Paleontology of leaf beetles

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'The rate of evolution in any large group is not uniform; there are periods of relative stability, and periods of comparatively rapid change.'
Cockerell and LeVeque, 1931

To Yenli Yeh, my beloved wife, a most wonderful person!

Abstract

The fossil record of the Chrysomelidae can be tentatively traced back to the late Paleozoic to early Mesozoic (Triassic). Mesozoic records (at least 9 subfamilies, 19 genera, and 35 species), are represented by the Sagrinae, the exclusively Mesozoic Protoscelinae, Clytrinae, Cryptocephalinae, Eumolpinae, Chrysomelinae, Galerucinae, Alticinae, and Cassidinae. Cenozoic records (at least 12 subfamilies – 63% of the extant – 121 genera, and 325 species), include the same extant subfamilies as well as the Donaciinae, Zeugophorinae, Criocerinae, and Hispinae and can be frequently identified to genus, especially if preserved in amber. Quaternary records are often identified to extant species. In total, at least 131 genera (about 4% of total extant), and 357 species (< 1%) have been reported. At least, 24 genera (< 1% of the extant) seem to be extinct.

Although reliable biological information associated with the fossil chrysomelids is very scarce, it seems that most of the modern host-plant associations were established, at least, in the late Mesozoic to early Cenozoic. As a whole, stasis seems to be the general rule of the chrysomelid fossil record. Together with other faunal elements, chrysomelids, especially donaciines, have been used as biogeographic and paleoclimatological indicators in the Holocene.

1. Introduction

The Chrysomelidae constitute one of the most abundant and diverse families of living organisms. Chrysomelids are known as leaf beetles because, at least, in one stage of their life history they feed on living plant tissues such as leaves or roots. With more than 50,000 extant, described species (Lopatin, 1984) distributed in 19 subfamilies (Seeno & Wilcox, 1982; Suzuki, 1985), this family probably ranks among the top 20 of living forms in number of species (Strong *et al.*, 1984). Based on Erwin's (1983) estimates, the number of described species will undoubtedly grow, at least, by a factor of three, although precise extrapolations are difficult (May, 1990).

Despite the abundance and awareness of leaf beetles in the present, their fossil history is little known. I am not aware of review papers on the fossil record of this family as a whole. Goecke (1943, 1960a) and Jolivet (1970) treated the fossil Donaciinae. A significant number of species descriptions date from the second half of the 1800's (e.g. Heer or Scudder, and others, in References) or treat the subject in connection with larger topics, such as the evolution of the Insecta (Carpenter, 1930, 1992; Larsson, 1978) or the Coleoptera (Crowson, 1975, 1981). This, as well as other insect families, are overlooked in a well-known invertebrate paleontology book (Moore *et al.*, 1952). Even though chrysomelids are relatively abundant in the fossil record (Ander, 1942; Villiers, 1979), many authors have noted that most specimens in collections remain undetermined (Crowson, 1981; Larsson, 1978; Lutz, 1990) probably because most specimens are known only from elytra or parts of elytra (Brodie, 1845; Debray, 1873; Martynova, 1961; Westwood, 1854).

This chapter attempts to compile our knowledge of the fossil leaf beetles and, I hope, it will serve as a supplement to the extraordinary annotated generic list of extant chrysomelids by Seeno and Wilcox (1982). This compilation is a first step towards a meaningful use of fossils integratively to assess the phylogeny of any group (Jablonski *et al.*, 1985). This paper is **not** a taxonomic revision. Since 1986, and in collaboration with other researchers, I have been working on fossil chrysomelids, particularly but not exclusively, those preserved in amber. The detailed results of those investigations will soon be submitted for publication elsewhere. Since our knowledge of fossil chrysomelids must still be regarded as incomplete and to save space, I have decided **not** to include keys to and diagnoses of the genera of fossil chrysomelids. The reader is referred to the tables and the figures, as well as to the specialized, pertinent references.

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2. A systematist's pandemonium

The effort to compile the data herein included faced many challenges. The task of sorting through the enormous, largely uncatalogued, and diversely languaged paleozoological literature proved to be huge. Paleoentomology seems to lack the very useful, species-level, global catalogues available in paleobotany (U.S. Geol. Surv., 1955, no date a, b). This situation is worsened by the frequent lack of clear indications of a geologic time frame, the variable assignment of a locality's stratum to geologic periods (Jarzembowski, 1980), and/or the question of sample purity (Kühne & Schlüter, 1985). The general topic of dating techniques has been thoroughly addressed by Dalrymple (1991). Occasionally, species are described but a family placement is not given (Zeuner, 1962). Furthermore, the depository and/or accession number of the specimens is often not stated, especially, but not exclusively, in the older papers. Knowing the collector is not necessarily a good indicator of the depository. For example, Scudder's collections of Florissant (Colorado, USA) fossils are deposited at the Museum of Comparative Zoology of Harvard University in Cambridge, MA, USA (Anonymous, 1988) but there are specimens also at the University of Colorado (Boulder, CO, USA), Princeton University (New Jersey, USA; Wickham, 1913a), the National Museum of Natural History (Washington, D.C., USA) (Grande, 1980), the American Museum of Natural History (New York, USA) and, apparently, at the Yale Peabody Museum (New Haven, CT, USA) (McLeod, pers. comm. 16 Dec. 1991). During the second half of the 19th century, bibliographic recycling (that is, the practice of having a paper published, almost unchanged, in several journals) was not uncommon, greatly complicating literature retrieval. Also, different authors entered journal citations in different, highly abbreviated, fashion. Finally, at times, the family name of an author is spelled in different ways (e.g. Rodendorf vs. Rohdendorf or Wejenbergh vs. Weyenberg or Medvediev vs. Medvedev or Martinov vs. Martynov); I choose to spell the name as it appears in the corresponding journal.)

To overcome some of these problems, several sources, such as, Commission de Stratigraphie (1956), Fairbridge and Jablonski (1979), Luttrell *et al.*, 1986, Mulvihill (1982), Pearl (1951), Porter (1983), Sustrac (1984), Ward *et al.* (1981), and Wood *et al.* (1989) were recommended to me. To obtain the full citation of many 19th century papers, I relied on, amongst others, the British Museum, Natural History (1903), Royal Society of London (1867–1921), Scudder (1882, 1890c, 1891), and Spahr (1981a). Furthermore, I conducted several computer-assisted literature searches with combinations of the key words 'Chrysomelidae', 'Coleoptera', and 'fossil', using Agricola (1970–September 1992), BIOSIS (1989–July 1993), CAB (1984–September 1992), GEOREF (1785–1992), and Life Sciences Collection (1989–June 1992). However, many papers and some taxa, hidden under articles whose main subject is fossil Coleoptera or fossil insects, may have escaped my detection. Although an invaluable and comprehensive source, the Zoological Record was only searched in part because of the projected, additional time investment required.

The taxonomy of fossil chrysomelids has several serious problems. Most of the records are very old and reflect the then available classifications or popular identification guides, such as: Fabricius (1775, 1792), Gyllenhall (1808–1827), Latreille (1819), Olivier (1791), Panzer (1795), Paykull (1800), Richardson (1837), and Ward (1776), among others. Some descriptions are very brief, for example, 'the species is very small' or 'one deeply punctured' (Hope, 1847). The quality of many descriptions and illustrations is inadequate, according to typical modern standards. However, there are some notable exceptions such as Förster (1891). Some identifications are, or were, in error (Birket-Smith, 1977; Ermisch, 1942; Oppenheim, 1887–1888), and some other classifications, such as the placement of *Phalacrus* in the Chrysomelidae (Berendt, 1845), have been abandoned by modern systems. Usually, owing to mediocre preservation, some fossils are identified, tentatively to genus, to family (Brodie, 1845; Göppert, 1855; Grande, 1980; Grimaldi & Maisey, 1990; Meunier, 1898c; Phillips, 1871; Ponomarenko & Schultz, 1988; Robert, 1838; Schawaller, 1986; Westwood, 1854) or in very general terms (Brongniart, 1827). Many others apparently have not been examined by specialists (Hieke & Pietrzeniuk, 1984). Recently, I had the opportunity to examine Scudders's collection of fossil chrysomelids deposited at Harvard University and felt that, often, it is difficult to be certain whether a piece contains a chrysomelid at all. For example, a species of *Trirhabda* has been described based on antennal segments that can barely be seen. Currently, North American members of this genus can only be distinguished from several closely related genera by the relative length of several antennal segments (Wilcox, 1965; Hogue, 1970). Whalley (1985) said about the beetles found in the Lias (= European Jurassic) of Dorset, England, 'it is difficult, in many cases impossible, to place a single elytron (or even a pair of elytra) into a modern family reliably'. For example, many of the so-called Mesozoic chrysomelids may not be chrysomelids at all. (See Illustrations.) The most dramatic known case of misidentification are the plant remains considered by Heer as insects, including chrysomelids (Birket-Smith, 1977). Birket-Smith (1977) used the Latinized phrases *nomen relictum*, or *nomina relictum*, to indicate old names that now are regarded as misidentifications. These terms do not appear in the codes of Botanical or Zoological Nomenclature. Since long ago, it has been noted that, for the most part, amber-preserved insects can be identified to extant genera (Burmeister, 1836). However, unfortunately, amber deposits tend to be biased against larger organisms. On the other hand, the preservation of insect fossils deposited in the Oligocene-Eocene (23–50 mya) rocks of Florissant is less complete.

3. The fossil record

3.1 *Paleozoic* (570 to 245 mya)

There seems to be no unequivocal fossil chrysomelid from the Paleozoic. Chrysomelids can be traced back only **tentatively** to the late Paleozoic to early Mesozoic (Triassic). This is in agreement with Rohdendorf (1956), Scudder (1887), Wootton (1981), and others, who placed the origin of the Phytophaga at the 'Permian-Triassic line'. Owing to the apparent absence of described Paleozoic fossil chrysomelids, it is very difficult to infer how common and speciose the family was in the late Paleozoic, as well as its affinities with closely-related beetles.

3.2 *Mesozoic* (245 to 66.4 mya)

There are, at least, 9 subfamilies, 19 genera, and 35 species of fossil chrysomelids reported from the Mesozoic.

Handlirsch recorded possibly the oldest known chrysomelid: *Pseudochrysomelites rothenbachi* Heer from a Trias. (=Triassic) Formation in Switzerland (Handlirsch, 1906–1908 a, b). Whether this taxon is conspecific with *Chrysomelites rothenbachi* Heer (1877), from the same formation, remains to be seen. This specimen, a right elytron (Fig. 29), is among the few Chrysomelids (or their parts) known from the Triassic. I consider this report questionable based on the lack of more conspecific material and of further study of the specimen.

Medvedev (in Rohdendorf, 1968) described several chrysomelid-like beetles that he assigned to the Protoscelinae. Protoscelines appeared in the late Jurassic and constitute the first good evidence of leaf beetles. However, 'some of Medvedev's Protoscelinae also show the long antennae and other cerambycid-like features' (Figs. 2–19; Crowson, 1975, 1981; Medvedev in Rohdendorf, 1968). The separation of cerambycid and chrysomelid lineages may date from the late Jurassic and may have been related to a division between Coniferae and Cycadeoids (cycad-like plants presumed to be ancestors of angiosperms) as basic food plants. Perhaps, protoscelines were visitors of cycads before the onset of angiosperms as has been suggested for *Trigona* bees (Ornduff, 1991). Medvedev (in Rohdendorf, 1968) believed that protoscelines are closely related to the Aulacoscelinae. Study of this material, in connection with the revision of the Aulacoscelinae, may be illuminating. Aulacoscelines, which have not yet been reported in the fossil record, are particularly interesting because they have been regarded as primarily cycad feeders (Monrós, 1954). Cycads (Stevenson, 1992) or cycadeoids were abundant in the Mesozoic, particularly in the Jurassic (Pant, 1973, 1988; Crowson, 1975, 1991), a fact that agrees with the inferred origin of the Aulacoscelinae. However, aulacoscelines not only visit cycads, but have been noted visiting, perhaps accidentally, plants in several families of angiosperms (Santiago-Blay, unpl. data). The Protoscelinae are also the first major evidence of the extinction, during the Cretaceous, of a Chrysomelidae lineage.

Eight extant subfamilies of chrysomelids are also represented in the Mesozoic fossil record: the Sagrinae, Clytrinae, Cryptocephalinae, Chrysomelinae, Eumolpinae, Galerucinae, Alticinae, and Cassidinae, most of which first appeared during the Jurassic.

The following 19 chrysomelid genera have been reported for the Mesozoic (subfamily parenthesized after a series of consubfamilials): *Mesosagrites* (Sagrinae), *Cerambyomima, Protoscelis, Protosceloides, Pseudomegamerus* (Protoscelinae), *Clytra* (as *Melolontha*?, Clytrinae), *Cryptocephalus* (Cryptocephalinae), *Eumolpites* (Eumolpinae), *Chrysomela* (most of them probably *Chrysolina* or Chrysomela *sensu lato*), *Chrysomelites, Gonioctena, Oreina, Plagiodera, Timarchopsis* (considered Coleoptera *incertae sedis*, Rohdendorf, 1957) (Chrysomelinae), *Galerucites* (Galerucinae), *Altica* (Alticinae), *Cassida, Ditomoptera* (Cassidinae), and *Mesopleurites* (uncertain subfamily placement).

Chrysomelids have been described for the Jurassic of the former Soviet Union and from western Mongolia. They are putatively similar to those present in the lower Cretaceous of those areas (Nikritin & Ponomarenko, 1991; Kukalová-Peck, 1991). Curiously, no chrysomelids were reported for the former Soviet Union in the major work by Arnoldi *et al.*, 1977.

Table 1 details the Mesozoic records and illustrations of fossil chrysomelids. Arrangement of subfamilies follows Seeno and Wilcox (1982).

3.3 *Cenozoic* (66.4 mya to the present)

There are, at least, 12 subfamilies, 121 genera, and 325 species of fossil chrysomelids reported for the Cenozoic. The newly represented subfamilies are the Donaciinae, Criocerinae, and the Hispinae. The increased number of taxa as geologic time approaches the present parallels that of many insect groups and comes as no surprise (Cockerell, 1925; Scudder, 1887). Most of the extant subfamilies of chrysomelids were represented in the Eocene (58–37 mya). Furthermore, according to Larsson (1978), many genera are represented in Cenozoic amber although relatively few have been described. Donaciines, a holartic, aquatic group (Borowiec, 1984), are the most common fossil chrysomelids (Debray, 1874). Larvae usually pupate in brown cocoons attached to the roots of their host plants, typically aquatic plants (particularly monocotyledoneous and presumed related dicots, such as the Nymphaeaceae) and not in a gas-filled chambers (Merritt & Cummins, 1984).

Interestingly, some chrysomelid subfamilies have not yet been noted for the fossil record. These are the: Orsodacninae, Megascelinae, Synetinae, Megalopodinae, Chlamisinae, and Aulacoscelinae. All but the Chlamisinae are uncommon groups and their fossils are less likely to be collected, other things being equal. The Chlamisinae are more speciose, especially in the tropics. Additional sampling effort will probably disclose exemplars of these subfamilies.

The following 121 chrysomelid genera have been reported for the Cenozoic (subfamily parenthesized after a series of consubfamilials): *Eosagra* (Sagrinae), *Donacia, Donaciella, Eodonacia, Haemonia, Hemidonacia, Macroplea, Neohaemonia, Plateumaris, Sominella* (Donaciinae), *Zeugophora* (Zeugophorinae), *Crioceridea, Criocerina, Crioceris, Electrolema, Lema* (many now placed in *Lema sensu lato*, Criocerinae), *Clytra, Clytrina, Labidostomis, Saxinis, Smaragdina?* (Clytrinae), *Cryptocephalites, Cryptocephalus, Pachybrachis* (Cryptocephalinae), *Adoxus, Bromius, Chalcosycia, Colaspis, Colasposoma, Eoeumolpinus, Eumolpites, Eumolpus, Graphops, Metachroma, Nodostoma, Pachnephorus, Profidia, Pseudocolaspis* (Eumolpinae), *Calligrapha, Chrysochloa* (valid name is *Oreina*), *Chrysolina, Chrysomela* (many of the species now placed in *Chrysolina* or *Chrysomela sensu lato*), *Chrysomelites, Chrysothoracus, Colaphellus, Crosita?, Eochrysomela, Eomelasoma, Gastroidea, Gonioctena, Gonocelis, Halocoleus, Hemisphaerocosites, Hydrothassa, Lina, Melasoma* (valid name is *Chrysomela*), *Oreina, Phaedon, Phratora, Phyllodecta* (valid name is *Phratora*), *Plagiodera, Prasocuris* (=*Hydrothassa*?), *Stenoplatys?, Strichosa, Zygogramma, Timarcha, cf. Zygospila* (Chrysomelinae), *Adimonia?, Agelasa, Agelastica, Diabrotica, Eogaleruca, Galeruca, Galerucella, Hadroscelus, Leptonesiotes, Lochmaea, Luperodes, Luperus, Monolepta, Ophraella, Pyrrhalta, Scelolyperus, Trirhabda* (Galerucinae), *Altica, Aphthona, Apteropeda, Asiorestia* (as *Crepidodera*), *Chaetocnema, Docemina* (as *Docemines*), *Hippuriphila, Longitarsus, Mantura, Ochrosis, Oedionychus, Oryctocirtites, Plectrotetrophanes, Prochaetocnema, Psylliodes, Systena, Walterianella* (Alticinae), *Anisodera, Anoplitis* (a synonym of *Chalepus*, many species listed in *Anoplitis* belong in *Sumitrosis*, both are New Word genera), *Chalepus, Dicladispa, Hispa, ca. Microrhopala, Odontota, Oposispa, Protanisodera, Sucinagonia* (Hispinae), *Acassidites, Callistaspis, Cassida, Coelocassida, Delocrania, Eocassida, Inclusus, Mesomphalia, Oligocassida*, and *Paracassida* (Cassidinae).

Table 2 details the Cenozoic fossil chrysomelids find and illustrations. The arrangement of subfamilies follows Seeno and Wilcox (1982). *Airaphilus* Redtenbacher, 1858 (see Ermisch, 1942) and *Phloeonemites* Wickham, 1912, both mentioned by Carpenter (1992), are reported to belong in the Cucujidae and Colydiidae, respectively.

4. Extinctions and changes in geographical distribution

The following 24 genera (<1% of the extant) are possibly extinct: *Eosagra* Sagrinae), *Criocerina, Electrolema* (Criocerinae), *Clytrina* (Clytrinae), *Cryptocephalites* (Cryptocephalinae), *Eoeumolpinus, Eumolpites* (Eumolpinae), *Chrysomelites, Eochrysomela, Gonocelis, Halocoleus, Hemisphaerocosites* (Chrysomelinae), *Galerucites, Hadroscelus* (Galerucinae), *Oryctoscyrtetes Plectrotetrophanes* (Alticinae), *Sucinagonia, Oposispa, Protanisodera* (Hispinae), *Acassidites, Callistaspis, Coelocassida, Eocassida*, and *Inclusus* (Cassidinae) (cf. Seeno & Wilcox, 1982). However, further studies may disclose members of some of these genera still living today, particularly in the tropics (Gressitt, 1963). Also, after revisionary works, many of these 'extinct' genera may actually be classified as members of extant genera.

Other genera seem to have become rare or extinct in areas that they previously occupied. For example, *Delocrania* (Cassidinae) (Farell *et al.*, 1992; Morell, 1992) *Leptonesiotes* Galerucinae), and *Walterianella* (Alticinae) have been found in Dominican amber but they have not been reported for the extant Hispaniolan chrysomelid fauna.

Insect low extinction ratio over evolutionary time (Labandeira and Sepkoski, 1993) may serve as a baseline of comparison with modern, mostly anthropically-caused, extinction rates.

5. Biogeography and paleoclimatology

Fossils provide factual data on where taxa lived in the past (Schwert & Ashworth, 1988). Also, they document places where large **faunas** that once existed are now absent (Heer, 1876).

One of the best examples is the entomofauna of the Shanwang fossil beds (mid Miocene), located in the

People's Republic of China. This deposit shares less taxa with its extant local counterparts. However, when compared with younger fossil beds, the Shanwang shows the strongest affinities with the Florissant (late Oligocene), and less similarities with the Baltic fauna (late Eocene to early Oligocene) (Zhang, 1989). This broad Holarctic biotal similarity has been noted repeatedly for many other groups (e.g. Ornduff, 1974).

In general, the fossil record of chrysomelids appears to be dominated by relative stasis, with occasional spurts of extinctions in some groups and speciation in others. For instance, the donaciine fossil species, *Plateumaris primaeva* (Wickham, 1912) and *Donacia wightoni* (Askevold, 1990a), members of inferred relatively derived groups, have not changed much morphologically, suggesting relative stasis (Askevold, 1990a, 1991). The origin of the lineage comprising these species groups has been dated at, approximately, 40–60 mya (Askevold, 1991).

Owing to the lack of geologic series of any chrysomelid taxon, the stratophenetic method of circumscribing taxa and suggesting classifications (Gingerich, 1979) is of little use for the family. Others, such as Stevens (1980) believed that the fossil record is almost useless in cladistic analyses due to its incompleteness. In addition, some have said that, even assuming a perfectly complete fossil record, it would be impossible to infer a logically necessary ancestor-descendant relationship among three or more taxa because the spatio-temporal connection between fossils is a construct that investigators overlay to the specimens. The consequences of this kind of epistemology are fatal to anyone trying to do historical reconstructions.

Insect assemblages, including chrysomelids, have been used to assess paleoenvironmental conditions and community structure (Ashworth *et al.*, 1981; Böcher, 1989; Elias, 1982, 1985, 1991, 1992; Elias & van Devender, 1990; Elias *et al.*, 1992; Fujiyama, 1980; Kimoto, 1981; Nasarow, 1984; Nel, 1988; Schwert & Ashworth, 1988, 1990; Schwert & Morgan, 1980; Whitehead, 1989; and many others). Dispersal allows insects to satisfy their ecological and physiological requirements (Coope, 1970; Elias, 1991; Schwert & Ashworth, 1988, 1990). Apparently, judging from the places chrysomelids have lived, ecological requirements have remained similar to those of modern faunas (Ashworth & Hoganson, 1983; Coope, 1970, 1978, 1979a, 1979b; Zhang, 1989). Evidently, chrysomelids and many other insects, have adapted to this by shifting their geographical ranges. Kimoto (1981) used donaciines and Nel (1988) hispines to assist determining paleoenvironmental conditions. However, similarity of faunas is not necessarily an indication of synchronous climate resemblance (Wickham, 1917). Faunal data, together with pollen analyses, are more reliable for inferring paleoclimatological variations, such as in North America (Baker *et al.*, 1991; Elias & Short, 1992; Elias & Van Devender, 1992; Elias *et al.*, 1986; Elias & Wilkinson, 1983; Morgan *et al.*, 1986; Pearson, 1962; Pilny & Morgan, 1987; Schwert, 1992; Short & Elias, 1987; Short *et al.*, 1992), Chile (Hoganson & Ashworth, 1992), Europe (Pearson, 1962; Ponel & Coope, 1990); and in the former Soviet Union (Rohdendorf *et al.*, 1980). Some recent distribution patterns of beetles, including chrysomelids, have apparently developed only since the Quaternary (Ashworth & Hoganson, 1987; Girling, 1976, 1977, 1978; Kenward, 1978).

In spite of large climatic oscillations, there seems to have been little modification of the Chrysomelidae during the Cenozoic; the most dramatic change is the apparent extinction of several genera, including some known only from the Cenozoic (Coope, 1978, 1979a, 1979b). However, due to dispersal, extinction is not a necessary an indication that the extant fauna is only a remnant of a putatively much larger fauna (Askevold, 1991). For example, *Hemidonacia insolita*, does not occur today in the western Paleartic region where the fossils were found (Askevold, 1991).

6. Feeding preferences and other biological features

The biological information inferred from the available data suggests that the chrysomelid-plant associations were established, at least, in the late Mesozoic to early Cenozoic. However, it is 'difficult to say what leaves they [phytophagous insects, including chrysomelids] had fed upon' (Heer, 1876). Some donaciines from the Paleocene were found associated with water-lily fossils (Nymphaeaceae) (Uhmann, 1939). Recent donaciines are common inhabitants of water lilies and other aquatic plants (Schneider & Moore, 1977). Probably due to the co-occurrence of fossil plants and fossil chrysomelids, Heer (1876) speculated that species of *Donacia* would have been found 'sitting on flowers of rushes' and feeding on *Juncus*, while *D. palaemonis* Heer apparently fed on reeds and rushes. *Plateumaris braccata* (Scopoli, 1772) lived on *Iris pseudoacorus* (Pawłowski *et al.*, 1987) and *D. tomentosa* possibly lived on *Butomus umbellatus. Lema vetusta* Heer (Criocerinae) probably lived on liliaceous plants (Heer, 1876). *Gonioctena curtisi* Oustalet, 1874 (Chrysomelinae) fed on *Populus* spp. like the extant *G. decemnotata* Marsham (= *G. rufipes* DeGeer). Heer (1872, 1876) suggested that *C. calami* Heer fed on rosales and spent time 'sunning themselves on reeds' and that *Chrysomela populeti* (Heer) (as *Lina*) most probably ate poplar and willow leaves (Heer, 1876). *Phyllobrotica* (Galerucinae) beetles and the Labiaceae host plants are believed to have been associated, at least, since the mid-Tertiary (Farrell & Mitter, 1990). Eggs of alticines, perhaps *Altica*, have been found on fossilized, middle Eocene *Alnus* (Betulaceae) leaves, a host-plant relationship that still persists (Lewis & Carroll, 1991). '*Anoplitis*' *bremii* Heer (Hispinae) is presumed to feed on pomaceans (Rosaceae), such as *Pyrus* and *Amelanchier*, in the Tertiary of Switzerland and *Cassida hermione* Heer, 1847 and *C. blancheti* Heer, 1856a possibly fed on thistles (Asteraceae) (Heer, 1876).

Some host plant information seems to lack credibility. For example, according to (Bachofen-Echt, 1949), *Electrolema baltica* Schaufuss, 1892 'apparently lived in the needles of the amber tree'. This species possibly did not live in association with the amber tree because many Criocerinae are associated with monocots and, occasionally, with dicots (Larsson, 1978; Schmitt, 1988). The same probably holds true for the elytra of *Plateumaris discolor* (Panzer, 1795) that have been associated with glacial deposits containing remains of *Pinus* (Pinaceae), *Populus* (Salicaceae), and *Alnus* (Lortet & Chantre, 1872). Many chrysomelids that have been found in amber more likely got stuck in the resin (Poinar, 1992) and were not associates of the resin-producing plant.

Very little information is known or has been inferred about other aspects of the biology of fossil chrysomelids (Scudder, 1887; Heer, 1872, 1876). Donaciines are the most common identifiable chrysomelids in the Cenozoic, particularly the Quaternary deposits and, as their extant counterparts, they have been assumed to be aquatic (Blair, 1923–1924). Heer (1876) noted that, surprisingly, donaciines were rare in the chrysomelid-rich deposits of Lake Oeningen, in Switzerland. Amber preservation is so good that identified larvae have occasionally been mentioned, such as three *Chrysomela* (*sensu lato*, Menge, 1856) and cocoons of *Donacia* (Henriksen, 1914). A larval case assigned to *Clytra carbonaria* Heyden is illustrated showing that this feature of its life history was fully developed millions of years ago (Heyden & Heyden, 1865). I have seen larval cases that probably belong in one of the subfamilies in the old Camptosomes or Camptosomata.

There is almost no data available on the terrestrial biomes that fossil chrysomelids inhabited. *Pachybrachis* sp. (Cryptocephalinae), *Strichosa eburata* Blanch. (Chrysomelinae), several species of *Altica* and other alticines, as well as a species in a genus close to *Asiorestia* (Alticinae) have been associated with Quaternary forest vegetation; other genera have been connected with aquatic/shoreline vegetation (Hoganson & Ashworth, 1992).

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Table 1. Mesozoic records of fossil Chrysomelidae

Taxon, author, year	Period	Location	Depositories, references, other
Sagrinae			
Mesosagrites multipunctatus Martynov, 1935 (Fig. 1)	Lower Jurassic	*ca.* village of Sukhomesovo, Tcheliabinsk district, former Soviet Union	type: no 33, only known from a single damaged elytron, doubtful placement; Hennig, 1981
Protoscelinae			
Cerambyomima longicornis Medvedev (*in* Rohdendorf, 1968) (Fig. 2)	Jurassic	Kara Tau, Kazaktstan, Central Asia	speciments 2066/3241 at Paleontology Institute of the Academy of Sciences, Moscow
Protoscelis jurassica Medvedev (*in* Rohdendorf, 1968) (Figs. 3–10)	Jurassic	Kara Tau, Kazaktstan, Central Asia	specimens 2066/3311, 2066/3000, 2239/923, 2239/1342, and 2384/770 at Paleontology Institute of the Academy of Sciences, Moscow; Crowson, 1975, 1981
Protosceloides nitidicornis Medvedev (*in* Rohdendorf, 1968) (Fig. 12–14)	Jurassic	Kara Tau, Kazaktstan, Central Asia	specimen 2066/3311 at Paleontology Institute of the Academy of Sciences, Moscow
P. parvula Medvedev (*in* Rohdendorf, 1968) (Fig. 11)	Jurassic	Kara Tau, Kazaktstan, Central Asia	specimen 2066/2593 at Paleontology Institute of the Academy of Sciences, Moscow
Pseudomegamerus grandis Medvedev (*in* Rohdendorf, 1968) (Figs. 15–17)	Jurassic	Kara Tau, Kazaktstan, Central Asia	specimens 2066/2593 at Paleontology Institute of the Academy of Sciences, Moscow
Clytrinae			
Clytra sp. (as *Melolontha*?)	Jurassic	West Cracombe, Worcestershire, England	Phillips, 1871
Cryptocephalinae			
Cryptocephalus antiquus Weyenbergh, 1869a (Fig. 18)	Jurassic	Solnhofen, Bavaria	Weyenbergh, 1869a, 1869b, 1874
C. mesozoicus Weyenbergh, 1869a (also as Cryptocephalus mesozoïcus) (Fig. 19)	Jurassic horizon	Solnhofen, Bavaria	some specimens at Paleontology Museum, Munich; Meunier, 1898c; Oppenheim, 1887–1888; Weyenbergh, 1869a, 1869b
Cryptocephalus sp.	not found	Oölite of Bavaria; England	Scudder, 1887
Eumolpinae			
Eumolpites jurassicus Martynov, 1926 (Fig. 20)	Jurassic	slates of east Kara Tau Kazaktstan, Central Asia	collections of the Geological Committee former Soviet Union; possibly not a chrysomelid (Crowson, *pers. comm.* Jan. 1993)
Eumolpites liberatus Heer, 1865 (Fig. 21)	Jurassic to Tertiary	Switzerland	Heer, 1872, 1876
Eumolpites sp.	Lias (Jurassic)	Schabelen, England	Heer, several papers; Scudder, 1887
possible Eumolpinae, resembling *Pilacolaspis* (Figs. 240, 241, the later a SEM from a silicon rubber cast)	Upper Cretaceous	Hawkes Bay, New Zealand	New Zealand Geological Survey Coll. (AR 1421); Craw and Watt, 1987
Chrysomelinae			
Chrysomela andraei Brodie, 1845 (valid name for many species on this genus is *Chrysolina*)	Lower Lias (= European Jurassic) horizon	Forthampton, England,	Giebel, 1856; Scudder, 1887
C. dubia Westwood, 1854	lower Purbecks horizon, Jurassic?	Durdlestone Bay, England	Giebel, 1856
C. dunkeri Westwood, 1854	lower Purbecks horizon, Jurassic?	Durdlestone Bay, England	Giebel, 1856

Table 1. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
C. ignota Westwood, 1854	lower Purbecks horizon, Jurassic?	Durdlestone Bay, England	Giebel, 1856
Chrysomela spp.	Lias horizon (Jurassic)	Oölite, Bavaria; and England	Heer, 1876, 1879, 1883b; Scudder, 1887
Chrysomelites jurassicus Oppenheim, 1887–1888 (Figs. 22–23) (Fig. 22 from Meunier, 1898c).	Jurassic	Eichstätt, Bavaria	some specimens at Paleontology Museum, Munich; Meunier, 1898c
C. liasina Brodie, 1845	Lower Lias horizon (Jurassic)	Hasfield, England	Giebel, 1856
C. lithographica Weyenbergh, 1869a (Figs. 24, 25)	Jurassic horizon	Solnhofen, Bavaria	Weyenbergh, 1869b, 1874a, 1874b
C. macrothoracicus Oppenheim	Mesozoic	possibly Eichstätt, Bavaria, Germany	some specimens at Paleontology Museum, Munich; Meunier, 1898c
C. minima Oppenheim, 1887–1888 (also as *Chrysomelites minimus*) (Fig. 26)	Jurassic horizon	Eichstätt, Bavaria	some specimens at Paleontology Museum, Munich; Scudder, 1891; Meunier, 1898c
C. prodromus Heer, 1865 (Fig. 27)	Lias horizon (Jurassic)	Schambelen, Switzerland	Heer, 1872, 1876, 1879, 1883b; Scudder, 1885, 1886
C. rura Weyenbergh, 1869a (also as *Chrysomela rara*) (Fig. 28)	Jurassic horizon	Solnhofen, Bavaria	Weyenbergh, 1869b, 1874
C. rothenbachi Heer, 1877 (=? *Pseudochrysomelites rothenbachi*) (*Fig. 29*)	Trias. (= Triassic) horizon	Rütihard, Basel, Switzerland,	Handlirsh 1906–1908a, b
Chrysomelites sp.	Triassic; Lias (Jurassic)	Lettenkohle of Rütihard, Basel; England, Schambelen	Heer, 1876, 1879, 1883b; Scudder, 1887
Gonioctena curtisii Oustalet, 1874 (*Gonictena* and *Gonictema* are mispellings)	not found	not found	Flach, 1884
Oreina sp.	Oligocene to Miocene	Germany	Förster, 1891; Heer, 1847
Plagiodera sp.	Oligocene	France; Germany	Heyden and Heyden, 1866; Théobald, 1937
Timarchopsis czckanowskii Brauer, Redtenbacker, and Ganglbauer, 1859	Lias (Jurassic) horizon	Ust Balei, Siberia	considered Coleoptera *incertae sedis*, Rohdendorf, 1957; according to Jolivet, *pers. comm.* it resembles *Timarcha.*
Galerucinae			
Galerucites carinata Oppenheim, 1887–1888 (also as *G. carinatus*) (Fig. 30)	Jurassic horizon	Kelheim, Bavaria	some specimens at Paleontology Museum, Munich; Meunier, 1898c; Oppenheim, 1887–1888; Scudder, 1891; possibly a heteropteran
Alticinae			
Altica sp.	Lower Purbecks horizon, Jurassic?	Durlestone Bay, England	Westwood, 1854
Cassidinae			
Cassida aequivoca Weyenbergh, 1869a (Fig. 31)	Jurassic horizon	Solenhofen, Bavaria	Giebel, 1856; Handlirsch, 1906–1908a, 1906–1908b; Scudder, 1891; Weyenbergh, 1869b, 1874
Cassida nr. *meridionalis*	not found	not found	Serres, 1829
C. nr. *viridis* (Dejean)	not found	not found	Serres, 1829
Cassida sp.	not found	Oölite of Bavaria	Scudder, 1887
Ditomoptera dubia Germar, 1839	Jurassic horizon	Solenhofen, Bavaria, Germany	a synonym of *Ditomoptera dubia* Deichmüler 1896; Assmann, 1870; Giebel, 1852; Oppenheim, 1887–1888; Weijenbergh, 1869b

Table 1. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Uncertain subfamily placement			
Mesopleurites jurasicus Martynov, 1926	Jurassic	Malm of Karatau, former Soviet Union	Rohdendorf, 1962
Unidentified "chrysomelids" (Fig. 32)	Lias (Jurassic) horizon	Apperley, Eyeford, Forthampton, Hasfield, Stonefield Slate, England	Brodie, 1845; Phillips, 1871

Table 2. Cenozoic records of fossil Chrysomelidae

Taxon, author, year	Period	Location	Depositories, references, other
Sagrinae			
Eosagra obliquata Haupt, 1950 (Fig. 33)	Tertiary to middle Eocene	Geiseltal, Germany	specimens 2610, 5871; Crowson, 1975
E. subparallela Haupt, 1950 (Figs. 34–36)	Tertiary to middle Eocene	Geiseltal, Germany	specimens 1249, 1858, 2205, 2302, 2485, 2654, 2720, 3303, and 3385; Crowson *et al.*, 1967
Eosagra sp. (Figs. 37–39)	Eocene	Geiseltal, Germany	types, G 55/85, 86ab, 87, 88; others specimens: G 55/89-55/94, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Haupt, 1956; Zherikhin, 1970
Donaciinae			
Donacia aquatica Linné, 1758 (also as *D. acuatica*)	Quaternary	West Cumberland, England; widespread in Findland; Schonen, Sweden; Denmark and southern Sweden	(=? *D. dentipes* Fabricius); Henriksen, 1933; Kurck, 1917; Pearson, 1962 Poppius, 1911
D. aequalis Say	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
D. bidens Olivier	Quaternary	Schonen, Sweden	Kurck, 1917
D. bicolor Zschach, 1788 (Fig. 41) (also as *D. bicolora*)	Holocene	West Cumberland, England; Belorussia, former Soviet Union	some specimens probably at Paleontological Institute of the Academy of Sciences, Moscow; Goecke, 1943; Nasarow, 1984; Pearson, 1962
D. biimpressa Melsch.	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
D. brevicornis Ahrens, 1810	Quaternary	southeast Finland	Poppius, 1911
D. cincticornis Newman or *D. proxima* Kirby	Holocene	Gervais Formation, Minnesota, USA	Ashworth, 1980
D. conelli Cockerell, 1927	Pleistocene	interglacial, Cordova Bay, Victoria, Vancouver Island, Canada,	Goecke, 1960a; Wickham, 1933
D. (Donacia) *crassipes* Fabricius, 1775 (possible mispelled as *D. cryssipes* in Nasarow, 1984)	Quaternary	Mundesley, England; Vanne, France; Denmark and southern Sweden; Nordost Seeland, Denmark; Sumpfland-Fauna; mid-Finland	some specimens probably at the Paleontomological Institute of the Academy of Sciences, Moscow (9/274); Bell, 1888; Fliche, 1876; Henriksen, 1933; Jessen, 1920; Meunier, 1901; Poppius, 1911; Nasarow, 1984; Schäff, 1892

