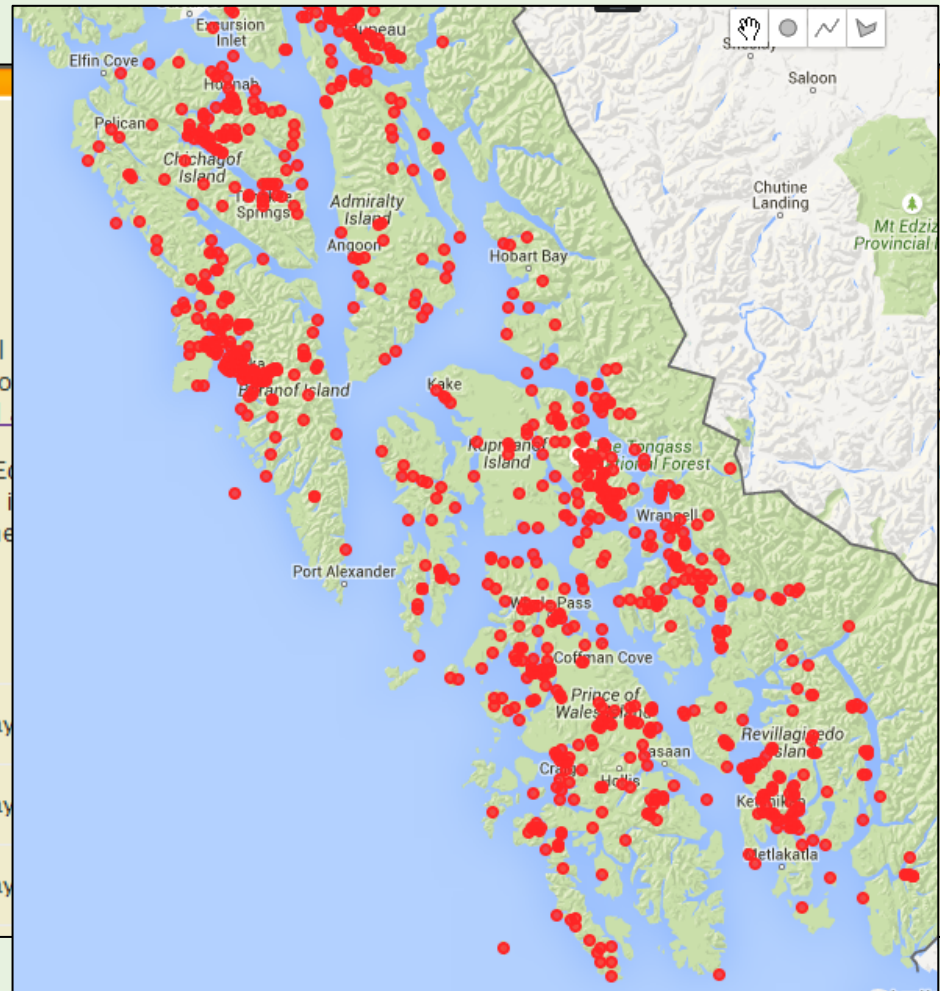
This module guides students through tests of two fundamental Archipelago in Southeastern Alaska. The module was designed for Mexico. Instructors may find it useful to also use the [How to Read](#)

There are three attachments at the bottom of this page. The Excel required to complete the activity. The Data.xls document in Module_Feedback.doc is feedback to let us know how you used the

 [Data.xls.xls](#) (32k)

 [EducationalModule_2012Islands.pdf](#) (408k)

 [Module_Feedback.doc.doc](#) (24k)



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Modules leverage specimen data to teach a variety of concepts, including:

- Introduction to natural history collection data
- Introduction to GIS
- How to read a scientific paper
- Influence of climate change on plant morphology
- Introduction to phylogenetics
- Plant biogeography and ecology

