

## Coleoptera: Scarabaeidae: Melolonthinae

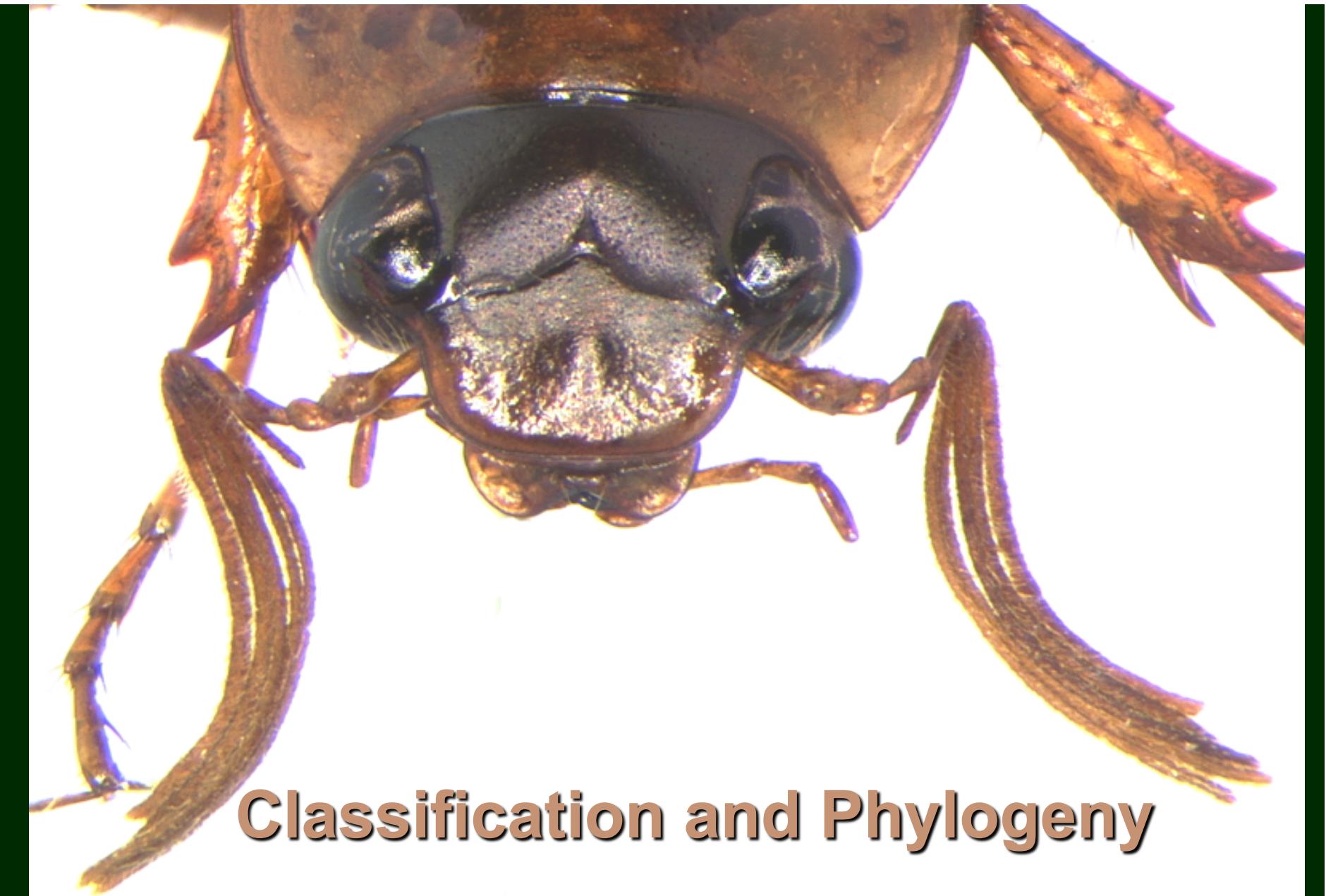


# **Diagnostic characters**

- Antennae with 7-10 antennomeres, club with 3-7 antennomere club
- Claws symmetrical\*; simple, cleft, toothed, serrate, or pectinate
- Antennal insertion not visible from above
- Mandibles generally hidden in dorsal view

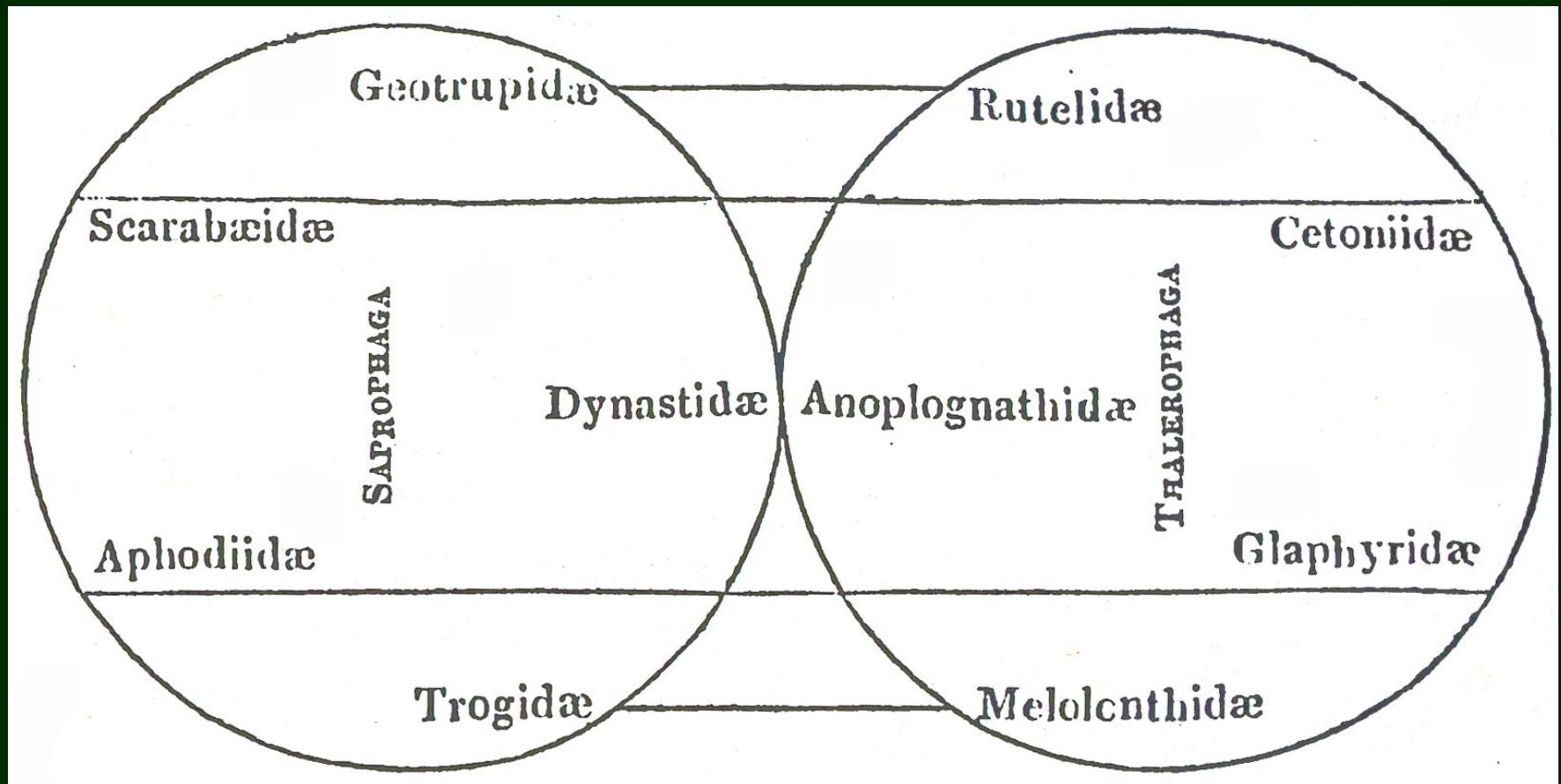
# **Is Melolonthinae monophyletic?**

- There is no compelling evidence that Melolonthinae is a monophyletic taxon
- There is no compelling evidence that Melolonthinae is not a monophyletic taxon\*

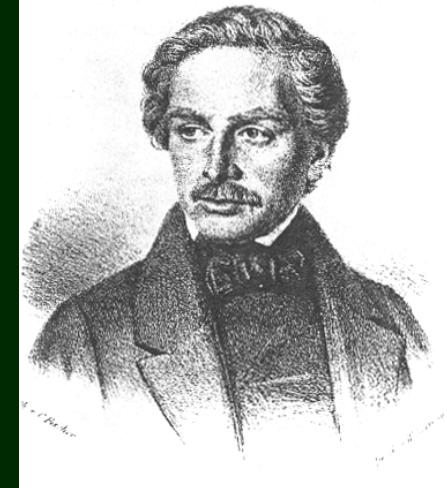


# Classification and Phylogeny

# MacLeay 1819



# Wilhelm Erichson 1847-1848 - Naturgeschichte der Insecten Deutschlands

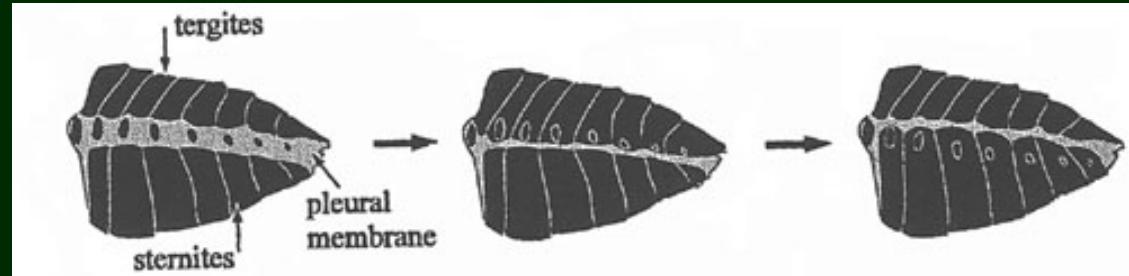


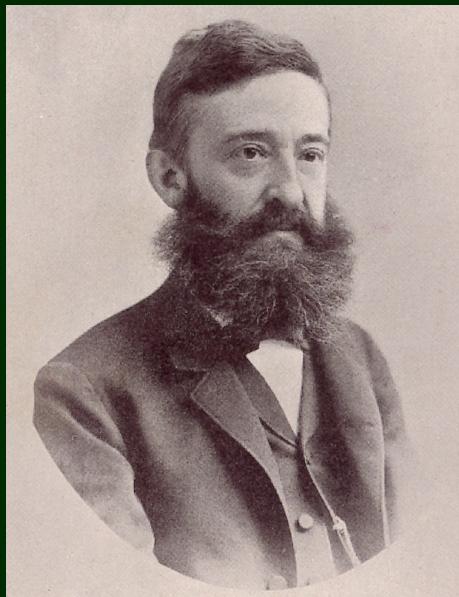
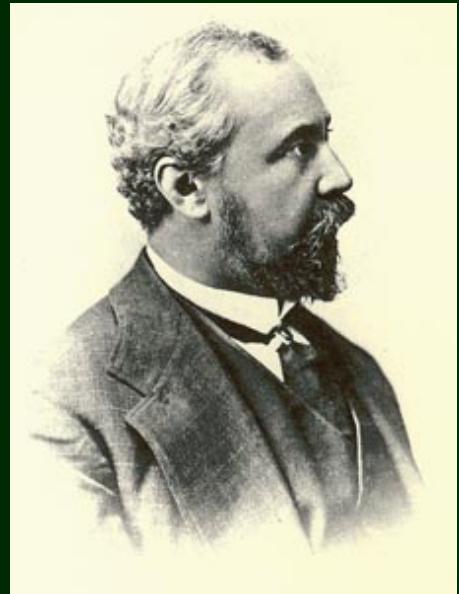
**Scarabaeides laparosticti**

**Glaphyridae**  
**Hybosoridae**  
**Geotrupidae**  
**Copridae**  
**Aphodiidae**  
**Orphnidae**  
**Trogidae**  
**Passalidae**  
**Lucanidae**

**Scarabaeides pleurosticti**

**Melolonthidae**  
**Cetoniidae**  
**Dynastidae**  
**Rutelidae**





# LeConte & Horn 1883

## Lamellicornia

### Lucanidae

Lucanini

Passalini

### Scarabaeidae

#### Subfamily Laparosticti

Coprini

Aphodiini

Orphnini

Hybosorini

Geotrupini

Pleocomini

Acanthocerini

Nicagini

Trogini

#### Subfamily Melolonthinae

Glaphyrini

Oncerini

#### Subfamily Pleurosticti

Rutelini

Dynastini

Cetoniini

# Leng 1920

## Scarabaeoidea

### Scarabaeidae

Coprinae  
Aegialiinae  
Aphodiinae  
Ochodaeinae  
Hybosorinae  
Geotrupinae  
Pleocominae  
Glaphyrinae  
Acanthocerinae  
Troginae  
Melolonthinae  
Rutelinae  
Dynastinae  
Cetoniinae

### Lucanidae

Lucaninae  
Dorcinae  
Aesalinae  
Sinodendrinae  
Passalidae

# Balthasar 1963

## Lamellicornia

### Lucanoidea

Lucanidae

Passalidae

### Scarabaeoidea

Scarabaeidae

Scarabaeinae

Coprinae

Aphodiidae

Aegialidae

Aegialinae

Chironinae

Hybosoridae

Hybosorinae

Orphninae

Dynamopodinae

Ochodaeidae

Ochodaeinae

Aclopinae

Trogidae

Troginae

Acanthocerinae

Allidiostominae

### Geotrupidae

Geotrupinae

Taurocerastinae

### Pachypodidae

Pachypodinae

Aulanocneminae

Pleocominae

### Glaphyridae

### Systellopodidae

### Melolonthidae

Melolonthinae

Sericinae

### Phaenomeridae

### Euchiridae

### Rutelidae

Rutelinae

Hopliinae

### Dynastidae

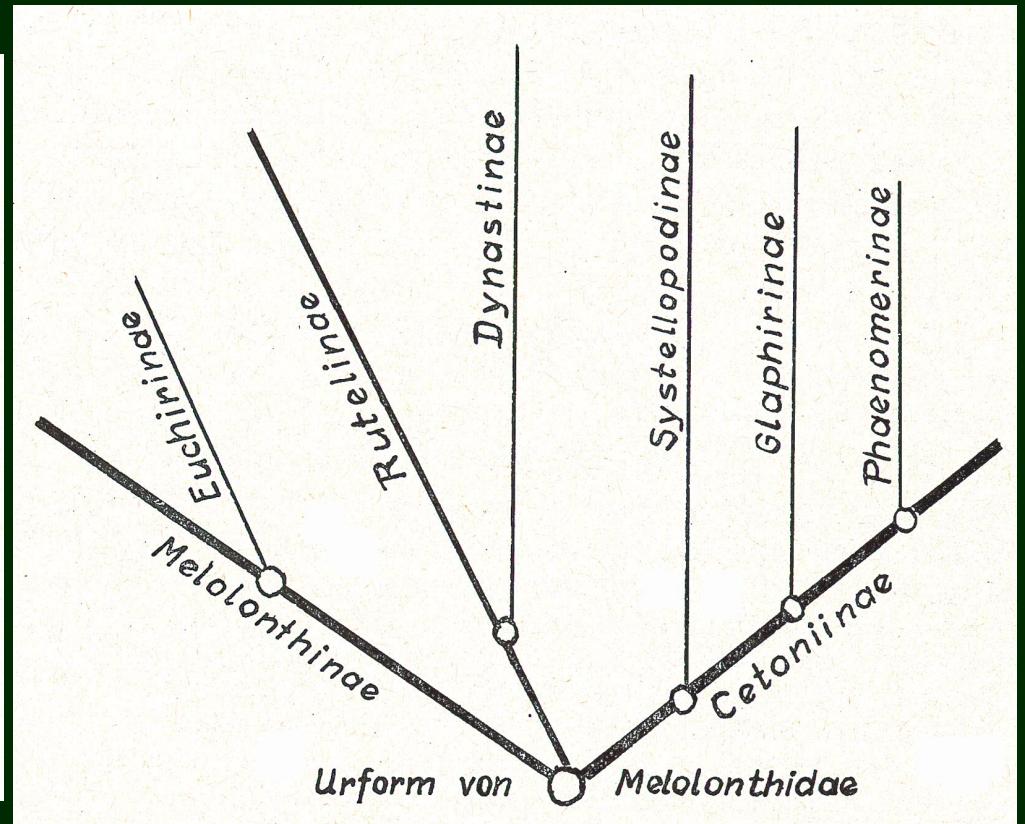
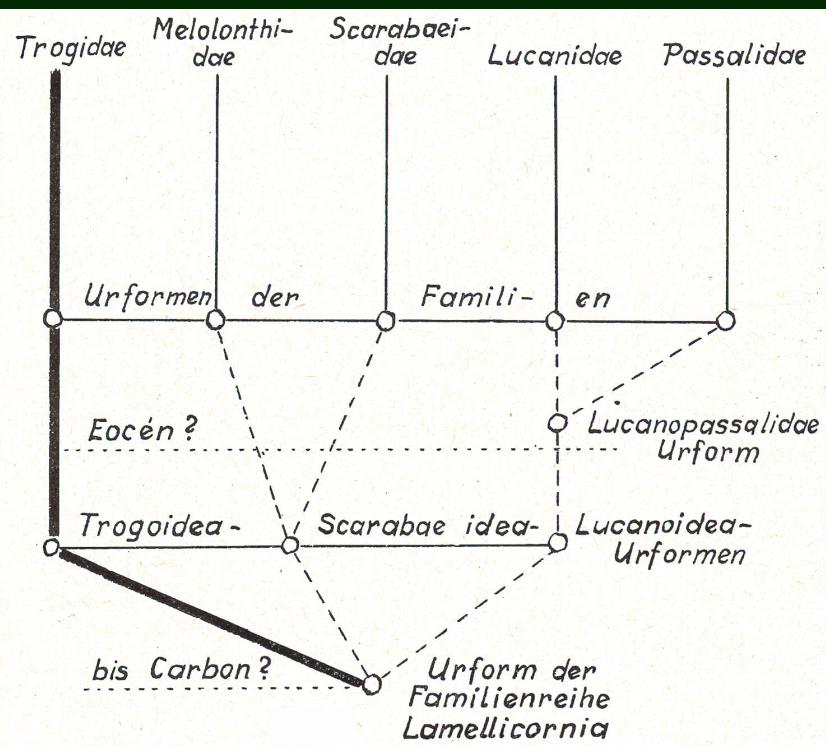
### Cetoniidae

Valginae

Trichiinae

Cetoniinae

# Endrödi 1966



# **Arnett 1968**

## **Scarabaeoidea**

### **Lucanidae**

**Lucaninae**  
**Dorcinae**  
**Platycerinae**  
**Sinodendrinae**

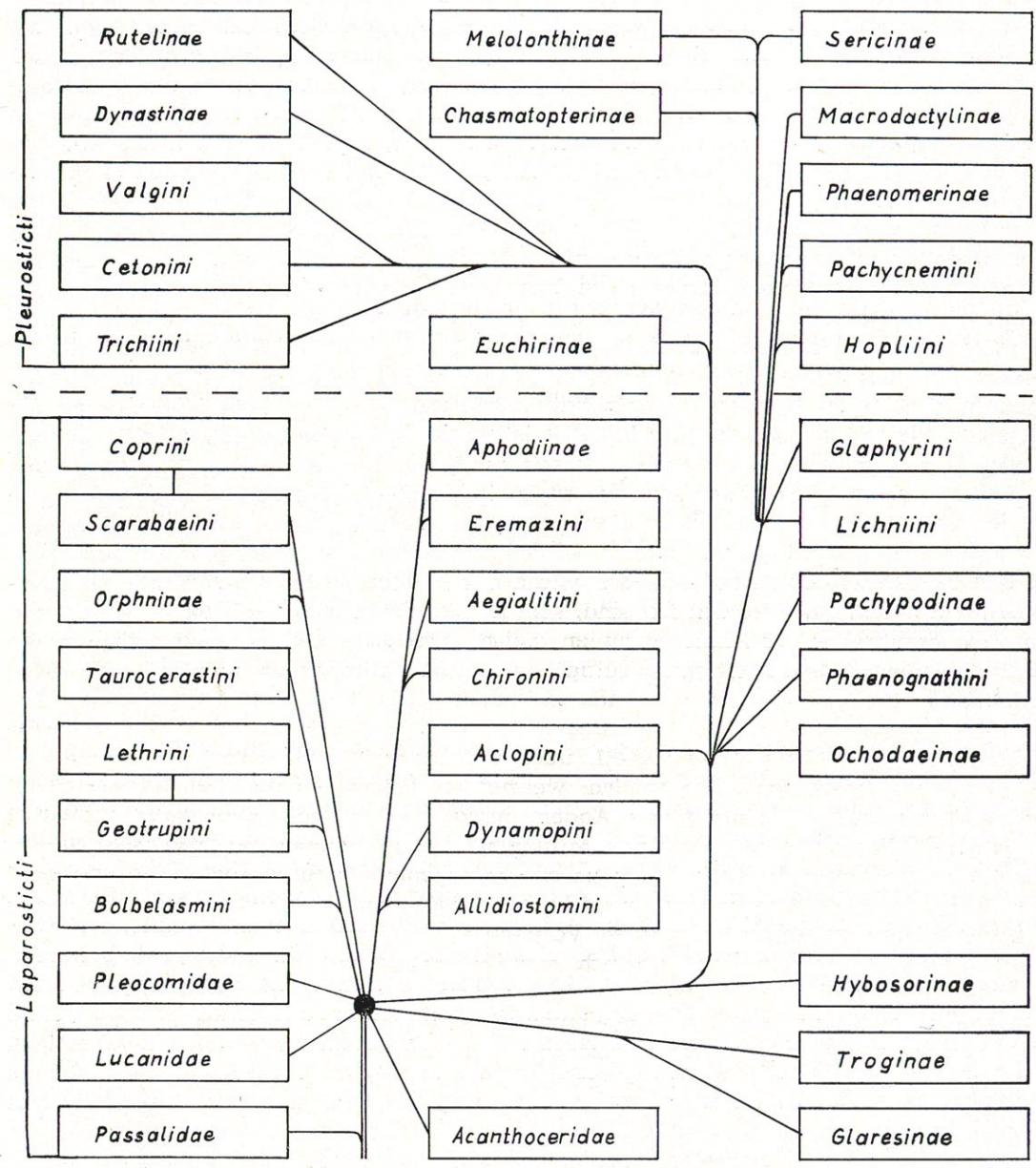
### **Passalidae**

**Pseudacanthinae**  
**Passalinae**

### **Scarabaeidae**

**Scarabaeinae**  
**Aphodiinae**  
**Ochodaeinae**  
**Hybosorinae**  
**Geotrupinae**  
**Pleocominae**  
**Glaphyrinae**  
**Acanthocerinae**  
**Troginae**  
**Melolonthinae**  
**Rutelinae**  
**Dynastinae**  
**Cetoniinae**

