

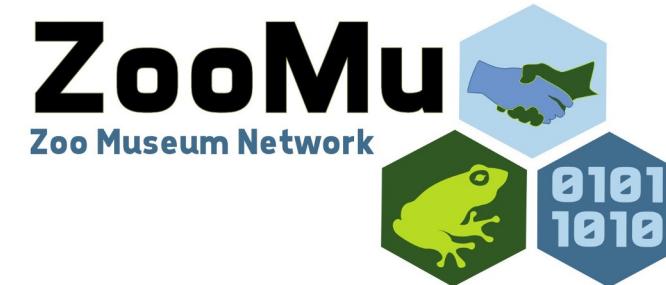
# ZooMu Research Coordination Network

## Cyberinfrastructure Topical Working Group

Kickoff Meeting  
18-20 March 2025

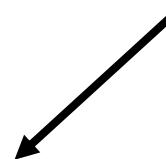


**ZooMu RCN: Integrating Zoos and Natural History Museums to Enhance Capacity for Biological Collections Research**



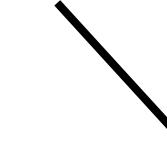
# What is ZooMu?

**NSF-funded Research Coordination Network**  
**Cross-Institutional Network Connecting**  
**Biodiversity Collections**



**Zoos & Aquariums**

Living Collection



**Natural History Museums**



Preserved Collection

Birth

Death

$\infty$

Long-lasting & transdisciplinary network between complementary biological collections and broadening access to collection data & materials

