Paleoniches: digitizing fossils to enable new syntheses in biogeography

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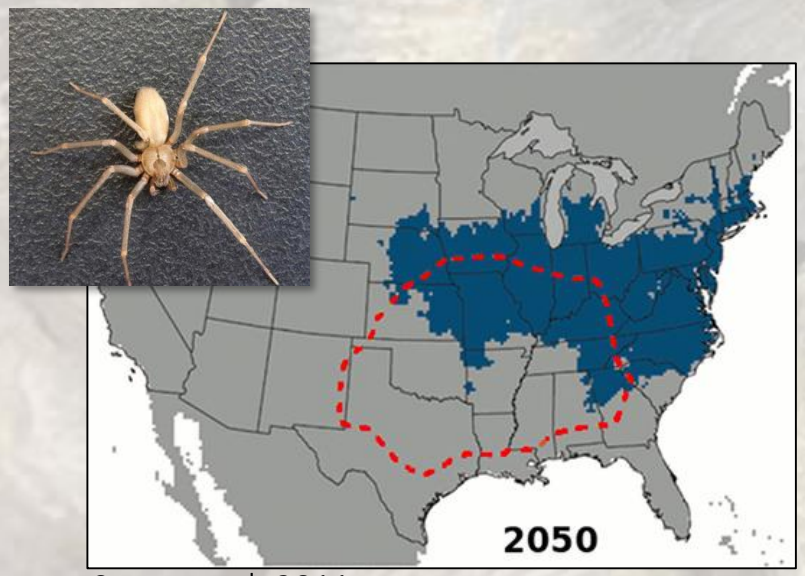
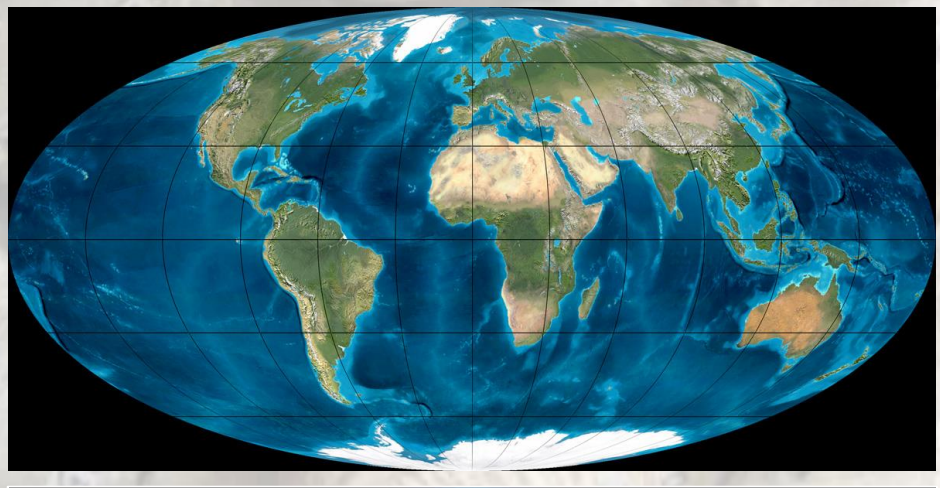
University of Kansas, Biodiversity Institute
Paleodigitization Workshop Sept 23-25 2013

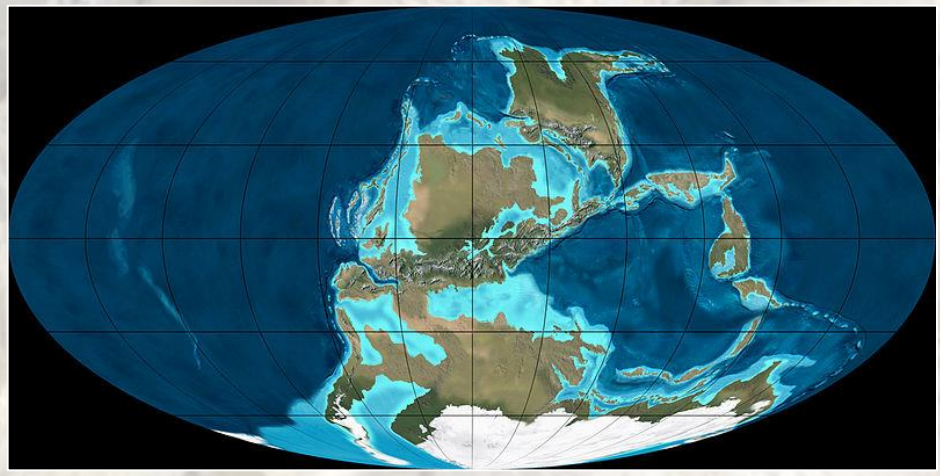
Biodiversity Science and Paleontology

How do species respond to environmental change through time?