# Iablokoff-Khnzorian 1977

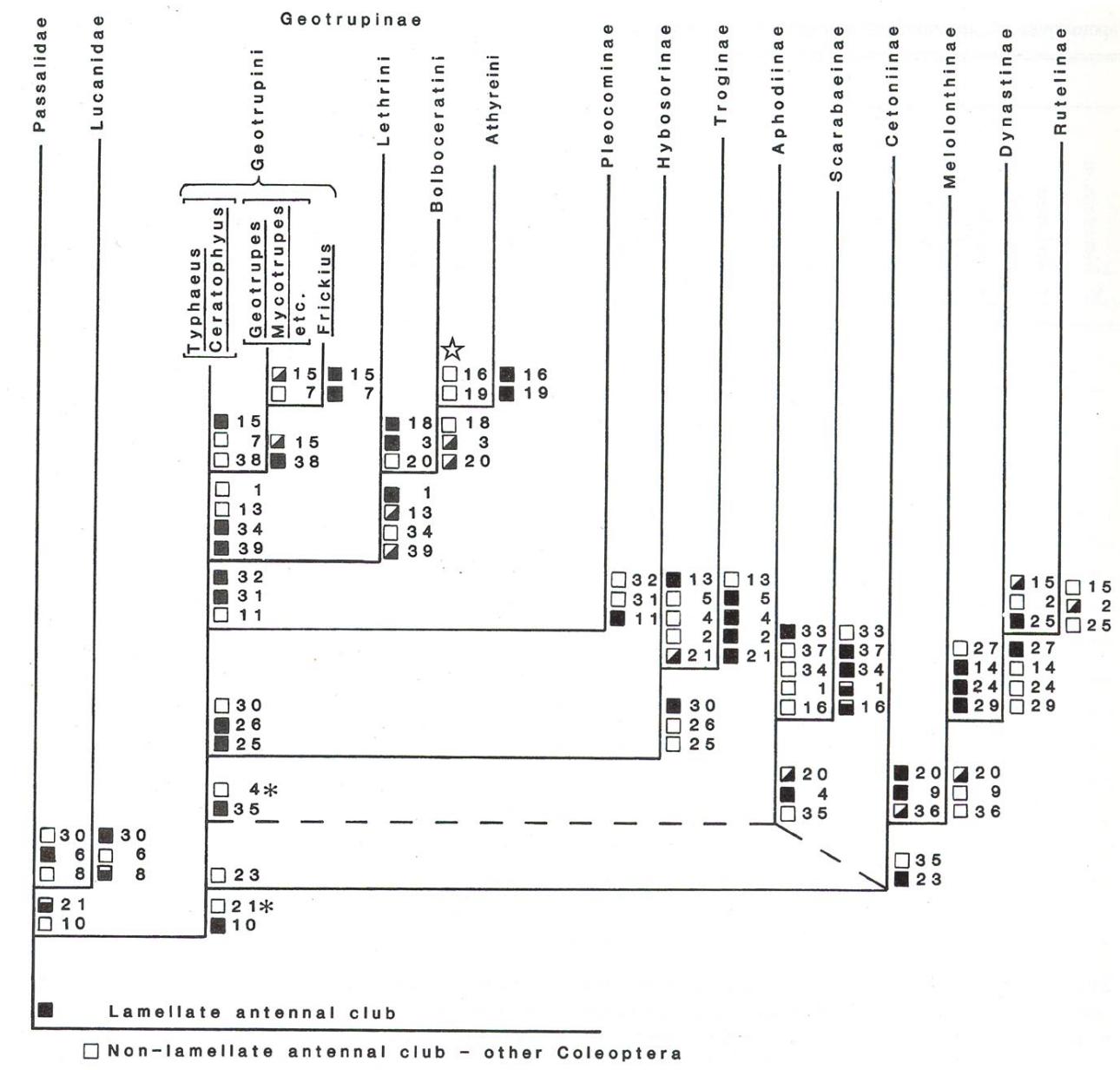


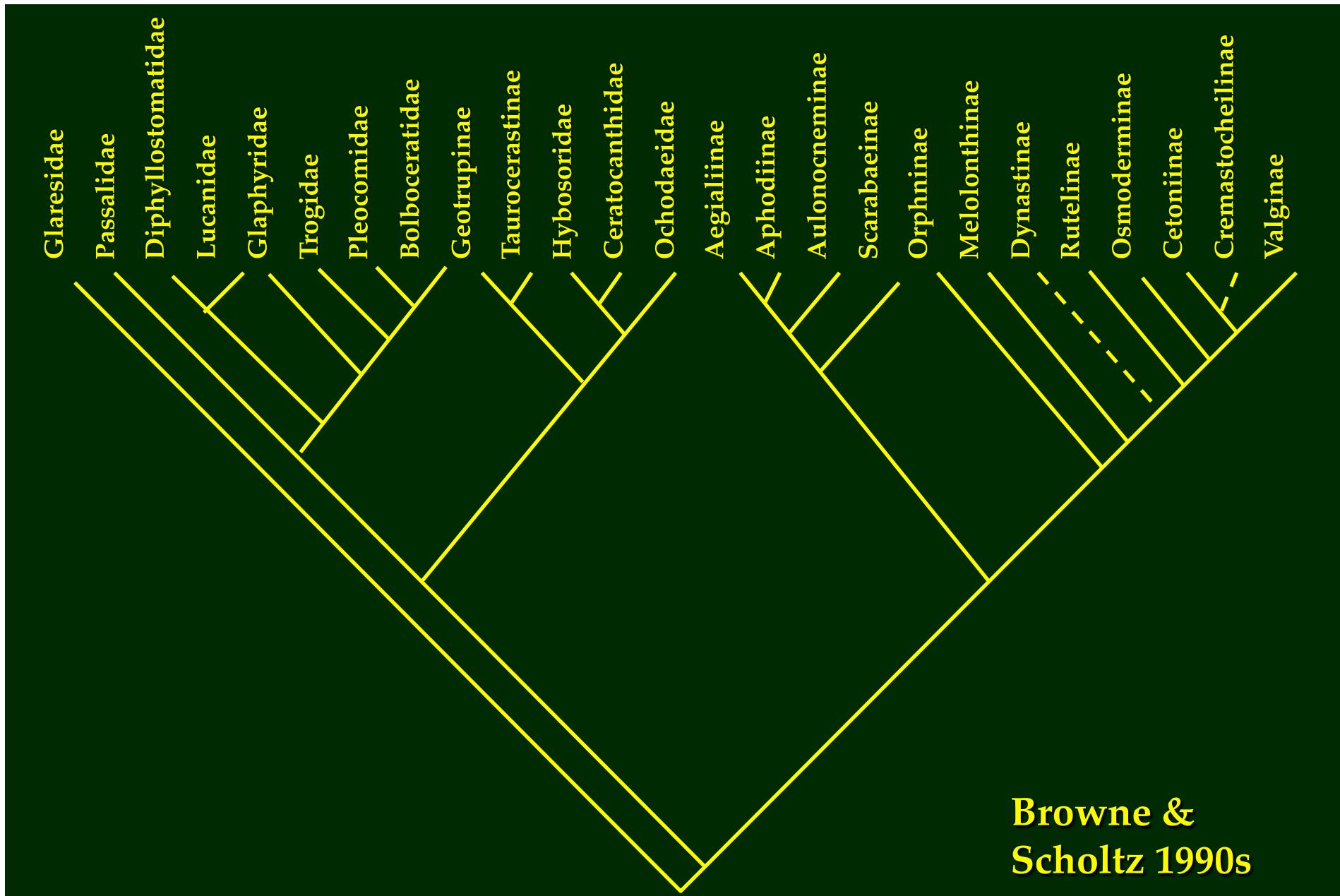
**The scarab classification system is based on completely outdated opinions.  
Classification systems such as this will not endure when they are still based primarily on single characters.**



**Johann Machatschke 1965**

# Howden 1982





Browne &  
Scholtz 1990s

# **Lawrence & Newton 1995**

## **Scarabaeoidea**

### **Lucanidae**

Aesalinae  
Nicaginae  
Syndesinae  
Lampriminae  
Penichrolucaninae  
Lucaninae

### **Passalidae**

Aulacocycinae  
Passalinae

### **Trogidae**

### **Glaresidae**

### **Pleocomidae**

### **Diphyllostomatidae**

### **Geotrupidae**

Bolboceratinae  
Geotrupinae  
Lethrinae

### **Belohinidae**

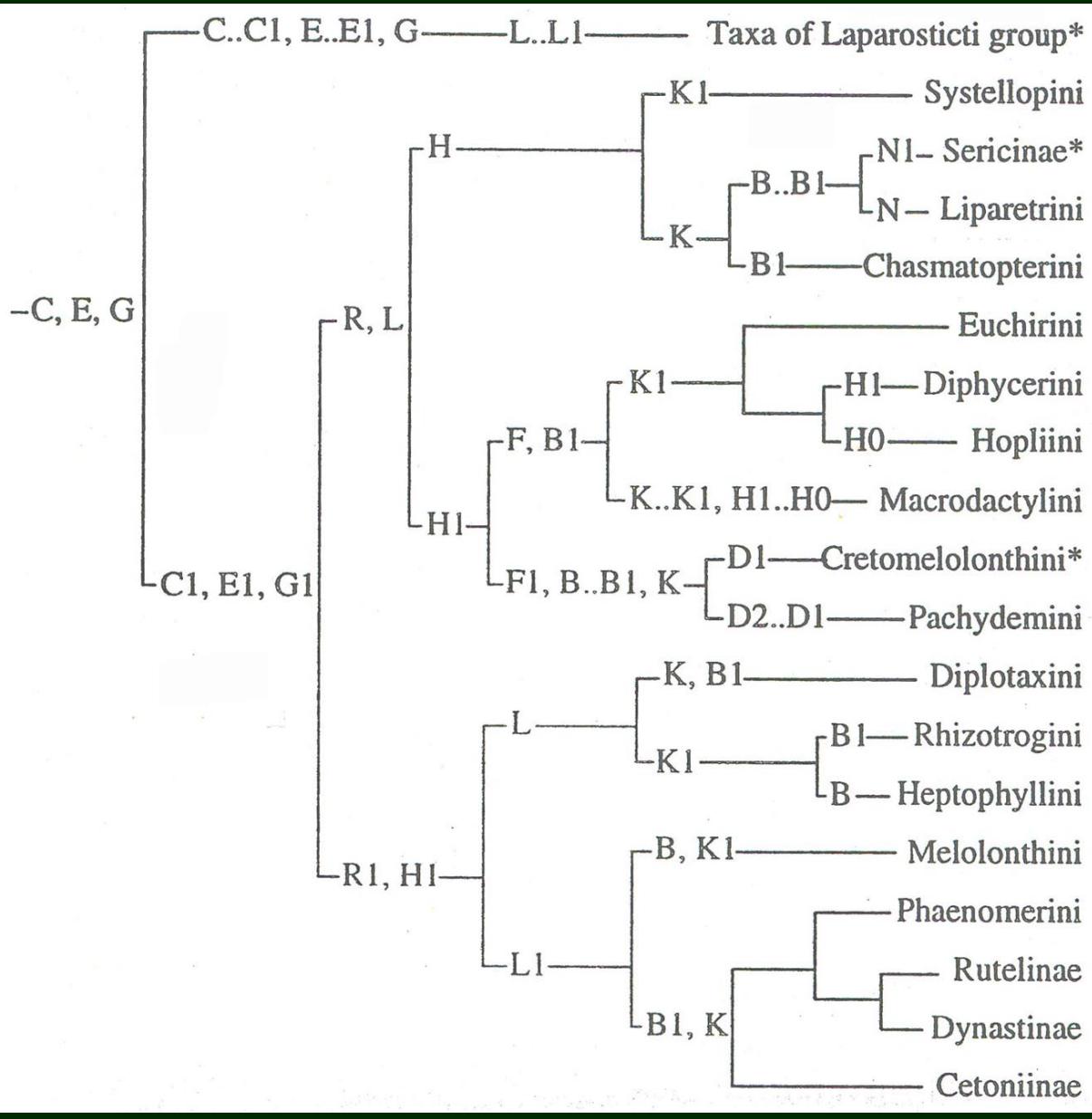
### **Ochodaeidae**

Ochodaeinae  
Chaetocanthinae  
Ceratocanthidae  
Hybosoridae  
Glaphryidae  
Scarabaeidae

### **Aphodiinae**

Scarabaeinae  
Pachypodinae  
Orphninae  
Allidiostomatinae  
Dynamopodinae  
Aclopinae  
Euchirinae  
Phaenomeridinae  
Melolonthinae  
Rutelinae  
Dynastinae  
Cetoniinae

# Nikolajev 1998



# Martín Piera 2000 - Iberian Fauna

## Scarabaeoidea

Glaresidae

Lucanidae

    Lucaninae

    Aesalinae

    Syndesinae

Glyphyridae

Trogidae

Geotrupidae

    Geotrupinae

    Bolboceratinae

Ochodaeidae

Hybosoridae

Aphodiidae

    Aphodiinae

    Eupariinae

    Psammodiinae

Aegialiidae

Scarabaeidae

Orphnidae

Melolonthidae

    Melolonthinae

    Chasmatopterinae

    Pachydeminae

    Sericinae

Rutelidae

    Rutelinae

    Hoplinae

Dynastidae

Cetoniidae

    Cetoniinae

    Trichiinae

    Valginae

# American Beetles – Ratcliffe et al. 2002

## Scarabaeoidea

### Lucanidae

  Lucaninae  
  Nicaginae  
  Syndesinae

### Passalidae

### Glaresidae

### Trogidae

### Pleocomidae

### Geotrupidae

  Geotrupinae

  Bolboceratinae

### Ochodaeidae

  Ochodaeinae

  Chaetocanthinae

### Ceratocanthidae

  Hybosoridae  
  Glaphryidae  
  Scarabaeidae

  Aphodiinae

  Scarabaeinae

  Melolonthinae

  Rutelinae

  Dynastinae

  Cetoniinae

  Trichiinae

  Valginae

**PLEOCOMIDAE**

- Pleocominae  
Cretocominae†  
Archescarabaeinae†

**GEOTRUPIDAE**

- Bolboceratinae  
Geotrupinae

**BELOHINIDAE****PASSALIDAE**

- Aulacocyclinae  
Passalinae

**TROGIDAE**

- Avitortorinae†  
Troginae  
Omorginae

**GLARESIDAE****DIPHYLLOSTOMATIDAE****LUCANIDAE**

- Protolucaninae†  
Aesalinae

**Ceruchitinae†**

- Syndesinae  
Lampriminae

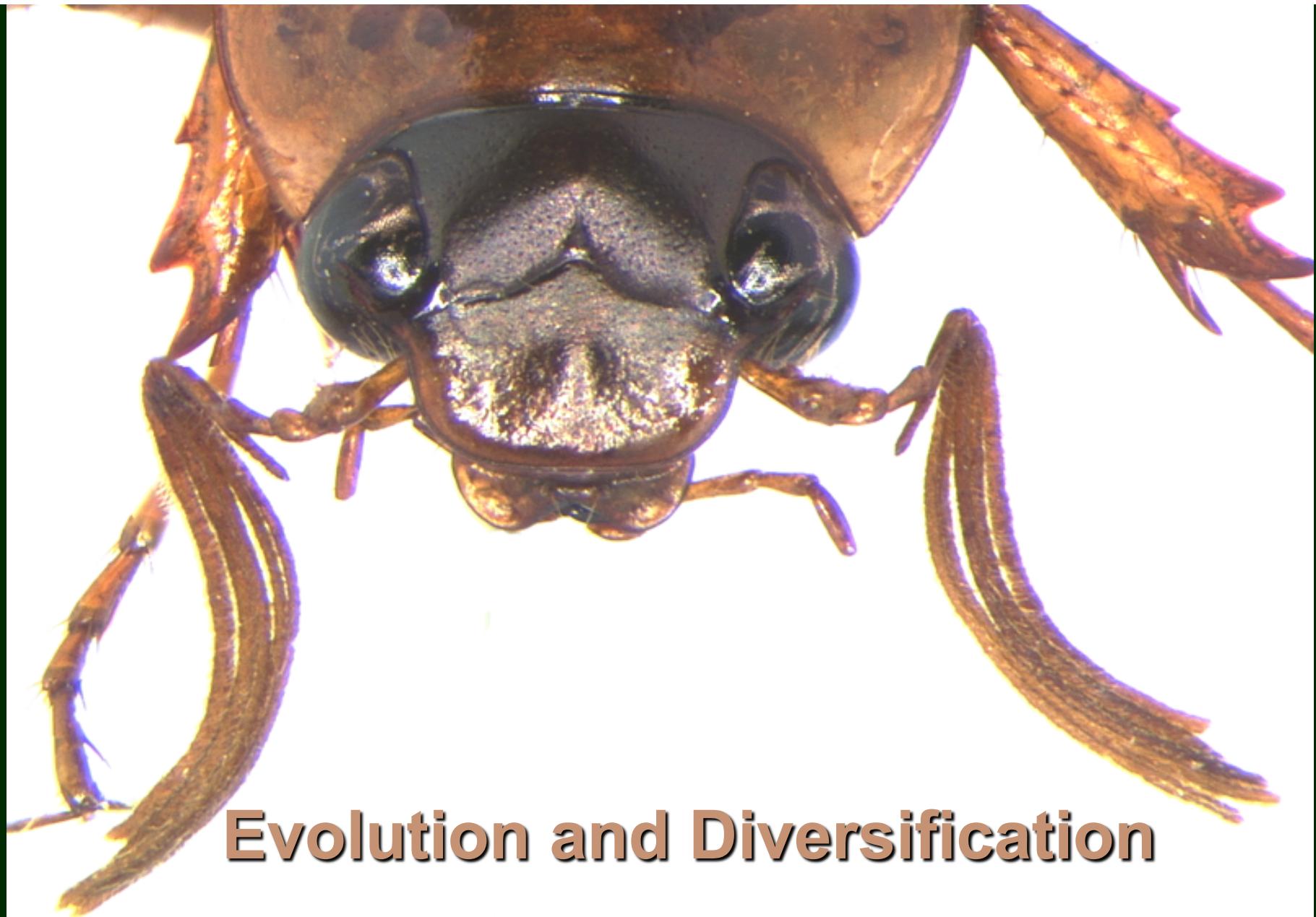
**Lucaninae****Paralucaninae†****OCHODAEIDAE**

- Cretochodaeinae†

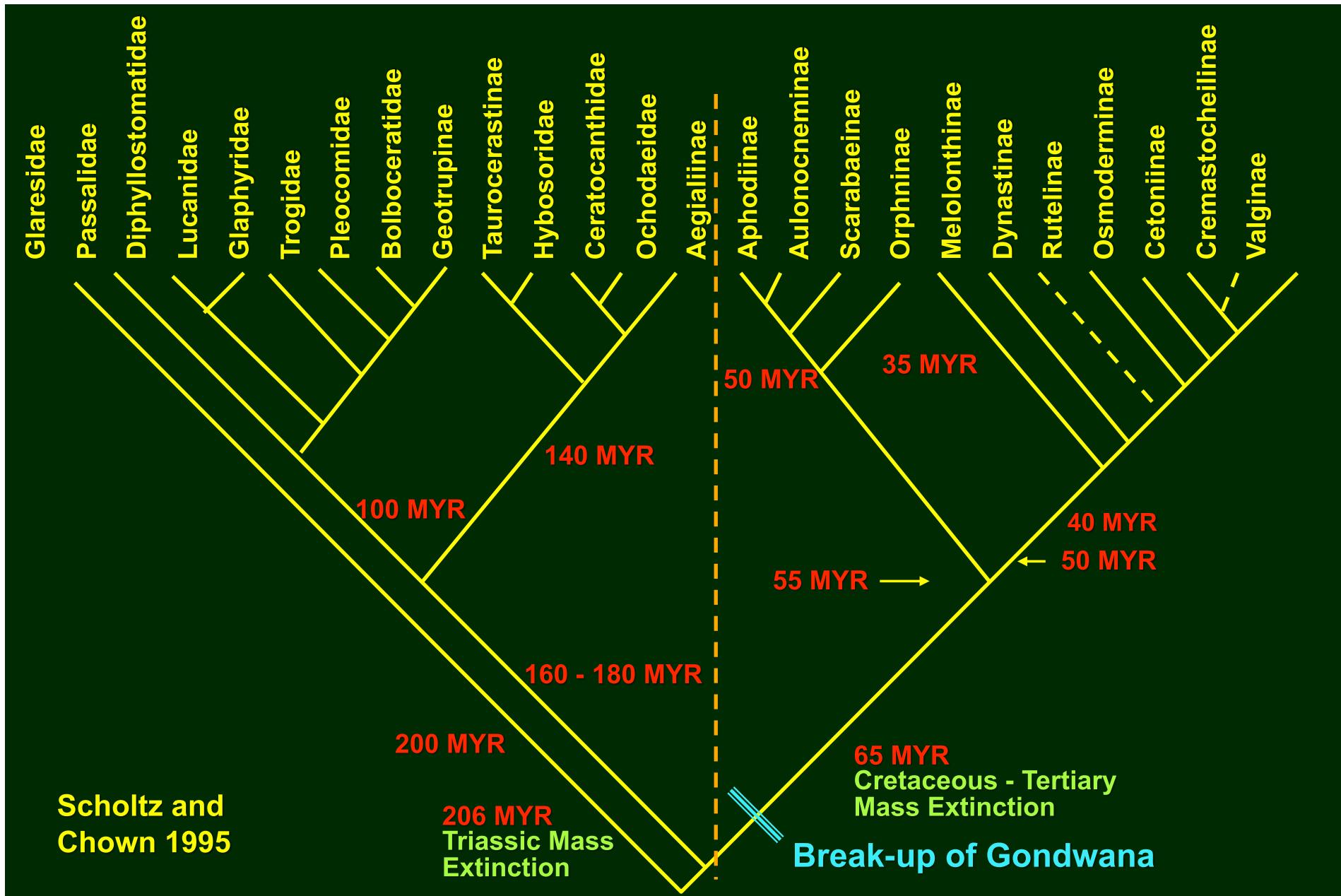
**Ochodaeinae****Chaetocanthinae****HYBOSORIDAE****Mimaphodiinae†****Anaidinae****Ceratocanthinae****Hybosorinae****Liparochrinae****Pachyplectrinae****GLAPHRYIDAE****Glaphyrinae****Amphicominae****Cretoglaphyrinae†****SCARABAEIDAE**

- Lithoscarabaeinae†

**Chironinae****Aegialiinae****Eremazinae****Aphodiinae****Aulonocneminae****Termitotroginae****Scarabaeinae****Prototroginae†****Cretoscarabaeinae****Dynamopodinae****Phaenomeridinae****Orphninae****Alliodiostomatinae****Aclopinae****Melolonthinae****Rutelinae****Dynastinae****Cetoniinae**

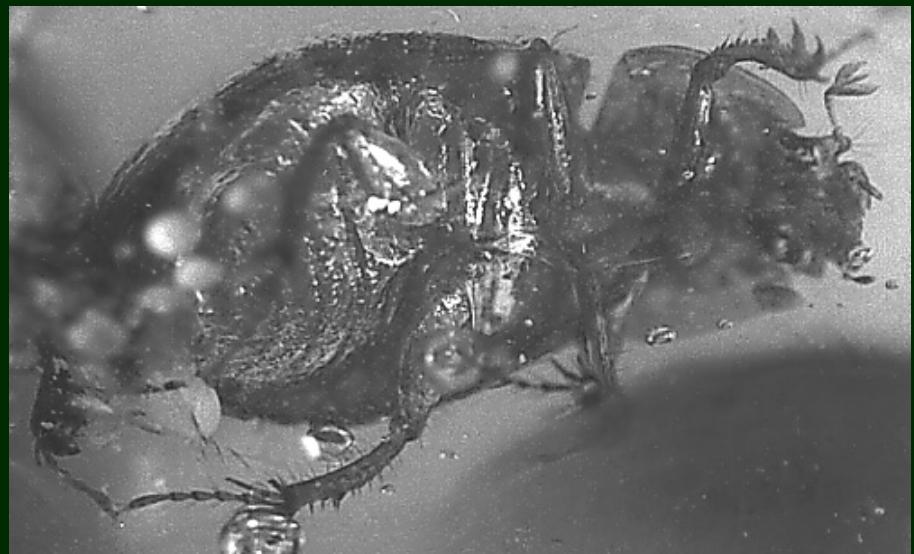


**Evolution and Diversification**



# Dating phytophagous scarab evolution and diversification

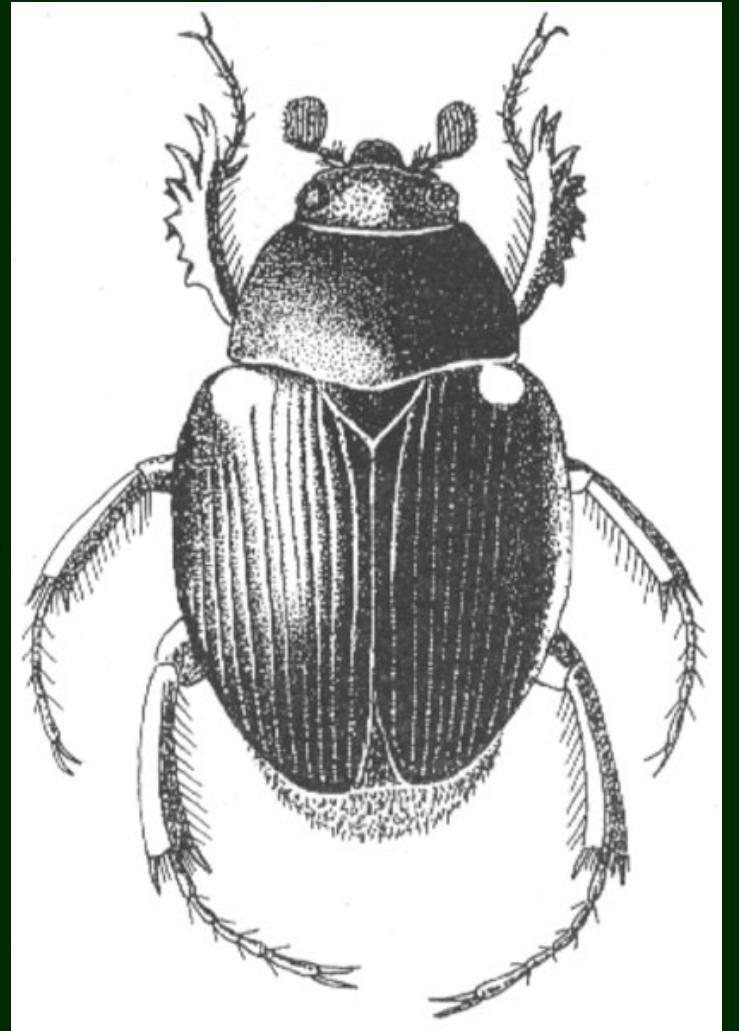
- ➔ Fossil record is notoriously poor and has many gaps
- ➔ Especially for certain groups of terrestrial insects
- ➔ The age of a taxon is often severely underestimated by the fossil record



