

23. LUCANIDAE Latreille 1804

by Brett C. Ratcliffe

Family common name: The stag beetles

Stag beetles range in size from less than 1 cm to 9 cm. The largest Nearctic species attains a length of 6 cm. Most males possess greatly enlarged, curving mandibles that are sometimes used in combat with male opponents during fights to establish dominance. Female lucanids lack enlarged mandibles. In most, male development of the mandibles is allometric, that is, the size of the mandibles is proportional to the size of the body. Those males with the largest mandibles are referred to as “male majors” and those with the smallest mandibles are called “male minors.”

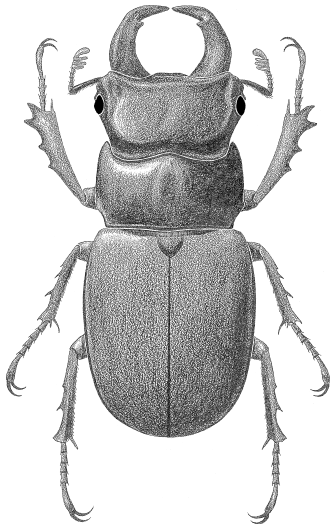


FIGURE 23.1. *Lucanus capreolus* (Linnaeus) (Used by permission of University of Nebraska State Museum)

Description. Length 8.0–60.0 mm. Shape usually weakly convex, subdepressed, or cylindrical, elongate. Color testaceous to reddish brown to black.

Head prognathus, not deflexed. Antennae geniculate or straight, 10-segmented, with 3–7 segmented club (all antennomeres unopposable and tomentose); first antennomere often subequal to remaining antennomeres. Eyes with eucone or acone ommatidia; eye canthus present or absent. Clypeus and labrum fused to frons. Mandibles produced beyond apex of labrum, prominent (males often with large, curved, elongate mandibles).

Maxillae with 4-segmented palpi; labium with 3-segmented palpi.

Pronotum weakly convex, base narrower than elytral base, lacking tubercles, ridges, horns, or sulci. Elytra weakly convex, with or without impressed striae. Scutellum exposed, triangular or parabolic. Pygidium concealed by elytra or only weakly exposed. Legs with coxae transverse, mesocoxae separated; protibiae dentate on outer margin, apex with one spur; meso- and metatibia with ridges, apex with 2 spurs; tarsi 5–5–5; claws equal in size, simple; empodium present, extending weakly beyond fifth tarsomere or extending nearly one half claw length, with 2 to several setae. Profemora with tomentose patch anteriorly.

Abdomen with 5 visible sternites; 8 functional abdominal spiracles situated in pleural membrane. Wings well developed, with M-Cu loop and two, apical, detached veins. Male genitalia trilobed. References: Didier and Seguy 1953; Scholtz 1990.

Larvae are scarabaeiform (c-shaped, subcylindrical). Color creamy-white or yellowish (except at caudal end which may be darkened by accumulated feces). Cranium heavily sclerotized, lightly pigmented. Antennae 3–4 segmented, last segment greatly

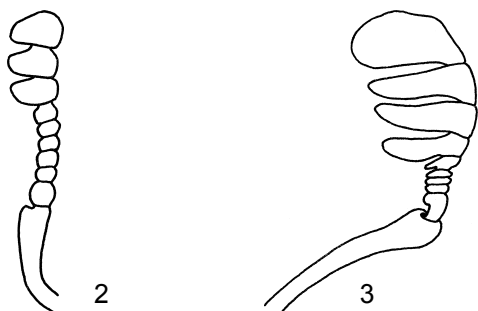
reduced in size. Stemmata absent (present in *Platycerus*). Frontoclypeal suture present. Labrum at apex rounded or weakly lobed. Epipharynx rounded or lobed, with symmetrical tormae. Maxilla with galea and lacinia distinctly separate; maxillary stridulatory teeth absent (present in *Platycerus*); maxillary palpus 4-segmented. Mandibles elongate, asymmetrical. Abdominal segments 3–7 with 2 annuli, each with 1 or more transverse rows of short setae. Spiracles cribriform. Anal opening Y-shaped or longitudinal, surrounded by 2 fleshy lobes. Legs 4-segmented. Stridulatory apparatus on meso- and metathoracic legs present; claws present. References: Ritcher 1966; Scholtz 1990.

Habits and habitats. Lucanids are usually associated with decaying wood and logs in coniferous and deciduous forest habitats. Adults of some species are attracted to lights at night and some feed at sap flows from fluxing trees. Adults of some smaller species have been observed feeding on flowers. The eggs are customarily laid in crevices in bark or logs, and the larvae feed on decaying wood. The larvae resemble those of Scarabaeidae, but in lucanids the anal opening is longitudinal or Y-shaped transverse or Y-shaped in a few. References: Ratcliffe 1991.