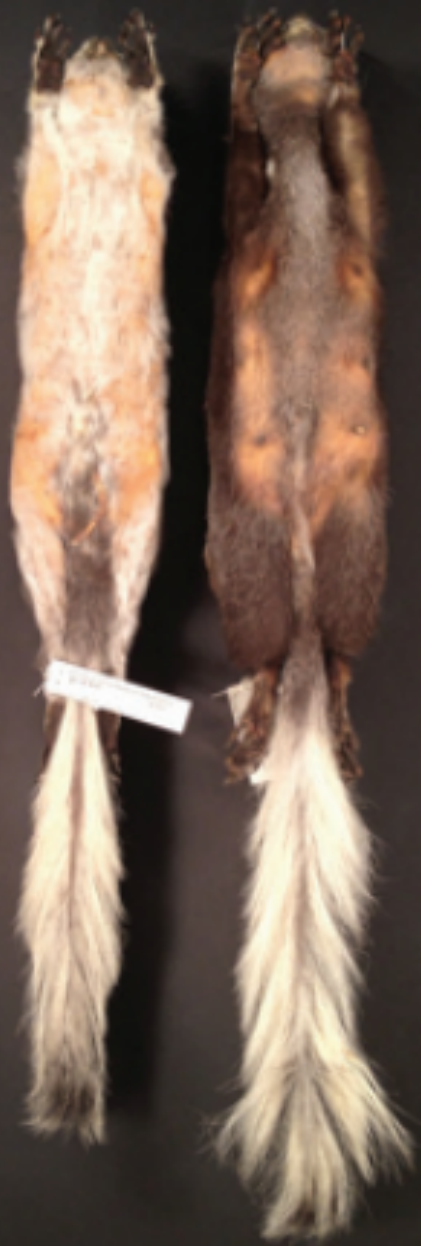
Goal is to make the benefits of collections-based education universally available.

AIM-UP! Educational Collaborations



Bringing student artists into the museum to develop new ways to convey/teach biological concepts



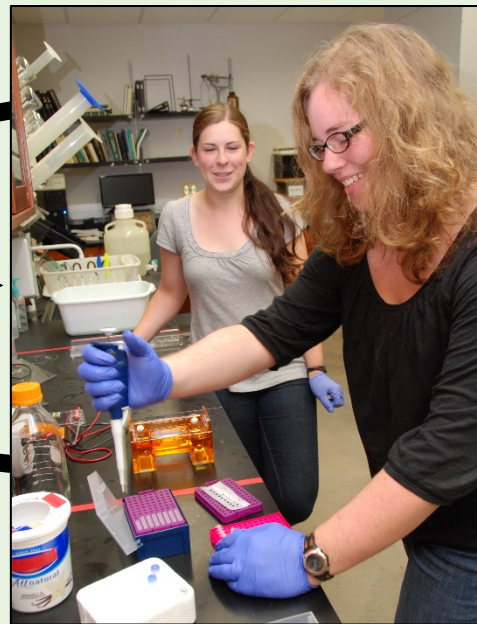


AIM-UP! Network Participants: providing models for place-based student learning

Specimen-based, place-based discovery...



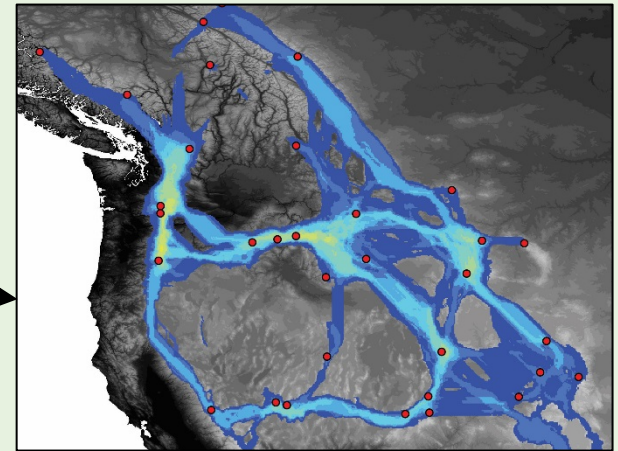
...can lead to student-centered activities focused on...



...genomic variation,...

