

**Establishment of Metadata Digitization in the Colorado State  
University Biology Teaching Collection: Literature Review and  
Applied Outcome**

Honors Thesis

Presented In Partial Fulfillment of the Requirements for the  
University Honors Program  
Colorado State University

By

Lindsay Barr

Fish, Wildlife, and Conservation Biology

Dr. Tanya Dewey, Biology

Dr. Jennifer Neuwald, Biology

Fall, 2025

**Abstract:**

Digitization in natural history collections is essential in the pursuit of sharing information in the scientific field. However, this is an underutilized resource, and the absence of digital records increases barriers to entry in scientific research. This is especially true with small and teaching-focused collections, such as the Biology teaching collection at Colorado State University, which is underrepresented in digital databases. The collection houses more than 13,000 specimens with valuable scientific data, yet no data is accessible outside of the collection. These collections lack consistency and have a high turnover rate of volunteers, which poses a challenge to setting up and maintaining an effective and reliable system. This project aims to synthesize the current knowledge on digitization strategies, and implement an effective workflow through the platform of Symbiota for how volunteers can digitize collections in the future. I conducted a literature review examining peer-reviewed studies and case studies to evaluate the best approaches for accessibility and sustainability in digitization. This led to the creation of an official Symbiota guide, detailing how to input data in the system, along with the facilitation of a workshop for members of the different specimen collections on the CSU campus. Ultimately, small collections such as the Biology Teaching Collection hold great value in their specimens, particularly with locally significant data, but are frequently overlooked. Platforms like Symbiota, which are publicly accessible, make these data available worldwide and can significantly contribute to the field of scientific study. The establishment of digitization initiatives in smaller collections is essential for strengthening biodiversity data networks and expanding scientific knowledge.

## **Introduction**

Natural history collections are an essential part of human experience and scientific developments. Studying and understanding our history is one of the most essential aspects of learning and growth in the scientific community. The specimens housed in these collections, and the data attached to them, provide centuries of carefully preserved documentation about the diversity of all living things (Lane, 1996). Across the world, there are billions of these valuable specimens housed in natural history collections (Tamisiea, 2023), and these vast numbers need to be catalogued and accounted for appropriately. Only a small fraction of this information is digitized, though digital infrastructures are developing and growing constantly. Of the 1.5-3 billion estimated existing specimens, only an approximate 233 million are available digitally, as of 2024 (Martellos & Seggi, 2024). This metadata can provide invaluable information to a number of fields, such as the study of taxonomy and systematics, conservation biology, agriculture, pharmacognosy, land planning, and countless others (Lane, 1996). Small collections are a large part of this database, and have an underappreciated value. Unique data from these smaller collections could fill in taxonomic gaps, and a digitization of these collections would enhance scientific connectivity and collaboration (Lane, 1996). The purpose of this literature review is to evaluate the importance of specimen data digitization, identify barriers to small natural history collections, and assess Symbiota (Symbiota, 2024) as a platform for sustainable and accessible data representation.

## **The Value of Small Natural History Collections**

Smaller natural history collections, ones with a few thousand specimens compared to the millions found in many larger museums, still contain extremely valuable data and information

that is frequently overlooked. One of the primary examples of this is the local specificity that these collections house. Likewise, many of these regionally-focused specimens cannot be found in larger databases. Smaller collections frequently house unique specimen occurrence records, which can fill critical gaps in taxonomic and geographic understandings of global biodiversity.

Smaller collections frequently host unique specimen occurrences and best represent the local biodiversity in the region, both of which can fill critical gaps in taxonomic and geographic understandings of global biodiversity (Monfils et al., 2020). When these datasets go unpublished, they become 'dark data', and cannot contribute any of their rare or valuable information to the scientific community. The access to these datasets are essential for a further understanding of macroevolutionary patterns and bridging geographic and environmental collection gaps (Dean & Thompson, 2025).

In addition, smaller natural history collections significantly contribute to a number of scientific research practices and are invaluable in those contributions. One such contribution is through the study of global climate change. Natural history collection specimens host a number of data spanning up to thousands of years, and can reveal patterns of adaptation and change that cannot be observed in other datasets (Meineke et al., 2018). One specific pattern revealed by natural history collections, particularly those of a smaller size, is that of species distribution models and conservation. Creating species distribution models can aid in conservation and management decisions, but the data needs to be properly selected and filtered to account for decisions being made at the local level (Zarzo-Arias et al., 2022). The region of study can drastically impact the results of these models, which is where smaller collections can contribute through a database of historical distribution data and georeferenced specimens specific to the local area. Another contribution of these data are to local population trends, since many

discrepancies in population trends can be attributed to the use of global datasets (Rodríguez-Caro et al., 2024). This bias can imply that the trends are not accurately capturing and representing the local processes, which can be resolved through the use of regional-specific, smaller specimen collections.

