A Snake in the Glass

Wet tank setup and focus stack imaging method for reptile and amphibian specimens

UCM 21061 *Lampropeltis mexicana greeri*

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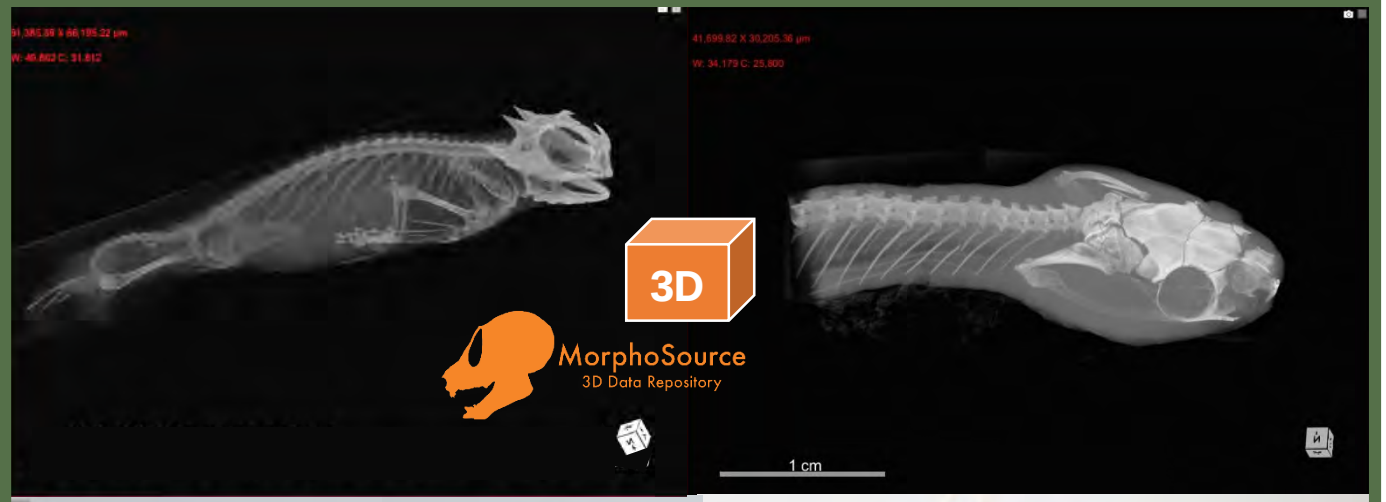
SPNHC 2022, Edinburgh

Project Background

NSF Award 2001474



oMeso

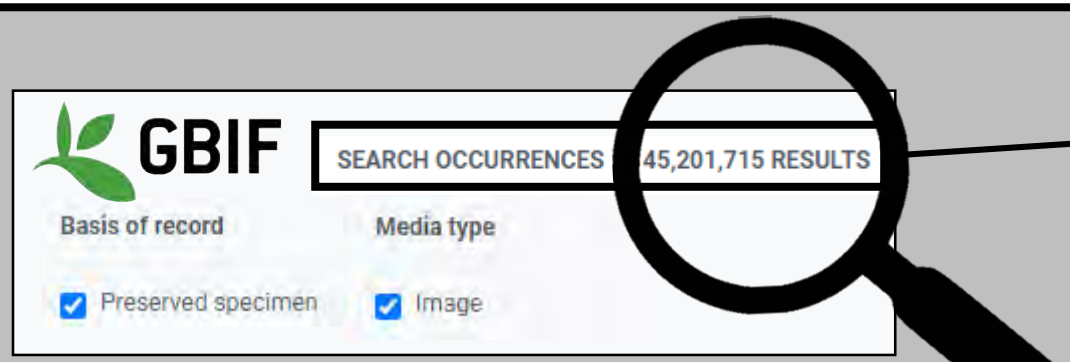
Opening Mesoamerican Herpetofaunal Diversity to Whole Phenome Imaging

- Partner to oVert project (NSF)
- Mesoamerican amphibians and squamates
- 2D & 3D data resource
- Emphasis in endemic, endangered, and cryptic taxa

