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KEYS FOR IDENTIFYING LARVAE OF SCARABAEOIDEA
TO THE FAMILY AND SUBFAMILY
(Coleoptera)

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Keys for identifying larvæ of Scarabaeoidea (Coleoptera) to Family and Subfamily

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The superfamily Scarabaeoidea includes three families of lamellicorn beetles, the Passalidae, Lucanidae and the Scarabaeidae. Passalid larvae are elongate with diminutive metathoracic legs and bluish bodies. Lucanid and scarabaeid larvae are usually C-shaped with white, yellowish or bluish bodies. Their mandibles have a characteristic ventral process. Most grubs of all three families possess cribriform spiracles but a few genera of scarabaeids have biforous spiracles.

Larvae of passalids, lucanids, and some scarabaeids are usually found in decaying wood. Many primitive scarabaeids breed in or under dung. Larvae of Melolonthinae, *Pleocoma*, and some Rutelinae and Dynastinae feed on live roots and are frequently of economic importance.

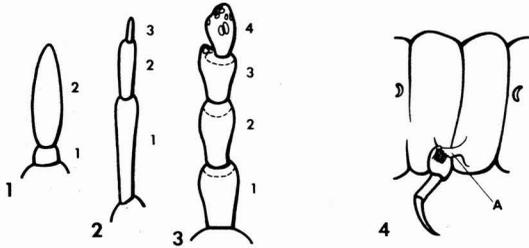
Scarabaeoid larvae may be preserved by putting them in near-boiling water for 3 minutes and then storing them in vials of 70% ethyl alcohol. Characters of the mouthparts and epipharynx are best seen if the head is severed from the body, the mandibles removed, and the maxillae and labium separated by a scissors cut on each side. These parts should be stored in a small, cotton-stoppered microvial, with the rest of the specimen.

The following keys to families and subfamilies of scarabaeoid larvae have been modified from keys used for a number of years in my classes in immature insects at Oregon State University. They were designed for keying out the last instars (third, except for *Pleocoma*) of species found in the United States and Canada.

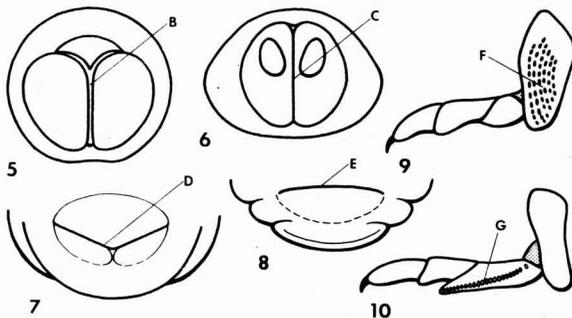
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KEY TO FAMILIES OF SCARABAEOIDEA

1. Antenna 2 segmented (Fig. 1). Thoracic spiracles with emarginations of respiratory plates facing anteriorly, those of abdominal segments facing posteriorly (Fig. 4). Metathoracic legs greatly reduced in size, unsegmented (Fig. 4, A). . . .family *Passalidae*
 Antenna with 3 or more segments (Figs. 2 and 3). Spiracles not as above. Metathoracic legs, if reduced in size, with 2 or more segments.2

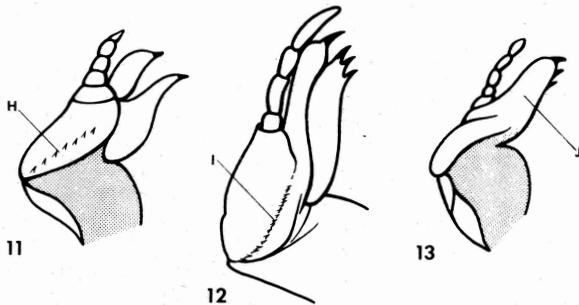


2. Anal opening longitudinal or Y shaped, usually situated between two oval lobes (Fig. 5, B and Fig. 6, C). Stridulatory organs present on mesothoracic and metathoracic legs (Figs. 9, F and Fig. 10, G). Maxilla usually without stridulatory teeth.
family *Lucanidae*
 Anal opening usually transverse (Fig. 8, E) or angulate (Fig. 7, D); if Y shaped, legs without stridulatory organs. Stridulatory organs present or absent on legs. Maxilla usually with stridulatory teeth (Fig. 11, H and Fig. 12, I) (absent or vestigial in a few minor groups).family *Scarabaeidae*

