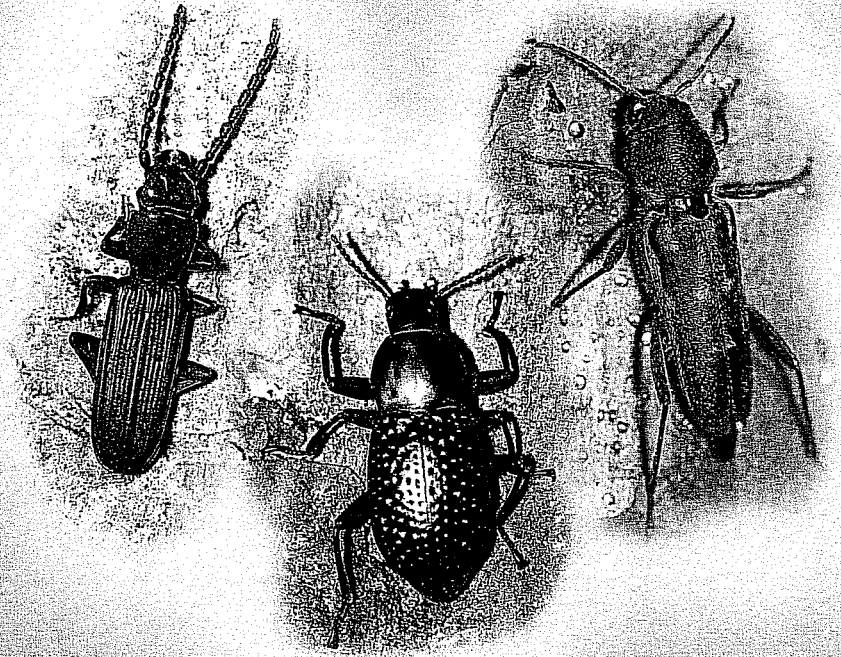


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VOLUME 1

# AMERICAN BEETLES

Archostemata, Myxophaga, Adephaga,  
Polyphaga: Staphyliniformia



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## 21. SILPHIDAE Latreille, 1807

by Stewart B. Peck

Common name: The carrion beetles

Family synonym: Necrophoridae Kirby, 1837

Members of the family are large beetles, frequently found in association with decaying organic material. They are most commonly encountered at vertebrate carcasses and hence have the common name of carrion beetles. The habit of adult *Nicrophorus* of interring small vertebrate carcasses has also led to the use of the common names of burying beetles and sexton beetles. Adults can be easily recognized by their size; possession of clavate or capitate 11-segmented antennae; prominent fore coxae; and elytra which are truncate (Fig. 1.21), reticulate (Fig. 2.21), tricostate (Figs. 3.21, 4.21), or lacking costae, generally blackish, and usually with orange or red markings in *Nicrophorus*.

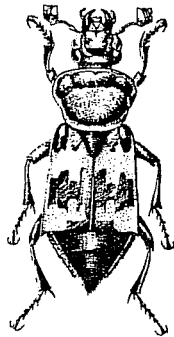


FIGURE 1.21. *Nicrophorus marginatus* Fabricius (From Peck 1990).

11 lamellate (Nicrophorinae).

Pronotum with complete lateral edges, sometimes explanate. Procoxae transverse, projecting, and contiguous, with large, exposed trochantins; their cavities widely open posteriorly and open internally. Mesocoxae usually moderately to very widely separated, rarely subcontiguous. Scutellum very large. Elytra sometimes truncate, exposing one or two abdominal terga (three to four in *Nicrophorus*); never striate; in Silphinae bearing none to three upraised costae (carinae) on each; a raised area (callus) may occur near the posterior end of the outermost costa; epipleura usually well-developed and complete almost to the apex. The elytra of

**Description:** Body 7–45 mm (usually 12–20 mm) long, ovate to moderately elongate and slightly to strongly flattened; usually glabrous dorsally, pronotum rarely pubescent. Males usually with broadly expanded protarsal segments, female protarsi resembling those on the other legs.

Head at least slightly constricted posteriorly; frontoclypeal suture occasionally distinct; gular sutures sometimes confluent. Antennae occasionally geniculate, with a long scape and a highly reduced pedicel; antennal insertions exposed; ending in a three-segmented, tomentose club, usually preceded by two or three enlarged but glabrous segments (Silphinae) or antennomeres 9–

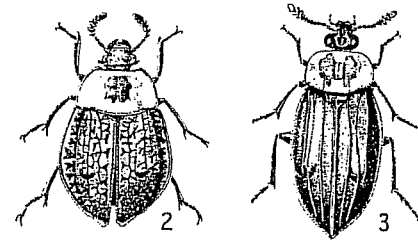
*Nicrophorus* usually have broad colored bands (maculae) extending laterally to meet the epipleura. Tibial spurs occasionally enlarged, and tarsal claws sometimes apendiculate. Hindwing provided with a secondary hinge.