Left: UCM 41483 *Phrynosoma modestum*

Right: UCM 40626 *Dipsas brevifacies*

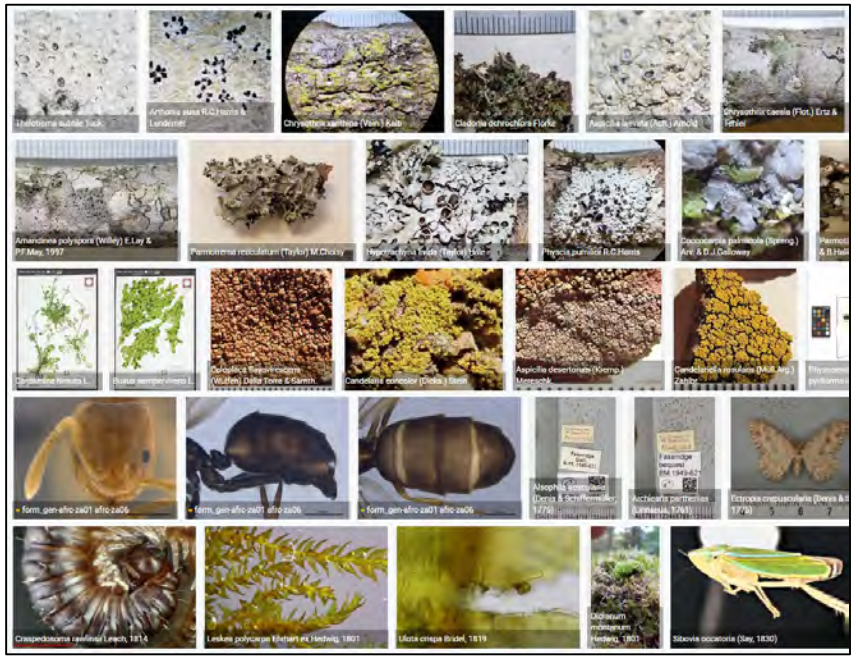
Herp Media in GBIF



TAXONOMIC DISTRIBUTION OF OCCURRENCES

Explore **Major groups**

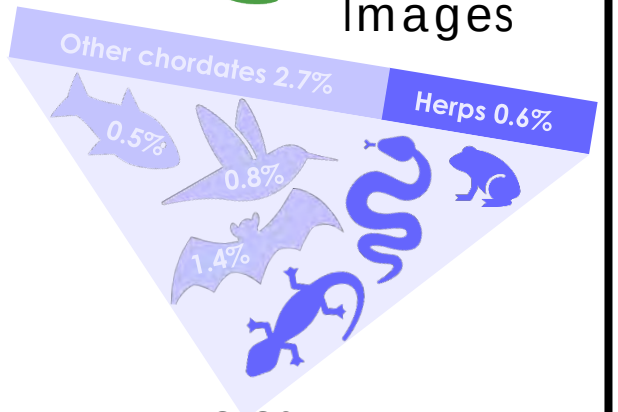
- Plantae 81%
  - Tracheophyta 77%
    - Magnoliopsida 57%
      - Asterales 7%
        - Asteraceae 7%
      - Fabales 6%
    - Liliopsida 15%
      - Poales 10%
- Animalia 13%
  - Arthropoda 8%
    - Insecta 7%

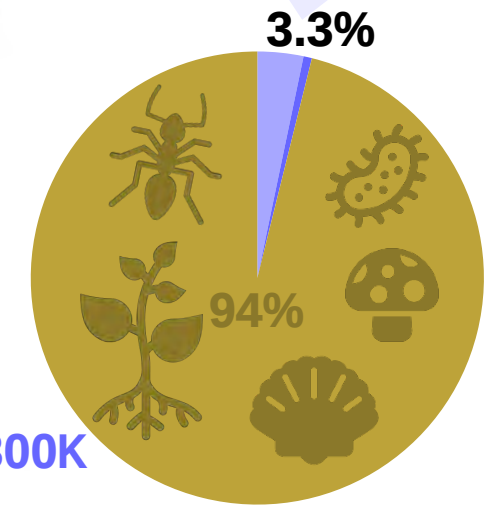


GBIF.org (2022), *GBIF Occurrence Gallery*. Available from: https://www.gbif.org [25 April 2022].

45,201,715
Specimen Images

- Chordata 1,489,750
  - Mammalia 623,638
  - Aves 349,335
  - Actinopterygii 226,394
  - Elasmobranchii 7,944
  - Ascidiacea 3,716
  - Thaliacea 1,067
  - Cephalaspidomorphi 404
  - Appendicularia 401
  - Leptocardii 315
  - Holocephali 299
  - Sarcopterygii 234
  - Myxini 143
  - Reptilia 169,957
  - Amphibia 103,700
  - Unknown class 2,203





<300K

Diverse 3D forms... tricky!

Figured (top to bottom, left to right)

UCM 38227 *Thorius pulmonaris*

UCM 16191 *Laemanctus serratus*

UCM 40777 *Phrynosoma cerroense*

UCM 8985 *Sceloporus spinosus*

UCM 41256 *Incilius cycladen*

UCM 65662 *Pituophis catenifer affinis*

UCM 25520 *Bolitoglossa lincolni*

Photo Tank

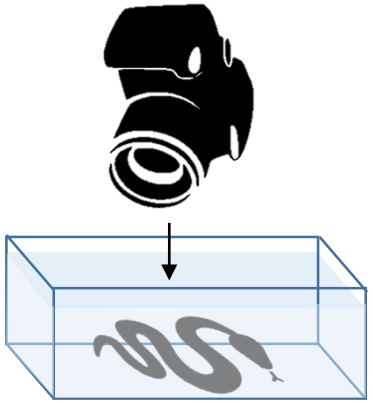
aka "photo immersion"
or "squeeze" tank

Tank Photo: Zack Randall (FLMNH)

Benefits

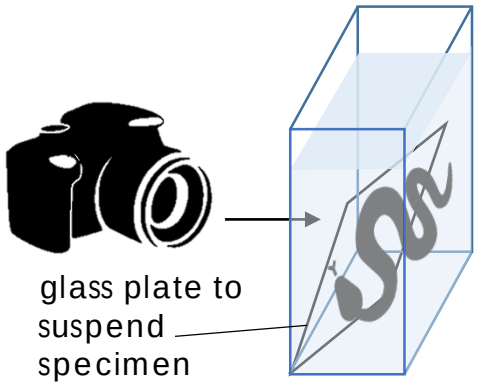
- Eliminates glare
- Eliminates shadows
- Maintains hydration
- Supports specimen
- Better portrays patterning and color

