APHODIINAE

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Presentation

• Part 1: Aphodiinae
• Part 2: Collecting techniques
• Part 3: Test

APHODIINAE

• “It’s The Little Things That Makes Living Worthwhile.” ~ Unknown
• “It has long been an axiom of mine that the little things are infinitely the most important.” ~ Sir Arthur Conan Doyle
APHODIINAE

- Known from all continents (even Antarctica!)
- Worldwide ~300 genera, 3500 spp
- Generally small scarabs (>1 cm), elongate body
- Pygidium partially covered by complete elytra
- Antenna with fewer than 11 segments
- Antennal club tight, of 3 antennomeres
- Abdomen with 6 visible sternites
- Mesotibial spur not pectinate
- Most adult mandibles reduced (except Aegialiini)

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Natural History

- Common name “small dung beetles” is basically WRONG for the majority
- Feed on specific accumulations of rich organic matter
- Larvae mostly detritivores (some in dung)
- Adults with mandibles – detritivores
- Adults reduced mandibles – liquid feeders (?) (some in dung)
- Many unknown habits
Natural History

- Dung (= special type of detritus), many types
- Decaying plant matter (+ dung of insects?)
- Inquilines, feeding on ‘dung’ or nest materials
- Predators, feeding on ant/termite brood, fly larvae, opportunistic liquids (blood)
- Fungivores (?)
- Pollinators (?)
- Niche collecting best way to learn about aphodiines and their diversity

APHODIINAe CLASSIFICATION

Higher Classification?

- What is a genus? Lumpers vs. Splitters.
- Ranks of recognized higher taxa debated.
- Relationships need solid phylogenetic work.
Higher Classification?
• Aphodiinae or Aphodiidae?
• Subfamily? Tribe? Subtribe?
• Relationships of 16 generally recognized higher divisions need solid phylogenetic work.
• Generally accepted "Tribes":

Aegialiini ¹
Aphodiini
Aulonocnemini
Chironini ²
Corythoderini
Didactyliini
Eremazini ³
Euparini
Odohilini
Odontolocini
Proctophanini
Psammodini
Rhynarini
Stereomerini
Termitoderini
Termitogonina ²

* Scarabaeidae Subfamilies in Bouchard et al. 2011

General Morphology
• External, internal, sexual dimorphisms, etc.
• Some poorly (?) defined, subtle distinguishing characters
General Morphology

• External, internal, sexual dimorphisms, etc.
• Some poorly (?) defined, subtle distinguishing characters
• There are always exceptions and oddities.

10 “Tribes” in New World

• With well developed mandibles: Aegialiini, Eremaeini
• With reduced mandibles:
  • Pygidium smooth: Aphodiini, Didactylini, Proctophanini
  • Pygidium modified elytral locking mechanism:
    • Prosternum not stellate, tibial spurs present: Euparini, Odontolochini, Psammodini
    • Prosternum stellate, tibial spurs lacking: Rhyparini, Stereomerini

NOTE: May not follow evolutionary history. Grouped for ease in identification.

AEGIALIINI

• Mandibles visible
• 9 genera, 65 spp. worldwide
• 6 genera, 36 spp. New World, mostly Nearctic
AEGIALIINI - habits

- Detritivores
- Many prefer sandy soils, sand dunes, sandbars.
- Some live in high elevation detritus.
- All seem to be active in ‘cooler’ seasons.
- Sifting, Berlese/Winkler samplers, night walking on ground, washup.

EREMAZINI ?

- Worldwide 2 genera, less than 20 species
- Argeremazus, 1 sp. – questionable placement in tribe (Eremazini ?)
- Mandibles of Argeremazus not exposed

EREMAZINI ? - habits

- Detritivore?
- Collected at light on sand dune
- Sifting? Lighting? Night walking on dunes?
- Few specimens known, from Argentina
APHODIINI

Lumpers:
• Worldwide, ~20 genera, +2000 spp.
• New World, ~5 genera, ~370 spp.

Splitters:
• Worldwide ~200 genera, +2000 spp.
• New World, ~80 genera, ~370 spp.

• New World, mostly North America

APHODIINI

• Adult mandibles reduced
• Pygidium smooth, not modified
• Elytral base lacking marginal bead
• Prosternum not projecting, or stellate
• Metatarsus articulates between apical spurs
• Transverse metatibial carina usually present (reduced in some)

APHODIINI - habits
• “Detritivores”, many in ‘dung’
• Few attracted to light.
• Baited pitfalls useful when in the preferred niche.
• Barrier pitfalls for flightless taxa.
• Litter samples, in flights, washup, etc.
• Key is niche collecting at the right time/season.
APHODIINI - habits
• Many cool weather active (higher elevations). Seasonal activity.
• Rodent burrow/nests
• Sand dunes
• Dung specialists – pats, pellets, etc. in niche.
• Organic muck around marshes
• Few ant specialists

DIDACTYLIINI
• Adult mandibles reduced
• Pygidium smooth, not modified
• Elytral base lacking marginal bead
• Prosternum not projecting, or stellate
• Metatarsus does not articulate between apical spurs
• Transverse metatibial carina lacking
• Worldwide 10 genera, 40 spp.
• Only genus Aidophus in New World, 12 spp., mostly South America

DIDACTYLIINI - habits
• Lights in sandy areas
• Flight traps in sandy areas
• Detritivore?
PROCTOPHANINI
• Adult mandibles reduced
• Pygidium smooth, not modified
• Elytral base lacking marginal bead
• Prosternum not projecting, or stellate
• Metatarsus does not articulate between apical spurs
• Transverse metatibial carina present
• Worldwide 5 genera, 30 spp.