A hybosorid scarab from Miocene amber

*Proteroscarabaeus yeni*

Early Cretaceous, China



**“...the description contains no characters that formally justify its inclusion in the [Scarabaeoidea]”**

Nikritin 1991

## **Fossil record? - Krell 2000**

- Some dubious Cretaceous records of phytophagous scarabs in the fossil record
- Vast majority of phytophagous scarab fossils are from the Miocene or later

# Australian Melolonthinae

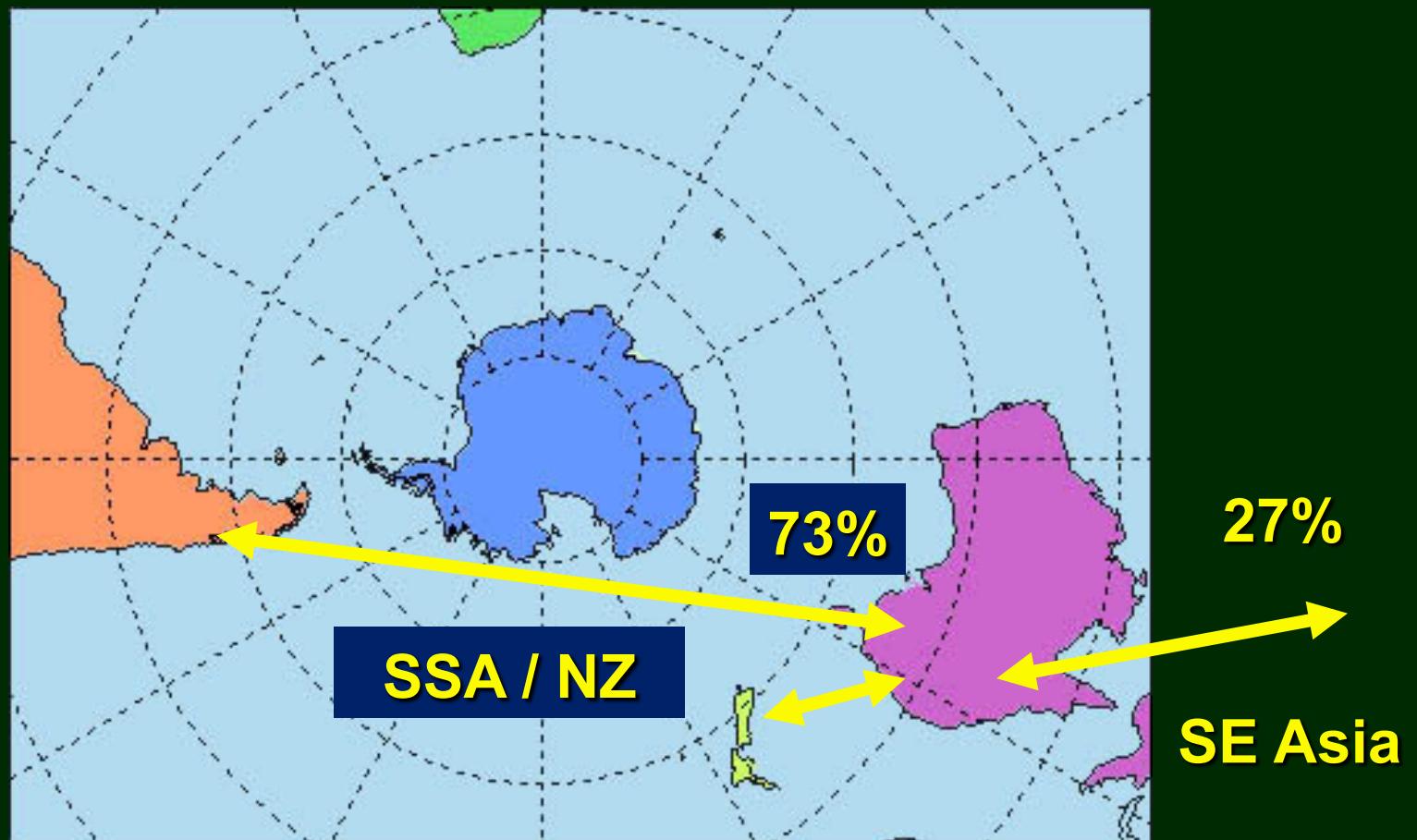
→Closest relatives:  
SE Asia

- Diphucephalini*, 3 genera, 78 species
- Melolonthini*, 16 genera, 111 species

→Closest relatives:  
Southern South  
America, New  
Zealand

- Automoliini*, 5 genera, 59 species
- Comophorinini*, 1 genus, 1 species
- Heteronycini*, 11 genera, 249 species
- Liparetrini*, 30 genera, 440 species
- Maechidiini*, 6 genera, 80 species
- Pachytrichini*, 1 genus, 5 species
- Phyllotocidiini*, 1 genus, 4 species
- Scitalini*, 17 genera, 128 species
- Sericini*, 10 genera, 55 species
- Systellopini*, 7 genera, 20 species
- Xylonychini*, 6 genera, 13 species

# Australian phytophagous scarabs

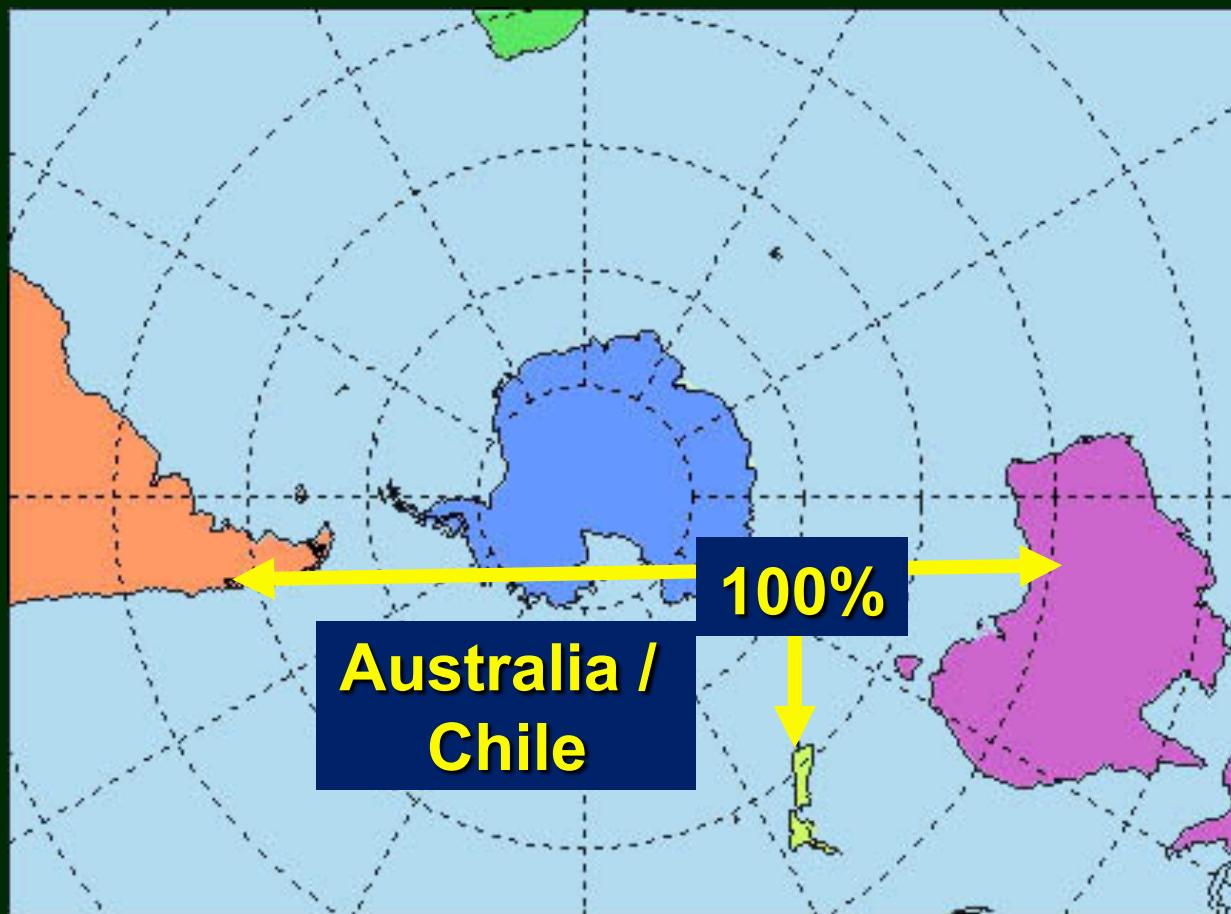


# New Zealand Melolonthinae

→Closest relatives:  
Australia, Southern  
South America

- Colpochilini, 5 genera, 74 species
- Sericini, 2 genera, 3 species
- Scitalini, 1 genus, 2 species
- Xylonychini, 2 genera, 21 species

# New Zealand phytophagous scarabs



→5 tribes, 12 genera, 106 species

# **Southern South American Melolonthinae**

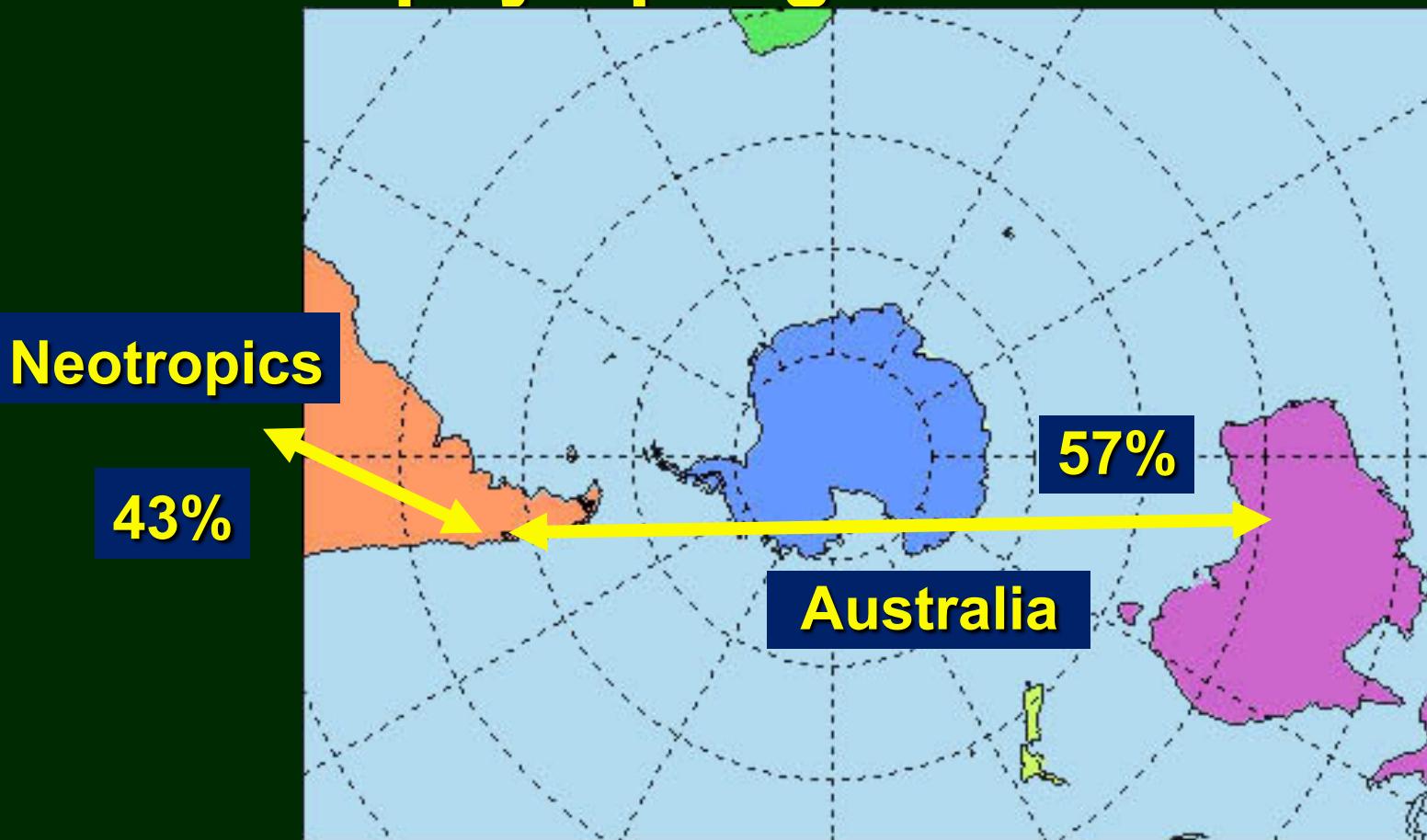
**→Closest relatives:  
Neotropics**

- Diplotaxini, 3 genera, 18 species**
- Macrodactylini, 8 genera, 23 species**
- Pachydemini, 1 genus, 1 species**

**→Closest relatives:  
Australia, New  
Zealand**

- Sericoidini, 4 genera, 52 species**
- Xylonychini, 2 genera, 5 species**

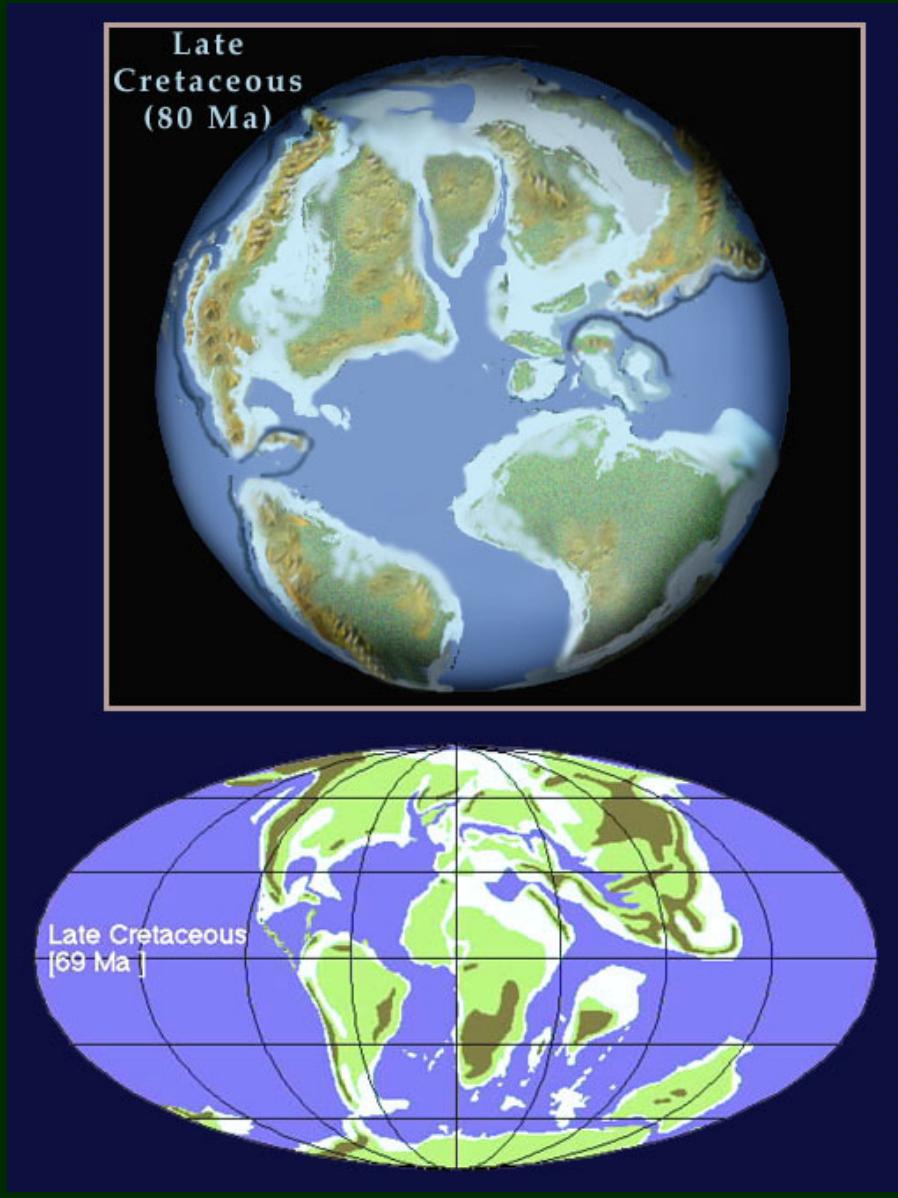
# Southern South American phytophagous scarabs

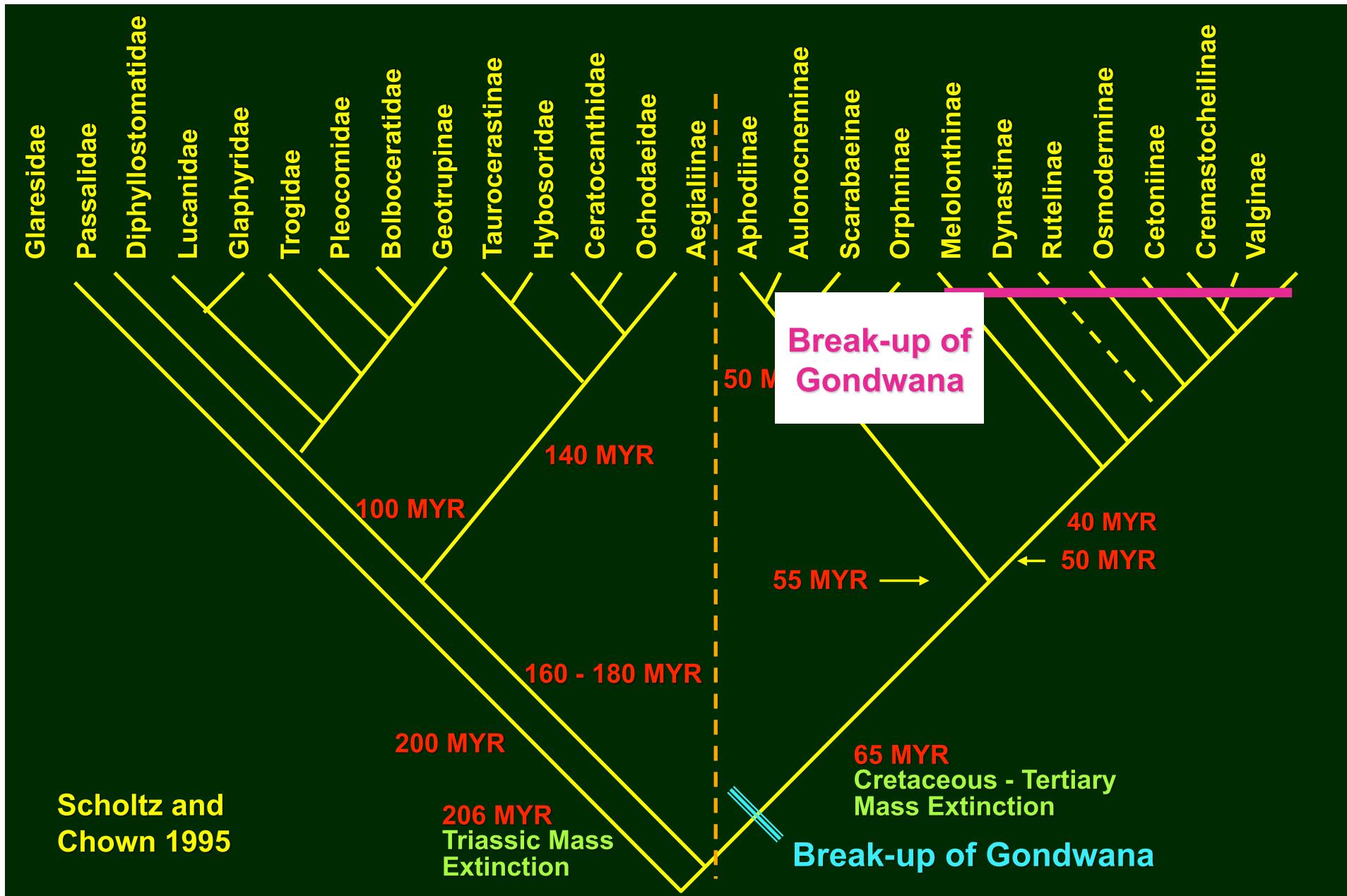


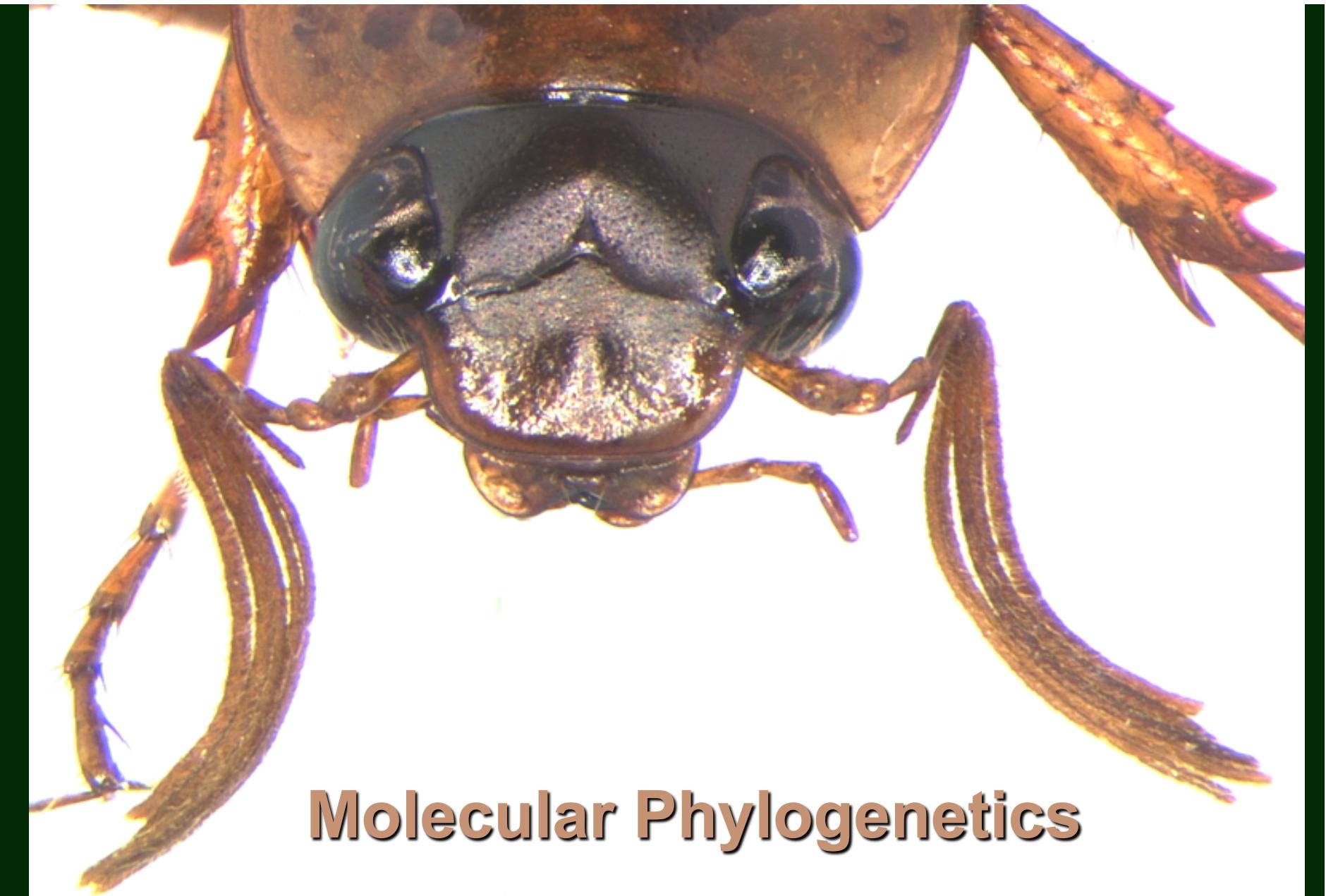
→10 tribes, 27 genera, 136 species

# The timeline

- Late Cretaceous
- Fossil record of an angiosperm plant radiation and diversification
- Biogeographic and phylogenetic evidence of phytophagous scarab radiation and diversification
- Gondwana separated into modern continents



