SCARABAEOID IDENTIFICATION WORKSHOP

Gad Cha Kum Lodge, Chanchamayo, Peru
10-20 January 2012

Feliz Año Nuevo 2012

Happy New Year 2012

Class Participants

PERU

1. Christian Ampudia Gatty
2. Daniel Saavedra Albuquerque
3. Vanesa Estrella
4. Alfredo Giraldo

Class Participants

BOLIVIA

5. Ana Caroli Hamel-Leigue

Class Participants

CHILE

6. Jose Gerardo Mondaca Escudero

Class Participants

COLOMBIA

7. Camila Plata
8. Hector Jaime Gasca Alvarez

Class Participants

ECUADOR

9. Luis Camacho

Class Participants

ARGENTINA

10. Mario Gabriel Ibarra Polesel
11. Jhon Cesar Neita Moreno
12. Miryam Pieri Damborsky de Varisco

Class Participants

MEXICO

13. Fernando Escobar Hernandez

Class Participants

HONDURAS

14. Oliver Schlein

Class Participants

UNITED KINGDOM

15. Beulah H. Garner

Class Participants

AUSTRALIA

16. Nicole Louise Gunter

Class Participants

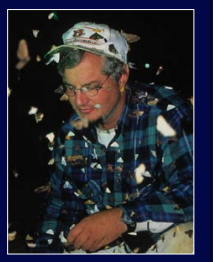
UNITED STATES

17. Amy Elizabeth Maile
18. Julianne Matczyszyn
19. Patricia Susman
20. Andy Matz
21. Kentaro Miwa
22. Bruce Noll
23. Dana Price
24. Paul O Kaufman
25. Ronald H. McPeak
26. Sayde Ridling
27. Bethany Sue Teeters
28. Timothy P. Christensen

Meet Your Instructors

Dr. Ronald D. Cave

Associate Professor of Entomology, University of Florida's Indian River Research and Education Center in Ft. Pierce, Florida.



Primary research interests:

1. Biological control of invasive insects
2. Biotic surveys of the Dynastinae of Mexico, Guatemala, and Belize and the West Indies (with B. Ratcliffe)
3. The Scarabaeoid faunas of Honduras and Paraguay

Meet Your Instructors

Dr. Mary Liz Jameson

Associate Professor of Entomology, Wichita State University, Wichita, Kansas.

Primary research interests:

1. Evolution, phylogeny, and biogeography of scarab beetles
2. A faunistic survey and inventory of the Scarabaeoidea of the West Indies
3. Systematics of the Rutelinae

Meet Your Instructors

Dr. Federico Ocampo

Researcher, Instituto Argentino de Investigaciones de Zonas Aridas, Mendoza, Argentina.

Primary research interests:
1. Evolution, phylogeny, biogeography, and conservation of New World scarabs
2. Systematics and ecology of dung beetles
3. Systematics of the Neotropical Aclopinae and Allidiostomatinae

Meet Your Instructors

Dr. Paul Skelley

Entomologist, Florida State Collection Arthropods, Gainesville, Florida.

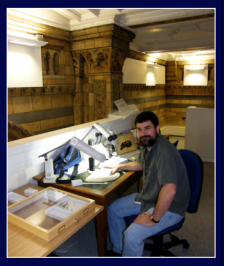
Primary research interests:
1. Aphodiinae and scarabs of the southeastern USA.
2. Descriptions of new taxa of Aphodiinae
3. Creating an annotated checklist and key to the genera of New World Aphodiinae

Meet Your Instructors

Dr. Andrew Smith

Research Associate, Canadian Museum of Nature, Ottawa, Canada.

Primary research interests:
1. Systematics of Melolonthinae
2. Molecular phylogenetics, biogeography, and conservation of scarab beetles
3. Scarab beetle biodiversity of southern South America



Meet Your Instructors

Dr. Brett Ratcliffe

Curator and Professor, University of Nebraska State Museum, Lincoln, Nebraska.

