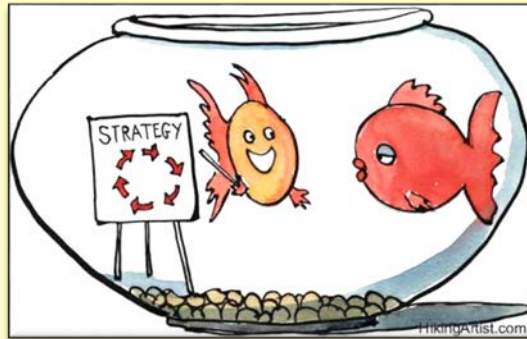


Strategies for Digitizing Small Vertebrate Collections



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Collections Manager, Vertebrate Collections
Division of Natural Science
Michigan State University Museum



Overview

- MSU Museum vertebrate collections & records
- Digitization history & early strategies employed
- Additional strategies employed
- Standards & best practices
- Data dilemmas
- Digitization status & next steps
- Impacts

231411 FROM THE OÖLOGICAL COLLECTION OF *Pomeroy*
E. A. MCILHENNY, - - AVERY'S ISLAND, IBERIA PARISH, LA.

A. O. U. NO.	NAME	DATE	MONTH	DAY	YEAR
199	<i>Ardea herodias ruficollis</i> <i>La. Heron</i>		5	26	95

COLLECTED BY: *E. A. McIlhenny*
LOCALITY: *Lake St. John, La.*
SET MARK: *062* IDENTITY: *2nd* INCUBATION: *fresh*
NEST: *in low mangrove brush, about 2 ft. above ground, on small island, in lake 7 miles from shore. Thousands nest here.*



A museum of Science & Culture

On the campus of Michigan State University, East Lansing, Michigan



Founded in 1857 – one of the oldest museums in the U.S.



Houses over 111,000 vertebrate specimens

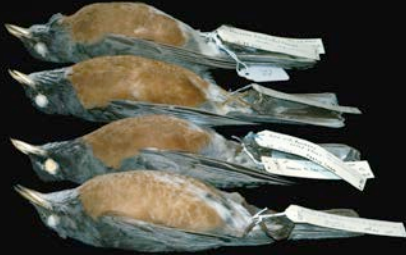
Earliest specimens date from 1844

Specimens are used for research, teaching, & outreach



Vertebrate Specimens

41,395 mammals



14,450 birds

18,745 reptiles & amphibians



4,000 fossils



36,125 fishes

Preparation Types



taxidermy mounts



skeletons



skins & skulls



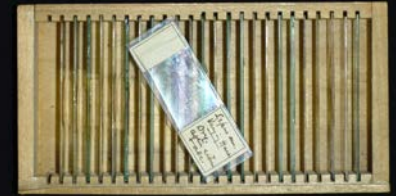
skins

tanned hides





nests & eggs



anatomical
preparations



frozen tissues & DNA



fluid preserved specimens



Since 1857, there have been 13 different cataloging systems in the Museum

Over its 158 year history, the MSU Museum has employed multiple cataloging and numbering systems for vertebrate collections



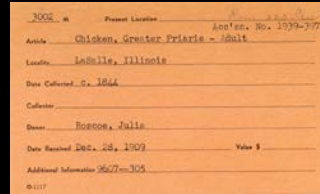
Separately cataloged research and teaching collections are maintained



Original Records & Specimen Data Sources

Catalog Ledgers

Cards



3002 m Present Location: Antea, No. 1029-377
Article: Chicken, Greater Prairie - Adult
Locality: LaSalle, Illinois
Date Collected: Ca. 1844
Collector:
Donor: Boscoe, Julia
Date Received: Dec. 28, 1909 Value \$
Additional Information: 9567 on 305
00007



Accession & Preparation Documents

Field Notes

Specimen Tags



Egg Slips

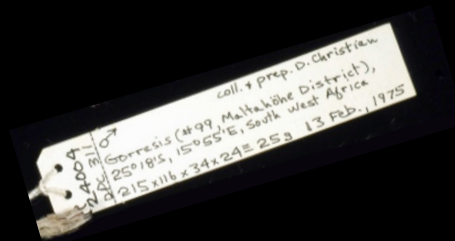
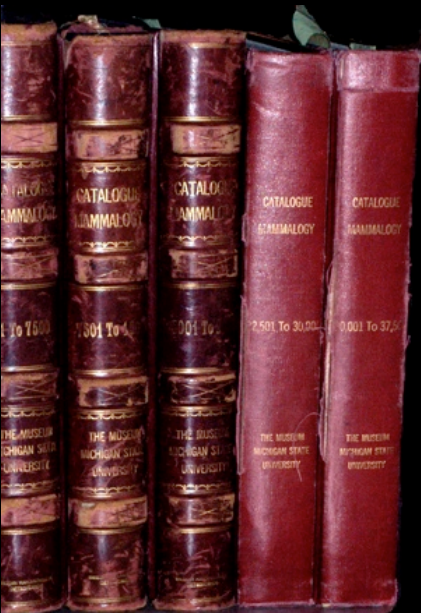
Reports (e.g. necropsy, wildlife)