One of the most valuable contributions that smaller specimen collections have is that of education and community engagement. The Colorado State University Biology Teaching Collection, is used in many university science classes and labs to enhance learning and understanding, such as mammalogy, herpetology, ornithology, plant systematics, and more (CSU Biology, 2022). Tindan and Anaba (2024) demonstrate that this hands-on learning approach is an invaluable method of education and academic success, and cannot be replaced by more traditional models of teaching. Student training will help create the next generation of scientists but does not stop at the classroom level. The collection is almost entirely run by student volunteers, who participate in valuable processes and learning opportunities such as digitization or specimen preparation. This collection also participates in community outreach, offering tours to local schools and organizations, as well as numerous tabling events across the local area to increase education about biodiversity and science. Smaller collections are particularly advantageous for place-based learning in rural communities, connecting curriculum to local heritage and biodiversity.

### **Digitization in Natural History Collections**

Natural history museums have protected and preserved invaluable specimens and data through much of human history. Digitization is a method that can continue to protect and

preserve for many more generations to come, with delicate, handwritten tags saved in a timeless digital platform.

The benefits are resounding, in terms of data preservation, research, and even scientific accessibility. (Popov et al., 2021). The vast majority of these data are handwritten, on small tags attached to specimens, and have already been preserved for hundreds of years. The digitization of this information ensures that it is properly preserved and accounted for, and is usable and understandable for future generations. It also enables remote access, which gives access of the collection to the world, instead of the few that are able to witness the collection in person. This can drastically expand the resources available to researchers that would otherwise have no access to this information or even know that it exists, overcoming geographic, financial, or institutional barriers to knowledge.

The workflow for digitization is relatively simple, though it can be time-consuming with a steep learning curve. The first step is transcription, by typing out the exact words from each tag and databasing them. This involves the use of a database platform that has a specific form detailing each part of the label (Harris & Marsico, 2017). Georeferencing is another step in this process, which involves detailing the precise location in which the specimen was collected, adding those specific coordinates to the larger database (Arnald Marcer et al., 2020). Metadata standards should be applied to all of these steps, using controlled vocabulary, such as a Darwin Core (Biodiversity Information Standards (TDWG), 2025), to ensure understanding and cohesion in the database. A controlled vocabulary contains a strict set of terms that are clearly defined, of which only those terms may be used in the data entry. The final step in this workflow is imaging, which provides an overall image of the specimen and attached metadata, from multiple angles, so

that any inferences and mistakes in transcription can be identified by another party. This also provides a fuller understanding of the specimen and its condition.

Digitization is widely established as an essential step in the curatorial process for natural history collections (Martellos & Seggi, 2024), yet the process is still rarely initiated or completed, particularly in smaller collections (Harris & Marsico, 2017). In a survey of different natural history collections, the majority being smaller university collections, the three most cited barriers to digitization were funding, time, and staff (Vollmar et al., 2025). There is often little funding to be able to hire the proper professionals to complete this work in digitization, and a volunteer workforce does not have the same motivation or time that a hired staff member might. This is also a time intensive process, and there are many other objectives that need to be completed to have a functioning specimen collection. Finally, the digitization process can seem overwhelming, especially if there is a backlog, or the collection is starting from scratch, such as the Colorado State University Teaching Collection, which is only beginning to digitize its more than 13,000 specimens. Despite the importance of digitization, these and other barriers impede the process and interfere with the advancement of scientific knowledge.

### **Symbiota as a Platform for Small Collections**

As a platform, Symbiota is an open-source software for digitizing biodiversity data. It is a community-driven system that has incorporated data from over 1,900 biodiversity collections. (Symbiota, 2024). It is the most used biodiversity management system in the United States, due to their open source platform and user-friendly design (Barkworth et al., 2019). Symbiota is designed to be a tool for organizations across the world to publish and explore data, with a key goal of collaborative digitization. The portal contains themes pertaining to different

classifications of taxonomy, and allows for free scientific and accurate access to biodiversity data for anyone.

This portal was originally created to support small to medium-sized regionally themed natural history collections (Gries et al., 2014), which emphasizes its relevance to the Colorado State University Biology Teaching Collection. The collection houses a large percentage of specimens collected within the region of Fort Collins, Colorado, and is considered small to medium size. The program has key features that are built for and relevant to small collections, including user-friendly data entry, built-in imaging capabilities, and a Darwin Core, fixed vocabulary compliance. Another added benefit to using this platform is its integration into larger data networks, such as GBIF and iDigBio, so that the information is shared with multiple other databases (Global Biodiversity Information Facility, 2022).

This organization has a particular advantage for small institutions due to its worldwide establishment and user-friendly systems. The collections management portal creates a process where volunteers and undergraduate students can easily upload and digitize data without advanced knowledge of programming or software. The system is low-cost, and needs minimal management. Another added benefit is the community support and collaboration, since this is an open-source program where anyone can access and give feedback on collections. Due to these factors, Symbiota is a well-suited option for curators of small collections who are looking to digitize their collections. However, challenges remain, including user training requirements and variability in data quality depending on volunteer experience.