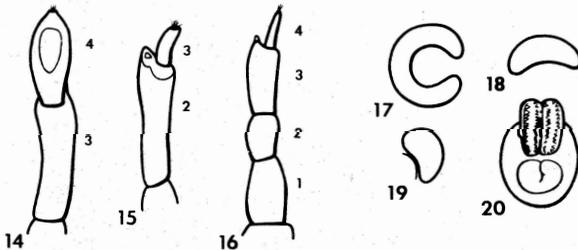


KEY TO SUBFAMILIES OF SCARABAEOIDEA

1. Maxilla with separate galea and lacinia (Fig. 11) or the two partially separated (Fig. 12).2
- Maxilla with galea and lacinia fused to form a mala (Fig. 13). . . .8

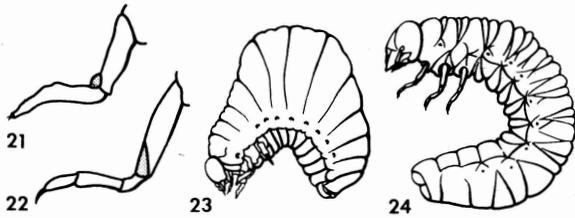


2. Last segment of antenna not reduced in size and with a single, dorsal, sensory spot (Fig. 14). Spiracles usually C-shaped (Fig. 17).(part) subfamily *Melolonthinae*
- Last segment of antenna much smaller in diameter than next to last segment, without sensory spots on sides (Figs 15 and 16). Spiracles kidney-shaped (Fig. 19), half-moon shaped (Fig. 18) or biforous (Fig. 20), not C-shaped.3

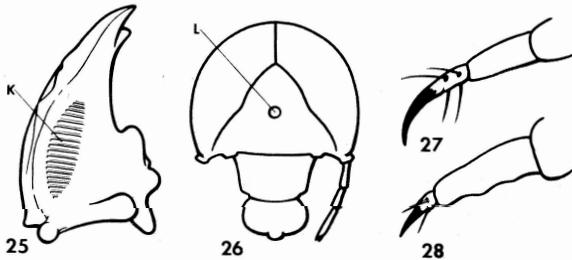


3. Antenna 3 segmented (do not count apparent basal segment).4
- Antenna 4 (Fig. 16) or apparently 5-segmented.6
4. Legs 2 or 3 segmented, metathoracic legs may be reduced in sizesubfamily *Geotrupinae*

- Legs 4-segmented; none reduced in size.5
5. With stridulatory organs on mesothoracic and metathoracic legs. . .
subfamily *Pleocominae*
 Without stridulatory organs on legs.subfamily *Troginae*
6. Legs 2-segmented, claws very small or absent (Fig. 21). Body
 strongly "hump-backed" (Fig. 23).
subfamily *Scarabaeinae* (Coprinae)
- Legs 4-segmented, claws well developed (Fig. 22). Body not "hump-
 backed" (Fig. 24).7

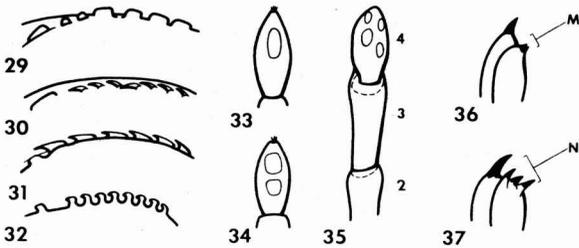


7. Frons of head with a large median pit (Fig. 26). Body densely covered
 with soft, hair-like setae. Claws with 4 setae (Fig. 27)
subfamily *Glaphyrinae*
 Frons of head without large median pit. Dorsal folds of body with
 one or more transverse rows of short setae. Claws with 2 setae
 (Fig. 28).subfamily *Aphodiinae*

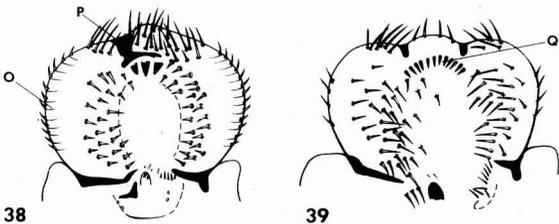


8. Mandible without definite, ventral stridulatory area. Anal opening
 usually angulate (Fig. 7).(part) subfamily *Melolonthinae*
 Mandible with definite, ventral stridulatory area (Fig. 25). Anal
 opening a slightly curved transverse slit, not angulate (Fig. 8)
9