Saupe et al. 2011





~546,000 invertebrate fossil specimens

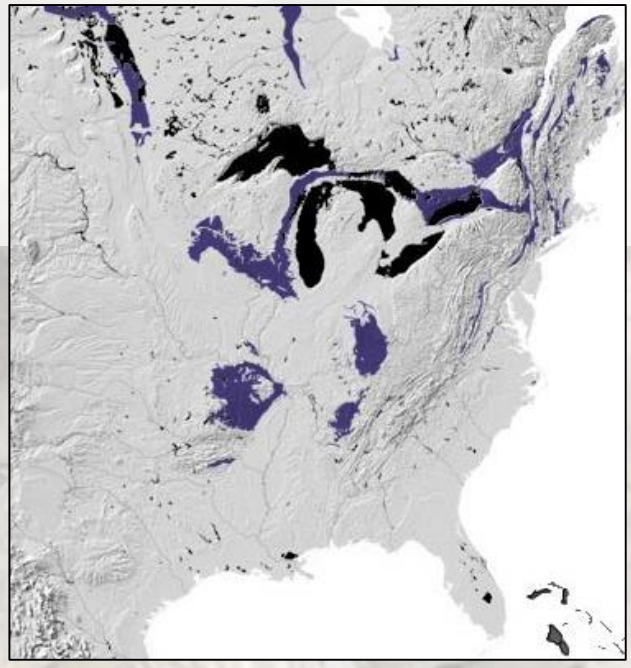
~20,000 localities

8 institutions

3 major time periods/biogeographic regions

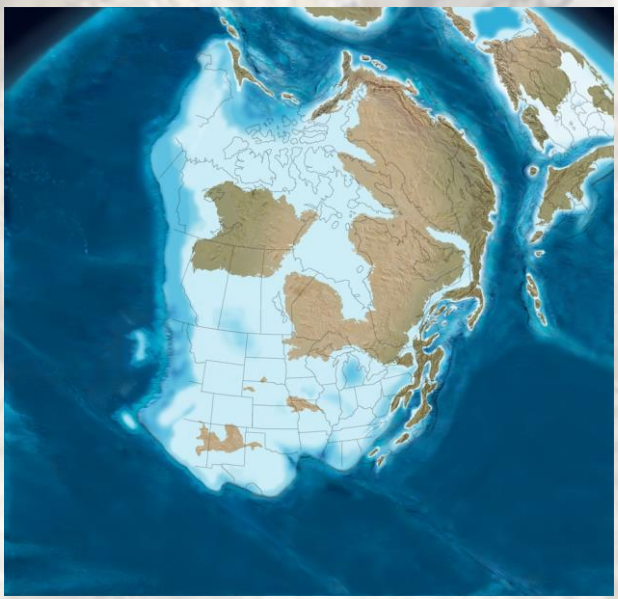
Ordovician – Cincinnati Region

485 - 443 Ma



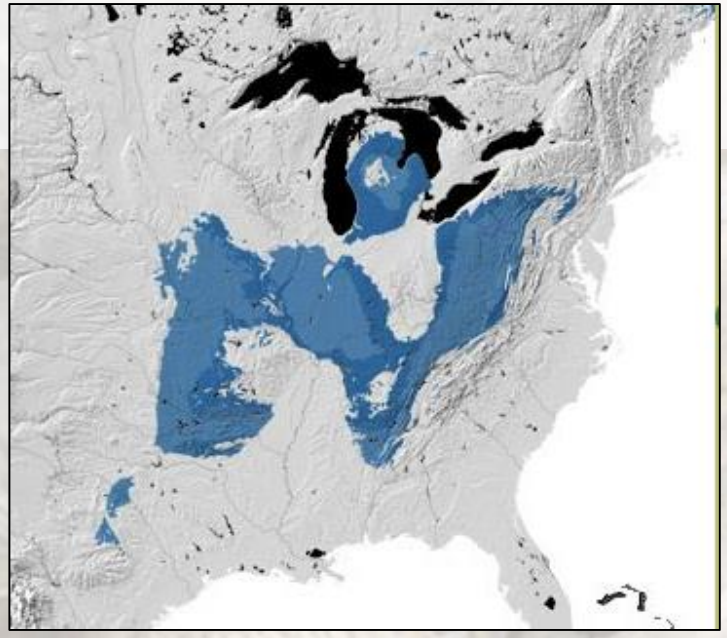
Ohio University Zoological Collections
Cincinnati Museum Center
Karl E. Limper Geology Museum (MUGM)
Yale Peabody Museum
Texas Natural Science Center