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
D. curticollis Haupt, 1956 (= *D. geiseltali* Goecke, 1959?)	Eocene	Geiseltal, Germany	type, G 55/76, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
D. dentata Hoppe, 1795	Quaternary	Denmark and southern Sweden; Nordost Seeland, Denmark	Henriksen, 1914, 1933; Jessen, 1920
D. disjecta Förster, 1891 (Fig. 42)	Oligocene	Brunnstadt Alsace-Lorraine, France	Goecke, 1960a; Théobald, 1937
D. distincta LeConte, 1850 (Fig. 43)	Quaternary	Lake Agassiz, Minnesota, USA; Umiakoviarusek, Northeastern Labrador, Canada; Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Ashworth, *et al.*, 1972; Elias, 1982; Pilny and Morgan, 1987
D. dubia Théobald, 1937 (Fig. 242)	Oligocene	Kleinkembs, France	R 698, Coll. Mieg du Museum de Bâle; Théobald, 1937
D. elongatula Scudder, 1900 (Fig. 44)	Pleistocene	Fort River, Hadley, Old Hampshire Co., Massachusetts, USA	Goecke, 1943, 1960a; Scudder, 1898, 1900; Wickham, 1920
D. extincta Kolbe, 1933	Quaternary	spätglacial, Toppeladugard, Sweden; Denmark and southern Sweden;	Goecke, 1960a; Holst, 1908; Henriksen, 1933; no. 11
D. fennica Paykull, 1800	Pleistocene	Hösbach in Bayern	Flach, 1884, Meunier, 1901
D. cf. *fuegens* LeConte	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
D. genin Mortillet, 1850 (also as *D. genini*)	Quaternary	Sonnaz, France	Goecke, 1960a; Meunier, 1884
D. hirticollis Kirby	late Quaternary	False Cougar Cave, Boreal Montana, USA	Elias, 1991
D. hydrocaridis? Fabricius	Quaternary	south Schonen, Sweden	not found
D. impressa Payskull, 1799	Quaternary	Schonen, Sweden; Denmark and southern Sweden	Andersson, 1889; Kurck, 1917; Henriksen, 1933
D. jaroslavii Lomnicki, 1894 (Fig. 45)	Pleistocene	Ozokerritton, Baryslaw, Galizien, Poland	Goecke, 1943, 1960a
D. laevicollis? Thomson	Quaternary	south Schonen, Sweden	Andersson, 1889
D. letzneri Assmann, 1870 (=? *D. limbata* Panzer) (Fig. 46)	Oligocene	Schossnitz, Schlesien, Germany	Goecke, 1943, 1960a
D. lignitum Sordelli, 1882 (Fig. 47)	Pleistocene	Leffe, Italy	Goecke, 1943, 1960a
D. limbata (=? *D. lemnae* Fabricius)	not found	Lombardia, Italy	Sordelli, 1882a
D. marginata Hoppe, 1795	Holocene	West Cumberland, England; Belorussia, former Soviet Union	some specimens probably at the Paleontomological Institute of the Academy of Sciences, Moscow; Nasarow, 1984; Pearson, 1962
D. menyanthidis Fabricius	Quaternary	Greifswald, Germany	Chamisso, 1824; Schaff, 1892
D. minuta Haupt, 1956 (Fig. 48)	Eocene	Geiseltal, Germany	type, G 55/78, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
D. obtusa Haupt, 1956 (also as *D. obstusa*)	Eocene	Geiseltal, Germany	type, G 55/77, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
D. obscura (also as *D. oscura*) Gyllenhal, 1813 (Fig. 49)	Quaternary	West Cumberland, England; Hösbach, Bayern, Germany; valley of the Seine, Paris; Denmark, Schonen and southern Sweden; widespread in Finland	Flach, 1884; Goecke, 1943; Henriksen, 1933; Holst, 1908; Jessen, 1932; Kurck, 1917; Lesne, 1925; Meunier, 1901; Pearson, 1962; Poppius, 1911; Westergard, 1912
D. palaemonis Heer, 1847 (Fig. 50)	Miocene	Lake Oeningen, Baden, Germany	Giebel, 1852; Goecke, 1943, 1960a; Heer, 1847, 1876, 1883b
D. parvula Heer, 1870 ("*nomina relictum*", Birket-Smith, 1977) (Figs. 51, 88 A-D; Fig. 50 from Goecke, 1943; others from Birket-Smith, 1977)	Eocene to Miocene	Spitsbergen, Grönland	Goecke, 1943, 1960a
D. piscatrix Lacordaire	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
D. pitoni Goecke, 1959? (= *D. antiqua* Piton (*in* Piton and Théobald, 1935) (Fig. 40)	Miocene to Quaternary	Cinérites de Varennes, L'Auvergne, Masif Central, France	no. 6, Station Limnologique de Besse; a *Donacia antiqua* has already been named!; Kunze, 1818; Goecke, 1960a
D. polita Kunze, 1818	Quaternary	Belle-Ile	Lesne, 1918a, b
D. pompatica Scudder, 1890b (Fig. 52) [(close to *D. pubicollis* (Suffrian, 1872)]	Quaternary	interglacial deposits: Scar.-borough, Ontario; Cordova Bay, Victoria, Vancouver Island, Canada,	variable in color, from purple to green, specimens 14566, 14577, 14582, 14573, and 14581; Cockerell, 1927; Goecke, 1943, 1960a; Scudder, 1890b, 1895a 1895; Wickham, 1920
D. proxima Kirby	Quaternary	Illinois, USA; Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny nad Morgan, 1987; Baker, 1920; Wickham, 1927
D. pterobrachys Haupt, 1956 (also as *D. pterobrachis*) (Fig. 53)	Eocene	Geiseltal, Germany	type, G 55/80, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
D. pubescens LeConte	Holocene	Lake Agassiz, Minnesota, USA	Ashworth *et al.*, 1972
D. pusilla LeConte	Holocene	Umiakoviarusek, Northeastern Labrador, Canada	Elias, 1982
D. rottensis Goecke, 1960b	Oligocene	Rott, Germany	not found
D. sagittariae Fabricius, 1792 [=? *Donacia aurea* Hoppe, =? *D. bicolora* Zschach, 1788] (Fig. 54)	Pleistocene	Pre- and Interglacial, Launberg, Elbe; Hösbach, Bayern, Germany	Flach, 1884; Meunier, 1900, 1901
D. semicuprea Panzer, 1795 (Fig. 55)	Quaternary	Denmark and southern Sweden; Belorussia, former Soviet Union	some specimens probably at the Paleontomological Institute of the Academy of Sciences, Moscow; Goecke, 1943; Henriksen, 1933; Jessen, 1932; Nasarow, 1984
D. simplex Fabricius, 1775 [? *D. linearis* Hoppe 1795]	Pliocene – Quaternary	Wester Cumberland peat, Wolvercote, Oxfordshire, Norfolk forest bed (preglacial), and Mundesley, England; Dogger Bank, North Sea, long. 2–5° E, lat. 54–56° N, *ca.* 200 km NNE London; Denmark and southern Sweden; Poland?	some specimens possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Bell, 1888; Bell and Bell, 1873; Blair 1923–1924; Pawlowski *et al.*, 1987; Pearson, 1962; Poulton, 1923–1924; Reid, 1890; Sordelli, 1882; Whitehead, 1920
D. simittiana Heer, 1870 ("*nomina relictum*", Birket-Smith, 1977) (Figs. 56 and 89)	Eocene to Miocene	Spitsbergen, Grönland	Goecke, 1943, 1960a

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
D. sparganii Ahrens, 1810	Quaternary	Denmark and southern Sweden	Henriksen, 1914, 1933; Jessen, 1920, 1923
D. spinosa DeGeer (=? *D. crassipes* Fabricius, 1792)	Quaternary	Schonen, Sweden	Andersson, 1889; Henriksen, 1914, 1933; Kurck, 1917
D. splendida Théobald (*in* Piton and Théobald, 1935) (Fig. 57)	Miocene to Quaternary	L'Auvergne, Masif Central, France	no. 14, 21, Coll. L. Piton; Goecke, 1960a
D. statzi Goecke, 1943 (Fig. 58)	Eocene	Germany	Goecke, 1960a
D. stiria Scudder, 1890b (Fig. 59)	Quaternary	Interglacial clays near Scarborough, Ontario and Leda, Ottawa, Canada	Goecke, 1943, 1960a; Scudder, 1890a, b, 1892, 1895a; Wickham, 1920
D. stirioides Wickham, 1917 (also as *D. styrioides* in same paper)	Pleistocene	Sangamon peat, Sangamon River, near Mahomet, Champaign Co., Illinois, USA	National Museum of Natural History (NMNH = USNM), Washington, D. C., USA; Wickham, 1920; Goecke, 1960a
D. subtilis group	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
D. tenuipunctata Théobald (*in* Piton and Théobald, 1935) (Fig. 60)	Miocene to Quaternary	Cinérites du lac Chambon, L'Auvergne, Masif Central, France	no. 12, deposited at Collection Théobald; Goecke, 1960a
D. thalassina Germar, 1811	Quaternary	Wester Cumberland, England; Hösbach in Bayern, Germany; Denmark and southern Sweden; Belorussia, former Soviet Union	some specimens probably at the Paleontomological Institute of the Academy of Sciences, Moscow; Andersson, 1889; Flach, 1884; Henriksen, 1933; Holst, 1908; Kurck, 1917; Meunier, 1901; Nasarow, 1984; Pearson, 1962
D. near *thalassina* Germar, 1811	Quaternary	central and southern Finland	Poppius, 1911
D. thyphae Ahrens	Quaternary	south Schonen, Sweden	Andersson, 1889
D. versicolorea Brahm, 1790 (=? *D. bidens* Olivier)	Quaternary	Denmark and southern Sweden	Andersson, 1889; Henriksen, 1933
D. vicina Haupt, 1956 (= D. haupti Goecke, 1959?) (Figs. 61–62)	Eocene	Geiseltal, Germany	type, G 55/75, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
D. voigti Goecke, 1943 (Fig. 63)	Eocene	Geiseltal, Germany	Goecke, 1960a
D. vulgaris Zschach, 1788 (=? *D typhae*)	late Pliocene – Quaternary	West Cumberland, England; Dogger Bank, North Sea, long. 2–5° E, lat. 54–56° N, *ca.* 200 km NNE London; Denmark and southern Sweden	Andersson, 1889; henriksen, 1933; Pearson, 1962; Whitehead, 1920 Whitehead and Goodchild, 1909, fed on *Typha*
D. weigelti Goecke, 1943 (Fig. 64)	Eocene	Gieseltal, Germany	Goecke, 1960a
D. weylandi Goecke, 1960b	Oligocene	Rott, Germany	not found
D. (*Donacia*) *wightoni* Askevold, 1990a	Paleocene	Paskapoo Formation, Alberta, Canada	University of Alberta Paleontological Collec. 5566(407); oldest known fossil donaciine
Donacia spp.	lower Oligocene to Quaternary	West Cumberland, Lancashire, England; Mooren von Nordost-Seeland and interglacial of Denmark; La Taphanel, Massif Central and Interglacial, Lauenberg,	specimens at Quaternary Entomology Section, University of Birmingham, England; others possibly at Institute of Systematic; others Experimental Zoology, Polish Academy of Sciences, Kraków; Coll. Berlin; and at the insti-

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
		Elbe, France; Brackwassertorf, Nykerk, The Netherlands; Glacial Wanne-Eickel, Posen, Cottbus, Germany; Baltic amber, Russia and Poland; Dogger Bank, North Sea, long. 2–5° E, lat. 54–56° N, Poland?; *ca.* 200 km NNE London; Denmark and southern Sweden; nordost Seeland, Denmark; Schonen, Sweden; Lake Oeningen and interglacial, Gondiswill-Zell, Switzerland; Villechétif and Vanne, France; Re in Val Vigezo, Italy; Donnaz, Leffe, Val Gandino, older formation of Schossnitz, Oeningen, Sitzerland, and Spitzbergen; many extant species from multiple European localities; Nushagak and Holitna lowlands, southwest Alaska; Innerkip, Ontario, Canada; Lamb Spring site, Colorado; Wedron, Illinois; Norwood, south-central Minnesota; Gervais Formation, Minnesota; Winter Gulf site, *ca.* North Collins, New York; Missouri Coteau, North Dakota; Kewaunee, Wisconsin, USA	tute of Arctic and Alpine Research, Boulder, CO, USA; Ashworth, 1972b, 1980; Ashworth and Schwert, 1992; Ashworth and Brophy, 1972, 1981; Bell and Bell, 1873; Benassi, 1896; Budde, 1937; Elias and Nelson, 1989; Elias and Wilkinson, 1983; Fliche, 1876; Förster, 1891; Garry *et al.* 1987; Garry *et al.*, 1990 Goecke, 1943; Hartz, 1902, 1909; Hartz and Milthers, 1901; Heer, 1876; Helm, 1896; Henriksen, 1914; Hieke and Pietrzeniuk, 1984; Jensen, 1920; Jentzsch, 1910; Klebs, 1910; Kurck, 1910, 1917; Lyell, 1840; Meunier, 1900, 1901; Nehring, 1895; Pawłowski *et al.*, 1987; Pearson, 1962; Pilny and Morgan, 1987; Ponel and Coope, 1990; Puni, 1881; Rostrup, 1859; Schwert and Morgan, 1980; Scudder, 1887; Short and Elias, 1987; Short *et al.*, 1992; Spahr, 1981b; Studer, 1920–22; Westergard, 1912; Whitehead, 1920; in many fragments of elytra; some specimens at the Quaternary Entomology Laboratory, University of Waterloo, Canada; Department of Biology, University of Wisconsin, River Falls, USA
Donacia sp., larvae and pupae (Figs. 65–66)	Eocene	Geiseltal, Germany	Haupt, 1956; "holotypus" G 55/83, 84 Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
Donaciella cinerea herbst, 1784 (=? *D. hydrocharidis* Fabricius)	Quaternary	Denmark and southern Sweden; Switzerland	Possibly at Institute of Alpine and Arctic Research, Boulder, CO, USA; Elias and Wilkinson, 1983; Henriksen, 1933
D. clavipes (Fabricius, 1792) (as *Donacia clavipes*) (=? *Donacia menyanthidis* Fabricius, 1792)	Miocene – Quaternary	West Cumberland, England; Dogger Bank, North Sea, long. 2–5° E, lat. 54–56° N, *ca.* 200 km NNE London; Chambéry, and Sonnaz, Savoy, Belle Ile, valley of Seine, Paris, France; Nordost Seeland, Denmark; Denmark and southern Sweden; Lappland, Finland; Switzerland Belorussia, former Soviet Union; Poland?	some specimens probably at Paleontological Institute of the Academy of Sciences, Moscow, others possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; others possible at Institute of Alpine and Arctic Research, Boulder, CO, USA; Kolbe, 1984; Henriksen, 1914; Jessen, 1923; Lesne, 1918a, b, 1925; Lortet and Chantre, 1872; Nasarow, 1984; Pawłowski *et al.*, 1987; Pearson, 1962; Poppius, 1911; Whitehead, 1920; Whitehead and Goodchild, 1909
D. tomentosa (Ahrens 1810) (as *Donacia tomentosa*)	Quaternary	Denmark and southern Sweden; Poland?	some specimens possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Henriksen, 1933; Pawłowski *et al.*, 1987
Eodonacia goeckei (Haupt, 1956) (*Eodonacia* = *D.* (*Donacia*), Askevold, 1991) (Figs. 67, 68)	Eocene	Geiseltal, Germany	appears very similar to the extant *D. D. crassipes* Fabricius; Goecke, 1960a

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
E. paludosa Haupt, 1956 (Fig. 69)	Eocene	Geiseltal, Germany	type, G 55/73, 74, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
Haemonia sp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Berendt, 1845; Spahr, 1981b
Hemidonacia insolita Haupt, 1956 (similar to *D.* (*Cyphogaster*) *provostii* Fairmaire, 1885; *Hemidonacia* = *D.* (*Cyphogaster*), Askevold, 1991) (Fig. 70)	Eocene	Geiseltal, Germany	type, G 55/82, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
Hemidonacia sp.	Eocene	Geiseltal, Germany	Haupt, 1956
Macroplea appendiculata (Panzer, 1794)	Quaternary	La Taphanel, Massif Central, France	Ponel and Coope, 1990
M. mutica (Fabricius, 1792) (as *Donacia mutica*)	Quaternary	Schonen, Toppeladugard, Sweden	Andersson, 1889; Holst, 1906; Kurck, 1917
M. nigrirostris Kirby	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
Neohaemonia nigricornis (Kirby, 1837)	Quaternary	Missouri Coteau, Missouri; peat, Norwood, south-central Minnesota	Department of Geology, North Dakota State University, Fargo, North Dakota, USA; Ashworth and Brophy, 1972; Ashworth *et al.*, 1981; Schwert, 1992
Plateumaris affinis Kirby, 1837 (not Kuntze, 1818) (=? *P. abdominalis* Olivier) (Fig. 71)	Quaternary	interglacial of Fütland, Denmark; southern Sweden	Goecke, 1943; Hartz, 1909; Henriksen, 1933
P. braccatta (Scopoli, 1772)	Quaternary	La Taphanel, Massif Central, France; Denmark and southern Sweden; interglacial, Wildhaus, Kanton St. Gallen, Switzerland; Poland?; Belorussia, former Soviet Union	some specimens probably at Paleontological Institute of the Academy of Sciences, Moscow (13/351), others possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Andersson, 1889; Heim and Gams, 1918; Henriksen, 1933; Nasarow, 1984; Pawłowski *et al.*, 1987; Ponel and Coope, 1990
P. consimilis Schrank.	Quaternary	Germany; Poland?	some specimens possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Beyle, 1913; Pawłowslo *et al.*, 1987
P. cf. *chalcea* Lacordaire	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
P. discolor (Panzer, 1795) (=? *D. commari* Suffrian, =? *P. geniculata* Th.) (Figs. 72)	Miocene to Quaternary	Denmark and southern Sweden; Chambéry, France; pre and interglacial from Lauenberg, Elbe; Dürten and Utznach, Hösbach in Bayern, Germany; widespread in Finland; Switzerland; Glaciales Torflager	possibly at Institute of Artic and Alpine Research. Boulder, CO, USA Askevold, 1990; Elias and Wilkinson, 1983; Flach, 1884; Fliche, 1876; Goecke, 1943; Harpe, 1877; Heer, 1865, 1876, 1883b; Henriksen, 1933; Kolbe, 1894; Lortet and Chantre, 1872; Meunier, 1900, 1901; Poppius, 1911; "the most abundant donaciine in Dürsten and Utznach"
P. cf. *emarginata* Kirby	Quaternary	Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilnyu and Morgan, 1987

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
P. fallax Haupt, 1956 (not a donaciine, Askevold, 1991) (Fig. 73)	Eocene	Geiseltal, Germany	type, G 55/81, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany; Goecke, 1960a
P. flavipes (Kirby)	Quaternary	Saylorville, lowa, USA; Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987; Schwert, 1992
P. fulvipes (Kirby)	late Quaternary	Lefthand Reservoir and Mount Ida Ridge Pond, Front Range, Colorado, USA	Elias, 1985
P. germari (Mannerheim)	Quaternary	Boreal Montana, False Cougar Cave, USA; Innerkip, Ontario, Canada	Quarternary Entomology Laboratory, University of Waterloo Canada; Elias, 1991; Pilny and Morgan, 1987
P. cf. *metallica* Ahrens	Quaternary	southeast Alaska, USA, Innerkip, Ontario, Canada	Quaternary Entomology Laboratory, University of Waterloo Canada; Pilny and Morgan, 1987
P. micans	Quaternary	Nordost Seeland, Denmark	Henriksen, 1914; Jessen, 1920
P. nigra (Fabricius, 1792) (as *D. nigra*)	Quaternary	Schonen, Sweden; Nordost Seeland, Denmark	Andersson, 1889; Jessen, 1920; Kurck, 1917
P. primaeva (Wickham, 1912) (Figs. 74, 90) (as *Donacia primaeva*) (indistinguishable from males of extant *P. nitida* Germar)	Miocene-Oligocene	Florissant, Colorado	holotype, AMNH 39488B, 39488A; MCZ 2601–2603 = Scudder Coll. 8853, 10177, 11989, respectively, other specimens 2601–2603 MCZ (no. 8853, 10177, and 11989 in Scudder coll.); Askevold, 1990a; Goecke, 1943, 1960a; Wickham, 1914b, 1920
P. pusilla group	Quaternary	Nuyakuk, Nushagak, and Holitna lowlands, southwestern Alaska, USA; Innerkip, Ontario, Canada; Lamb Spring site, Colorado, USA	Possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Quaternary Entomology Laboratory, University of Waterloo, Canada; Elias and Short, 1992; Pilny and Morgan, 1987; Short and Elias, 1987; Short *et al.*, 1992
P. rustica (Kunze)	Quaternary	Poland?	some specimens possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Pawłowski *et al.* 1987
P. sericea (Linne, 1758) (frequently, as *Donacia sericea* L. or *D. serica*) (Fig. 75)	Miocene to Holocene	glaciers, Torf, Soignies, Belgium; interglacial of Jüland, Denmark; Wolvercote, Oxfordshire, Aston Mill, Worcestershire, Mundesley, Staffordshire, Lancashire, West Cumberland, England; Dogger Bank, North Sea, long. 2–5° E, lat. 54–56° N, *ca.* 200 km NNE London; Denmark and southern Sweden; charbons de Durnten, France; Schulau, Niederelbe, Dürten, Holstein, and Utznach, Hösbach in Bayern, Germany; Denmark and southern Sweden; interglacial, Widhaus, Kanton St. Gallen, Switzerland; Belorussia, former Soviet Union; Poland?	some specimens probably at Paleontomological Institute of the Academy of Sciences, Moscow (10/297), others possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Andersson, 1889; Ashworth, 1972a, b; Bell, 1888, Beyle, 1901, 1913, 1920, 1924, 1926, 1931; Blair, 1923–24; Flach, 1884; Goecke, 1943; Hartz, 1909; Heer, 1958b, 1876; Heim and Gams, 1918; Henriksen, 1933; Holst, 1908; Lapouge, 1902; Kolumbe and Beyle, 1938; Meunier, 1901; Nasarow, 1984; Pawłowski *et al.*, 1987; Pearson, 1962; Reid, 1890; Scoltz, 1934; Whitehead, 1920; Whitehead, 1989

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Plateumaris spp. (Fig. 76)	not older than lower Miocene, probably lower Oligocene to late Quaternary	Wedron, Illinois; Missouri Coteau, North Dakota; Norwood, south-central and Lake Agassiz, Minnesota; Kewaunce, Wisconsin; Winter Gulf site, *ca.* North Collins, New York, USA; Lancashire, England; South Siberia, former Soviet Union; Tokai and Mikawa districs, central Japan	Vouchers at Department of Biology, University of Wisconsin, River Falls, USA; specimens in the Quaternary Entomology Laboratory, University of Waterloo Canada; Quaternary Entomology Section, University of Birmingham, England; Natl. Sci. Museum (Tokyo, Japan) NSM-PA12096, NSM-12097; Ashworth and Schwert, 1992; Ashworth *et al.*, 1972, 1981; Fujiyama, 1980 Garry *et al.*, 1987, 1990; Martynov, 1929; Pilny and Morgan, 1987; Schwert and Morgan, 1980
Plateumaris sp. or *Donacia* sp. (Fig. 77)	late Cenozoic	Schulau, Niederelbe, Germany; Tokai and Mikawa districs, central Japan	Natl. Sci. Museum (Tokyo, Japan) NSM-PA12090; Beyle, 1901, 1913, 1920, 1924, 1926, 1931; Fujiyama, 1980
Sominella reticulata (Gyllenhal, 1817) (as *D. reticulata*)	Italy	possibly Quaternary	Malfatti, 1881
Donaciinae spp.	Quaternary	Poland?; Denmark and southern Sweden; Wedron, Illinois, USA	some specimens possibly at Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Kraków; Department of Biology, University of Wisconsin, River Falls; Garry *et al.*, 1987; Henriksen, 1933; Pawłowski *et al.*, 1987
Zeugophorinae			
Zeugophora sp.	Tertiary	Baltic amber, Russia and Poland	Coll. Berlin; Hieke and Pietrzeniuk, 1984
Criocerinae			
Crioceridea dubia Wickham, 1912 (Figs. 78, 79, and 91)	Miocene	Florissant, Colorado, USA	MCZ 2615–2619, and possibly 438, 8644; Scudder Coll. 4458, 7977, 9577, 11242, 11737; Wickham, 1913a, 1920
Criocerina sp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Spahr, 1981b
Crioceris margarum Oustalet, 1874 (Fig. 80)	Tertiary to Oligocene	Provence, France	Meunier, 1884; Théobald, 1937
C. vetusta (Heer, 1872?) (as *Lema vertusta*) (Fig. 81)	Miocene	Lake Oeningen, Switzerland	Heer, 1876, 1883
Crioceris spp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland; and Aix, Provence, France	Burmeister, 1836; Klebs, 1910; Scudder, 1887; Spahr, 1981b
Lema t. cyanella Linné	Quaternary	La Taphanel, Massif Central, France	Polne and Coope, 1990
L. evanescens Wickham, 1910 (Fig. 92)	Miocene to Oligocene	Florissant, Colorado, USA	type at Peabody Museum, Yale University, cat. no. 15, MCZ 2604–2611 other exemplars: Scudder Coll. 811, 897, 1985, 3593, 4956, 8693, 8919, 9595; Wickham, 1920
L. fortior Wickham, 1914b (Fig. 83, 93)	late Oligocene	Florissant, Colorado, USA	type, MCZ 2612, other specimens Scudder Coll. 8116, perhaps also MCZ 2613 and 2614, Scudder 3375 and 7762 are also conspecific; Wickham, 1920

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
L. lesquereuxi Wickham, 1914a (Fig. 84)	Miocene	Florissant, Colorado	Wickham Coll., possibly at UNSM
L. lichensis Voet.	Holocene	Belorussia, former Soviet Union	some specimens probably at the Paleontomological Institute of the Academy of Sciences, Moscow (6/89); Nasarow, 1984
L. pervetusta Cockerell, 1921 (Fig. 85)	Eocene	Rocky Mountains, Colorado, USA	holotype, USNM 66579 (USGS 1299)
L. pulchella Förster, 1891 (Fig. 86)	not found	Alsace-Lorraine, France	not found
L. trilinea White	late Quaternary	Kaetan Cave, Colorado Plateau, Colorado, USA	Elias *et al.*, 1992
L. tumulata Heyden and Heyden, 1865 (Fig. 87)	Tertiary	Salzhausen, Germany	not found
Lema sp.	Tertiary to Quaternary	West Cumberland, England; Baltic amber, Russia and Poland; Salzhausen, Germany Oeningen, Switzerland	Förster, 1885, 1889; Pearson, 1962; Scudder, 1887; Spahr, 1981b
Clytrinae			
Clytra carbonaria Heyden and Heyden, 1865 (Fig. 94)	Miocene	Salzhausen, Germany; Lake Oeningen, Switzerland	Scudder, 1887
C. greithiana (Heer, 1847 (as elolontha) (Fig. 97)	Tertiary	Lake Oeningen, Germany	not found
C. hippocastani (as *Melolontha*)	Quaternary	Nordost Seeland, Denmark	Jessen, 1920
C. pandorae Heer, 1847 (Fig. 95)	Tertiary	Lake Oeningen, Switzerland	Giebel, 1852
Clytrina eocenica Piton, 1940 (Fig. 243)	Eocene	Menat (Puy-de-Dome), France	Coll. L. Piton, no. 843
Labidostomis pyrrha Heyden and Heyden, 1866 (Fig. 96)	not found	Siebengebirge, Germany	not found
*Labidostomis*sp.	not found	Rott, Germany	Scudder, 1887
Saxinis regularis Scudder, 1898 (Figs. 98, 99)	Pleistocene	Old Hampshire Co., Massachusetts, USA	Wickham, 1920
Smaragdina? *incerta* Zhang, 1989 (Fig. 100)	mid-Miocene	Shanwang, Shandong, China	S 830019, possibly Linqu Paleontological Museum, Shandong Provicial Museum, China
Cryptocephalinae			
Cryptocephalites auratus Haupt, 1956 (Fig. 101)	Eocene	Geiseltal, Germany	holotype, G 55/95, 96, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
C. bidens Thomson	Tertiary to Quaternary	Italy; Schonen, Sweden	Kurck, 1917; Malfatti, 1881
C. elongatus Haupt, 1956 (Fig. 102)	Eocene	Geiseltal, Germany	type, G 55/105
C. punctatus Scudder, 1892? (Fig. 103)	Tertiary	Similkameen, British Colum-	Handlirsch, 1910; Scudder, 1985b; Wickham, 1920
C. rufiger Haupt, 1956 (Fig. 104)	Eocene	Geiseltal, Germany	holotype, G 55/97, other specimens G 55/99, 55/100, 55/102, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany.
Cryptocephalus miocenus Wickham, 1913c (Fig. 105)	Miocene	Florissant, Colorado, USA	type in Wickham's collection
C. minusculus Piton, 1940 (Fig. 244)	Eocene	Menat (Puy-de-Dome), France	Coll. L. Piton, no. 980

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
C. pitoni Théobald, 1937	Oligocene	Kleinkembs, France	R. 809, Coll. Mieg du Museum de Bâle; Théobald, 1937
C. relictus Schlechtendal, 1893 (Fig. 106)	not found	Braunkolengebirge, Germany	Königlichen mineralogischen Museum, Germany
C. rugosus Haupt, 1956 (Fig. 107)	Eocene	Geiseltal, Germany	holotype, G 55/101, other specimens G 55/102, 55/103, 44/104, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
C. sericeus Linné (=? *C. bidens* Th.)	Quaternary	Denmark and southern Sweden	Henriksen, 1933
Cryptocephalus nr. *sericea*	not found	amber	Helm, 1896
C. vetustus Scudder, 1878 (Fig. 108)	Eocene	Green River, Wyoming, USA	Specimens 4003, 4004, 4039, 4044; Scudder, 1890b
Cryptocephalus spp.	late Eocene to Quaternary	Baltic amber, Russia and Poland; La Taphanel, Massif Central, France	Klebs, 1910; Menge, 1856; Polne and Coope, 1990; Scudder, 1887; Spahr, 1981b
Pachybrachis cf *mitis* Fall	Quaternary	northern Chihuahuan desert, Texas and New Mexico, USA	Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias, 1992b; Elias and Van Devender, 1992
Pachybrachis spp.	Quaternary	Arizona, California and Kewaunee, Wisconsin, USA; Chile; north eastern Siberia, former Soviet Union	Quaternary Entomology Laboratory, North Dakota State University, Fargo, USA; probably at Paleontology Institute, Academy of Sciences, Moscow; Ashworth and Hoganson, 1983; Garry *et al.*, 1990; Hall *et al*, 1988; Hoganson and Ashworth, 1992; Kiselev, 1981
Eumolpinae			
Adoxus obscurus (Lindé)	Quaternary	West Cumberland, England; Switzerland	possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias and Wilkinson, 1983; Pearson, 1962
Bromius obscurus (Linné, 1758)	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981
Chalcosycia spp. **NEW RECORD**	lower Eocene to lower Oligocene	Dominican Republic amber	identified by S. Clark and JASB
Colaspis aetatis Wickham, 1911	late Eocene to early Oligocene	Florissant, Colorado, USA	type at University of Colorado, Boulder no. 61; Wickham, 1920
C. diluvialis Wickham, 1914b (Figs. 109, 116)	late Eocene to early Oligocene	Florissant, Colorado, USA	type, MCZ 2626 = Scudder Coll. 6872; Wickham, 1920
C. luti Scudder, 1893 (Figs. 110, 117)	Tertiary	North America	Scudder, 1990; Wickham, 1920
C. proserpina Wickham, 1914b (Figs. 111, 118)	not found	not found	Wickham, 1920
Colasposoma metallica	Oligocene to Holocene	Europe	Zherikhin, 1970
Colasposoma sp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Scuder, 1887; Spahr, 1981b; Zaddach, 1868
Eoeumolpinus azureviridis Haupt, 1950 (Fig. 112)	Tertiary to middle Eocene	Geiseltal, Germany	specimen 3852
Eumolpites liberatus Heer, 1865 (Fig. 21)	Jurassic to Tertiary	Switzerland	Heer, 1872, 1876
Eumolpus spp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Helm, 1896; Spahr, 1981b; Zhang, 1989

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Graphops cf. wyomingensis Blake	late Quaternary	Lake Isabelle Delta site Left-hand Reservoir, Front Range, and lake Emma Colorado, USA	specimens possibly of Institute of Arctic and Alpine Research, Boulder, CO, USA Elias, 1985, Elias *et al.*, 1991
Graphops spp.	Quaternary	Peary Land, Greenland; Innerkip, Ontario, Canada; Missouri Coteau, North Dakota, USA	Quaternary Entomology Laboratory, University of Waterloo, Canada; others in the Zoological Museum, University of Copenhagen, Denmark; Ashworth and Schwert, 1992; Böcher, 1989; Pilny and Morgan, 1987
Metachroma florissantensis Wickham, 1912 (Fig. 113)	lower Eocene to early Miocene	Florissant, Colorado, USA; Dominican Republic amber	type at University of Colorado, Boulder, USA; Wickham, 1920
Nodostoma sp.	late Eocene to lower Oligo-cene	Baltic amber, Russia and Poland	Klebs, 1910; Spahr, 1981b
Pachnephorus sp. (as *Pachnophorus*)	late Eocene to lower Oligo-cene	Baltic amber, Russia and Poland	Klebs, 1910; Spahr, 1981b
Profidia nitida Gressitt, 1963 (Fig. 115)	Miocene to Oligocene	Chiapas amber, México	University California, Berkeley, Museum Paleontology
Pseudocolaspis sp.	late Eocene to lower Oligo-cene	Baltic amber, Russia and Poland	Klebs, 1910; Spahr, 1981b
unidentified Eumolpinae	Tertiary	Baltic amber, Germany	Coll. Berlin; Hieke and Pietrzeniuk, 1984
Chrysomelinae			
Calligrapha dislocata Rogers	late Quaternary	northern Chihuahuan desert, Texas and New Mexico, USA	Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias, 1992b; Elias and Van Devender, 1992
Chrysochloa sp. (valid name is *Oreina*) (Fig. 120)	Oligocene to Quaternary	West Cumberland, England; France	Pearson, 1962; Théobald, 1937
Chrysolina aurichalcea	late Cenozoic	north eastern Siberia, former Soviet Union	probably deposited at the Paleontology Institute, Academy of Sciences, Mos-cow; Kiselev, 1981
C. bungei Jacoby	not found	not found	not found
C. cavigera Sahlbr.	late Cenozoic	Belorussia and north eastern Siberia, former Soviet Union	probably deposited at the Paleontology Institute, Academy of Sciences, Mos-cow (16/433); Kiselev, 1981; Nasarow, 1984
C. perforata Gebl.	late Cenozoic	north eastern Siberia, former Soviet Union	probably deposited at the Paleontology Institute, Academy of Sciences, Mow-cow; Kiselev, 1981
C. rufilabris Falb.	late Cenozoic	north eastern Siberia, former Soviet Union	probably deposited at the Paleontology Institute, Academy of Sciences, Mos-cow; Kiselev, 1981
C. septentrionalis Dejean (or Men.?)	late Cenozoic	north eastern Siberia and Belorussia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow (8/269); Kiselev, 1981; Nasarow, 1984
Chrysolina sp.	Holocene	Nushagak Lowland, southwestern Alaska; north-ern Chihuahuan desert, Texas and New Mexico, USA; Belorussia, former Soviet Union	Institute of Arctic and Alpine Research, Boulder, CO, USA; prob-ably deposited at Paleontomological Institute of the Academy of Sciences, Moscow; Elias and Van Devender, 1992; Lea *et al.*, 1991; Nasarow, 1984
Chrysomela bipunctatus Linné (many of the species placed in this genus are currently placed in *Chrysolina*)	Quaternary	West Cumberland, England	Pearson, 1962

