Collections as a source of data for education, conservation and monitoring change in a time of extinction: an amphibian example
How to increase our visibility and importance?

- Shift focus from documenting species to conserving species:
  - Enhance and provide data to wide audiences
  - Integrate data into education & conservation
    - AIM-UP! project
    - Conservation case studies: amphibians
Increase visibility and importance

- Enhance specimen data
  - Georeferencing
  - Collection digitization
    - Specimen imaging
    - Scanning of original documentation
    - Transcription of field notes

provides context and allows for new approaches in applied research and conservation
Increase visibility and importance

- Provide data
  - Examples of efforts:
    - Vertnet
    - Arctos (Cicero’s presentation)

- Integrate collections into education
  - AIM-UP!
    - Create & disseminate specimen-based educational modules
Increase visibility and importance

- Emphasize collections as an educational resource
  - Teachers & students can study biodiversity by examining specimens and their associated data
  - Promote multiple core competencies in biology

- AIM-UP!
  (poster presentation)
Advancing Integration of Museums into Undergraduate Programs

- Research Coordinating Network funded by the US National Science Foundation

Specific goals:

1. train students in specimen-based research
2. develop instructional tools based on online databases
3. inform educators at non-museum institutions of the learning potential of museum collections
4. interact with the public to increase awareness of the educational importance of natural history museums
AIM-UP!

- Themes over five years:
  1. Integrative inventories: complex biotic associations across space & time
  2. Geographic variation
  3. Evolutionary dynamics of genomes
  4. Biotic response to climate change
  5. Co-evolving communities of pathogens and hosts as related to emerging disease
Educational modules (available @ aim-up.org)
- Explore many topics in ecology & evolution
  - e.g. geographic variation, genome evolution, response to environmental change, range shifts, etc
- Focus on upper-level undergraduates
How to increase our visibility and importance?

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Amphibian conservation

- **Current status of amphibians**
  - Single greatest taxa-focused conservation crisis of 21st century
  - >32% of 6,300 species in immediate threat of extinction
  - >43% species in decline
  - Occurring rapidly with hundreds of die-offs in last 30 yrs

- **Shifting role of collections**
  - Historical, specimen-based records
  - Access to field notes
  - Opportunity to make well-informed surveys & management decisions
Amphibian conservation

- Direct role of collections
  - Examination of specimens and data
    - Species distributions – collecting localities
  - Field notes
    - Qualitative treatment of abundance
      - If rare – set as low priority
      - If common – set as a high priority

- Two case studies:
  - Rediscovery of *Craugastor fleischmanni* in Costa Rica
  - Status of *Anaxyrus microscaphus* in New Mexico, USA
Rediscovery of *Craugastor fleischmanni* in Costa Rica

- Considered extinct and not detected for 26 years
- Threatened by disease & habitat loss
- Examination of historical field notes determined that species was common and easily detected at collection localities
- Determined high priority to be rediscovered
  - Survey efforts began in 2005
Rediscovery of *Craugastor fleischmanni* in Costa Rica

- Rediscovered in 2010!
- Instant conservation improvement & proof that it is not extinct
Status of *Anaxyrus microscaphus* in New Mexico, USA

- Declining in Arizona, Nevada, & Utah
- Threatened by hybridization, drought, and habitat loss
- Restricted to mountainous areas of southwestern New Mexico
- Population status unknown
  - Systematic surveys began in 2013 and continuing (2014)
Established 91 survey localities
  - based on historical collection data

Identified March-April breeding season
  - most specimens collected outside of breeding season

Compared with distribution of *Anaxyrus woodhousii*
  - congener known to hybridize in AZ
Amphibian conservation – Case Study 2

- All records of *A. woodhousii* in Catron Co. are those of *A. microscaphus*!
  - 15 localities
  - Combination of tadpoles, juveniles and adults
  - Different collections, collecting dates, collectors, etc...
Re-evaluate distribution of both species in New Mexico

Importance of data quality
AND
Responsibility of researchers/end users
Conclusions

- Need to expand educational and scientific potential of natural history collections
  - Collections have much potential for integration into curricula (university and other)
  - Train students to think beyond traditional role of museums

- Expand role to conservation
  - Specimens & field notes as a crucial aid in setting conservation priorities
  - Can help in evaluation of conservation status of ALL endangered species
Conclusions

- In both education and research need to review specimens and associated data for errors
  - Quality of data increases value & credibility of collections
  - Accuracy of data associated with specimens potentially overlooked by both keepers and users of collections
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