PROCTOPHANINI - habits
• Only genus Australaphodius, 1 sp., in New World
• Single species introduced into New World: W-USA, Chile
• Maybe locally common.
• Domestic animal dung?

EUPARIINI
• Worldwide 45 genera, 565 spp.
• New World 31 genera, 341 spp., mostly tropical
EUPARIINI

- Adult mandibles reduced
- Pygidium modified
- Elytral base with marginal bead
- Prosternum not projecting, or stellate
- Metatarsus does not articulate between apical spurs
- Transverse metatibial carina absent
- Pronotum without transverse ridges/grooves

EUPARIINI - habits

- More tropical, fewer in temperate areas.
- Most detritivores, RARELY in ‘dung’
- Some under bark in decaying frass(?)
- Some species come to light.
- Myrmecaphiles, termitophiles(?)
- Sift from detritus, substrates.
- Knowledge of specific detritus and seasonality vital to collecting.

ODONTOLOCHINI

- Worldwide 7 genera, 33 spp.
- New World, 4 genera, 11 spp., tropical
- Similar to Eupariini
- Pronotum more declivous (not expanded laterally)
- Head more gibbous
- Protibial teeth more apical (usually)
ODONTOLOCHINI - habits

- Rarely collected
- At lights, flight traps, litter samples, under bark
- Termites?

ODONTOLOCHINI NEWS FLASH!
San Ramon, Peru: students in a Scarab identification workshop discovered *Saprositellus* sp., larvae and adults feeding on red rotten wood boring insect frass(?). Detailed study in progress.

PSAMMODIINI

- Worldwide 26 genera, 400 spp.
- New World 15 genera, 89 spp.
- Similar to Eupariini
- Pronotum with transverse ridges/grooves
PSAMMODIINI - habits

- PSAMMODIINI – live in sandy substrates.
- Some come to light.
- Some are found walking on sand.
- Most need to be sifted.

RHYPARIINI

- Worldwide, 11 genera, 77 spp.
- New World, 5 genera, 17 spp., tropical
- Prosternum stellate and projecting posteriorly
- Elytra with large modified tubercles at apex
- Body highly modified

RHYPARIINI - habits

- Termitophilus (Myrmecophilus?)
- Rhyparus come to light, others do not
- Litter samples, in termite colonies, flight traps
STEREOMERINI

- Worldwide, ~7 genera, 18 spp.
- New world, only *Termitaxis*, 1 specimen from termite nest in Peru
- Prosternum stellate
- Elytra lacking tubercle at apex
- Body highly modified

Literature/handouts

- Electronic handouts
  - Electronic Key from website
  - PDFs of generic keys
  - PDFs of important generic revisions
- Text books to view
- Specimens to study

COLLECTING METHODS

- Time for a break
Lighting, Light trapping

Catch mostly commoner taxa.
Occasional rarities.
Always use a ground sheet.
Always watch where you step.
Look at the little stuff!

Lighting, Light trapping

Rarely collected areas/habitats.
Recent weather considerations.
LUCK - THE night of a flight.
Always pay attention to small beetles on the ground sheet!
WATCH YOUR STEP!

Surface pitfall trapping

• Dung baited pitfalls on surface collect common surface generalist aphodiines.
• Placement of baited pitfalls vital for many aphodiines.
Surface pitfall trapping

• Unbaited traps can be effective, require patience and persistence.
• Examples: barrier pitfalls, fake burrow pitfalls near other animal burrows.

Flight traps

Feces, Dung, Caca

Pellets or Patties? Where and when deposited?
Organic accumulations

Ant nests
• *Atta* spp. (leaf cutter ants)
• *Formica* spp. (thatch ants)
• *Solenopsis* spp. (fire ants)
• Others?
Termite nests

- *Coptotermes* sp.
- "*Rhinotermes*" sp.

Small burrowing animals

- Mice
- Pack rats
- Pocket gophers, tuco tuco
- Ground squirrels, prairie dogs, ...
- Tortoises
- Many other possibilities unexplored
- Know the local vertebrate fauna, dung or nest associates possible

Pocket Gophers
Gopher beetle trap

Plague* - Scooping

* Some rodents carry flea transmitted diseases. Sample with caution.

Why stop?
Prairie

Aphodiines in flight video

Snow banks
Sifting substrates

- Sand, small screen, watch for beetles on screen (or float)
- Litter for extraction with Berlese or Winkler separators, use larger screen, sample materials falling through screen
- Throw detritus in sun and see what moves!
Litter samples

Spoils from nests in logs, litter under foot & over head, endless possibilities

Simply look!
The TEST it next

• Time for a short break

Niche (Microhabitat) collection discussion

Let’s walk through some landscapes and discuss things we’ve learned (or might explore) about where/when/how to collect aphodiines. (I apologize for lack of tropical pictures, I am still learning!)

Look for ‘edges’, niches, and accumulations of rich organic matter.

~ Audience Participation Expected ~
USA, N.Carolina, Hardwood forest

USA, Florida, mesic woodland

Surinam, lowland tropical forests
Surinam, Lowland tropical savannah

USA, Utah, Alpine meadow

USA, Wyoming, sand dune edge
Collecting aphodiines is exhausting

GOOD LUCK