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
C. calami Heer, 1847 (Fig. 121)	Tertiary to late Cenozoic	north eastern Siberia, former Soviet Union	some specimens probably at the Paleontology Institute, Academy of Sciences, Moscow; Heer, 1872; Kiselev, 1981
C. cerealis (or like *C. cerealis*)	Quaternary	La Taphanel, Massif Central, France	Burmeister, 1832, 1836; Polne and Coope, 1990
C. ceresti Théobald, 1937 (Fig. 122)	Oligocene	France	holotype, F 73 + 68, Coll. Fliche, Ecole des E. and F., Nancy, France; Théobald, 1937
C. debilis Oustalet, 1874 (Fig. 123)	Tertiary to Oligocene	Provence, France	Meunier, 1884; Théobald, 1937
C. fastuosa Scopoli	Quaternary	Denmark and southern Sweden	Henriksen, 1933
C. haemoptera (L.)	Quaternary	West Cumberland, England	Pearson, 1962
C. haydingeri Heer	not found	not found	Oustalet, 1874
C. hilberi Lomnicki, 1894 (Fig. 124)	Pleistocene	not found	not found
C. lichenis Richter, 1820 (valid name is *Chrysolina lichenis*) (Fig. 125)	Pleistocene	not found	Lomnicki, 1894
C. lithographica Weyenbergh, 1869a	not found	not found	not found
C. lyelliana Heer, 1856a (Fig. 126–127)	Tertiary to Oligocene	Provence, France	Meunier, 1884; Oustalet, 1874; Théobald, 1937
C. mathrona Oustalet, 1874 (Fig. 128)	Tertiary	Provence, France	Meunier, 1884; Oustalet, 1874
C. matheroni Oustalet, 1874 (Fig. 129)	Oligocene	Provence, France	Meunier, 1884; Théobald, 1937
C. punctigera Heer, 1847 (Fig. 130)	Tertiary	not found	Giebel, 1852
C. subsulcata Mnh.	not found	Lake Oeningen, Switzerland	Giebel, 1852; Heer, 1876, 1883a
C. taimyrensis Medvedev	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981
C. varians (Schall.)	Quaternary	West Cumberland, England	Pearson, 1962
C. vesperalis Scudder, 1893 (also as *Chrysomelites vesperalis*) (Figs. 131, 136)	Miocene-Oligocene	Florissant, CO, USA	MCZ 7851, 10416, 2627, 2628 (11264, 13649, Scudder Coll.); Scudder, 1893, 1900; Wickham 1914b, 1920
Chrysomela sp., including larvae (Fig. 132)	Tertiary to Quaternary	Peary Land, Greenland; Oeningen, Switzerland; Aix, Provence, France; Lexden and Bielbecks, Eastern Norfolk, Yorkshire, Durdestone Bay, England; Baltic amber, Russia and Poland. Lamb spring site, Colorado; south central New Mexico, USA	some specimens at Zoological Museum, University of Copenhagen, Denmark; others possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Bell, 1888; Berendt, 1845; Böcher, 1989; Curtis, 1829; Elias, 1987; Elias and Nelson, 1989; Elias and Wilkinson, 1983; Giebel, 1856; Helm, 1896; Menge, 1856; Scudder, 1887; Spahr, 1981b; Westwood, 1854; most abundant chrysomelid genus in Baltic amber
Chrysomelites alaskanus Heer, 1869 (Fig. 136)	Tertiary	English Bay, Alaska	Scudder, 1900; Wickham, 1920
C. allochlamys Cockerell, 1920b (Fig. 133)	Eocene	Bartonian, Bagshot Beds, Bournemouth, England	British Museum 19008
C. azureus Haupt, 1956 (Fig. 134)	Eocene	Geiseltal, Germany	type, G 55/132, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
C. bartonicus Cockerell, 1920b (Fig. 135)	Eocene	Barshot Beds, Bournemouth, England	British Museum, lost label, possibly 19022, also marked with an "x"
C. bisornatus Haupt, 1956 (Fig. 139)	Eocene	Geiseltal, Germany	type, G 55/131, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
C. cupreus haupt, 1956 (Fig. 140)	Eocene	Geiseltal, Germany	type, G 55/133, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
C. danielis Cockerell, 1926 (Fig. 141)	Tertiary	Sunchal, Provincia Jujuy, Argentina	"will be placed in British Museum"
C. fabricii Heer, 1868 (Fig. 142)	Tertiary	Greenland	Heer, 1883a, b; Scudder, 1900; Wickham, 1920
C. foveolatus Haupt, 1956 (Fig. 143)	Eocene	Geiseltal, Germany	type, G 55/129, 130, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
C. lindhageni Heer, 1870 "*nomen relictum*" (Fig. 138 A-F, 144)	Eocene	Spitsbergen, Grönland	"a small capsule or pod from some plant"; Wickham, 1920; apparently not Heer, 1883a, b; Scudder, 1900
C. prodromus Heer, 1865 (Fig. 27)	Jurassic to Tertiary	Schambelen, Switzerland	Heer, 1865, 1872, 1876, 1879, 1883a; Scudder, 1885, 1887
C. quadrilineatus Cockerell, 1920b (Fig. 145)	Eocene	Bartonian, Bagshot Beds, Bournemouth, England	British Museum, 19006
C. thulensis Heer, 1870 *nomen relictum* (Fig. 150 A–D)	Eocene	Spitsbergen, Grönland	"some plant remains", one of fossil fragments like *Metasequoia occidentalis* (Newb.) (Taxodiaceae) seed fragment; Birket-Smith, 1977
Chrysomelites spp.	not found	Alaska; Spitzbergen, Greenland	Förster, 1889
Chrysothoracus tropicus Zhang, 1989 (Figs. 146–149)	mid-Miocene	Shanwang, Shandong, China	S 82701, Shandong Provicial Museum, China
Colaphellus alpinus Payskull	late Cenozoic	north eastern Siberia, former Soviet Union	probably deposited at the Paleontology, Academy of Sciences, Moscow; Kiselev, 1981
Crosita? sp.	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Institute, Academy of Sciences, Moscow; Kiselev, 1981
Eochrysomela indecorata Haupt, 1956 (Fig. 151)	Tertiary to middle Eocene	Geiseltal, Germany	type, G 55/113, other specimen, 55/114; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
E. ornata Haupt, 1956 (Figs. 152–153)	Tertiary to middle Eocene	Geiseltal, Germany	type, G 55/111; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, The Netherlands; apparently, described twice, with two specimens that look different (Haupt, 1956)
E. punctator Haupt, 1956 (Fig. 154)	Tertiary to middle Eocene	Geiseltal, Germany	type, G 55/106, other specimens G 55/107–55/110; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
E. pustulata Haupt, 1956 (Fig. 155)	Tertiary to middle Eocene	Geiseltal, Germany	holotype, G 55/112; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
Eomelasoma incostata Haupt, 1956 (Fig. 156)	Tertiary to middle Eocene	Geiseltal, Germany	type, G 55/116; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
E. scutellata Haupt, 1956 (Fig. 157)	Tertiary to middle Eocene	Geiseltal, Germany	type, G 55/116; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
Gastroidea polygoni (Linné)	Quaternary	West Cumberland, England	Pearson, 1962
Gastroidea sp.	Quaternary	West Cumberland, England	Pearson, 1962
Gonioctena clymene Heer, 1847 (Fig. 172)	Tertiary	Lake Oeningen, Switzerland	Giebel, 1852, Heer, 1872; 1876; Oustalet, 1874
G. japeti Heer, 1847 (Fig. 174)	Tertiary	Lake Oeningen, Switzerland	Giebel, 1852
G. primordialis Assmann, 1870 (Fig. 175)	Oligocene	Schossnitz, Schlesien, Germany	not found
Gonioctena spp.	Holocene	Oeningen, Switzerland; Aix, Provence, France; Schossnitz, Germany; Belorussia, former Soviet Union	probably deposited at Paleontomological Institute of the Academy of Sciences, Moscow (9/287); Nasarow, 1984
Gonocelis notatus Haupt, 1950 (Fig. 158)	Tertiary to middle Eocene	Geiseltal, Germany	not found
Halocoleus cameratus Haupt, 1950 (Fig. 159)	Tertiary to middle Eocene	Geiseltal, Germany	not found
Hemisphaerocosites sphaericus Haupt, 1956 (Fig. 160)	Tertiary to middle Eocene	Geiseltal, Germany	type, G 55/115; Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
Hydrothassa glabra Herbst	Quaternary	La Taphanel, Massif Central, France	Polne and Coope, 1990
H. hannoverana Fabricius	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981
Hydrothassa sp.	Pliocene-Quaternary	Peary Land Greenland; Switzerland	probably at the Zoological Museum, University of Copenhagen, Denmark; others possibly at Institute of Arctic and Alpine Research, Boulder, Co, USA; Böcher, 1989; Elias and Wilkinson, 1983
Lina populeti Heer, 1847 (also as *L. populeti*) (valid name is *Chrysolina populeti*) (Fig. 176)	Tertiary	Lake Oeningen, Switzerland	Heer, 1858b, 1872, 1876, 1883a, b; Heyden, 1862
L. sociata Heyden and Heyden, 1866 (Fig. 177)	not found	Siebengebirge, Germany	not found
L. wetteravica Heyden 1862 (Fig. 178)	Tertiary	Salzhausen, Germany	not found
Lina spp.	not found	Oeningen, Switzerland; Rott, Salzhausen, Germany	Scudder, 1887
Melasoma aenea Linné (valid name is *Chrysomela*)	Quaternary	southern Lappland, Finland	Poppius, 1911
M. micropunctata Piton (in Piton and Théobald, 1935) (valid name is *Chrysomela*) (Fig. 181)	Quaternary	Cinérites Varennes, L'Auvergne, Masif Central, France	no. 5, collection Station Limnologique de Bessé
Melasoma sp. (valid name is *Chrysomela*)	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Spahr, 1981b
Oreina amphyctionis Heer, 1847 (Fig. 182)	Tertiary	Oeningen, Switzerland	not found
O. hellenis Heer, 1847 (Fig. 183)	Tertiary	Oeningen, Switzerland	Giebel, 1852
O. protogeniae Heer, 1847 (Fig. 184)	Tertiary	Oeningen, Switzerland	Giebel, 1852

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
O. pulchra (Förster, 1891) (Fig. 185)	Oligocene	Kleinkembs, Alsace-Lorraine, France	Specimen R 770, Coll. Mieg Museum Bâle, France; Théobald, 1937
Oreina spp.	Tertiary	peat, Lexden, England	Förster, 1886, 1889; Scudder, 1887
Phaedon armoraciae Thorell	Quaternary	Denmark and southern Sweden	Henriksen, 1933
P. cochleariae (Fabricius)	Holocene	Aston Mill, Worcestershire, England	Whitehead, 1989
P. t. tumidulum Germai	Quaternary	La Taphanel, Massif Central, France	Polne and Coope, 1990
Phaedon spp.	late Cenozoic	Lake Emma, Colorado, USA; north eastern Siberia, former Soviet Union	specimens possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; and probably at the Paleontology Institute, Academy of Sciences, Moscow; Elias *et al.*, 1991; Kiselev, 1981
Phratora vulgatissima (Linné) (valid name is *Phyllodecta*)	Quaternary	valley of the Seine, Paris	Lesne, 1925
Phratora sp. (valid name is *Phyllodecta*)	late Cenozoic	Belorussia and north eastern Siberia, former Soviet Union	probably at at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981; Nasarow, 1984
Phyllodecta curtisii (Oustalet, 1874), as *Gonioctena* (valid name is *Phratora*) (Fig. 171)	not found	Provence, France	Meunier, 1884; Théobald, 1937
P. vitellinae (Linné) (valid name is *Phratora*)	Quaternary	Switzerland	possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias and Wilkinson, 1983
Phyllodecta sp. (valid name is *Phratora*)	Quaternary	La Taphanel, Massif Central, France	Polne and Coope, 1990
Plagiodera lyelliana (Heer, 1956) [= *Chrysomela lyelliana* Heer, 1856] (=? *C. mathrona* Oustalet, 1874)	Oligocene	France	specimen F. 141 Coll. Fliche, Ecole des E. and F., Nancy, France; Curtis, 1829; Meunier, 1884; Théobald, 1937
P. novata (Heyden and Heyden, 1866) (Fig. 161)	not found	Rott, Siebengebirge, Germany	not found
Prasocuris aucta var. *egena* Zgl. (= *Hydrothassa?*)	Pleistocene	Hösbach, Bayern, Germany	Flach, 1884; Meunier, 1901
Stenoplatys? fausti Weise	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981
Strichosa eburata Blanch.	Quaternary	Chile	at Quaternary Entomology Laboratory, North Dakota State University, Fargo, USA; Ashworth and Hoganson, 1983; Hoganson and Ashworth, 1992
Timarcha metallica Laicharting, 1781–1784	Pleiostecene	Höbach, Bayern, Germany	Flach, 1884; Meunier, 1901
Timarcha sp.	late Eocene to Quaternary	Baltic amber, Russia and Poland; Norfolk forest bed, England	Bell, 1888; Spahr, 1981b
Zygogramma tortuosa Rogers	late Quaternary	northern Chihuahuan desert, Texas and New Mexico, USA	Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias, 1992b; Elias and Van Devender, 1992
c.f. Zygospila sp.	late Quaternary	Arizona and California, USA	Hall *et al.*, 1988
Galerucinae			
Adimonia? sp.	Quaternary	in peat at Jarville, Nancy, France	Fliche, 1875; Meunier, 1901; Scudder, 1887

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Agelasa sessilis Förster, 1891 (Fig. 162)	Oligocene	Alsace-Lorraine, France	Théobald, 1937
Agelastica alni Linné	Quaternary	Nordost Seeland, Denmark; Denmark and Southern Sweden	Henriksen, 1914, 1933; Jessen, 1920
Diabrotica atripennis (Say)	late Quaternary	Winter Gulf site, *ca.* North Collins, New York, USA	Schwert and Morgan, 1980
D. bowditchiana Wickham, 1914b (Figs. 163, 189)	Miocene	Florissant, Colorado, USA	type, MCZ 2600 = Scuder Coll. 34367; Wickham, 1920
D. exesa Wickham, 1911 (Fig. 190)	Miocene	Florissant, Colorado, USA	type, AMNH, station no. 13, collection no. 123; specimen, not type, in MCZ 2631 = Scudder Coll. 9193; Wickham, 1920
D. florissantella Wickham, 191b (Figs. 164, 191)	Miocene	Florissant, Colorado, USA	type, MCZ 2630 = Scudder Coll. 9566; Wickham, 1920
D. uteana Wickham, 1914b (Figs. 165, 192)	Miocene	Florissant, Colorado, USA	type, MCZ 2629, = Scudder Coll. 507; Wickham, 1920
Eogaleruca irregularis Haupt, 1956 (Fig. 166)	Eocene	Geiseltal, Germany	type, G 55/121, other specimens 55/122, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
E. minor Haupt, 1956 (Fig. 167)	Eocene	Geiseltal, Germany	type, G 55/118, other specimens 55/119, 55/120, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
E. punctipennis Haupt, 1956 (Fig. 168)	Eocene	Geiseltal, Germany	type, G 55/118, other specimens 55/119, 55/120, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
Galeruca buchi Heer, 1872 (as *G. buchii*) (Fig. 169)	Tertiary	Lake Oeningen, Switzerland	Heer, 1876, 1883a,b
G. gemmifera (as *Galleruca*)	not found	not found	Heer, 1883a, b
G. (*Adimonia*) *tanaceti* Linné	Quaternary	West Cumberland, England; La Taphanel, Massif Central, France; Denmark and southern Sweden	Henriksen, 1933; Pearson, 1962; Polne and Coope, 1990
G. xanthomelana Schrank	Quaternary	Kurck, 1917	Schonen, Sweden
Galeruca spp. (as *Galleruca*)	late Eocene to Quaternary	West Cumberland, England; La Taphanel, Massif Central France; Baltic Russia and Poland; Radoboj and Oeningen, Switzerland	Berendt, 1845; Burmeister, 1832, 1836; Pearson, 1962; Polne and Coope, 1990; Quiel, 1911; Scudder, 1887; Spahr, 1981b
Galerucella affinis Förster, 1891 (Fig. 170)	Oligocene	Alsace-Lorraine, France	Théobald, 1937
G. emarginata Théobald, 1937 (Fig. 245)	Oligocene	Kleinkembs, Alcase-Lorraine, France	R 776, Coll. Mieg du Museum de Bâle; Théobald, 1937
G. lineola (Fabricius)	Holocene	Aston Mill, Worcestershire, England	Whitehead, 1989
G. monoguttata (as *G. l-guttata*)	not found	not found	Heer, 1883a, b
G. nymphaeae Linné	Quaternary	Denmark and southern Sweden	Henriksen, 1933
G. picea Scudder, 1879 (Fig. 171)	Tertiary (Miocene)	Ninemile Creek, British Columbia	one specimen (no. 62); Handlirsch, 1910; Scudder, 1890a, b, 1893, 1895a

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Galerucella sp.	late Eocene to lower Oligocene	Kleinkembs, France; Baltic amber, Russia and Poland	Klebs, 1910; Spahr, 1981b; Théobald, 1937
Hadroscelus schultzii Quedenfeldt, 1885	Cenozoic	Benguela, African copal	not found
Hadroscelus sp.	not found	Baltic amber, Russia and Poland	Spahr, 1981b
Leptonesiotes sp. **NEW RECORD**	lower Eocene to lower Oligocene	Dominican Republic amber	identified by S. Clark
Lochmaea capraea (Linné)	Quaternary	Switzerland	possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA
L. crategi Forster	Quaternary	Nordost Seeland, Denmark; Denmark and southern Sweden	Henriksen, 1914, 1933; Jessen, 1920
Luperodes submonillis Wickham, 1914a (Fig. 179)	Miocene	Florissant, Colorado, USA	Wickham Coll.; Wickham, 1920
Luperus cf. *flavipes* (Linné)	Quaternary	West Cumberland, England	Pearson 1962
L. fossilis Schlechtendal, 1893 (Fig. 180)	not found	Braunkohlengebirge of Rott, Siebengebirge, Germany,	Königlichen mineralogischen Museums
Luperus sp.	late Eocene to late Cenozoic	Baltic amber, Russia and; Poland; north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; also at Col. Berlin; Hieke and Pietrzeniuk, 1984; Kiselev, 1981; Spahr, 1981b
Monolepta sp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Klebs, 1910; Spahr, 1981b
Ophraella species A	late Quaternary	Winter Gulf site, *ca.* North Collins, New York, USA	Schwert and Morgan, 1980
Pyrrhalta luteola (Müller) (= *Galeruca luteola* = *G. xanthomelaena* Schr.)	Quaternary	Denmark and southern Sweden	Henriksen, 1933
Pyrrhalta sp.	late Quaternary	Umiakoviarusek, Northeastern Labrador, Canada; Lake Isabelle Delta site, Front Range, Colorado; Northern Chihuahuan desert, Texas and New Mexico, USA	Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias, 1982, 1985, Elias and Van Devender, 1992;
Scelolyperus sp. (as *Scelyloperus*)	Quaternary	Big Bend Region, Chihuahuan Desert, Texas; south-central New Mexico, USA	Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias, 1987;
Trirhabda majuscula Wickham, 1914b (Figs. 186, 193)	Miocene	Florissant, Colorado, USA	type, 2634 = Scudder Coll. 11266; Wickham, 1920
T. megacephala Wickham, 1914b (Figs. 187, 194)	Miocene	Florissant, Colorado, USA	type, MCZ 2633, other specimen 316; Wickham, 19206
T. sepulta Wickham, 1914b (Fig. 188, 195)	Miocene	Florissant, Colorado, USA	type, MCZ 2632 = Scudder Coll. 3931; Wickham, 1920
Trirhabda sp.	Quaternary	south-central New Mexico, USA	Institue of Arctic and Alpine Research, Boulder, CO, USA; Elias, 1987
unidentified galerucines	Tertiary	Baltic amber, Russia and Poland	Coll. Berlin; Hieke and Pietrzeniuk, 1984
Alticinae			
Altica dryophyllorum Piton, 1940 (as *Haltica* dryophyllorum) (Fig. 246)	Eocene	Menat (Puy-de-Dome), France	Coll. Piton, no. 447

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
A. dubia Förster, 1891 (Fig. 197)	Tertiary	Alsace-Lorraine, France	not found
A. lythri (Aubé, 1843) (as *H. lythri*)	Holocene	Aston Mill, Worcestershire, West Cumberland, England	Pearson, 1962; Whitehead, 1989
A. magna Förster, 1891 (Fig. 198)	Oligocene	Alsace-Lorraine	Théobald, 1937
A. oleracea (Linné, 1858) (as *H. oleracea*)	Quaternary	widespread in Finland	Poppius, 1911
A. quercetorum Foudras, 1860 (as *H. quercetorum*)	Quaternary	Denmark and southern Sweden	Henriksen, 1933
A. renovata Wickham, 1914 (as *Haltica renovata*) (Figs. 199, 205)	Miocene	Florissant, Colorado, USA	type at MCZ 2635 = Scudder Coll. 7296, probably other specimens are MCZ 2636, 2637 = Scudder Coll. 3507, 7736, respectively; Wickham, 1920
Altica spp. (frequently as *Haltica*)	late Eocene to Holocene	Lancashire, West Cumberland, England; La Taphanel, Massif Central, France; Baltic amber, Russia and Poland; north eastern Siberia, former Soviet Union; Nushagak and Holitna Lowlands, southwest Alaska; Innerkip, Ontario, Canada; Lake Isabelle Delta site, Lake Isabelle peat site, Lefthand Reservoir, and Mount Ida Ridge Pond, Front Range Lake Emma, Lamb Spring Site, Mary Jane site, and Rocky Mountains National Park Colorado; Norwood, south-central Minnesota; Wedron, Illinois; Big Bend Region, Chihuahuan Desert, Texas and New Mexico, USA; Chile	Quaternary Entomology Section, University of Birmingham, England; probably at the Paleontology Institute, Academy of Sciences, Moscow; Quaternary Entomology Laboratory, University of Waterloo, Canada; Quaternary Entomology Laboratory, North Dakota State University, Fargo, USA; Department of Biology, University of Wisconsin, River Falls, USA; Institute of Arctic and Alpine Research, Boulder, CO, USA; Ashworth, 1972b; Ashworth *et al.*, 1972a, 1981; Ashowrth and Hoganson, 1983; Berendt, 1845; Burmeister, 1831, 1832, 1836; Elias, 1985; Elias and Nelson, 1989; Elias *et al.*, 1986; 1991; Elias and Van Devender 1990, 1992; Förster, 1889; Helm, 1896, Garry *et al.*, 1987; Hoganson and Ashworth, 1992; Kiselev, 1981; Pearson, 1962; Pilny and Morgan, 1987; Piton, 1940; Polne and Coope, 1990; Scudder, 1887; Short and Elias, 1987; Short *et al.*, 1992; Spahr, 1981b;
Apthona coerulera Payskull	Quaternary	West Cumberland, England	Pearson, 1962
A. puncticollis Piton, 1939 (Fig. 200) (homonym with A. puncticollis Allard, 1866)	Pliocène	Lac Chambon, Puy-de-Dôme, France	Coll. L. Piton, holotype, no. 1012
Aphtona sp.	Quaternary	West Cumberland, England	Pearson, 1962
Apteropeda grossa Théobald (in Piton and Théobald, 1935) (as *Apteropoda grossa*) (Fig. 201)	Quaternary	Cinérites du lac Chambon, L'Auvergne, Masif Central, France	no. 15, collection L. Piton
Asiorestia antiqua (Gressitt, 1971) (Fig. 202) (as *Crepidodera*)	Miocene to Oligocene	Chiapas, México	type at University of California, Berkeley, Museum of Paleontology 13523
A. ferruginea (Scopoli, 1763) (as *Crepidodera ferruginea*)	Holocene	Aston Mill, Worcestershire, England	Whitehead, 1989
A. transversa (Marsham, 1802) (as *Crepidodera transversa*)	Holocene	Aston Mill, Worcestershire, England	Whitehead, 1989
Asiorestia spp. (as *Crepidodera*)	Lower Oligocene to Holocene	Baltic amber, Russia and Poland; Chile; Nushagak and Holitna lowlands, south-western Alaska; Gervais Formation, Minnesota, USA	Some at Quaternary Entomology Laboratory, North Dakota State University, Fargo, USA; Ashworth, 1980; Ashworth and Hoganson, 1983; Hoganson and Ashworth, 1992; Klebs, 1910; Leo *et al.* 1991; Short *et al.* 1992

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Chaetocnema aridula Gyllenhal (*C. a. hortensis* Geoffr.)	Holocene	Belorussia, former Soviet Union	probably deposited at Paleontomological Institute of the Academy of Sciences, Moscow; Nasarow, 1984
C. costulata (Motschulsky, 1860)	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981
C. cribrata LeConte	late Quaternary	southwestern Alaska	Elias, 1992a
C. elongatula Hatch	late Quaternary	northern Chihuahuan desert, Texas and New Mexico, USA	Institute of Arctic anc Alpine Research, Boulder, CO, USA; Elias, 1992b; Elias and Van Devender, 1992
C. obesa Boield.	Quaternary	La Taphanel, Massif Central, France	Polne and Coope, 1990
Chaetocnema spp.	Quaternary	Lancashire, England; La Taphanel, Massif Central, France; Switzerland Innerkip Ontario, Canada; Bida Cave, Colorado Plateau, Colorado; Winter Gulf site, *ca.* North Collins, New York, USA	Quaternary Entomology Section, University of Birmingham, England; Quaternary Entomology Laboratory, University of Waterloo, Canada; possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Ashworth, 1972b; Elias *et al.*, 1992; Elias and Wilkinson, 1983; Pilny and Morgan, 1987; Polne and Coope, 1990; Schwert and Morgan, 1980
Docemina crassipes Champion, 1918 (as *Docemines*, probably a typographic error)	Late Quaternary	Chile	Quaternary Entomology Laboratory, North Dakota State University, Fargo, USA Ashworth *et al.*, 1991
Hippuriphila canadensis Brown	late Quaternary	Winter Gulf site, *ca.* North Collins, New York, USA	Schwert and Morgan, 1980
Longitarsus sp.	Quaternary	Denmark and southern Sweden	Henriksen, 1933
Mantura sp.	Quaternary	Lancashire, England	Quaternary Entomology Section, University of Birmingham, England; Ashworth, 1972b
Ochrosis sp.	lower Oligocene	Baltic amber, Russa and Poland	Klebs, 1910; Spahr, 1981b
Oedionychus sp. (as *Oedionychis*)	Quaternary	Rocky Mountain National Park, CO, USA	possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Elias *et al.* 1986
Oryctocirtites protogaeum Scudder, 1876 (Figs. 203, 207)	Miocene to Oligocene	Florissant, Colorado, USA	Wickham, 1920; Scudder, 1990
Plectrotetrophanes hageni Wickham, 1914b (Figs. 204, 208)	Miocene	Florissant, Colorado, USA	type, MCZ 2642 = Scudder Coll. 8125; Wickham, 1920
Prochaetocnema florissantella Wickham, 1914b (Figs. 114, 119)	Miocene to Oligocene	Florissant, Colorado, USA	type, MCZ 2643 = Scudder Coll. 9430; Wickham, 1920
Psylliodes defiguratus Théobald, 1937 (Fig. 247)	Oligocene	Kleinkembs, France	R 138, Coll. Mieg du Museum de Bâle; Théobald, 1937
P. difficilis (Förster, 1891) (as *Haltica*) (Fig. 196)	Oligocene	Brunnstatt and Klenkembs, Alsace-Lorraine, France	R9+283, 288+788, 549, and 106, Coll. Mieg du Museum de Bâle; Théobald, 1937
P. picina (Marsham, 1802)	Holocene	Aston Mill, Worcestershire, England	Whitehead, 1989
P. polonica Lomnicki, 1894	not found	not found	not found
Psylliodes sp.	Quaternary	La Taphanel, Massif Central, France	Polne and Coope, 1990

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Systena florissantensis Wickham, 1913b (Figs. 205, 209, and 210)	Miocene	Florissant, Colorado, USA	type, USNM 59660; other specimens at MCZ 2638–2641 = Scudder Coll. 413, 3430, 8933, 9615, respectively; Wickham, 1914b, 1920
Walterianella sp. **NEW RECORD**	lower Eocene to lower Oligocene	Dominican Republic amber	identified by JASB and S. Clark
Alticinae spp.	Tertiary to Quaternary	Baltic amber, Russia and Poland; Chile	Coll. Berlin; Quaternary Entomology Laboratory, North Dakota State University, Fargo, USA; Ashworth and Hoganson, 1983; Hieke and Pietrzeniuk, 1984; Hoganson and Ashworth, 1992
Hispinae			
Anisodera sp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Spahr, 1981b
"*Anoplitis*" *bremii* Heer, 1847 probably belong in another genus (Figs. 211–212)	Tertiary	Lake Oeningen, Switzerland	Giebel, 1852; Heer, 1847, 1872, 1876, 1883a, b;
Anoplitis sp. (*Anoplitis* is a synonym of *Chalepus*, many species of *Anoplitis* belong in *Sumitrosis*. Both genera are restricted to the New World.)	Quaternary	Norwood, south-central Minnesota	Ashworth *et al.*, 1981
Chalepus americanus (Wickham, 1914b) (as *Odontota americana* Wickham, 1914b) (Figs. 213, 238)	late Oligocene to Miocene	Florissant, Colorado, USA	type, MCZ 2644 = Scudder Coll. 7176, another possible conspecific, MCZ 2645 = Scudder Coll. 10506; Andersson, 1889; Wickham, 1920
Chalepus spp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Spahr, 1981b
Dicladispa beskonakensis Nel, 1988 (Figs. 214–216)	Miocene	Anatolia, Turkie	IPMB-47738 Typothèque, Institut Paléontologie, Muséum National Histoire Naturelle, Paris
D. muratensis Nel, 1988 (Figs. 217–219)	Pliocene	Murat, Cantal, France	IPMR-07721 Typothèque, Institut Paléontologie, Muséum National Histoire Naturelle, Paris
Electrolema baltica Schaufuss, 1892 (Fig. 82)	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Danzinger Provinzialmuseum, Germany; Korschefsky, 1939; Spahr, 1981b; Uhmann, 1939
Hispa sp.	lower Oligocene	Baltic amber, Russia and Poland	Klebs, 1910; Spahr, 1981b
ca. *Microrhopala* sp.	Tertiary to Holocene	Vancouver Island, Canada; Greenland	Chagnon, 1895; Handlirsch, 1910; Scudder, 1900; Zherikhin, 1970
Odontota sp.	not found	in amber	Menge, 1856; Scudder, 1887
Oposispa scheelie Uhmann, 1939 (Fig. 220)	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Larsson, 1978; Spahr, 1981b
Oposispa sp.	Oligocene	Europe	Zherikhin, 1970
Protanisodera glaesi Quiel, 1909	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Museum für Naturkunde, Berlin; Spahr, 1981b
Protanisodera sp.	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Spahr, 1981b
Sucinagonia javetana Uhmann, 1939 (Fig. 221)	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Larsson, 1978; Spahr, 1981b
Sucinagonia sp.	Oligocene	Europe	Zherikhin, 1970
Hispinae spp.	lower Oligocene to Holocene	Baltic amber, Russia and Poland Lake Isabella Delta site, Front range, Colorado, USA	Col. Berlin; Elias, 1985; Hieke and Pietrzeniuk, 1984; Klebs, 1910

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
Cassidinae			
Acassidites separandus Haupt, 1950 (Fig. 222)	Tertiary to middle Eocene	Geiseltal, Germany	type 1526
Callistaspis punctatus Haupt, 1950 (Figs. 223–224)	Tertiary to middle Eocene	Geiseltal, Germany	specimens 1831, 1711, 2136, 2165
Cassida blancheti Heer, 1856a, (Fig. 225)	Tertiary to Oligocene	Lake Oeningen, Switzerland; Provence, France	Heer, 1872, 1876; Meunier, 1884; Oustalet, 1874; Théobald, 1937
C. hermione Heer, 1847 (Fig. 226)	Tertiary	Lake Oeningen, Switzerland	Giebel, 1852; Heer, 1872, 1876
C. interemta Heyden, 1862 (Fig. 227)	Tertiary	Salzhausen, Germany	not found
C. kramstae Förster, 1891 (Fig. 228)	Oligocene to late Cenozoic	Riedisheim, Alsace-Lorraine, France; north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; also at Coll. Serv. carte géol., Alcase-Lorraine, France; Kiselev, 1981; Théobald, 1937
C. megapenthos Heer, 1847 (also as *C. megapentos*) (Fig. 229)	Tertiary	Lake Oeningen, Switzerland	Giebel, 1852
C. sanguinolenta Müller, 1776	late Cenozoic	north eastern Siberia, former Soviet Union	probably at the Paleontology Institute, Academy of Sciences, Moscow; Kiselev, 1981
Cassida sp. (like *C. viridis*)	not found	not found	Burmeister, 1836
Cassida sp.	Eocene to Quaternary	Denmark; Lexden, England; Baltic amber, Russia and Poland; Aix, Provence, France; Lexden, Oeningen, Switzerland; Rott, Germany; north eastern Siberia, former Soviet Union	some probably at the Paleontology Institute, Academy of Sciences, Moscow; Bell, 1888; Curtis, 1829; Förster, 1885; Henriksen, 1922; Kiselev, 1981; Klebs, 1910; Scudder, 1887; Spahr, 1981b
Coelocassida scabriusculum (Heer, 1870) (= *Elytridium scabriusculum* Heer, 1870) (Fig. 239 A–H)	Eocene	Spitsbergen, Grönland	not found
Delocrania sp.	lower Eocene to lower Oligocene	Dominican Republic amber	Farell, *et al.* 1992
Eocassida longula Haupt, 1950 (Fig. 230)	Tertiary to middle Eocene	Geiseltal, Germany	not found
Inclusus sp. (Cassidinae?)	late Eocene to early Oligocene	Baltic amber, Russia and Poland	Spahr, 1981b
Mesomphalia gemmaspis Pongr., 1935 (Figs. 231–232)	Tertiary to middle Eocene	Geiseltal, Germany	Haupt, 1950
Oligocassida melaena Théobald, 1937 (Fig. 248)	Oligocene	Les Fumades, France	Ni 18, Coll. Musée Nîmes.
Paracassida aurichalcea Haupt, 1956 (Fig. 233)	Tertiary to middle Eocene,	Geiseltal, Germany	type 55/128, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
P. bisangulata Haupt, 1956 (Fig. 234)	Tertiary to middle Eocene	Geiseltal, Germany	"holotypus G 55/125, 126", Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
P. detrita Haupt, 1956 (Fig. 235)	Tertiary to middle Eocene	Geiseltal, Germany	type 55/127, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany
P. punctillata Haupt, 1956 (Fig. 236)	Tertiary to middle Eocene,	Geiseltal, Germany	type, G 55/124, Sammlung des Geologisch-Paläontologischen Instituts der Universität Halle, Germany

Table 2. (Continued)

Taxon, author, year	Period	Location	Depositories, references, other
unidentified chrysomelids (Figs. 237)	middle Miocene to Quaternary	Many localities in North America and Europe; Peary Land, Greenland; Nushagak and Holitna lowlands, southwestern Alaska; Tokai and Mikawa districts, central Japan; and in Shanwang, Shandong, China	S 82749 at Shandong Provincial Museum, China, others at the Zoological Museum, University of Copenhagen, Denmark; possibly at Institute of Arctic and Alpine Research, Boulder, CO, USA; Ashworth and Hoganson, 1983; Bachofen-Echt, 1949; Böcher, 1989; Elias, 1985; Elias *et al.*, 1986, 1992; Elias and Nelson, 1989; Elias and Wilkinson, 1983; Fujiyama, 1980 (Natl. Sci. Museum, Tokyo, Japan, NSM-PA12084); Furth, 1978; Germar, 1813; Giebel, 1856; Handlirsch, 1906–1908a, 1906–1908b; Klebs, 1910; Larsson, 1978; Lea *et al.*, 1991; Menge, 1856; Meunier, 1900; Quiel, 1911; Scudder, 1887, 1891; Schaufuss, 1892; Short *et al.*, 1992 Uhmann, 1939; Westwood, 1854, Zhang, 1989

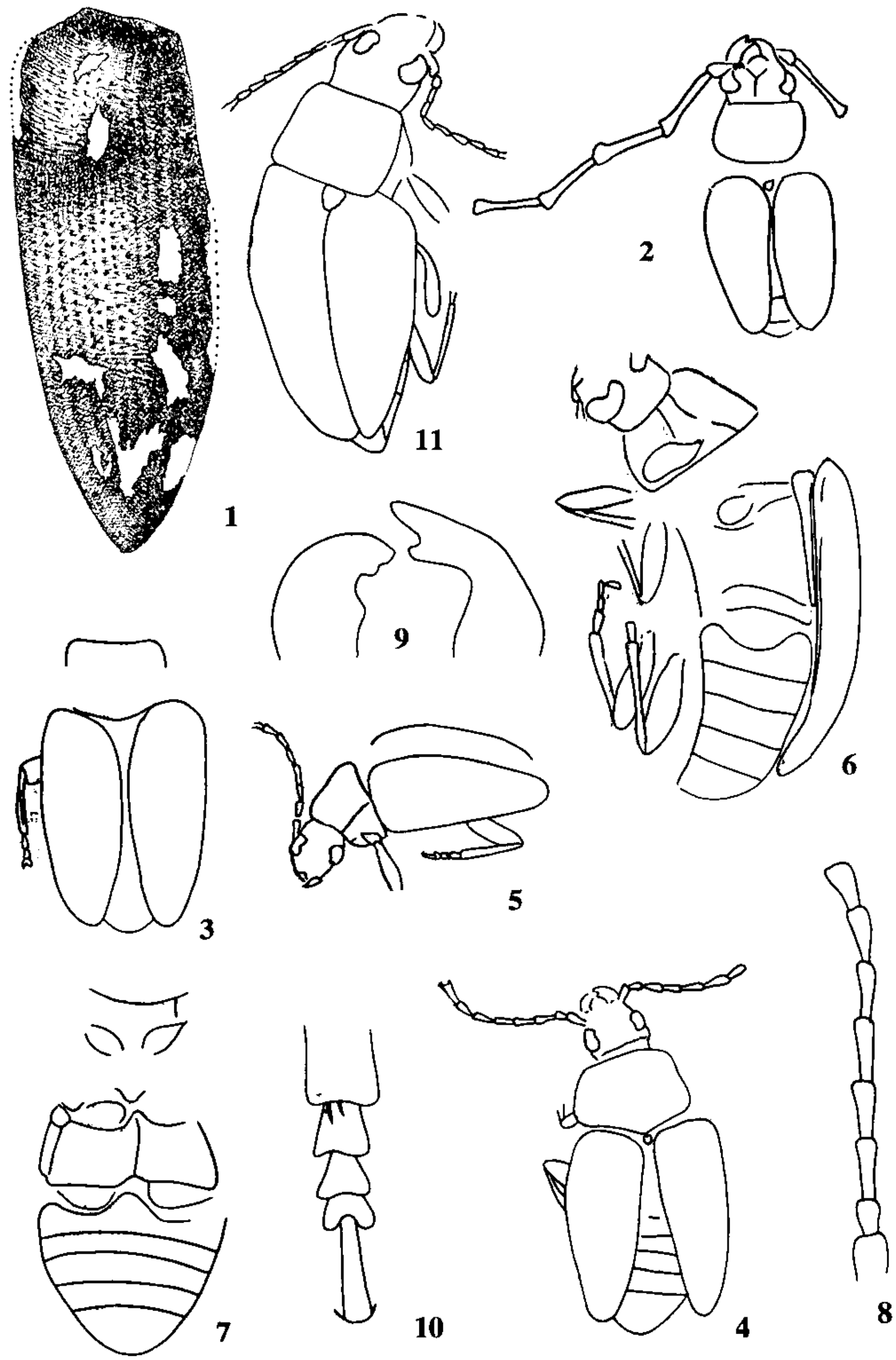


Plate 1. Fig. 1. *Mesosagrites multipunctatus* Martynov, 1935; Fig. 2. *Cerambyomina longicornis* Medvedev (in Rohdendorf, 1968); Figs. 3–10. *Protoscelis jurassica* Medvedev (in Rohdendorf, 1968). 3–4. Body, dorsal. 5. Dorsolateral. 6. Ventrolateral. 7. Ventral. 8. Antenna. 9. Mandibles. 10. Leg; Fig. 11. *Protosceloides parvula* Medvedev (in Rohdendorf, 1968).

