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Objective

- develop and implement an efficient workflow for cost-effective, high-throughput digitization of insect collections
Specific Goals

• Digitize all holdings of 22 midwestern arthropod collections (~50 million specimens)
  – Specimen images and metadata (label info)
  – Drawers, vials, slides
  – Advanced imaging (including 3D)
  – Best quality at reasonable cost (~$0.10/specimen)
• Provide access to images and other data via online virtual museum
  – browsable/searchable/zoomable web interface
  – link to other data providers (GBIF, iDigBio etc.)
• Provide platform for research and development of additional tools and resources
  – Data mining and analysis
  – Community building, collaboration, and support
  – Education, outreach, and reference
Accomplishments

- Created InvertNet cyberinfrastructure platform based on HUBzero ([invertnet.org](http://invertnet.org))
- Implemented efficient workflows for slides and vials using 2D scanning technology
- Built 14 robotic drawer digitization systems & delivered to collaborators
- Built 180 TB storage system to house InvertNet image library
- Ingested >46,000 images and metadata from collaborating institutions representing >2.5 million specimens
- Developed image annotation tool to facilitate specimen-level data capture
- Linked InvertNet data repository to iDigBio portal and BugGuide.net
- Held two training workshops for collaborators (April 2012 and November 2013)
- Participated in numerous workshops, symposia and planning meetings
- Published 2 papers describing our high-throughput digitization approach
- Trained 15 grad students and >30 undergrads
Ongoing Activities

- Capturing whole-drawer images at collaborating institutions
- Seeking additional funding for gameification of label data capture
InvertNet data management and use

- Data management
  - HUBzero-based cyberinfrastructure
  - 180TB storage system with tape archiving
  - Local image capture to duplicated removable hard drives
  - All data are open access
- Research use of data
  - 3D modeling and reconstruction
  - Automated identification using computer vision and machine learning
- Management of the network including oversight and processes
  - INHS permanent IT staff have assumed management responsibility for managing website and cyberinfrastructure
  - InvertNet PIs continue to provide oversight
VENEZUELA, Guar./Calabozo (40 km S)/Hato Masaguaral/ 5 March 1986/ PJSpangler/ colln#24

PJS-VZ-860305-2

CICADAPTERA

Aquatic

Belostomatid

Hybrid nymph

Notonecta

Immature

Naucorniidae

Gerrid nymph

Plea

Corixidae

Microvelia

lacephalus

laccinatus

macrovaculas

Lacephalus

laccinatus

Macrovaculas

laccinatus

larvae

Helobata

Helochares

Snaeclius

Berusus

Tropestromus

(30+)

Derallas

Hydroche

Hydraena

Tereus

Helodid

Arachnid

Est. # Spms 2037 590 2

*: end of roll of 400 x first few of 1000 x roll... 2 Pairs
**Tropisternus apicipalpis**

- Lentic (General): 99.5%
- Passive Trapping: 0.5%

**Tropisternus chalybeus**

- Lentic (General): 48.4%
- Lentic (Riparian): 39%
- Lotic: 4%
- Hygropetric: 8.9%
- Passive Trapping: 0.5%
- Pytotelmata: 4%
- Terrestrial: 0.5%
- Unknown: 0.5%

*n=1631* for *T. apicipalpis*

*n=1001* for *T. chalybeus*
Specimens vs Events

Specimen-based approach: This event never happened!
27 genera

39 genera