>2000 localities
>100,000 specimens
~115 species



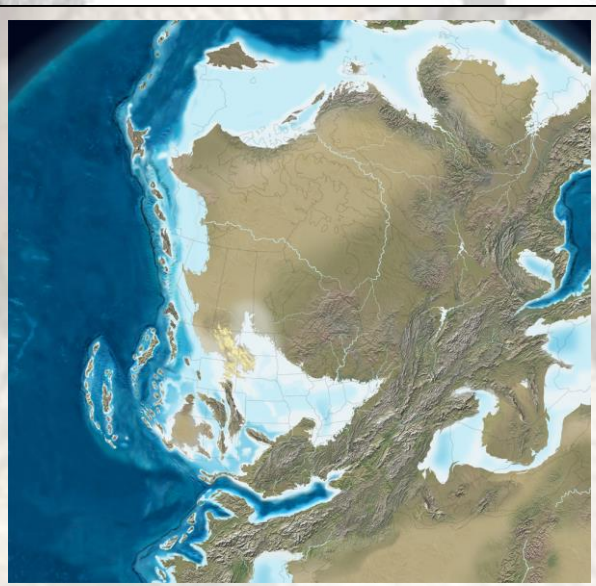
Pennsylvanian – U.S. Midcontinent

323 - 298.9 Ma



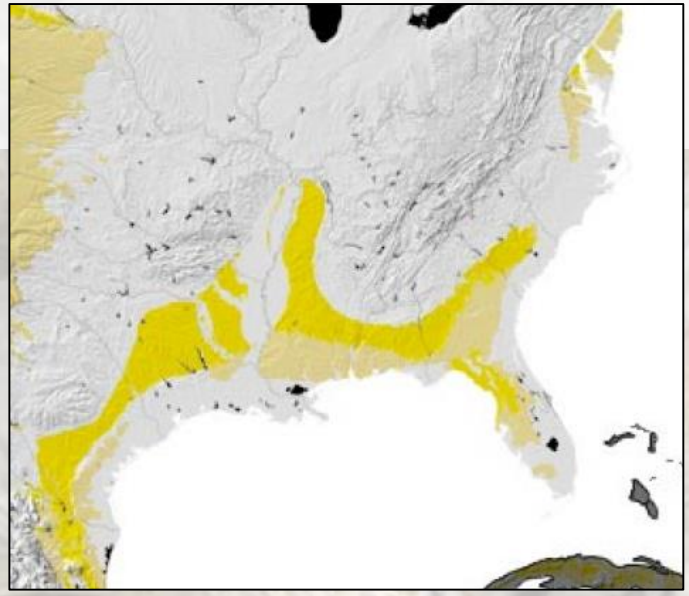
University of Kansas, Biodiversity Institute
Yale Peabody Museum
Texas Natural Science Center

~7,000 localities
>170,000 specimens
~240 species



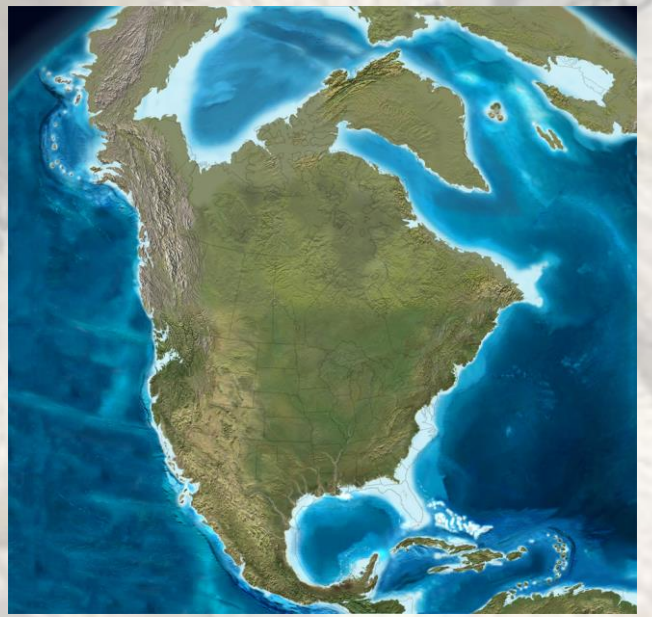
Neogene – Gulf/Atlantic Coastal Plain

23 - 2.6 Ma

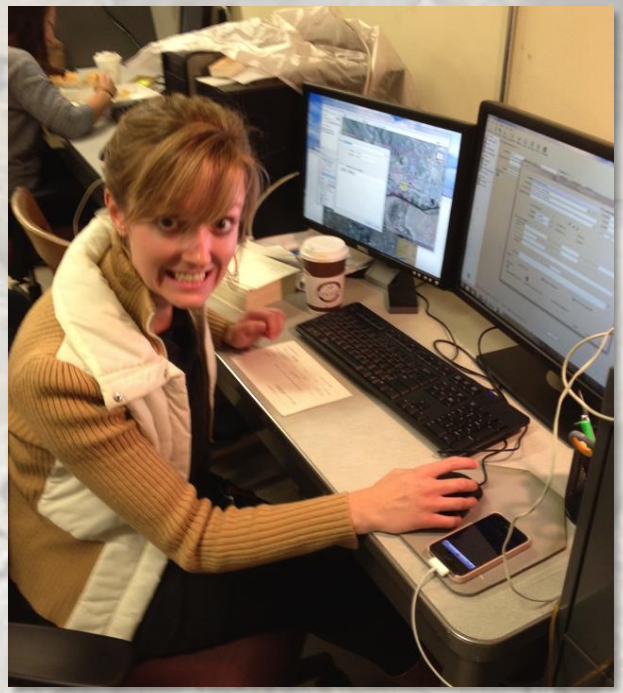


Florida Museum of Natural History
Yale Peabody Museum
Texas Natural Science Center