Status of the classification. The family Lucanidae has long been considered one of the most primitive groups in the Scarabaeoidea (Crowson 1967; Howden 1982; Ritcher 1966), and scarabaeoid classifications and evolutionary hypotheses have generally regarded the Lucanidae as basal to all scarabaeoids (Howden 1982; Iablokoff-Khnzorian 1977; Lawrence and Newton 1995). However, based on comparison with “primitive” scarabaeoid groups, Scholtz *et al.* (1994) hypothesized that the scarabaeoid family Glaresidae, rather than the Lucanidae, is the most primitive scarabaeoid. According to this hypothesis, the Lucanidae is a member of a clade including the Passalidae, Diphylostomatidae, Glaphyridae, Trogidae, Pleocomidae, and Bolboceratinae (Geotrupidae).

Prior to the taxonomic elevation of the genus *Diphylostoma* to the family Diphylostomatidae (Holloway 1972), the Lucanidae was hypothesized to be most closely related to the Passalidae (Howden 1982). Based on shared characters, it is now thought that the Lucanidae is most closely related to the Diphylostomatidae (Caveney 1986; Browne and Scholtz 1995).

The world Lucanidae (about 800 species) have been treated in checklists by Benesh (1960) and Maes (1992) and in illustrated



FIGURES 2.23-3.23. Right antenna dorsal view of: 2. *Ceruchus piceus* and 3. *Platycerus* sp.

catalogs by Didier and Seguy (1953) and Mizunuma and Nagai (1994). The latter is spectacular for its colored plates of the world fauna. Benesh (1960) recognized eight subfamilies, four of which occurred in the United States. The classification of the North American species had been relatively stable until Howden and Lawrence (1974) proposed a significant rearranging of genera within subfamilies based partly on the work of Holloway (1960, 1968, 1969). This newer classification is followed here, with three subfamilies now recognized as occurring in North America: Nicaginae, Syndesinae, and Lucaninae.

Distribution. The world fauna consists of about 800 species (Mizunuma and Nagai 1994) with more species found in Asia than in other areas. In North America there are three subfamilies with eight genera and 24 species. Keys to adults: Benesh 1946; Blatchley 1910; Howden and Lawrence 1974; Ratcliffe 1991. Keys to larvae: Ritcher 1966; Smith 2001. World catalog: Krajcik 2001. Regional works: Edwards 1949; Hatch 1971; Kirk and Balsbaugh 1975; Ratcliffe 1991. Biology: Milne 1933; Hoffman 1937.

KEY TO THE NEARCTIC SUBFAMILIES, TRIBES,
AND GENERA OF LUCANIDAE

- 1. Antenna straight, not geniculate (Fig. 2); body form oval or cylindrical; prosternal process narrow, anterior coxae nearly contiguous 2
- Antenna geniculate (Fig. 3); body form elongate, weakly flattened; prosternal process broad, anterior coxae distinctly separated (Lucaninae) . 4

- 2(1). Form short, oval, convex; elytra coarsely punctate with conspicuous bristles; antenna with club lamellate (Nicaginae) *Nicagus*
- Form elongate, cylindrical; elytra striate and nearly glabrous; antenna with club only weakly lamellate (Syndesinae)..... 3

- 3(2). Head of male with long, median horn; female with median tubercle; mandibles in both sexes small and inconspicuous (Sinodendrini) . *Sinodendron*
- Head in both sexes lacking median horn or tubercle; mandibles large, conspicuous, especially in male (Ceruchini) *Ceruchus*

- 4(1). Eye nearly entire, canthus absent or very short; antenna weakly geniculate, scape lacking groove at apex; body length mostly less than 15 mm (Platycerini) 5
- Eye divided by canthus, canthus more than 1/4 as long as eye; antenna strongly geniculate, scape with apical groove; body length more than 15 mm 7

- 5(4). Body robust, obovate, strongly convex; posterior tibia stout, expanded at apex, triangular in cross section; apical spurs spatulate *Platyceropsis*
- Body distinctly depressed; posterior tibia narrow, not expanded at apex, not triangular in cross section; apical spurs slender, not spatulate 6

- 6(5). Anterior margin of head semicircularly excised; clypeus mostly concealed; mandibles subequal to length of head; club of antenna with 4 segments in male, 3 segments in female *Platycerus*
- Anterior margin of head lacking excision on front; clypeus distinctly produced; mandibles about half length of head; club of antenna 3-segmented in both sexes *Platyceroides*

- 7(4). Elytra nearly smooth; pronotum with lateral margin strongly arcuate or angulate; posterior tibia with 0, 2, or 3 spines along outer edge (Lucanini) *Lucanus*
- Elytra striate-punctate; pronotum with lateral margins subparallel; posterior tibia with 1 spine on outer edge (Dorcini) *Dorcus*

CLASSIFICATION OF THE NEARCTIC GENERA

Lucanidae Latreille 1804

Lucaninae Latreille 1804

Lucanini Latreille 1804

Characteristics: Eye partly or completely divided by canthus. Antenna geniculate. Body form elongate, weakly flattened. Pronotal process broad between procoxae, coxae distinctly separated. Internal sac of aedeagus permanently everted.