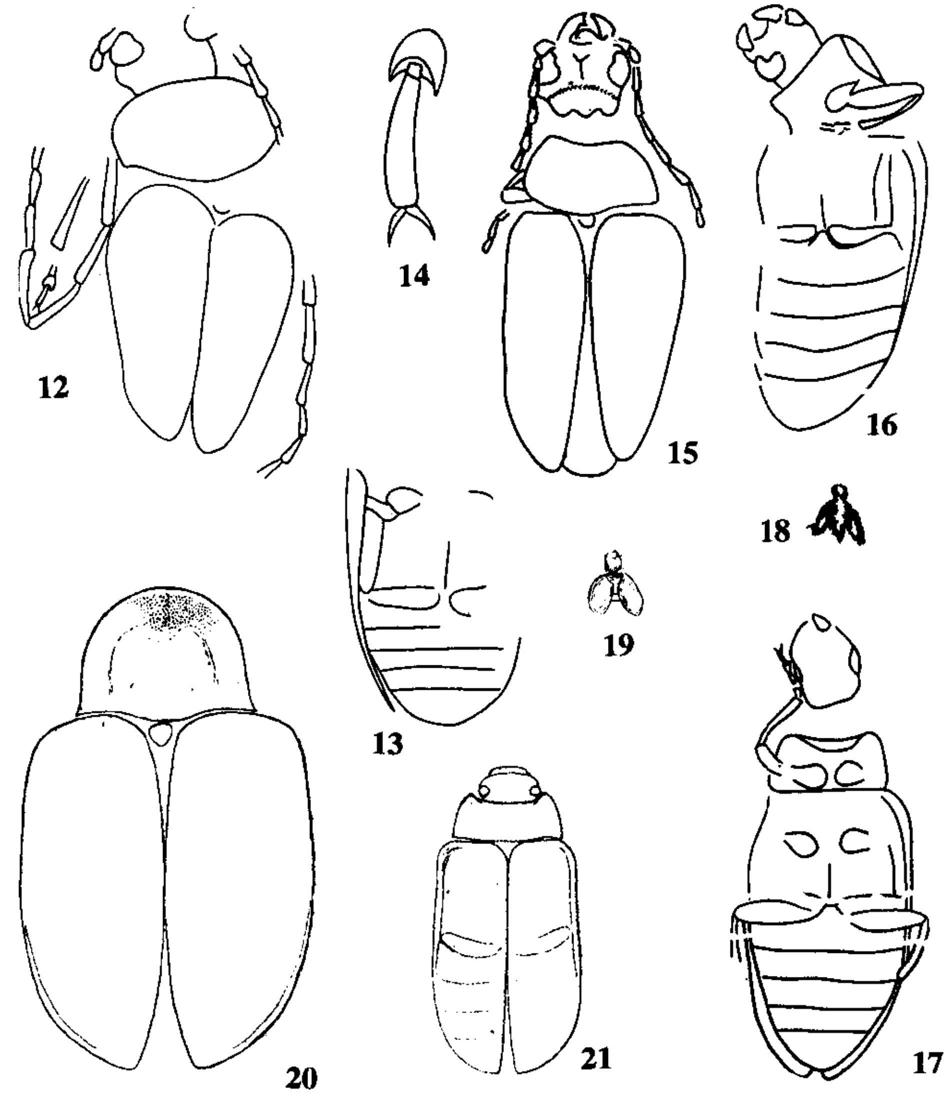


Plate 2. Figs. 12–14. *Protosceloides nitidicornis* Medvedev (in Rohdendorf, 1968). 12. Body, dorsal. 13. Abdomen, ventral. 14. Leg apex; Figs. 15–17. *Pseudomegamerus grandis* Medvedev (in Rohdendorf, 1968). 15. Dorsal. 16–17. Ventral; Figs. 18. *Cryptocephalus antiquus* Weyenbergh, 1869a; Figs. 19. *C. mesozoicus* Weyenbergh, 1869a. (From Oppenheim, 1887–1888); Fig. 20. *Eumolpites jurassicus* Martynov, 1926; Fig. 21. *Eumolpites liberatus* Heer, 1865 (From Heer).

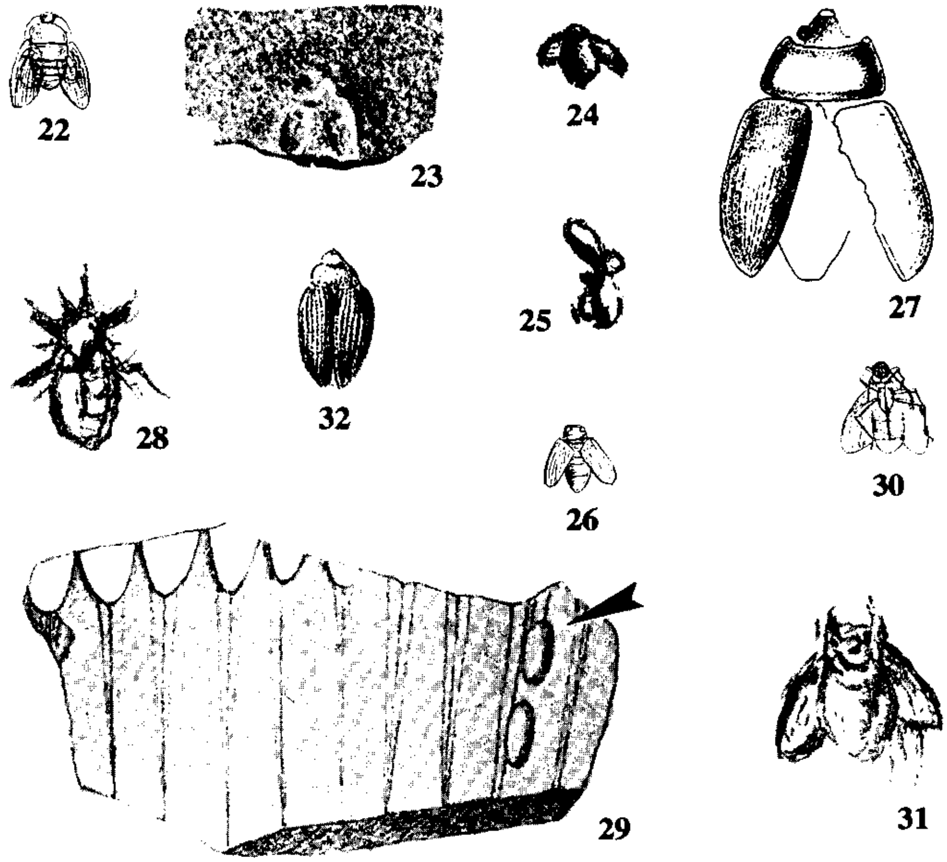


Plate 3. Figs. 22–23. *Chrysomelites jurassicus* Oppenheim, 1887–1888 (Fig. 23 from Meunier, 1898c); Figs. 24–25. *Chrysomelites lithographica* Weyenbergh, 1869a; Fig. 26. *Chrysomelites minima* Oppenheim, 1887–1888; Fig. 27. *Chrysomelites prodromus* Heer, 1865; Fig. 28. *Chrysomelites rara* Weyenbergh, 1869a; Fig. 29. *C. rothenbachi* Heer, 1877 (arrowhead) on *Equisetum*; Fig. 30. *Galerucites carinata* Oppenheim, 1887–1888. Note similarities with a heteropteran, such as a typical mirid; Fig. 31. *Cassida aequivoca* Weyenbergh, 1869a; Fig. 32. Unidentified alleged chrysomelid. (From Brodie, 1845).

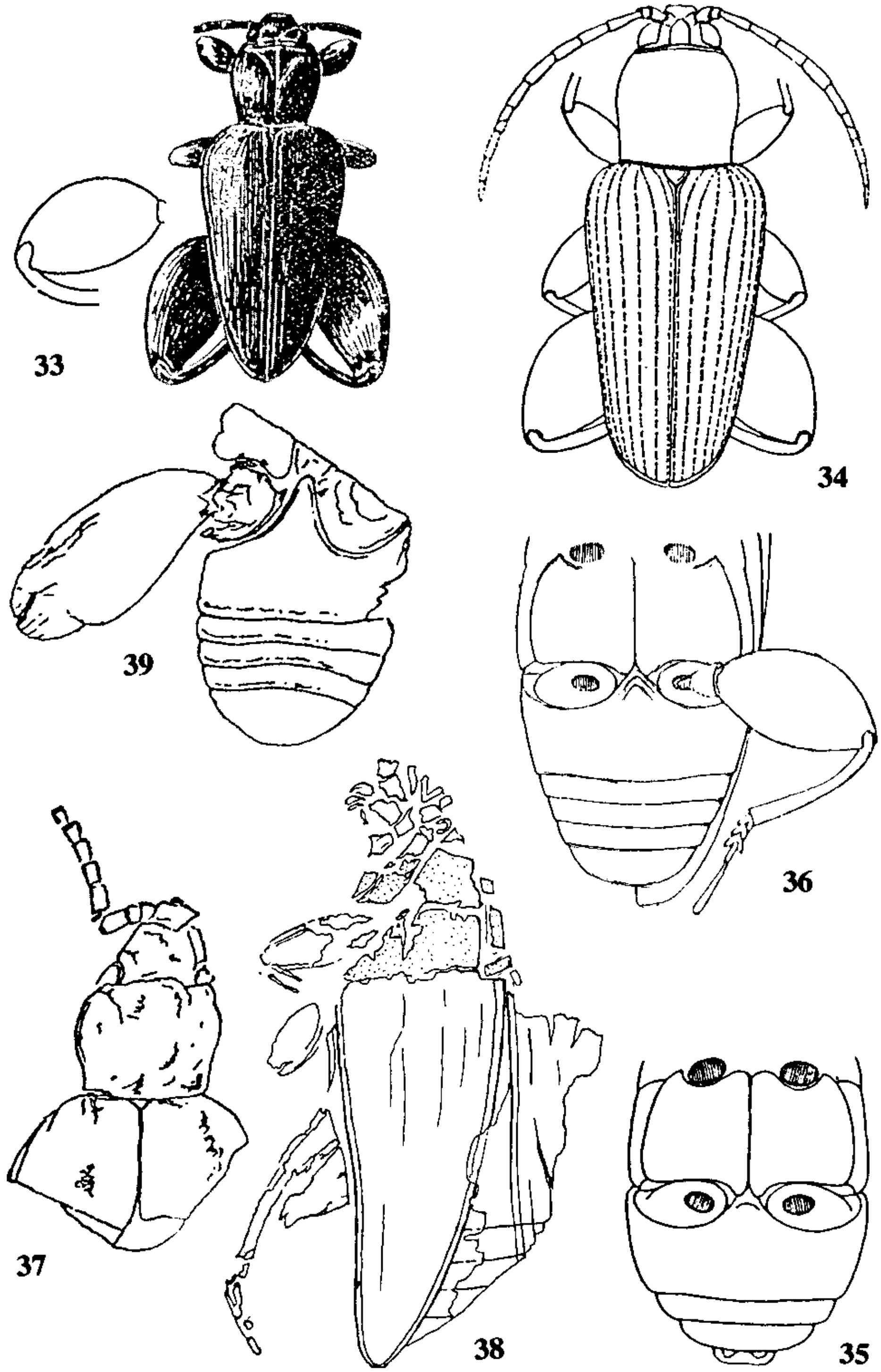


Plate 4. Fig. 33. *Eosagra obliquata* Haupt, 1950; Fig. 34–36. *Eosagra subparallela* Haupt, 1950. 34. Body, dorsal. 35 and 36. Thorax and abdomen, ventral; Figs. 37–39. *Eosagra* sp. 37. Anterior part of body, dorsal. 38. Dorsolateral. 39. Thorax and abdomen, ventral.

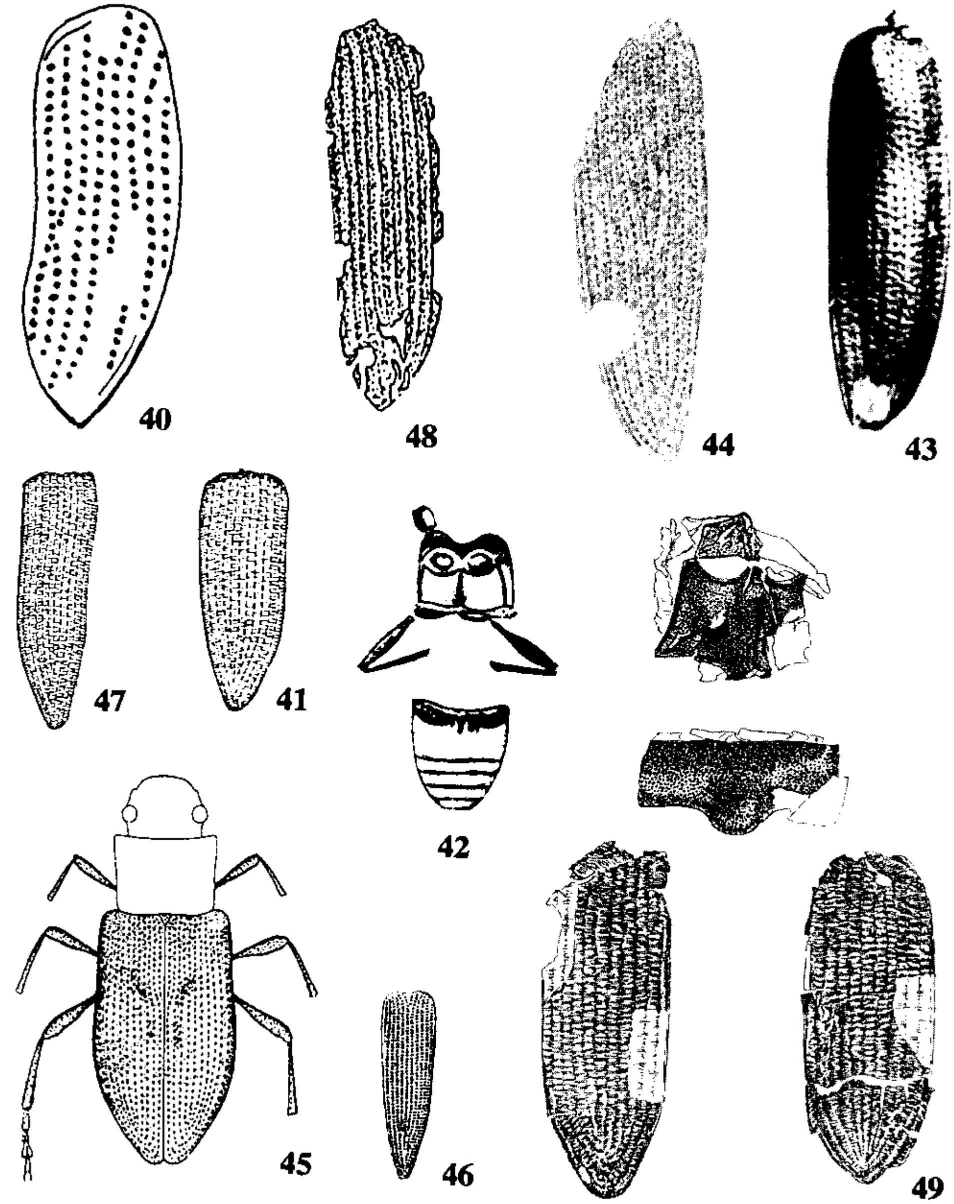


Plate 5. Fig. 40. *Donacia pitoni* Goecke, 1959? (= *D. antiqua* Piton, in Piton and Théobald, 1935); Fig. 41. *D. bicolor* Zschach, 1788 (From Goecke, 1943); Fig. 42. *disjecta* Förster, 1891 (From Elias, 1982); Fig. 43. *D. distincta* LeConte, 1850; Fig. 44. *elongatula* Scudder, 1990 (From Goecke, 1943); Fig. 45. *D. jaroslavii* Lomnicki, 1894; Fig. 46. *D. lezneri* Assmann, 1870; Fig. 47. *D. lignitum* Sordelli, 1882 (From Goecke, 1943); Fig. 38. *D. minuta* Haupt, 1956; Fig. 49. *D. obscura* Gyllenhal, 1813 (From Jessen, 1932).

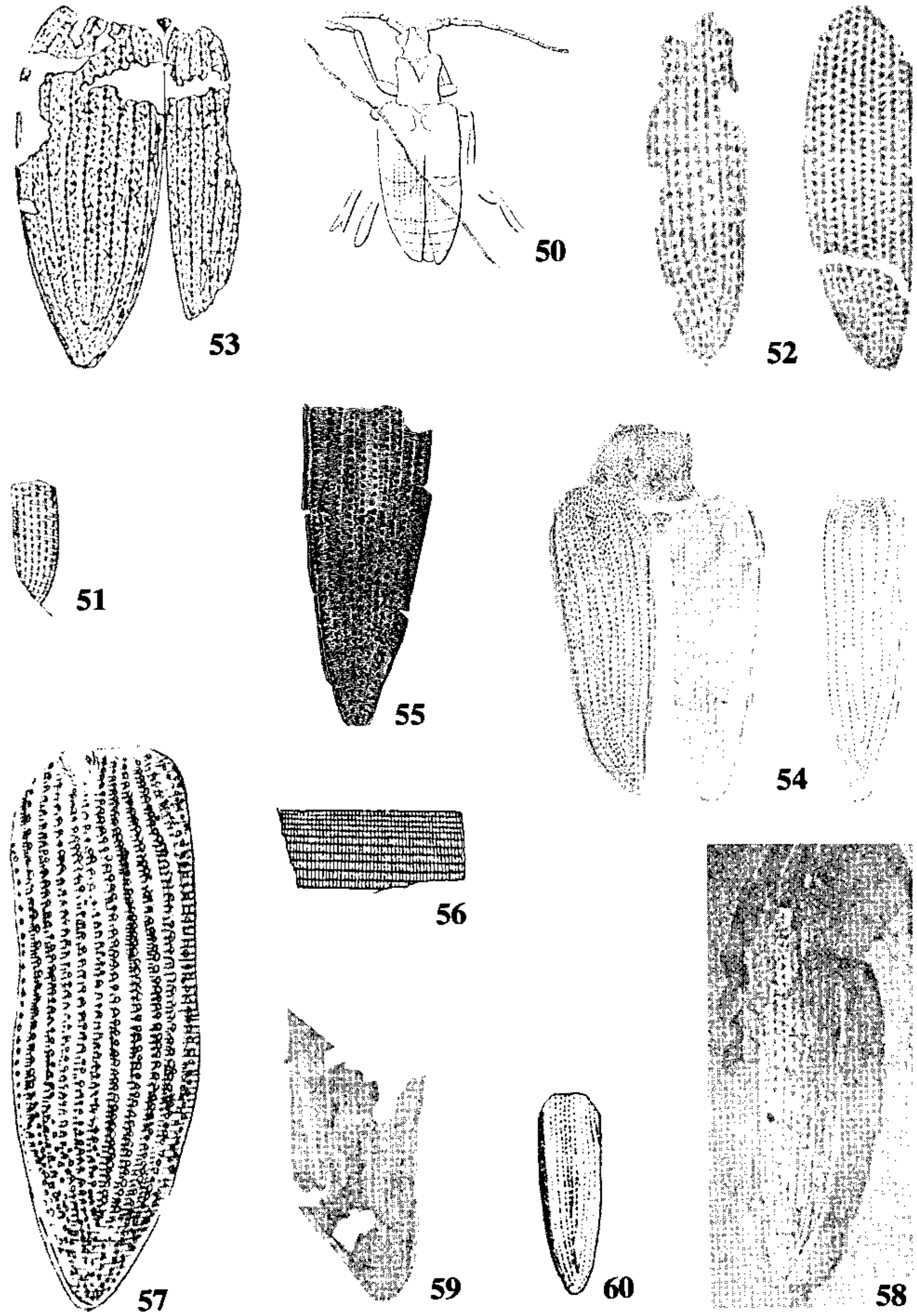


Plate 6. Fig. 50. *Donacia palaemonis* Heer, 1847; Fig. 51. *D. parvula* Heer, 1870 ('nomina relictum', Birket-Smith, 1977) (See also Figs. 88 A–D); Fig. 52. Elytra of *D. pompatica* Scudder, 1890b; Fig. 53. *D. pterobrachys* Haupt, 1956; Fig. 54. *D. sagittariae* Fabricius, 1792 (From Goecke, 1943); Fig. 55. *D. semicuprea* Panzer, 1796 (From Jessen, 1932); Fig. 56. *D. smittiana* Heer, 1870 ('nomina relictum', Birket-Smith, 1977) (See also Fig. 89); Fig. 57. *D. splendida* Théobald (in Piton and Théobald, 1935); Fig. 58. *D. statzi* Goecke, 1943; Fig. 59. *D. stiria* Scudder, 1890b; Fig. 60. *D. tenuipunctata* Théobald (in Piton and Théobald).

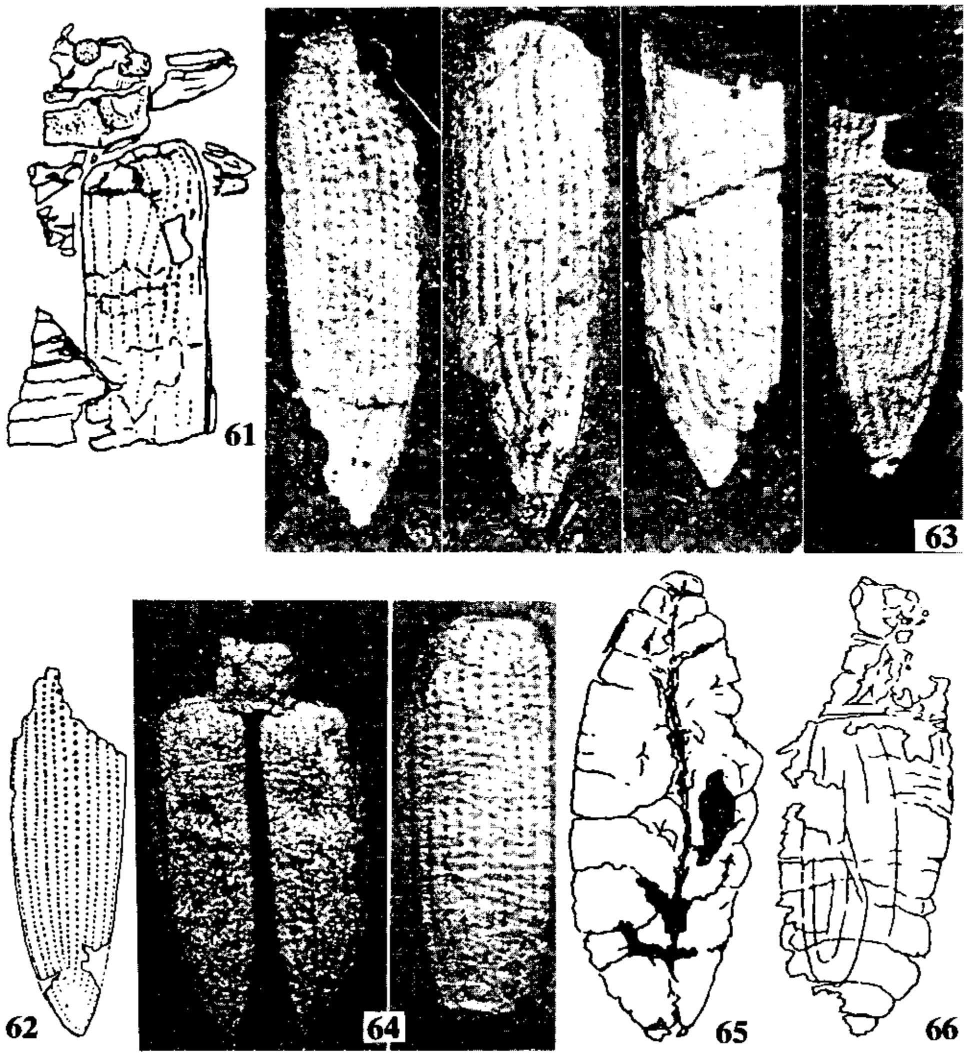


Plate 7. Figs. 61–62. *Donacia vicina* Haupt, 1956; Fig. 63. *D. voigti* Goecke, 1943; Fig. 64. *D. weigelti* Goecke, 1943; Fig. 65–66. *Donacia* sp., larvae and pupae, respectively.

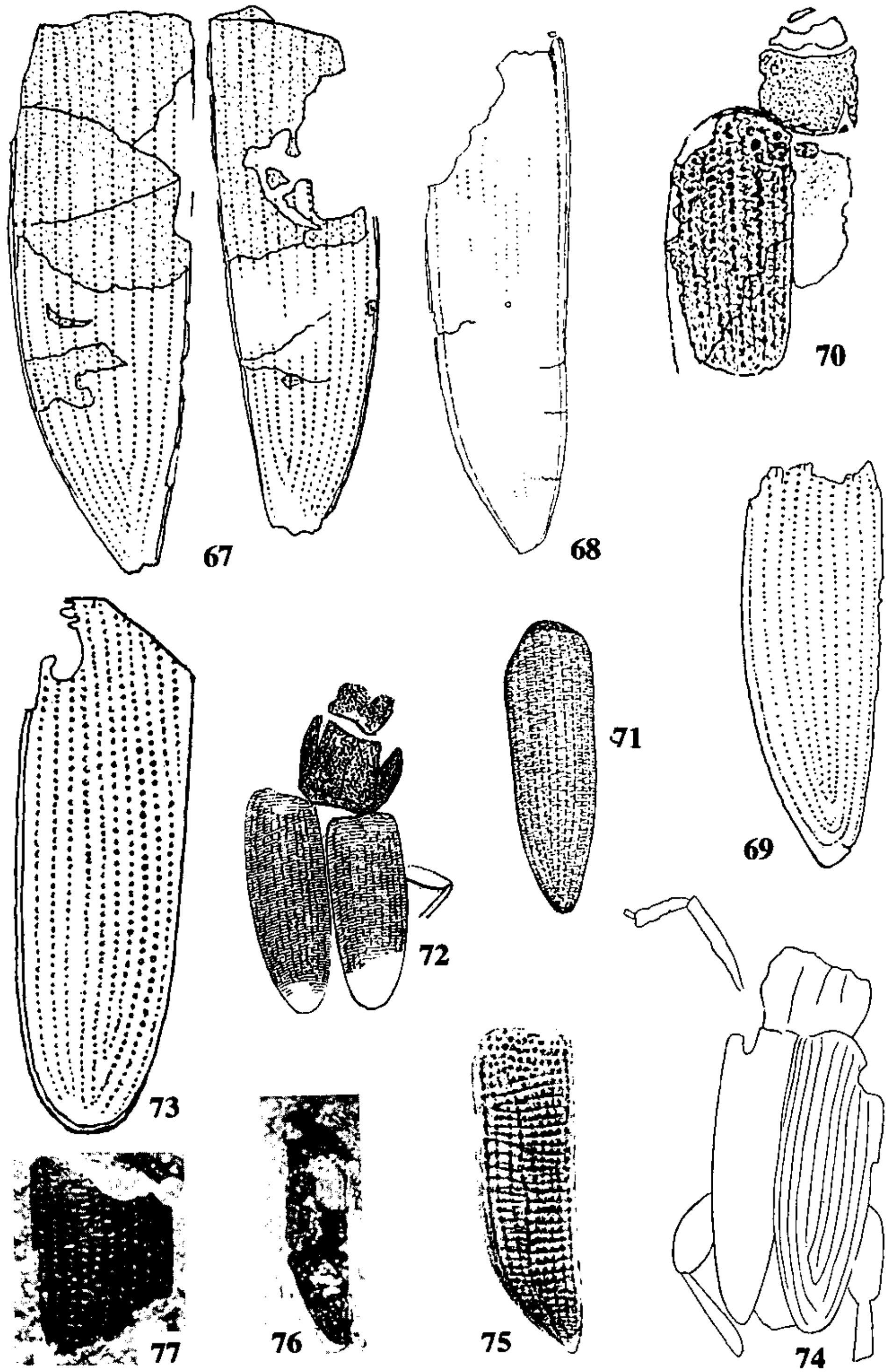


Plate 8. Figs. 67–68. *Eodonacia goeckei* (Haupt, 1956) (*Eodonacia* = *D.* (*Donacia*), Askevold, 1991); Fig. 69. *E. paludosa* Haupt, 1956; Fig. 70. *Hemidonacia insolita* Haupt, 1956 (similar to *D.* (*Cyphogaster*) *provostii* Fairmaire, 1885; *Hemidonacia* = *D.* (*Cyphogaster*), Askevold, 1991); Fig. 71. *Plateumaris affinis* Kirby, 1837; Fig. 72. *P. discolor* (Panzer, 1795); Fig. 73. *P. fallax* Haupt, 1956 (Not a donaciine, Askevold, 1991; is it a chrysomelid?); Fig. 74. *P. primaeva* (Wickham, 1912) (Fig. 74); Fig. 75. *P. sericea* (Linné, 1758); Fig. 76. *Plateumaris* sp.; Fig. 77. *Plateumaris* sp. or *Donacia* sp.

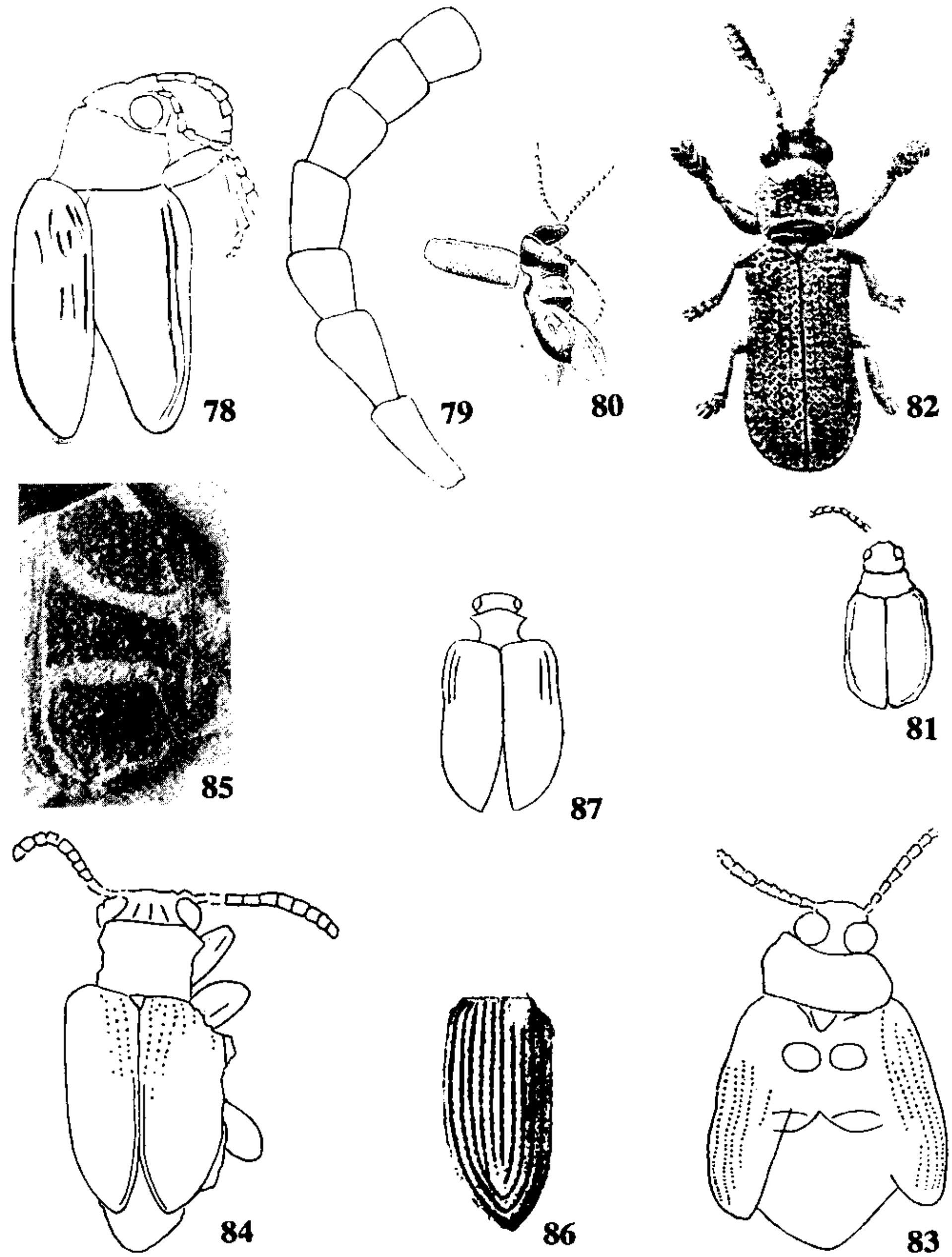


Plate 9. Figs. 78–79. *Crioceridea dubia* Wickham, 1912. Body, dorsal and antenna, respectively; Fig. 80. *Crioceris margarum* Oustalet, 1874; Fig. 81. *C. vetusta* (Heer); Fig. 82. *Electrolema baltica* Schaufuss, 1892 (From Korschefsky, 1939); Fig. 83. *Lema fortior* Wickham, 1914b; Fig. 84. *L lesquereuxi* Wickham, 1914a; Fig. 85. *L pervetusta* Cockerell, 1921; Fig. 86. *L pulchella* Förster, 1891; Fig. 87. *L tumulata* Heyden and Heyden, 1865.

