

Digitizing the USNM dragonfly and damselfly collection



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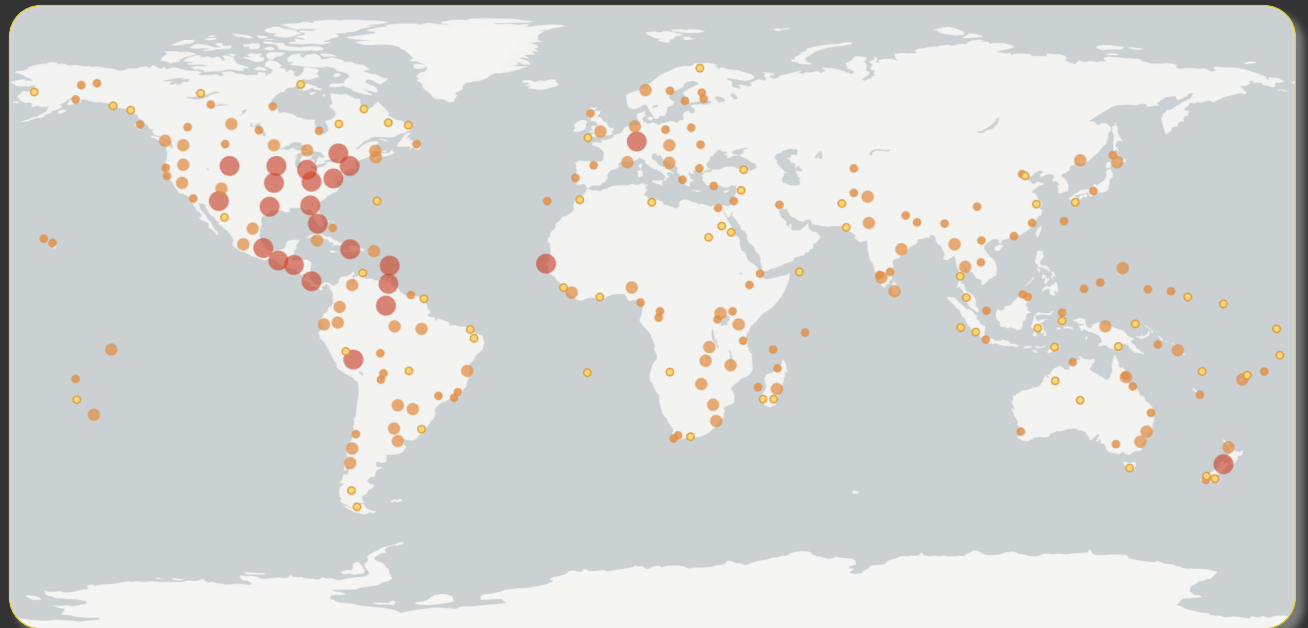
PICTURAE

◇ collection

- › 3,265 species
- › 109,000+ specimens in envelopes
 - › glycine envelopes 3×5 in (7.62×12.7 cm)
 - › 957 boxes
- › 6,200+ specimens on pins

◇ digitization to date

- › specimen-level data capture 2001–2005
- › data available at GBIF
- › 75% georeferenced
 - › 87,756 specimens
 - › gaps for records from Brazil, China, India, Indonesia, and Sri Lanka



◇ 2019

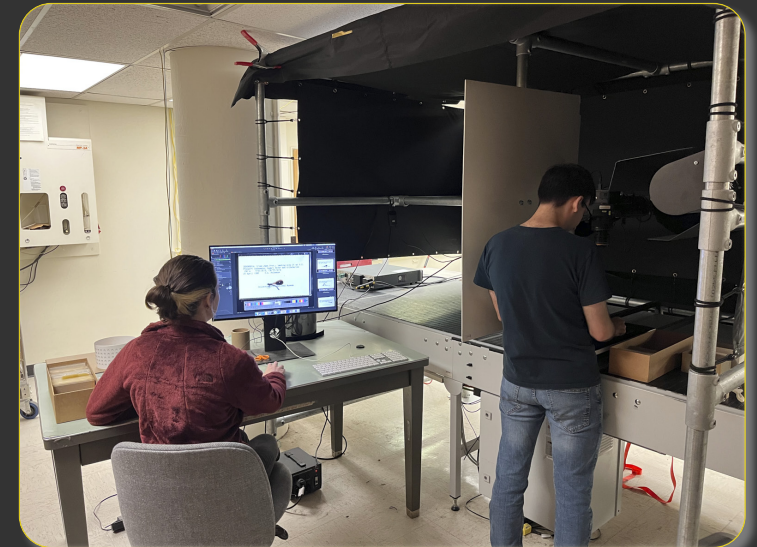
- › initial imaging trial
- › Picturae studio in Jersey City, NJ



