

# **Issues Involved with Incorporating Museum Collections into GIS Analytical Studies**



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# **What this long-term project wants to illustrate and promote**

- **Spatial Data Mining of Museum Specimens**
  - Location, Altitude/Depth, Environment
  - Collected over Time
  - Collected by Department
  - Spatial Biases in the Collections
  - Identify Where to Collect New Specimens
  - Long-term Species' Migrations/Displacements

**The Smithsonian holds more than 128 million objects and artifacts in its natural history collections.**

**So far, we have georeferenced about 2 million objects.**

**BUT georeferencing is a slow process with editing of one record at a time.**

**Like most museums around the world, the vast majority of our records are recorded with descriptive locations, rather than coordinate locations.**

**Our collections, like many other museums manages these database records with EMu Software.**

*We found KE Software happy to sit down with us and work through our issues in order to get a result that satisfied both parties.*

User Syst  
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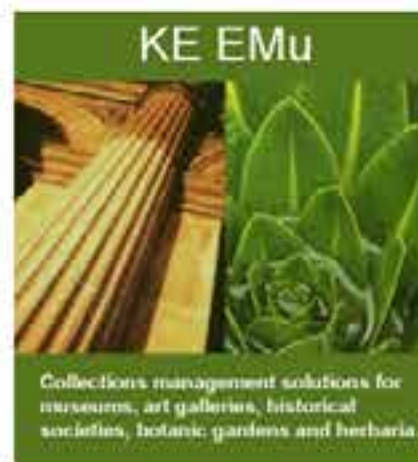


## KE EMu: the world's premier Collections Management System

Engineered to manage all types of collections, EMu is suited to:

- ▶ Cultural collections, Anthropology, Archaeology, Science and Technology.
- ▶ Paintings, Drawings, Prints, Sculpture and 3-dimensional objects, Decorative Art, Performing Art, Photography, Textiles and Digital Objects.
- ▶ Natural History collections, including Zoology, Earth Sciences, Palaeobiology, Botany, Horticulture and Physical Anthropology.
- ▶ Special collections, Digital Assets, Historical Societies and Archives.

[Read on...](#)



Spect  
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### Shortcuts

[EMu User Confer](#)

#### Case Studies

- ▶ 11th Australasia Conference, Sydney, September 2012
- ▶ 8th North American Conference, Washington, October, 2013
- ▶ 10th European Conference, New York, April 2013
- ▶ 7th North American Conference, New York, October 2012

### EMu News

2013 North American EMu User Conference

Tuesday, 11 June 2013

10th European EMu User Conference

Tuesday, 07 May 2013

**If the records have been recorded using coordinate locations from GPS, those records can be mapped in EMu or exported to SHP or KMZ.**