>3000 localities
176,615 specimens
~500 species

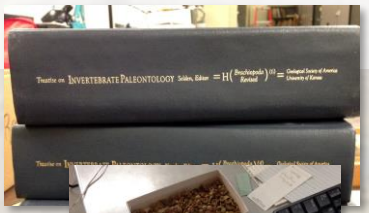


Data Collection



Workflows

Identify/Sort



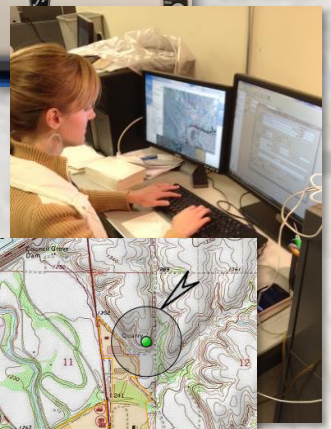
Assign numbers

Database

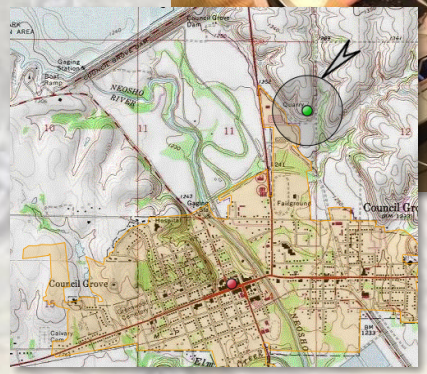
Print new label

Scan locality cards

Proofread



Georeference



Photograph representative specimens

Records linked in Specify

Make data available

iDigBio, GBIF, Specify online, Digital Atlases

Georeferencing

Protocol: GBIF (Global Biodiversity Information Facility) Best Practices