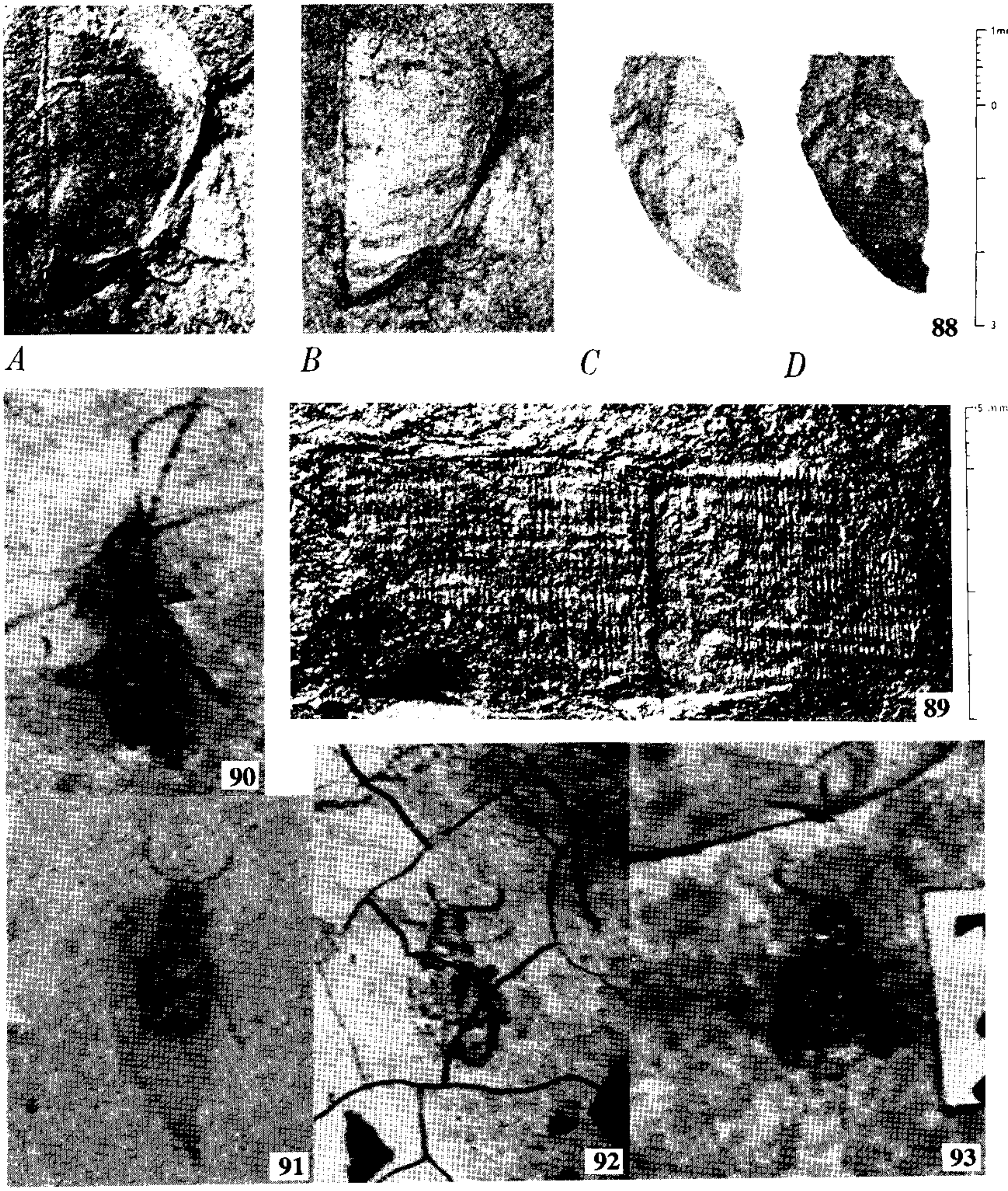


Plate 10. Figs. 88 A–D. *Donacia parvula* Heer, 1870. (From Birket-Smith, 1977); Fig. 89. *D. smittiana* Heer, 1870 (From Birket-Smith, 1977); Fig. 90. *Plateumaris primaeva* (Wickham, 1912); Fig. 91. *Crioceridea dubia* Wickham, 1912; Fig. 92. *Lema evanescens* Wickham, 1910; Fig. 93. *L fortior* Wickham, 1914b.

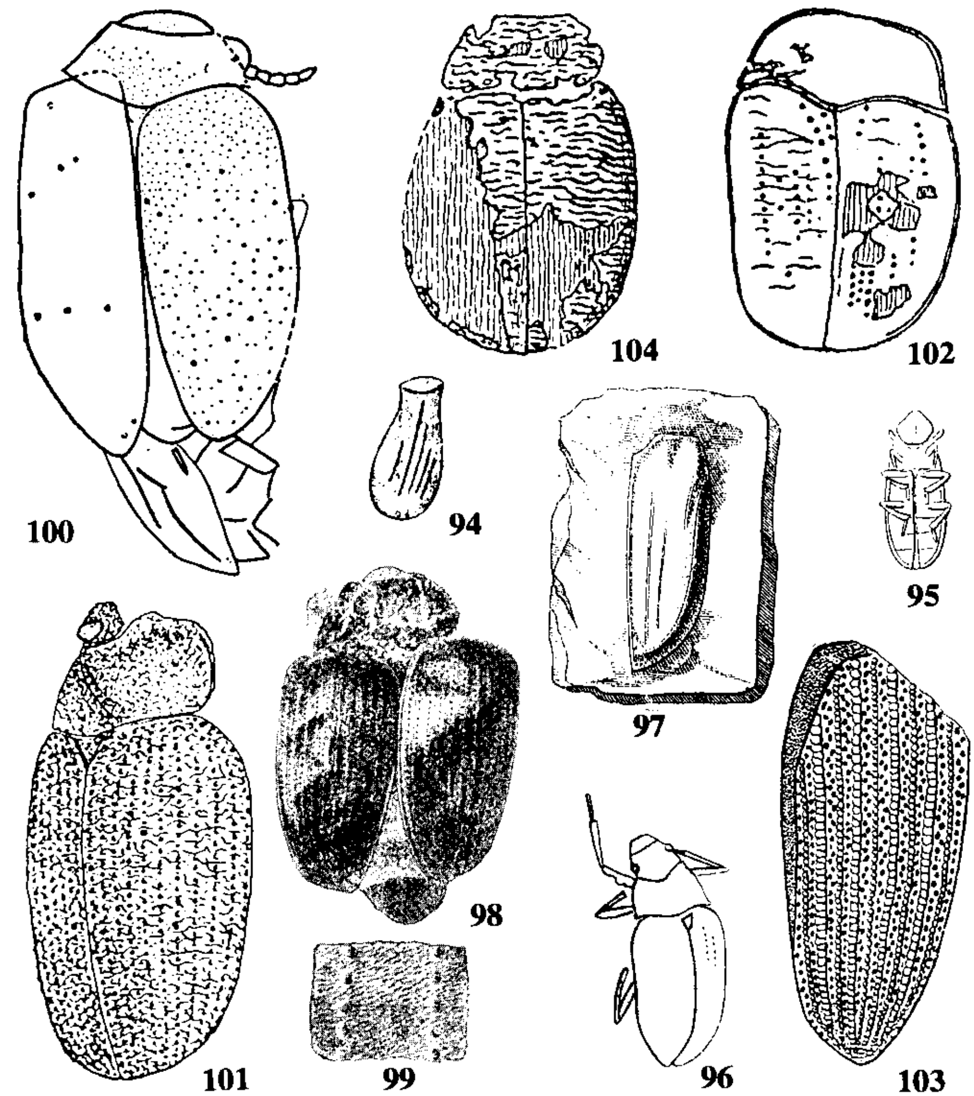


Plate 11. Fig. 94. Larval case of *Clytra carbonaria* Heyden and Heyden, 1865; Fig. 95. *C. pandorae* Heer, 1847 (ventral view, not a larval case); Fig. 96. *Labidostomis phrrha* Heyden and Heyden, 1866; Fig. 97. *Clytra greithiana* (Heer, 1847) (as Melolontha); Figs. 98–99. *Saxinis regularis* Scudder, 1898. 98. Body, dorsal. 99. Portion of right elytron; Fig. 100. *Smaragdina? incerta* Zhang, 1989; Fig. 101. *Cryptocephalites auratus* Haupt, 1956; Fig. 102. *C. elongatus* Haupt, 1956; Fig. 103. *C. punctatus* Scudder; Fig. 104. *C. rufiger* Haupt, 1956.

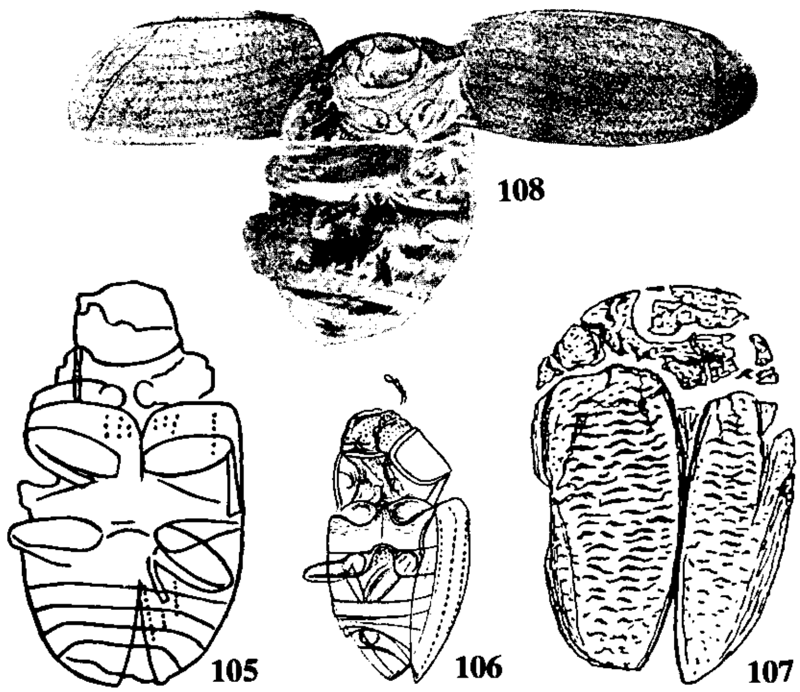


Plate 12. Fig. 105. *Cryptocephalus miocenus* Wickham, 1913c; Fig. 106. *C. relictus* Schlechtendal, 1893; Fig. 107. *C. rugosus* Haupt, 1956; Fig. 108. *C. vetustus* Scudder, 1878.

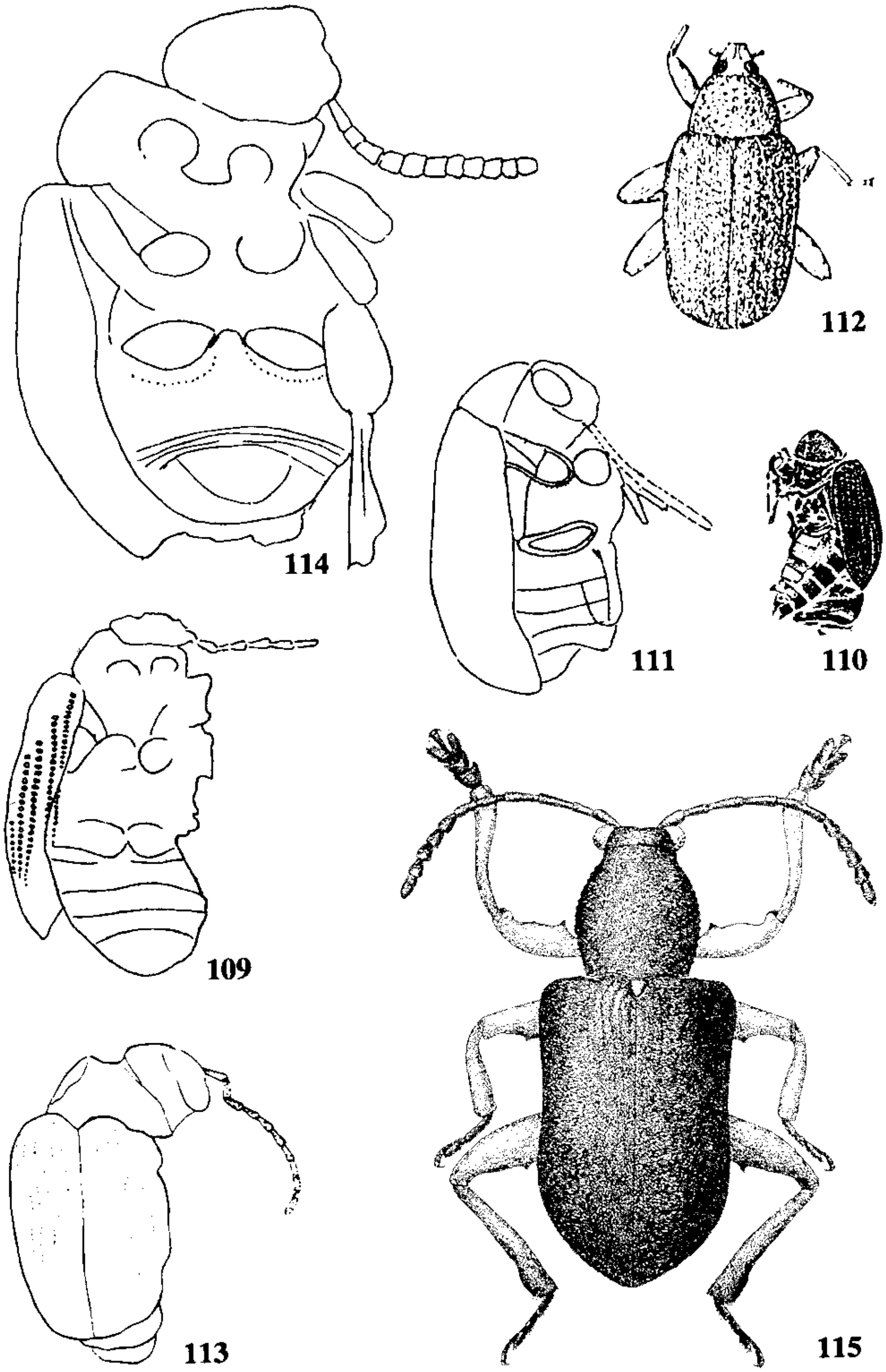


Plate 13. Fig. 109. *Colaspis diluvialis* Wickham, 1914b. (See also Fig. 116); Fig. 110. *C. luti* Scudder, 1893. (See also Fig. 117); Fig. 111. *C. proserpina* Wickham, 1914b. (See also Fig. 118); Fig. 112. *Eoeumolpinus azureviridis* Haupt, 1950; Fig. 113. *Metachroma florissantensis* Wickham, 1912; Fig. 114. *Prochaetocnema florissantella* Wickham, 1914b. (See also Fig. 119); Fig. 115. *Profidia nitida* Gressitt, 1963.

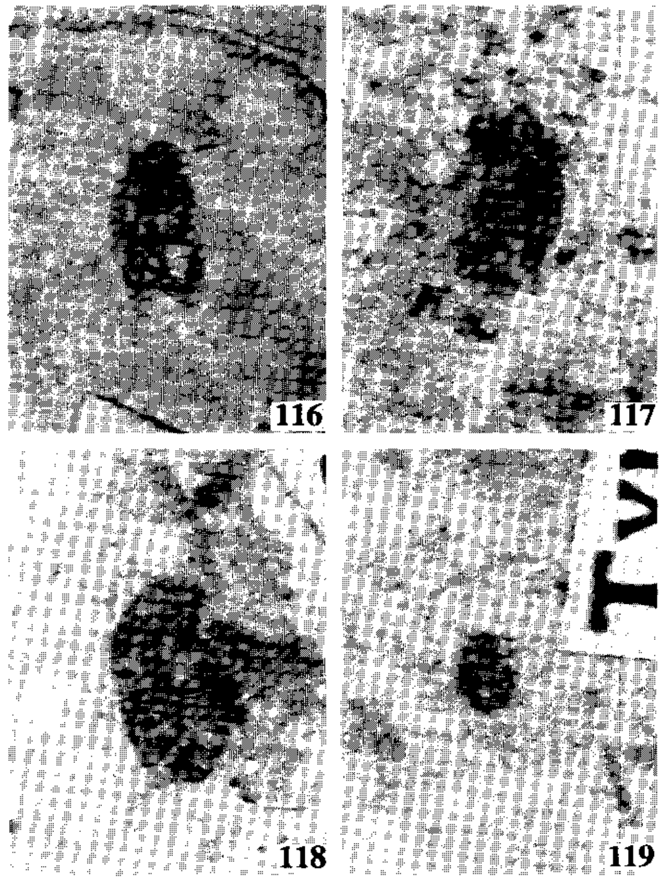


Plate 14. Fig. 116. *Colaspis diluvialis* Wickham, 1914b. (See also Fig. 109); Fig. 117. *C. luti* Scudder, 1893. (See also Fig. 110); Fig. 118. *C. prosperpina* Wickham, 1914b. (See also Fig. 111); Fig. 119. *Prochaetocnema florissantella* Wickham, 1914. (See also Fig. 114).

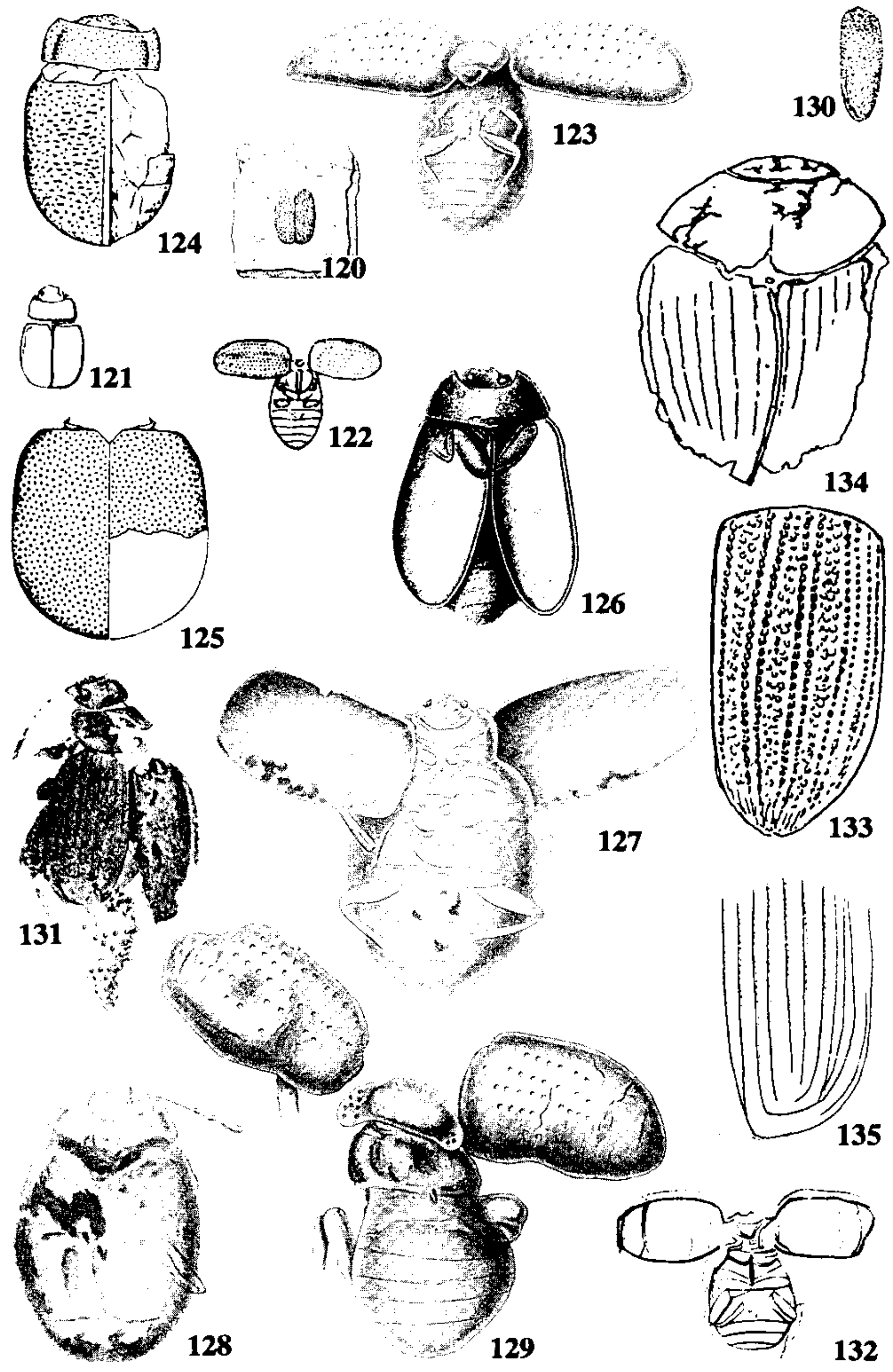
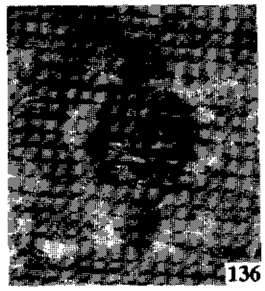


Plate 15. Fig. 120. *Chrysochloa* sp. (From Théobald, 1937; valid name is *Oreina*); Fig. 121. *Chrysomela calami* Heer, 1847. (From Heer, 1872) (Valid name for most of these *Chrysomela* is *Chrysolina*); Fig. 122. *C. ceresti* Théobald, 1937; Fig. 123. *C. debilis* Oustalet, 1874; Fig. 124. *C. hilberi* Lomnicki, 1894; Fig. 125. *C. lichenis* Richter, 1820 (From Lomnicki, 1894; valid name is *Chrysolina lichenis*); Figs. 126–127. *C. lyelliana* Heer, 1856a. 126. Dorsal. 127. Ventral. (From Oustalet, 1874); Fig. 128. *C. mathrona* Oustalet, 1874; Fig. 129. *C. matheroni* Oustalet, 1874; Fig. 130. *C. punctigera* Heer, 1847; Fig. 131. *C. vesperalis* Scudder, 1893. (See also Fig. 136); Fig. 132. *Chrysomela* sp. (From Curtis, 1829); Fig. 133. *Chrysomelites allochlamys* Cockerell, 1920b; Fig. 134. *C. azureus* Haupt, 1956; Fig. 135. *C. bartonicus* Cockerell, 1920b.



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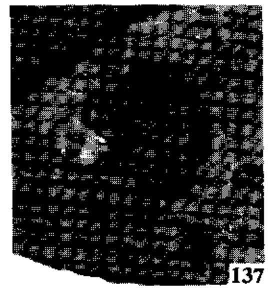

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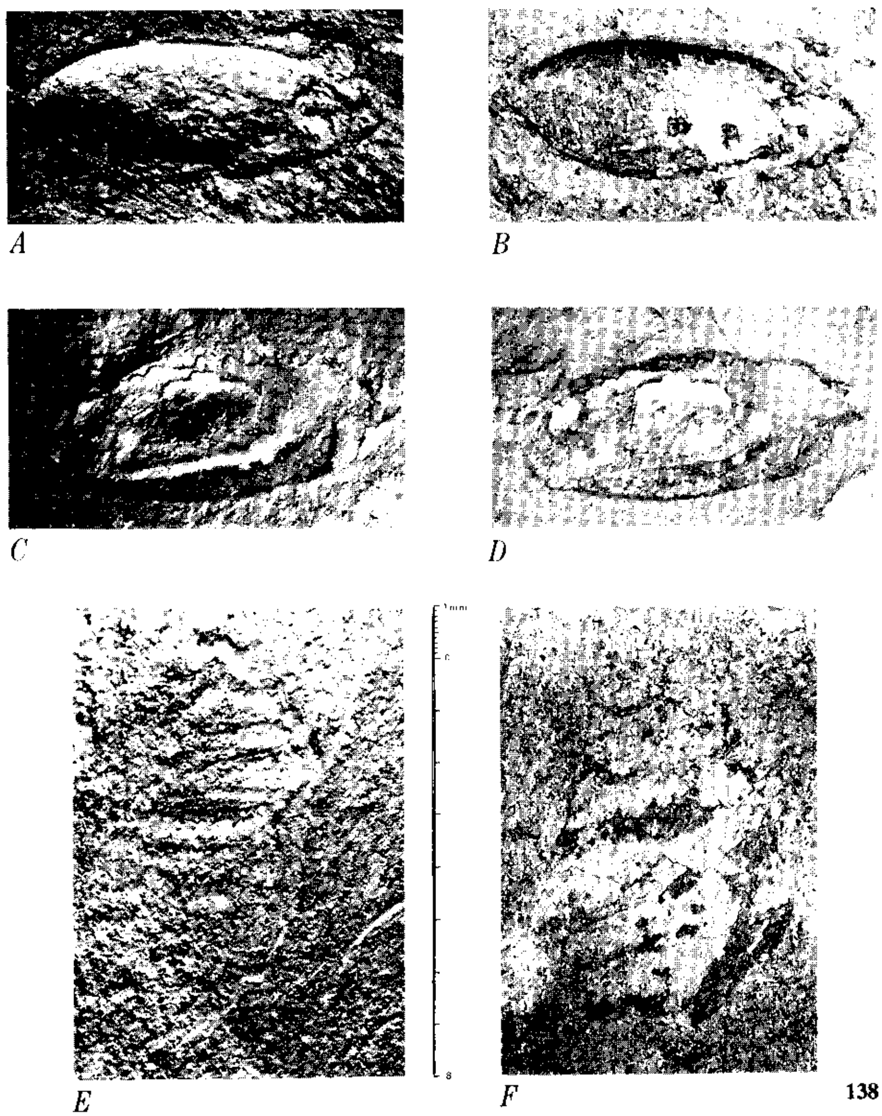

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Plate 16. Fig. 136. *Chrysomela vesperalis* Scudder, 1893. (Valid name for most of these *Chrysomela* is *Chrysolina*.) (See also Fig. 131); Fig. 137. *Chrysomelites alaskanus* Heer, 1869; Fig. 138. *C. lindhageni* Heer, 1870 *nomen relictum*. (From Birket-Smith, 1977).

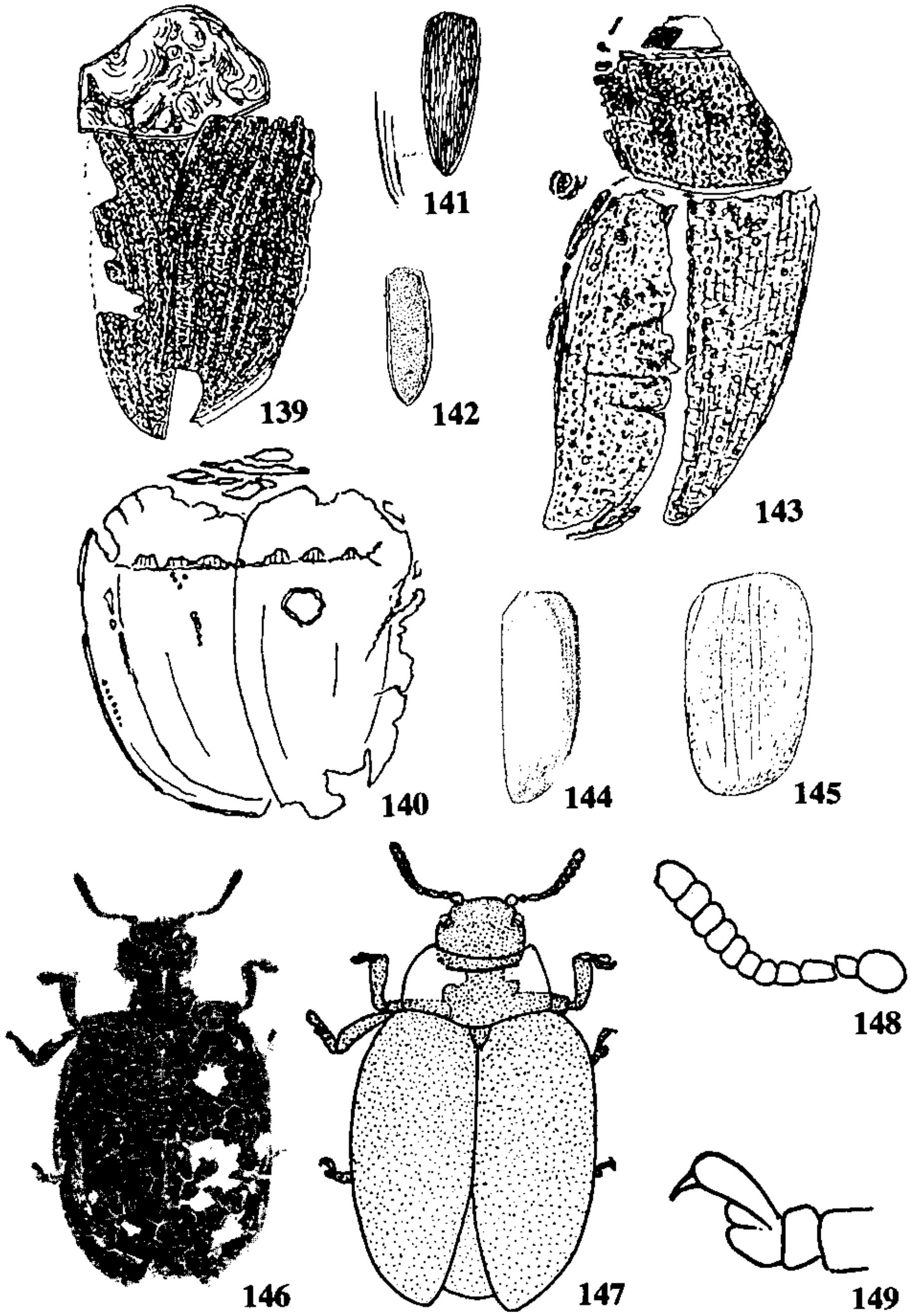


Plate 17. Fig. 139. *Chrysomelites bisornatus* Haupt, 1956; Fig. 140. *C. cupreus* Haupt, 1956; Fig. 141. *C. danielis* Cockerell, 1926; Fig. 142. *C. fabricii* Heer, 1868; Fig. 143. *C. foveolatus* Haupt, 1956; Fig. 144. *C. lindhageni* Heer, 1870 *nomen relictum.* (See also Fig. 138 A–F); Fig. 145. *C. quadrilineatus* Cockerell, 1920b; Fig. 146–149. *Chrysothoracus tropicus* Zhang, 1989. 146, 147. Body, dorsal. 148. Antenna. 149. Tarsi.

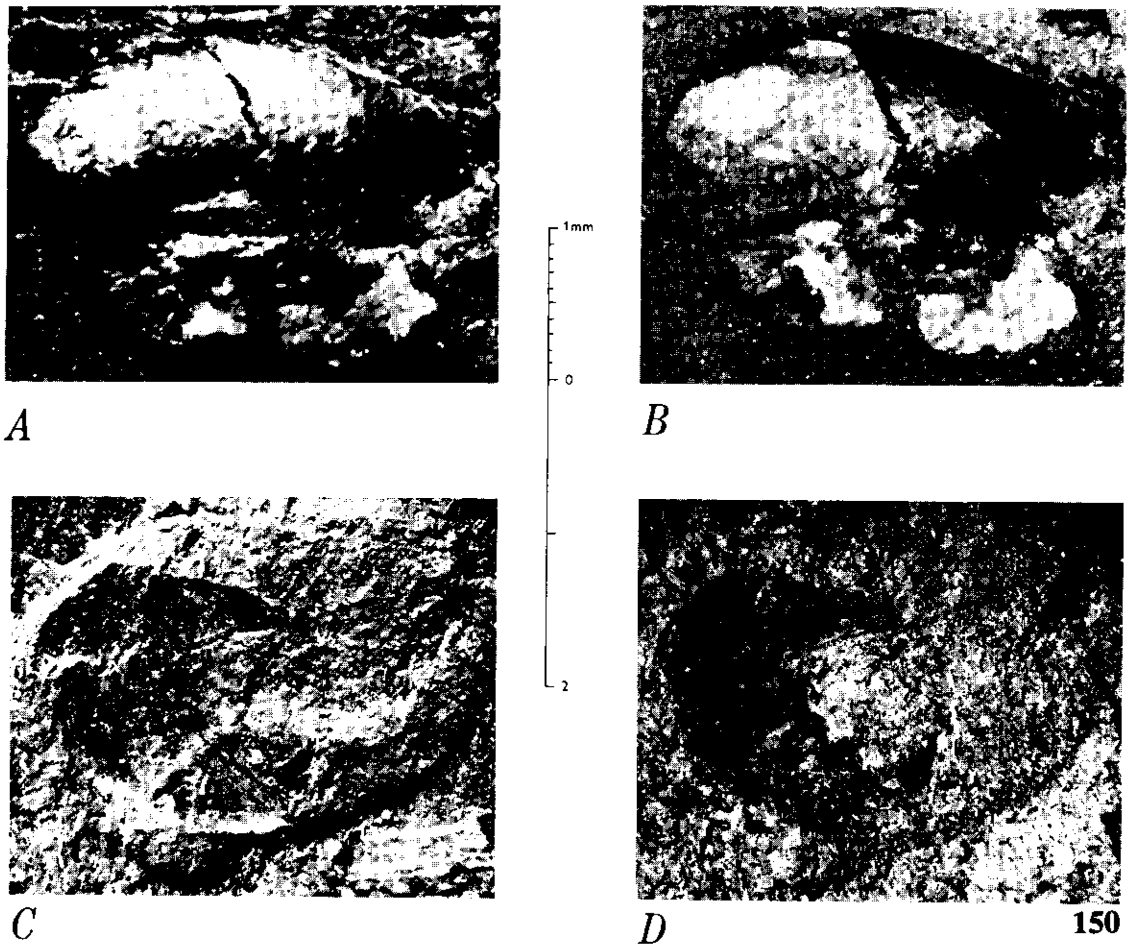


Plate 18. Fig. 150 A–D. *Chrysothoracus thulensis* Heer, 1870 *nomen relictum.* (From Birket-Smith, 1977).

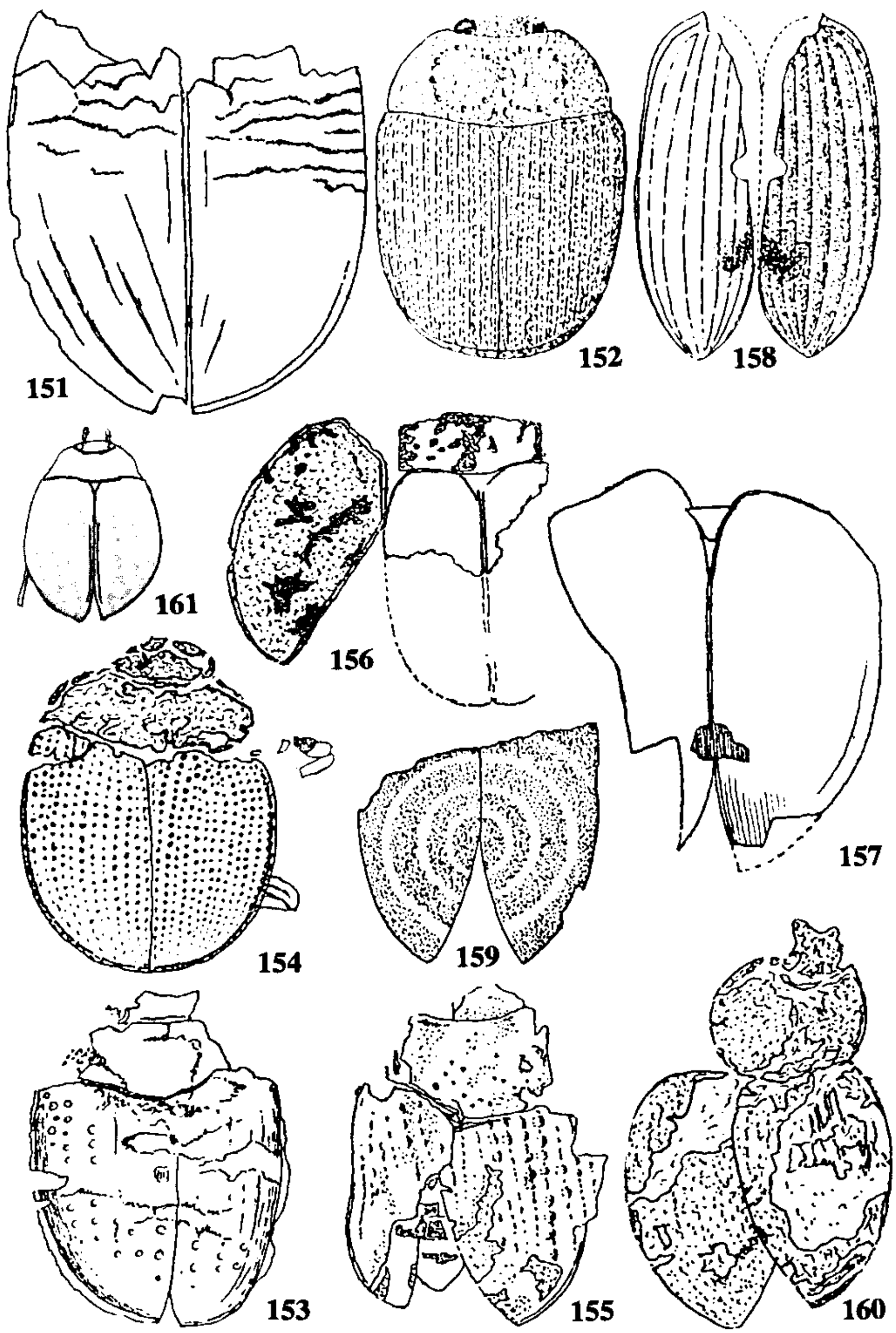


Plate 19. Fig. 151. *Eochrysomela indecorata* Haupt, 1956; Figs. 152–153. *E. ornata* Haupt, 1956; Fig. 154. *E. punctator* Haupt, 1956; Fig. 155. *E. pustulata* Haupt, 1956; Fig. 156. *Eomelasoma incostata* Haupt, 1956; Fig. 157. *E. scutellata* Haupt, 1956; Fig. 158. *Gonocelis notatus* Haupt, 1950; Fig. 159. *Halocoleus cameratus* Haupt, 1950; Fig. 160. *Hemisphaerocosites sphaericus* Haupt, 1956; Fig. 161. *Plagiodera novata* (Heyden and Heyden, 1866).