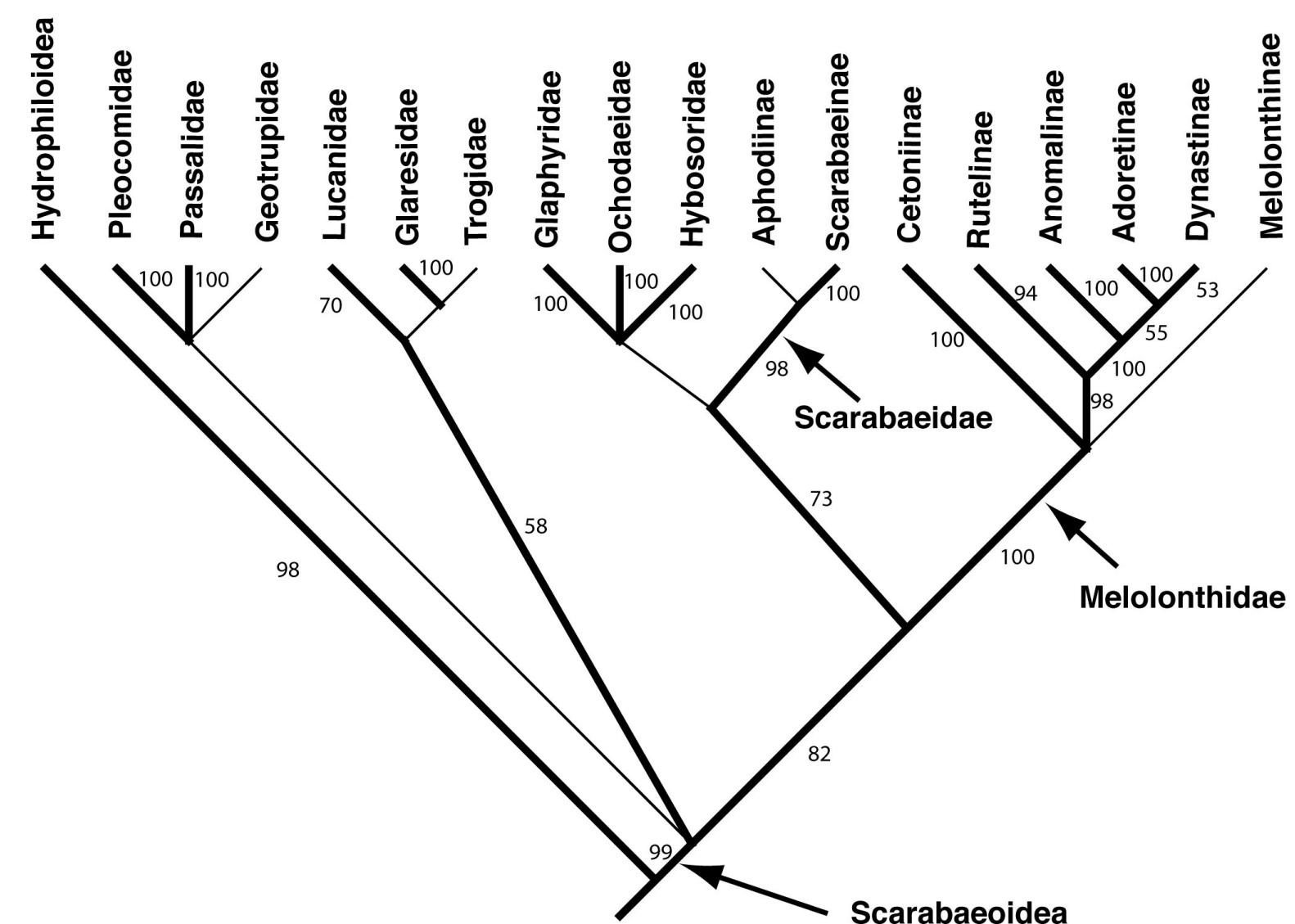


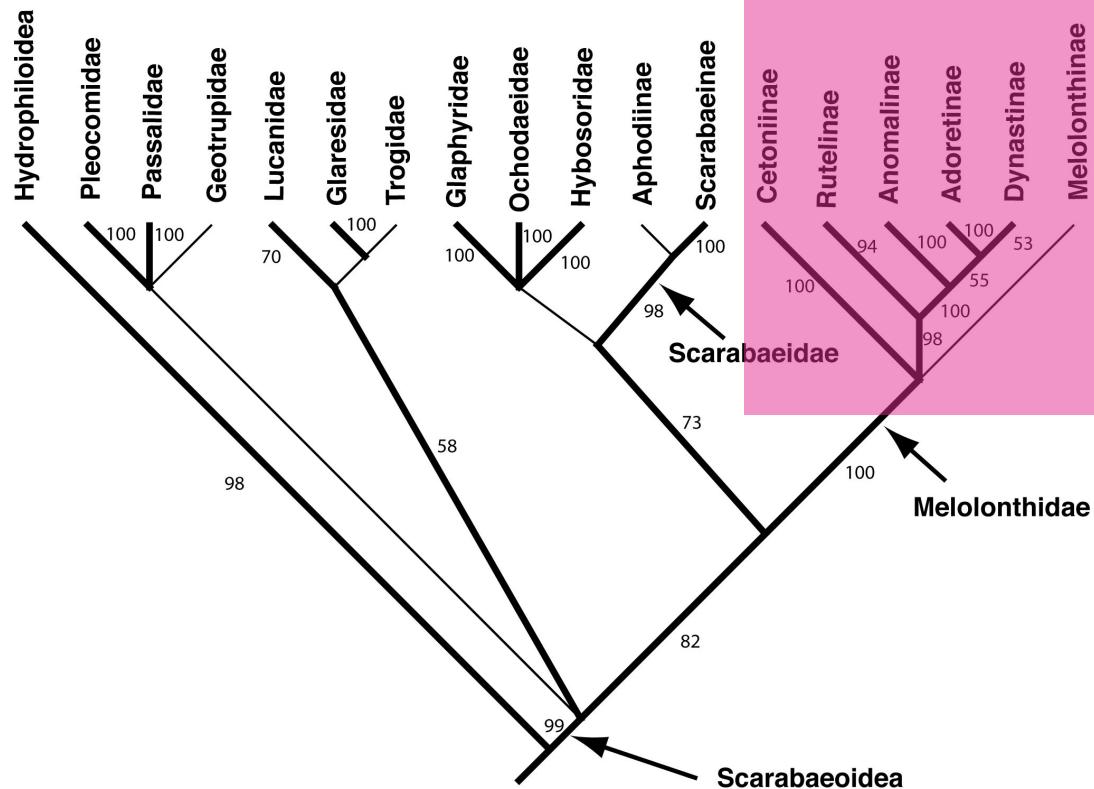


# Molecular Phylogenetics

# **Molecular phylogenetics research on scarabs**

- ➔ 28S D2 and D3 regions (rDNA), 1245 bp
- ➔ 18S region (rDNA), 832 bp
- ➔ 936 informative characters in Scarabaeoidea
- ➔ 509 informative characters in the phytophagous scarabs
- ➔ Maximum-parsimony optimality criterion



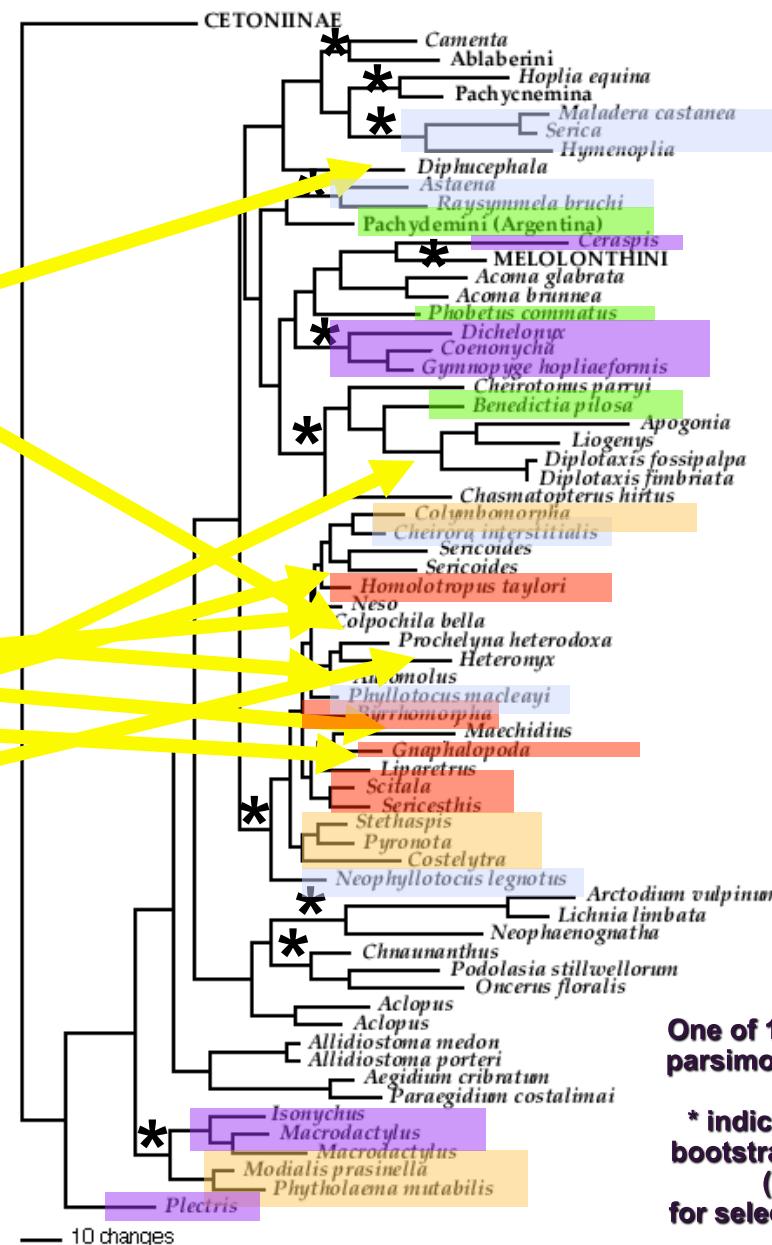
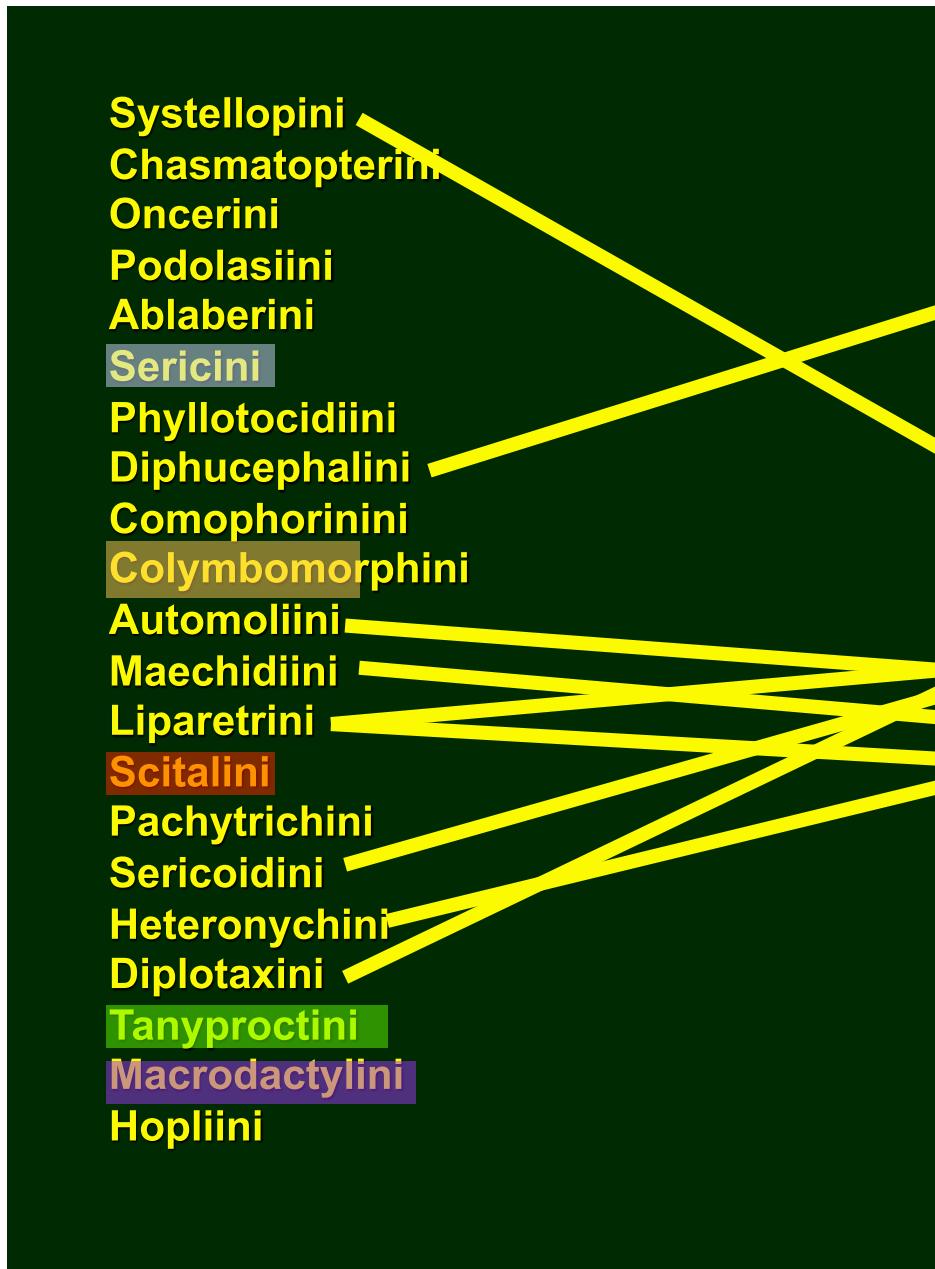


## What is a phytophagous scarab?

The phytophagous clade of Scarabaeoidea contains over 70% of the known scarab species (25,000+ species)

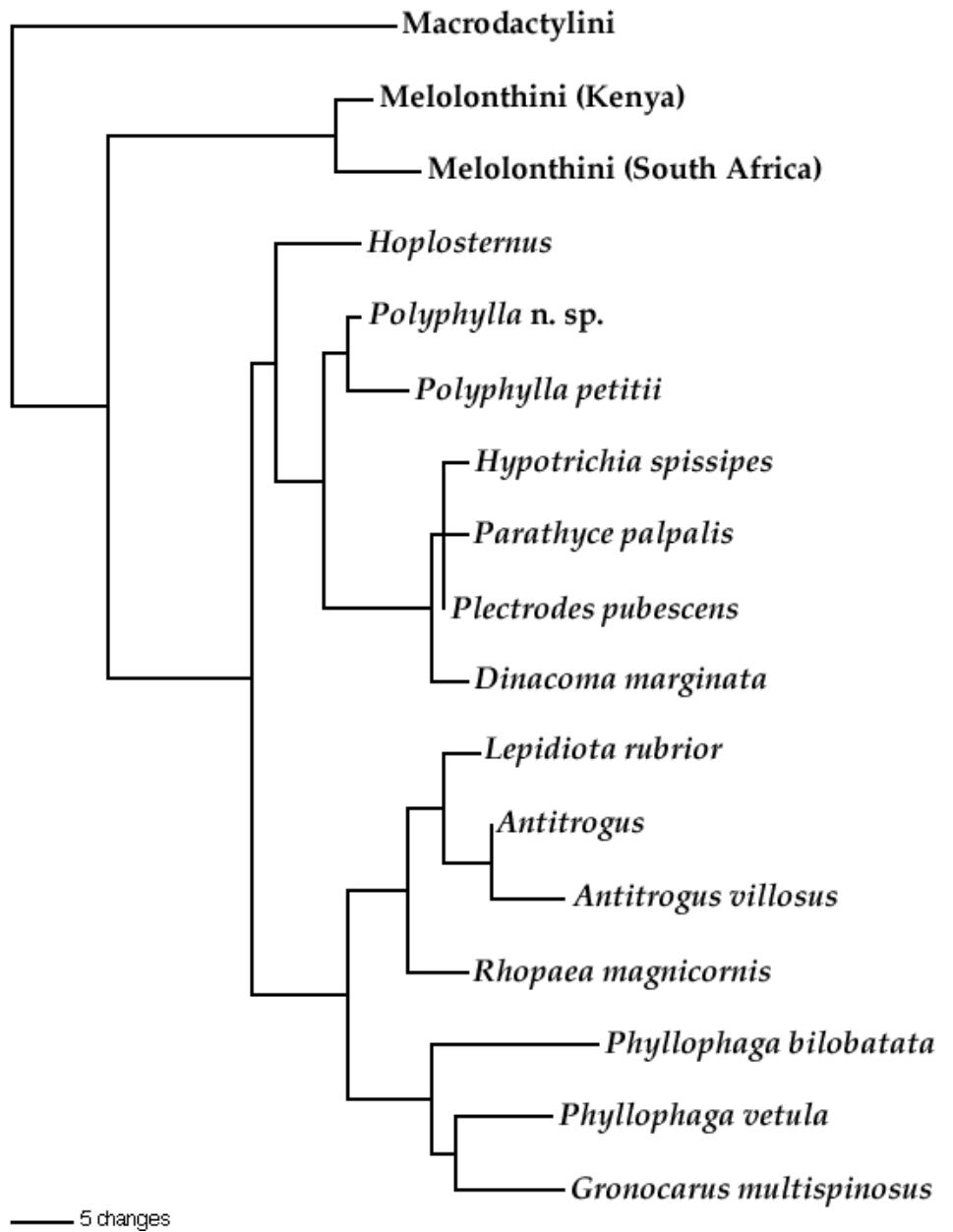
Larvae: humus → angiosperm plants  
 Adults: fungus → angiosperm plants



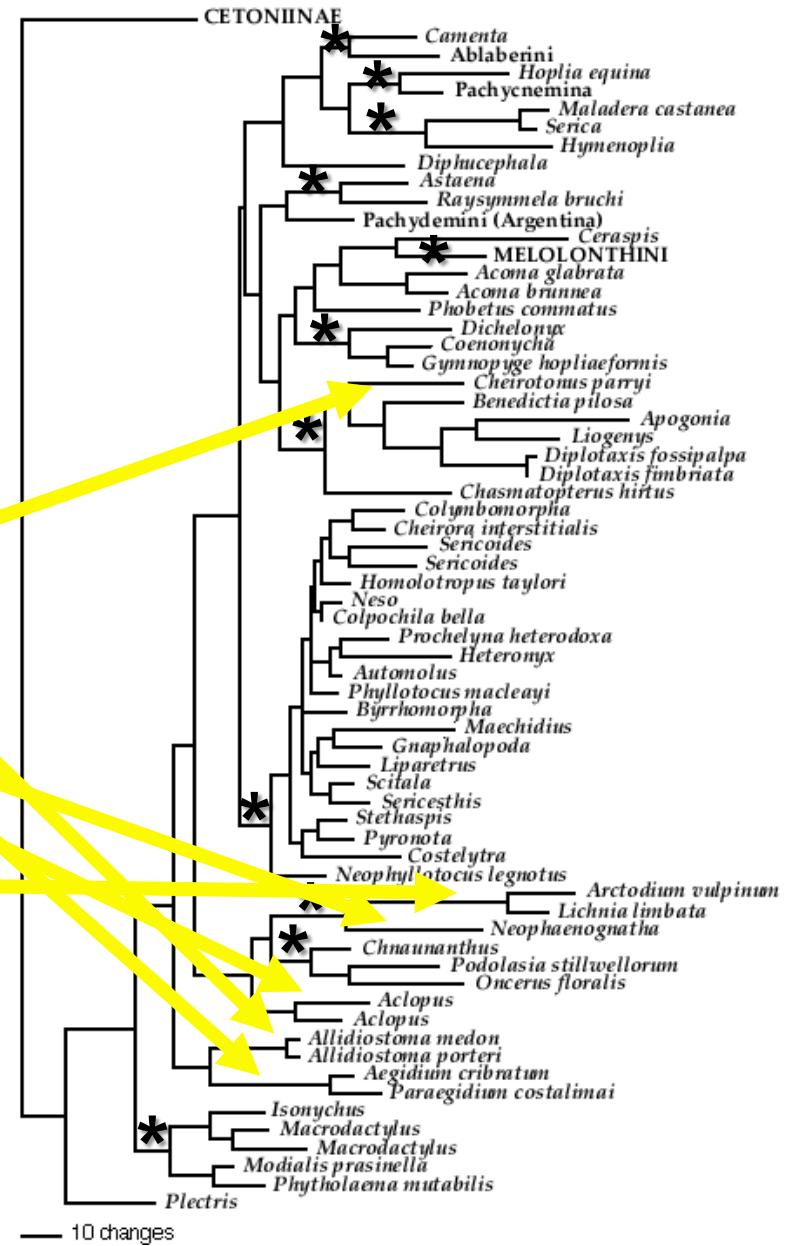


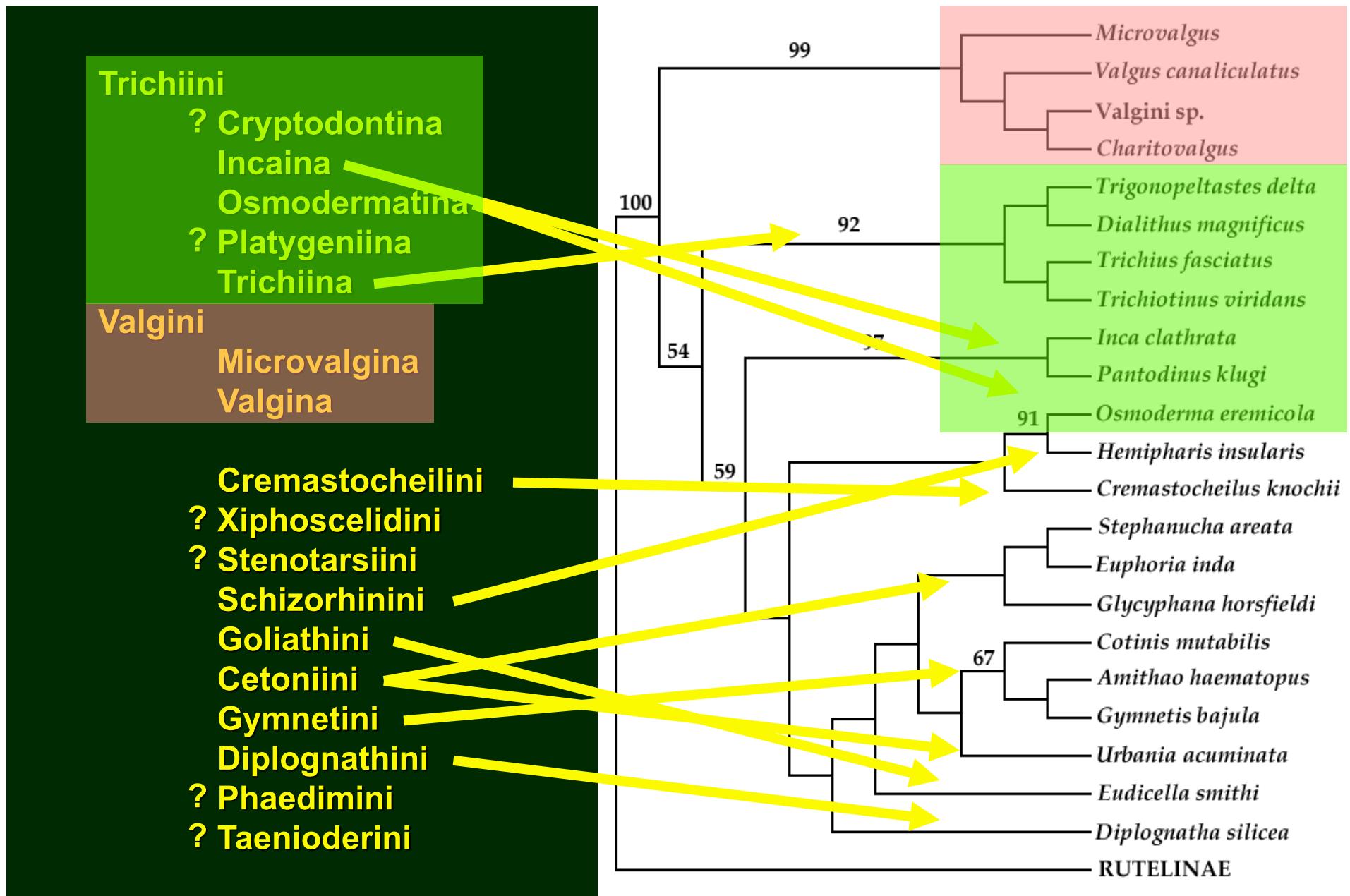
# Melolonthini

1 of 2 equally  
parsimonious trees



**? Pachypodinae**  
**Orphninae**  
**Allidiostomatinae**  
**? Dynamopodinae**  
**Aclopinae**  
**Euchirinae**  
**? Phaenomeridinae**  
  
