Quantification of the costs of insect collection curation

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Introduction

A substantial portion of the **Triplehorn Insect Collection** is still tightly packed into cork- or wood-bottom unit trays. The specimens are very well preserved, but because of this storage issue, they are relatively inaccessible for study.

Beetles make up more than 1/3 of our loan requests and are our first priority for curation. The process involves:

1. **Preparation** – update taxonomic names
2. **Transfer** – move specimens to new unit trays
3. **Re-housing** – move trays to clean & well-sealed drawers
4. **Databasing** – digitize specimen level data

Trained **undergraduate curatorial assistants** & two curatorial staff were timed and output measured for each of the steps involved in the curation process. Cost of labor is included in the calculations. Totals were rounded up.

Standardized hourly rates (**$10 per hour**) were used for comparison. Tasks that require greater expertise might cost more.

The data presented here are a follow up and expansion of those first presented with the same title at the Entomological Society of America meetings in 2012.

CURATION IN NUMBERS

- **104,538** = beetle specimens transferred
- **600** = hours worked on specimen transfer
- **3,911** = taxonomic names checked
- **$10** = hourly rate used for calculations
- **294 =** drawers at start of curation
- **366** = drawers at end of curation

Space 25%

MATERIALS & SUPPLIES

COST MATERIALS PER DRAWER **= $57 - 68**

Shopping list:

- USNM-style drawer = **$42 each**
- USNM-style unit trays
  - **$0.8 x 32 per drawer = $26**
  - **$0.9 x 16 per drawer = $15**

Unit trays are custom-made. Cost of each unit (*above*) includes foam, glue & wages to glue foam to tray.

Step-by-step of our curatorial process, with associated costs

1. Preparation

(N=183 drawers, 65,150 specimens)

COST PREP PER DRAWER **= $13**

- **Move to temporary drawers**

✓ Cost per drawer = **$1**

- **Update Taxonomic Names**

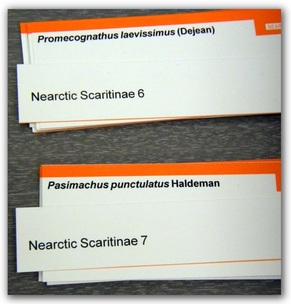
✓ Cost per drawer = **$7**

A. Update taxonomic catalog (= make list).
B. Determine the number of header labels and biogeographic regions needed for each taxon.
C. Get current names using catalogs, online databases, published literature.

- **Make header labels for unit trays**

✓ Cost per drawer = **$5**

A. Print & cut header labels
B. Organize header labels.



2. Transfer

(N=104,538 specimens, 294 drawers start, 366 drawers end)

COST TRANSFER PER DRAWER **= $19**

- **Label unit trays and handle the specimens.**

✓ Cost per drawer (based on an average of 356 specimens per drawer) = **$19**

A. Place header labels in new unit trays.
B. Transfer specimens from the hard-bottom unit trays to new foam-bottom trays.

3. Re-housing

(N=183 drawers, 65,150 specimens)

COST RE-HOUSING PER DRAWER **= $9**

- **Organize specimen trays within and between drawers.**

✓ Cost per drawer = **$7**

- **Repair or remount specimens.**

✓ Cost per drawer = **$2**

The cost of specimen repair is highly variable. Depends on the type of damage and the type of repair required.

Rate of damage so far: **less than 1%**

- **Add Label to Drawers & Cabinets**

No data yet. This will only be done when the project is completed.

COST OF CURATION BEFORE DATABASING

TOTAL COST CURATION PER DRAWER **= $98 - $109**

Databasing is not a required step for insect collection curation and the costs vary greatly based on the method used. Thus we present our curation and databasing costs separately.

For collections like ours (with millions of specimens jam-packed in hard-bottom unit trays), attempting to do specimen level databasing without prior curation would be disastrous.

However, general curation (preparation to re-housing) is considered part of normal operating costs of a collection, and therefore not usually funded by the National Science Foundation.

Curation is essential to the effort of mobilizing the enormous amount of specimen data available in collections and needs to be a priority as much as the data gathering itself.

Careful record-keeping and continuous review of the curatorial process can improve performance greatly and make it more cost-effective.

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4. Databasing

(N=13,000 barcoded & 9,040 specimens entered)

TOTAL $ DATABASING PER DRAWER **= $142**

A. Cost of the barcode labels
   i. Medium & thermal transfer ribbon
   ii. Labor to print barcodes
B. Add barcode label to specimens as unique ID
C. Transcribe specimen data: copy all label data verbatim into a data entry template.
D. Semi-automated data entry
   i. DEA v. 2
   ii. Georeferencing localities
   iii. Final data upload

Database & system administration costs are not included in the calculations.

✓ Cost for databasing one specimen = **$0.40**

Access our Specimen Data:

- **Local web portal**: *hol.osu.edu*
- **Global Biodiversity Information Facility** (GBIF): *www.gbif.org*
- **Symbiota Collections of Arthropods Network** (SCAN): *scan1.acis.ufl.edu/*

MAJOR CHALLENGES

1) FUNDING
   A. Size of insect collection: 4+ million strong at OSU
   B. Re-curation – ~4 hours of work per drawer
   C. Materials – unit trays
   D. Storage – cabinets and drawers

2) LABOR
   A. Need skilled, well-trained personnel, but we must depend on temporary help (undergrads, volunteers)
   B. Training & supervision take most of the time of our two permanent staff – no time for "orphan groups"

3) UPDATING TAXONOMIC NAMES
   A. Catalogues – when available
      i. Outdated
      ii. Not comprehensive
      iii. Rarely online and/or searchable
   B. Very few experts that can provide help

4) GEOREFERENCING
   a) Technical challenges
   b) Many localities with few specimens

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