Horizontal Setup



camera on copystand

Vertical Setup



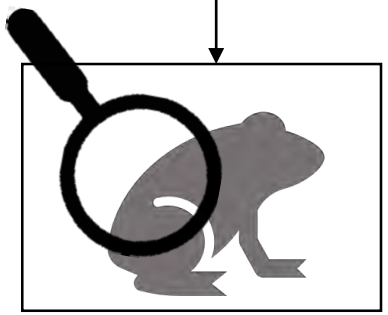
camera on tripod

Focus Stacking

Extended Depth of Field

Image Stack
Different focal distances

Composite Image
Sharp and in focus

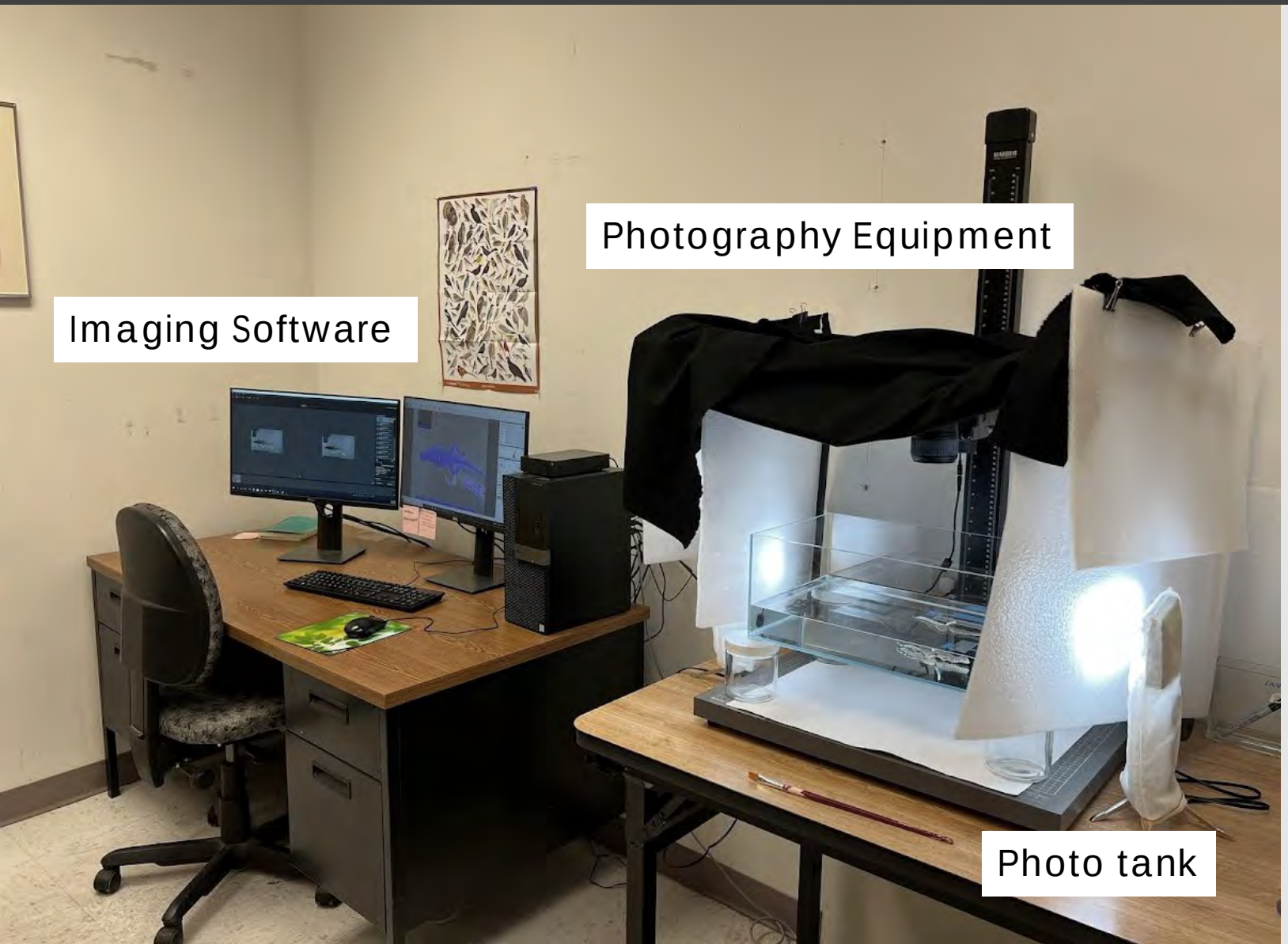


UCM 61380 *Phrynosoma cornutum*

1 Image

16 Images

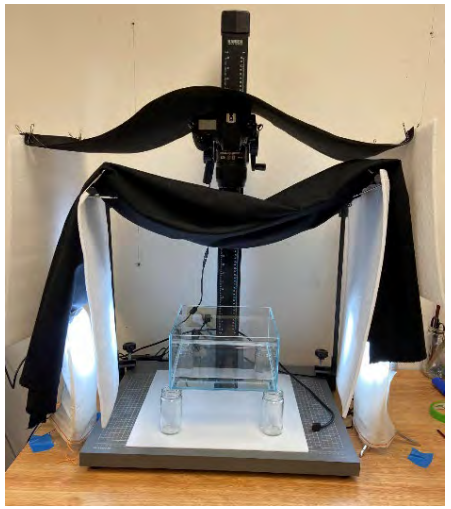
Wet Station Setup



General Recommendations:

- Keep computer workstation physically separate from imaging station
- Use nitrile **Flocked Gloves** for moving between wet and dry equipment (reusable)

Equipment - Photography



Copy Stand

Mounts camera parallel to base

- Many options

Kaiser RS10 with RTP Arm (40”)

Camera

- **DSLR body** (digital single-lens reflex)
- **Lens:** 50-100mm macro

Nikon 810D, Nikon AF-S Micro-NIKKOR 60mm f/2.8G ED Lens

Lighting

- Tabletop options
- Soft box
- Umbrella

Product search: portable LED lighting kit

Light Diffuser

- Many options
- Velvet drape

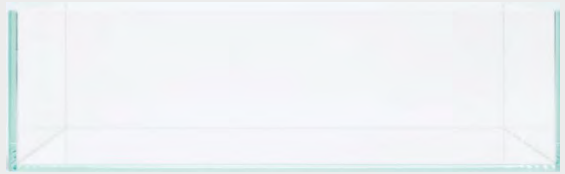
diffuser paper, light box, soft box, Ethafoam, fabric

Background

- Non-reflective (acrylic blotting paper, etc.)
- White Balance card
- Scale Bar
- Color card (optional)

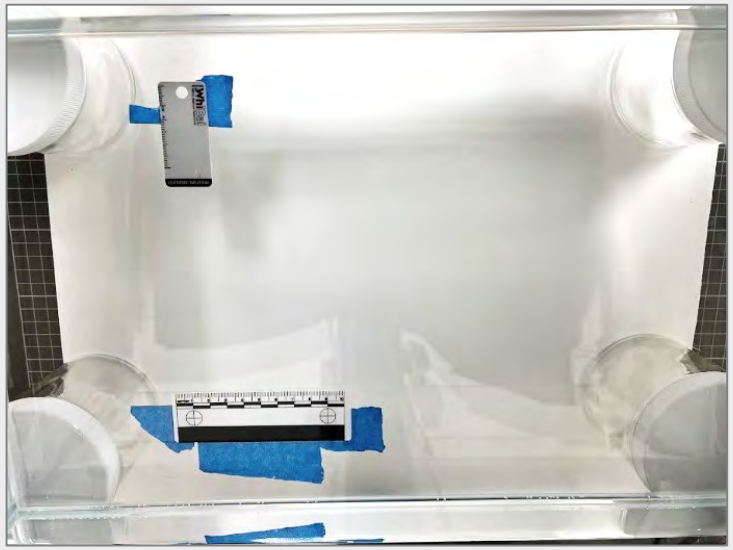
Product search: nonreflective Acrylic background boards