Specify 6

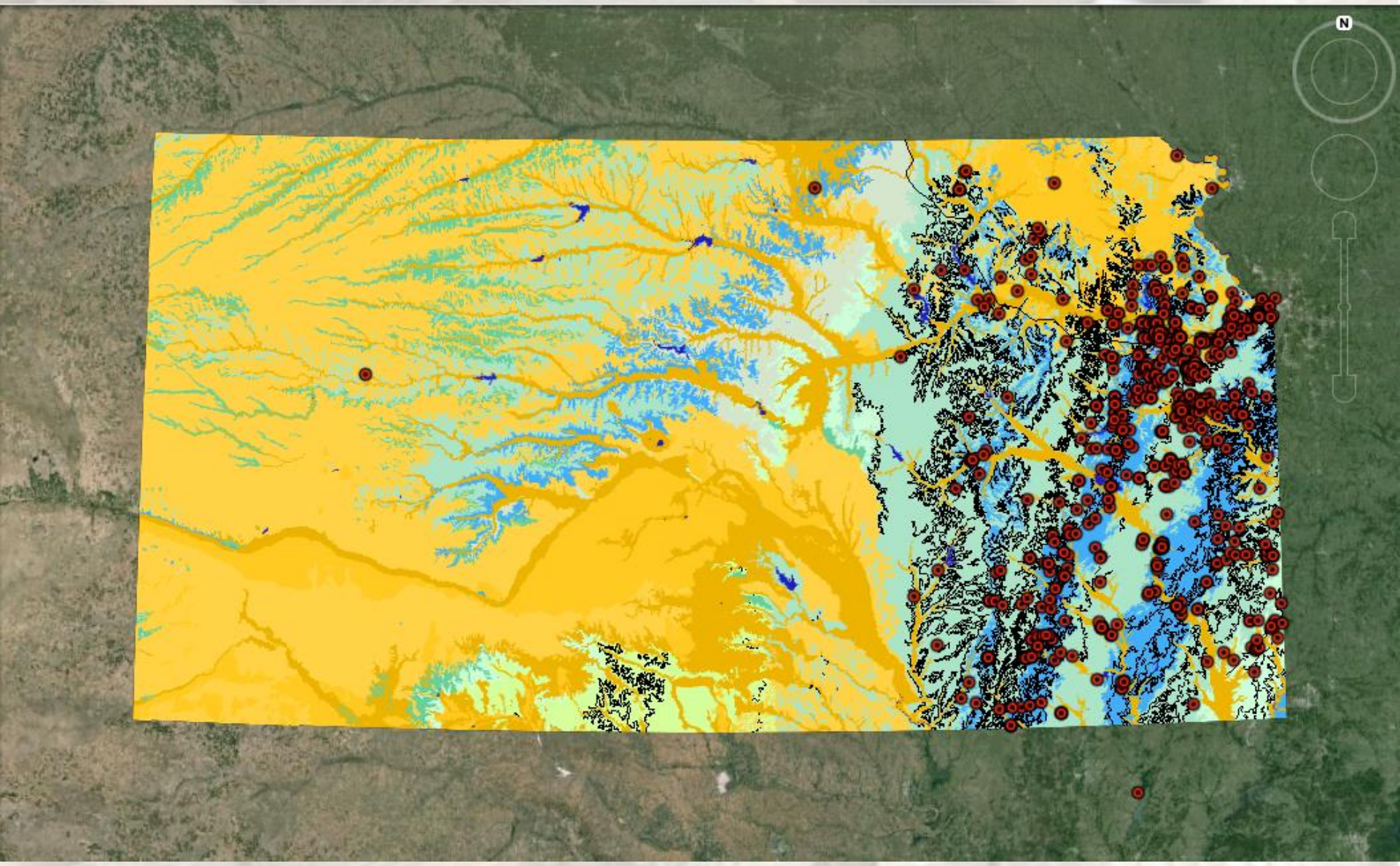
KE EMu
ELECTRONIC MUSEUM

GEOLocate

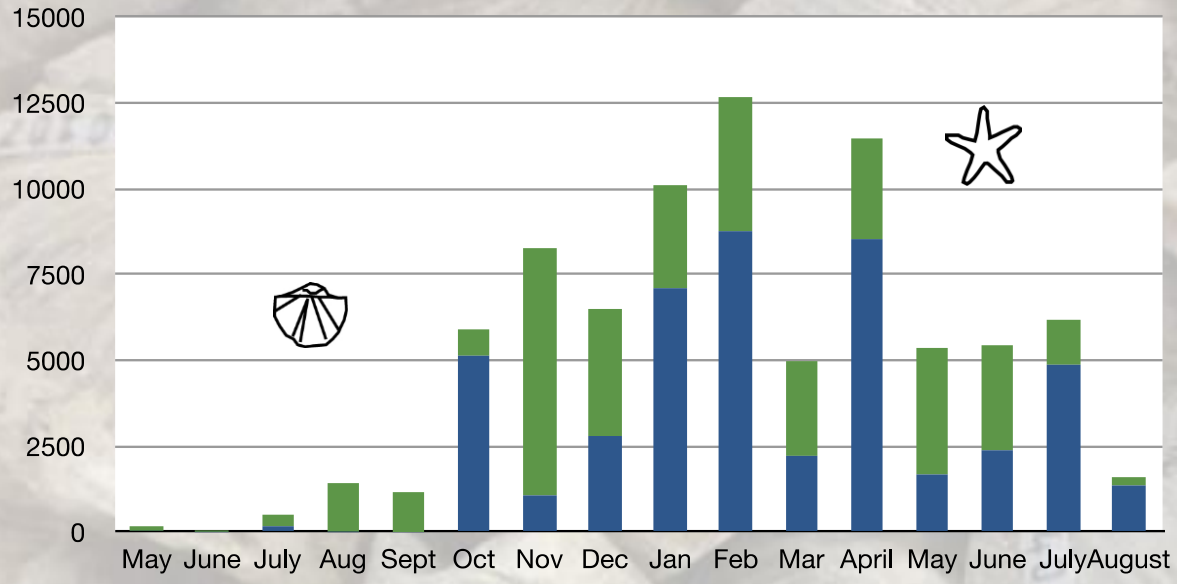
iDigBio
Integrated Digitized Biocollections

Georeferencer's Trained-to-train:

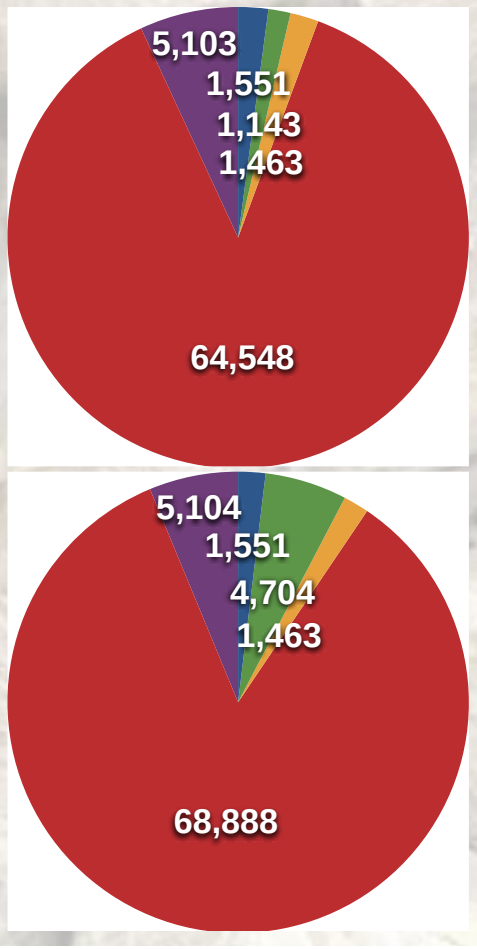
Hannah Braeme, Ohio University
Una Farrell, University of Kansas
Michelle Casey, University of Kansas
Nina Abdollahian, San Jose State
Jessica Utrup, Yale University
Liath Appleton, Texas Natural Science Center