USNM00391262, Martha's pennant (*Celithemis martha*)
800 ppi, polarized light

◇ 2022

- › US herbarium digitization complete at NMNH
- › opportunity to image “flat” dragonfly envelopes on Picturae conveyor belt



re-configured herbarium conveyor as imaging set-up

◇ Item Driven Image Fidelity (IDIF)

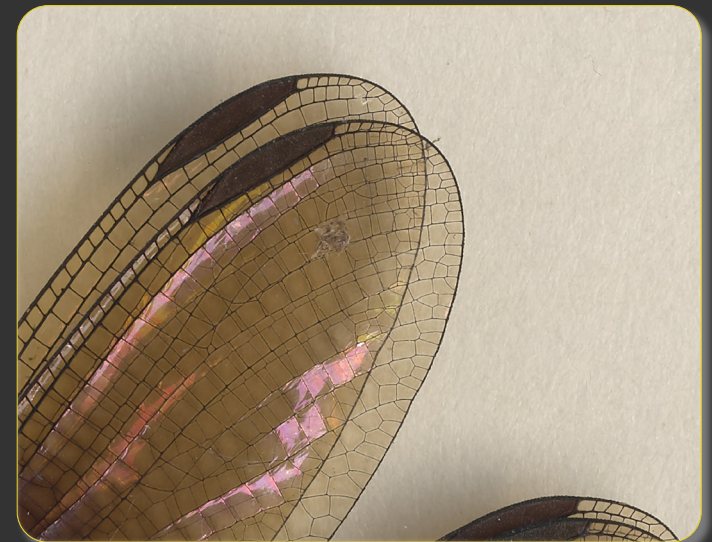
- › or “Hitting the Digital Capture Sweet Spot”
- › size of smallest to be resolvable structure
 - › specimens USNMENT00391566, USNMENT00391606
- › $0.01 \text{ mm} = 10 \text{ }\mu\text{m}$
 - › width of setae on face and legs

◇ image resolution

- › 2,100 ppi
- › compromise: depth of field, lighting, smallest resolvable structure

◇ imaging equipment

- › Phase One IQ3 100 MP digital back
- › Rodenstock 105 mm HR Digaron Macro lens
- › LED light source from top and side with bounce back screen
- › single photo (.tif-file approx. 152 MB)