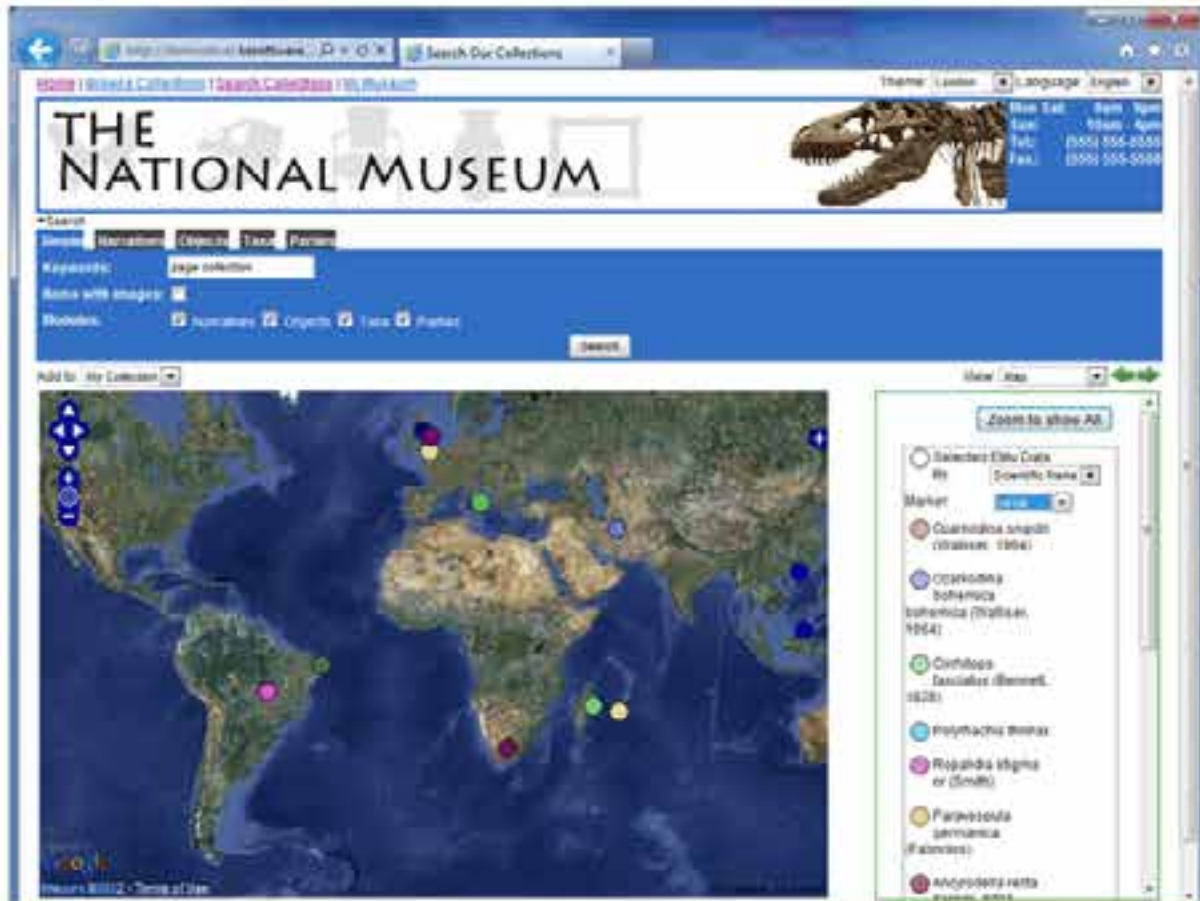
## Geo-referencing and Mapping

EMu supports geo-referencing of your collection. Comprehensive geo-referencing details can be stored in EMu and used to map objects and specimens in mapping tools such as IMu Web Maps. Geo-referencing information is designed to contain all locality co-ordinate information and associated error values.

IMu Web Maps is a web browser utility that can be accessed from within EMu or directly from a website and which plots the location and distribution of data (typically specimens) on maps. IMu Web Maps is interactive and dynamic, with data sourced directly out of EMu or from other suitable web service data providers.

IMu Web Maps comprises discrete components that can be used to incorporate maps of varying sophistication or features in other web pages. It can be implemented and accessed as part of a website or can be generated as a web page directly out of the EMu client

It is possible to map the collection locality of a series of specimens by plotting details on to a map of the world. With a large enough set of specimens, this can provide a distribution map for various species that have been collected.



# **Museum Collections: Problems**

- **Fuzzy Locations**
- **Incomplete Distributions**

# **Museum Collections: Advantages**

- **Where species can be/were found**
- **Subsequent analyses of  
archaeological and geological data  
and evaluations of  
biogeographic/ecological models**



# Georeferencing

- **BioGeomancer Workbench (Sept. '06):**
  - **BioGeomancer Classic (Yale, UC-Berkeley, U of Kansas, Centro de Referência em Informação Ambiental-Brazil)**
  - **GeoLocate (Tulane)**
  - **Diva-GIS**
- **Commercial Geographic Text Search:**
  - **MetaCarta**

# GeoLocate with an example site georeferenced in Calhoun County, South Carolina

The screenshot displays the GeoLocate v.3.22 application window. The main area is a map of the United States with state boundaries and names. A red location marker is placed in the southeastern part of the country, specifically in Calhoun County, South Carolina. The software interface includes a menu bar with 'File', 'Georeference', 'Display', and 'Help'. Below the menu is a toolbar with various icons. At the bottom, there is a data panel with the following information:

Georeference  
Comment

Locality String:

Country:       Calculated Coordinates  
Lat:       Lon:

State:       Precision: High

County:

**When georeferenced by humans,  
Collection localities may have the  
following problems:**

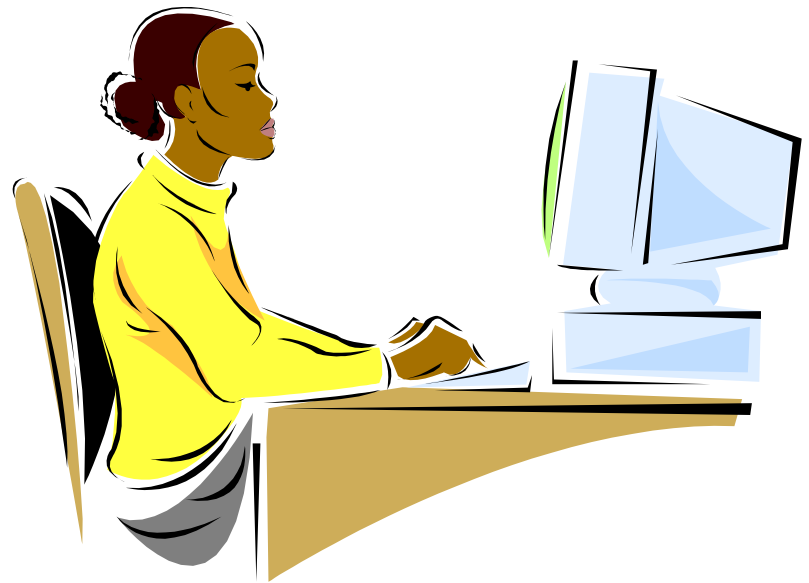
- Reversal of latitude and longitude**
- Forgetting to use a negative sign with decimal degrees in western and southern hemispheres**
- Mistaking a 4 and a 9, 6 and a 0, or an 8 and a 3 from handwritten records**
- Simply typing the wrong number**
- Or any combination of the above!**

**So we must always rely of the descriptive locations included in the database:**

- **Country**
- **Province/State**
- **County**
- **Ocean**
- **Sea/Gulf**
- **Archipelago**
- **Island**
- **Precise Location**

# Interactive Curator/Map Reader

- Wants the ability to manipulate the base map
  - Projection
  - Scale
  - Geographic Focus
- Wants the ability to manipulate the data
  - Classification
  - Symbolization