## **Accessibility and Outreach Benefits of Digitization**

Digitization provides many opportunities for increased accessibility to scientific data, and provides an outlet for this information to be accessed from anywhere. Digitization improves public access to biodiversity data, which therefore democratizes scientific access and provides a significant increase in the quality of scientific research. When access is improved to scientific data and research, evidence shows that there is a substantial positive effect on the quality and quantity of scientific research (Nagaraj et al., 2020). This digitization can also provide increased access to scientists from developing communities and lower-ranked institutions, which increases the diversity of perspectives in research and the scientific community. Online portals for digitization, such as Symbiota, hold an influential role in citizen science and public engagement. These platforms offer an electronic public space where a citizen's direct participation in science is enabled and furthers dialogue between scientists and the general public. Therefore, the platform enhances opportunities for diverse scientific collaboration and participation, which signifies an advancement for the accessibility of scientific data to the public (Gheorghe-Gavrilă Hognogi et al., 2023).

There are extensive educational applications for digitization that would not otherwise be accessible for students, expanding the hands-on benefits of specimen collections in universities. By publishing information and images related to natural history specimen data, particularly in an open-source platform such as Symbiota, educational facilities at the undergraduate and graduate levels are able to explore scientific data and observe realistic specimens. Virtual laboratory applications can enhance confidence and understanding in other areas of scientific growth, and the skills learned can be further applied in real-life situations (Yap et al., 2021). This opportunity provides a clear exploration and a realistic experience of observing these specimens, despite

location or access to in-person specimens. An added benefit is the opportunity to broaden disability-related accessibility issues to data, with functions such as text-to-speech, or changing fonts for better legibility.

Aside from university level contributions, this data digitization can also have broader impacts for community engagement, conservation, land management, and K-12 education. Natural history museum-led citizen science programs, such as digitization, have shown evidence of supporting conservation through site and species management, as well as impacts on education, research, and policy decisions (Ballard et al., 2017). The results from digitization, when georeferenced properly, can also provide land managers with specific data about species history on the property to better aid in management decisions. Incorporation of these data in K-12 classrooms provides an opportunity for students to engage in authentic scientific practices and can help to address challenges when building curriculum around current science classroom standards (Flemming et al., 2020). This provides a simple introduction into the use of primary resources and raw data that ensures a better understanding of the scientific process and the natural world.

One of the largest barriers in scientific education and research is the issue of digital equity, wherein everyone would have equal access to online resources. Factors such as gender, socioeconomic status, age, geography, ethnicity, and parent education all have studied impacts on the educational digital divide (Martin et al., 2024). Paywalls in scientific literature pose a large threat to the field of public education, undermining the work of public advocacy where the public are responsible for lobbying for research funding to create these data (Day et al., 2020). Members of the public should have this literature accessible as a resource for information and decision-making; paywalls limit this access to knowledge. Open access to scientific data and

research is critical to continue to progress, and is foundational to the scientific enterprise (Schiltz, 2018). Digitization of natural history specimen data is a partial solution to this issue, as the Symbiota platform is open-access and available to any member of the public. Specimen digitization can reduce concerns of digital equity in the scientific field by reducing geographic, financial, and institutional barriers to access of information.

### **Gaps in the Literature & Future Directions**

In this field, there is a significant underrepresentation of smaller or teaching-focused specimen collections, though they hold a unique value to the contribution of data. To institutions that are more resource-limited, there is also a significant lack of standardized workflows, and many of the specific instructions about data uploading are unclear or unavailable. Georeferencing in particular in Symbiota is a difficult topic that continuously provides false locations and information, and is not user-friendly. Data security in particular is in need of further exploration, with concerns of cyber attacks being prevalent. Furthermore, the digitization process must incorporate safeguards to address ethical considerations, with controls to protect against misuse to exploit vulnerable populations. In terms of future directions, there are many opportunities to further automate the process, such as machine learning imaging that would eliminate issues of staff shortages and funding.

### **Conclusion**

Digitizing small specimen collections is a necessary task to ensure the future of biodiversity information data is preserved. Small collections house countless rare or locally significant specimens that are critical to fully understand gaps in the data, and have uses for

many scientific fields. The Symbiota platform is the strongest solution to the issue of data digitization, as it is an open-access database that is user-friendly and promotes collaboration in the scientific field. Digitization of specimen collections, particularly in smaller institutions, is critical to fully support biodiversity research and provide a significant dataset. In addition, these smaller collections hold great importance in education and public engagement, and are a necessary resource to preserve and support.

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

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## Appendix A: Symbiota Metadata Entry Guide for CSU Biology Teaching Collection

### Symbiota Metadata Entry Guide for Vertebrate Specimens

This guide is designed for undergraduate student volunteers entering specimen metadata into the Symbiota portal for the Colorado State University Biology Teaching Collection. It covers both wet and dry vertebrate specimens and includes field-by-field instructions for accurate data entry. This guide follows Darwin Core standards where possible, meaning a strict fixed vocabulary, and uses a coded system to indicate the expected frequency of use for each data field:

-  = Always filled out
-  = Usually filled out
-  = Occasionally filled out
-  = Rarely or never used (but still included in the guide if relevant)

#### Note:

Some fields appear only if toggled or expanded. Some are auto-generated or restricted by your user permissions. Ask your supervisor if unsure.

