

1. Changes in classification and list of families and subfamilies

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The classification used in Handbook of Zoology, part 38.1 (Coleoptera, Beetles, Vol. 1) was based primarily on that of Lawrence & Newton (1995) and Lawrence *et al.* (1999), with a few additions or modifications based on subsequent work. Further changes and additions to that family list based on more recent publications are listed below:

Artematopodidae. The tribe Allopogonini Crowson was elevated to subfamily level by Lawrence (2005a).

Eucnemidae. The subfamily Anischiinae Fleutiaux, recognized at the family level in 38.1, was moved into the family Eucnemidae by Lawrence *et al.* (2007) and considered to be a subfamily well within the major eucnemid clade (excluding Perothopinae, Phyllocerinae, Palaeoxeninae, Pseudomeninae and Phlegoninae).

Elateridae. The subfamily Tetralobinae was reduced to a tribe within Agrypninae by Costa *et al.* (1992, 1994). Campyloxeninae Costa (1975) and Morostominae Dolin (2000) were added as subfamilies.

Lycidae. The new subfamily and tribal classification proposed by Bocak & Bocakova (2008) and based in part on Bocakova *et al.* (2007) was used in Chapter 4.11.

Phengodidae. Mastinocerinae LeConte and Penicillophorinae Paulus were recognized at the subfamily level.

Rhagophthalmidae. Although treated as a separate family here, as in 38.1, some molecular evidence (Bocakova *et al.* 2007) suggests that this group does belong within Phengodidae, as suggested by Crowson (1972).

Lampyridae. The constitution of this family used in Chapter 4.15 is based on cladograms produced by Branham & Wenzel (2001, 2003); thus several formerly included taxa within Pterotinae, Otoretinae and Otoretadrilinae have been discussed in a separate Chapter (4.18) dealing with Elateriformia *incertae sedis*. Subfamilies remaining in Lampyridae are the Psilocladinae (= Cyphonocerinae; Jeng *et al.* 1998), Amydetinae, Lampyrinae, Photurinae and Luciolinae.

Elateriformia incertae sedis. Chapter 4.18 includes elateriform taxa whose family-group relationships are in doubt. All of these taxa belong within Elateroidea with the exception of Podabrocephalidae, which appears to be related to Ptilodactylidae. All of the taxa excluded from Lampyridae by Branham & Wenzel (2001, 2003) are also included here, as well as the doubtful throscid genus *Neocrowsonium* Kistner & Abdel-Galil and the subfamily Cydistinae Paulus (1972), formerly included in Karumiidae.

Derodontiformia. The placing of Derodontidae, Nosodendridae and Jacobsoniidae in a separate superfamily increases the likelihood that Bostrichoidea is a monophyletic group. It is not at all certain, however, that the three families placed here form a single clade. This is discussed in Chapters 5 and 6.

Dermestidae. New data on the phylogeny of Dermestidae have been published by Lawrence & Ślipiński (2005) and Kiselyova & McHugh (2006). In the former work, Dermestinae and Trinodinae were redefined to include Marioutinae and Thylo-driinae, respectively.

Ptinidae. The priority of Ptinidae Latreille 1802 over Anobiidae Fleming 1821 was pointed out by Lawrence & Newton (1995); the family name has been changed in this volume.

Lymexylinae. Atractocerinae is recognized a subfamily separate from Lymexylinae and containing several genera following Paulus (2004).

Trogossitidae. A new family-group classification involving only two subfamilies was proposed by Kolibáč (2005, 2006) and is followed in Chapter 9.2.

Thanerocleridae. The clerid subfamily Thaneroclerinae was elevated to family rank by Kolibáč (1992, 1998) and a new subfamily Zenodosinae was proposed.

Metaxinidae. The genus *Metaxina* Broun, tentatively included in Thaneroclerinae by Crowson (1964) was made the type of this new family by Kolibáč (2004).

Mauroniscidae. This family was proposed by Majer (1994 b, 1995) and recognized in Lawrence *et al.* (1999).

Melyridae. The subfamily Gietellinae, recognized by Lawrence & Newton (1995), was reduced to tribal level within Dasytinae.

Cucujoidea. A new arrangement of cucujoid families was proposed by Leschen *et al.* (2005). These authors also noted that Cucujoidea was probably paraphyletic if the cleroids are excluded, and similar statements have been made in other recent works (Beutel & Pollock 2000; Hunt *et al.* 2007).

Cryptophagidae. The subfamily Hypocoprinae was considered to be a tribe within Atomariinae by Leschen (1996).

Phloeostichidae. The subfamilies Agapythinae Sen Gupta & Crowson, Myrabioliinae Lawrence & Britton, Priasilphinae Crowson and Tasmosalpinginae Lawrence & Britton were all raised to family rank by Leschen *et al.* (2005), leaving only Phloeostichinae and Hymacinae within this family. See Chapters 10.11, 10.12, 10.13, 10.16 and 10.23.