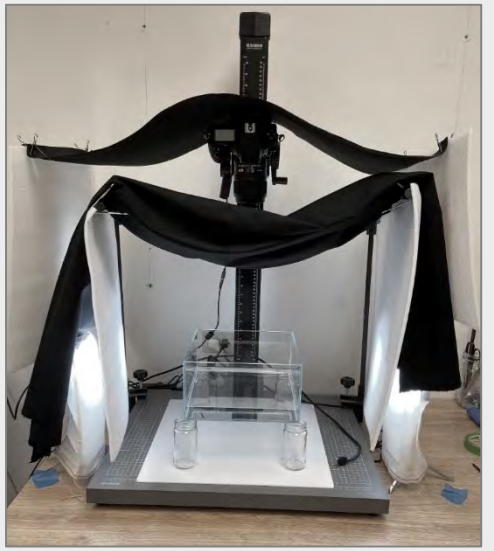
Equipment – Photo Tank



Shallow Aquarium

- Build – glass, silicon, [plexi]
- Purchase - e.g. Glass Aqua
  9.8 x 9.8 x 4.2 in. (model 25S $56)
  17.7 x 11.0 x 7.1 in. (model 45S $85)





Elevate on jars or build custom stand

- Even backdrop
- Reduces shadows
- Less reflectance

Preservative
bath

Rubber-tipped Forceps
prevents tank scratches

Glass & Museum Wax
Specimen positioning

Paintbrush, Bulb Syringe
remove bubbles, debris, film

Painter's Tape
Repositioning scales and marking lights

Equipment – Software & Accessories

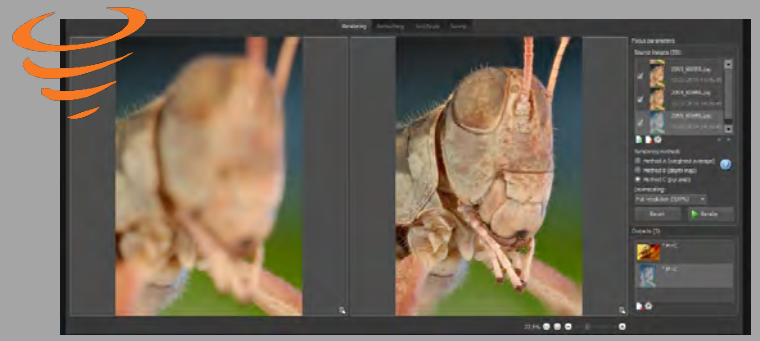
Camera Power Adapter

Continuous wall outlet power (vs battery)

- Kit dependent on camera model

Image Stacking Software

- Helicon Focus
- Zerene Stacker
- CombineZ
- Adobe Photoshop



Tethering

Connect camera to computer for remote operation

Cords:

- USB 3.0 Charger Cable - A-Male to Micro-B

Software options:

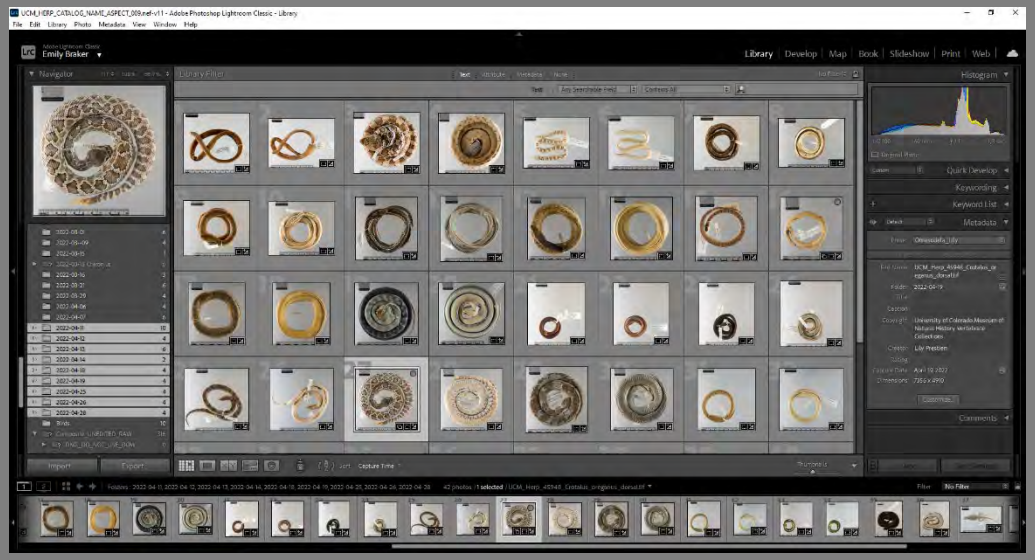
- Helicon Focus Remote
- EOS Utility (Cannon)
- Camera Control Pro (Nikon)