Abdomen with six (rarely seven) visible sterna; lateral portions of sternum 2 exposed; intersegmental areas marked with a pattern of microsclerites; the three basal terga membranous, tergum 5 with paired stridulatory files in *Nicrophorus*. Aedeagus basal piece reduced but distinct, parameres well-developed and symmetrical.

Larvae (see Newton 1991) campodeiform; with heavily sclerotized terga either bearing posterior spines or produced laterally beyond the edges of the sterna; sterna sclerotized or membranous; antennae long, with a very short sensorium; labrum composed of several sclerites; frontoclypeal suture laterally distinct, either six or only one ocelli on each side; mandibles without a mola or prostheca; mandibular apex more or less acute; mola divided apically; galea furnished with a large, dense brush of hairs; lacinial lobe spinose only on the lateral margins; ligula bilobed; urogomphi usually short, one- or two-segmented, and in most species segment 10 bears several eversible lobes.

Habits and habitats. Silphids are primarily scavengers and carrion feeders, but some species are phytophagous and may be garden pests (*Aclypea*) and others are predators of caterpillars or snails (*Dendroxena* in Europe). *Nicrophorus* spp. bury small mammal or bird carcasses and guard and feed their larvae. Their complex subsocial behavior has been extensively studied (reviewed in Anderson and Peck 1985; Scott 1996, 1997; see also Trumbo 1992). The largest North American species, *Nicrophorus americanus* Olivier, has vanished from most of its former extensive range, and is a federally listed endangered species (Lomolino *et al.* 1995; Backlund and Marrone 1997) with protected status.

Status of the classification. The family has historically included many other taxa currently not regarded as silphids. Most notable among these are members of the Agyrtidae, which, although still considered by some as silphids, are now interpreted as not being closely related to them. This once vaguely defined



FIGURES 2.21–3.21. Fig. 2.21. *Nicrophila americana* (Linnaeus), habitus. Fig. 3.21. *Oxelytrum ducivalle* (Brullé), habitus (From Peck 1990).

group is now restricted to the larger carrion and burying beetles (e.g., Anderson and Peck 1985; Peck 1990) after the removal of some subfamilies or tribes that now form the separate family Agyrtidae (see above), and the removal of other groups to the families Leiodidae (e.g., Leprodirini and Estadiini) or Staphylinidae (e.g., Apatericini, Trigonurinae, Microsilphinae) (Lawrence and Newton 1982). In this restricted sense, silphids are clearly monophyletic and closely allied to staphylinids (Lawrence and Newton 1982).

The North American silphids were first revised by LeConte (1853) and subsequently by Horn (1880). At that time, all species were placed into only two genera, *Nicrophorus* and *Silpha*. Revision of the world fauna by Porrevin (1926) divided the genus *Silpha* into numerous genera. That revision incorporated genera proposed by Leach and also erected many new ones. This generic system has been refined and is now in widespread use in Europe and Asia, but the concepts were not generally applied consistently or correctly to the North American fauna. Only recently have these generic concepts been used for the Nearctic species in a way, as used here, which is consistent with that for the Palearctic species (Madge 1980). To complicate the matter, subgenera of *Silpha* and *Nicrophila* are often used as genera by some European workers (but this does not affect the North American species).

Two species have been introduced into the Nearctic from the Palearctic. *Dendroxena quadrimaculata* (Scopoli) was introduced intentionally into the northeastern U.S. for the control of gypsy moth larvae, but did not become established. *Silpha tristis* Illiger, a scavenger on dead insects, was seemingly accidentally introduced into southern California, and around Montreal, Quebec. Only the second population seems to be established (LaPlante 1997).