**Lichniini**





## Rutelini

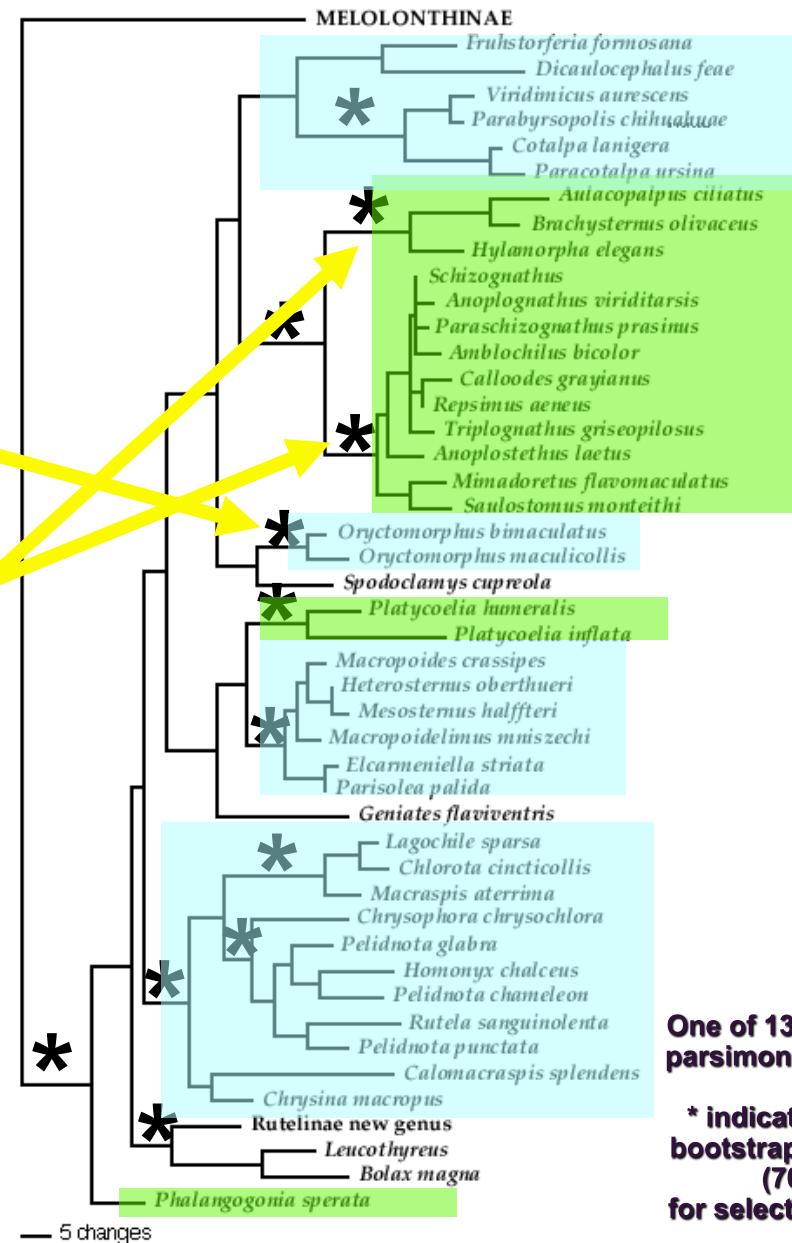
Areodina  
Heterosternina  
Didrepanephorina  
Pelidnotina  
Lasiocalina  
Oryctomorphina  
Desmonychina  
Rutelina  
Fruhstorferiina  
Antichirina

## Anatistini

## Anoplognathini

Anoplognathina  
Schizognathina  
Phalangogoniina  
Platycoeliina  
Brachysternina

## Geniatini



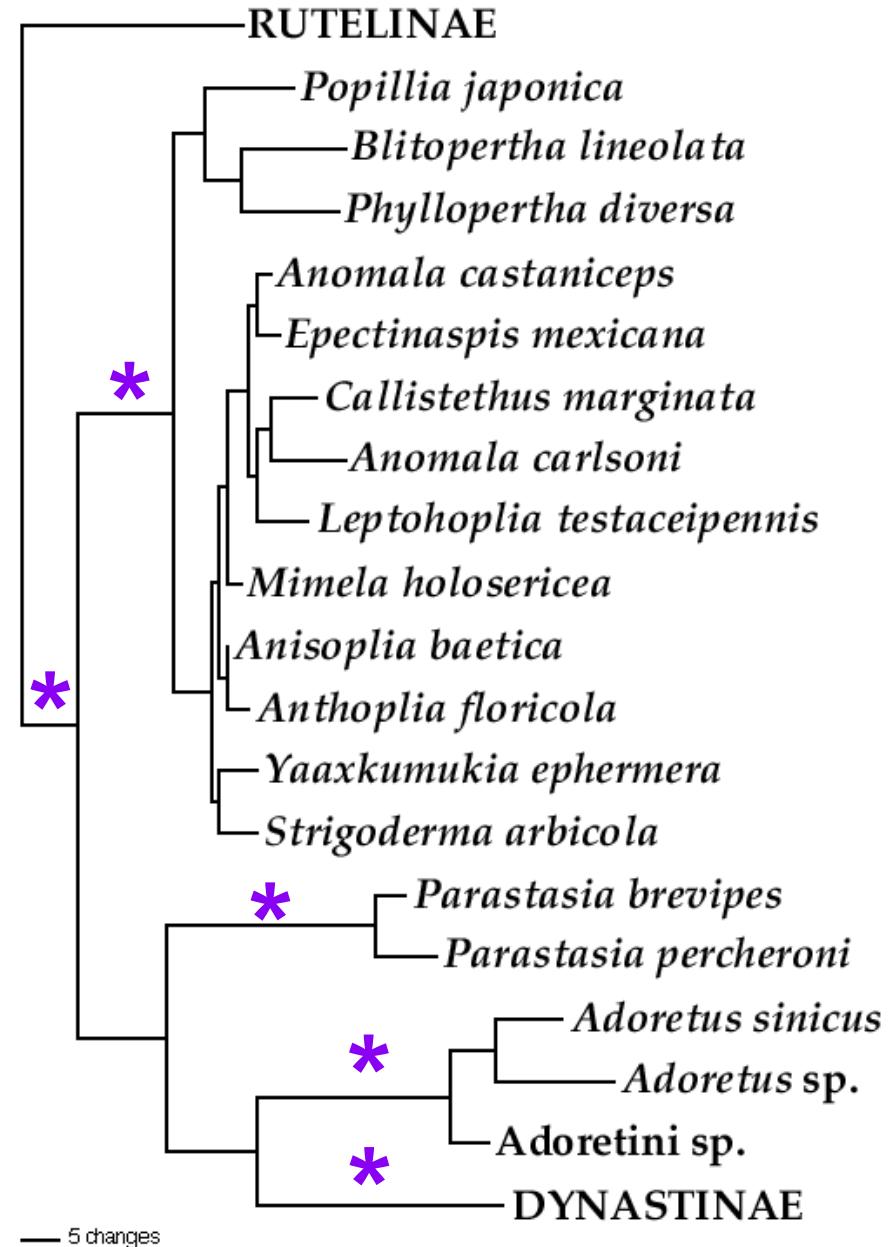
One of 130 equally parsimonious trees

\* indicates high bootstrap support (70+) for selected clades

## Anomalini, Parastasiina, and Adoretini

One of 26 equally  
parsimonious trees

\* indicates high bootstrap  
support (82+)



## The true rutelines?

**Fruhstorferiini**  
**Oryctomorphini**  
**Heterosternini**  
**Geniatini**  
**Platycoeliini**  
**Anatistini**  
**Phalangogoniini**  
**Areodini**  
**Anoplognathini**  
**Brachysternini**  
**Antichirini**  
**Rutelini**

## The false rutelines?

**Anomalini**  
**Adoretini**  
**Parastasiini**

## Cyclocephalini

### Oryctoderini

### Agaocephalini

### Pentodontini

### Pentodontina

### Metanastina

### Cheiroplatina

### Dipelicina

### Pseudoryctina

### Oryctini

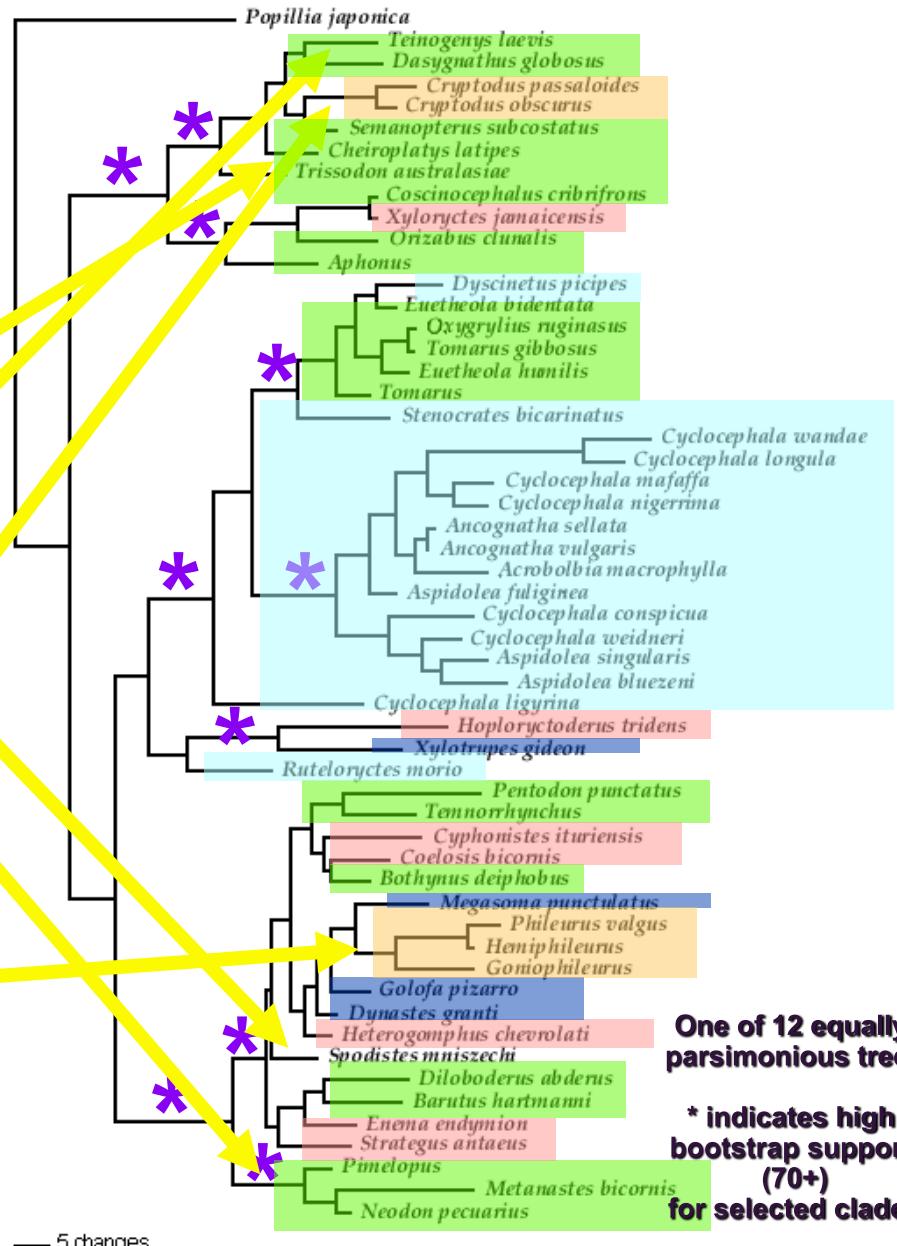
### Dynastini

### Hexodontini

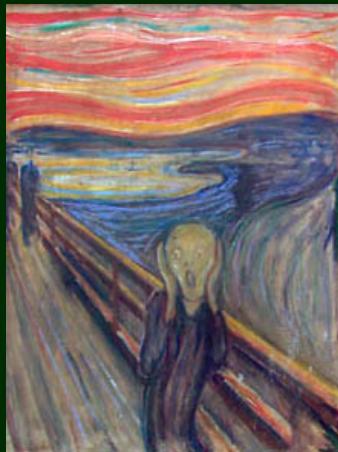
### Phileurini

### Phileurina

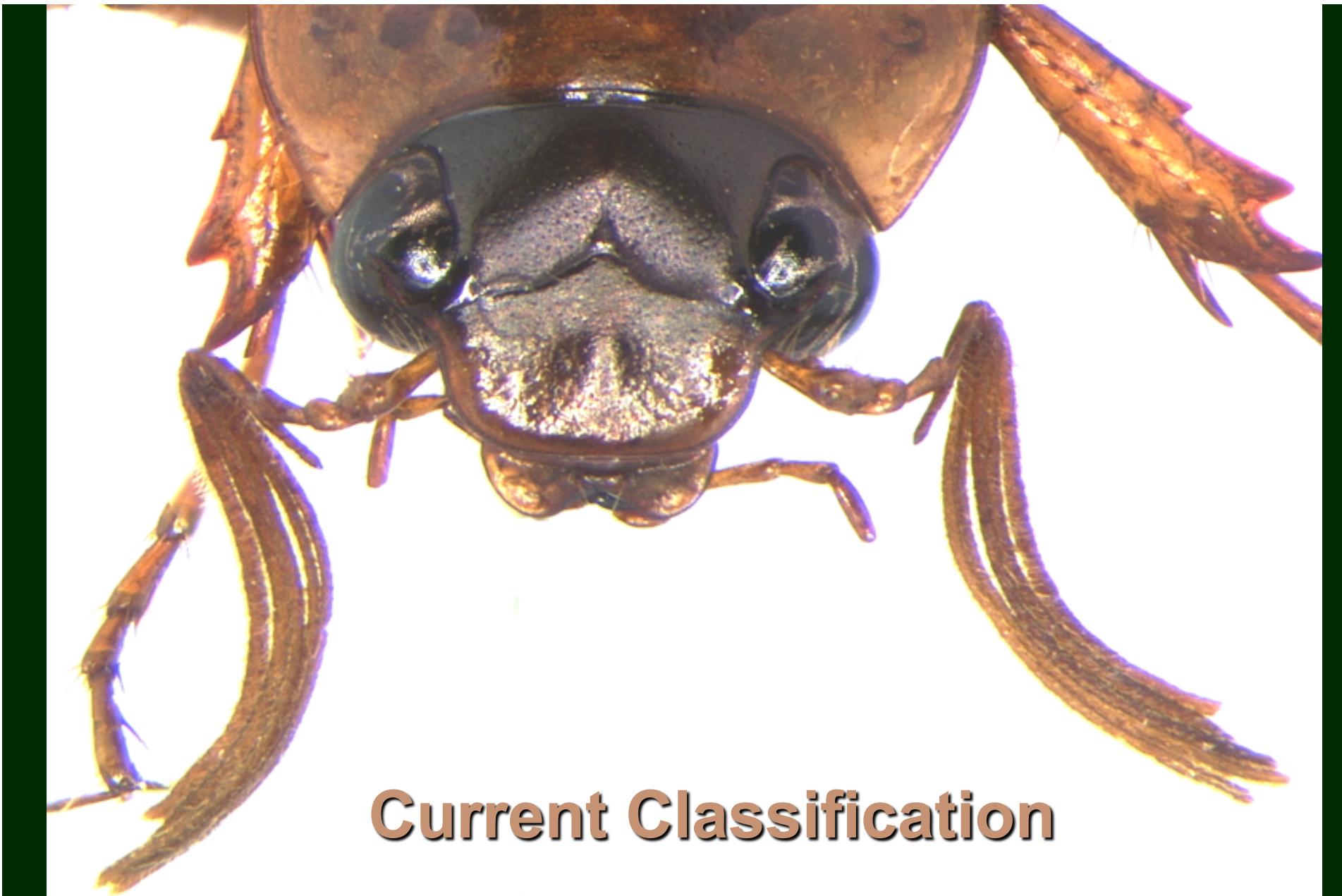
### Cryptodina



# **Stages of changing your scarab classification scheme**



- 1. Denial**
- 2. Anger and frustration**
- 3. Depression and withdrawal**
- 4. Acceptance**

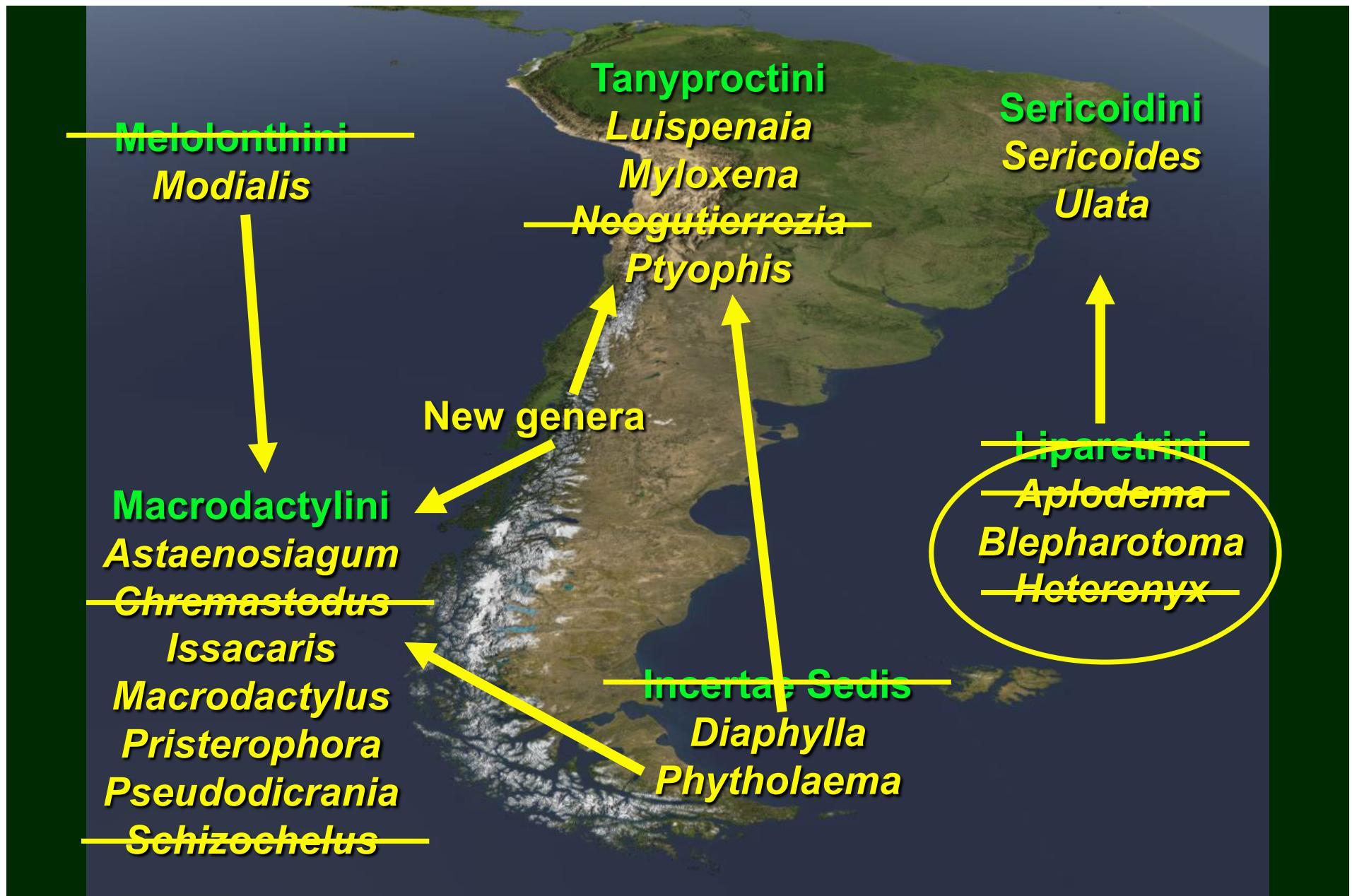


**Current Classification**



# Scarab biodiversity of southern South America





# **Melolonthinae: Smith 2006 & Bouchard *et al.* 2011**

**Systellopini**

**Lichniini**

**Chasmopterini**

**Oncerini**

**Podolasiiini**

**Diphycerini**

**Ablaberini**

**Sericini**

**Phyllotocina**

**Sericina**

**Trochalina**

**Hopliini**

**Pachycnemina**

**Hopliina**

**Phyllotocidiini**

**Diphucephalini**

**Comophorinini**

**Colymbomorphini**

**Automoliini**

**Maechidiini**

**Liparetrini**

**Scitalini**

**Pachytrichini**

**Sericoidini**

**Heteronychini**

**Euchirini**

**Diplotaxini**

**Pachypodini**

**Melolonthini**

**Heptophyllina**

**Schizonychina**

**Enariina**

**Pegylina**

**Rhizotrogina**

**Leucophilina**

**Melolonthina**

**Tanypoctini**

**Macrophyllina**

**Tanypoctina**

**Macrodactylini**

**Dichelonychini**

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini



## An electronic checklist of the New World chafers (Coleoptera: Scarabaeidae: Melolonthinae)

**Version 1 - released  
16 September 2005**

Arthur V. Evans and Andrew B. T. Smith

This electronic publication is available to download as a PDF file:

[Download the New World Melolonthinae checklist PDF file](#)

Please email us <[asmith@mus-nature.ca](mailto:asmith@mus-nature.ca)> if you find any errors or omissions in this checklist. We would greatly appreciate copies of new papers pertaining to New World Melolonthinae to help us keep this list as up-to-date as possible.