Correspondence

Institution Archives

Library/online Theses & Dissertations

Publications



Digitization History

Began digitizing Vertebrate Collections in 1993



Original goals of digitization were to facilitate collections management & effectively respond to data requests



Key-entered text data
into database system

Digitization History and Early Strategies Employed

Entered data directly from catalog ledgers & cards

3005. 10 Present Location: Amherst, Mo. 1939-1977
Article: Chicken, Greater Prairie - 1861
Locality: LeMotte, Illinois
Date Collected: ca. 1864
Collector: _____
Donor: Benson, Julia
Date Received: Dec. 28, 1909 Value \$ _____
Additional Information: 56/7=305
©1977

Wrote protocols for digitization
-created data entry manual

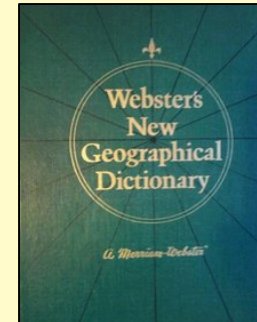
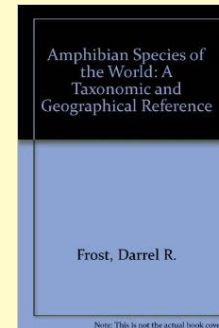
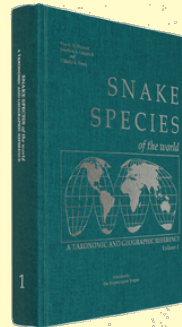
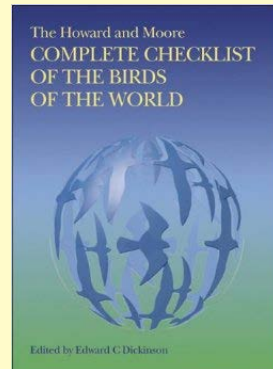
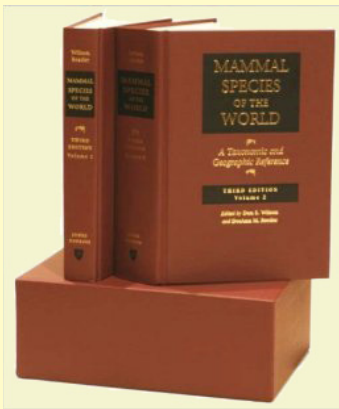
Divided digitization activities into smaller discreet components


Same data fields set up for extant vertebrate disciplines

Different data fields for vertebrate paleontology

Strategies Employed for Digitization

Utilized standard resources for taxonomy & geography





ITIS

Integrated Taxonomic Information System

Welcome to ITIS, the Integrated Taxonomic Information System! Here you will find authoritative taxonomic information on plants, animals, fungi, and microbes of North America and the world. We are a [partnership](#) of U.S., [Canadian](#), and [Mexican](#) agencies (ITIS-North America), other organizations, and taxonomic specialists. ITIS is also a partner of [Species 2000](#) and the [Global Biodiversity Information Facility \(GBIF\)](#). The ITIS and Species 2000 [Catalogue of Life \(COL\)](#) partnership is proud to provide the taxonomic backbone to the [Encyclopedia of Life \(EOL\)](#).

Quick search on:

☒ Any Name or TSN* ☐ Common Name ☐ Scientific Name ☐ TSN*

In every Kingdom containing

* Taxonomic Serial Number (TSN)

[Go to Advanced Search and Report](#)

New & Collected Scientific Names this week: **5,820**

Month	Scientific Names (any rank, any usage)	Common Names
30-Apr-2015	684,389	124,439
03-Apr-2015	688,269	122,778

Last updated Thursday, 08-Apr-2015 16:00:11 EDT

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[http://www.itis.gov/index.html](#)

ITIS - Integrated
Taxonomic
Information
System
online resource

Early Strategies Employed for Digitization

Standardized names of collectors

when absolutely certain and

when affiliated with our collection or institution

J. Alan Holman

instead of J.A. Holman, Al Holman, Holman



Early Strategies Employed for Digitization

Utilized standard terminology for specimen preparation types across all vertebrate groups