Helicon Remote

Image Processing Software

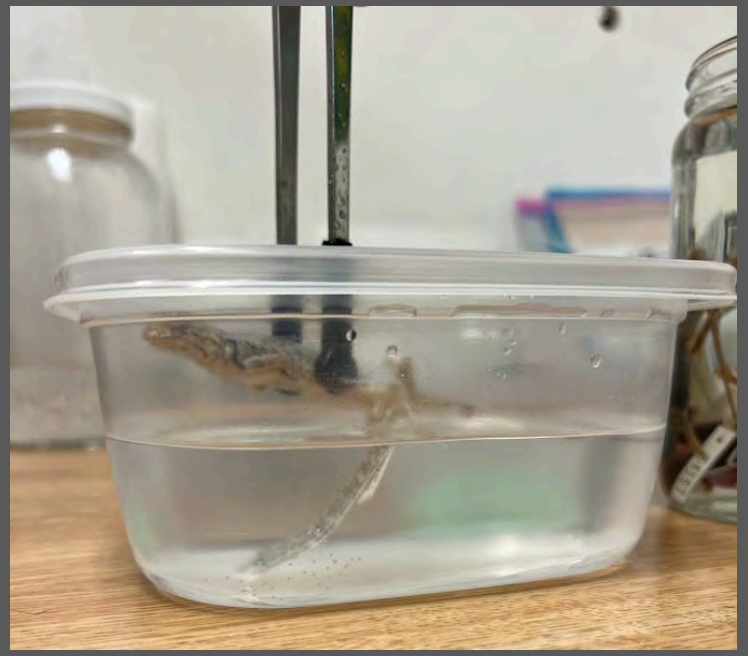
Cropping, adjustments, Exporting images

- Adobe LightRoom
- Adobe Photoshop



Workflow – Set up

Dunk Tank

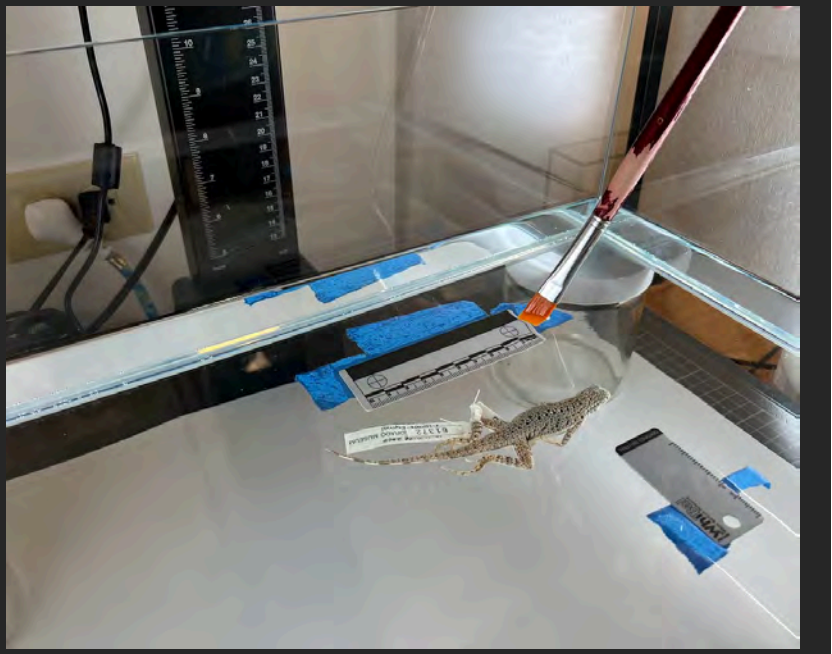


- Gently remove loose debris
- Discard ETOH and replace as needed

Position Specimen

- Position specimen parallel to scale bar
- Catalog# visible, flatten tags if possible
- Fill frame – adjust camera height, scale bar and white balance as needed

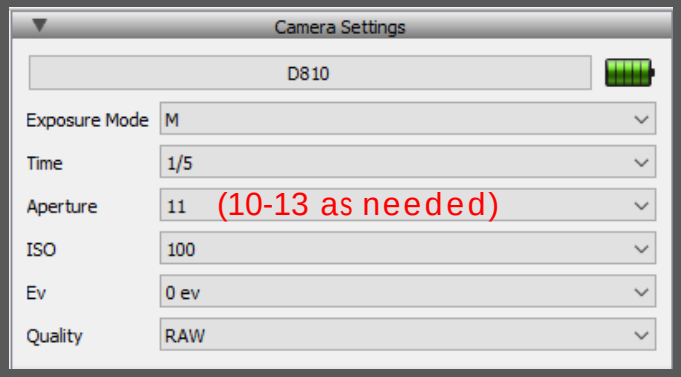
Clean Stage



- Pop bubbles
- Remove particulates
- Sip surface film with bulb syringe as necessary