**Suggested citation:**

Evans, A. V. and A. B. T. Smith. 2005. An Electronic Checklist of the New World Chafers (Coleoptera: Scarabaeidae: Melolonthinae). Version 1. Electronically published, Ottawa, Canada. 344 pp.



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# **This will save you time!**

- Number of metatarsal claws?
- Position of labrum relative to clypeus?
- Position of metatibial spurs relative to metatarsomere?
- Abdominal sternites fused?
- Fifth abdominal sternite and propygidium fused?
- Anterior pronotal margin with translucent border at middle?
- Claws simple, toothed, serrate, etc.?

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## **Lichniini – 2 genera**

*Arctodium* Burmeister (4)

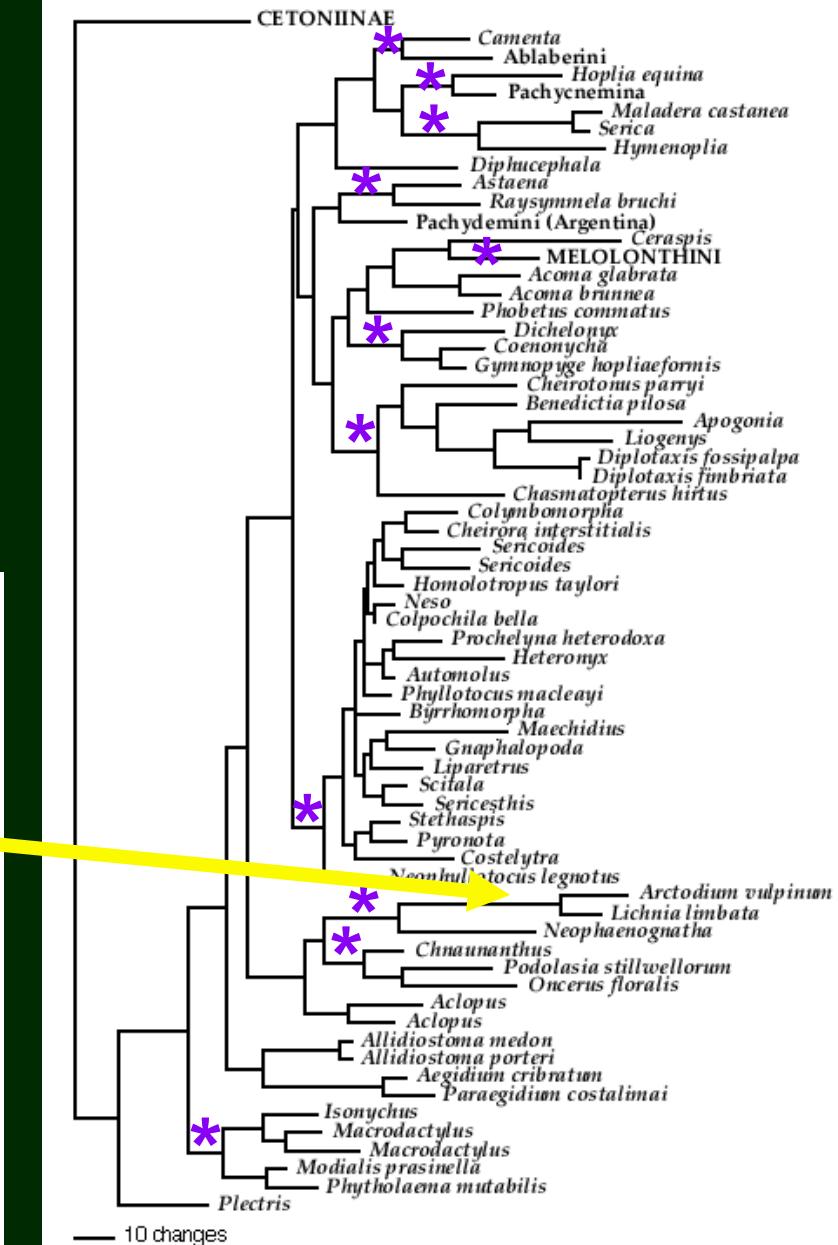
*Lichnia* Erichson (2)

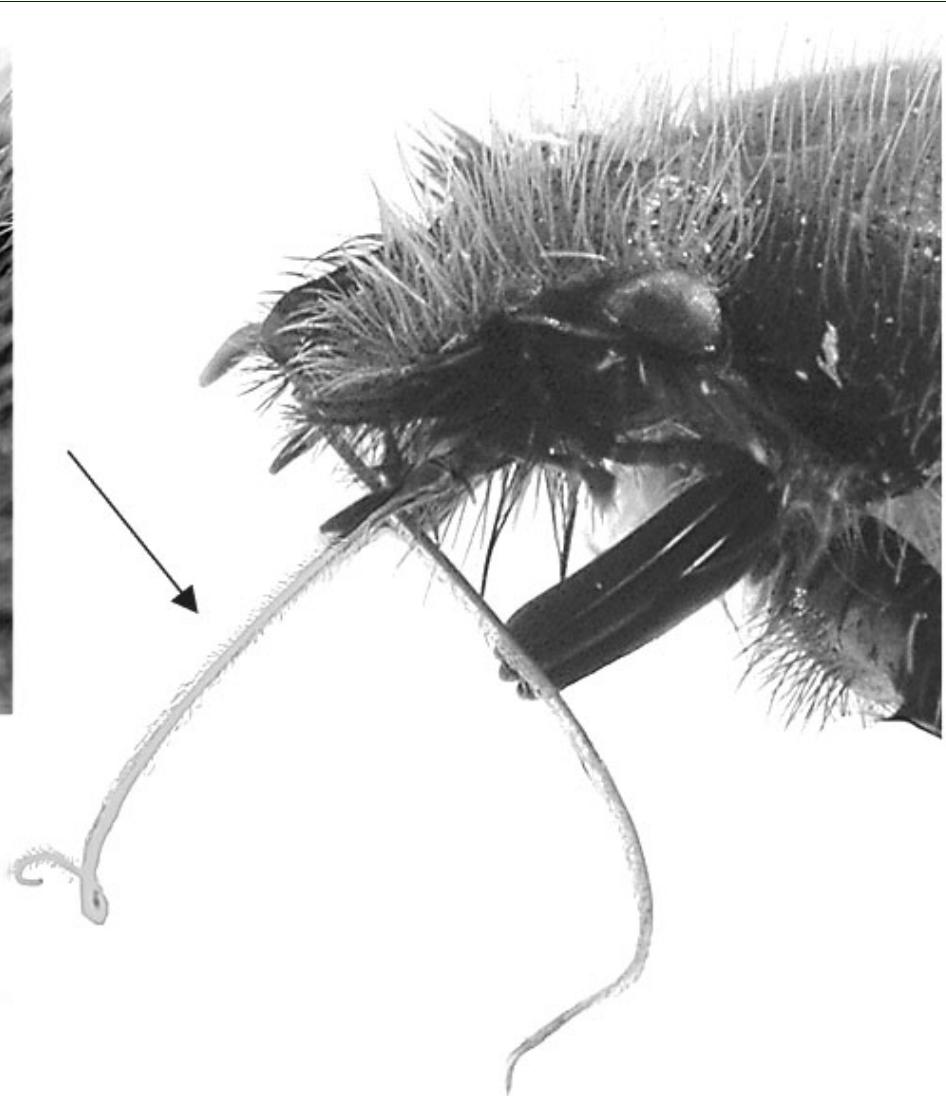
# ZOOTAXA

1266

A revision of the Chilean tribe Lichniini Burmeister, 1844  
(Coleoptera: Scarabaeidae: Melolonthinae)

SHAUNA JOY HAWKINS





*Arctodium  
discolor*



5.0 mm

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## **Oncerini – 2 genera**

*Oncerus* LeConte (1)

*Nefoncerus* Saylor (1)

*Oncerus floralis*



# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

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Sericoidini

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Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## **Podolasiiini – 2 genera**

*Podolasia* Harold (10)

*Podostena* Howden (4)

The Coleopterists Bulletin, 51(3):223–255. 1997.

PODOLASIINI HOWDEN, NEW TRIBE, AND A REVISION OF THE INCLUDED GENERA, PODOLASIA HAROLD AND PODOSTENA HOWDEN, NEW GENUS (COLEOPTERA: SCARABAEIDAE: MELOLONTHINAE)

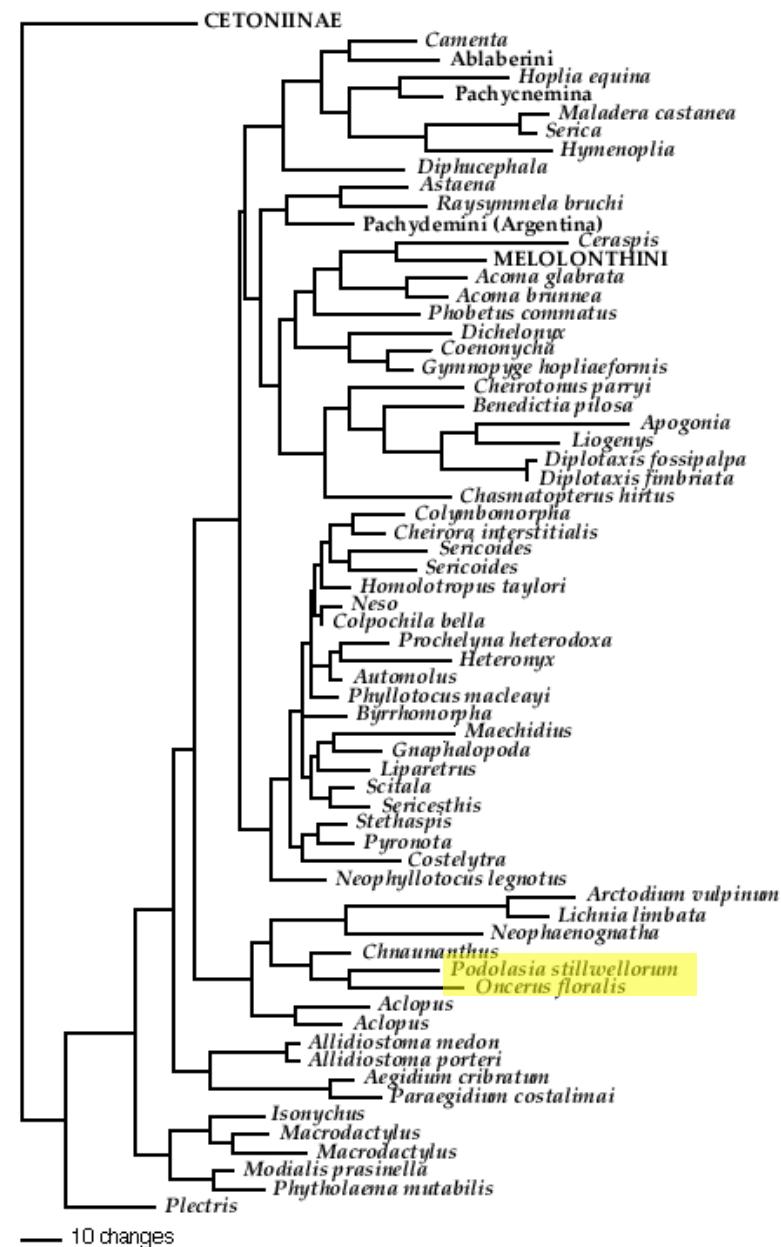
H. F. HOWDEN  
Canadian Museum of Nature  
P. O. Box 3443  
Station "D"  
Ottawa, ON, K1P 6P4, Canada

Abstract

A new tribe, Podolasiini Howden, is proposed for two closely related melolonthine genera: *Podolasia* Harold and *Podostena* Howden, new genus. Major tribal characters are: size small (total length less than 10 mm); mouthparts greatly reduced, hidden under clypeus; clypeus elevated basally; antenna 8- or 9-segmented; antennal club 3-segmented, small, oval; abdominal sternites 2–5 connate medially; tarsal claws simple, slender, posterior claws equal; females flightless. *Podolasia* Harold includes nine species, of which four are new: *P. lavignei* Howden, new species, from San Luis Potosí, *P. stillwellorum* Howden, new species, from Texas, *P. longipennis* Howden, new species, from Durango, and *P. rotundipennis* Howden, new species, from Durango and Chihuahua. *Podolasia saylori* Howden is placed as a junior synonym of *P. peninsularis* Howden.

*Podostena* Howden, new genus, includes the type species, *Pt. bottimeri* (Howden), and *Pt. rileyi* Howden, new species, from Texas, *Pt. sleeperi* Howden, new species, and *Pt. litoralis* Howden, new species, both from Baja California Sur. The first known female of a species in either genus, *Podostena bottimeri*, is described. All species of both genera are keyed and illustrated.

Relationships within *Podolasia* and its out group, *Podostena*, are discussed and the geographic patterns are mapped.





*Podolasia  
stillwellorum*

*Podostena  
bottimeri*



# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## New World Sericini – 9 genera

*Astaena* Erichson (132)

*Athlia* Erichson (10)

*Dihymenonyx* Gutiérrez (3)

*Maladera* Mulsant & Rey (1)

*Miotemna* Lacordaire (1)

*Nipponoserica* Nomura (1)

*Raysymmela* Saylor (4)

*Serica* MacLeay (104)

*Symmela* Erichson (20)

## The phylogeny of Sericini and their position within the Scarabaeidae based on morphological characters (Coleoptera: Scarabaeidae)

DIRK AHRENS

Deutsches Entomologisches Institut im Zentrum für Agrarlandschafts- und Landnutzungsforschung Müncheberg, Germany

**Abstract.** To reconstruct the phylogeny of the Sericini and their systematic position among the scarabaeid beetles, cladistic analyses were performed using 107 morphological characters from the adults and larvae of forty-nine extant scarabaeid genera. Taxa represent most 'traditional' subfamilies of coprophagous and phytophagous Scarabaeidae, with emphasis on the Sericini and other melolonthine lineages. Several poorly studied exoskeletal features have been examined, including the elytral base, posterior wing venation, mouth parts, endosternites, coxal articulation, and genitalia. The results of the analysis strongly support the monophony of the 'orphnine group' + 'melolonthine group' including phytophagous scarabs such as Dynastinae, Hopliinae, Melolonthinae, Rutelinae, and Cetoniinae. This clade was identified as the sister group to the "dung beetle line" represented by *Aphodius* + *Copris*. The 'melolonthine group' is comprised in the strict consensus tree by two major clades and two minor lineages, with the included taxa of Euchirinae, Rutelinae, and Dynastinae nested together in one of the major clades ('melolonthine group I'). Melolonthini, Cetoniinae, and Rutelinae are strongly supported, whereas Melolonthinae and Pachydemini appear to be paraphyletic. Sericini + Ablaberini were identified to be sister taxa nested within the second major melolonthine clade ('melolonthine group II'). As this clade is distributed primarily in the southern continents, one could assume that Sericini + Ablaberini are derived from a southern lineage. Plausibly, ancestors of Sericini + Ablaberini and *Athlia* were separated by a vicariance event, such as the separation of the African plate from the rest of Gondwana, whereas Sericini and Ablaberini probably diversified during the early Tertiary, with dispersal of some basal Sericini to South America.

### Introduction

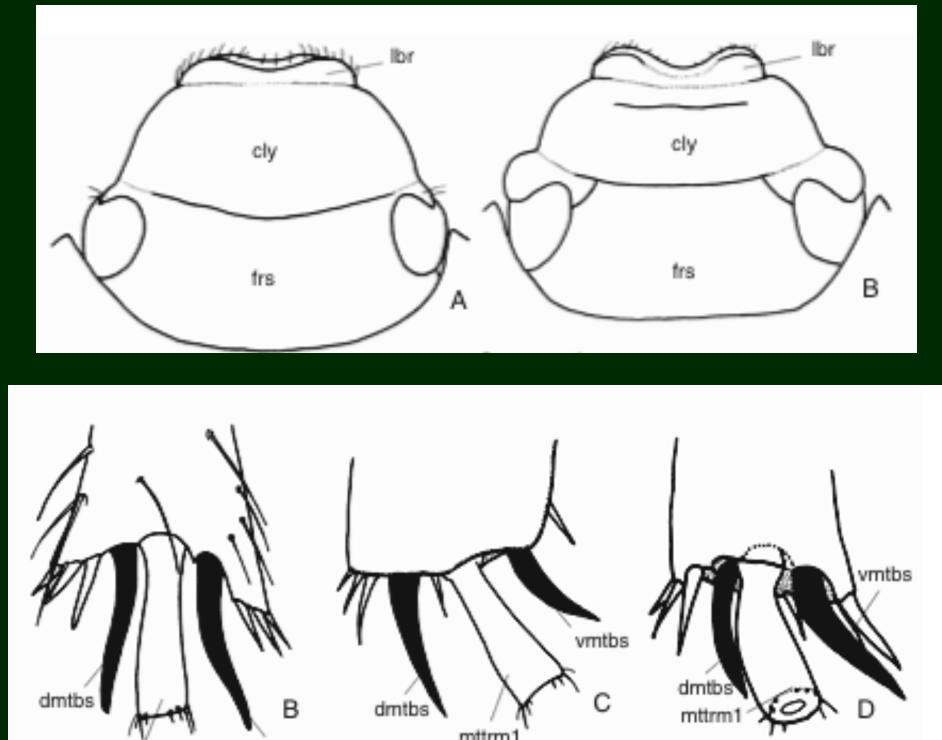
The family Scarabaeidae (Scholtz, 1990) is one of the more intensively studied groups of beetles with respect to their biology, taxonomy, and phylogeny. However, Scarabaeidae, with 4000 described species in about 200 genera,

represent a striking exception, being poorly known in terms of phylogeny, taxonomy, and larval morphology. The tribe Sericini occurs in the Holarctic (apart from the polar and subpolar region), Palaeotropic and Neotropic region, being most diverse in tropical and subtropical zones (Fig. 1). It is absent entirely in New Guinea, Australia, New Zealand, and southern South America.

As with other groups of phytophagous Scarabaeidae, adult Sericini are generalist herbivores. *Maladera castanea* (Arrow, 1913) feeds on more than 100 different plant species, preferring some thirty host plants with succulent roots (Tashiro, 1987). The larvae, known as white grubs, feed on roots and underground stems of living plants (Richter,

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E-mail: ahrens.dirk\_col@gmx.de

Unpublished for the purposes of Zoological nomenclature (Art. 8.2 ICZN)  
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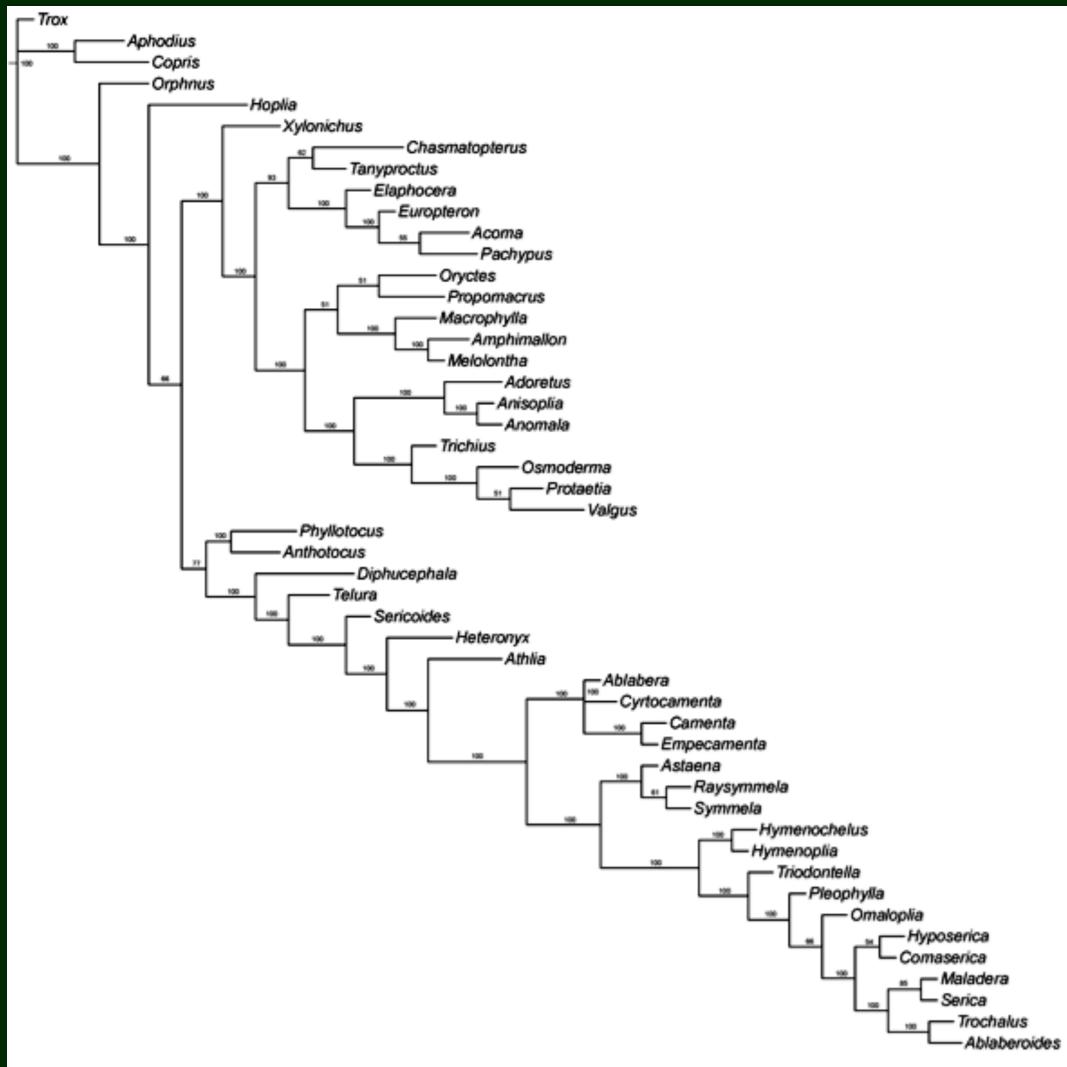


**Regarding the exclusion of *Athlia* from Sericini, it is premature to erect a new tribe for this genus until more detailed studies are made to explore the relationships between southern hemispheric melolonthine lineages.**

- Ahrens 2005



***Athlia parvissima***



**Fig. 17.** Majority rule consensus tree generated with WINCLADA showing unsupported nodes collapsed and using the proportional branch lengths. The numbers above the branches indicate the frequency of the node among all maximum parsimonious trees.