### Step 1: Log In to CSVColl

- Go to [CSVColl.org/portal](https://csvcoll.org/portal) and make an account
  - Username: Your first and last name , Password: make it your own
  - Send your username to your supervisor to connect you to the project.
- In the top right corner of the screen, there is a button labeled “**My Profile**”. Click it
- Go to the tab labeled “**Occurrence Management**” and select the CSU teaching collection
- In the section labeled “**Data Editor Control Panel**”, click “**Add New Occurrence Record**”.
- On your screen, there should be a form with many different boxes to enter data. This guide will walk you through how to fill this out. Many fields will be left blank.
- The data entered will be in Darwin Core format, which is the universal museum format used for specimens. Don’t worry about looking this up, the specific format for each box will be listed in this guide

#### **\*REMINDER\***

Not every tag will look the same, with some specimens only containing the scientific name or even just the common name. With this in mind, it is OK to only fill out one or two fields in the form based on the information available on the specimen tag. Not every box needs to be filled and it is likely that many of the boxes on the form remain blank. If you have finished and there is something on the tag that you did not enter, ask your supervisor.

# Collector Info

## Catalog Number

**What it is:** A new, unique identifier for the specimen.

**How to fill it out:** - Format: CSUB.AA.00000 - Prefixes: - AV = bird - MA = mammal - RE = reptile - AM = amphibian, etc. Go to the appropriate sheet in CSUB Catalog, scroll to the bottom, and use the next available number.

**Example:** CSUB.MA.00161

1	CSUB #	Accession Number	Species (scientific)	Species (common)	ID Note
154	CSUB.MA.00153	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
155	CSUB.MA.00154	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
156	CSUB.MA.00155	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
157	CSUB.MA.00156	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
158	CSUB.MA.00157	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
159	CSUB.MA.00158	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
160	CSUB.MA.00159	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
161	CSUB.MA.00160	CSUB.ACC.00001	Peromyscus maniculatu	Deer Mouse	
162					
163					

## Tag Name & Additional Identifier Value

**What it is:** Old catalog or other reference numbers. The collection that the specimen was originally from.

**How to fill it out:** - Use only approved **Tag Names** (see list below).

- Use **Additional Identifier Value** for the number as written on the tag.
- If the tag title/label is unknown, include the whole thing in the value field and leave Tag Name blank.

### Controlled Vocabulary for Tag Name:

College Museum Number

X-Catalog Number

American Ornithologist's Union

**If you see a number that doesn't fit one of these categories, ask your supervisor.**

## Collector, Associated Collectors, and Number

**What it is:** The person or people who collected the specimen.

**How to fill it out:** - Use full name if available. If only initials are provided, format them as: P. H. Baldwin - First collector goes in **Collector** field. - Additional collectors go in **Associated Collectors** field, separated by | (vertical bar + space).

### Known Collector Initials: -

Frequently seen	Full name
PHB   P. H. Baldwin	Paul Herbert Baldwin
W. L. Burnett	William Lewis Burnett
Geo. E. Osterhout	George Everett Osterhout
EBR	E.B. Reed
B. O. Longyear	Burton Orange Longyear

**What if there's a preparator too?** - See the "Preparation Notes" section under **Occurrence Remarks**.

### Number :

This is a number assigned to the specimen by the collector. It will likely be found right after the name of the collector and is usually 1-2 digits.

## Date Collected (Event Date)

**Darwin-Core Format:** YYYY-MM-DD - Partial dates are allowed, e.g. 1924 or 1924-06

- Interpret the date from the verbatim into the Darwin-Core format
- Place in the Date(start) category, unless there is more than one date.

**Troubleshooting:** - If a 2-digit year is given, consult your supervisor. If the date is incomplete, write only the known sections.

**Verbatim Date** : Record the tag's original date exactly as written.

Collector Info				
Catalog Number <sup>Ⓢ</sup>	Tag Name (optional) <sup>Ⓢ</sup>		Additional Identifier Value	
<input type="text"/>	<input type="text"/>		<input type="text"/>	
Collector / Observer <sup>Ⓢ</sup>	Number <sup>Ⓢ</sup>	Date (start) <sup>Ⓢ</sup>	End Date <sup>Ⓢ</sup>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Associated Collectors <sup>Ⓢ</sup>			Verbatim Date <sup>Ⓢ</sup>	
<input type="text"/>			<input type="text"/>	

# Latest Identification

## Scientific Name

**What it is:** Current accepted name, including genus and species.

**How to fill it out:** - Use Symbiota's taxonomic thesaurus. - Select the full species name (or subspecies **IF** that is indicated in the original data).

- Autofill fields: Author, Family (verify that they populate).
- If the tag shows an outdated synonym, record that in **Taxon Remarks:** -  
Original label: *Vulpes fulva*; updated to *Vulpes vulpes*  
(taxonomic update)

## Identification Confidence

**Pre-assigned by supervisor.** Do not change. Check with your supervisor for an identification confidence before starting a new set of specimens.

## Identified By & Date Identified

**If you updated the scientific name,** enter your name and today's date. - If tag is still valid and accepted: use **collector's name** and **collection date in Darwin core format.**

## Identification References

If you changed the identification, this is where you would include any sources used.

## Identification Remarks

Use to note: - Synonyms that were updated - Label misspellings in scientific name - Specifics about partial identification

## Taxon Remarks

Optional. Use only if needed to clarify complex taxonomic situations.