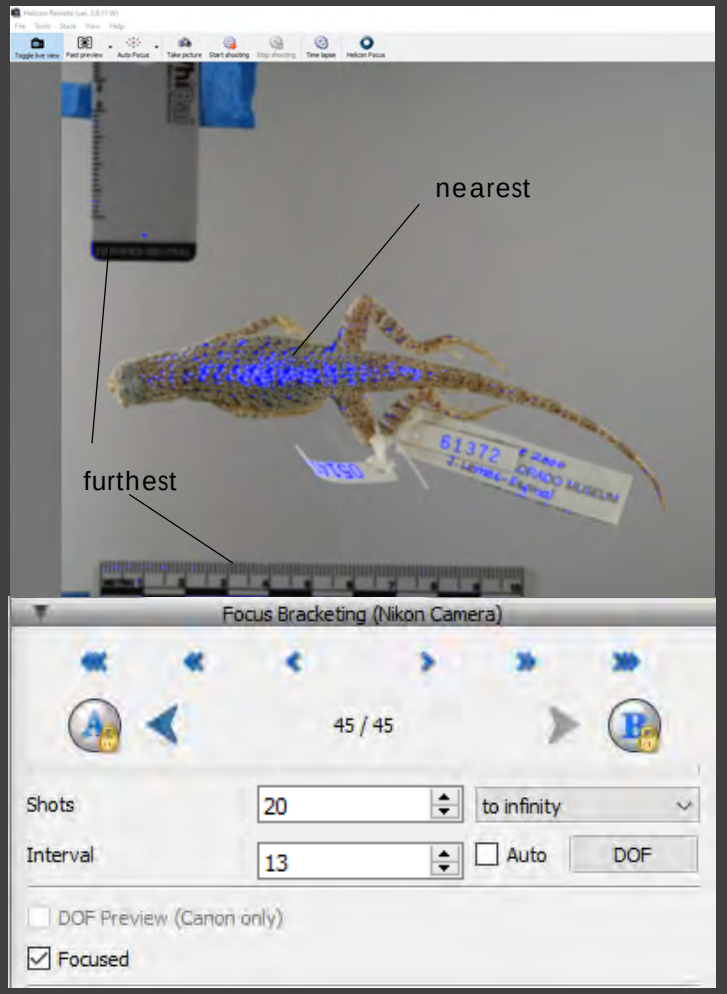
Workflow – Imaging

Settings & Exposure



- Typical settings
- Check exposure

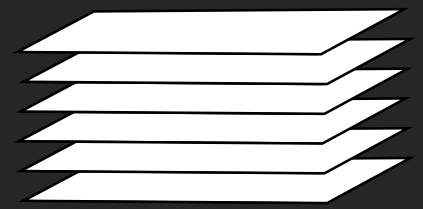
Focus Bracketing



Set nearest and furthest distance points

Photograph

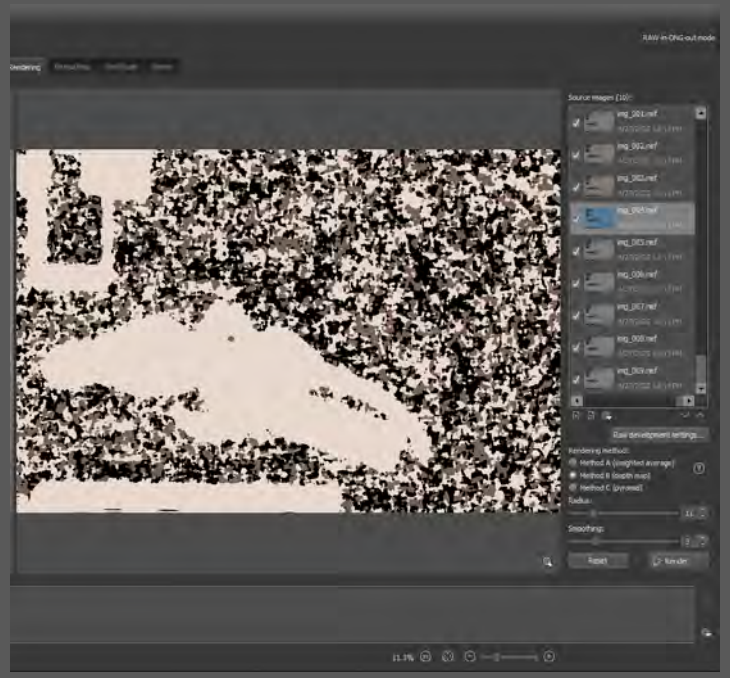
Remote imaging at specified focal distances



Workflow – Image Rendering

Helicon Focus Pro

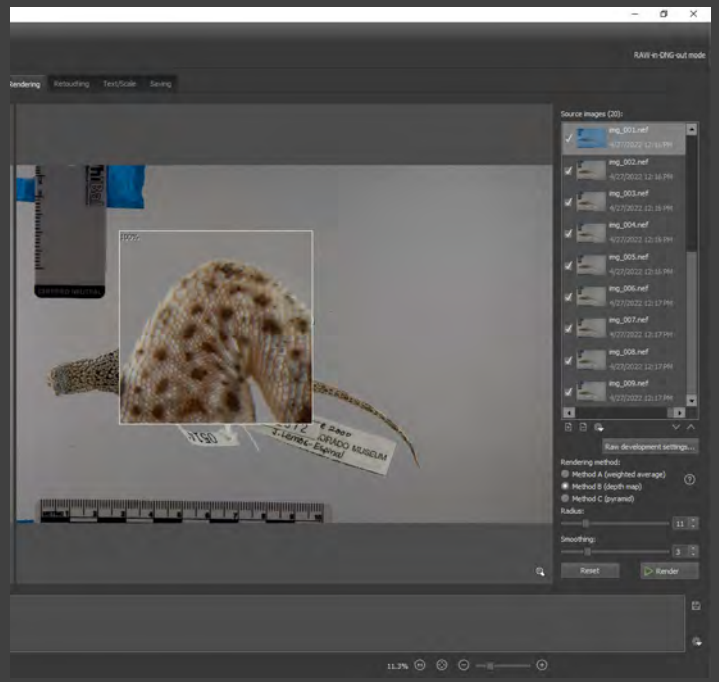
Render Image Stack



Automated stitching

(various algorithms available – experiment with what works best)

Quality Check



Composite image fully in focus?

(if not, reimage and ↑ # shots)

Retouching

Optional at this stage:

- Dust mapping – identify and batch remove particles/known imperfections from entire stack
- Blur tool - manually remove background noise in composite image
- Add digital scalebar

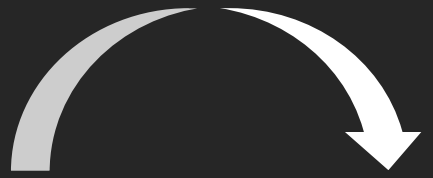
Export

DNG composite image (.dng)

Apply consistent file naming convention, e.g.