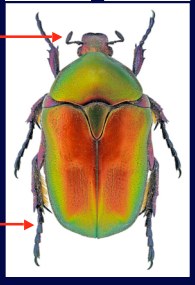
Primary research interests:

1. Systematics of world Dynastinae
2. Biotic surveys of the Dynastinae of Mexico, Guatemala, and Belize, and the West Indies (with R. Cave)
3. Revisions of the genera of New World Gymnetini (Cetoniinae)

Meet the Scarabs

Superfamily Scarabaeoidea

- Presence of elbowed, lamellate antenna
- Tarsi segments 5-5-5



Lucanidae - Stag beetles

- Occasionally large, 10-60 mm
- Males often possess large, often forked, mandibles
- Antennae usually elbowed, club cannot close
- Males rear up in defense with open mandibles and will fight other males for possession of a food site . . . not always for females
- Most found in wooded areas
- Adults feed on sap, honeydew; larvae feed in decaying wood

Lucanidae

Passalidae - Bess beetles

- Large mandibles for chewing through wood
- Large, shiny beetles, most occur in tropics
- Larvae and adults live in logs in loosely organized colonies; galleries large. Feed on microorganisms; new larvae will not mature unless these organisms present; adults help feed larvae by pre-chewing wood. Adults stridulate (rub wings against top of abdomen) to communicate; larvae also stridulate using hind leg

Passalidae

Trogidae - Skin beetles

- Size 5-22 mm; cryptically colored, often covered with debris
- Most found in bird and mammal nests and carrion in late stage decay; sometimes found at lights
- Adults and larvae feed on decaying animal product

Geotrupidae - Geotrupines

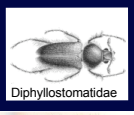
- Adults live in burrows; feed on decaying vegetation, dung, occasionally carrion; rarely leave burrow
- Sometimes found at lights

Other Scarabaeoids not Covered in this Workshop

Belohinidae

Pleocomidae

Hybosoridae



Diphyllostomatidae

Glaphyridae

Glaresidae

Ochodaeidae

Scarabaeidae - Scarab beetles

Large, diverse group, 35,000 spp. Many habits: feed on dung, carrion, decomposing plants, in vertebrate burrows and ant and termite nests. Many attracted to lights at night. Distinguished by lamellate club on antenna that can close; increases surface area for detecting odors.


Subfamily Scarabaeinae - Dung beetles

Form robust, some males with head and/or pronotal horns. Feed on dung or carrion; some work dung into a ball, may roll ball long distance, usually in pairs, pushing-pulling, bury in soil, egg laid in ball and so larvae provisioned with food while developing underground.





Scarabaeinae - Dung beetles

In Egyptian mythology, dung ball represented sun, and the beetle was the sun god, Ra, the sacred scarab, moving the sun across the sky.





Subfamily Aphodiinae - Small dung beetles

Mostly small scarabs, 1-15 mm. Feed primarily in dung of mammals. Often attracted to lights, many found in burrows of mammals.


Aphodius species

Subfamily Melolonthinae - June beetles, leaf chafers

Adults feed on above ground plant parts, and larvae feed on underground plant roots; often cause damage to ornamentals, grasses, fruits, some crops. Larvae of *Phyllophaga* species can be important turf pests; 2-3 year life cycle.


Subfamily Rutelinae - Shining leaf chafers

Adults often brightly colored. Adults feed on leaves, some have pest status such as the Japanese beetle, *Popillia japonica*, a serious pest in nursery stock and ornamental flowers and shrubs.





Subfamily Dynastinae - Rhinoceros beetles

Some very large (160 mm); sexual dimorphism often present, males with pronotal/cephalic horns, females without. Some of the largest insects in the world. Nocturnal and most attracted to lights.

Cyclocephala sexpunctata
Panama

Dynastes satanus
Colombia

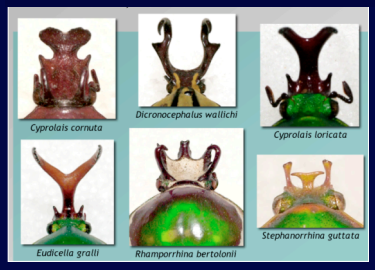
Golofa porteri
Venezuela

Subfamily Dynastinae - *Dynastes hercules* life cycle

Subfamily Cetoniinae - Flower chafers

Adults fast flying, brightly colored, diurnal. Adults feed on sap, pollen, and rotting fruit; larvae live in humus. *Cremastocheilus* species inquilines with ants. Tribe Goliathini with very large and colorful African goliath beetles.