9. Maxilla with truncate stridulatory teeth (Fig. 29); last segment of antenna with at least 2, dorsal, sensory spots (Figs. 34 and 35)subfamily *Dynastinae*
 Maxillary stridulatory teeth with anteriorly projecting points (Figs. 30, 31, and 32); last segment of antenna with one (Fig. 33) or more dorsal, sensory spots.10



10. Lacinia of maxilla with 3 unci (Fig. 37), last segment of antenna with one dorsal sensory spot.a few *Dynastinae*
 Lacinia of maxilla with 1 or 2 unci (Fig. 36), last segment of antenna with one or more dorsal sensory spots.11
 11. Labrum (and epipharynx) symmetrical, often tri-lobed (Fig. 39). Epipharynx without epizygmum and without plegmata (Fig. 39). Haptomerum of epipharynx often with a conspicuous, transverse, curved row of stout setae (Fig. 39, Q). .subfamily *Cetoniinae*
 Labrum (and epipharynx) usually asymmetrical (Fig. 38). Epipharynx usually with epizygmum and usually with plegmata (Fig. 38)subfamily *Rutelinae*12



12. Last segment of antenna with one dorsal sensory spot.
tribe *Anomalini*
 Last segment of antenna with two or more dorsal sensory spots.
tribe *Rutelini*

EXPLANATION OF FIGURES

1. Passalidae (*Popillius*). Antenna
2. Lucanidae (*Sinodendron*). Antenna.
3. Scarabaeidae (*Cotinis*). Antenna.
4. Passalidae (*Popillius*). Left side of mesothorax and metathorax.
5. Lucanidae (*Ceruchus*). Caudal view of last abdominal segment.
6. Lucanidae (*Sinodendron*). Caudal view of last abdominal segment.
7. Melolonthinae. Caudal view of last abdominal segment.
8. Rutelinae. Caudal view of last abdominal segment.
9. Lucanidae (*Ceruchus*). Left mesothoracic leg.
10. Lucanidae (*Ceruchus*). Right metathoracic leg.
11. Scarabaeinae (*Pinotus*). Left maxilla, dorsal view.
12. Melolonthinae. Left maxilla, dorsal view.
13. Rutelinae. Right maxilla, ventral view.
14. Melolonthinae. Right antenna, last two segments.
15. Pleocominae (*Pleocoma*). Right antenna, last two segments.
16. Scarabaeinae. Right antenna.
17. Melolonthinae (*Polyphylla*). Spiracle.
18. Pleocominae (*Pleocoma*). Spiracle.
19. Troginae (*Omorgus*). Spiracle.
20. Troginae (*Trox*). Spiracle.
21. Aphodiinae (*Aphodius*). Left mesothoracic leg.
22. Scarabaeinae (*Pinotus*). Left mesothoracic leg.
23. Scarabaeinae (*Pinotus*). Left, lateral view of larvae.
24. Aphodiinae (*Aphodius*). Left, lateral view of larva.
25. Rutelinae. Right mandible, ventral view.
26. Glaphyrinae (*Lichnanthe*). Head.
27. Glaphyrinae (*Lichnanthe*). Apical segments of leg.
28. Aphodiinae (*Aphodius*). Apical segments of leg.
29. Dynastinae (*Bothynus*). Maxillary stridulatory teeth.
30. Dynastinae (*Aphonus*). Maxillary stridulatory teeth.
31. Rutelinae (*Anomala*). Maxillary stridulatory teeth.
32. Detoniinae (*Cotinis*). Maxillary stridulatory teeth.
33. Dynastinae. Last segment of antenna, dorsal surface.
34. Dynastinae. Last segment of antenna, dorsal surface.
35. Rutelinae (*Parastasia*). Last two segments of antenna, dorsal surface.
36. Cetoniinae (*Cremastocheilus*). Apical portions of left galea and lacinia showing unci.
37. Dynastinae (*Bothynus*). Apical portions of left galea and lacinia showing unci.
38. Rutelinae (*Anomala*). Epipharynx.
39. Cetoniinae (*Cremastocheilus*). Epipharynx.

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