UCM_HERP_61372_Uma_paraphygas_dorsal

Workflow – change position in tank

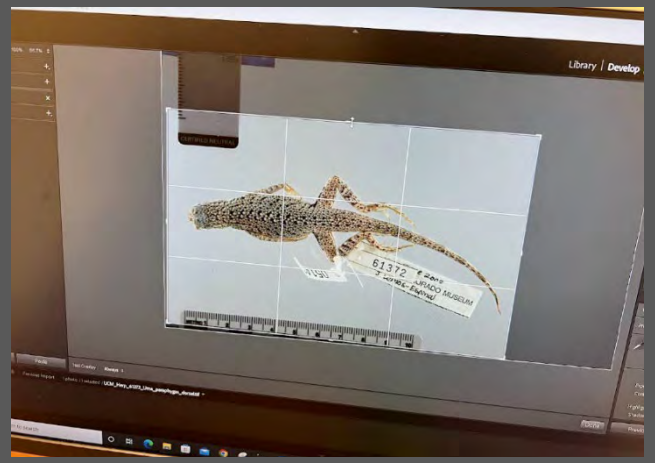


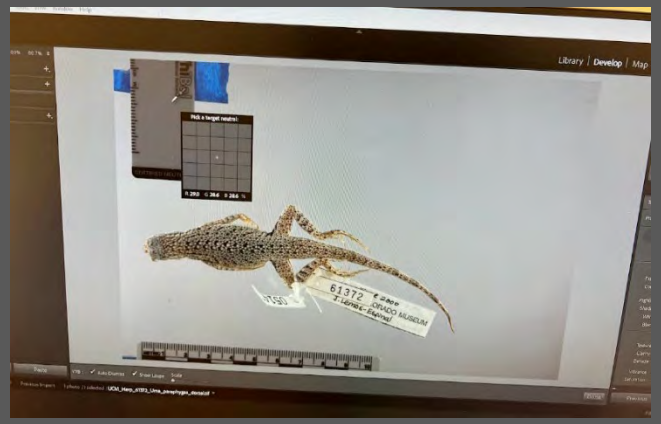
Flip aspect, repeat previous steps

UCM 67222 *Lampropeltis pyromelana*

Workflow – Post-processing

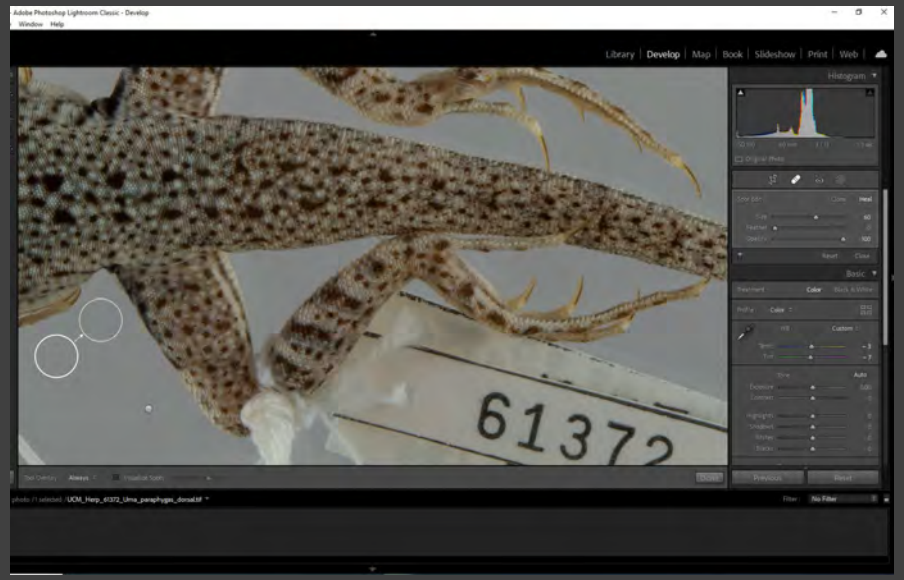
Cropping & White Balance





Batch-process multiple images from same session

Retouching

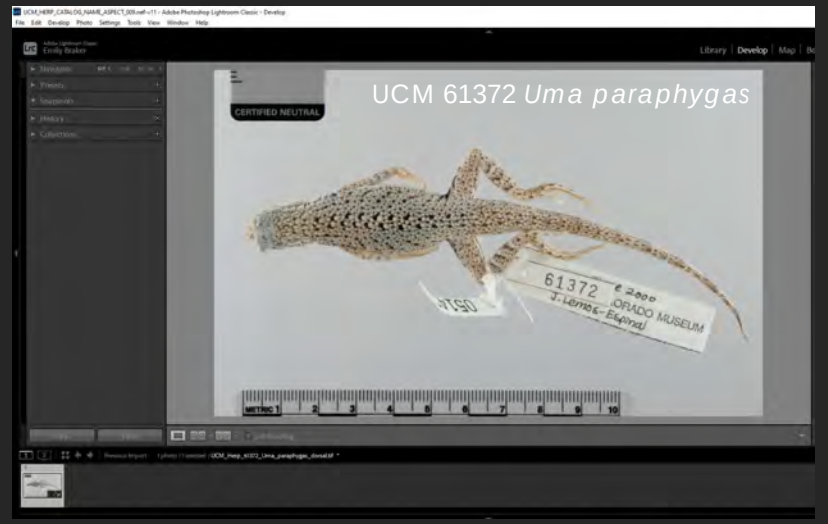


Spot Removal Tool
clone or heal background

Increase exposure

- web JPEGs only (if needed)
- preserve TIFFs with minimal processing (whole-image manipulations only so they are journal-compliant)

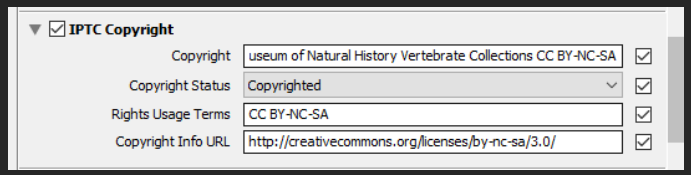
Export Final Versions



Recommendations

TIFF → No compression, 300 ppi

JPEG → 3500 pixels long edge, 72 ppi



Export with Metadata preset (EXIF)

Accessibility

- Web-accessible JPEGs
- TIFFs available upon request
- Associated with 3D media

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CC BY
Arctos Data Ownership and Use
https://arctos.database.museum/collection/UCM:Herp
Loan Policy

Arctos

Search | Enter Data | Manage Data | Manage Arctos | Reports/Services | Portals | My Stuff | Join Arctos | About/Help | Notifications [310 unread]

UCM:Herp:39768
Diaglena spatulata
get a DOI
Request Cache Refresh (Status: FLAT update requested)

San Antonio, Tehuantepec
North America, Mexico, Oaxaca
23 May 1969 (1969-05-23)

Parts:
whole organism

Comment or report bad data [0][0]

Identification | Accn | Locality | Agents | Parts | Part Locn. | Attributes | Other IDs | Media | Encumbrances

[expand all] [collapse all]

Identifications — Edit
Diaglena spatulata
Diaglena spatulata
Animalia, Chordata, Amphibia, Anura, Hylidae, Diaglena, Diaglena spatulata
Identified by Thomas MacDougall on 1969-05-23
Nature of ID: features
Remarks: Former nature_of_id: legacy.

collector — Edit
Thomas MacDougall

Links
GBIF Occurrence
iDigBio Occurrence

Media — Attach/Upload Media
Media linked to this Cataloged Item.
Showing results 1 - 4 of 4 Media Gallery

image (image/jpeg)
Media Details
UCM HERP 39768 Diaglen…

image (image/jpeg)
Media Details
UCM HERP 39768 Diaglen…

CT scan (image/tiff)
Media Details
CC BY-NC-SA
UCM 39768 Diaglena spatu…

3D model (model/stl)
Media Details
CC BY-NC-SA
mesh

Remarks: Collected by Thomas MacDougall and purchased by the CU Museum in 1969; Cataloged by: Ferner, 1 December 1969
Entered By: Emily Braker on 2014-11-12
Last Edited By: ebraker on 2022-04-26 More — Edit

Accession — Edit
Edit 0 or View 0

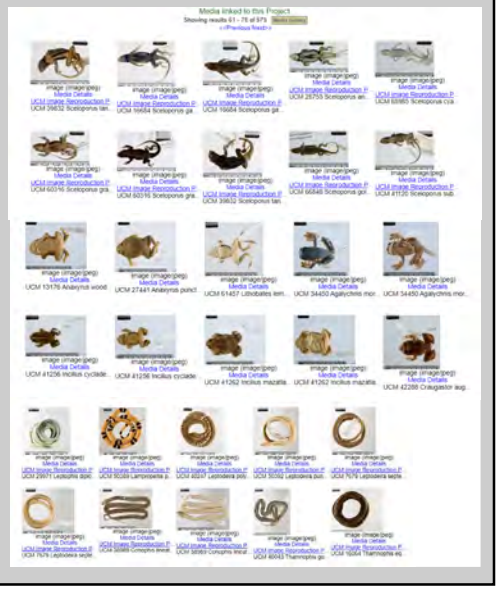
Usage
Used By Project: Digitization PEN: oMeso: Opening Mesoamerican Herpetofaunal Diversity to Whole Phenome Imaging
Loan History: Click for loan list