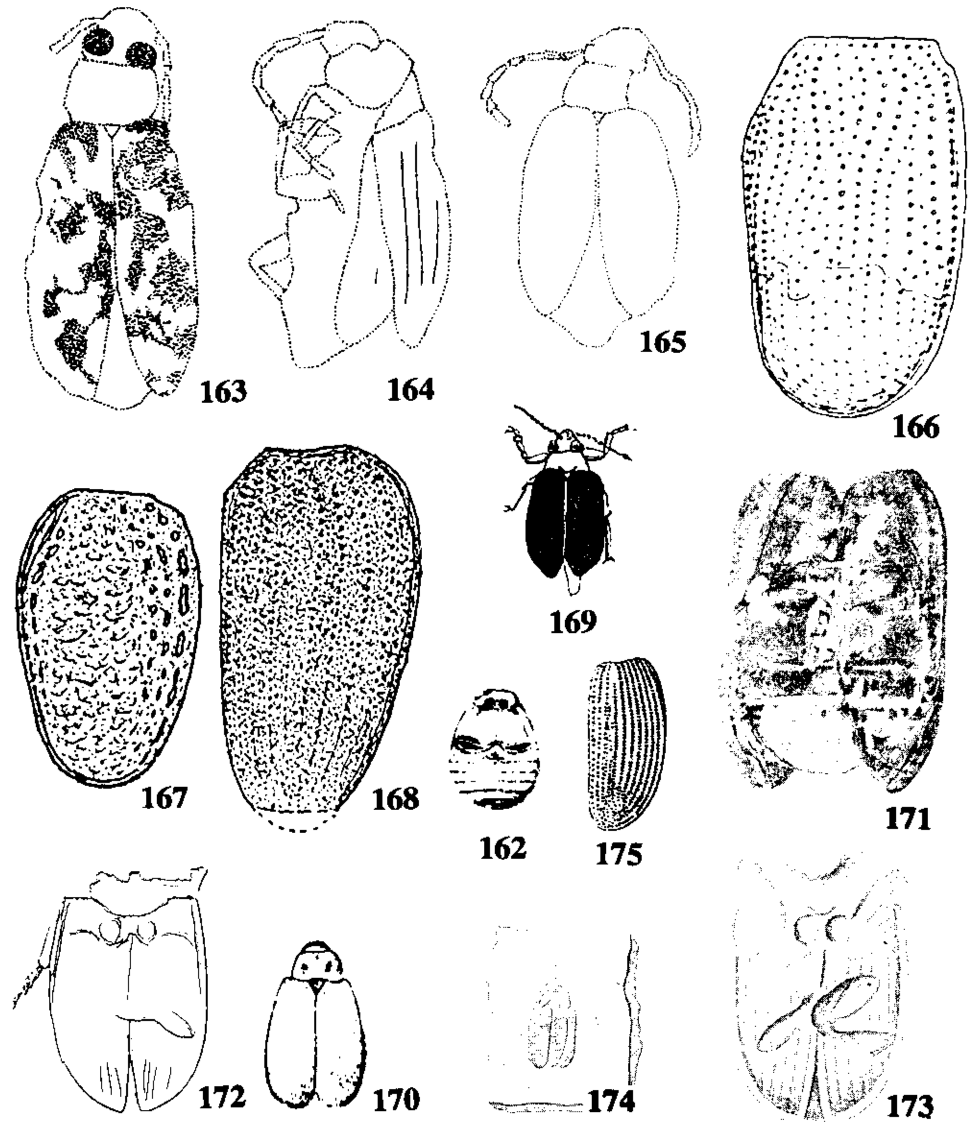


Plate 20. Fig. 162. *Agelasa sessilis* Förster, 1891; Fig. 163. *Diabrotica bowditchiana* Wickham, 1914b. (See also Fig. 189); Fig. 164. *D. florissantella* Wickham, 191b. (See also Fig. 191); Fig. 165. *D. uteana* Wickham, 1914b. (See also Fig. 192); Fig. 166. *Eogaleruca irregularis* Haupt, 1956; Fig. 167. *E. minor* Haupt, 1956; Fig. 168. *E. punctipennis* Haupt, 1956; Fig. 169. *Galeruca buchi* Heer, 1872 (as *G. buchii*); Fig. 170. *Galerucella affinis* Förster, 1891; Fig. 171. *G. picea* Scudder, 1879. (From Scudder, 1890a); Fig. 172. *Gonioctena clymene* Heer, 1847; Fig. 173. *G. curtisii* Oustalet, 1874; Fig. 174. *G. japeti* Heer, 1847; Fig. 175. *G. primordialis* Assmann, 1870.

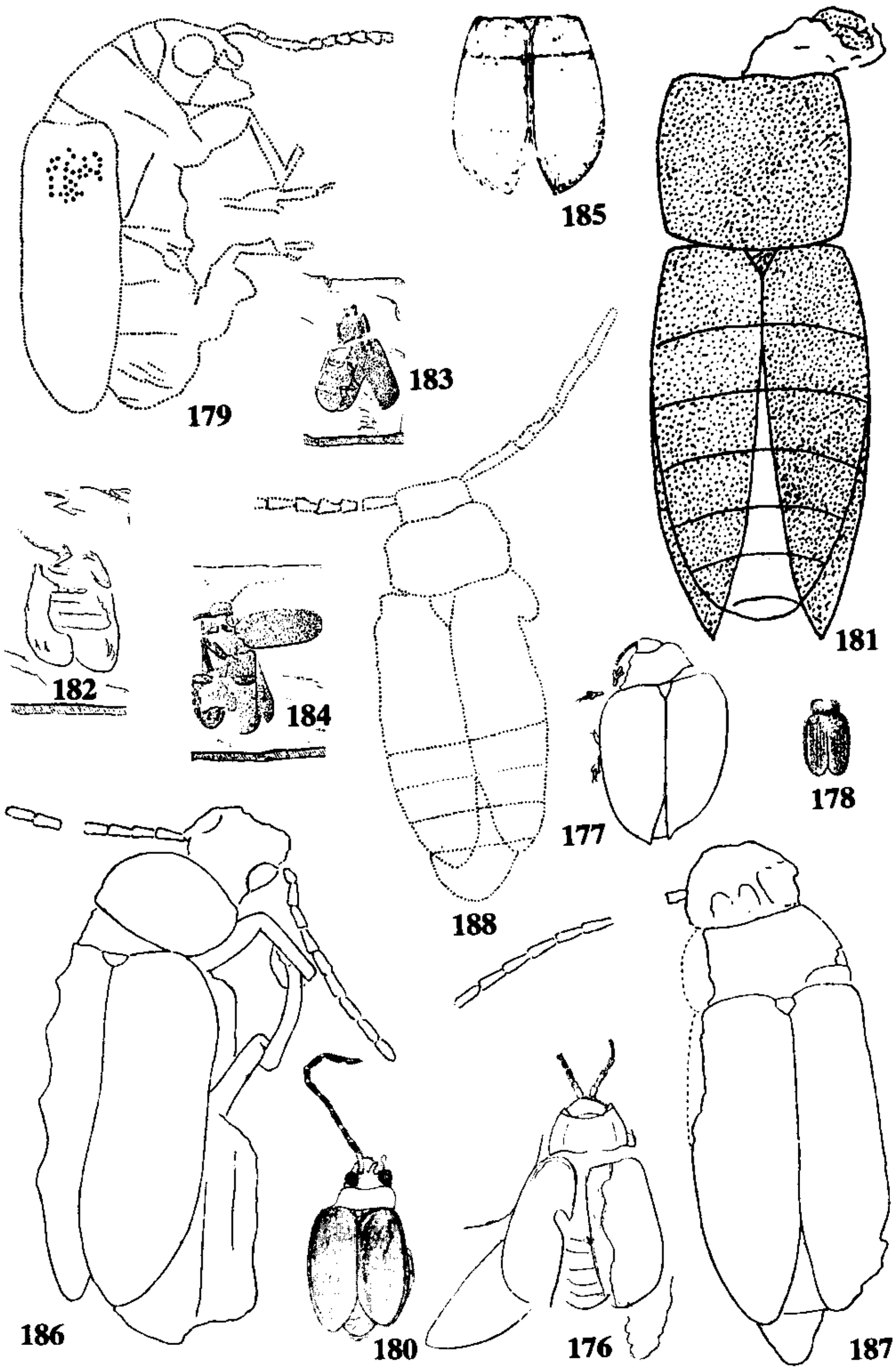


Plate 21. Fig. 176. *Lina populeti* Heer, 1847 (also as *L populi*, valid name is *Chrysomela populeti*); Fig. 177. *Lina sociata* Heyden and Heyden, 1866, Fig. 178. *L. wetteravica* Heyden, 1862; Fig. 179. *Luperodes submonillis* Wickham, 1914a; Fig. 180. *Luperus fossilis* Schlechtendal, 1893; Fig. 181. *Melasoma micropunctata* Piton (in Piton and Théobald, 1935; valid name is *Chrysomela*); Fig. 182. *Oreina amphyctionis* Heer, 1847; Fig. 183. *O. hellenis* Heer, 1847; Fig. 184. *O. protogeniae* Heer, 1847; Fig. 185. *O. pulchra* (Förster, 1891); Fig. 186. *Trirhabda majuscula* Wickham, 1914b (See also Fig. 193); Fig. 187. *T. megacephala* Wickham, 1914b (See also Fig. 194); Fig. 188. *T. sepulta* Wickham, 1914b (See also Fig. 195).

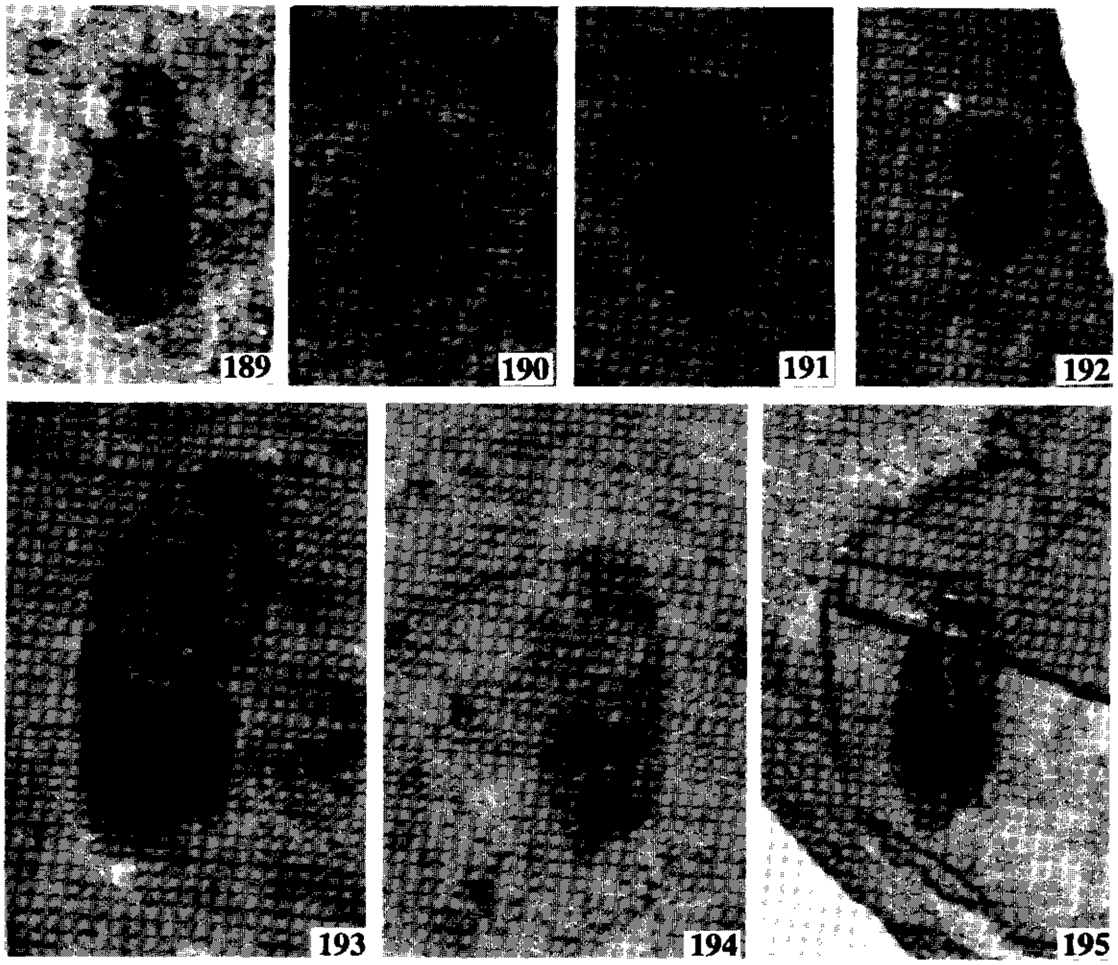


Plate 22. Fig. 189. *Diabrotica bowditchiana* Wickham, 1914b (See also Fig. 163); Fig. 190. *D. exesa* Wickham, 1911; Fig. 191. *D. florissantella* Wickham, 1911b (See also Fig. 164); Fig. 192. *D. uteana* Wickham, 1914b (See also Fig. 165); Fig. 193. *Trirhabda majuscula* Wickham, 1914b (See also Fig. 186); Fig. 194. *T. megacephala* Wickham, 1914b (See also Fig. 187); Fig. 195. *T. sepulta* Wickham, 1914b (See also Fig. 188).

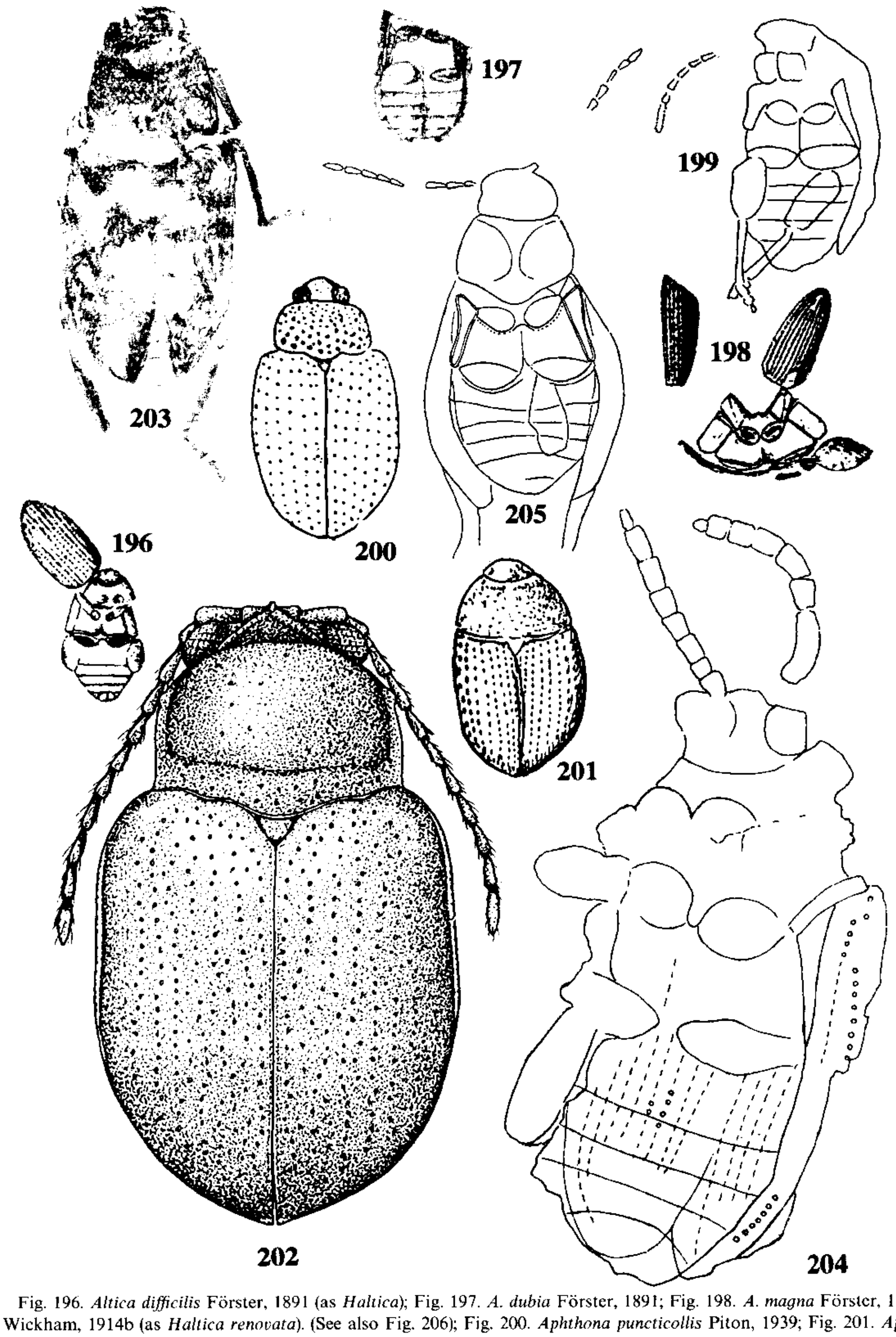


Plate 23. Fig. 196. *Altica difficilis* Förster, 1891 (as *Haltica*); Fig. 197. *A. dubia* Förster, 1891; Fig. 198. *A. magna* Förster, 1891; Fig. 199. *A. renovata* Wickham, 1914b (as *Haltica renovata*). (See also Fig. 206); Fig. 200. *Aphthona puncticollis* Piton, 1939; Fig. 201. *Apteropeda grossa* Théobald (in Piton and Théobald, 1935); Figs. 202. *Crepidodera antiqua* Gressitt, 1971. (valid name is *Asiorestia*); Fig. 203. *Oryctocirtites protogaeum* Scudder, 1876. (See also Fig. 207); Fig. 204. *Plectrotetrophanes hageni* Wickham, 1914b (see also Fig. 208); Fig. 205. *Systena florissantensis* Wickham, 1913b (See also Figs. 209, 210).

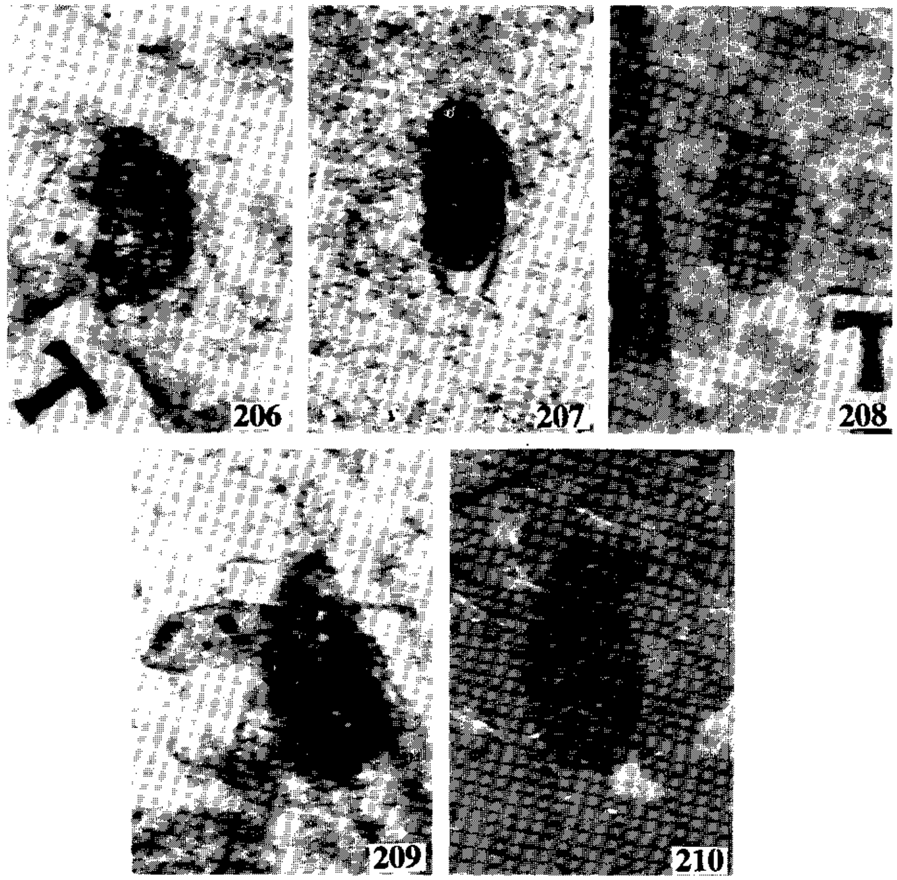


Plate 24. Fig. 206. *Altica renovata* Wickham, 1914b (as *Haltica renovata*). (See also Fig. 199); Fig. 207. *Oryctocirtites protogaeum* Scudder, 1876. (See also Fig. 203); Fig. 208. *Plectrotetrophanes hageni* Wickham, 1914b (See also Fig. 204); Figs. 209, 210. *Systena florissantensis* Wickham, 1913b. 210. Dorsal, 211. Ventral.

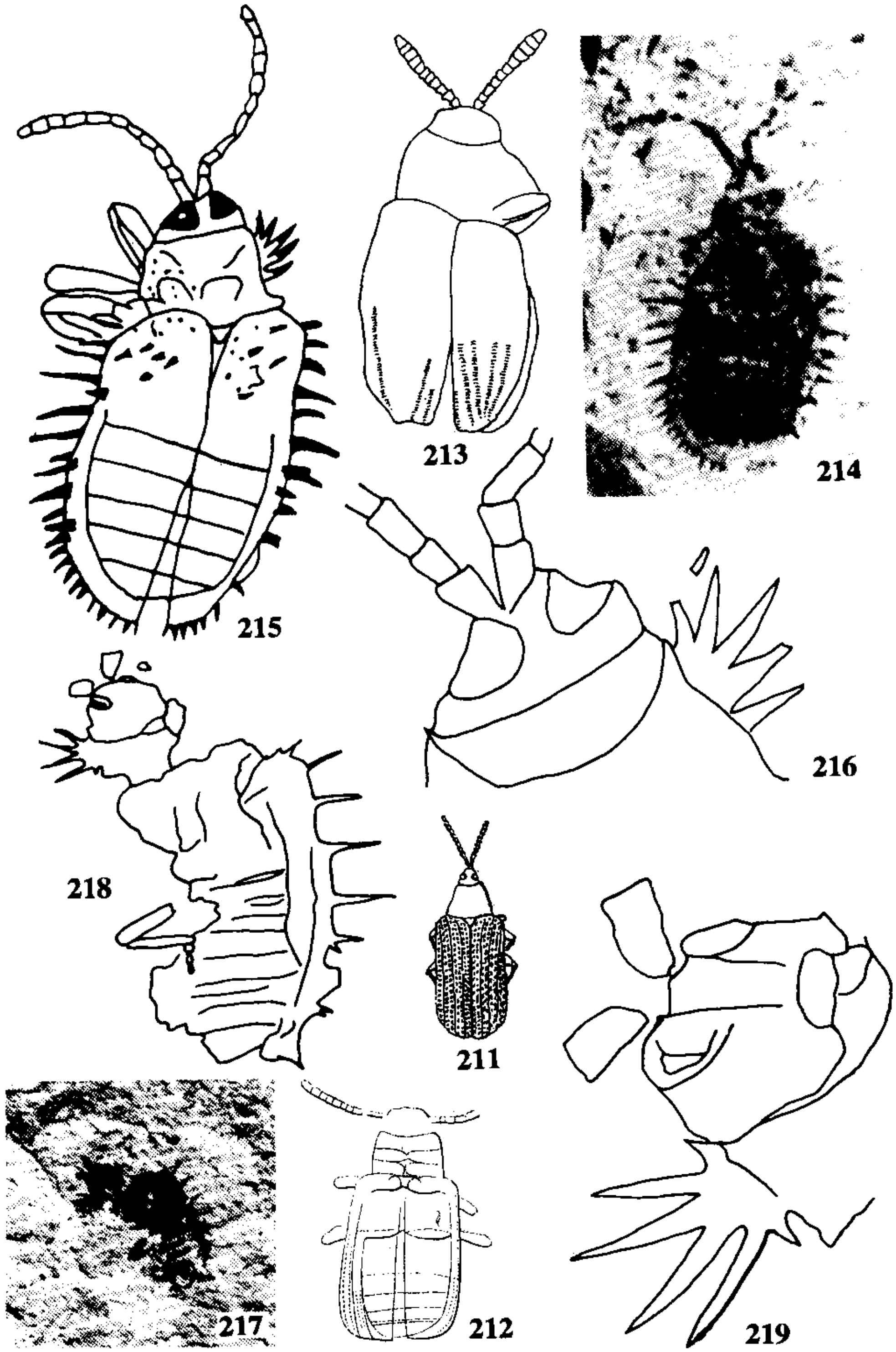


Plate 25. Fig. 211–212. *'Anoplitis' bremii* Heer, 1847 (Fig. 211 from Heer, 1872); Figs. 213. *Chalepus americanus* (Wickham, 1914b) (as *Odontota americana* Wickham, 1914b) See also Fig. 238); Figs. 214–216. *Dicladispa bes-konakensis* Nel, 1988; Figs. 217–219. *D. muratensis* Nel, 1988.

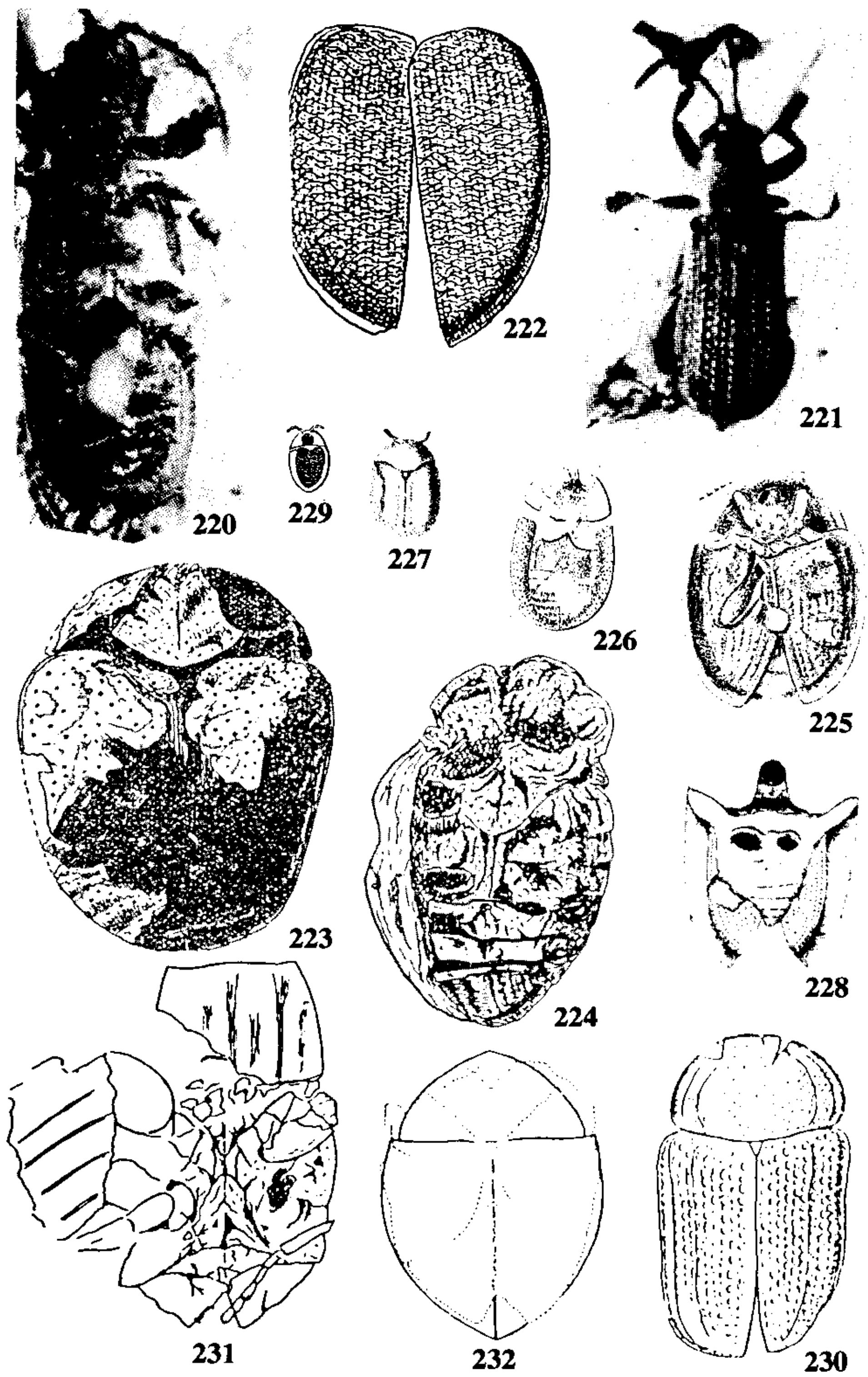


Plate 26. Fig. 220. *Oposispa scheelie* Uhmann, 1939; Fig. 221. *Sucinagonia javetana* Uhmann, 1939. (From Larsson, 1978); Fig. 222. *Acassidites separandus* Haupt, 1950; Figs. 223–224. *Callistaspis punctatus* Haupt, 1950; 223. Dorsal. 225, Ventral; Fig. 225. *Cassida blancheti* Heer, 1856a. (From Oustalet, 1874); Fig. 226. *C. hermione* Heer, 1847; Fig. 227. *C. interemta* Heyden, 1862; Fig. 228. *C. kramstae* Förster, 1891; Fig. 229. *C. megapenthos* Heer, 1847 (also as *C. megapentos*; Fig. 230. *Eocassida longula* Haupt, 1950; Figs. 231–232. *Mesomphalia gemmaspis* Pongr., 1935; 231. Ventral. 232. Dorsal. (From Haupt, 1950).

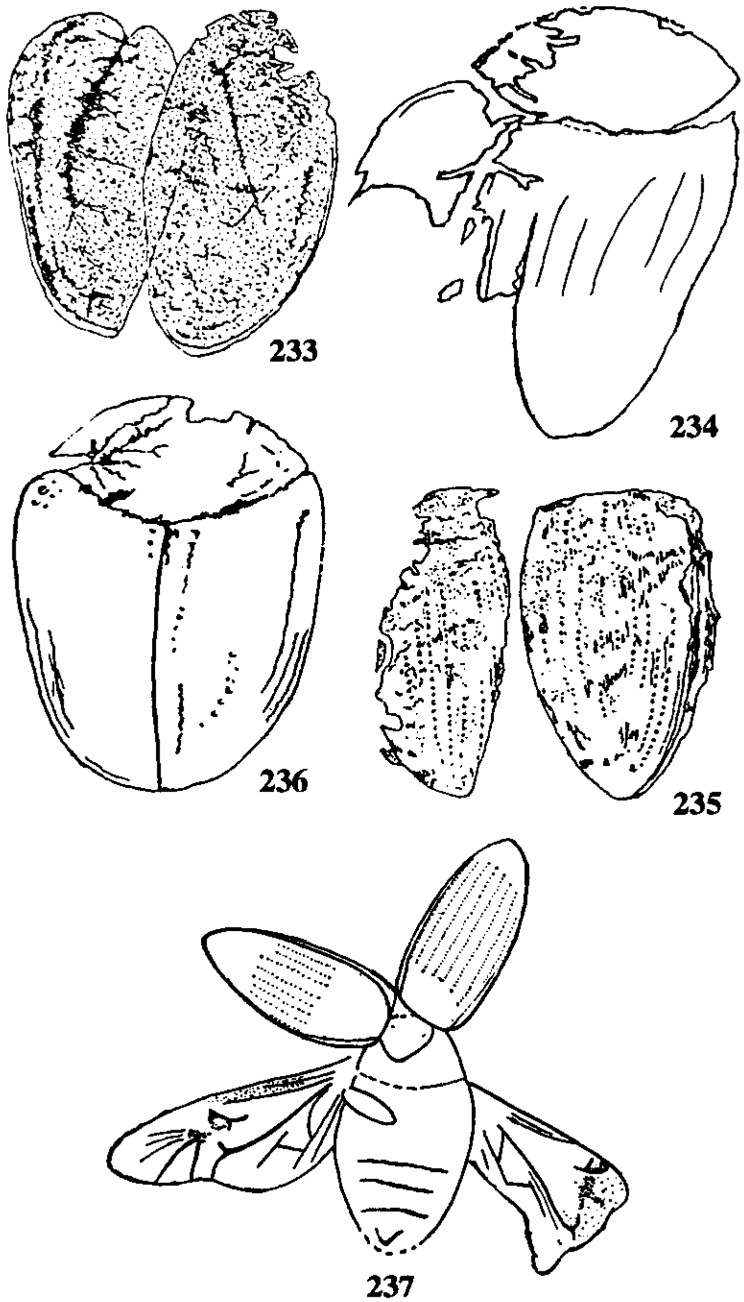
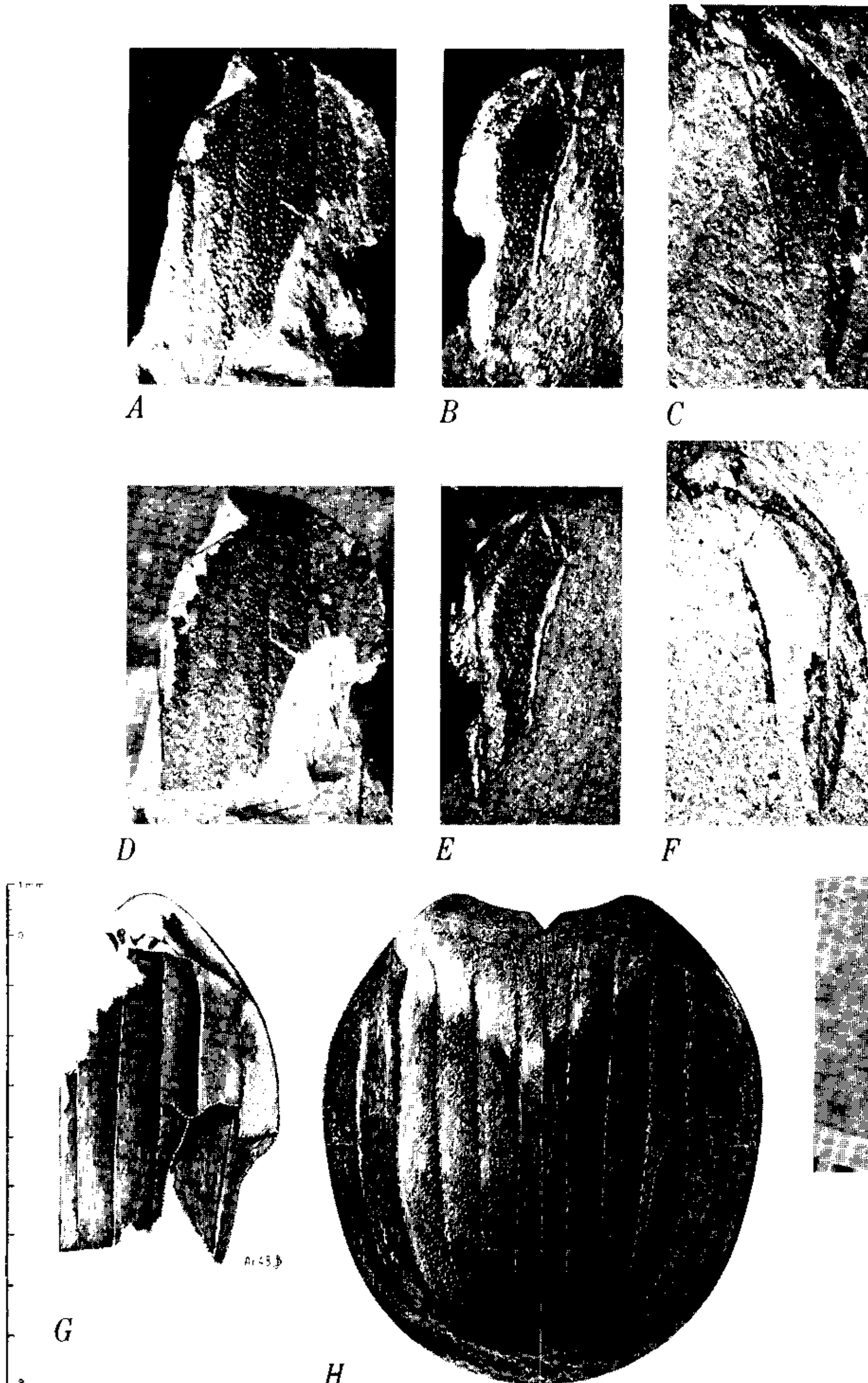


Plate 27. Fig. 233. *Paracassida aurichalcea* Haupt, 1956; Fig. 234. *P. bisangulata* Haupt, 1956; Fig. 235. *P. detrita* Haupt, 1956; Fig. 236. *P. punctillata* Haupt, 1956; Fig. 237. Unidentified chrysomelid. (From Zhang, 1979).



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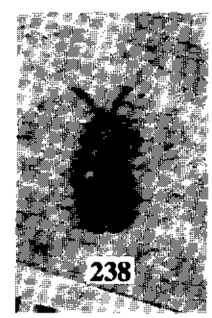

Plate 28. Fig. 238. *Chalepus americanus* (Wickham, 1914b). (as *Odontota americana* Wickham, 1914b) See also Fig. 213); Fig. 239A–H. *Coelocassida scubriusculum* (Heer, 1870).