**Pilot Project**  
**A Temporal Mapping Study:**  
**200 years of Collecting Specimens**  
**for Natural History**

**One Million Collection Records:**

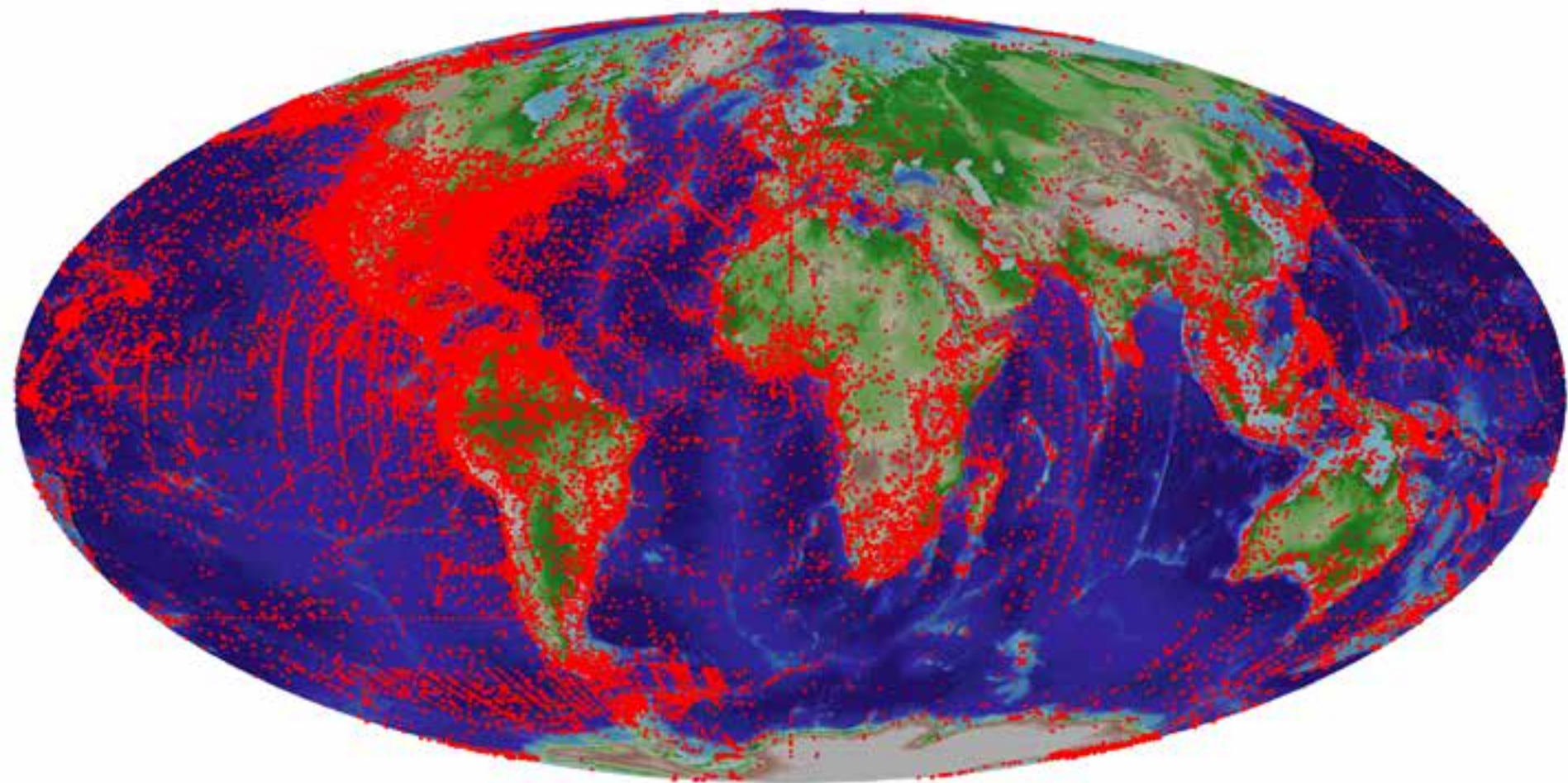
**Botany**

**Invertebrate Zoology**