Much of the older literature is difficult to use in making determinations of North American silphids. Peck (1990) and Sikes and Peck (2000) give modern keys for the U.S. species. Anderson and Peck (1985) present keys and distribution maps for Canadian and Alaskan species. Distribution and bionomics of all or some of the U.S. species are summarized by Peck and Kaulbars (1987) and Ratcliffe (1996). Anderson (1982) and Anderson and Peck (1985) give data on all known larvae. The fauna of Latin America is reviewed by Peck and Anderson (1985) and phylogenetic relationships are proposed. A complete systematic catalogue

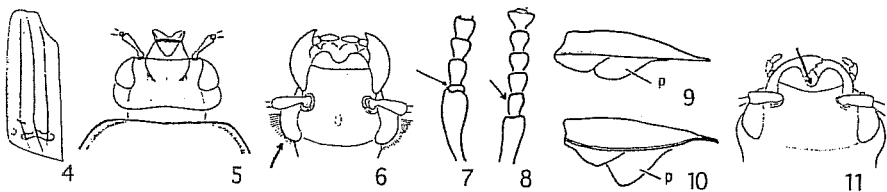
of the Nearctic fauna is that of Peck and Miller (1989). Herman (1964) discusses the correct spelling of *Nicrophorus*. Many *Nicrophorus* species show variation in coloration and this led to the naming of many invalid species, subspecies, or varieties (Anderson and Peck 1986; Peck and Miller 1989).

**Distribution.** This family contains 15 genera and about 175 species worldwide (Newton 1995). These are contained in two subfamilies. Nicrophorinae contains the Asian genera *Eonecrophorus*, *Ptomascopus*, and the widely distributed genus *Nicrophorus*, with 74 species, which occurs throughout the Holarctic Region and extends into Southeast Asia to New Guinea and the Solomon Islands, northern Africa, the Caribbean island of Hispaniola, and Andean South America. The Silphinae, with 12 genera and 119 species, occur mainly in the Northern Hemisphere, but *Oxelytrum* extends throughout South America. Asian *Diamesa* extends into, and *Ptomaphilo* occurs widely in, Australia. *Silpha* and *Thanatophilus* extend to South Africa. At present we recognize 30 species in eight genera in North America north of Mexico. Only *Heterailpha* is restricted to the Nearctic. Twenty-five species in six genera occur from Mexico southward (Anderson and Peck 1985).

## KEY TO THE NEARCTIC GENERA

1. Elytra shorter, truncate, exposing 3 or 4 abdominal terga, usually with red or orange irregular spots (Fig. 1.21); fifth abdominal tergum with stridulatory files; epistomal suture present (Fig. 5.21); second antennomere small, distinct, hidden in tip of first antennomere ..... *Nicrophorus*
- Elytra longer, usually not truncate, at most exposing 1 or 2 abdominal terga, usually without large colored areas; fifth abdominal tergum lacking stridulatory files; epistomal suture absent (Fig. 6.21); second antennomere large, not hidden in tip of first antennomere (Fig. 8.21) subfamily Silphinae ..... 2
- 2(1). Pronotum with disc black, margins yellow (Figs. 2.21, 3.21) ..... 3
- Pronotum entirely black, or, with disc black, margins orange red ..... 4
- 3(2). Elytra with intervals between carinae smooth, and with apices drawn out to needlelike points (Fig. 3.21) ..... *Oxelytrum*
- Elytra with intervals between carinae with coarse reticulate sculpturing, and with apices rounded, not drawn out to needlelike points (Fig. 2.21) ..... *Nicrophila*
- 4(2). Eyes larger; pronotal postcoxal lobe low, rounded (Fig. 9.21); pronotum orbicular, widest toward middle; elytra with small red markings near tip (Fig. 4.21); males with hind femora greatly expanded ..... *Necrodes*
- Eyes smaller; pronotal postcoxal lobe well-developed, projecting, pointed (Fig. 10.21); pronotum not orbicular, widest toward base; elytra without small red markings near tip; males with hind femora not expanded ..... 5
- 5(4). Head with short row of long erect hairs behind eyes (Fig. 6.21) ..... 6

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FIGURES 4.21-11.21. Fig. 4.21. *Necrodes surinamensis* (Fabricius), left elytron with three longitudinal costae. Fig. 5.21. *Nicrophorus defodiens* Mannerheim, head, with epistomal suture. Fig. 6.21. *Oiceoptoma inaequale* (Fabricius), head, epistomal suture absent. Fig. 7.21. *Nicrophorus orbicollis* Say, antenna, with small second segment. Fig. 8.21. *Necrodes surinamensis*, antenna, with normal sized second segment. Fig. 9.21. *Necrodes surinamensis*, lateral view of pronotum and rounded postcoxal lobe (p). Fig. 10.21. *Thanatophilus trituberculatus* (Kirby), lateral view of pronotum and pointed postcoxal lobe (p). Fig. 11.21. *Aclypea bituberosa* (LeConte), head with deeply emarginate labrum (Figs. 5, 9, 10 from Peck 1990).