**Latest Identification**

Scientific Name  Author

ID Confidence  Identification Qualifier

Family

Identified By  Date Identified


Identification References:

Identification Remarks:

Taxon Remarks:

# Locality

## Locality Fields

- **Continent:** Fill
- **Country, State, County:** Fill all if available
- **Locality:** Enter original description **verbatim**, in quotes
  - Example: "Lindemeir Lake, 3 mi. No. Ft. Collins, Larimar Co., Colo"
- **Location Remarks:**
  - **Start with:** Interpretation of verbatim locality:
  - **Expand abbreviations, correct misspellings**
  - **Example:** Interpretation of verbatim locality: Lindenmeier Lake, 3 miles north of Fort Collins, Larimer County, Colorado
- **Elevation** 
  - This is normally written in feet on the tag, you can enter the verbatim elevation and it will automatically convert into meters.

## Georeferencing

Use GEOLocate tool. - Uncertainty: Click grey arrow if not visible. - Remarks:

Coordinates estimated using GEOLocate based on interpreted locality.

After entering locality information, use the button for GeoLocate Locality, and it will take you to a new window. Most likely, there will be a few options, choose the one with the highest confidence. Sometimes you might need to use interpretations and change the verbatim locality in order for the tool to work properly. Hit "save to your application" at the bottom of the screen. The occurrence editor should automatically enter a latitude and longitude when you return to it.

- **Georeferenced by:** Enter your full name
- **Georeference Sources:** It will automatically enter GeoLocate if you use the tool.

### Things you might see:

**"T" and "R" coordinates.** e.g. T16N R65W.

- **What it is:** This is the Public Land Survey System (PLSS), which divided many (but not all) US states into grids. The combined "township" (T) number

and “range” (R) number reference a 6 x 6 mi square plot of land. Each square mile within this plot is a “section”.

- How to handle it: click the black “F” button next to the “Datum” field in the Locality section. This will open additional fields – fill in the TRS fields.
- The Geolocate tool should still work in identifying a specific latitude and longitude from these coordinates.
  - T and R fields: enter the number that occurs right after “T” and “R” respectively. Make sure directions (N/S, E/W) are set to match the data.
  - Sec: the “section”. May or may not be present in data. It would be a number between 1 and 36 and would be right after the T and R values and would be referenced as “S” or “sec”. Leave blank if no section number is present.
  - Meridian selection. May be written/abbreviated after the T and R values. If not, look to see what options there are for the state the specimen is from. Many states only have one option. If there are multiple options (e.g. “Wyoming, Sixth Principal” and “Wyoming, Wind River”) you will need to cross reference any additional locality data with the specimen and Google the meridian options. In general, the “Principle” meridians cover the entire state or multiple states, and other meridians only cover a specific region of the state.

Locality				
Continent <sup>Ⓞ</sup>	Water Body <sup>Ⓞ</sup>	Island Group <sup>Ⓞ</sup>	Island <sup>Ⓞ</sup>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Country <sup>Ⓞ</sup>	State/Province <sup>Ⓞ</sup>	County <sup>Ⓞ</sup>	Municipality <sup>Ⓞ</sup>	Location ID <sup>Ⓞ</sup>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Locality <sup>Ⓞ</sup>				
<input type="text"/>				
Location Remarks <sup>Ⓞ</sup>				
<input type="text"/>				
Security: <input type="text" value="Security not applied"/> <sup>Ⓞ</sup>				<input type="checkbox"/> Deactivate Locality Lookup
Latitude	Longitude	Uncertainty <sup>Ⓞ</sup>	Datum <sup>Ⓞ</sup>	Verbatim Coordinates <sup>Ⓞ</sup>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="C F"/>	<input type="text"/>
Elevation in Meters <sup>Ⓞ</sup>	Verbatim Elevation <sup>Ⓞ</sup>	Depth in Meters <sup>Ⓞ</sup>	Verbatim Depth <sup>Ⓞ</sup>	
<input type="text"/> - <input type="text"/>	<input type="text"/>	<input type="text"/> - <input type="text"/>	<input type="text"/>	
Lat: <input type="text"/> ° <input type="text"/> ′ <input type="text"/> ″ N <input type="text"/> W <input type="text"/>	Zone: <input type="text"/>	T <input type="text"/> N <input type="text"/> R <input type="text"/> E <input type="text"/>		
Long: <input type="text"/> ° <input type="text"/> ′ <input type="text"/> ″ W <input type="text"/>	East: <input type="text"/>	Sec: <input type="text"/> Details: <input type="text"/>		
North: <input type="text"/>		Meridian Selection <input type="text"/>		
Hemisphere: North <input type="text"/>		Insert TRS Values <input type="button"/>		
Insert Lat/Long Values <input type="button"/>		Insert UTM Values <input type="button"/>		
Georeferenced By	Georeference Sources <sup>Ⓞ</sup>	Georeference Remarks <sup>Ⓞ</sup>		
<input type="text"/>	<input type="text"/>	<input type="text"/>		
Georeference Protocol <sup>Ⓞ</sup>	Georef Verification Status <sup>Ⓞ</sup>	Footprint Polygon		
<input type="text"/>	<input type="text"/>	<input type="text"/>		

# Misc

## Habitat

- Only include if habitat is mentioned (e.g., shortgrass prairie, under log).
- Skip **Substrate** field entirely.