**Vertebrate Zoology**

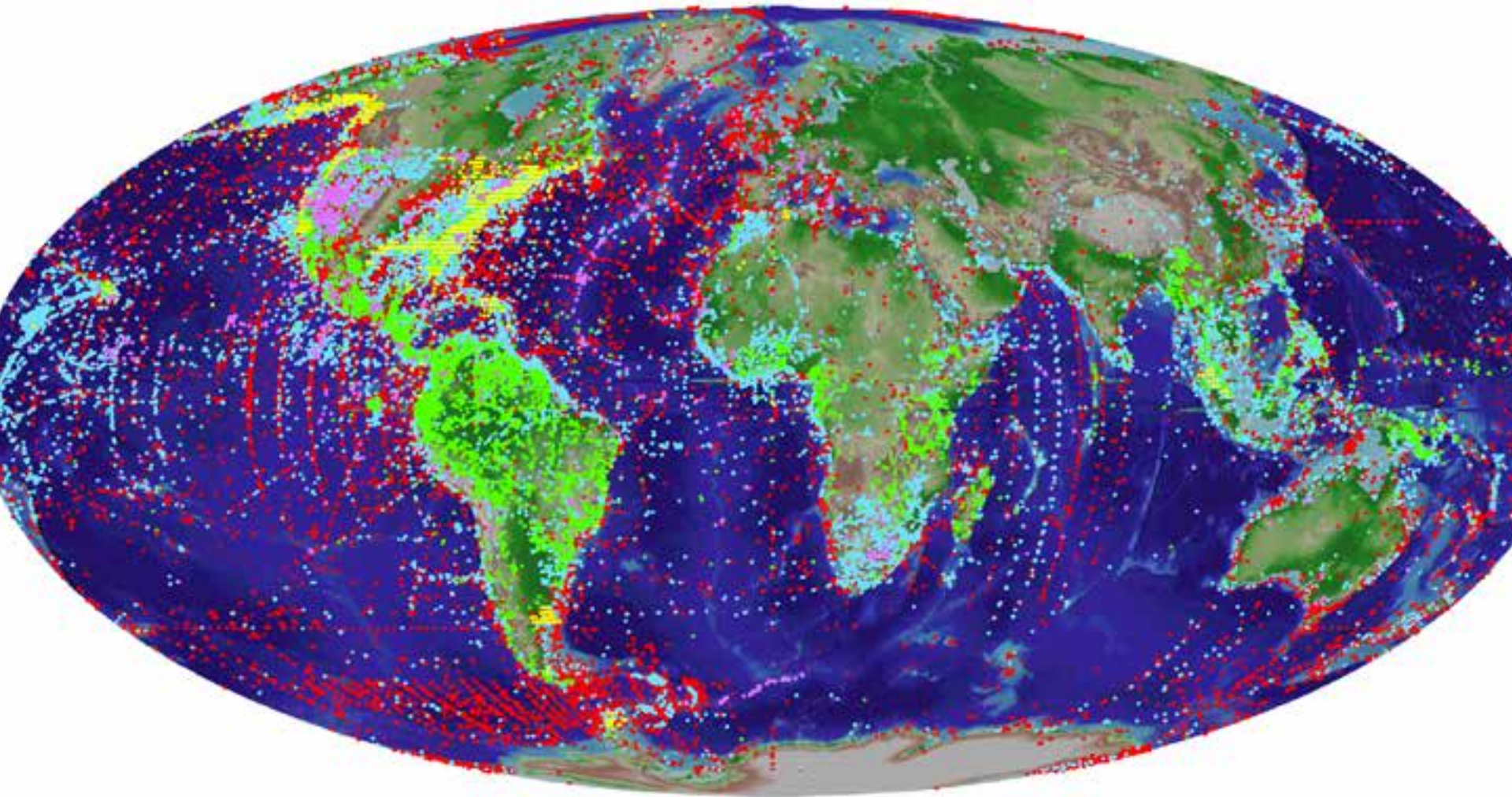
**Mineral Sciences**

**Paleobiology**





# Collections by Department



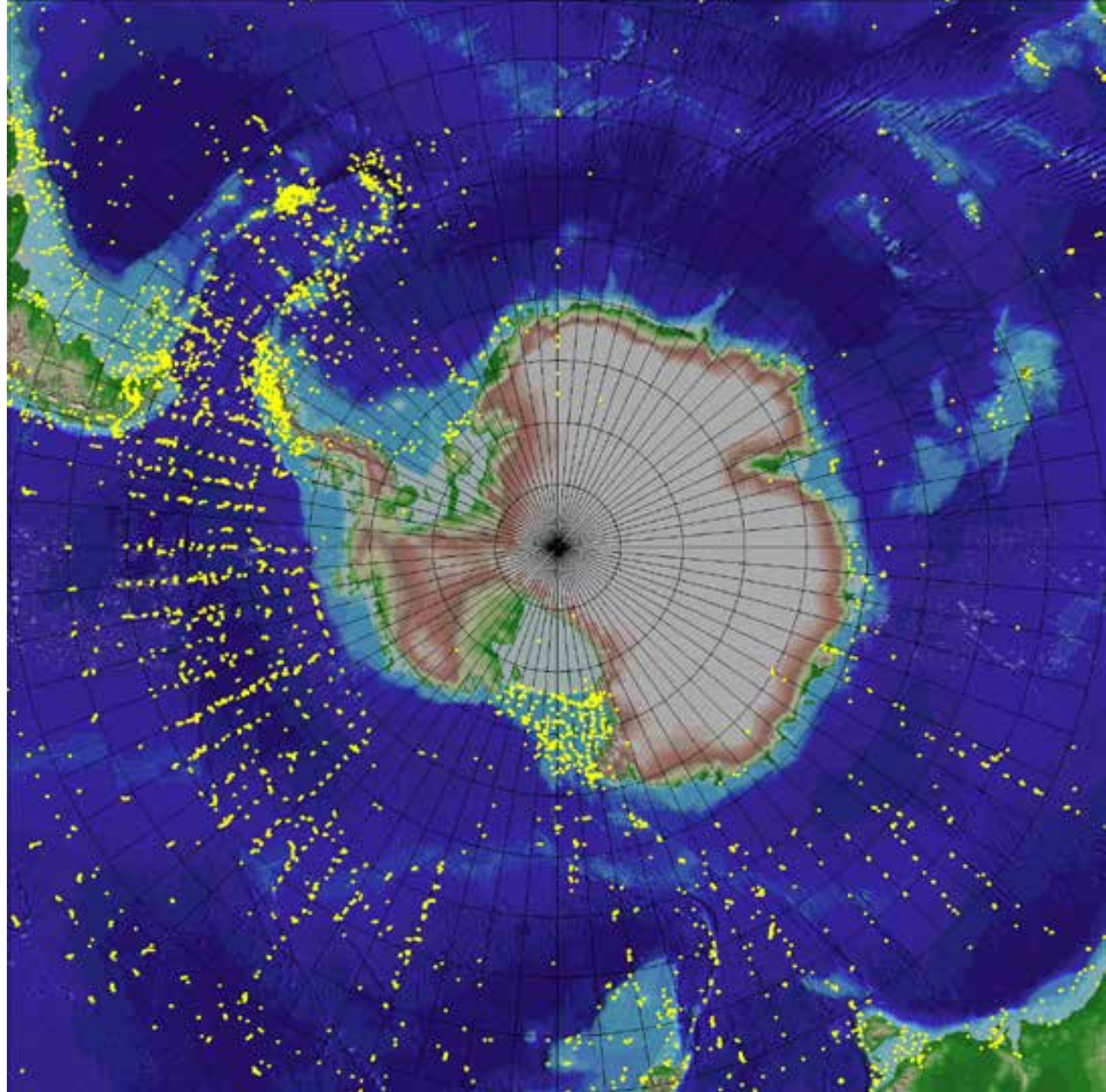
Invertebrate Zoology – Red  
Vertebrate Zoology - Cyan