# Who We Are: PI and co-PIs

**Greg Watkins-Colwell**  
Senior Collections Manager  
Yale Peabody Museum



**Steven Whitfield**  
Director of Terrestrial and  
Wetlands Conservation  
Audubon Nature Institute



**Sinlan (Sheila) Poo**  
Curator of Research  
Memphis Zoo



**Alex Shepack**  
Postdoctoral Researcher  
Florida International University



# Who We Are: Other Key Players

## Advisory Board



**Gil Nelson**  
University of Florida,  
iDigBio



**Barbara Theirs**  
Emeritus, NY  
Botanical Garden

## Steering Committee



**Jennifer  
D'Agostino**  
Oklahoma City Zoo



**Catherine Early**  
Science Museum of  
Minnesota



**John Fraser**  
Alaska Sea Life  
Center, Knology

## External Evaluators



**INFORM**  
EVALUATION & RESEARCH



**Joe Mendelson**  
Zoo Atlanta



**Anna Monfils**  
Central Michigan  
University



**Shelly Grow**  
Association of Zoos  
and Aquariums

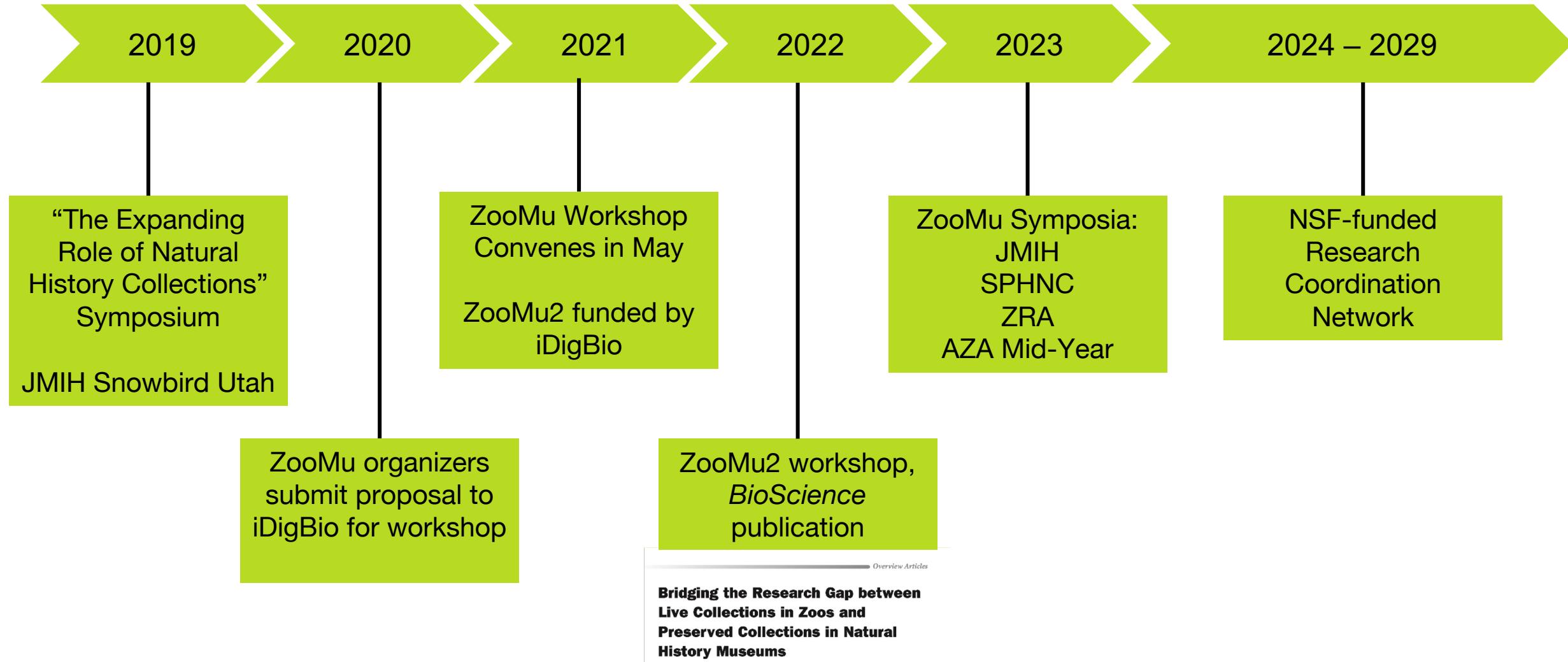


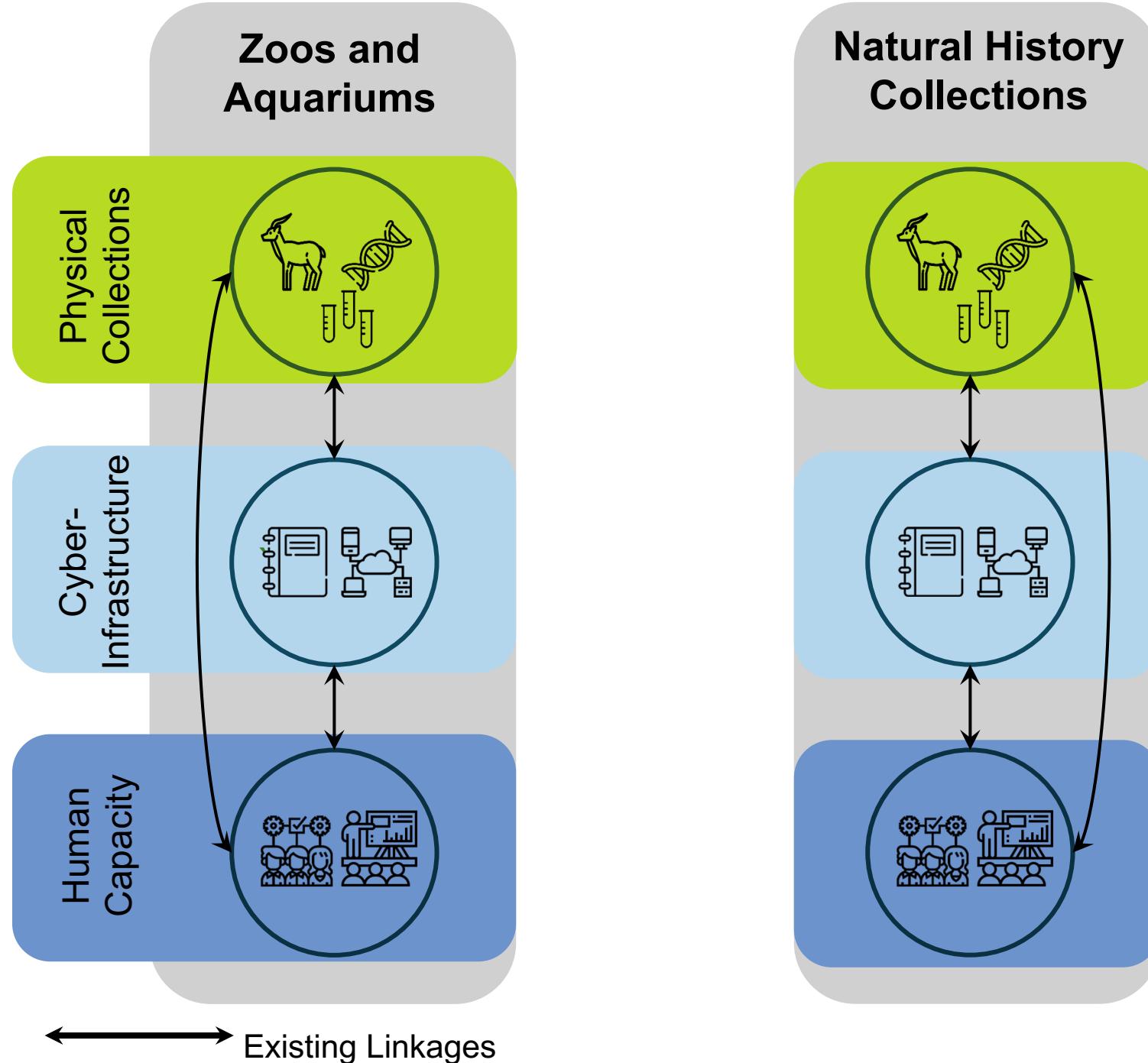
**Michelle Koo**  
UC Berkeley  
Museum of  
Vertebrate Zoology