USNMENT00335596, *Cora marina*
2,100 ppi, 200% detail of legs and wing tip

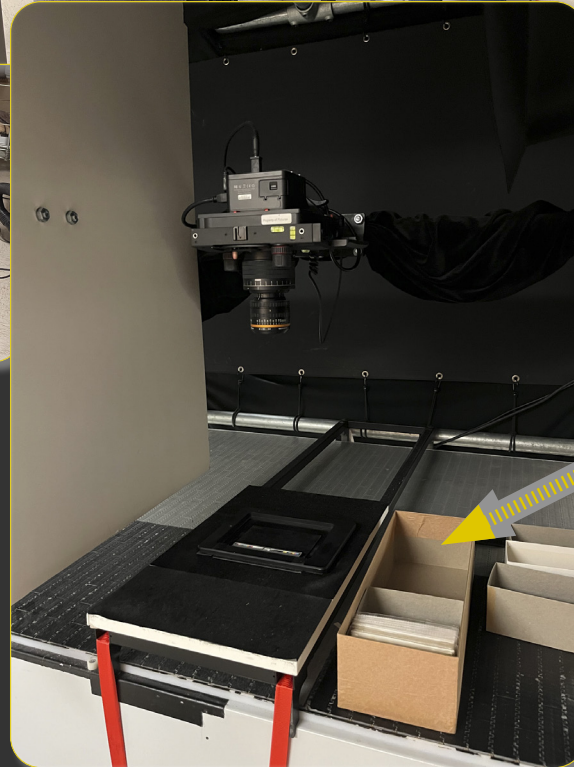
daily rate: 1,700+



visual inspection of each specimen photo before moving on

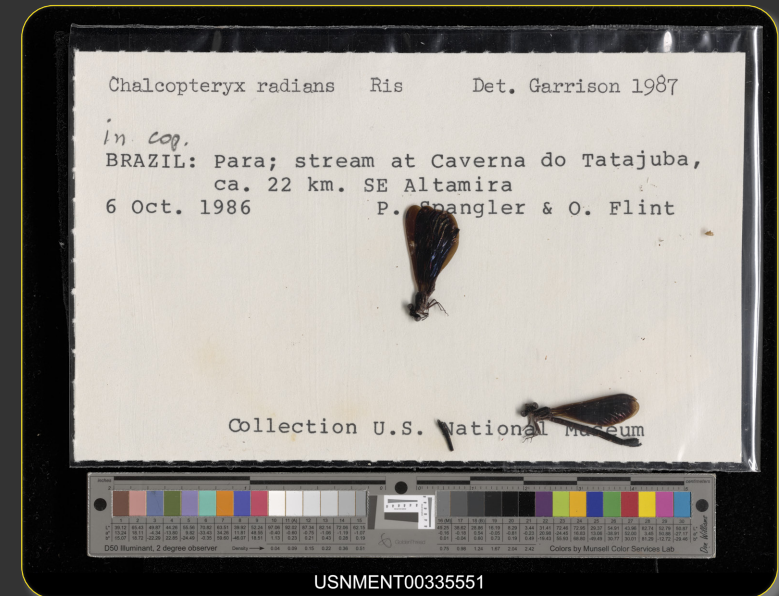
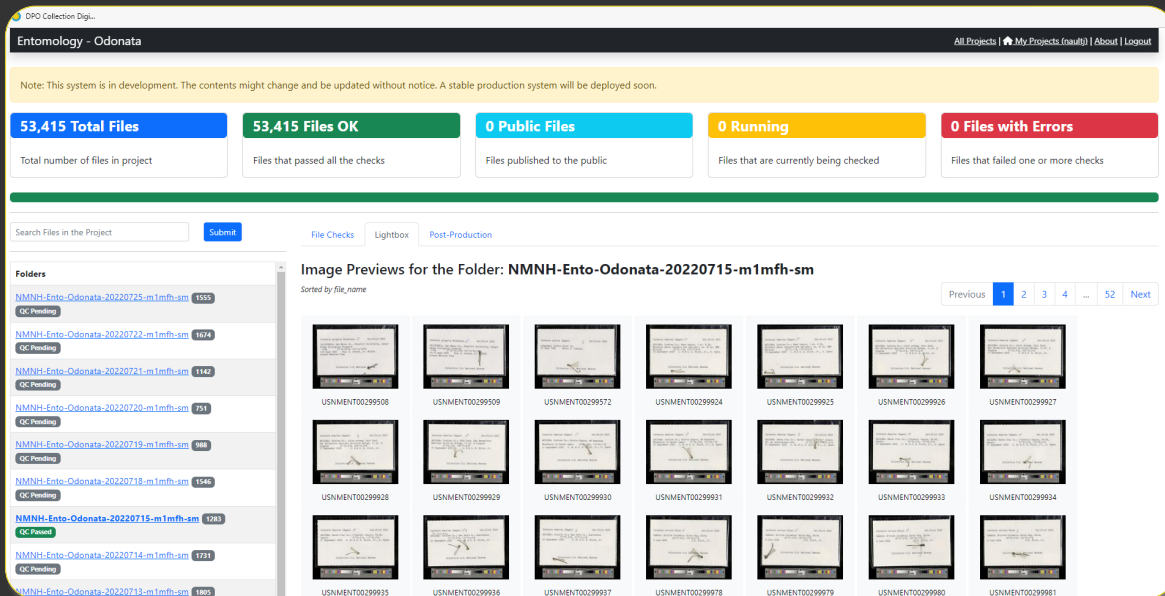
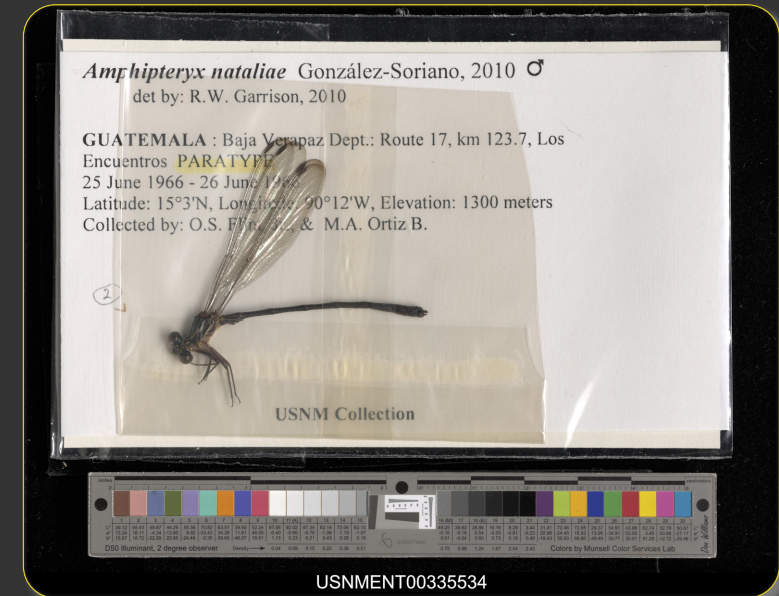