N

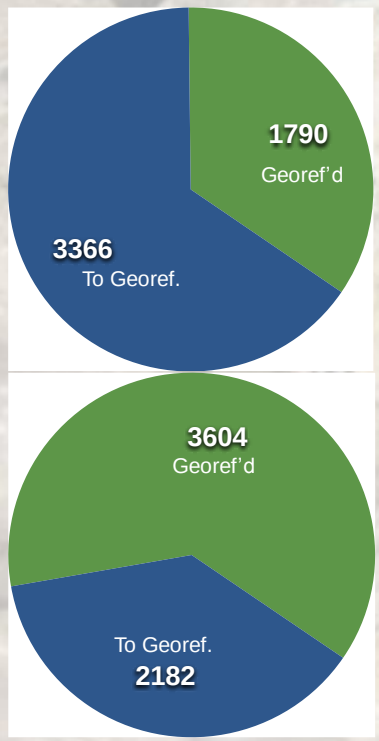
Specimens per month



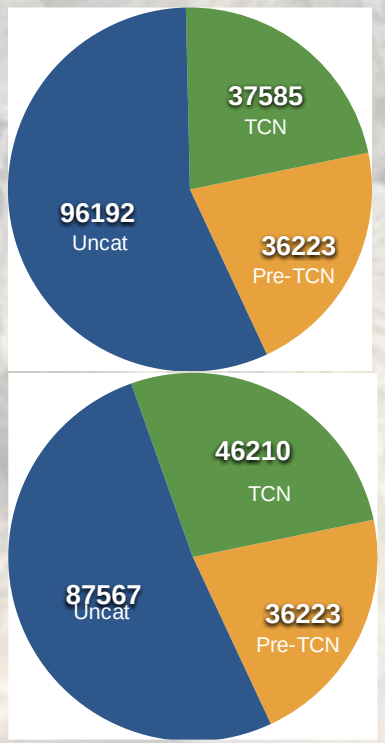
Taxonomic Breakdown



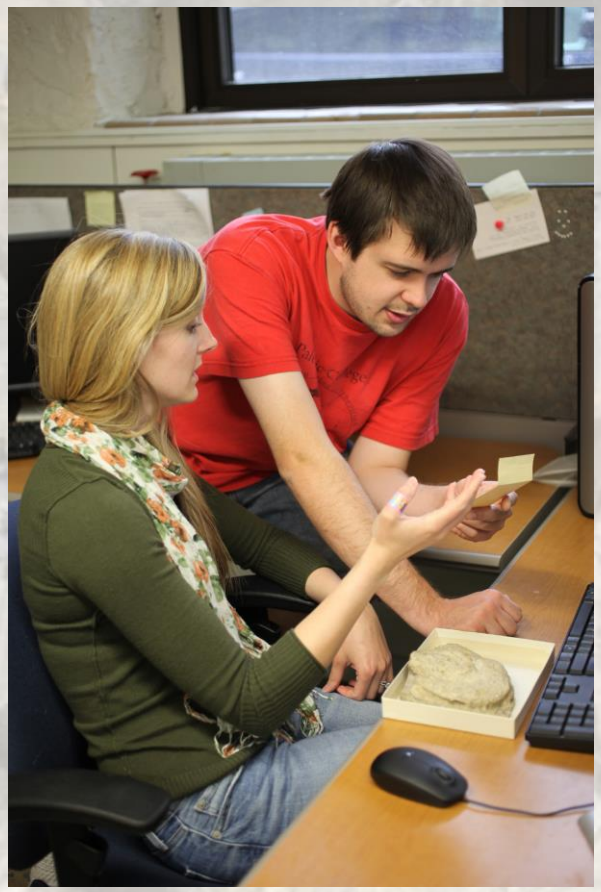
Pennsylvanian Localities



Pennsylvanian Specimens



Data Use

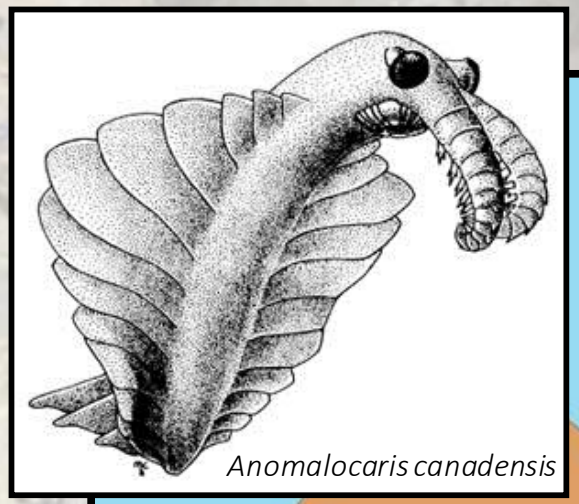


Using GIS to study palaeobiogeographic and macroevolutionary patterns in soft-bodied Cambrian arthropods – *Hendricks, Lieberman and Stigall, 2008*