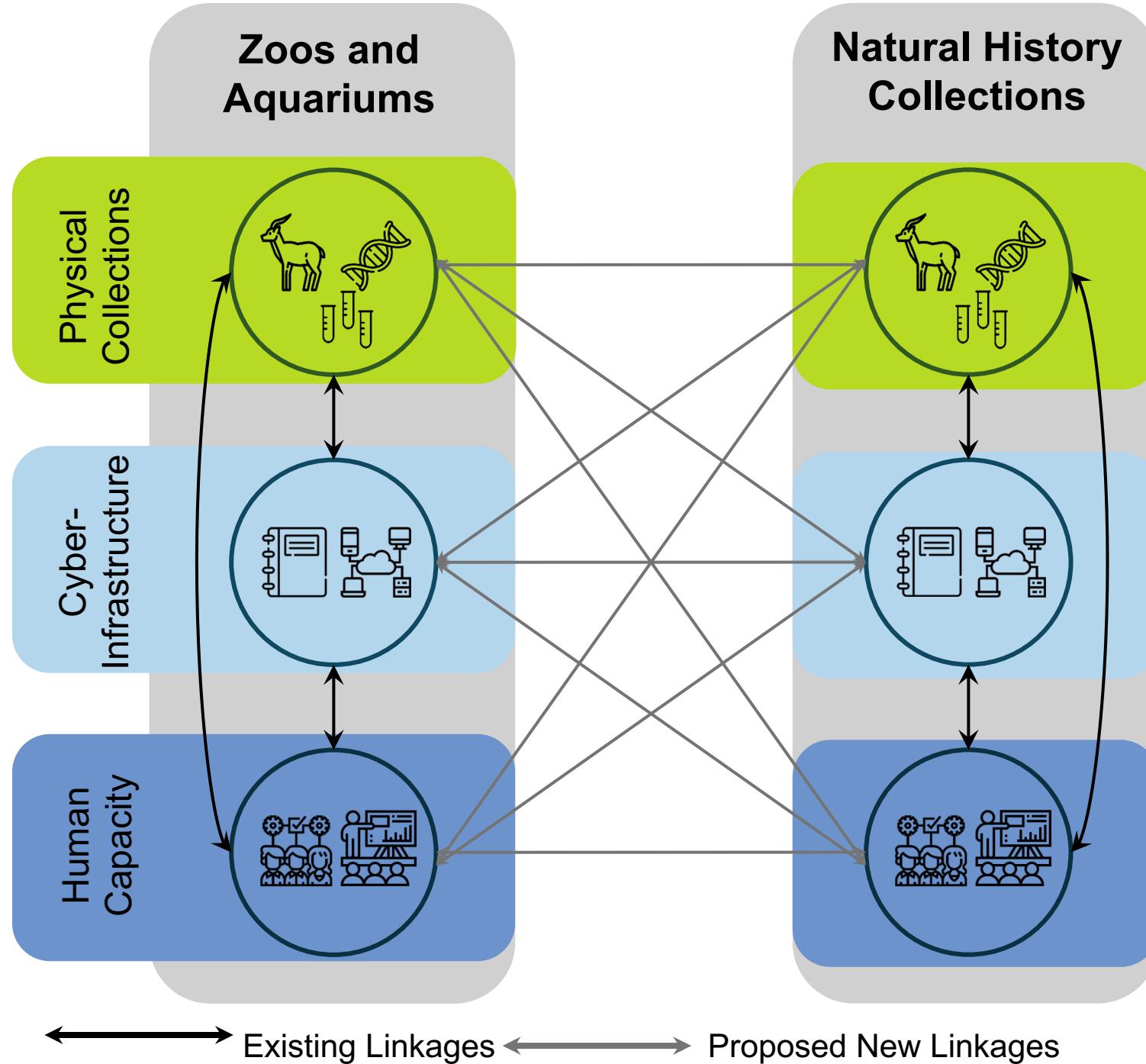


**Amanda Mazza**  
Duke Lemur Center

# Timeline: Where we are, and how we got here

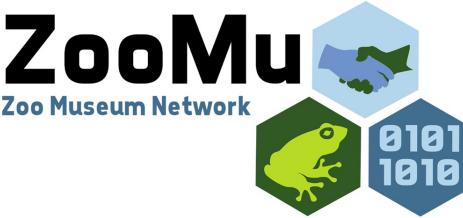






# ZooMu RCN

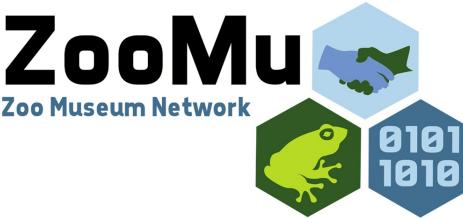
## Schedule of Activities



Calendar Year	2024		2025				2026				2027				2028				2029	
Calendar Quarter	Q3	Q4	Q1	Q2																
<b>General/Administrative</b>																				
Hire Part-time Assistant																				
Build ZooMu Website																				
Overview Webinar			W																	
<b>TWG: Physical Collections</b>																				
TWG-PC Planning																				
TWG-PC Launch Meeting						M														
TWG-PC Webinar																				
<b>TWG: Cyber-Infrastructure</b>																				
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TWG-HC Launch Meeting						M														
TWG-HC Webinar																				
<b>Regional Network Meetings</b>											M									
Southeast RegNet																				
Western RegNet												M								
Midwest RegNet													M							
Southeast RegNet														M						
<b>Conference Symposia</b>																M				
AZA Annual Meeting																	M			
SPNHC Annual Meeting																		M		
ZooMu Con																			M	
<b>Grant Year</b>	Year 1				Year 2				Year 3				Year 4				Year 5			
<b>Grant Quarter</b>	Q1	Q2	Q3	Q4																