From Element Names and Modifiers, J. Howard Hutchison, Appendix 2, pp119-124 In: Guidelines and Standards for Fossil Vertebrate Databases. Blum, Stanley, D (ed) 1991. SVP. Sponsored by NSF

Following Hutchison (1991), we employed standard “Collective” terms (skull, skeleton) and expanded the listing to include all preparation types of our vertebrate specimens

We also used “Element” terms of standard comparative anatomy terminology (over vernacular or medical terminology), per Hutchison

Early Strategies Employed for Digitization

Standard terminology for specimen preparation types

- The collective and elements terms were combined to form a pick list in the database for preparation types
- Examples of listed terms: scale, scaphoid, scapholunar, scapula, scapulocoracoid, sclerotic, sesamoid, scute, shell, skeleton, skin, skull, sphenethmoid, sphenoid, spiracular, splenial, squamosal, stapes, supracleithrum...
- A specimen in our collection (and the database) may have multiple preparation types:
skull, axis, atlas, baculum, skin

Strategies Employed for Digitization



In 2004, we began using *Specify*

Specify team converted our legacy data to *Specify* database

Database fields were modified to conform to the Darwin Core



Strategies Employed for Digitization (2000s)

In 2004 and subsequent years, the MSU Museum joined several online database consortia

MaNIS



Employed best practices & standard resources for georeferencing



Point radius method

Wieczorek et al., 2004. Point-radius method for georeferencing locality descriptions and calculating associated uncertainty. *International Journal of Geographical Information Science* 18(8):745-767

BioGeoMancer (used in past)

GEOLocate

See resources on iDigBio website

Strategies Employed (2000s)

- Performed inventory and reconciled physical specimens with data records. Problems were flagged and tracked
- Utilized multiple original data sources & documents to reconcile records & enhance specimen data

Michigan State University Archives and Historical Collections

Miles D. Pirnie Papers UA.17.102

TABLE OF CONTENTS	SUMMARY INFORMATION
Summary Information	Repository Michigan State University Archives and Historical Collections
Biographical Note	Creator Pirnie, Miles David, 1898-
Scope and Content	Title Miles D. Pirnie papers
Arrangement	ID UA.17.102
Administrative Information	Date [inclusive] 1915-1977
Controlled Access Headings	Extent 3.0 Cubic feet
Collection Inventory	Language English
Projects and Reports	
Notes and Drawings	
Correspondence	
Miscellaneous	

Preferred Citation
Researchers wishing to cite this collection should include the following information: "Item title, Collection title, Collection Identifier, Michigan State University Archives & Historical Collections, East Lansing, Michigan".

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BIOGRAPHICAL NOTE

Miles David Pirnie was born on June 4, 1898 in Pulaski, New York. He received a B.S. degree in ornithology, zoology, and entomology from Cornell University in 1923. Upon graduation, he entered the Graduate School at Cornell where he studied the life histories and habits of ducks. Pirnie received his Ph.D. in June 1928.

From 1928 to 1931 Pirnie served as the Staff Ornithologist for the Michigan Department of Conservation. In 1931 he became the first Director of the W. K. Kellogg Bird Sanctuary, part of the Michigan State College of Agriculture. Pirnie and his family lived at the sanctuary until 1948, when he left to join the MSC Fisheries and Wildlife Department. He served many offices in the Michigan Audubon Society, co-edited the *Jack-Pine Warbler* in the 1940s, and researched waterfowl in the United States and Canada. Pirnie was a wildlife conservationist, ornithologist, author, wetlands expert, sportsman, and decoy carver. Miles Pirnie died on September 4, 1976 in Lansing, Michigan.

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- Accession Records
- Field Notes
- Tags
- Egg Slips
- Reports
- Theses
- Dissertations
- Correspondence
- Archival Records
- Other Publications

Data Dilemmas

Considerations for Digitization

Multiple taxa associated with a specimen

e.g. Brown-headed cowbird (*Molothrus ater*) eggs in a Yellow Warbler (*Dendroica petechia*) nest with eggs