Paleobiology – Yellow  
Mineral Sciences - Magenta

Botany - Green

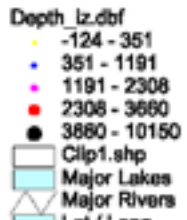
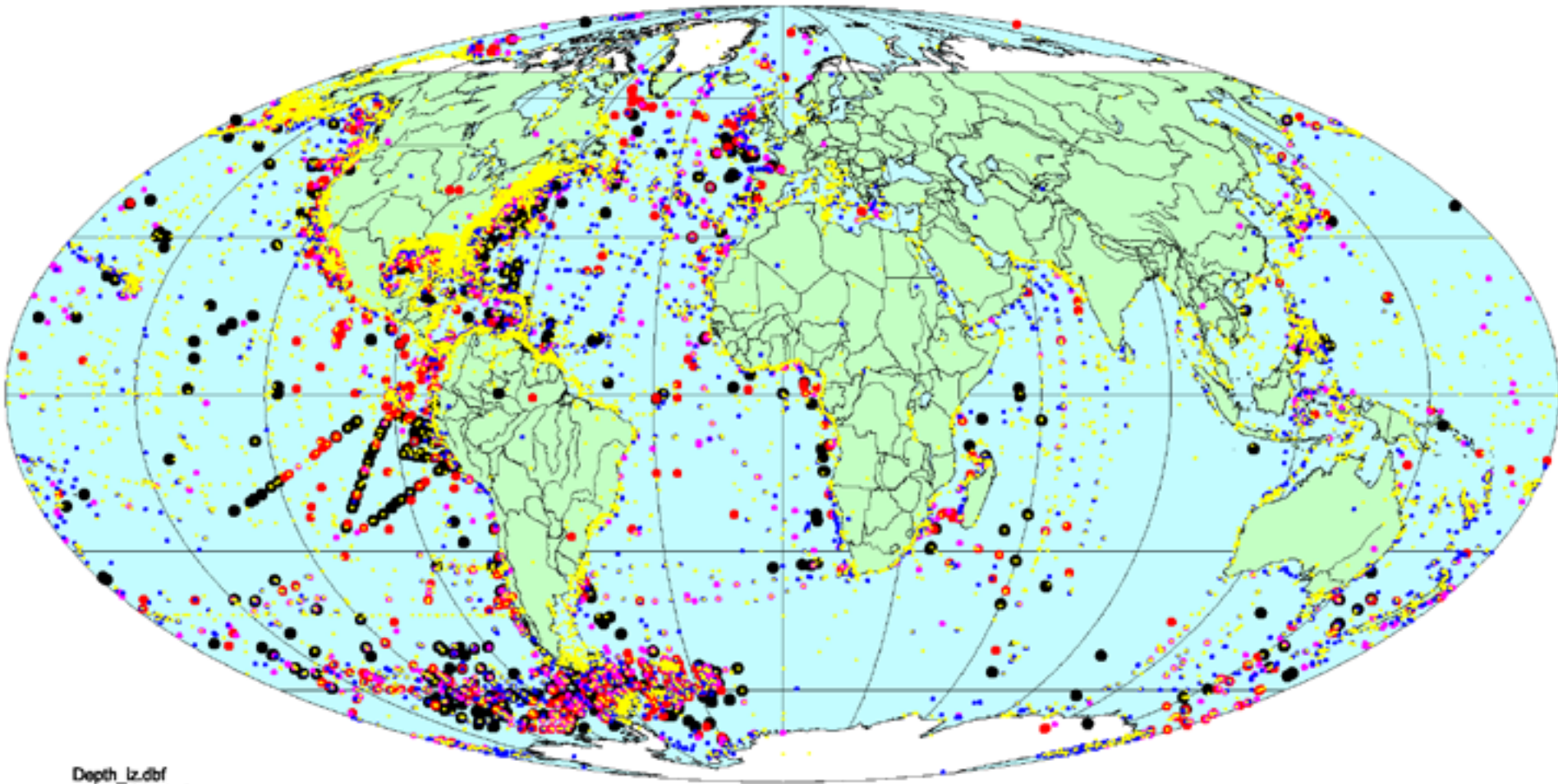