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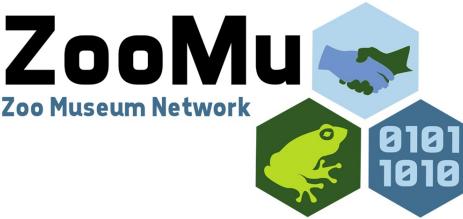
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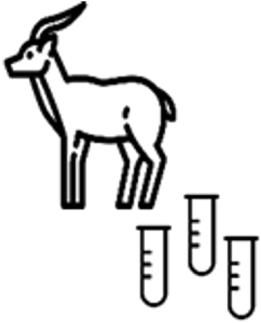
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# ZooMu RCN

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# TWG1: Physical Collections

## Nature of Collections

Specimen and Sample Transfer

Permitting Considerations

### Zoos and Aquariums

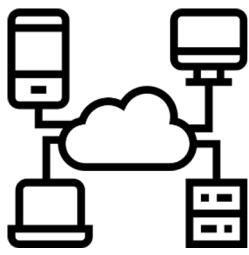
- Accredited zoos and aquariums hold ~800,000 animals among ~16,000 species
- Specimens receive regular medical care, most are part of cooperative breeding programs, have detailed specimen data
- Zoos may collect biological materials (blood, tissues, gametes) through the life of the animal for preservation in “**biobanks**”



### Natural History Collections

- Natural history collections contain 500M to 1B billion specimens from ~1.2 million species
- Specimens include preserved organisms or parts (skins, skeletons, DNA, tissue, etc)
- “Taxidermy” specimens for in front of house are typically small part of overall collection
- “**Cryo collections**” primarily for genomics





# TWG2: Cyber-Infrastructure

## Collection Management Systems

### Data Standards

### Data Accessibility

### Zoos and Aquariums

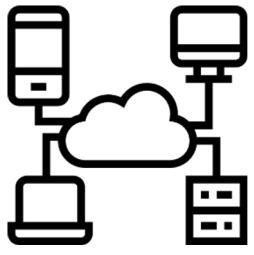
- CMS hold specimen data, including life milestones, health information, behavioral notes
- Zoological Information Management System (ZIMS) and Tracks are most standard CMS systems
- CMS share data among zoos as inherent part of software

The screenshot shows the iDigBio Species Holding interface. At the top, there are filters for 'Pending Transactions' (413), 'Incomplete Accessions' (392), and 'Recent Animals' (13). Below these are sections for 'Pending Taxonomic Changes' (3) and 'Incomplete Accessions' (3). A central table lists specimens with columns for 'Local ID', 'Taxonomy', and 'Image'. A modal window titled 'Species Holding report from Business Milesone / Great Indian hornbill' is open, displaying a grid of specimen data.

### Natural History Collections

- CMS hold specimen data, including collector, locality, date of collection, etc
- Common CMS software include Specify, Arctos, Emu, Symbiota
- Data not shared through institutions via CMS directly. Instead aggregators (VertNet, iDigBio, GBIF, DISSCO) are allowed access to certain data within CMS

The screenshot shows the iDigBio interface with a detailed specimen record for 'HER05208-Dromococcyx urbicus (1)' from 'Wetmore Colwell, G. J.' on October 10, 2013. The record includes fields for 'Accession', 'Collector', 'Locality', 'Date Collected', 'Sex', and 'Stage'. To the right, a world map displays collection localities for 'panthera onca' across various countries like USA, Brazil, and Argentina.