Data Dilemmas

Considerations for Digitization

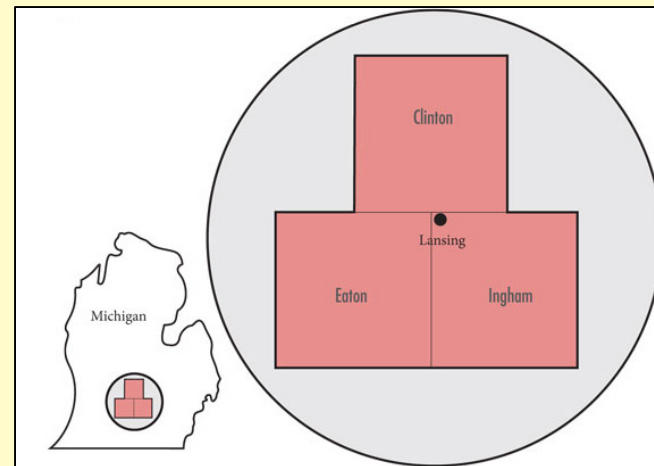
- Specimens that are hybrid crosses

Hybrid crosses indicated in Ichthyology and Ornithology catalogs

Long series of wolf-dog hybrids in Mammal Collection

- County confusion

City of Lansing in Michigan is at the intersection of 3 counties





2015

Using *Specify* database system

We are listed in GRBio

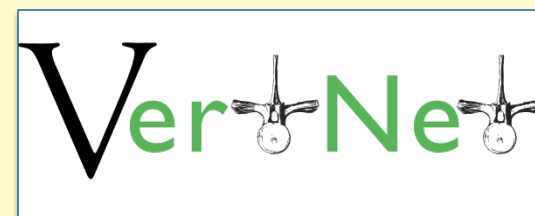
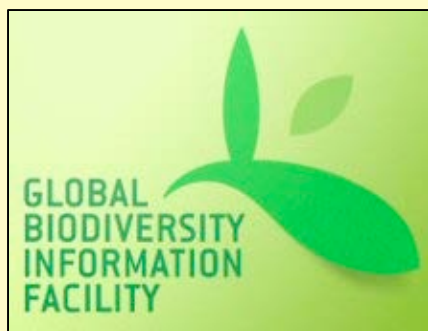


We have two institution codes for our vertebrate collections

MSU for mammalogy, ornithology, & vertebrate paleontology

MSUM for herpetology & ichthyology

Our data are online via GBIF, iDigBio, VertNET, & FishNET2





Looking to the Future

2015 Specimen imaging activities - passive and driven by researchers



2015 and beyond - planning for targeted, prioritized, active imaging of specimens and utilizing standards and best practices shared through iDigBio

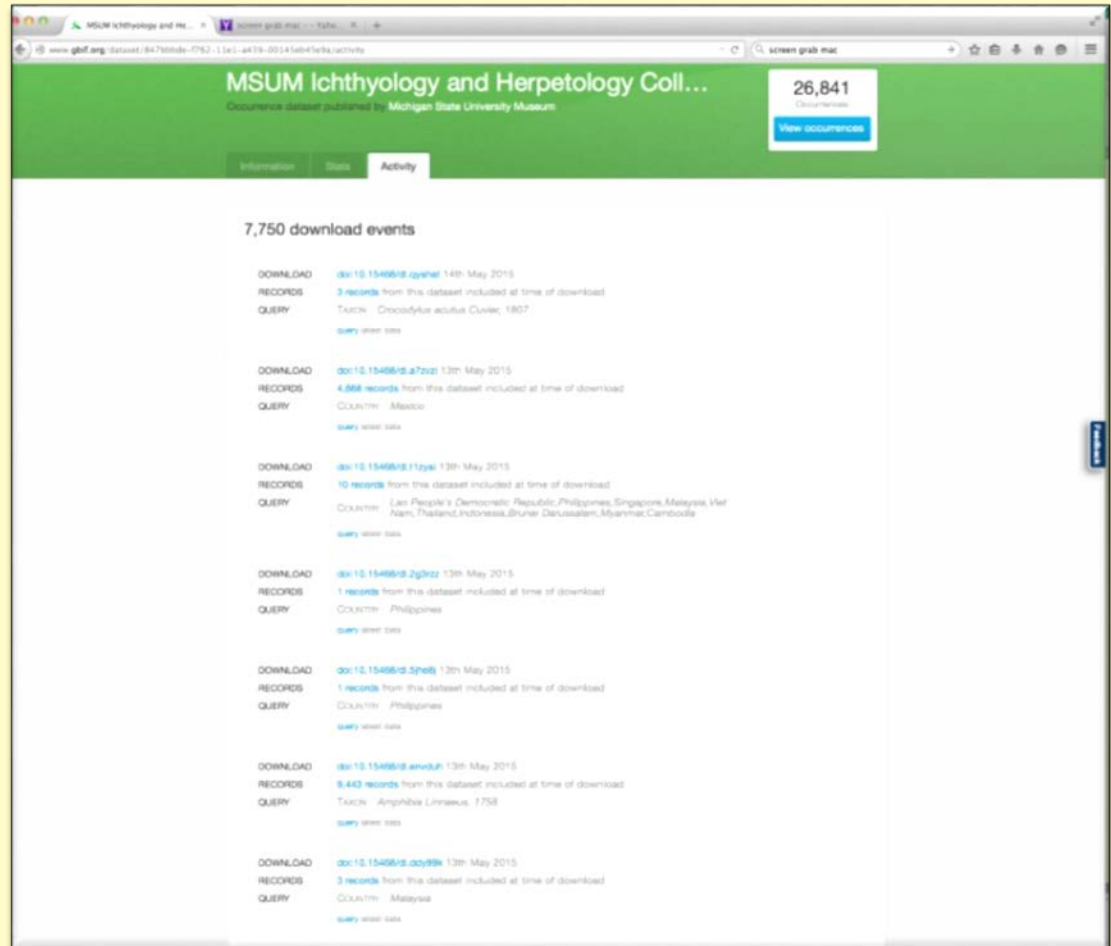
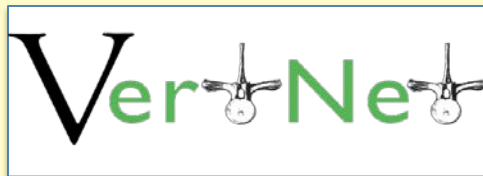
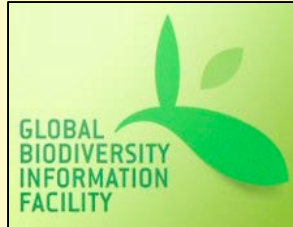