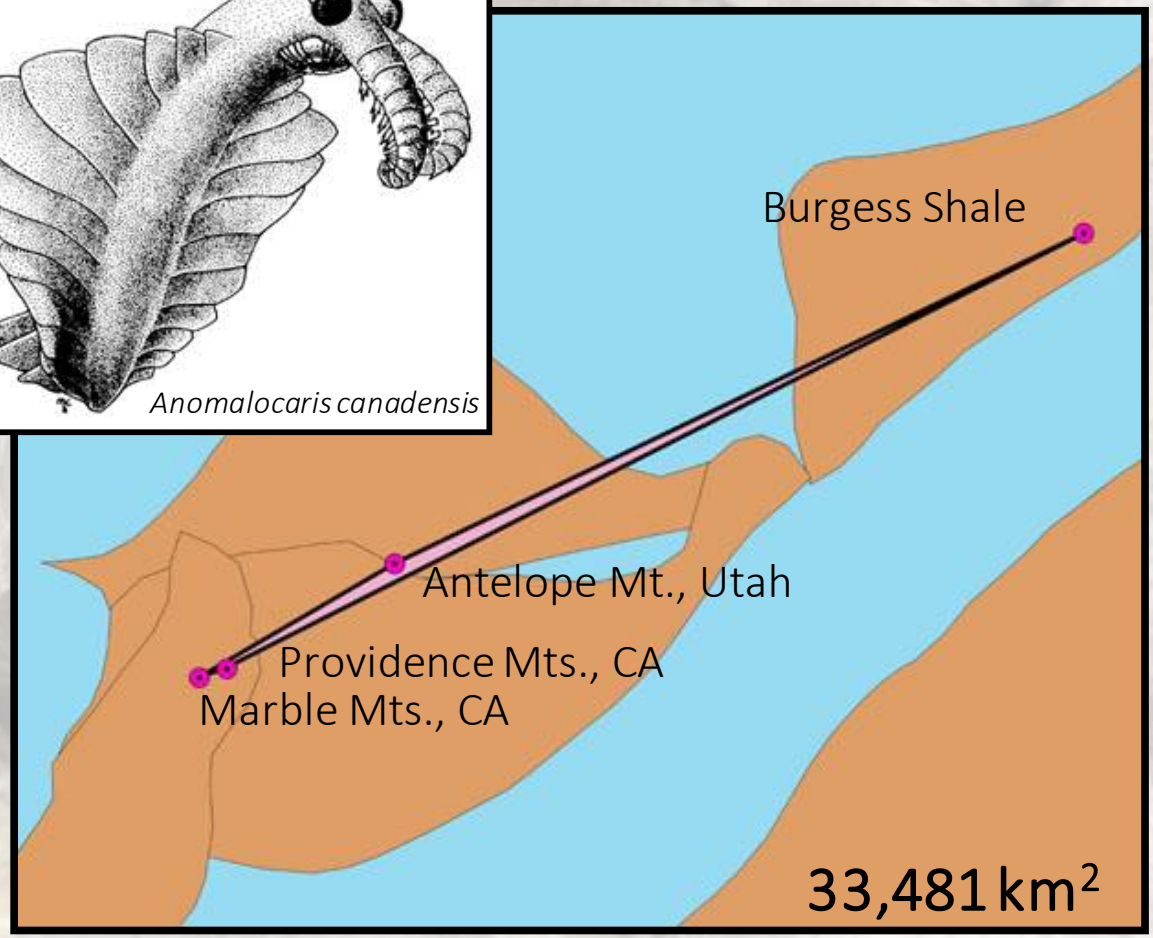
Aim: Compare distribution patterns of soft-bodied arthropod species to co-occurring trilobites.

51 localities, 284 species

Soft-bodied Cambrian arthropods show larger range and greater stratigraphic longevity