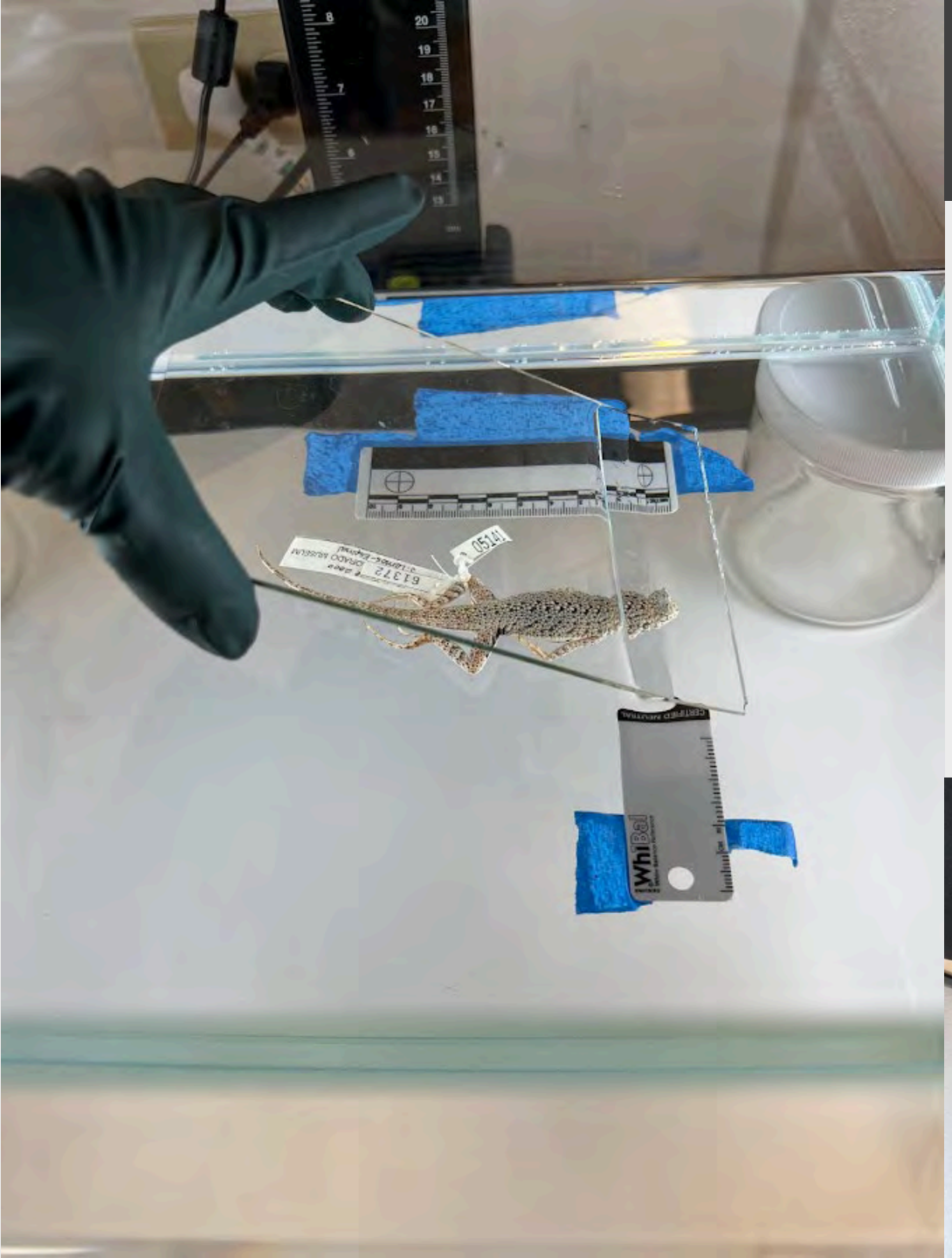
Location (1 Events)
highlight linked components
Event Type: collection
assigned by Leticia Ochoa on 2006-06-05
Event Date: 1969-05-23
Verbatim Date: 23 May 1969
Higher Geography: North America, Mexico, Oaxaca details
Estado Libre y Soberano de Oaxaca
Free and Sovereign State of Oaxaca
Huâxyacac
Specific Locality: San Antonio, Tehuantepec details
Verbatim Locality: Mexico, Oaxaca, San Antonio, Tehuantepec details
Associated Names: Mexico, Oaxaca, Dist. Tehuantepec, North Pacific Ocean, Mexican Exclusive Economic Zone, NORTHEAST PACIFIC OCEAN (180W), NORTH AMERICA MAINLAND
Coordinates: 16.36 / -95.22
As Entered: 16.36/-95.22
primary_spatial_data: point-radius
Datum: North American Datum 1927
Georeference Source: Cartografía Digital del Laboratorio de SIG'S y PR. Instituto de Geografía, UNAM. Incluye: INEGI, 2000, IMT,2000. Escala 1:250 000
Georeference Protocol: not recorded
Tehuantepec
Google Terms of Use
map key/tools
Event Details:
Collecting Source: wild
Event Verification: accepted Define

Parts summary view
IMPORTANT: The summary view may exclude some information.

Part Name	Preservation	Condition	Disp
whole organism	ethanol, 70%; formalin-fixed	unchecked	on l

Project Media Gallery





TIPS

- **Batch specimens by size** to avoid frequent adjustments
- **Save time & money** - avoid using a larger tank than necessary and cover when not in use (but change out ETOH as needed to avoid long post-processing times)
- **Keep equipment dust-free**
- Use **glass plate to gently position specimens or tags** that do not lie flat on their own
- Consider hiring technicians with photography and art backgrounds

Acknowledgements

UCM 50877 *Agalychnis dacnicolor*

oMeso Imaging Technicians:

Genevieve Anderegg

Lily Prestein

Alison Sewart

Chinmay Shalawadi

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Talia Karim, CUMNH

Zachary Randall, FLMNH

Virginia Scott, CUMNH

Andrew Williston, MCZ

NSF Award 2001474

Museum of Natural History
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