MSU Museum Ornithology Collection



Impacts

Our digitized vertebrate specimen records are publicly accessed every day



Impacts – recent examples

MSU Museum digitized data

Revealed possible voucher of rare *Bufo houstonensis* from Brazos County, Texas

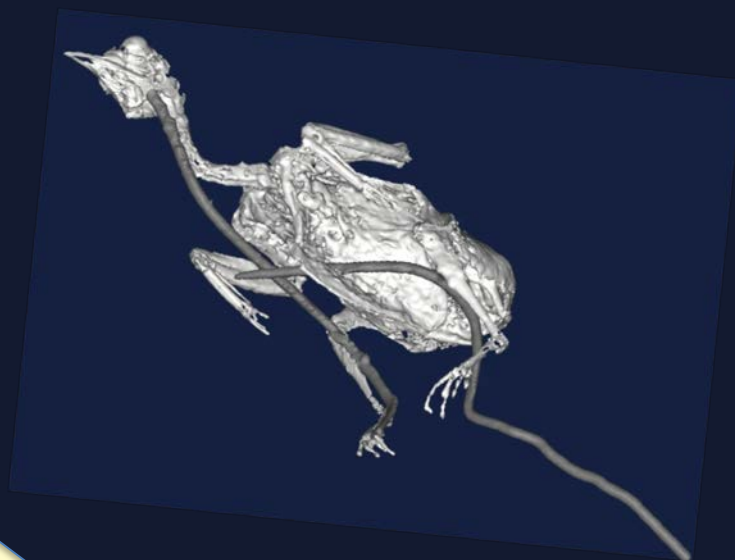
Have informed solutions to problems
at other museums

Likewise, others' digitized data have helped
to resolve “old” problems at our Museum



Previously “dark data” have been brought to light
through digitization

In April 2014, Dr. Pamela Rasmussen CT-scanned several Passenger Pigeons (*Ectopistes migratorius*) from the MSU Museum as part of a research project



MSU OR.2569 *Ectopistes migratorius*, Michigan,
Chamberlain-Warren Collection number 48609,
Donated 1925, Taxidermy Mount with no base

Acknowledgements

Dr. Barbara Lundrigan

Robin Bolig

Institute of Museum and Library Services

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MSU Museum

MSU Department of Zoology

MSU Vice President for Research and Graduate Studies

MaNIS - John Wieczorek, Barb Stein

Specify - Andy Bentley, James Beach

ORNIS - Carla Cicero, A. T. Peterson, John Wieczorek

HerpNET- Carol Spencer

VertNET- Carla Cicero, Dave Bloom, Laura Russell

iDigBio - Gil Nelson, Joanna McCaffrey

FishNET2 - Nelson Rios, Hank Bart, Justin Mann

GBIF team members

Dr. Pamela Rasmussen