Most of the lucanids of the world are found in this subfamily although many of the tribes are poorly or inconsistently characterized (Howden and Lawrence 1974). The classification of the North American genera seems now to be stable.

Characteristics: Antenna strongly geniculate, scape with apical groove. Elytra nearly smooth or with minute and irregular punctation. Pronotum with lateral edges arcuate or angulate. Metatibia lacking spines or with 2 or 3 spines along outer edge. Most with body length greater than 25 mm.

This tribe consists of two genera in the New World. One genus, *Cantharolethrus*, is found from Mexico to South America. Keys to U.S. species: Fuchs 1882; Dillon and Dillon 1961. Keys to larvae: Ritcher (1966) was unable to distinguish between the three U.S. species he examined.

8 · Family 23. *Lucanidae*

Lucanus Scopoli 1763

Hexaphyllus Mulsant 1839

Pseudolucanus Hope 1845

The genus *Lucanus* (Fig. 1) contains about 50 species distributed in Asia, Europe, and North America (Benesh 1960). Most of the species occur in Asia while five species occur in the United States and northern Mexico. Three species are restricted to the eastern United States while the other two are found in the Southwest and northern Mexico. Keys to species: Dillon and Dillon 1961. Biology: Milne 1933.

Dorcini Parry 1864

Characteristics: Antenna strongly geniculate, scape with apical groove. Elytra striate-punctate. Pronotum with lateral edges subparallel. Metatibia with 1 spine on outer edge. Body length more than 15 mm.

There is only one genus of Dorcini represented in North America: *Dorcus*. The tribe Dorcini has six genera, five of which are endemic to Asia.

Dorcus MacLeay 1819

The genus *Dorcus* contains about 30 species; most occur in Asia and India although two are also found in southern Europe, one in Mexico, and two in the United States (Benesh 1937). The two U.S. species are found in the eastern half of the country, and one species occurs in Quebec. Key to species: Downie and Arnett 1996.

Platycerini Mulsant 1842

Characteristics: Antenna weakly geniculate, scape lacking apical groove. Eye nearly entire, eye canthus absent or very short. Elytra striate in most. Most with body length less than 15 mm.

The tribe Platycerini consists of three genera in North America, with *Platycerus* also being found in Asia, Europe, and North Africa. Key to genera: Benesh 1946; Howden and Lawrence 1974.

Platyceroides Benesh 1946

This genus contains seven species, all of which are found in Washington, Oregon, and northern California. Key to species: Benesh 1946.

Platyceropsis Benesh 1946

This monobasic genus contains one species, *P. keeni* (Casey), which occurs from British Columbia to northern California.

Platycerus Geoffroy 1762

Systemocerus Weise 1883

Systemus Sharp and Muir 1912

Eight species are found in this genus, and five of these occur in the United States. Four of the U.S. species are found in the Pacific Northwest while the fifth species is found in the eastern United

States and Canada. Key to species: Benesh 1946. Larval description: Ritcher 1966. Biology: Hoffman 1937.

Nicaginae LeConte 1860

Characteristics: Antenna not geniculate, instead straight, with strongly lamellate club. Eye entire (lacking canthus). Pronotum with lateral margins strongly crenulate. Elytra coarsely punctate, with conspicuous bristles. Prosternal process narrow so that anterior coxae almost contiguous. Aedeagus with internal sac eversible. Body form short, oval, convex.

According to Howden and Lawrence (1974), the Nicaginae contain two genera: *Ceratognathus* from Australia and New Zealand and *Nicagus* from North America and Japan. Previously, these genera were included in the subfamily Aesalinae.

Nicagus LeConte 1860

One species, *N. obscurus* LeConte, occurs in the eastern half of the United States.

Syndesinae MacLeay 1819

Characteristics: Antenna straight, not geniculate; club weakly lamellate. Eye entire (lacking canthus). Elytra striate, nearly glabrous. Prosternal process narrow, anterior coxae nearly contiguous. Aedeagus with internal sac eversible. Body form elongate, cylindrical.

This subfamily is composed of three tribes: Syndesini with the genera *Syndesus* (from Australia, Tasmania, New Caledonia, and Africa) and *Psilodon* (from South America); Sinodendriini with the genus *Sinodendron* (from North America); and Ceruchini with the single Holarctic genus *Ceruchus*.

Sinodendriini Mulsant 1842

Characteristics: Head of male with long, median horn; female with median tubercle. Mandibles in both sexes small and inconspicuous.

Sinodendron Hellwig 1894

Ligniperda Fabricius 1801

This genus contains two species and one, *S. rugosum* Mannerheim, is found in the Pacific Northwest. Generic overview: Hatch 1928.

Ceruchini Jacquelin du Val 1857

Characteristics: Head lacking median horn or tubercle in both sexes. Mandibles large, conspicuous (especially in male).

Ceruchus MacLeay 1819

Seven species occur in this Holarctic genus (Benesh 1960), and three species are found in North America. One species occurs in southeastern Canada and the northeastern quadrant of the United States while the other two species are found from California to

Vancouver Island. Larval description: Ritcher 1966. Biology: Hoffman 1937.

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