*Maladera  
castanea*





*Nipponoserica  
peregrina*

*Serica*





*Serica tristis*



*Serica georgiana*

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## New World Hopliini – 1 genus

*Hoplia* Illiger (39)



*Hoplia dispar*



# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

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Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## Sericoidini – 4 genera

*Apterodemidea* Gutiérrez (1)

*Blepharotoma* Blanchard (17)

*Sericoides* Guérin-Méneville (53)

*Ulata* Saylor (1)

## Subfamily MELOLONTHINAE

### Tribe SERICOIDINI

*Apterodemidea* Gutiérrez, 1952

*Blepharotoma* Blanchard, 1850

*Sericoides* Guérin-Méneville, 1839

*Ulata* Saylor, 1945

*Sericoides  
similis*



## Subfamily MELOLONTHINAE

### Tribe SERICOIDINI

*Apterodemidea* Gutiérrez, 1952

*Blepharotoma* Blanchard, 1850

*Manonychus* Moser, 1919

*Sericoides* Guérin-Méneville, 1839

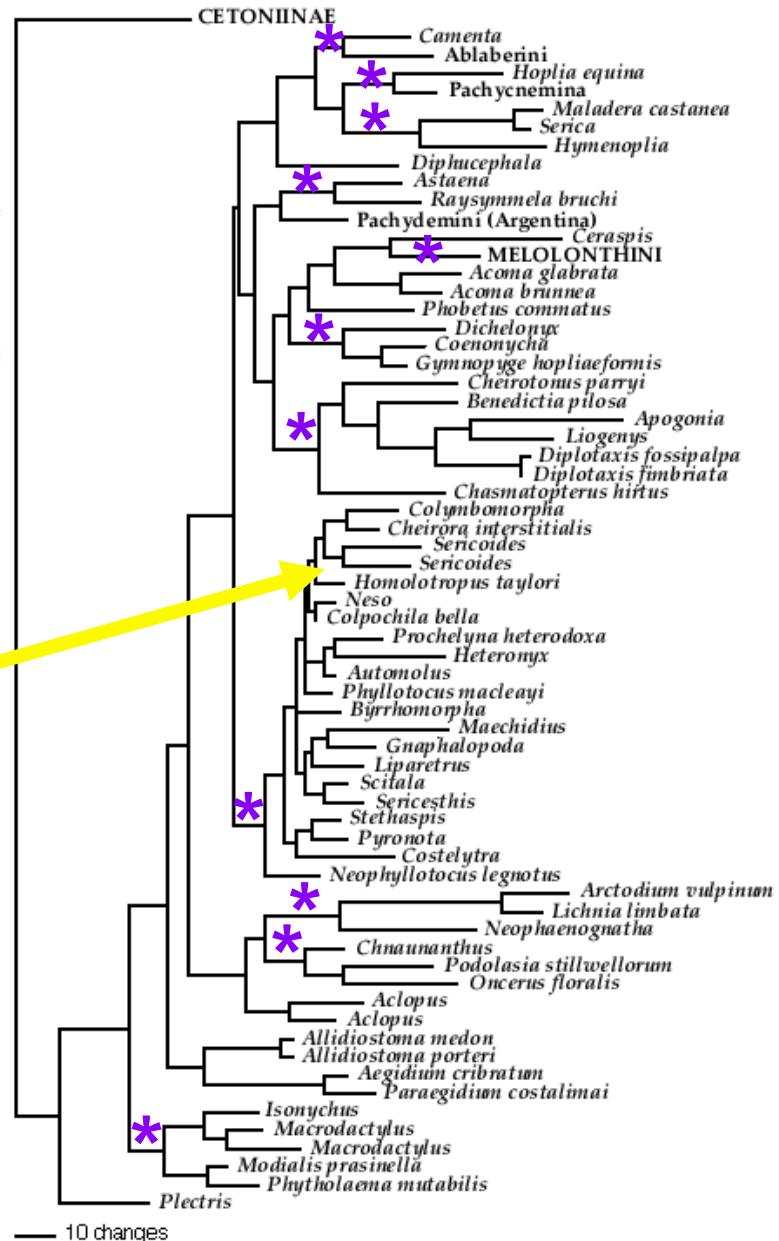
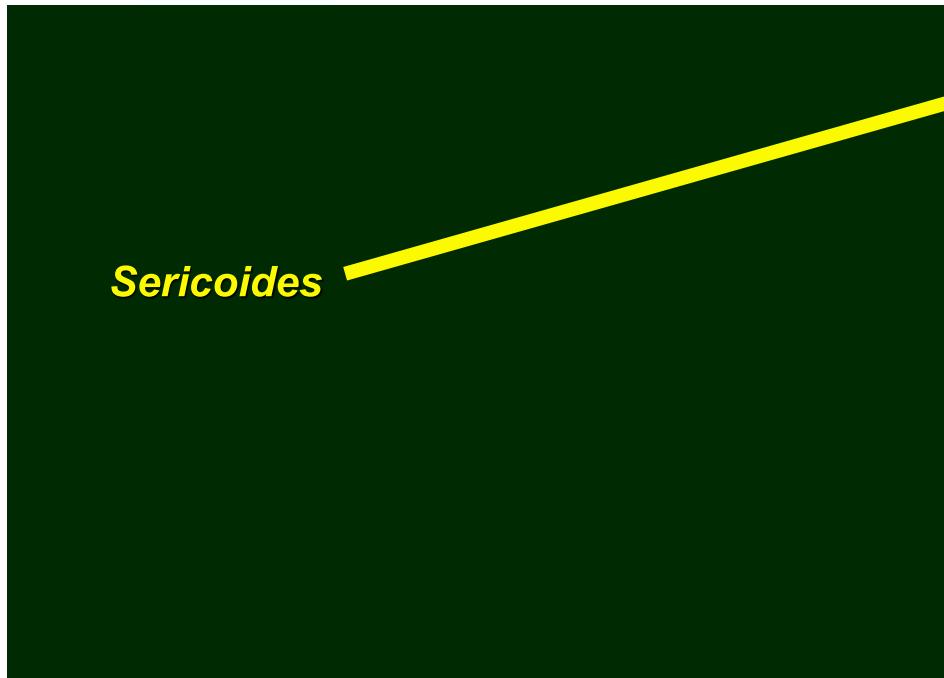
*Zaburina* Saylor, 1945

*Sericoides  
similis*





**Sericoides lineolata**





***Sericoides testacea***



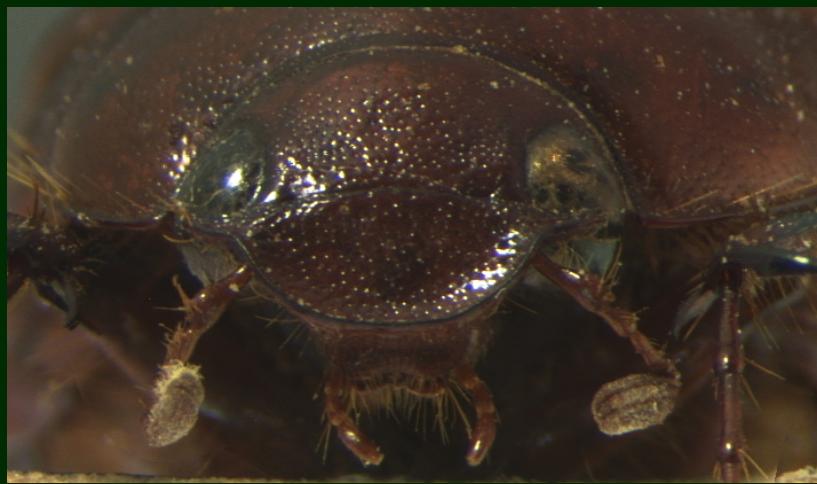
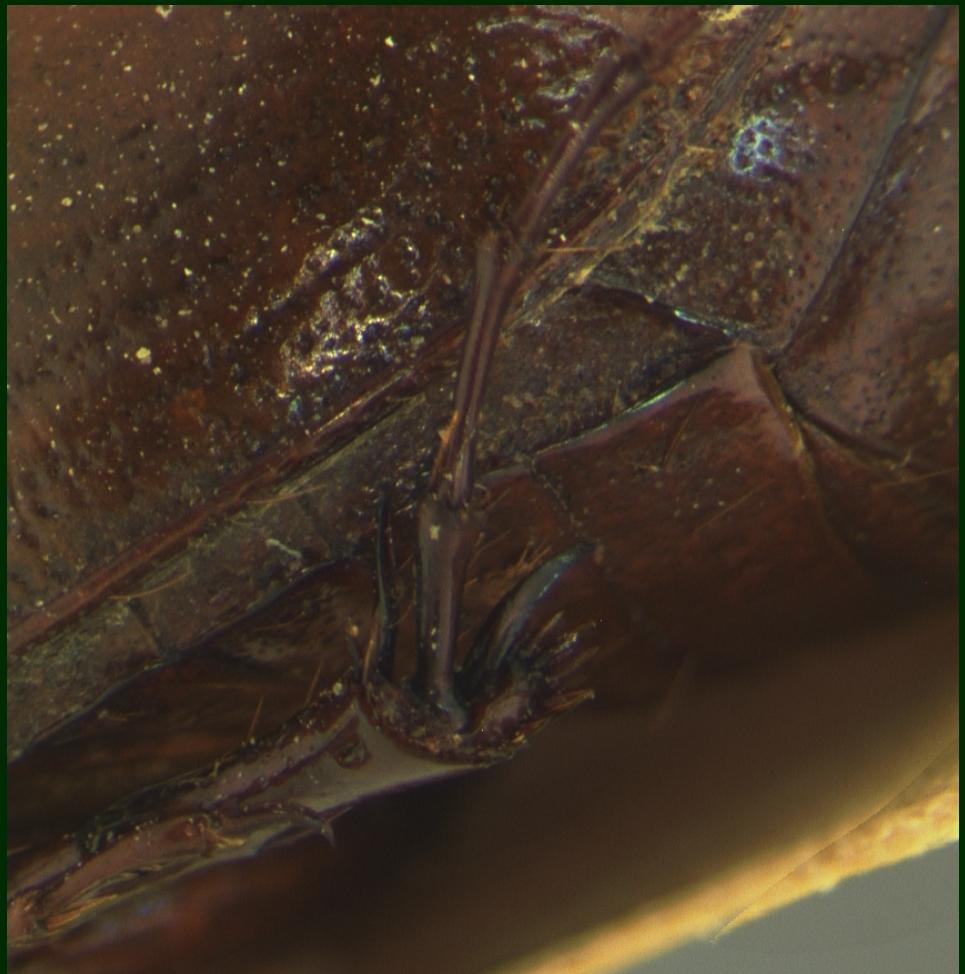
**Blepharotoma**



*Heteronyx*



***Manonychus***



***Manonychus***



***Zaburina colombiana***

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## New World Diplotaxini – 8 genera

- Diplotaxis* Kirby (239)
- Homalochilus* Blanchard (2)
- Homoliogenys* Gutiérrez (1)
- Liogenys* Guérin-Méneville (76)
- Pachrodema* Blanchard (9)
- Pacuvia* Curtis (2)
- Pseudodiplotaxis* Nonfried (1)
- Pseudoliogenys* Moser (1)



*Diplotaxis sordida*



*Diplotaxis*



*Diplotaxis liberta*



*Liogenys flavigula*



5.0 mm

*Liogenys kuntzeni*



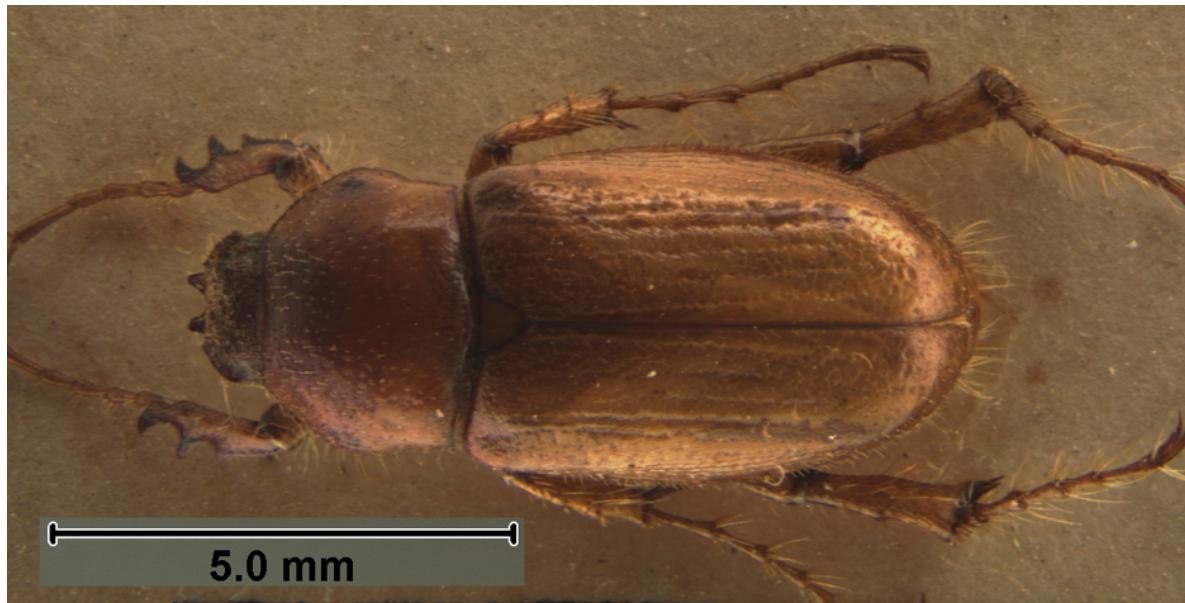
5.0 mm

*Pachrodemam  
castanea*



*Pacuvia*





*Pseudoliogenys  
bidentula*



# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

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Phyllotocina

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Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## New World Melolonthini – 15 genera

- Amblonoxia* Reitter (6)
- Amphimallon* Latreille (1)
- Catrachia* Coca-Abia & Robbins (2)
- Dinacoma* Casey (2)
- Fossocarus* Howden (1)
- Gronocarus* Schaeffer (2)
- Howdenocarus* Hardy (1)
- Hypothyce* Howden (3)
- Hypotrichia* LeConte (1)
- Miolachnostenra* Wickham (1)
- Modialis* Fairmaire & Germain (1)
- Phyllophaga* Harris (857)
- Plectrodes* Horn (1)
- Polyphylla* Harris (37)
- Thyce* LeConte (2)

# *Phyllophaga*





*Phyllophaga  
bruneri*



*Phyllophaga  
crenulata*

*Phyllophaga  
hirticula*



*Phyllophaga  
lanceolata*



*Ampimallon  
majale*



*Amblonoxia fieldi*





*Dinacoma  
marginata*



*Fossocarus  
creoleorum*

***Gronocarus  
inornatus***





*Hypothyce  
mixta*

*Hypotrichia  
spissipes*

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*Plectrodes  
pubescens*



*Polyphylla  
decemlineata*

*Polyphylla comes*



*Polyphylla hirsuta*



*Thyce  
squamicollis*



# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

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Diphycerini

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Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

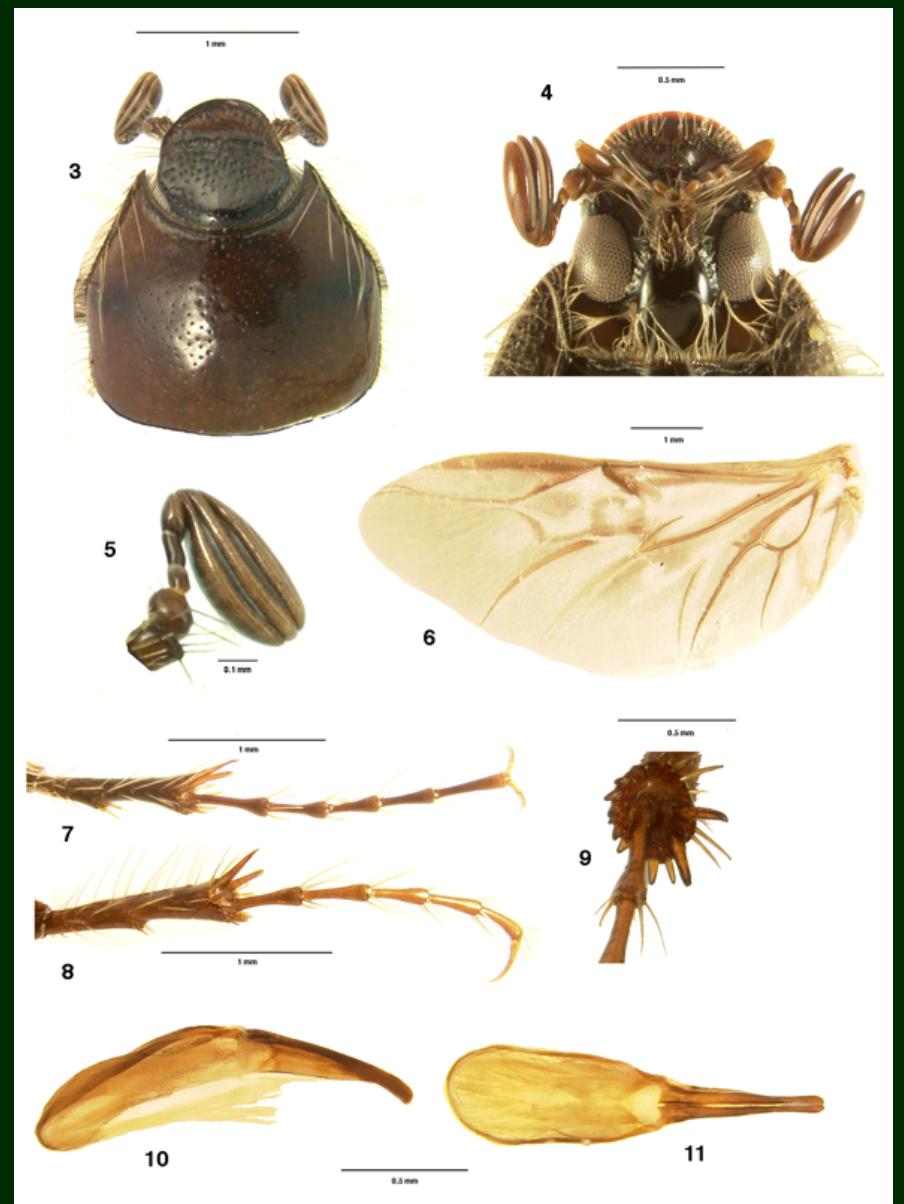
Dichelonychini

## New World Tanyproctini – 20 genera

*Acylochilus* Ohaus (5)  
*Anahi* Ocampo & Ruiz-Manzanos (3)  
*Burmeisteriellus* Berg (1)  
*Castanochilus* Ohaus (1)  
*Diaphylla* Erichson (5)  
*Faargia* Martínez (1)  
*Leuretra* Erichson (1)  
*Lichniops* Gutiérrez (1)  
*Lichniopsoides* Martínez (1)  
*Longicrura* Frey (1)  
*Luispenaia* Martínez (1)  
*Madiniella* Chalumeau & Gruner (1)  
*Myloxena* Burmeister (4)  
*Myloxenoides* Martínez (1)  
*Parapetiia* Martínez (1)  
*Pentacoryna* Moser (1)  
*Phobetus* LeConte (11)  
*Ptyophis* Redtenbacher (1)  
*Puelchesia* Ocampo & Smith (1)  
*Warwickia* Smith & Evans (1)

## Subfamily MELOLONTHINAE

### Tribe TANYPROCTINI



*Phobetus  
comatus*





## *Warwickia pilosa*



*Ptyophis*



10.0 mm



*Diaphylla*

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

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Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## New World Macrodactylini – 41 genera

- Agaocnemis* Moser (1)  
*Alvarinus* Blanchard (16)  
*Ampliodactylus* Smith (2)  
*Ancistrosoma* Curtis (15)  
*Anomalochilus* Blanchard (2)  
*Anomonyx* Saylor (1)  
*Astaenoplia* Martínez (1)  
*Aulanota* Martínez (1)  
*Barybas* Blanchard (49)  
*Calodactylus* Blanchard (10)  
*Canestera* Saylor (1)  
*Ceraspis* Lepeletier & Serville (101)  
*Ceratolontha* Arrow (1)  
*Chariodactylus* Moser (2)  
*Chariodema* Blanchard (12)  
*Clavipalpus* Laporte (20)  
*Ctenotis* Burmeister (1)  
*Dasyus* Lepeletier & Serville (2)  
*Dicrania* LePeletier & Serville (42)  
*Gama* Blanchard (30)  
*Gastrohoplus* Moser (1)
- Hadrocerus* Guérin-Méneville (1)  
*Hamatoplectris* Frey (3)  
*Hercites* Burmeister (4)  
*Hieritis* Burmeister (1)  
*Isonychus* Mannerheim (147)  
*Issacaris* Fairmaire (3)  
*Macrodactylus* Dejean (111)  
*Mallotarsus* Blanchard (1)  
*Manodactylus* Moser (1)  
*Manopus* Laporte (2)  
*Oedichira* Burmeister (2)  
*Pectinosoma* Arrow (1)  
*Philochloenia* Dejean (30)  
*Plectris* Lepeletier & Serville (362)  
*Pristerophora* Harold (3)  
*Pseudodicrania* Gutiérrez (1)  
*Pseudoleuretra* Martínez & D'Andretta (1)  
*Pusiodactylus* Smith (2)  
*Rhinaspis* Perty (13)  
*Schizochelus* Blanchard (3)

# INSECTA MUNDI

A Journal of World Insect Systematics

0023

A generic-level phylogenetic review of the Macrodactylini  
(Coleoptera: Scarabaeidae: Melolonthinae)

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Whitewater, WI 53715, USA  
katovick@uww.edu

Date of Issue: January 28, 2008

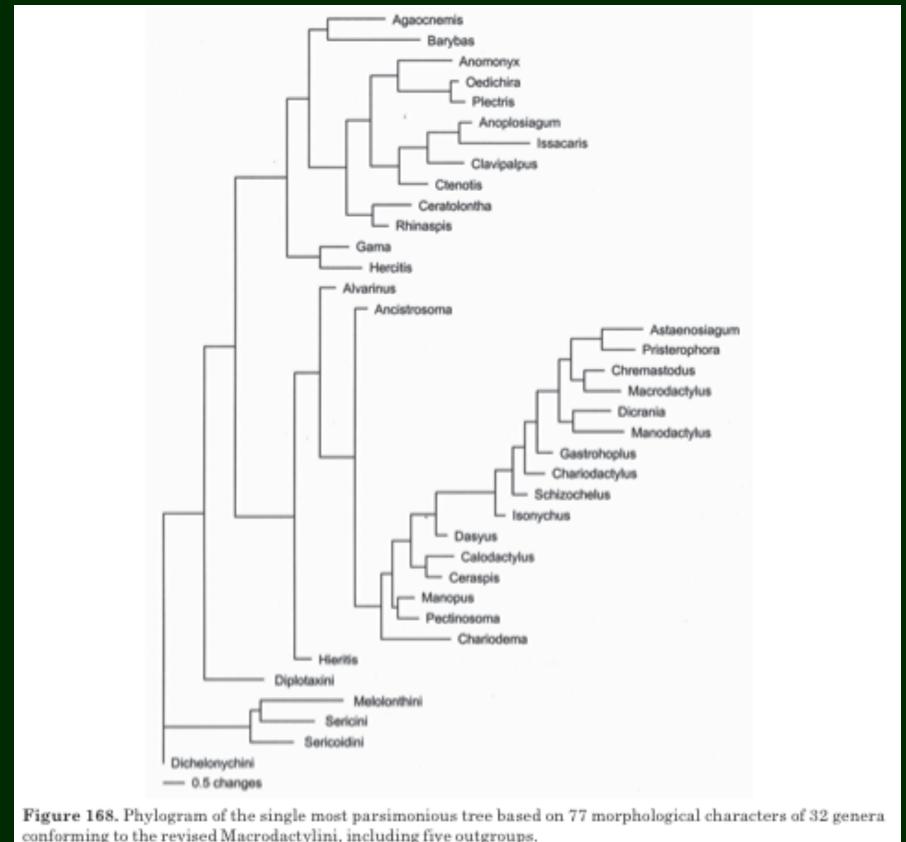


Figure 168. Phylogram of the single most parsimonious tree based on 77 morphological characters of 32 genera conforming to the revised Macrodactylini, including five outgroups.