# TWG2: Cyber-Infrastructure

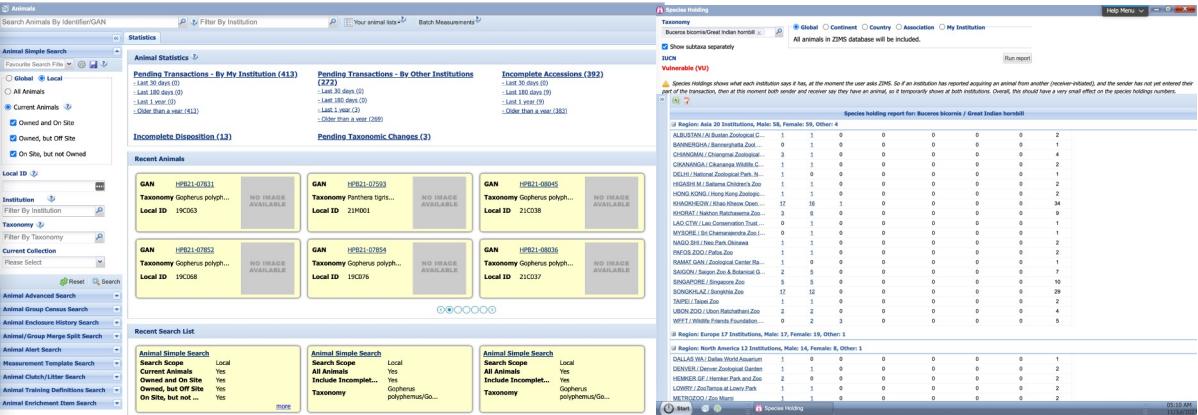
## Collection Management Systems

### Data Standards

### Data Accessibility

### Zoos and Aquariums

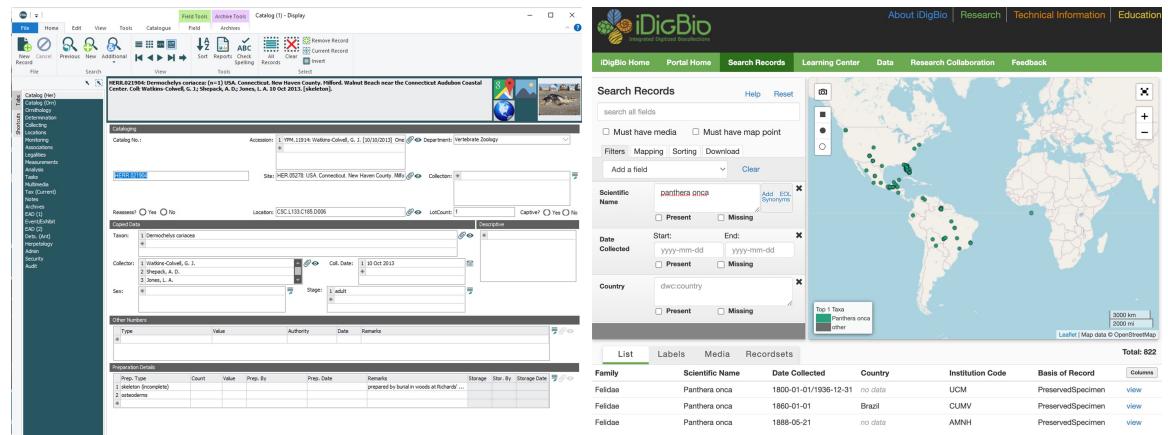
- Many data are sensitive medical records, HIPAA may be starting point for understanding data use
- Data are not interoperable with other biodiversity platforms



The screenshot shows the ZooKeeper software interface. It includes sections for Animal Statistics (Pending Transactions - By My Institution (413), Pending Transactions - By Other Institutions (272), Incomplete Accessions (392)), Recent Animals (GAN, HPB21-07811, Taxonomy Gopherus polyphemus, Local ID: 19C03; GAN, HPB21-07933, Taxonomy Panthera tigris, Local ID: 21M01; GAN, HPB21-08495, Taxonomy Gopherus polyphemus, Local ID: 21C038), and Recent List (Animal/Group Merge Split Search, Animal Alert Search, Measurement Template Search, Animal Clutch/User Search, Animal Training Definitions Search, Animal Enrollment Item Search).