Subfamily Cetoniinae



Scarabaeidae or Melolonthidae?

The family Scarabaeidae is sometimes referred to as the family Melolonthidae, especially by some Latin American workers. In this usage, Melolonthidae includes the subfamilies Melolonthinae, Euchirinae, Phaenomeridinae, Rutelinae, Dynastinae, Cetoniinae, Glaphyrinae, Orphninae, and Systellopodinae, while Scarabaeidae refers to Scarabaeinae, Aphodiinae, Geotrupinae, Hybosoridae etc. Passalidae, Lucanidae, and Trogidae remain separate. This classification is not in wide use today and is incorrect.

La familia Scarabaeidae a veces se le refiere como la familia Melolonthidae, especialmente entre los trabajadores latinoamericanos. En este sentido, Melolonthidae incluye las subfamilias Melolonthinae, Euchirinae, Phaenomeridinae, Rutelinae, Dynastinae, Cetoniinae, Glaphyrinae, Orphninae, y Systellopodinae, mientras que Scarabaeidae se refiere a Scarabaeinae, Aphodiinae, Geotrupidae, Hybosoridae, etc. Passalidae, Lucanidae y Trogidae quedan separadas. Esta clasificación no se usa ampliamente hoy día y es incorrecta.

Scarabaeidae or Melolonthidae?

The family group names Rutelinae and Dynastinae were established by MacLeay in 1819, and the family group name Melolonthinae was established by Samouelle in 1819. However, the family group name Cetoniinae was established a few years earlier in 1815 by Leach. Thus, the family group name Cetoniidae has priority over Melolonthidae. Therefore, if one wanted to consider all of these subfamilies in the same family (exclusive of Scarabaeinae, which was established by Latreille in 1802), then the valid name would be Cetoniidae! Accordingly, the family name Scarabaeidae (Latreille1802) (including Scarabaeinae, Aphodiinae, Melolonthinae, Rutelinae, Dynastinae, Cetoniinae, etc.) is the correct family group name for these taxa and *not* Melolonthidae.

Los nombres de grupo familiar Rutelinae y Dynastinae fueron establecidos por MacLeay en 1819, y el nombre de grupo familiar Melolonthinae fue establecido por Samouelle en 1819. Sin embargo, el nombre de grupo familiar Cetoniinae fue establecido uno pocos años antes en 1815 por Leach. Por eso, el nombre de grupo familiar Cetoniidae tiene prioridad sobre Melolonthidae. Por lo tanto, si se quiere considerar que todas estas subfamilias pertenecen a la misma familia (exclusiva de Scarabaeinae, la cual fue establecida por Latreille en 1802), entonces el nombre válido sería Cetoniidae! Asimismo, el nombre familiar Scarabaeidae (Latreille 1802) (incluyendo Scarabaeinae, Aphodiinae, Melolonthinae, Rutelinae, Dynastinae, Cetoniinae, etc.) es el nombre correcto de grupo familiar para estos taxones y *no* Melolonthidae.

Heirarchical Classification

Kingdom: Animalia
Phylum: Arthropoda
Class: Hexapoda (Insecta)
Order: Coleoptera
Superfamily: Scarabaeoidea. Always ends in -oidea
Family: Scarabaeidae. Always ends in -idea
Subfamily: Rutelinae. Always ends in -inae
Tribe: Anomalini. Always ends in -ini
Genus: *Chrysina*
Species: *glorioisa*
Author: LeConte

What is a Scientific Name?

A scientific name consists of:
Genus
Species
Author

Plusiotis gloriosa LeConte. Original combination.
*Chrysina gloriosa (*LeConte). Current name.