## Associated Taxa

Rarely used. Only if tag notes parasites, symbionts, or direct associations (e.g., with ticks, nesting with barn swallows).

## Description

Used for descriptive observations from the tag (e.g., fur reddish, emaciated, scars on flank).

## Occurrence Remarks

Use for: - **Preparation notes:** Skull only; mandible missing. - **Permit info:** Collected under salvage permit RGSW. - **Specimen condition - Other metadata that doesn't belong elsewhere**

Be specific when documenting damage, use anatomically accurate terms. Ex: Cranium highly fragmented, mandible split in half.

## Dynamic Properties

Use for structured but non-standard data, like **mammal measurements**.

**Formatting:** - total length = 355 mm; tail length = 120 mm; hind foot length = 22 mm; ear length = 18 mm; weight = 78 g

**Tag Examples:** - 355-120-22-18 78

## Life Stage

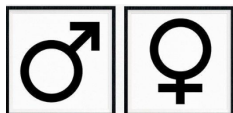
Use exact verbatim terms from tag.

### Controlled Vocabulary: -

Adult	An adult is an individual that is fully grown and has achieved mature characteristics.
Juvenile	A juvenile is a young individual organism and has not yet reached its subadult or adult form, sexual maturity or size. Generally juveniles are newly hatched or birthed and sometimes look different from the adult form, particularly in color and lack secondary sexual characteristics, etc. In many organisms, the juvenile has a different name from the adult.
Subadult	A subadult is an individual which lacks all the adult phenotypic characters. In birds, an individual that is fully feathered, with full body size, but is not in mature adult plumage.
More Info	<a href="https://arctos.database.museum/info/ctDocumentation.cfm?table=ctlife_stage">https://arctos.database.museum/info/ctDocumentation.cfm?table=ctlife_stage</a>

## Sex

- Record if stated. This will be listed on the tag with a symbol.



Alt. description: A circle with an arrow pointing up-right (left), a circle with a small cross below (right)

- The one on the left is the symbol for “**Male**” and the one on the right is the symbol for “**Female**”

Controlled vocabulary:

Female	Of or denoting the sex that can bear offspring or produce eggs, distinguished biologically by the production of gametes (ova) that can be fertilized by male gametes.
Female ?	The examiner believes the specimen to be a female, but is uncertain.
Male	Physiological sex that produces sperm.
Male ?	The examiner believes the specimen to be a male, but is uncertain.
Unknown	Sex is either not determinable or not recorded/there was no attempt to determine. Remarks and/or method should be used to elaborate.
More info	<a href="https://arctos.database.museum/info/ctDocumentation.cfm?table=ctsex_cdev">https://arctos.database.museum/info/ctDocumentation.cfm?table=ctsex_cdev</a>

## Individual Count

- Always enter 1
- We do not use batch or lot specimens.

## Sampling Protocol

Use only if the method is stated on the tag (e.g., mist net, museum special trap).

## Preparations

- List each preparation using **Darwin Core vocabulary**, separated by a **vertical line**.
- Examples: skin | skull, cranium, fluid preserved specimen

## Controlled vocabulary:

### Mammals:

Antler	Extensions of the skull often grown by members of the deer family; also used for antilocaprids (pronghorn keratin sheaths)
astragalus	The bone in the ankle that articulates with the leg bones to form the ankle joint (we have some artiodactyl astragali)
baculum	A bone found in the penis of many placental mammals
baleen plate	Baleen is a filter-feeding system inside the mouths of baleen whales.
bone	FIRST: if we know which bone it is, look in full list of Darwin Core terms above to see if the specific bone is accepted vocabulary. Only use "bone" if we don't know what bone it is, or that bone is not specifically listed in Darwin Core Any of the pieces of hard whitish tissue making up the skeleton in humans and other vertebrates; including paleontological, zoological, or archaeological samples.
calcaneum	The heel bone in non-human therian mammals. In humans the same bone is called the calcaneus.
claw	An appendage, typically made of keratin, found at the end of a toe or finger in most amniotes
feces	The solid or semi-solid remains of food that was not digested in the small intestine, and has been broken down by bacteria in the large intestine. Intestinal excrement, droppings, scat