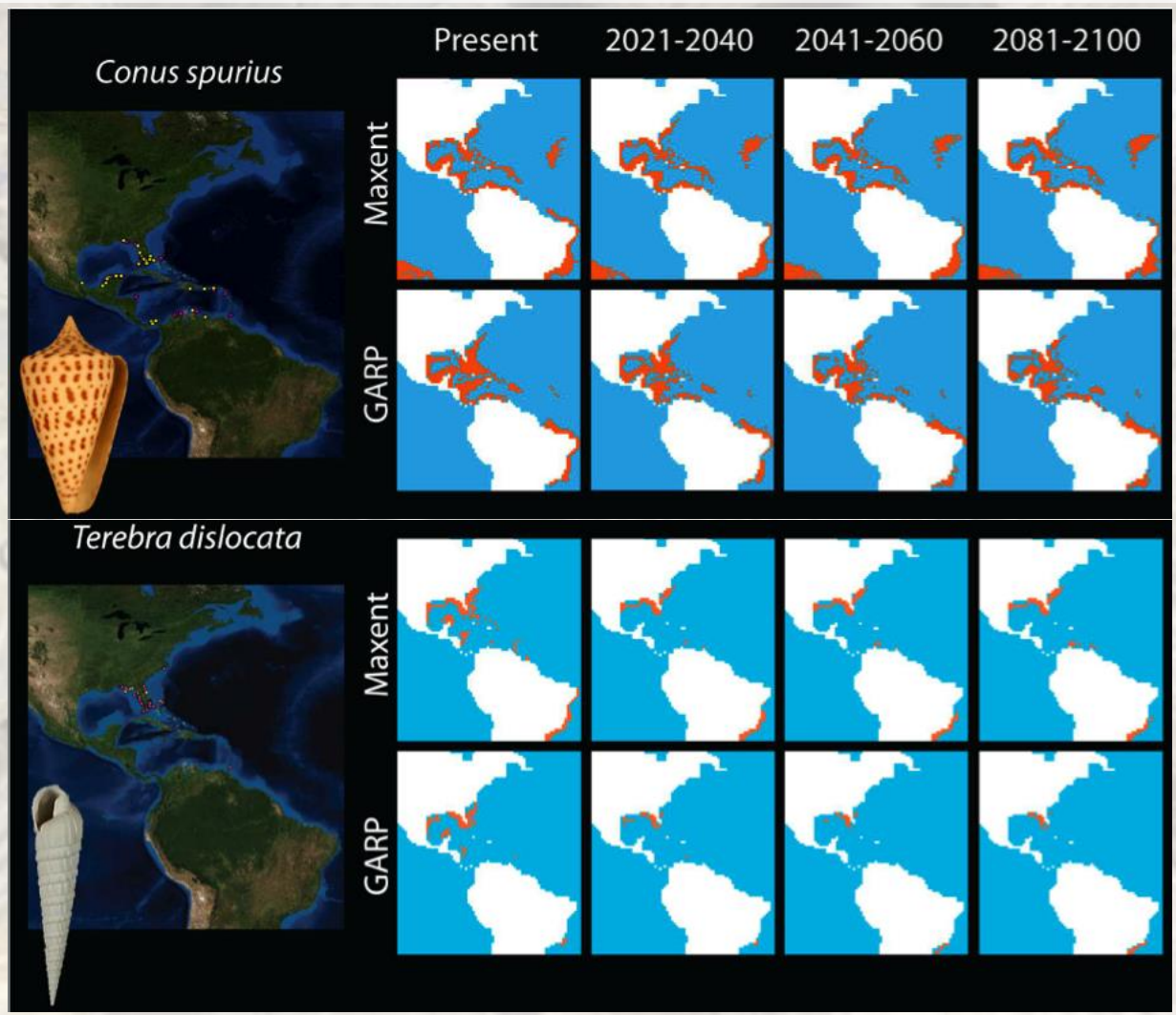
Anomalocaris canadensis



Climate change and marine molluscs: a tale of mostly extinctions – *Saupe, Hendricks, Peterson and Lieberman, in review*

Aim: to forecast how marine species might respond to future environmental change

Evidence for contraction of suitable area, with significant loss (>20%) in half of the 14 studied species



The Digital Atlas of Ancient Life

Home | Digital Atlases | Project Overview

@PaleoDigAtlas

The Digital Atlas of Pennsylvanian Life: American Midcontinent

Home | Atlas | Geology | Other Information

Callucina keenae

Classification

Phylum: Mollusca
Class: Bivalvia
Family: Lucinidae
Genus: *Callucina*
Species: *Callucina keenae* Chavan, 1971

Geological Range

Late Pliocene to Late Pleistocene; Recent

Stratigraphic Occurrences

Late Pleistocene:
- Fort Thompson Fm. (S. FL)
- Jaimanitas Fm. (Guantanamo Province, Cuba)

Middle Pleistocene:
- Bermont Fm. (S. FL)
- Canepatch Fm. (SC)

Early Pleistocene:
- Bear Bluff Fm. (SC)
- Caloosahatchee Fm. (S. FL)
- Nashua Fm. (N. FL)
- Waccamaw Fm. (NC, SC

Late Pliocene:
- Duplin Fm. (NC, GA)
- Raysor Formation (GA, NC, SC)
- Jackson Bluff Fm. (N. FL)
- Tamiami Fm. (Pinecrest Beds) (S. FL)

Late Pleistocene Map

Middle Pleistocene Map

Early Pleistocene Map

Late Pliocene Map

Photographs

Callucina keenae from the Late Pliocene Tamiami Fm. (Pinecrest Beds) of Sarasota County, FL (UF 200860).

Summary

Aim: Database and georeference and photograph paleontological collections from three major time periods

Provide detailed taxonomic, stratigraphic (age, environment) and geographic data

- Through iDigBio, GBIF and databases (Specify/KeEmu) - to enable paleobiogeographic, paleoecologic, and macroevolutionary analyses
- As digital atlases - resource for students, teachers, the public

Acknowledgements

Pis: Bruce Lieberman (KU), Jon Hendricks (San Jose State), Alycia Stigall (Ohio U.)

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Deb Paul and iDigBio Georef Working Group

Theresa Miller, Andy Bentley and Specify 6 staff

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iDigBio
Integrated Digitized Biocollections