Cited as *Chrysina gloriosa (*LeConte) (Coleoptera: Scarabaeidae: Rutelinae)

The International Code of Zoological Nomenclature

http://www.nhm.ac.uk/hosted-sites/iczn/code/

Scientific Names

Criteria of publication: print versus e-publication, widely disseminated, multiple copies, free.

Priority: date of publication.

Validity of names: oldest available name.

Formation of names: family, genus, species.

Homonomy: 2 species with same name.

Synonymy: 2 names for same species.

The Type Concept in Nomenclature

Holotype

Allotype

Paratypes (syntypes, co-types)

Lectotype

Paralectotype

Neotype

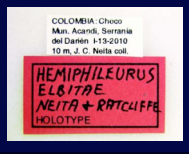
Homotype

Topotype

The Kinds of Types

Holotype

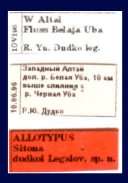
The single specimen selected by the author of a new species as the name-bearing type of that species. It is the "name holder" for the species and not necessarily representative in appearance of all members of that species. Designated with a red label.



The Kinds of Types

Allotype

A paratype of the opposite sex from that of the holotype. Usually designated with a red label.



The Kinds of Types

Paratype

Any specimen in the type series of a new species other than the specimen designated as the holotype. In the older literature, often referred to as co-types or syntypes. Designated with a yellow label.

The Kinds of Types

Lectotype

A specimen selected from a series of syntypes as the name-bearing type specimen subsequent to the original description. In the 19th century, for example, specimens were often described based upon a series of syntypes (co-types) without a specific specimen designated as the holotype. In the event a new species was described based upon only a single specimen, then that specimen automatically defaults to the status of holotype. Designated with a red label.

The Kinds of Types

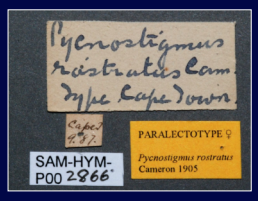
Lectoallotype

A syntype of the opposite sex from the lectotype. Usually designated with a red label.

The Kinds of Types

Paralectotype

All of the remaining syntypes after a lectotype has been selected. Designated with a yellow label.



The Kinds of Types

Homotype

A specimen that has been compared to the holotype and deemed to be conspecific.

The Kinds of Types

Topotype

Any specimen, often not in the type series, that has been collected from the same type locality as the holotype. Usually no specific label color.

Insect Collecting

Collecting Methods

Aquatic net

Sweep net

Aerial nets

Nets

Envelopes

Killing jar

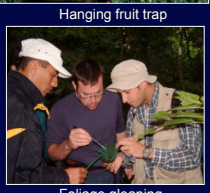
Tropics net

Collecting Methods

Excavating rotten logs

Hanging fruit trap

Excavating animal droppings

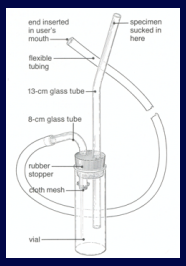


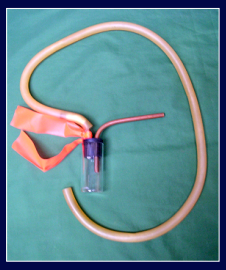
Foliage gleaning

Collecting Methods

Beating sheet

Collecting Methods





Aspirator or "pooter"