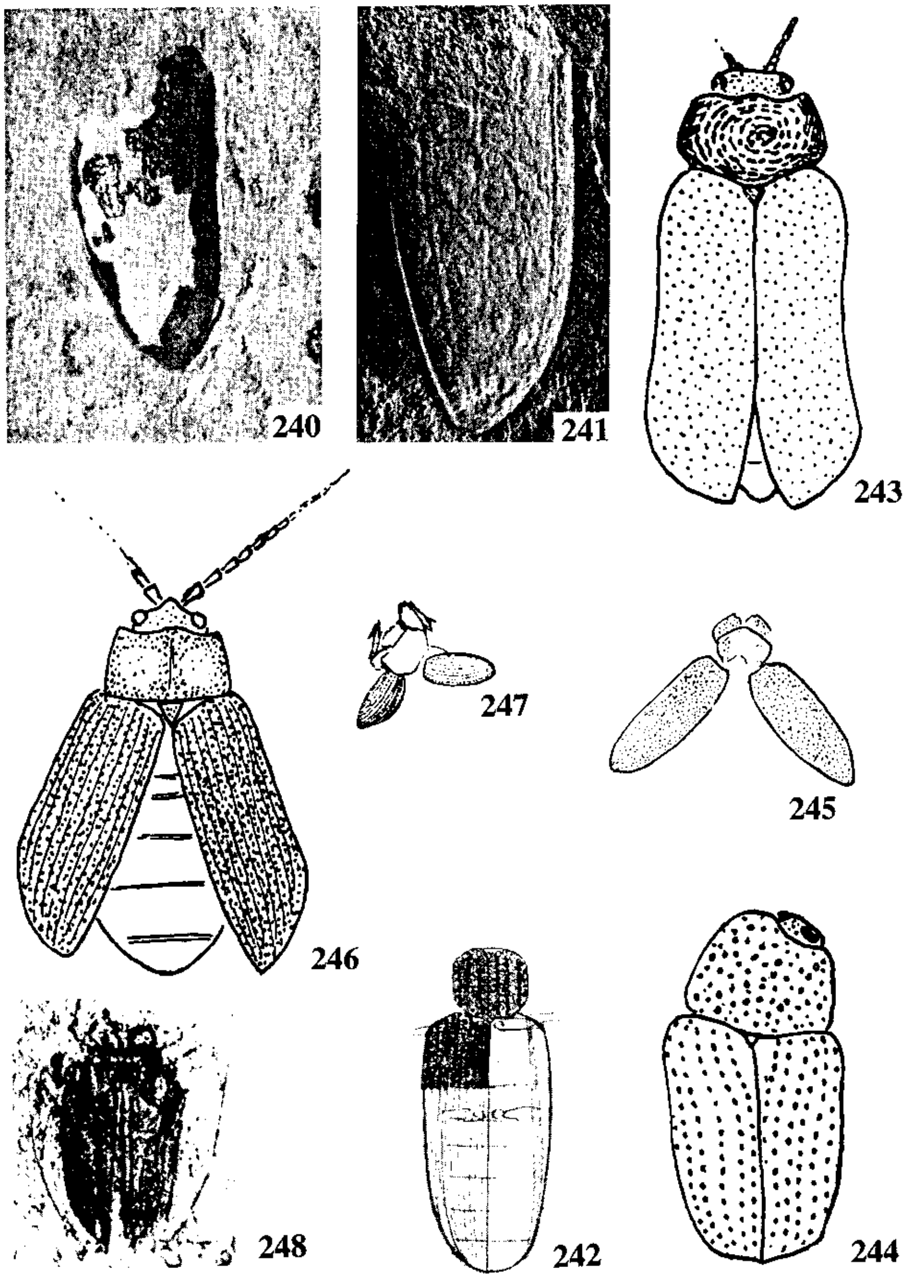

Plate 29. Fig. 240, 241. possible Eumolpinae, resembling *Pilacolaspis* (from Craw & Watt, 1987); Fig. 242. *Donacia dubia* Théobald, 1937; Fig. 243. *Clytrina eocenica* Piton, 1940; Fig. 244. *Crytocephalus minusculus* Piton, 1940; Fig. 245. *Galerucella emarginata* Théobald, 1937; Fig. 246. *Altica dryophyllorum* Piton, 1940 (as *Haltica*); Fig. 247. *Psylliodes defiguratus* Théobald, 1937; Fig. 248. *Oligocassida melaena* Théobald, 1937.

References

Ander, K. E. V., 1942. Die Insektenfauna des Baltischen Bernsteins Nebst damit verknüpften zoogeographischen Problemen. Lunds Universitets Årsskrift, N. F. Avd. 2. Bd. 38. Nr. 4. Kungl. Fysiografiska Sällskapets Handlingar. N. F Bd. 53. Nr. 4. 82 pp.

Andersson, G., 1889. Studier öfver Torfmossar i södra Skane. Bih. till Kongl. Svenska vetensk.-akad. handl. 15:1–43.

Anonymous, 1988. Florissant Fossil Beds National Monument. Bull. South. Calif. Paleontol. Soc. 20:228–234.

Arnoldi, L. V., Zherikhin, V. V., Nikritin, L. M. & Ponomarenko, A. G., 1977. Mesozoic Coleoptera. Trudy paleont. Inst. 161A:1–204.

Ashworth, A. C., 1972a. Deformed head of a fossil *Plateumaris sericea* L. (Col., Chrysomelidae). Entomol. Monthly Mag. 108:65.

Ashworth, A. C., 1972b. A late-glacial insect fauna from Red Moss. Lancashire, England. Entomol. Scand. 3:211–224.

Ashworth, A. C., 1980. Environmental implications of a beetle assemblage from the Gervais Formation (Early Wisconsinan?), Minnesota. Quatern. Res. 13:20–212.

Ashworth, A. C. & Brophy, J. A., 1972. Late Quaternary fossil beetle assemblage from Missouri Coteau, North Dakota. Bull. Geol. Soc. Amer. 83:2981–2988.

Ashworth, A. C., Clayton, L. & Bickley, W. B., 1972. The Mosbeck site: a paleoenvironmental interpretation of the Late Quaternary history of Lake Agassiz based on fossil insect and mollusk remains. Quatern. Res. 2:176–188.

Ashworth, A. C. & Hoganson, J. W., 1983. Testing the Late Quaternary climatic record of southern Chile with evidence from fossil Coleoptera. ASAQUA Intern. Symp. Swaziland. (29 Aug.–2 Sept. 1983). pp. 85–102.

Ashworth, A. C. & Hoganson, J. W., 1987. Coleoptera bioassociations along an elevational gradient in the lake region of southern Chile, and comments on the postglacial development of the fauna. Ann. Entomol. Soc. Amer. 80:865–895.

Ashworth, A. C., Markgraf, V. & Villagran, C., 1991. Late Quaternary climatic history of the Chilean Channels based on fossil pollen and beetle analyses, with an analysis of the modern vegetation and pollen rain. J. Quatern. Sci. 6:279–291.

Ashworth, A. C. & Schwert, D. P., 1992. The Johns Lake site: a late Quaternary fossil beetle (Coleoptera) assemblage from the Missouri Coteau of North Dakota. Proc. F. D. Holland, Jr. Geol. Symp. J. M. Erickson and J. W. Hoganson (eds.) North Dakota Survey Misc. Ser. 76:257–265.

Ashworth, A. C., Schwert, D. P., Watts, W. A. & Wright Jr., H. E., 1981. Plant and insect fossils at Norwood in south-central Minnesota: a record of late-glacial succession. Quatern. Res. 16:66–79.

Askevold, I. S., 1990a. Classification of Tertiary fossil Donaciinae of North America and their implications about evolution of the Donaciinae (Coleoptera: Chrysomelidae). J. Canad. Zool. 68:2135–2145.

Askevold, I. S., 1990b. Reconstructed phylogeny and reclassification of the genera of Donaciinae (Coleoptera: Chrysomelidae). Quest. Entomol. 26:601–664.

Askevold, I. S., 1991. Classification, reconstructed phylogeny, and geographic history of the New World members of *Plateumaris* Thompson, 1859 (Coleoptera: Chrysomelidae, Donaciinae). Mem. Entomol. Soc. Canada. 157. 175 pp.

Assmann, A., 1870. Paleontologie. Beiträge zur Insekten-Fauna der Vorwelt. Einleitung. I. Beitrag. Die fossilen Insekten des tertiären (miocenen) Thonlagers von Schossnitz bei Kanth in Schleisien. II. Beitrag. Fossile Insekten aus der tertiären (oligocenen) Braunkohle von Naumburg am Bober. Mit einer Tafel Abbildungen. Breslau. 62 pp.

Bachofen-Echt, A. von, 1949. Bernstein und seine Einschlüsse. Wien. 244 pp.

*Baker, [A. C.], 1920. The life of Glacial Lake Chicago. Bull. Illinois Univ. 95 pp.

Baker, R. G., Schwert, D. P., Bettis III, E. A., Kemmis, T. J., Norton, D. G. & Semken, H. A., 1991. Mid-Wisconsian stratigraphy and paleoenvironments at the St. Charles site in south-central Iowa. Bull. Geol. Soc. Amer. 103:210–220.

Bell, A., 1888. Post-glacial insects. The Entomologist 21:1–2.

Bell, A., 1922. On the Pleistocene and later Tertiary British insects. Ann. Rep. Yorkshire Phil. Soc. 1921:42–51.

Bell, A. & Bell, R., 1873 ["1870–1871"]. On the English Crags and the stratigraphical divisions indicated by their invertebrate fauna. Proc. Geol. Assoc. (London) 2:185–218.

Benassi, P., 1896. Piante ed insetti di Re in Val Vigezzo. Riv. Ital. Pal. 2:315–320.

*Berendt, G. C., 1830. Die Insekten in Bernstein. Ein Beitrag zur Thiergeschichte der Vorwelt. 1[es] heft. Danzig.

Berendt, G. C., 1845. Die im Bernstein befindlichen Organischen Reste der Vorwelt gesammelt in Verbindung mit Mehreren bearbeitet und herausgegeben. I. Band. I. Abd. Der Bernstein und die in ihm befindlichen Pflanzenreste der Vorwelt. Berlin, Preussen. 125 pp.

*Beyle, M., 1901. Über ein altes Torfmoor im hohen Elbufer vor Schulau. Ver. naturw. Unterh. Hamburg 11:

Beyle, M., 1913 ['1912']. Über einige Ablagerungen fossiler Pflanzen der Hamburger Gegend. Mitt. Min.-Geol. Inst. Hamburg. Erster Teil 30(6 Beiheft):83–99.

Beyle, M., 1920. Über einige Ablagerungen fossiler Pflanzen der Hamburger Gegend. Mitt. Min.-Geol. Inst. Hamburg. Erster Teil 36:33–47.

*Beyle, M., 1924. Über einige Ablagerungen fossiler Pflanzern in der Hamburger Gegend. Mitt. Min.-Geol. Inst. Hamburg. 6:

*Beyle, M., 1926. Über einige Ablagerungen fossiler Pflanzern in der Hamburger Gegend. Mitt. Min.-Geol. Inst. Hamburg. 8:

*Beyle, M., 1931. Über ein Torflager am kleinen Pönitzer See im Öslichen Holstein. Mitt. Min.-Geol. Inst. Hamburg. 12:

Birket-Smith, S. J. R., 1977. Fossil insects from Spitsbergen. Acta Arctica 19:1–42.

Blair, K. G., 1923–1924. Some coleopterous remains from the peat-bed at Wolvercote, Oxfordshire. Trans. Ent. Soc. London. 71:558–563. (Bound with Proc. Entomol. Soc. London. 1923–1924 ['1923'].)

Böcher, J., 1989. Boreal insects in northernmost Greenland: palaeoentomological evidence from the Kap København Formation (Plio-Pleistocene), Peary Land. Fauna Norv. Ser. B. 36:37–43.

Borowiec, L., 1984. Zoogeographical study on Donaciinae of the World (Coleoptera: Chrysomelidae). Polskie Pismo Entomol. Bull. Entomol. Pologne 53:433–518.

*Brauer, F., Redtenbacher, J. & Ganglbauer, L., 1889. Fossile Insekten aus der Juraformation Ost-Sibiriens. Mém. Acad. Sci. St.-Pétersb. ser. 7. 36(15):1–22.

British Museum (Natural History), 1903. Catalogue of the books, manuscripts, maps, and drawings in the British Museum of Natural History. Order of Trustees. British Museum of Natural History, London.

Brodie, P. B., 1845. A history of the fossil insects in the secondary rocks of England. Accompanied by a particular account of the strata in which they occur, and the circumstances connected with their preservation. John Van Voorst. London. 130 pp.

Original, or copies, of the references listed (*) could not be located. The full citation of about twenty more works could not be confirmed, so they have not been included.

*Brodie, P. B., 1873. The distribution and correlation of fossil insects, and the supposed occurrence of Lepidoptera and Arachnida in British and foreign strata, chiefly in the secondary rocks, ... being a paper read at the annual meeting of the Warwickshire natural history and archaeological society, held at the museum, Warwick, April 18th, 1873. 19 pp. Distr. corr. foss. ins. 16. (Apparently, also in Ann. rep. Warw. nat. hist. arc. soc. 37:12–28.)

Brongniart, A. T., 1827. Succin. In: Cuvier, G. C. (ed.). Dictionnaire des sciences naturelles, dans lequel on traite méthodiquement des différents êtres de la nature, considérés soit en eux-mêmes, d'après l'état actuel de nos connoissances, soit relativement à l'utilité qu'en peuvent retirer la médecine, l'agriculture, le commerce et les arts. Suivi d'une biographie des plus clèbres naturalistes ... Par plusieurs professeurs du Jardin du loi, et des principales écoles de Paris. Strassbourg, Paris. 51:229–240.

Budde, H., 1937. Käfer-Reste aus dem letzten Glacial. Entomol. Blätter 33:378.

Burmeister, C. H. C., 1831. Derselbe über Bernsteininsecten. In: Hünefeld, L. Isis von Oken. Heft VIII.-X. Tafel VII. VII. pp. 1100–1101 (incorrectly paginated 2000–2001). Brockhaus, Leipzig.

Burmeister, C. H. C., 1832. Kerfe der Urwelt. pp. 632–640. In: Handbuch der Entomologie. 696 pp.

Burmeister, C. H. C., 1836. Insects of a former world. pp. 574–581. In: A manual of entomology. Shuckard, W. E. (ed.). E. Churton, London. 654 pp.

Carpenter, F. M., 1930. A review of our present knowledge of the geological history of the insects. Psyche 37:15–34.

Carpenter, F. M., 1992. Hexapoda. In: Treatise of Invertebrate Paleontology. Part R. Arthropoda 4(3 and 4). Geol. Soc. Amer. Boulder, CO. 655 pp.

Carpenter, F. M. & Burnham, L., 1985. The geological record of insects. Ann. Rev. Earth Planet. Sci. 13:297–314.

Chagnon, G., 1895. Insectes des âges disparus. Le Naturaliste Canadien. 22:109–110.

Chamisso, A. von, 1824. Untersuchung eines Torfmoores bei Greifswald. Arch. Bergbau Hüttenw. 8:129–139.

Cockerell, T. D. A., 1920a. Fossil arthropods in the British Museum. I. Ann. Nat. Hist. (London) 6:65–72.

Cockerell, T. D. A., 1920b. Fossil arthropods in the British Museum. III. Ann. Nat. Hist. (London) 5:455–463.

Cockerell, T. D. A., 1921 ['1920]. Eocene insects from the Rocky mountains. Proc. U.S. Natl. Mus. 57:233–260.

Cockerell, T. D. A., 1925. British fossil insects. Proc. U.S. Natl. Mus. 49(2119):469–499.

Cockerell, T. D. A., 1926. Some Tertiary fossil insects. Ann. Mag. Nat. Hist. 18:313–324.

Cockerell, T. D. A., 1927. Beetles of the genus *Donacia* from the Pleistocene of Vancouver Island, British Columbia. Canad. Entomol. 59:303–304.

Cockerell, T. D. A. & LeVeque, N., 1931. The antiquity of insect structures. Amer. Natur. 65:351–359.

Commission de Stratigraphie. International Geological Congress, 1956. Lexique stratigraphie international. Centre National de la Recherche Scientifique. Paris.

Coope, G. R., 1970. Interpretations of Quaternary insect fossils. Ann. Rev. Entomol. 15:97–120.

Coope, G. R., 1978. Constancy of insect species versus inconstancy of Quaternary environments. Chapter 11. pp. 176–187. In: Mound, L. A. and Waloff, N. (eds.) Diversity of insect faunas. Blackwell Scient. Publ., Oxford. 204 pp.

Coope, G. R., 1979a. Late Cenozoic fossil Coleoptera: Evolution, biogeography, and ecology. Ann. Rev. Ecol. Syst. 10:247–267.

Coope, G. R., 1979b. The Carabidae of the Glacial Refuge in the British Isles and their contribution to the post glacial colonization of Scandinavia and the North Atlantic islands. Chapter 2.43. pp. 407–424. In: Erwin, T. L., Ball, G. E., Whitehead, D. R., and Halpern, A. L. (eds.). Carabid beetles: their evolution, natural history, and classification. W. Junk Publ., The Hague, The Netherlands. 635 pp.

Craw, R. C. & Watt, J. C., 1987. An Upper Cretaceous beetle (Coleoptera) from Hawkes Bay, New Zealand. J. Roy. Soc. New Zealand 17:395–398.

Crowson, R. A., Rolfe, W. D. I., Smart, J., Waterson, C. D., Riley, E. C. & Wooton, R. J., 1967. Arthropoda: Chelicerata, Pycnogonida, Paleosopus, Myriapoda and Insecta. Chapter 19. pp. 499–534. In: The fossil record: a symposium with documentation, jointly sponsored by the Geological Society of London and the Paleoentomological Association. Part II. Geol. Soc. (London) Part II. 827 pp.

Crowson, R. A., 1975. The evolutionary history of Coleoptera, as documented by fossil and comparative evidence. Atti X Congr. Naz. Ital. Entomol. (Sassari, 20–25 May 1974). pp. 47–89.

Crowson, R. A., 1981. Evolutionary history of beetles. Chap. 20. In: The biology of the Coleoptera. Academic Press. London. pp. 658–688.

Crowson, R. A., 1992 ['1991']. The relations of Coleoptera to Cycadales. pp. 13–28. In: Zunino, M., Bellés, X., and Blás, M. (eds.) Advances in Coleopterology. European Association of Coleopterology. 323 pp. Barcelona, Spain.

Curtis, J., 1829. Observations upon a collection of fossil insects discovered near Aix-en-Provence in the summer of 1828, by R. J. Murchinson, Esq. and Charles Lyell, Esq. jun. Edinb. New Philo. Jour. 7:293–297.

Dalrymple, G. B., 1991. The age of the earth. Stanford Univ. Press. 474 pp.

Debray, H., 1873. Etude géologique et archéologique de quelques tourbières du Littoral Flammand et du département de la Somme. Mém. Soc. Sci. Agric. Arts Lille 3 ser. 11:433–495.

Debray, H., 1874. Tourbières du Littoral Flamand et du département de la Somme. Bull. Soc. Géol. France 12, 3 ser. 2:46–49.

Debray, H., 1878. Communications diverses, au sujet des tourbières. Ann. Soc. Gol. Nord. 5:125–135.

*Deichmüller, J. V., 1886. Die Insecten aus dem lithographischen im Dresdener Museum. Mitt. königl. Min.-Geol. Praehist. Mus. Dresden. Heft 7. 84 pp.

Elias, S. A., 1982. Paleoenvironmental interpretation of Holocene insect fossils from Northeastern Labrador, Canada. Arctic Alpine Res. 14:311–319.

Elias, S. A., 1985. Paleoenvironmental interpretations of Holocene insect fossil assemblages from four high-altitude sites in the front range, Colorado, U.S.A. Arctic Alpine Res. 17:31–48.

Elias, S. A. 1987. Paleoenvironmental significance of Late Quaternary insect fossils from packrat middens in south-central New Mexico. Southwest. Natur. 32:383–390.

Elias, S. A., 1991. Insects and climate change. BioScience 41:552–559.

Elias, S. A., 1992a. Late Quaternary beetle faunas of southwestern Alaska. Evidence of a refugium for mesic and hygrophilous species. Arctic Alpine Res. 24:133–144.

Elias, S. A. 1992b. Later Quaternary zoogeography of the Chihuahuan Desert insect fauna, based on fossil records from packrat middens. Jour. Biogeogr. 19:285–297.

Elias, S. A., Carrara, P. E., Toolin, L. J., and Jull, A. J. T. 1991. Revised age of deglaciation of Lake Emma based on new carbon and macrofossil analyses. Quatern. Res. 36:307–321.

Elias, S. A., Mead, J. I. & Agenbroad, L. D., 1992. Late Quaternary arthropods from the Colorado Plateau, Arizona and Utah. Great Basin Naturalist 52:59–67.

Elias, S. A. and Nelson, A. R. 1989. Fossil invertebrate evidence for Late Wisconsin environments at the Lamb Spring Site, Colorado. Plains Anthropol. 34:309–326.

Elias, S. A. and Short, S. K. 1992. Paleoecology of an interglacial peat deposit, Nuyakuk, southwestern Alaska, U.S.A. Géogr. Phys. Quatern. 46:85–96.

Elias, S. A., Short, S. K., and Clark, P. U. 1986. Paleoenvironmental interpretations of the Late Holocene, Rocky Mountain National Park, Colorado, U.S.A. Rev. Paléobiol. 5:127–142.

Elias, S. A. & Van Devender, T. R., 1990. Fossil insect evidence for Late Quaternary climatic change in the Big Bend Region, Chihuahuan Desert, Texas. Quartern. Res. 34:249–261.

Elias, S. A. and Van Devender, T. R. 1992. Insect fossil evidence of Late Quaternary environments in the northern Chihuahuan desert of Texas and New Mexico: comparisons with the paleobotanical recod. Southwest. Natur. 37:101–116.

Elias, S. A. and Wilkinson, B. 1983. Lateglacial insect fossil assemblages from Lobsigensee (Swiss Plateau). Studies in the Late Quaternary of Lobsigensee 3. Rev. Paléobiol. 2:189–204.

Ermisch, K., 1942. *Airaphilus denticollis*, n. sp. (*Donacia* spec. Helm.). Entomol. Blätter 38:128–129.

Erwin, T. L., 1983. Tropical forests: their richness in Coleoptera and other arthropod species. Coleops Bull. 36:74–82.

Fabricius, I. C., 1775. Systema entomologicae, sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus. Officina Libraria Kortii. Flensburgi et Lipsiae. 832 pp.

Fabricius, J. C., 1792. Entomologia systematica emendata et actua, secundum classes, ordines, genera, species adjectis synonymis, locis, observationibus, descriptionibus. Impensis C. G. Proft. Hafniae. Tom. I Pexperiencedars I. 330 pp., Pars. II. 538 pp., Pars. III. 519 pp.

Fairbridge, R. W. & Jablonski, D., 1979. The encyclopedia of paleontology. Dowden, Hutchinson & Ross. Stroudsburg, PA. 886 pp.

Farrell, B. & Mitter, C., 1990. Phylogenesis of insect/host plant interactions: Have *Phyllobrotica* leaf beetles (Chrysomelidae) and the Lamiales diversified in parallel? Evolution 44:1389–1403.

Farell, B. D., Mitter, C. & Futuyma, D. J., 1992. Diversification at the insect-plant interface. Insights from phylogenetics. BioScience 42:34–42.

Flach, K., 1884. Die Käfer der Unterpleistocänen Ablagerungen bei Hösbach unweit Aschaffenburg. Verhandl. Physikal.-Med. Gessells. Würzburg, n. f. 18:285–297.

Fliche, P., 1875. Sur les lignites quaternaires de Jarville, près de Nancy. Comptes Rendus hebd. séanc. Acad. sci. 80:1233–1236.

Fliche, P., 1876. Faune et flore des tourbières de la Champagne. Comptes Rendus hebd. séanc. Acad. sci. 82:979–982.

Förster, B., 1885. Mitteilungen über das Oberelsässische Tertiär. Tagebl. versamml. Deutsch. Naturf. Aerzt. Strass. 58:379–388.

Förster, B., 1886. Die Gliederung des Sundgauer Tertiärs. Mitth. Comm. Geol. Land. Unter. Elsass. Lothr. Band I. Heft I. pp. 150–177.

Förster, B., 1889. Vorläufige Mitteilung über die Insekten des 'Plattigen Steinmergels' von Brunstatt. Mitt. Comm. Geol. Elsass.-Lothr. Band II.-Heft I. pp. 102–104.

Förster, B., 1891. Die Insekten des 'Plattigen Steinmergels' von Brunstatt. Alsace-Lorraine. Geologische Landesanstalt. Abhandl. zur Geol. Specialk. von Elsass-Lothringen. 3:335–593.

*Früh., 1885. Beiträge zur Kenntnis des Torfes. Jahrb. k. k. Geol. Reichsanst. 5:

Fujiyama, I., 1980. Late Cenozoic insects from Tokai and Mikawa Districts, Central Japan. Mem. Natl. Sci. Mus. (Tokyo, Japan) 13:21–28. (In Japanese with English summary).

Furth, D. G., 1979 ['1978']. A fossil flea beetle (Coleoptera: Chrysomalidae) from Lake Huleh, Israel. Israel J. Entomol. 12:41–49.

Garry, C. E., Schwert, D. P., Baker, R. C., Kemmis, T. J. Horton, D. G. & Sullivan, A. E., 1987. Plant and insect remains from the Wisconsinan interstadial/Stadial transition at Wedron, northcentral Illinois. Quatern. Res. 33:387–399.

Garry, C. E., Baker, R. T., Schwert, D. P. & Schneider, A. F., 1990. Environmental analysis of a Twocreekan-aged beetle (Coleoptera) assemblage from Kewaunee, Wisconsin. Geol. Soc. Amer. Spec. Pap. 251:57–65.

Germar, E. F., 1813. Insecten in Bernstein eingeschlossen beschrieben aus dem academischen Mineralien-Cabinet zu Italie. Mag. Entomol. 1:11–18.

*Germar, E. F., 1839. Die versteinerten Insekten Solnhofens. Nova acta Acad. Cesareae Leopold.-Carol. Germanicae Naturae Curios. 19:187–222.

Giebel, C. G. A., 1852. Deutschlands Petrefacten. Ein systematisches Verzeichniss aller in Deutschland und den angrenzenden Ländern vorkommenden Petrefacten nebst Angabe der Synonymen und Fundorte. Verlag von Ambrosius Abel. Leipzig. 706 pp.

Giebel, C. G. A., 1856. Insecten und Spinnen der Vorwelt mit steter Berücksichtigung der lebenden Insekten und Spinnen; Monographisch dargestellt. In: Fauna der Vorwelt. II. Band. F. A. Brochaus. Leipzig. 511 pp.

Gingerich, P. D., 1979. Stratophenetic approach to phylogeny reconstruction in vertebrate paleontology. In: Cracaft, J. and Eldredge, N. (eds.). Phylogenetic analysis and paleontology. Proceedings of a symposium entitled 'Phylogenetic models'. North American Paleontological Convention II. Lawrence, Kansas. Aug. 8, 1977. Columbia Univ. Press. New York. 233 pp.

Girling, M. A., 1976. Fossil Coleoptera from the Somerset levels: The Abbott's way. Somer. Lev. Pap. 2:28–33.

Girling, M. A., 1977. Fossil insect assemblages from Rowland's tract. Somer. Lev. Pap. 3:51–60.

Girling, M. A., 1978. The application of fossil insect studies to the Somerset levels. Occas. Pap. (Inst. Archeaol.) 3:85–90.

Goecke, H. 1943. Monographie der Schilfkäfer II. Die fossilen Funde und ihre Bestimmung (13. Beitrag zur Kenntnis der Donaciinen.) Nova Acta Leopold. (N. F.) 12:339–380.

Goecke, H., 1960a. Monographie der Schilfkäfer. Die Gattungen und Arten der Donaciinae (Col. Chrys.) und ihre Verbeitung. (18. Beitrag zur Kenntnis der Donaciinen). Entomol. Blätter 56:1–19.

Goecke, H., 1960b. Donaciineen der oligocänen Ablagerungen von Rott. 16. Beitrag zur Kenntnis der Donaccinen (Col., Chrys.). Decheniana 112:279–281.

Göppert, H. R., 1855. Die tertiäre flora von Schossnitz in Schlesien. Heyn'sche Buchhandlung (E. Remer.). Vol. 7. 52 pp.

Grande, L., 1980. Paleontology of the Green River Formation, with a review of the fish fauna. Bull. Geol. Surv. Wyoming. 63:1–333.

Gressitt, J. L., 1963. A fossil chrysomelid from the amber of Chiapas, Mexico. J. Paleontol. 37:108–109.

Gressitt, J. L., 1971. A second fossil chrysomelid beetle from the amber of Chiapas, México. In: Studies of fossiliferous amber arthropods of Chiapas, Mexico. Univ. California Publ. Entomol. 63:63–64.

Grimaldi, D. & Maisey, J., 1990. Introduction. pp. 5–14. In: Grimaldi, D. (ed.) 1990. Insects from the Santana Formation, Lower Cretaceous, of Brazil. Bull. Amer. Mus. Nat. Hist. 195:1–195.

*Gripp, K. & Beyle, M., 1937. Das Interglacial von Billstedt (Öjendorf). Mitt. Min.-Geol. Inst. Hamburg. 16:

Gyllenhal, L., 1808–1827. Insecta Svecica. Classis I. Coleoptera sive Eleutherata. Tom. I. Pars I–IV. [Pars I. (1808) 572 pp., Pars II. (1810) 660 pp., Pars III. (1813) 730 pp., Pars IV. (1827) 761 pp.]

*Gyllenhal, L., 1817. Anmärkningar rörande ett af Baron de Geer, under namen af Attelabus glaber besrifvit insekt. Stockholm. Acad. Handl. 38:137–141.

Hall, W. E., Van Devender, T. R. & Olson, C. A., 1988. Late Quaternary arthropod remains from Sonoran desert packrat middens, southwestern Arizona and northwestern Sonora. Quatern. Res. 29:277–293.

Handlirsch, A., 1906–1908a. Die fossilen Insekten und die Phylogenie der rezenten Formen. Ein Handbuch für Paläontologen und Zoologen. Textband. Vol. I, Text, 1430 pp.; Vol. II, Atlas. Verlag von Wilhelm Engelmann, Leipzig.

Handlirsch, A., 1906–1908b. Die fossilen Insekten und die Phylogenie der rezenten Formen. Ein Handbuch für Paläontologen und Zoologen. Tafelband. Verlag von Wilhelm Engelmann, Leipzig.

Handlirsch, A., 1910. Canadian fossil insects. 5. Insects from the Tertiary Lake deposits of the southern interior of British Columbia, collected by Mr. Laurence M. Lambe, in 1906. Contributions to Canadian Paleontology. Vol. II. Pt. III. pp. 93–129.

Harpe, P., 1877. Sur un gisement de tourbe glaciaire trouvé à Lausanne. Bull. Soc. Vaud. Sci. Nat. 2e S. 14:456–458.

Hartz, N., 1902. Bidrag til Danmarks senglaciale Flora og Fauna. Danmarks geol. Undersøgel. (2 Raekke) 11:1–80.

Hartz, N., 1909. Bidrag til Danmarks tertiaere og diluviale Flora. Danmarks geol. Undersøgel. (2 Raekke) 20:1–292.

Hartz, N. & Milthers, V., 1901. Det senglaciale Ler i Allerød Teglvaersksgrav. Medd. Dansk. geol. Foren. 8:31–60.

Haupt, H., 1950. Die Käfer (Coleoptera) aus der Eozänen Braukohle des Geiseltales. Geologica (Berlin) 6:1–168.

Haupt, H., 1956. Beitrag zur Kenntnis der eozänen Arthropoden-fauna des Geiseltales. Nova Acta Leopold., Halle Deutsche Akademie der Naturforscher (N. S.) ser. 2, 18(128):1–90.

Heer, O., 1847–1853. Die Insektenfauna der Tertiärgebilde von Oeningen und von Radoboj in Croatien. I Teil. Verlag Engelmann. Leipzig. Third volume. 229 pp.

Heer, O., 1856a. Über die fossilen Insekten von Aix in der Provence. Viert. naturf. geselsch. Zürich 1:1–40.

Heer, O., 1856b. Über die Insektenfauna von Radoboj. Amtlich. Ber. Versamm. Gesell. deutscher Naturforsch. Ärtze 32:118–121.

Heer, O., 1858a. Lettre de M. Le Professeur Oswald Heer à Sir Ch. Lyell. Bull. Séances Soc. Vaud. Sci. nat. 5:145–151.

Heer, O., 1858b. Les charbons feuilletés de Durnten et D'Utznach. Arch. sci. phys. et nat., n. p. 2:305–339.

*Heer, O., 1862. Beiträge zur Insektenfauna Oeningens. Coleoptera: Geodephagen, Hydrocanthariden, Clavicornen, Lamellicornen und Buprestiden. Zürich. 90 pp.

Heer, O., 1865. Die Urwelt der Schweiz. Mit sieben landschaftlichen Bildern, elf Tafeln, einen geologischen Übersichtskarte der Schweiz und zahlreichen in den Text eingendruckten Abbildungen. F. Schulthess. Zürich. 622 pp.

Heer, O., 1868a. Die fossile flora der Polarländer enthaltend die in Nordgrönland, auf der Melville-Insel, im Banksland, am Mackensie, in Island und Spitsbergen entdeckten Pflanzen. Flora fossilis arctica. Zürich. Druck und Verlag von Friedrich Schulthess. 192 pp.

*Heer, O., 1868b. Flora fossilis arctica. Die fossile flora der Polarländer. 7 Band. Der zweiten Theil der fossilen Flora Grönlands. Verlag Wurster & Co. 273 pp.

*Heer, O., 1869. Flora fossilis alaskana. Flora fossilis von Alaska. Kongl. Svenska Vetenskapsakad. Handl. 8:1–41.

*Heer, O., 1870. Die Miocene Flora und Fauna Spitsbergens. Mit einem Anhang über die diluvialen Ablagerungen Spitsbergens. Kongl. Svenska Vetenskapsakad. Handl. 7(7):1–98.

Heer, O., 1872. Le monde primitif de la Suisse. Traduit de l'allemand par Isaac Demole. Genève et Bâle. 772 pp.

Heer, O., 1876. The primavaeval World of Switzerland. 2 vols. Longmans, Green, and Co., London. Vol. 1. 393 pp. Vol. 2. 324 pp.

Heer, O., 1877. Die Vorweltliche Flora der Schweiz. Flora Fossilis Helvetiae. Verlag von J. Wurster & Co., Zürich. 182 pp.

Heer, O., 1879. Die Urwelt der Schweiz. Zweite umgearbeite und vermehrte Auflage. Zürich. 713 pp.

Heer, O., 1883a. Die fossile flora der Polarländer enthaltend die in Nordgröndland auf der Melvilleinsel, im Banksland, am Mackensie, in Island und in Spitsbergen entdeckten fossilen Pflanzen. III. Ueber die fossilen Insekten Grönlands. 7 Band. Den zweiten Theil der fossilen Flora Grönlands. Flora fossilis arctica. Verlag von J. Wurster & Co., Zürich. 275 pp.

Heer, O., 1883b. Die Urwelt der Schweiz. Zeite Subscriptions-Ausgabe der zweiten umgearbeiteten und vermehrten Auflage. F. Schulthess. Zürich. 713 pp.

Heim, A. & Gams, H., 1918. Interglaziale Bildungen bei Wildhaus (Kt. St. Gallen). Viertel. Naturf. Gessel. Zürich 63:19–33.

Helm, O., 1896. Beiträge zur Kenntiss der Insecten des Bernsteins. Schr. Nat. Ges. Danzig. (Anlage C.) n. ser. 9:220–231.

Helm, O., 1897. Thierische Einschlüsse im Succinit. Schr. Nat. Ges. Danzig. 9:88–89.

Hennig, W., 1981. Insect phylogeny. J. Wiley & Sons, Chichester, England. 514 pp.

Henriksen, K. L., 1914. Den senglaciale og alluviale Insektfauna i Femsølyng Mose i Nord Sjaelland. Mindeskrift for Japetus Steenstrup. København. 35:1–43.

Henriksen, K. L., 1922. Eocene insects from Denmark. Danmarks geologiske undersøgelse. II. Raekke. Nr. 37. I Kommission hos C. A. Reitzel. 36 pp.

Henriksen, K. L., 1933. Undersøgelser over Danmark-Skånes kvataere Insektfauna. Vidensk. Meddel. Dansk naturh. Foren. 96:77–355.

Heyden, C. von, 1862. Gliederthiere aus der Braunkohle des Niederrhein's, der Wetterau und der Röhn. Paleontographica 10:62–82.

Heyden, C. von & Heyden, L. von, 1865. Fossile Insekten aus der Braunkohle von Salzhaussen. Paleontographica 14:31–35.

Heyden, C. von & Heyden, L. von, 1866. Käfer und Polypen aus der Braunkohle des Siebengebirges. Paleontographica 15:131–156.

Hieke, F. & Pietrzeniuk, E., 1984. Die Bernstein-Käfer des Museums für Naturkunde, Berlin (Insecta, Coleoptera). Mitt. zool. Mus. Berlin 60:297–326.

Hoganson, J. W. & Ashworth, A. C., 1992. Fossil beetle evidence for climatic change 18,000–10,000 years b.p. in south-central Chile. Quatern. Res. 37:101–116.

Hogue, S. M., 1970. Biosystematics of the genus *Trirhabda* LeConte of America North of Mexico (Chrysomelidae: Coleoptera). Ph. D. Diss. (Univ. Idaho, Moscow, USA). 212 pp.

*Holst, N. O., 1906. De senglaciala vid Toppeladugard. Sver. geol. undersokn. Ser. C 200:

*Holst, N. O., 1908. Efterskörd fran de senglaciala Lagren vid Toppelaguard. Sver. geol. undersokn. Ser. C 210:

Hope, F. W., 1847. XXXXIX. Observations on the fossil insects of Aix in Provence, with descriptions and figures of three species. Trans. Ent. Soc. Lond. 4:250–255.