### Natural History Collections

- Commonly use DarwinCore as metadata standard that allows data interoperability among platforms
- Articulated goal of FAIR data standards (Findable, Accessible, Interoperable, Reusable)



The screenshot shows the iDigBio software interface. It includes a Catalog (Catalog No.: HER05278, Date Collected: 19 Oct 2013, Site: HER05278, USA, Connecticut, New Haven County, Milford, Center Coll. Wethers-Colewell, G. J., 19 Oct 2013 (skeleton)), a search bar (Search Records), and a world map showing collection localities for panthera onca.



# TWG2: Cyber-Infrastructure

## Collection Management Systems

## Data Standards

## Data Accessibility

### Zoos and Aquariums

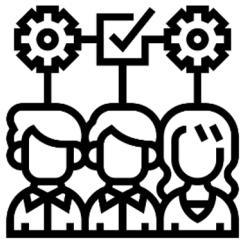
- Collections information available (public animals in zoo, listings of species on webpages) – but not in a format linked to global biodiversity platforms for science
- Species360 allows requests for anonymized data from ZIMS to external scientists after internal review

The screenshot shows the Species360 software interface. It includes sections for 'Pending Transactions - By My Institution (413)', 'Pending Transactions - By Other Institutions (272)', and 'Incomplete Accessions (392)'. The 'Pending Transactions' section lists items like 'Gan GAN-07811 Taxonomy Gopherus polyphemus' and 'Gan GAN-07933 Taxonomy Panthera tigris'. The 'Incomplete Accessions' section lists items like 'Gan GAN-08945 Taxonomy Gopherus polyphemus' and 'Gan GAN-07852 Taxonomy Gopherus polyphemus'. A 'Recent Animals' section shows a grid of animal records.

The screenshot shows the iDigBio software interface. It features a search bar at the top and a main area for viewing specimen records. One record is shown for 'Panthera onca' (Great Indian hornbill), detailing its accession number (HER.05278), date (2010-10-19), collector (Watson-Colewell, G. J.), and location (New Haven, CT). Below the record, there's a map of the world with green dots indicating collection localities. A legend on the right side of the map indicates collection types: 'Top 1 Taxon' (Panthera onca), 'other' (green dot), and 'Missing' (grey dot).

### Natural History Collections

- Major shift towards accessible data on specimens, facilitated through aggregators
- Like zoos, collections may contain sensitive data or information – which is withheld from CMS



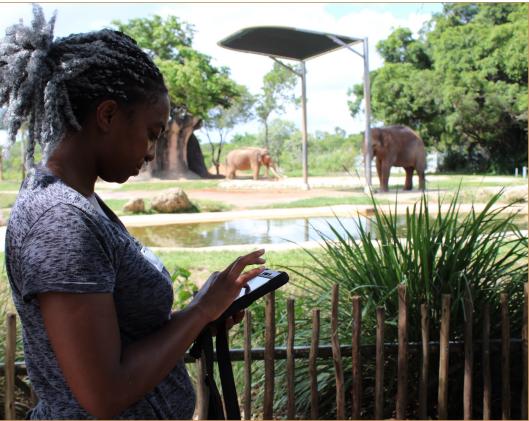
## **TWG3: Human Capacity**

### **Bridging Cultures**

Training and cross-training

Educational Pipelines

- Two biological collections communities with many shared interests and challenges
- Two collections communities that are largely separate – separate meetings and conferences, research agendas, terminologies)
- Well-ingrained differences in the culture of the collections communities (organizational mission, role of basic science vs. applied conservation, views on data standards)
- ZooMu meetings in person seek to bridge cultures, foster introductions, find common ground



## Housekeeping Notes

- Two biological collections communities with many shared interests and challenges
- Two collections communities that are largely separate – separate meetings and conferences, research agendas, terminologies)
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