**Invertebrate  
Zoology:  
Collections  
around  
Antarctica**

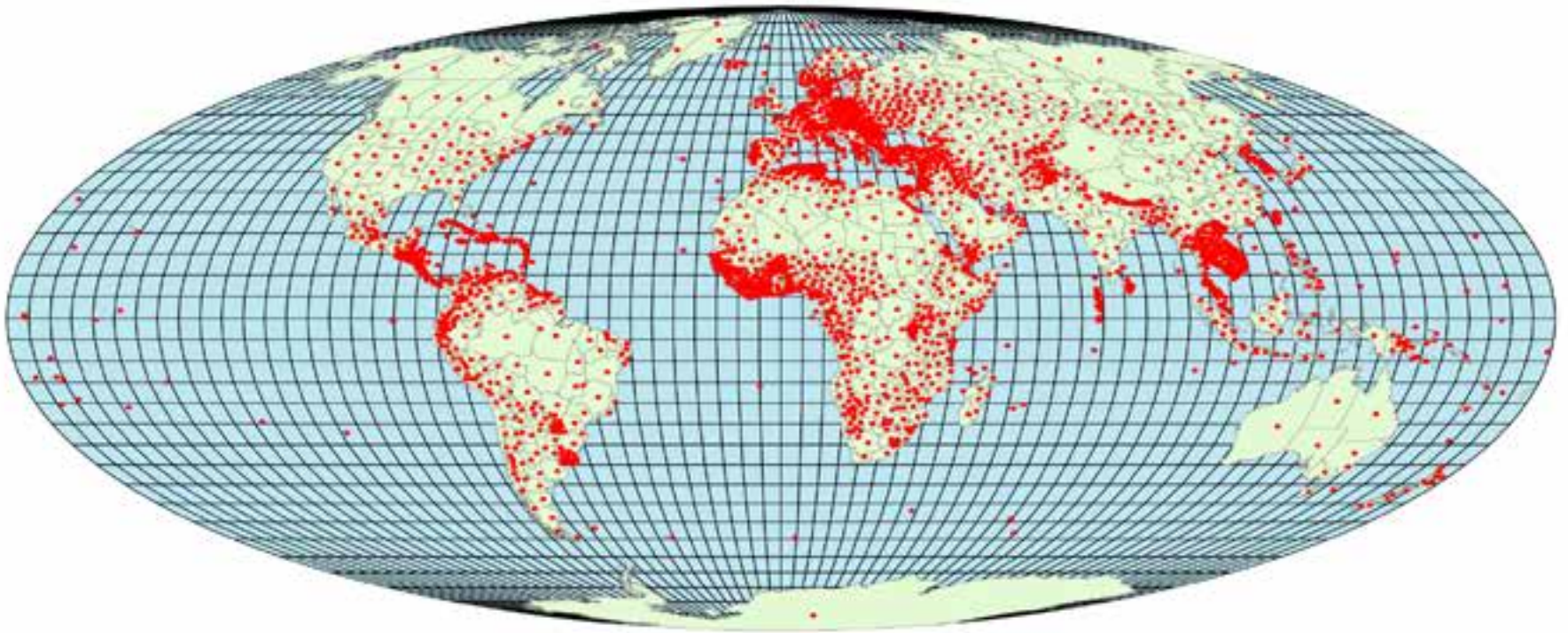




# Invertebrate Zoology Depth of Collections



# Next Five Million Records: Locations by Political Centroids



# Thank you



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