**Katovich 2008**

## **Macroactylini changes over the past few years**

- Katovich (2008) reviewed the genera and proposed a phylogeny
- Reduced number of New World genera from 78 to 41 genera (with many more changes to go)
- 15 genera were transferred to other tribes such as **Diplotaxini**
- 3 genera were transferred to the newly revived **Dichelonychini**
- Smith (2008) made further changes at the generic level, especially with southern South American taxa



Fig. 161



Fig. 162

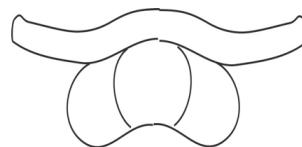


Fig. 163

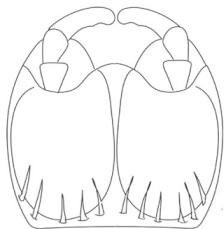


Fig. 164

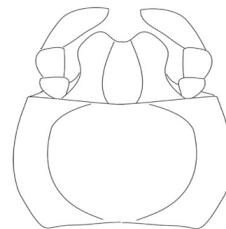


Fig. 165

## Plectris



# *Isonychus*



Fig. 120



Fig. 121

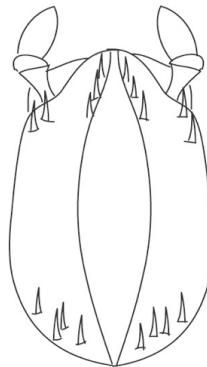


Fig. 122

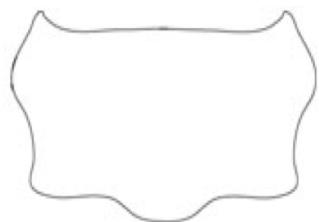


Fig. 123

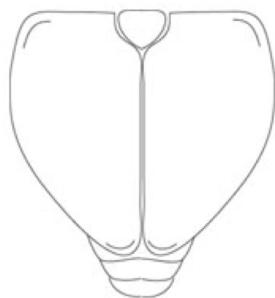


Fig. 124

# *Isonychus*



## *Macroductylus*



Fig. 130



Fig. 131

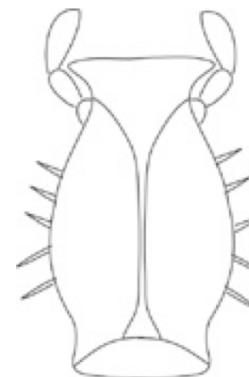


Fig. 132

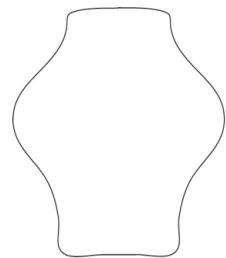
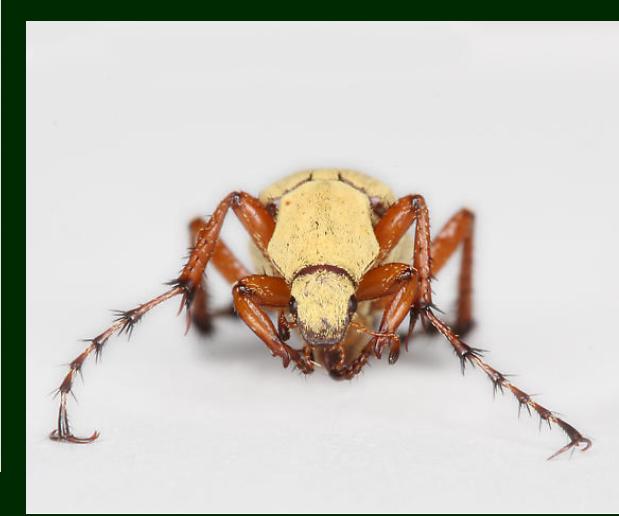


Fig. 133



Fig. 134

## *Macroductylus*



# *Ceraspis*



Fig. 43



Fig. 44

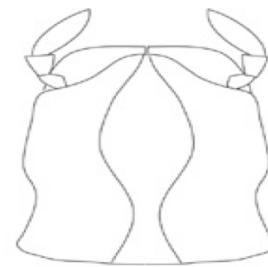


Fig. 45



Fig. 46

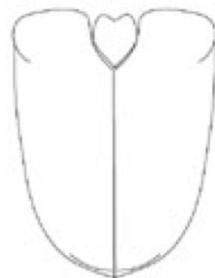


Fig. 47



Fig. 48

# *Barybas*



Fig. 33



Fig. 34



Fig. 35

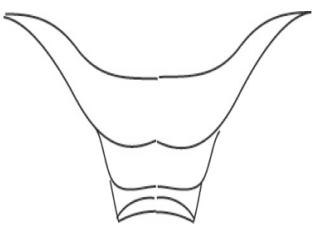


Fig. 36



Fig. 37

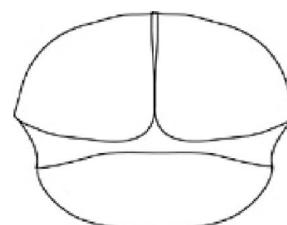


Fig. 38

# *Dicrania*



Fig. 87



Fig. 88

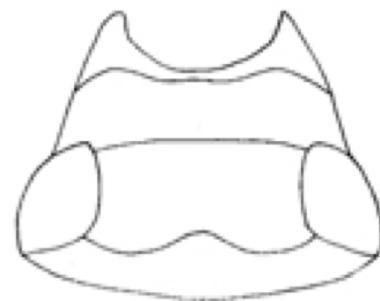


Fig. 89

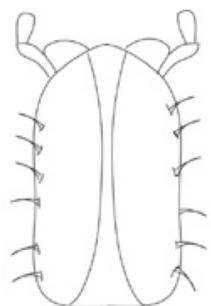


Fig. 90

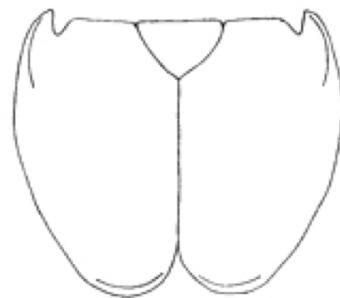


Fig. 91

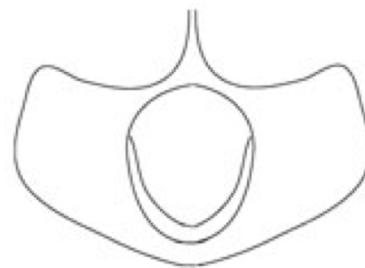


Fig. 92

# Gama



Fig. 98



Fig. 99

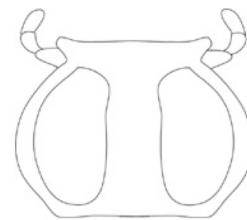


Fig. 100

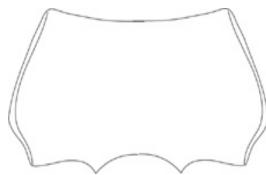


Fig. 101



Fig. 102

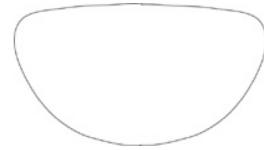
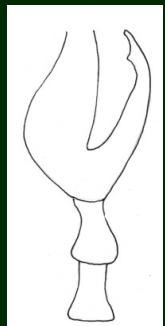
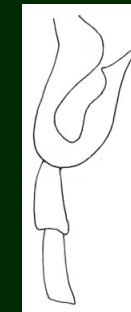
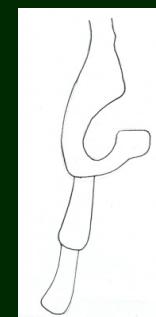


Fig. 103



*Philochloenia*  
(formerly  
*Anoplosiagum*)



Fig. 22



Fig. 23

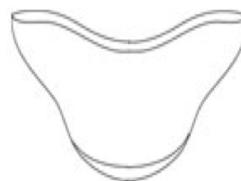


Fig. 24

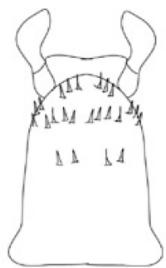


Fig. 25

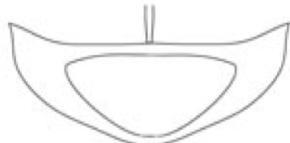


Fig. 26

# *Clavipalpus*



Fig. 67



Fig. 68

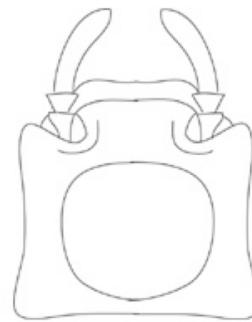


Fig. 69

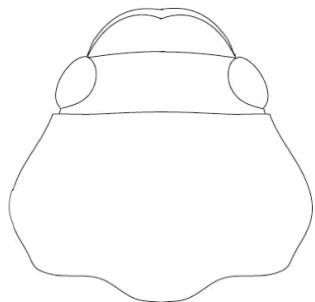


Fig. 70

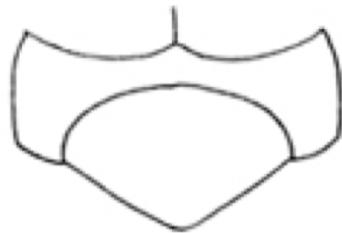


Fig. 71

# *Rhinaspis*



Fig. 171



Fig. 172

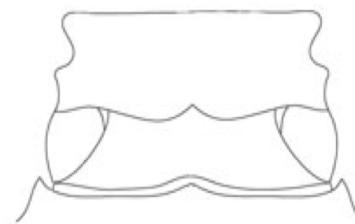


Fig. 173



Fig. 174

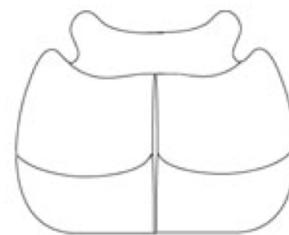


Fig. 175

## *Ceratolontha*



Fig. 49



Fig. 50



Fig. 51

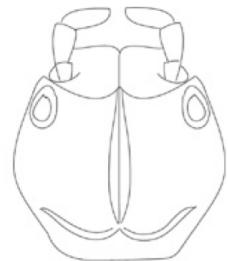


Fig. 52

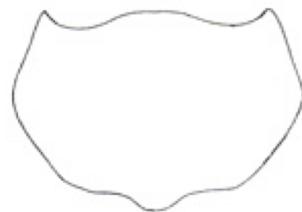


Fig. 53

## *Ctenotis*



Fig. 72



Fig. 73



Fig. 74



Fig. 75



Fig. 76

## *Oedichira*



Fig. 151



Fig. 152



Fig. 153



Fig. 154



Fig. 155

## *Manodactylus*



Fig. 140



Fig. 141

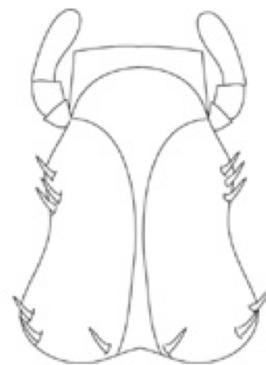


Fig. 142



Fig. 143



Fig. 144

## *Pectinosoma*



Fig. 156



Fig. 157

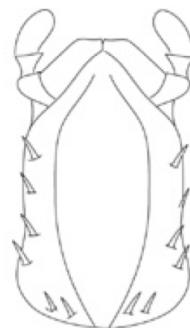


Fig. 158



Fig. 159

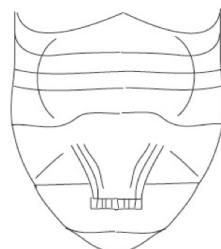


Fig. 160

New genus



# *Schizochelus*



Fig. 176



Fig. 177

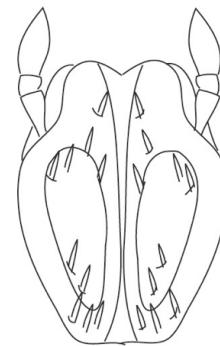


Fig. 178



Fig. 179



Fig. 180



Fig. 181

# INSECTA MUNDI

A Journal of World Insect Systematics

0060

South American Melolonthinae (Coleoptera: Scarabaeidae)  
classification and nomenclature: some problems and solutions

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Date of Issue: December 5, 2008

## Tribe MACRODACTYLINI

- Astaenosiagum* Martínez, 1957  
*Chremastodus* Solier, 1851  
*Issacaris* Fairmaire, 1889  
*Macroductylus* Dejean, 1821  
*Pristerophora* Harold, 1869  
*Pseudodicrania* Gutiérrez, 1950  
*Schizochelus* Blanchard, 1850

## Tribe MACRODACTYLINI

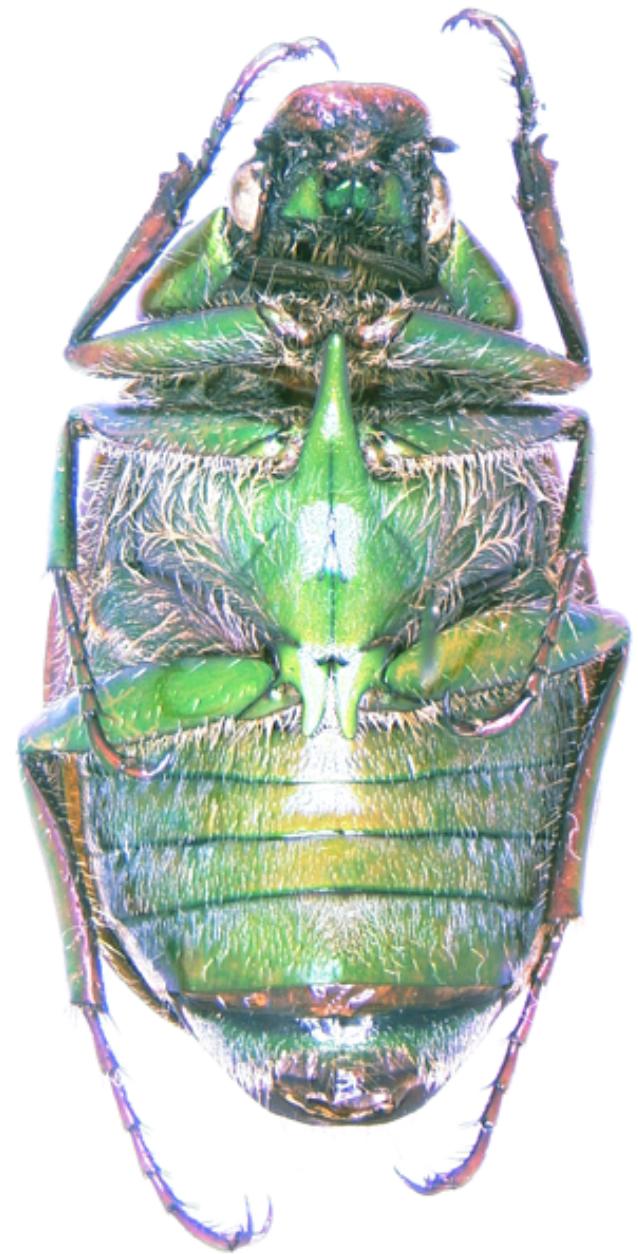
- Ampliodactylus* Smith, 2008  
*Issacaris* Fairmaire, 1889  
*Macroductylus* Dejean, 1821  
*Pristerophora* Harold, 1869  
*Pseudodicrania* Gutiérrez, 1950  
*Pusiodactylus* Smith, 2008

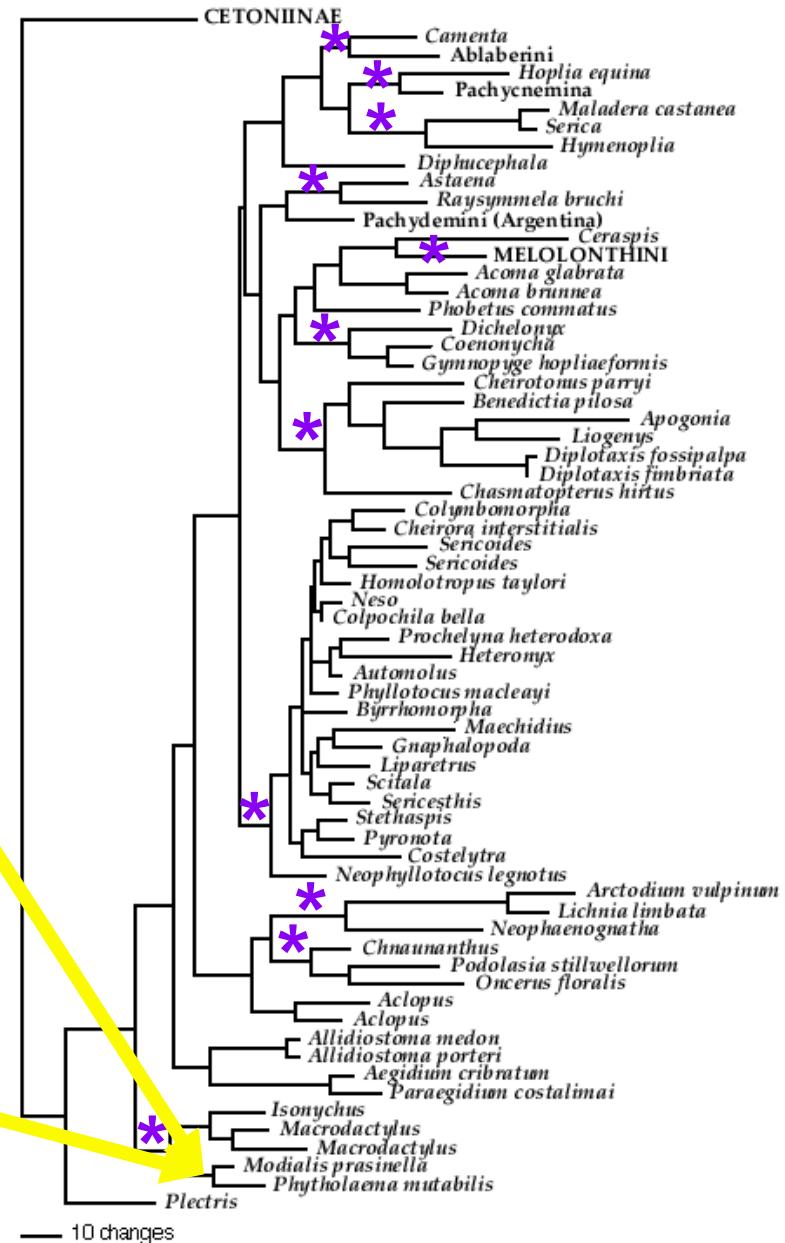
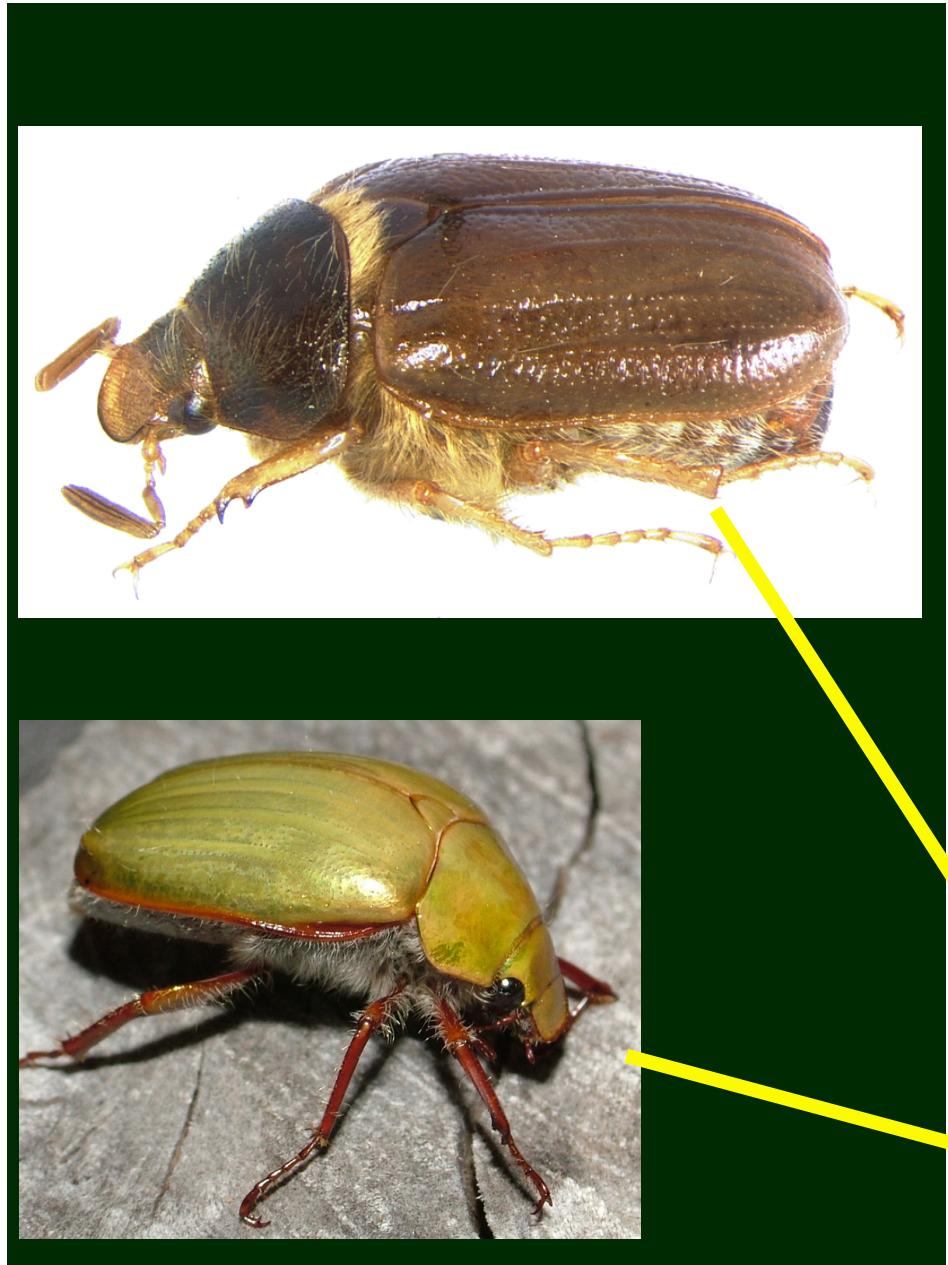
## Tribe MELOLONTHINI

- Modialis* Fairmaire and Germain, 1860  
INCERTAE SEDIS  
*Phytolaema* Blanchard, 1851



*Modialis prasinella*







***Macroductylus chilensis***  
lectotype male



***Chremastodus***  
***pubescens*** lectotype  
female



*Pristerophora picipennis*



*Pristerophora paulseni*



*Pusiodactylus mondacai*



*Issacaris  
petalophora*

*Pseudodicrania  
aeneobrunnea*





*Hyporhiza hypocrita*

# Melolonthinae: Smith 2006 & Bouchard *et al.* 2011

Systellopini

Lichniini

Chasmopterini

Oncerini

Podolasiiini

Diphycerini

Ablaberini

Sericini

Phyllotocina

Sericina

Trochalina

Hopliini

Pachycnemina

Hopliina

Phyllotocidiini

Diphucephalini

Comophorinini

Colymbomorphini

Automoliini

Maechidiini

Liparetrini

Scitalini

Pachytrichini

Sericoidini

Heteronychini

Euchirini

Diplotaxini

Pachypodini

Melolonthini

Heptophyllina

Schizonychina

Enariina

Pegylina

Rhizotrogina

Leucophilina

Melolonthina

Tanypoctini

Macrophyllina

Tanypoctina

Macrodactylini

Dichelonychini

## New World Dichelonychini – 3 genera

*Coenonycha* Horn (34)

*Dichelonyx* Harris (28)

*Gymnopyge* Linell (4)



*Coenonycha  
lurida*



© Joyce Gross

*Dichelonyx  
albicollis*





*Gymnopyge*

## **Subfamily MELOLONTHINAE**

### **Tribe INCERTAE SEDIS**

***Acoma* Casey (30) - new tribe?**

***Chaunocolus* Saylor (1) - new tribe?**

***Chnaunanthus* Burmeister (3) - new tribe?**

***Hilarianus* Blanchard (5) - ???**

***Manonychus* Moser (6) - Sericoidini**

***Phytholaema* Blanchard (3) - Macrodactylini**

***Zaburina* Saylor (1) - Sericoidini**



*Acomoa conjuncta*



*Acomoa mixta*



*Chnaunanthus  
chapini*



**new genus**