Hoppe, D. H., 1795. Enumeratio insectorum Elytratorum circa Erlangam indigenarum secundum systema fabricianum observatonibus iconibusque illustrata. 70 pp.

Jablonski, D., Flessa, K. W. & Valentine, J. W., 1985. Biogeography and paleobiology. Paleobiology 11.75–90.

Jarzembowski, E. A., 1980. Fossil insects from the Bembridge Marls, Palaeogene of the Isle of Wight, southern England. Bull. British Museum (Natural History): Geology (London) 33:237–293.

*Jentzsch, 1910 (probably published in 1913). Bericht über Aufnahmen auf Blatt Schwersenz (Prov. Posen). Jahrb. Preuss. Geol. Landes. 31:

Jessen, K., 1920. Moseundersøgelser i det nordøstelige Sjælland. Danmarks geol. undersøl. 34:1–268.

*Jessen, K., 1923. En undersoisk Mose i Runsgsted Havn. Danmarks geol. undersøl. 18:

Jessen, W., 1932. Käferreste im Tuul von Westerland (Sylt) und die jungterquartäre Schichtenfolge auf den nordfriesischen Inseln. Zentralbl. Min. Geol. Paläontol. Abt. B. 1:311–317.

Jolivet, P., 1970. Donaciinae. Coleopterorum Catalogus. Suplementa. Junk Pubs. Pars 51(2). Editio Seconda. 71 pp.

Kenward, H. K., 1978. The value of insect remains as evidence of ecological conditions in archeological sites. Occas. Pap. (Inst. Archeol.) 3:25–38.

Kimoto, S., 1981. Studies on the Japanese Donaciinae (Coleoptera: Chrysomelidae). 1. Data of distribution and biology obtained from survey in 1979 and 1980. Fossil Insect Research Group for Nojiri-ko Excavation. Bull. Osaka Mus. Nat. Hist. no. 34:27–46. (In Japanese, abstract in English)

Kiselev, S. V., 1981. Pozdnekainozoiskie zhestkokrylye Severo-Vostoka Sibiri. Moskva: 'Nauka'. Akademiia nauk SSSR. Paleontologicheskii institut. Nauchnyi sovet po probleme 'Puti i zakonomernosti istoricheskogo razvitiia zhivotnykh i rastitel'nykh organizmov.' 116 pp. (In Cyrilic)

Klebs, R., 1910. Über Bernsteinschlüsse im allgemeinen und die Coleopteren meiner Bernsteinsammlung. In: Schriften der Physikalish-ökonomischen Gesellschaft zu Königsberg in Pr. Im Kommission bei Wilh. Koch. pp. 217–242.

Kolbe, H. J., 1894. Über fossile Reste von Coleopteren aus einem alten Torflager (Schmierkohle) bei Gr. Räschen in her Nieder-Lausitz. Sitz.-Berich. Gesell. Naturforsch. Frend. Berl. 1894:236–238.

Kolbe, H. J., 1933. Fossile Coleopteren aus praeglazialer und spätglazialer Zeit Süd-Schwedens. Entomol. Medd. 18:209–214.

*Kolumbe, E. & Beyle, M., 1938. Die Bohlwege im Wittmoor (Holstein) und ihre Stellungen im Pollendiagramm. In: Carsten, R. H. (ed.) Zwischen Elbe und Skagerrak. Hamburg, Germany. p. 53–54.

Korschefsky, R., 1939. Abbildungen und Bemerkungen zu vier Schaufuss'schen Coleopteren aus dem deutschen Bernstein. Arbeit. Morphol. Taxonom. Entomol. Berlin-Dahlem 6:11–12.

Kühne, W. G. & Schlüter, T., 1985. A fair deal for the Devonian Arthropoda fauna of Rhynie. Entomol. Gen. 11:91–96.

Kukalová-Peck, J., 1991. Fossil history and the evolution of hexapod structures. In, The insects of Australia: a textbook for students and research workers. Chap. 6, pp. 141–179. Div. Entomol. Commonw. Sci. Industr. Res. Org. 2nd. ed. Ithaca, NY. Cornell Univ. Press. Vol. 1. 542 pp.

*Kunze, G., 1818. Beiträge zur Monographie der Rohrkäfer. Neue Schrif. Naturforsch. Gesell. Halle. 2:1–56.

*Kurck, C., 1910. Arkeologiska och växgeografiska öfver skanska torfmossar. Ymer. Tidsskr. Svensk. Sällsk. Antrop. Geogr. 30:

Kurck, C., 1917. Den forntida Utbredningen af kärrsköldpaddan, *Emys orbicularis* (*Lin.*). I. Sverige, Danmark och angränsande länder mit einer zusammenfassung in deutscher Sprache. Lunds Univ. Årsskr. N. F. Avd. 2 13:1–128.

Labandeira, C. C. and Sepkoski Jr, J. J. 1993. Insect diversity in the fossil record. Science 263:310–315.

*Laicharting, J. N. Edlen von, 1781–1784. Verzeichniss und Beschreibung der Tyroler Insekten. Zurich. 2 Band.

Lapouge, G. de, 1902. Degré d'évolution du genre *Carabus* à l'époque du pléistocène moyen. Bull. soc. sci. méd. Ouest. (Rennes) 11:548–566.

Larsson, S. G., 1978. Baltic amber – a paleobilogical study. Entomonograph. Vol. 1. Scandinavian Science Press, Ltd. Klampenborg, Denmark. 192 pp.

Latreille, M., 1819. Encyclopédie méthodique histoire naturelle entomologique, ou histoire naturelle des Crustacés, des Arachnides et des insectes. Tome neuvième. 828 pp.

Lea, P. D., Elias, S. A. and Short, S. K. 1991. Stratigraphy and paleoenvironments of Pleistocene nonglacial deposits in the southern Hushagak Lowland, southwestern Alaska, U.S.A. Arctic Alpine Res. 23:375–391.

Lesne, P., 1918a. Le faune entomologique subfossile des tourbières sous-marines de Belle-Ile. Comptes Rendus hebd. séanc. Acad. sci. 167:538–540.

Lesne, P., 1918b. Insectes subfossiles des tourbières sous-marines de Belle-Ile. Bull. Mus. Natl. Hist. nat. 24:397–402.

Lesne, P., 1925. Sur la faune des alluvions tourbeuses de la vallée de la Seine au sud de Paris. Comptes Rendus hebd. séanc. Acad. sci. 180:947–949.

Lewis, S. E. & Carroll, M. A., 1991. Coleopterous egg deposition on alder leaves from the Klondike mountain formation (Middle Eocene), northeastern Washington. J. Paleontol. 65:334–335.

Linné, C. von, 1758. Caroli Linnaei Systema naturae: Regnum animale. A photographic edition facsimile of the first volume of the tenth edition (1758). Trustees, British Museum (London). 823 pp.

Lomnicki, A. M., 1894. Fauna pleistocenica insectorum Boryslaviensium. Pleistocénskie owady z Borysławia. Mus. Imenia Dzieduszyckich 4:1–127.

Lopatin, I. K., 1984. Leaf beetles (Chrysomelidae) of Central Asia and Kazakhtan. Amerind Publ. Co. New Delhi, India. 416 pp.

Lortet, M. D. & Chantre, M. E., 1872. Etudes paléontologiques dans le bassin du Rhône Période Quaternaire. Arch. mus. hist. nat. Lyon. 1:59–130.

Luttrell, G. L. W., Hubert, M. L. & Jussen, V. M., 1986. Lexicon of new formal geologic names of the United States, 1976–1980. Washington, D. C. 191 pp.

Lutz, H., 1990. Systematische und palökologische Untersuchungen an Insekten aus dem Mittel-Eozän der Grube Messel bei Darmstadt. Courier Forsch. Senckenberg 124:1–165. Fossilfundstelle Messel Nr. 90. (Originally presented as Dissertation. Technische Hochschule Darmstadt. Fachbereich Biologie. Kenziffer D 17. Darmstadt. 1988.)

Lyell, C., 1840. On the Boulder Formation or Drift, and associated freshwater deposits composing the mud cliffs of eastern Norfolk. Proc. Geol. Soc. London 3:171–179.

Malfatti, G., 1881. Bibliografia degli insetti fossili italiani finora conosciuti. Atti. soc. ital. sci. nat. 24:89–100.

Martynov, A. K., 1926. To the knowledge of fossil insects from Jurassic beds in Turkestan. 5. On some interesting Coleoptera. Annuaire Société Paléontologique Russie 5:1–38. (In Cyrilic with English summary)

*Martynov, A. V., 1929. [Fossil insects from tertiary deposits in Ashutas, Zaisan district, S. Siberia.] Trudy Geologicheskogo Muzeia Akademi Nauk SSSR. 5:173–216. (In Cyrilic with English summary)

Martynov, A. V., 1935. [Note on the fossil insects from Mesozoic deposits in Cheliabinsk district.] Trudy Paleozoologicheskogo Instituta Akademii Nauk SSSR. 4:37–48. (In Cyrilic with English summary)

Martynova, O. M., 1961. Paleoentomology. Ann. Rev. Entomol. 6:285–293.

May, R. M., 1990. How many species? Phil. Trans. Roy. Soc. London. (ser. B) 330:293–304.

Medvedev, L. N., 1968. Leaf beetles from the Jurassic of Karataw. Akad. Medit. Nauk. SSSR Otd. biol. (Moskva) p. 155–165.

Menge, A., 1856. 1. Lebenszeichen vorweltlicher, im Bernstein eingeschlossener Thiere. In, Programm womit zu der am Montag den 17. März 1856 von 8 1/2 Uhr Vorm. und 2 1/2 Uhr Nachm.an stattfindenden öffentlichen Püfung der Schüler der Petrischule ergebenst einladet. Danzig.

Merritt, R. W. & Cummins, K. W. (eds.), 1984. An introduction to the aquatic insects of North America. 2nd. ed. Kendall/Hunt Publ. Co. Dubuque. Iowa. 441 pp.

*Meunier, F., 1898b. Observations sur quelques Insectes du Corallier de la Bavière. Zeitschr. Entomol. 3:

Meunier, F., 1898c. Les insectes des temps secondaires. Revue critique des fossiles du Musée paléontologique de Munich. Arch. Mus. Teyler (sér. 2) 6:85–148.

*Meunier, F., 1898d. Description de quelques Coléoptères de l'Oligocène d'Armissan (Aude). Ann. Soc. Scient. Bruxelles 22:113–115.

Meunier, F., 1900. Sur des élytres de Coléoptères de la tourbe préglaciaire de Lauenburg (Elbe). Bull. Soc. Ent. Fr. 1900:166–167.

Meunier, F., 1901. Über einige Coleopteren-Flügeldecken aus der präglacialen Braunkohle und dem interglacialen Torflager von Lauenburg (Elbe). Jahrb. Preuss. Geol. Landesant. 21:31–38.

*Meunier, F., 1918. Neue Beiträge über die fossilen Insekten aus der Braunkohle von Rott (Aquitanien) im Siebengebirge (Rheinpreussen). Jahrb. koening. Preuss. Geol. Landes. 39:141–153.

Meunier, S., 1884. Traité de Paléontologie pratique gisement et description des animaux et des végétaux fossiles de la France indication de localitées fossilifères, etc. J. Rothchild (ed.) Paris. 495 pp.

Monrós, F., 1954. Revision of the chrysomelid subfamily Aulacoscelinae. Bull. Mus. Comp. Zool. 112:320–360.

Moore, R. C., Lalicker, C. G. & Fischer, A. G., 1952. Invertebrate Fossils. McGraw-Hill Book Co., Inc., New York. 1st. ed. 766 pp.

Morgan, A. V., Morgan, A., Nelson, R. E. & Pilny, J. J., 1986. Current status of knowledge on the past and present distribution of the genus *Blethisa* (Coleoptera: Carabidae) in North America. Coleops Bull. 40:105–115.

Morell, V., 1992. 30-million-year-old DNA boosts an emerging field. Science 257:1860–1862.

Mortillet, G. de, 1850. Description d'une nouvelle espèce de coléoptère fossile (*Donacia Genin*) trouvé dans les lignites de Sonnaz. Arch. sci. phys. et nat. 15:78–79. (Also in Bull. Hist. Nat. Savoie 1850:135 and Les Alpes 1850, no. 5.)

Mulvihill, J., 1982. User guide to the bibliography and index to geology. The American Geological Institute. Leesburg Pike, VA. 160 pp.

Nasarow, V. I., 1984. Reconstruction of landscapes of Belorussia by paleontological data (Holocene). Trudy paleontologicheskogo instituta Akademii Nauk SSSR. 205:1–104. (In Cyrilic)

*Nehring, A., 1895. Über neue Funde von Klinge bei Cottbus. Naturw. Wochenschr. 10:

Nel, A., 1988. Deux *Dicladispa* fossiles des gisements de diatomites néogènes de Bes-Konak (Turquie) et de Murat (France) (Coleoptera, Chrysomelidae, Hispinae). Geobios 21:369–374.

Newberry, E., 1795. A natural history of fishes, and of reptiles, insects, waters, earths, fossils, minerals, and vegetables. Compiled from the best authorities, and illustrated by a great variety of copper plates, comprising near one hundred figures. London. 208 pp.

Nikritin, L. M. & Ponomarenko, A. C., 1992 ['1991']. Fossil Coleoptera of the USSR: their evolution and distribution. pp. 29–33. In: Zunino, M., Bellés, X., and Blás, M. (eds.) Advances in Coleopterology. European Association of Coleopterology. Barcelona, Spain. 323 pp.

Olivier, M., 1791. Encyclopédie méthodique ou histoire naturelle des insectes. Tome 50. Paris, France. 795 pp.

Oppenheim, P., 1887–1888. Die Insectenwelt des lithographischen Schiefers in Bayern. Palaeontographica. Beitr. Naturg. Vorz. Sttut. 34:215–247.

Ornduff, R., 1974. An introduction to California plant life. Univ. California Press. Berkeley. 152 pp.

Ornduff, R., 1991. Size classes, reproductive behavior, and insect associates of *Cycas media* (Cycadaceae) in Australia. Bot. Gaz. 152:203–207.

Oustalet, M. E., 1874. Recherches sur les insectes fossiles des terrains Tertiaires de la France. 12 Partie. Insectes Fossiles d'Aix en Provence. Ann. sci. géol. 5:319–347.

Pant, D. D., 1973. Cycads and the Cycadales. Central Book Depot. Alahabad, India. 255 pp.

Pant, D. D., 1988 (1987). The fossil history and phylogeny of the Cycadales. Geophytology 17:125–162.

Panzer, G. W. F., 1795. Entomologia Germanica. Exhibens insecta per Germaniam indigena secundum classes, ordines, genera, species, adiectis synonymis, locis, observationibus. I. Eleuterata. 370 pp. In: Deutschlands Insectenfauna oder Entomologisches Taschenbuch für das Jahr 1795. Nürnberg. 370 pp.

Pawlowski, J., Kúska, A. & Warchalowski, A., 1987. Ecological interpretation of the beetle assemblages (Coleoptera faunal units) from the 'Kluki 74' Holocene profile. Preliminary results. Acta Paleobot. 27:223–226.

Paykull, G. von, 1800. Fauna Suecica. Insecta. Upsaliae. Tomus I. 358 pp., Tomus II. 234 pp., Tomus III. 459 pp.

Pearl, R. M., 1951. Guide to geologic literature. McGraw-Hill Book Co., Inc. New York, NY. 239 pp.

Pearson, R. G., 1962. The Coleoptera from a late-glacial deposit at St. Bees, West Cumberland. J. Anim. Ecol. 31:129–150.

Petiver, J., 1764. Jacobi Petiveri Opera, historiam naturalem spectantia; or, Gazophylacium. Containing several 1000 figures of birds, beasts, reptiles, insects, fish, beetles, moths, flies, shells, corals, fossils, minerals, stones, fungusses, mosses, herbs, plants &c. from all nations, on 156 copper-plates, with Latin and English names. The shells, &c. have English, Latin, and native names. London. J. Millan, nr. Whiteball. 2 vols.

Phillips, J., 1871. Geology of Oxford and the valley of the Thames. Clarendon Press. Oxford, England. 523 pp.

Pilny, J. J. & Morgan, A. V., 1987. Paleoentomology and paleoecology of a possible Sangamonian site near Innerkip, Ontario Quatern. Res. 28:157–174.

Piton, L., 1939. Note complémentaire sur les fossiles insectes des cinérites Pliocènes du Lac Chambon (Puy-de-Dôme). Rev. sci. nat. Auvergne 5:102–108.

Piton, L., 1940. Paléontologie du gisement éocène de Menat (Puy-de-Dôme) (flore et faune) (première thèse). Vallier. Clermont-Ferrand. 303 pp.

Piton, L. & Théobald, N., 1935. Le faune entomologique des gisements Mio-Pliocènes du Massif Central. Rev. Sci. Nat. Auvergne 1:65–104.

Poinar, G. O. Jr., 1992. Life in amber. Stanford Univ. Press. Palo Alto, CA. 350 pp.

Polne, P. & Coope, G. R., 1990. Lateglacial and Early Flandrian Coleoptera from La Taphanel, Massif Central, France: climatic and ecological interpretations. J. Quatern. Sci. 5:235–249.

Poppius, B., 1911. Beiträge zur postglazialen Einwanderung der Käfer-Fauna Finnlands. Acta Soc. Fauna Flora fennica. 34:1–59.

Ponomarenko, A. G. & Schultz, O., 1988. Typen der Geologisch-Paläontologischen Abteilung: Fossile Insekten. Selbstverlag Naturhistorisches Museum Wien. Kataloge der wissenschaftlichen Sammlung des Naturhistorischen Museums in Wien. Paläozoologie. Bd. 6. Heft 1. 39 pp.

Porter, R., 1983. The earth sciences. An annotated bibliography. Garland Publ., Inc. New York, NY. 1901 pp.

Poulton, E. B., 1923. Fragments of beetles from a Pleistocene peat-bed at Wolvercote, near Oxford. Proc. entomol. Soc. (London) 1923–1924:15–17. (Bound with Proc. Entomol. Soc. London. 1923–1924 ['1923'])

Puni, N., 1881. In, Seduta del 29 maggio 1881. Presidenza del Presidente comm. Prof. E. Cornalia. F. Sordelli, Secretary. Atti. Soc. Ital. Sci. Nat. 24:53–54.

Quedenfeldt, G., 1885. Copal-Insecten aus Africa. Berl. Entomol. Zeitschr. 29:363–365.

Quiel, G., 1909. Zwei neue Coleopteren aus dem baltischen Bernstein. (Eocän bezw. unteres Oligocän. Berl. Entomol. Zeitschr. 54:49–52.

Quiel, G., 1911. ['1910'] Bemerkungen über Coleopteren aus dem baltischen. Berl. Entomol. Zeitschr. 55:181–192.

Reid, C., 1890. The Pliocene deposits of Britain. Mem. Geol. Surv. United Kingdom. London. 326 pp.

Richardson, J., 1837. Part the fourth and last. The insects. In: Fauna Boreali-Americana; or the Zoology of the Northern

Parts of British America: containing descriptions of the objects of natural history collected on the late northern land expedition under command of Cpt. Sir John Franklin, R. N. Norwich. 325 pp.

Robert, E., 1838. [Letter read by M. Cordier on 15 January 1838.] Bull. Soc. Géol. France. 9:114–118.

Rohdendorf, B. B., 1956. Les insectes Paléozoïques de la Sibérie du sud. Entomol. Obozrenie (Rev. Entomol. URSS) 35:611–619. (In Cyrilic with French summary)

Rohdendorf, B. B., 1957. Paleoentomologicheskie issledovaniia v SSSR. [Paleo-entomological research in the U.S.S.R.]. Moskva, Izd-vo. Akademii nauk SSSR. Paleontologicheskii institut (Akademiia nauk SSSR) Trudy. t. 66. 99 pp. (In Cyrilic)

Rohdendorf, B. B., 1958. Les insectes Paléozoïques de la Sibérie. pp. 853–859. In: Proc. Internt. Congr. Entomol., 10th Congr. Montreal (1956).

*Rohdendorf, B. B. (ed.), 1962. Arthropoda-Tracheata and Chelicerata. In: Textbook of Paleontology. A textbook for the paleontologists and geologists of the USSR. Academy of Sciences of the USSR. Moscow. Vol. 9. pp. 1–561.

Rohdendorf, B. B., 1968. Iurskie nasekomye Karatau Moskva: Izd-vo 'Nauka'. Akademiia nauk SSSR. Otdelenie obshchei biologii. Nauchnyi sovet po probleme 'Puti i zakonomernosti istoricheskogo razvitiia zhivotnykh i rastitel'nykh organizmov.' (Akademiia nauk SSSR). 252 pp. (*In Cyrilic*)

Rohdendorf, B. B., Zherikhin, V. V. & Rasnitsyn, A. P., 1980. Istoricheskoe razvitie klassa nasekomykh Moskva: Nauka. Trudy Paleontologicheskogo instituta Akademiia nauk SSSR. T. 175. 269 pp. (*In Cyrilic*)

Rostrup, E., 1859. Beskrivelse af 'Gallemosen' paa Lolland. Vidensk. Meddel. Dansk. naturh. Foren. 10:121–126.

Royal Society of London, 1867–1921. Catalogue of Scientific Papers. G. E. Eyre and W. Spottiswoode, London.

Schäff, H., 1892. Über Insektenreste aus dem Torflager von Kinge. Sitz.-Berich. Gesell. Naturforsch. Frend. Berl. 1892:8–11.

Schawaller, W., 1986. Fossil beetles from Miocene sediments of the Randeck Maar in southwest Germany (Insecta: Coleoptera). Stutt. Beitr. Naturk. (ser. B) 126:1–9.

Schaufuss, C., 1892. Preussens Bernstein–Käfer. Neue Formen aus der Helm'chen Sammlung im Danziger Provinzialmuseum, Berlin. Berl. Entomol. Zeitschr. 36:53–64.

Schlechtendal, D. H. R. von, 1893. Beitfage zur Kenntis Fossiler Insekten aus dem Braunkohlengebirge von Rott am Siebengebirge. Abhandl. Naturforsch. Gesell. Halle 20:199–228.

*Schlee, D., 1986. Der Bernsteinwald. Staatliches Museum für Naturkunde. 15 pp.

Schmitt, M., 1988. The Criocerinae: biology, phylogeny and evolution. Chapter 28. pp. 476–495. In: Jolivet, P., Petitpierre, E. and Hsiao, T. H. (eds.). Biology of Chrysomelidae. Kluwer Academic Publ. Dordrecht. The Netherlands.

Scholz, R., 1934. *Plateumaris sericea* L. als Überreste im Insektentorf. Entomol. Blätter 30:88.

Schneider, E. L. & Moore, L. A., 1977. Morphological studies on the Nymphaeaceae VII. The floral biology of *Nuphar lutea* subsp. *macrophylla*. Brittonia 29:88–99.

Schwert, D. P., 1992. Faunal transitions in response to an ice age: the late Wisconsinan record of Coleoptera in the north-central United States. Coleops Bull 46:68–94.

Schwert, D. P. & Ashworth, A. C., 1988. Late Quaternary history of the northern beetle fauna of North America: a synthesis of fossil and distributional evidence. pp. 93–107. In: Downes, J. A. and Kavanaugh, D. H. (eds.). Origins of the North America Insect fauna. Mem. Entomol. Soc. Canada 144:1–168.

Schwert, D. P. & Ashworth, A. C., 1990. Ice Age beetles. Natural History 1990(1):10–14.

Schwert, D. P. & Morgan, A. V., 1980. Paleoenvironmental implications of a late glacial insect assemblage from northwestern New York. Quartern. Res. 13:93–110.

Scudder, S. H., 1876. Fossil Coleoptera from the Rocky Mountain tertiaries. Bull. U. S. Geol. Surv. Terr. 2:77–87.

*Scudder, S. H., 1878. An account of some insects of unusual interest from the Tertiary rocks of Colorado and Wyoming. Bull. U.S. Geol. Georgr. Surv. Terr. 4:519–543.

*Scudder, S. H., 1879. Appendix A. The fossil insects collected in 1877 by Mr. G. M. Dawson, in the interior British Columbia. Report of Progress of the Geological Survey of Canada 1877–1878. B:176–185.

Scudder, S. H., 1881. The Tertiary lake-basin at Florissant, Colorado between South and Hayden Parks. Bull. U.S. Geol. Surv. Terr. 6:279–300.

Scudder, S. H., 1882 A bibliography of fossil insects. Bibliographical Contributions (Harvard College) 13:1–47.

Scudder, S. H., 1885. Systematische Übersicht der fossilen Myriapoden, Arachnoiden, und Insekten. p. 721–831. In: K. A. von Zittel. Handbuch der Paläontologie. Abtheilung I. Palæozoologie. II. Band Mollusca und Arthropoda. Oldenbourg. München. 893 pp.

Scudder, S. H., 1887. ['1886']. Systematic review of our present knowledge of fossil insects, including myriapods and arachnids. United States Geological Survey. Government Printing Office. Washington [D.C.]. Bull. U.S. Geol. Surv. V. no. 31. 1–128 pp.

Scudder, S. H., 1890a. The fossil insects of North America: with notes on some European species. Vol. I. The pretertiary insects. United States. Department of the Interior. Report of the United States Geological Survey of the Territories. 455 pp.

Scudder, S. H., 1890b. The fossil insects of North America, with notes on some European species. Vol. II. The Tertiary insects of North America. Report of the United States Geological Survey of the Territories. Dept. Interior. Washington Printing Office. Macmillan and Co., New York. Vol. XIII. 734 pp.

Scudder, S. H., 1890c. A classed and annotated bibliography of fossil insects. 2 ed. Bull. U.S. Geol. Surv. 69:1–101.

Scudder, S. H., 1891. Index to the known fossil insects of the World, including myriapods and arachnids. Bull. U.S. Geol. Surv. no. 71. 744 pp. Government Printing Office. Washington [D.C.].

Scudder, S. H., 1893. Tertiary rhynchophorous Coleoptera of the United States. Monogr. U.S. Geol. Surv. 21:1–206.

Scudder, S. H., 1895a. The Miocene insect-fauna of Oeningen, Baden. Geol. Mag. n.s. 2:116–122.

Scudder, S. H., 1895b. 2. The Coleoptera hitherto found fossil in Canada. Contributions to Canadian palaeontology. Vol. II. Pt. II. Canadian fossil insects. 56 pp. (According to Wickham, 1920, this is also dated 1892–93.)

Scudder, S. H., 1898. The Pleistocene beetles of Fort Rivers, Massachusetts. pp. 745–746. In: Geology of Old Hampshire County, Massachusetts comprising Franklin, Hampshire, and Hampden Counties. Emerson, B. J. Monogr. U.S. Geol. Surv. 29:1–782.

Scudder, S. H., 1900. Adephagous and clavicorn Coleoptera from the Tertiary deposits at Florissant, Colorado with descriptions of a few other forms and systematic list of the non-rhynchophorous Tertiary Coleoptera of North America. Monogr. U.S. Geol. Surv. 40:1–145.

Seeno, T. N. & Wilcox, J. A., 1982. Leaf beetle genera (Coleoptera: Chrysomelidae). Entomography 1:1–221.

*Sendel, N., 1742. Historia succinorum corpora aliena involventium et naturae opere pictorum et caelatorum, ex Regiis Augustorum cimeliis Dresdae conditis aeri insculptorum conscripta, a Nathanaele Sendelio. Lipsiae, apud IO.Fridericum Gleditschium. viii, [2], 328 pp.

*Serres, P. M. T. de, 1827. Notice sur les cavernes à ossements fossiles des carrières de calcaire grossier, situées aux environs de Lunnel Vieil dans le département de l'Hérault. Mém. Soc. Linn. Paris 5:442–464.

Serres, M., 1829. Géognosie des Terrains Tertiaires. Tableau des Principaux animaux invertébrés des terrains marins Tertiaires du midi de la France. Paris. 277 pp.

Short, S. K. and Elias, S. A. 1987. New pollen and beetle analyses at the Mary Jane site, Colorado: Evidence for lata glacial tundra conditions. Geol. Soc. Amer. Bull. 98:540–548.

Short, S. K., Elias, S. A., Waythomas, C. F. and Williams, N. E. 1992. Fossil pollen and insect evidence for postglacial environmental conditions, Nushagak and Holitna lowland regions, southwest Alaska. Arctic 45:381–392.

Sordelli, F., 1882a. Note sopra alcuni insetti fossili di Lombordia (1). Bull. soc. Ent. Ital. 14:224–235.

*Sordelli, F., 1882b. Descrizione di alcuni avanzi vegetali delle argille plioceniche Lombarde, coll'aggiunta di un elenco deille piente fossili finora conosciute in Lombardia. Atti. Soc. Ital. 16:350–429.

Spahr, U., 1981a. Bibliographie der Bernstein - und Kopal-Käfer (Coleoptera). Stutt. Beitr. Naturk. (ser. B) 72:1–21.

Spahr, U., 1981b. Systematischer Katalog der Bernstein - und Kopal-Käfer (Coleoptera). Stutt. Beitr. Naturk. (ser. B) 80:1–107.

Starratt, S. W., 1987. Micropaleontology, paleolimnology, and biochronology of middle Miocene lacustrine and nearshore facies belonging to the 'Esmeralda' Formation in Stewart Valley, west Central Nevada. Geol. Soc. Amer. Abstracts with Programs 19:336.

Stevens, P. F., 1980. Evolutionary polarity of character states. Ann. Rev. Ecol. Syst. 11:33–58.

Stevenson, D. W., 1992. A formal classification of the extant cycads. Brittonia 44:220–223.

Strong, D. R., Lawton, J. H. & Southwood, R., 1984. Insects on plants. Community patterns and mechanisms. Harvard Univ. Press. 313 pp.

Studer, T., 1920–1922. Die Fauna der Schieferkohlen von Gondiswil-Zell. Ecl. geol. Helvetiae 16:128–130.

Sustrac, G., 1984. La bibliothèque de Géologie bibliographie fondamentale thémathique et régionale en sciences de la terre. Bureau des recherches gélogiques et minières. Sér. Doc. BRGM. no. 69. Orléans, France. 192 pp.

Suzuki, K., 1985. Phylogenetic relationships among higher taxa of the family Chrysomelidae. Chrysomela 12:13–14.

Théobald, N., 1937. Les insectes fossiles des terrains oligocènes de France. Mém. Soc. Sci. Nancy. 473 pp.

Uhmann, E., 1939. Hispinen aus baltischem Bernstein. Bernstein-Forsch. 4:18–22.

United States Geological Survey, [1955.] A catalog of the Cambrian fossils of the World [as recorded through 1954. Washington, D.C.] General Service Administration. Microfilms.

United States Geological Survey, [no date a] Mesozoic species catalog. North and Central America, including the Caribbean Islands. General Service Administration. Microfilms.

United States Geological Survey, [no date b] Mesozoic species catalog. South America. General Service Administration. Microfilms.

Villiers, A., 1979. Initiation à l'entomologie. Société nouvelle des éditions Boubée, Paris. Vol. 2. 101 pp.

Ward, S., 1776. A modern system of natural history: containing accurate descriptions, and faithful histories, of animals, vegetables, and minerals. Together with their properties, and various uses in medicine, mechanics, manufactures, &c. illustrated with a great variety of copper-plates, accurately drawn from nature, and beautifully engraved. Twelve Volumes. Vol. 11: Natural history of reptiles and insects. 178 pp. Vol. 12: Natural history of waters, earths, fossils, minerals and vegetables. 171 pp. F. Newbery, London.

Ward, D. E., Wheeler, M. W. & Bier, Jr., R. T. A., 1981. Geologic reference sources. A subject and regional bibliography of publications and maps in the geological sciences. Scarecrow Press, Inc. NJ. 560 pp.

*Westergard, A. H., 1912. Beskrifning till kartbladt Trelleborg. Sver. geol. Undersø. ser. Aa (146):

Westwood, J. O., 1845. Introductory remarks. In: Brodie, P. B. A history of the fossil insects in the secondary rocks of England. Accompanied by a particular account of the strata in which they occur, and the circumstances connected with their preservation. John Van Voorst. London. 130 pp.

Westwood, J. O., 1854. Contributions to fossil entomology. Quart. Jour. Geol. Soc. London 10:378–396.

Weyenbergh Jr., H. (same as Weijenbergh, H.), 1869a. Sur les insectes fossiles du calcaire lithographique de la Bavière, qui se trouvent au Musée Teyler. Arch. Musée Teyler (ser. 1) 2:247–294.

Weijenbergh, H. (same as Weyenbergh, H.), 1869b. Prodromus en algemeene beschouwing der Fossiele Insekten van Beijeren. Tijdschr. v. Entomol. Uit. Neder. Ent. Ver. 2 Ser. 4:230–248.

*Weyenbergh, H., 1874. Enumération systématique des espèces qui forment la faune entomologique de la période mésozoïque de la Bavière; en même temps Supplément du Catalogue de la collection paléontologique du Musée Teyler. In: Varia Zoologica et Paleontologica, Periód. Zool. Org. Soc. Entomol. Argent. 1:17–111. Buenos Aires.

Whalley, P. E. S., 1985. The systematics and palaeogeography of the Lower Jurassic insects of Dorset, England. Bulletin of the British Museum (Natural History). Geology series. 39:107–189.

Whitehead, A. H., 1918/21 (1920). More about 'moorlog'. – A peaty deposit from the Dogger Bank in the North Sea. Essex Natur. 19:242–250.

Whitehead, A. H. & Goodchild, H. H., 1909/11 (1909). Some notes on 'moorlog', a peaty deposit from the Dogger Bank in the North Sea. Essex Natur. 16:51–60.

Whitehead, P. F., 1989. Changing environments and Coleoptera faunas from Aston Mill, Worcestershire, England. Entomol. Month. Mag. 125:187–198.

Wickham, H. F., 1910. New fossil Coleoptera from Florissant, with notes on some already described. Amer. J. Science (ser. 4) 29:47–51.

Wickham, H. F., 1911. Fossil Coleoptera from Florissant, with descriptions of several new species. Bull. Amer. Mus. Nat. Hist. 30:53–69.

Wickham, H. F., 1912. A report on some recent collections of fossil Coleoptera from the Miocene shales of Florissant. Bull. Univ. Iowa Lab. Nat. Hist. 6(3):3–38.

Wickham, H. F., 1913a. The Princeton collection of fossil beetles from Florissant. Ann. Ent. Soc. Amer. 6:359–366.

Wickham, H. F., 1913b. Fossil Coleoptera from Florissant in the United States National Museum. Proc. U.S. Natl. Mus. 45:283–303.

Wickham, H. F., 1913c. Fossil Coleoptera from Wilson ranch. Bull. Lab. Nat. Hist. State University Iowa 6:3–38.

Wickham, H. F., 1914a. Twenty new Coleoptera from Florissant. Trans. Amer. Entomol. Soc. 6:257–269.

Wickham, H. F., 1914b. New Miocene Coleoptera from Florissant. Bull. Mus. Comp. Zool. (Harvard Coll.) 58:422–494.

Wickham, H. F., 1917. Fossil beetles from Sangamon Peat. Amer. J. Sci. 44:137–145.

Wickham, H. F., 1920. Catalogue of the North American Coleoptera described as fossils. pp. 349–365. In: Leng, C. W. Catalogue of the Coleoptera of America, north of Mexico. Mt. Vernon, NY. 470 pp.

Wickham, H. F., 1927. Supplement to Catalogue of North American Coleoptera described as fossils. pp. 53–56. Supplement 1919 to 1924 (inclusive) to Catalogue of the Coleoptera of America, north of Mexico. 78 pp.

Wickham, H. F., 1933. Second supplement to Catalogue of North American Coleoptera described as fossils. pp. 103–105. In: Second and third supplements, 1925–1932 (inclusive) to Catalogue of the Coleoptera of America, north of Mexico. 112 pp.

Wilcox, J. A., 1965. A synopsis of North American Galerucinae (Coleoptera:Chrysomelidae). Bull. 400. New York State Mus. Sci. Serv. 226 pp.

Wood, D. N., Hardy, J. E. & Harvey, A. P., 1989. Information sources in the earth sciences. Second Edition. Bowker–Saur. London. 518 pp.

Wollaston, T. V., 1863. Note on the remains of Coleoptera from the peat of Lexten brick-pit. Quart. Jour. Geol. Soc. London. 19, i:400 (no. 2), 401 (no. 9).

Wootton, R. J., 1981. Paleozoic Insects. Ann. Rev. Entomol. 26:319–344.

Zaddach, G., 1868. IV. Amber; its origin and history, as illustrated by the geology of Samland. Quart. Jour. Sci. 5:167–185.

Zeuner, F. E., 1962. Fossil insects from the Lower Lias of Charmouth, Dorset. Bulletin of the British Museum (Natural History) Geology (London). 7:153–171.

Zhang, J. F., 1989. Fossil insects from Shanwang, Shandong, China. Shandong Science and Technology Publishing House. Jinan, People's Republic of China. 459 pp. (In Chinese with English summary)

Zherikhin, V. V., 1970. Zoogeograficheskie svyazi paleogenovykh nasekomykh. Doklady na dvadtsat vtopom ye zhegodnom chtenii pamyati N. A. Kholodkovskogo. Akademiya Nauk SSSR, Vcesoyuzhoe entomologicheskoe obshchestvo. Izdatelistvo 'Nauka'. Leningrad. USSR. pp. 29–88. (In Cyrilic).