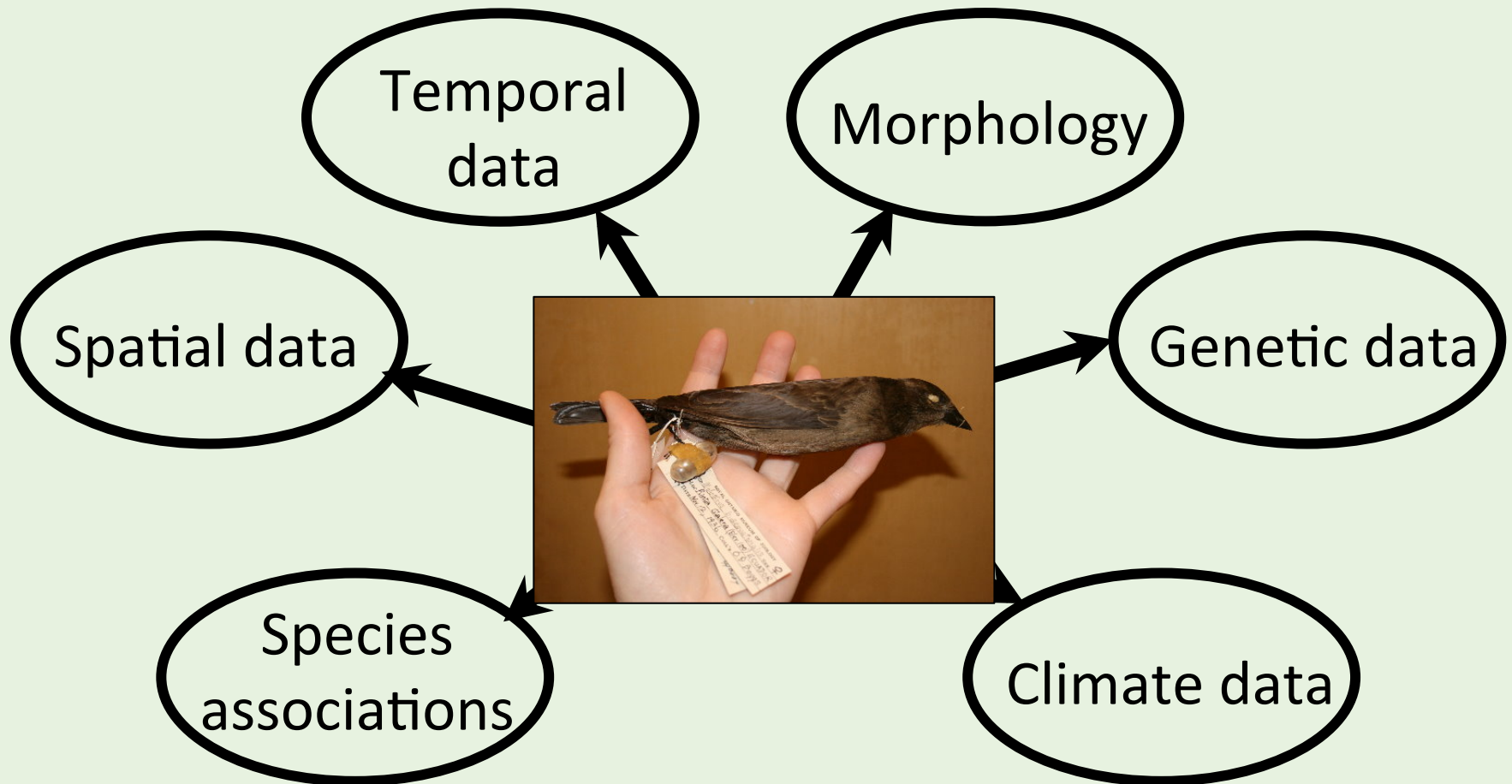


...morphology,...



...gene flow, ecological niche, biogeography, etc.

What does Big (collections) Data bring to small institutions (the front lines for undergraduate biology education)?



The opportunity at small institutions:

To train the next generation of museum biologists...

...and ecologists, wildlife managers, teachers, conservation biologists, economists, doctors, neuroscientists, climate change scientists, veterinarians, chemists, business owners, etc...



**Are you interested in helping to build a
biologically-literate and museum-aware
society?**

New members of the AIM-UP! network
are welcome and encouraged!

Contact Joseph Cook - cookjose@unm.edu
Museum of Southwestern Biology
University of New Mexico