flipper	A broad, flattened limb adapted for aquatic locomotion.
foot	An anatomical structure which is the terminal portion of a limb which bears weight and allows locomotion, or an invertebrate organ of locomotion or attachment.
hair	Includes spines, quills, etc. A protein filament that grows from follicles found in the dermis. Hair is one of the defining characteristics of mammals.
heart	A muscular organ in animals which pumps blood through the blood vessels of the circulatory system
Hoof wall	The hard exterior portion of the hoof.
horn	Make sure it's not an antler or a pronghorn (which goes under "antler") A permanent projection on the head of an animals consisting of a covering of keratin and other proteins surrounding a core of live bone
limb	A jointed, muscled appendage of a tetrapod vertebrate animal used for weight-bearing, terrestrial locomotion and physical interaction with other objects. Use part modifiers such as fore, hind, anterior, or posterior to specify position.
lung	The primary organ of the respiratory system in many animals including a few fish and some snails.
mandible	The bone that forms the lower jaw and holds the lower teeth in place. Also called lower jaw or jawbone. In arthropods, a pair of mouthparts used either for biting or cutting and holding food.
media	Photographs, literature, field notes, or digital media devices.
model	An informative representation of an object, person or system. May or may not be at scale
skeleton	An internal support structure of an animal, composed of mineralized tissue.
skin	The thin layer of tissue forming the natural outer covering of the body. Flat = pinned flat and dried rather than stuffed with cotton. Study = stuffed with cotton or similar inert material, preserved by drying (often in a linear position to conserve storage space, in contrast to a mount). Tanned = chemically preserved.
skull	A bone structure that forms the head in vertebrates. It supports the structures of the face and provides a protective cavity for the brain. The skull is composed of two parts: the cranium and the mandible.

tail	The tail is the section at the rear end of certain kinds of animals' bodies; in general, the term refers to a distinct, flexible appendage to the torso. It is the part of the body that corresponds roughly to the sacrum and coccyx in mammals, reptiles, and birds; for fish, the area between the anterior end of the anal fin to the anterior end of the caudal fin . While tails are primarily a feature of vertebrates, some invertebrates including scorpions and springtails, as well as snails and slugs, have tail-like appendages that are sometimes referred to as tails.
Tooth	A hard, calcified structure found in the jaws (or mouths) of many vertebrates and used to break down food.

**Birds:**

bill	An external anatomical structure of birds that is used for eating and for preening, manipulating objects, killing prey, fighting for food, courtship and feeding young.
egg	The organic vessel containing the zygote in which an embryo develops until it can survive on its own, at which point the animal hatches.
Feather	Epidermal growths that form a distinctive outer covering, or plumage, on dinosaurs, both avian (bird) and some non-avian (non-bird) and possibly other archosauromorphs.
foot	If anything ABOVE wrist/ankle is included, use "limb" An anatomical structure which is the terminal portion of a limb which bears weight and allows locomotion, or an invertebrate organ of locomotion or attachment.
head	The part of an organism which usually includes the ears, brain, forehead, cheeks, chin, eyes, nose, and mouth, each of which aid in various sensory functions such as sight, hearing, smell, and taste, respectively. Some very simple animals may not have a head, but many bilaterally symmetric forms do, regardless of size.
hyoid	A horseshoe-shaped bone situated in the anterior midline of the neck between the chin and the thyroid cartilage.
media	Photographs, literature, field notes, or digital media devices.
model	An informative representation of an object, person or system. May or may not be at scale
nest	A structure built for certain animals to hold eggs, offspring, and, oftentimes, the animal itself.
pellet	A mass of undigested parts of a bird's food that some bird species occasionally regurgitate.
skeleton	An internal support structure of an animal, composed of mineralized tissue.
skin	The thin layer of tissue forming the natural outer covering of the body.
syrinx	A complex vocal organ found in some birds, analogous to mammalian vocal folds in function but not in form. Some elements of the syrinx are mineralized.

Tail	The tail is the section at the rear end of certain kinds of animals' bodies; in general, the term refers to a distinct, flexible appendage to the torso. It is the part of the body that corresponds roughly to the sacrum and coccyx in mammals, reptiles, and birds; for fish, the area between the anterior end of the anal fin to the anterior end of the caudal fin . While tails are primarily a feature of vertebrates, some invertebrates including scorpions and springtails, as well as snails and slugs, have tail-like appendages that are sometimes referred to as tails.
tongue	A muscular organ in the mouth of a typical vertebrate. It manipulates food for mastication and swallowing as part of the digestive process, and is the primary organ of taste.
wing	A type of appendage that produces lift while moving through air or some other fluid.

### Herps:

carapace	Dorsal part of the turtle shell or the exoskeleton over the cephalothorax of an arthropod.
Egg	The organic vessel containing the zygote in which an embryo develops until it can survive on its own, at which point the animal hatches.
model	An informative representation of an object, person or system. May or may not be at scale
plastron	The nearly flat part of the shell structure of a turtle, what one would call the belly or ventral surface of the shell.
scute	A bony external plate or scale overlaid with horn, as on the shell of a turtle, the skin of crocodilians, and the feet of birds. If the horn or keratinous layer is not present, the appropriate part name is osteoderm along with the part modifier scute, bony. If both the keratinous and bony parts of the scute are present, it will be advantageous to record two parts, scute and osteoderm. The term is also used to describe the anterior portion of the mesonotum in insects as well as some arachnids (e.g., the family Ixodidae, the scale ticks).
skeleton	An internal support structure of an animal, composed of mineralized tissue.
skin	The thin layer of tissue forming the natural outer covering of the body.

### Phenology ☐

Use if reproductive condition is noted (e.g., pregnant, lactating).

- This normally appears in the top left corner of a tag, some examples being (testes abdominal), (no visible embryo). Enter verbatim comments.

### Behavior ◆

Only use if tag has notes like torpid, calling, flightless.

## Vitality

Only use if tag indicates condition at capture (e.g., dead, moribund).