Collecting Methods

Flight intercept traps

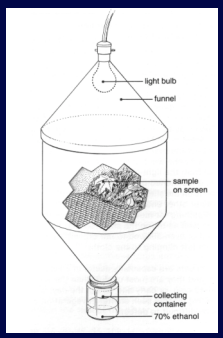
Collecting Methods

Malaise trap

Collecting Methods

Ground photoeclector trap

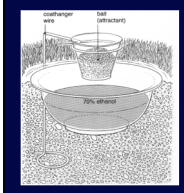
Collecting Methods

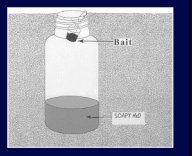


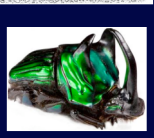
Berlese funnel

Collecting Methods

Baited pitfall traps:
feces, carrion, fruit







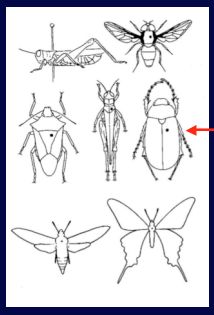
Collecting Methods

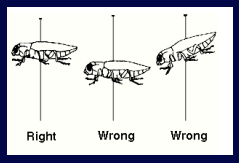
Light traps

Sorting Collected Specimens

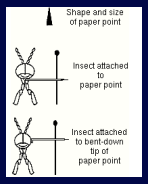
Always keep collecting data associated with the specimens

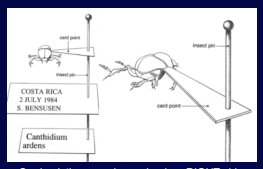
Pinning Insects



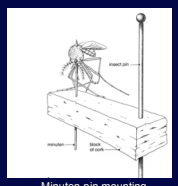


Pinning Insects

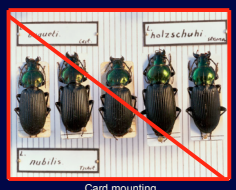




Card pointing: specimen glued on RIGHT side



Minuten pin mounting



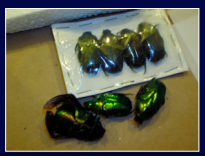
Card mounting

Preparation

Spreading boards

Preparation

Packaging (for exchange or long duration in the field)



Preparation

Monitoring and controlling insect pests and mold

Dermestidae

Mold

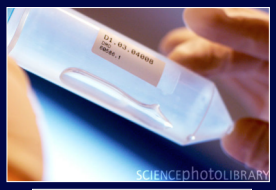
Preparation

Fluid Collections

Specimens in 70% ETOH

Preparation

Fluid Collections for DNA



Specimens in 95-100% ETOH
Store in ultracold freezer

Permanent Specimen Labels

- Each specimen (pinned and alcohol) must have a label that provides standard scientific data
- Labels must be printed on archival paper that is 100% cotton rag and acid free. Most paper contains acids and chlorides that cause the paper to become brittle and brown. NEVER use printer paper or 3X5 card stock
- Labels should be laser printed. In the field use permanent ink or pencil to make a temporary label; never use a ballpoint pen or felt tip pen

Label Data

- Locality label data should include enough information so that someone else can repeat your collecting event (repeatability is a cornerstone of science). At a minimum, data included on a label consists of:
- Locality (country, state or province, place, preferably GPS coordinates)
- Date (spell out the month or use a Roman numeral for the month)
- Name of collector
- If you do not have a GPS instrument (or your smart phone does not have GPS), you could use Google Earth to find the latitude and longitude
- Include ecological information such as habitat, host plant, method of collecting, and trapping method on a second label

PERU: Chanchamayo
San Ramón, Mensajero Lodge
S11°8' 0", W75°20'0"
I-12-2012 820 m
B. C. Ratcliffe coll.

Label Data
What Needs to be Included?

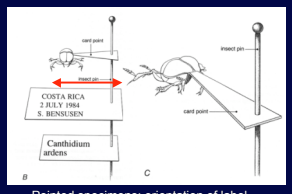
Print font is 4 point Helvetica or Arial

PERU: Chanchamayo, Junin
San Ramón, Mensajero Lodge
S11°8' 0″;W75°20'0"
I-12-2012 820 m
B. C. Ratcliffe coll.

- PERU: Province: District
- Specific location
- GPS location
- Date, elevation (use Roman numerals for month, *e.g.*,September = IX)
- Name of collector

Placement of Label

- Pinned specimens: Label placed beneath specimen; top of specimen should orient with head of the specimen. Ecological label placed below locality label. Labels read from LEFT side of specimen
- Pointed specimens: Label is beneath and parallel to paper point
- Specimens in alcohol vials: Place label directly into vial



Pointed specimens: orientation of label WITH direction of point

Pinned specimens: orientation of label WITH direction of label

Final Product

Final Product