- Head without row of long erect hairs behind eyes .... 7
- 6(5). Elytral shoulders with tooth; metafemur lacking carinae on inner face; elytra with intervals between carinae without reticulate sculpturing.....  
 — Elytral shoulders rounded, not toothed; metafemur with 2 carinae on inner face; elytra with intervals between carinae with reticulate sculpturing ....  
 ..... *Oiceoptoma*  
 ..... *Heterosilpha*
- 7(5). Labrum deeply emarginate (Fig. 11.21); mesocoxae narrowly separated; pronotum with small smooth glossy areas (discal callosities)..... *Aclypea*  
 — Labrum broadly, shallowly emarginate; mesocoxae widely separated; pronotum without smooth glossy discal callosities ..... 8
- 8(7). Antennal club more robust, antennomere 2 shorter than 3, 8 shorter than 9; native to North America; widespread, common ..... *Thanatophilus*  
 — Antennal club more slender; antennomere 2 as long as 3, 8 as long as 9; introduced to North America, Quebec, rare ..... *Silpha*

#### CLASSIFICATION OF THE NEARCTIC GENERA

##### Silphinae Latreille 1807

*Aclypea* Reitter 1884; 2 spp., *A. bituberosa* (LeConte) 1859, and *A. upaca* (Linnaeus) 1758, western North America (see Anderson and Peck 1985).

*Blitophaga* Reitter 1884

*Heterosilpha* Portevin 1926; 2 spp., *H. aeneus* (Casey) 1880, and *H. ramosa* (Say) 1823, Oregon to Mexico (see Miller and Peck 1979; Peck and Kaulbars 1987).

*Necrodes* Leach 1815; 1 sp., *N. surinamensis* (Fabricius) 1775, widespread North America (see Peck and Kaulbars 1987; Ratcliffe 1972).

*Cyclophorus* Stephens 1829

*Asbolus* Bergroth 1884

*Protonerodes* Portevin 1922

*Necrophila* Kirby and Spence 1828, 1 sp., *N. americana* (Linnaeus) 1758, widespread eastern North America (Peck and Kaulbars 1987).

subgenus *Necrophila* Kirby and Spence 1828

subgenus *Eosilpha* Semenov-Tian-Shanskij 1890

subgenus *Calosilpha* Portevin 1920

subgenus *Dentrosilpha* Portevin 1920

subgenus *Cbryosilpha* Portevin 1921

*Oiceoptoma* Leach 1815; 3 spp., eastern North America (Peck 1990; Peck and Kaulbars 1987).

*Oiceoptoma* Agassiz 1847

*Isosilpha* Portevin 1920

*Oxelytrum* Gistel 1848; 1 sp., *O. discicolle* (Brullé) 1836, southern Texas southward (Anderson and Peck 1985).

*Hypanerodes* Kraatz 1876

*Katanerodes* Schouteden 1905

*Paranerodes* Portevin 1921

*Silpha* Linnaeus 1758; *S. tristis* Illiger 1798, of Europe, established in southern Quebec (LaPlante 1997).

subgenus *Silpha* Linnaeus 1758

subgenus *Phosphaga* Leach 1817

subgenus *Ablatiaria* Reitter 1884

*Thanatophilus* Leach 1815; 6 spp., widespread North America (Anderson and Peck 1985; Peck 1990; Peck and Kaulbars 1987)

*Pseudopelta* Bergroth 1884

*Philas* Portevin 1903

*Silphosoma* Portevin 1903

*Chalcosilpha* Portevin 1926

##### Nicrophorinae Kirby 1837

##### The burying beetles

*Nicrophorus* Fabricius 1775, 15 spp., generally distributed in the U.S. and Canada (Anderson and Peck 1985; Peck 1990; Peck and Kaulbars 1987).

*Nicrophorus* Thunberg 1789 (unjust. emend. *Nicrophorus*)

*Nicrophagus* Leach 1815

*Cyrtocelis* Hope 1840

*Canthopisilus* Portevin 1914

*Necrocharis* Portevin 1923

*Necrocenus* Semenov-Tian-Shanskij 1926

*Eunicrophorus* Semenov-Tian-Shanskij 1933

*Necrocleptes* Semenov-Tian-Shanskij 1933

*Nicrophorindus* Semenov-Tian-Shanskij 1933

*Nicrophonuscus* Semenov-Tian-Shanskij 1933

*Nicropter* Semenov-Tian-Shanskij 1933

*Nesonicrophorus* Semenov-Tian-Shanskij 1933

*Nesonicropter* Semenov-Tian-Shanskij 1933

*Strictonicropter* Semenov-Tian-Shanskij 1933

*Neonicrophorus* Hatch 1946

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