## Establishment Means

If known, enter: - native - introduced - captive . **Do not guess. Leave blank if unsure.**

## Controlled vocabulary:

native	A taxon occurring within its natural range.
nativeReintroduced	A taxon re-established by direct introduction by humans into an area that was once part of its natural range, but from where it had become extinct.
introduced	Establishment of a taxon by human agency into an area that is not part of its natural range.
introducedAssistedColonisation	Establishment of a taxon specifically with the intention of creating a self-sustaining wild population in an area that is not part of the taxon's natural range.
vagrant	The temporary occurrence of a taxon far outside its natural or migratory range.
uncertain	The origin of the occurrence of the taxon in an area is obscure.
More info:	<a href="https://dwc.tdwg.org/em/">https://dwc.tdwg.org/em/</a>

## Cultivated/ Captive

If the tag specifies that the specimen was captive or cultivated, check the box.

**Misc**

Habitat <sup>Ⓢ</sup>

Substrate <sup>Ⓢ</sup>

Associated Taxa <sup>Ⓢ</sup>

Description <sup>Ⓢ</sup>

Notes (Occurrence Remarks) <sup>Ⓢ</sup>

Dynamic Properties <sup>Ⓢ</sup>

Life Stage <sup>Ⓢ</sup>   Sex <sup>Ⓢ</sup>   Individual Count <sup>Ⓢ</sup>   Sampling Protocol <sup>Ⓢ</sup>   Preparations <sup>Ⓢ</sup>  
           

Phenology <sup>Ⓢ</sup>   Behavior <sup>Ⓢ</sup>   Vitality <sup>Ⓢ</sup>   Establishment Means <sup>Ⓢ</sup>    Cultivated/Captive

# Curation

This will be information specifically related to each collection, including where the specimen is kept.

## Type Status

Do not use. We have no type specimens.

## Disposition

Enter the exact shelf code where the specimen is housed (e.g., AV-11.5).

## Occurrence ID

Auto-generated. Leave blank.

## Field Number

Skip. Not used in our collection.

## Label Project

Ask your supervisor which project to select. This is how it will be sorted for labeling.

## Dupe Count

This tells Symbiota how many labels to print. Enter the number of **labels needed + 1**. We need one label for each preparation, and then an additional label to mark that specimen's place in the cabinet. E.g. a specimen with preparations `skull | study skin` would have a dupe count of 3 (2 preparations + 1 extra label)

## Data Generalizations

Skip unless instructed.

## Processing Status

Skip unless instructed.

## Basis of Record

- Always `PreservedSpecimen`

Curation			
Type Status <sup>Ⓢ</sup>	Disposition <sup>Ⓢ</sup>	Occurrence ID <sup>Ⓢ</sup>	Field Number <sup>Ⓢ</sup>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Language <sup>Ⓢ</sup>	Label Project <sup>Ⓢ</sup>	Dupe Count <sup>Ⓢ</sup>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
Data Generalizations <sup>Ⓢ</sup>			
<input type="text"/>			
Institution Code (override) <sup>Ⓢ</sup>	Collection Code (override) <sup>Ⓢ</sup>	Owner Code (override) <sup>Ⓢ</sup>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
Basis Of Record <sup>Ⓢ</sup>	Processing Status <sup>Ⓢ</sup>		
<input type="text" value="PreservedSpecimen"/>	<input type="text" value="Pending Review"/>		

## Linking Related Specimens

If specimens are presumed to be from the same litter or event, and metadata is identical, note the association in **Occurrence Remarks**: > Presumed littermate of CSUB.MA.00326; same date and location.

## Formatting Rules

- Use lowercase for controlled vocab fields (e.g., juvenile, **not** Juvenile)
- Separate list values using:
  - Vertical bar and space (|) for name fields
- Use quote marks in any **verbatim** fields (e.g., Locality)

## Imaging:

- Images of the specimen can be added during initial tagging, or at a later time.
- Standardized imaging protocol should be followed, using high-quality photos, a light box, and multiple angles, including the attached metadata tag.

Occurrence Data	Determination History	Media	Linked Resources	Admin
Add a New Resource				
Select a media file located on your computer that you want to upload:				
<input type="button" value="Choose File"/> No file chosen				
<input type="checkbox"/> Do not map large version of image (when applicable)				
<input type="button" value="Enter URL"/>				
Caption: <input type="text"/>				
Creator: <input type="text" value="Select Creator"/>				
Notes: <input type="text"/>				
Copyright: <input type="text"/>				
Source Webpage: <input type="text"/>				
Sort: <input type="text"/>				
Describe this resource				
<input type="checkbox"/> Image shows an organism.				
<input type="checkbox"/> Image shows label data.				
<input type="checkbox"/> Image shows an annotation/identification label.				
<input type="checkbox"/> Image has typed or printed text.				
<input type="checkbox"/> Image has handwritten label text.				
<input type="checkbox"/> Field image of habitat.				
<input type="checkbox"/> There is a problem with this image.				
<input type="checkbox"/> Image contains a diagnostic character.				
<input type="checkbox"/> Image contains the adult organism.				
<input type="checkbox"/> Image contains the immature organism.				
<input type="button" value="Submit New Resource"/>				