specimen stage adjustable in height to accommodate thicker specimens (increase depth-of-field)

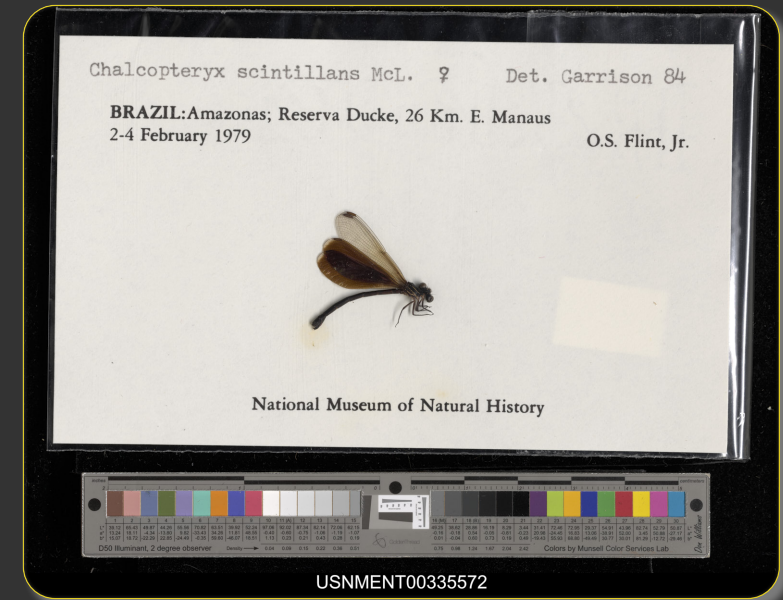


Picturae Digitization Technicians Nicole Oyler and Logan Cooley operating the system

- ◇ images visually inspected before moving on
- ◇ post capture
 - › automated tools check file name, color, RAW + TIF settings, etc.
 - › visual inspection of randomly selected images (1–2% per day)
 - › USNM unique specimen identifier added to photo
 - › unique identifier label in envelope on back of card



- ◇ digitization cost US\$1.04 per envelope
- ◇ every specimen handled
 - › located not yet data-captured specimens
- ◇ the way forward
 - › all images in public domain – CC0
 - › put resources into georeferencing
 - › explore machine learning applications on image data-set
- ◇ lessons learned
 - › no damage to specimens
 - › imaging back-side of envelope to access original labels + unique specimen identifier



› **images soon at GBIF + Smithsonian Open Access portal** ‹
› gbif.org + si.edu/OpenAccess ‹

◇ funding

- › Smithsonian Digitization Program Office – DPO
- › Smithsonian National Collections Program – NCP
- › Smithsonian National Museum of Natural History – NMNH / USNM

◇ digitization

- › Victor Shields + Lilli Cooper – Picturae project management
- › Ken Rahaim – DPO
- › Nicole Oyler + Logan Cooley – imaging
- › Samantha Schwartz + Julia Beros – moving specimens

◇ collection

- › Floyd Shockley – collection management