Nitidulidae. Three additional subfamilies were proposed by Kirejtshuk: Amphicrossinae (1986), Epuraeinae (1986) and Maynipeplinae (1998).

Endomychidae. A reanalysis of the subfamilies of Endomychidae (Tomaszewska 2005) confirmed the classification presented in 38.1.

Coccinellidae. A new classification involving only two subfamilies, with almost all currently recognized subfamilies considered to be tribes within Coccinellinae, was proposed by Ślipiński (2007) and is used in Chapter 10.33.

Corylophidae. A new subfamily and tribal classification was proposed by Ślipiński *et al.* (2009). Only two subfamilies, Periptyctinae and Corylophinae are recognized, with all other supergeneric groups included within the latter.

Tetratomidae. The melandryid subfamilies Halomeninae and Eustrophinae were transferred to this family by Nikitsky (1998, 2004 a, b).

Melandryidae. A new classification based in part on Nikitsky (2002) is included in Chapter 11.6.

Ripiphoridae. A new classification with the subfamilies Pelecotominae and Ptilophorinae redefined was proposed by Falin (2004). See Chapter 11.8.

Zopheridae. In the classification proposed by Ślipiński & Lawrence (1999) only two subfamilies are recognized, with both Usechinae and Monomatinae being downgraded to tribes within Zopherinae.

Promecheilidae. With the addition of the genus *Promecheilus* Solier to this family, the name Perimylopidae St. George (1939) has been replaced by the older name Promecheilidae Lacordaire (1959).

Tenebrionidae. The major changes at the subfamily level in Tenebrionidae are the recognition of the Nilioninae (including only *Nilio* Latreille) and the use of Stenochiinae as a senior synonym of Coelometopinae (Bouchard *et al.* 2005). See Chapter 11.14.

Oedemeridae. A new subfamily Polyprinae was proposed by Lawrence (2005 b) to include *Polypria* Chevrolat (Tenebrionoidea incertae sedis in Lawrence & Newton 1995) and *Dasytomima* Lawrence.

Meloidae. The subfamily Tetraonycinae Böving & Craighead (1931) was added by Bologna & Pinto (2001).

Mycteridae. As pointed out by Lawrence & Newton (1995), Euryrinae Thomson has priority over Lacconotinae and is used in Chapter 11.20.

Anthicidae. The subfamilies Afremiinae, Lagrioidinae and Ischaliinae were removed from Anthicidae and included in the next Chapter. With their removal a much stronger case can be made for the monophyly of this family. Ischaliidae was recognized at the family level by Nikitsky & Egorov (1992) and Nikitsky (1996), and doubts have been expressed about the inclusion of *Afremus* Levey and *Lagrioida* Fairmaire & Germain in Anthicidae (Lawrence & Britton 1991; Costa *et al.* 1995; Werner & Chandler 1995; Chandler 2002).

Tenebrionoidea incertae sedis. Chapter 11.29 includes three family-group taxa listed in the previous paragraph plus the genera *Rhizonium* Sharp and *Aprostomis* Grouvelle.

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List of Families and Subfamilies

Adephaga

Meruidae Spangler & Steiner, 2005
Aspidytidae Ribera *et al.* 2002

Polyphaga

Elateriformia

Elateroidea

Rhinorhipidae Lawrence, 1988
Artematopodidae Lacordaire, 1857
Electribiinae Crowson, 1975
Allopogoniinae Crowson, 1973
Artematopodinae Lacordaire, 1857
Brachypsectridae LeConte & Horn, 1883
Cerothyridae Latreille, 1834
Eucnemidae Eschscholtz, 1829
Perothopinae Lacordaire, 1857
Phyllocerinae Reitter, 1905
Pseudomeninae Muona, 1933
Palaeoxeninae Muona, 1993
Phlegoninae Muona, 1993
Anischiinae Fleutiaux, 1936
Melasinae Fleming, 1821
Eucneminae Eschscholtz, 1829
Macraulacinae Fleutiaux, 1923
Throscidae Laporte, 1840
Elateridae Leach, 1815
Cebrioninae Latreille, 1802
Agrypninae Candèze, 1857 (incl. Tetralobinae)
Thylacosterninae Fleutiaux, 1920
Lissominae Laporte, 1835
Semiotinae Jacobson, 1913
Campyloxeninae Costa, 1975
Pityobiinae Hyslop, 1917
Oxynopterinae Candèze, 1857
Denticollinae Stein & Weise, 1877 (1856)
Negastrinae Nakane & Kishii, 1956
Elaterinae Leach, 1815
Cardiophorinae Candèze, 1860
Hemiopinae Fleutiaux, 1941
Physodactylinae Lacordaire, 1857
Eudicronychinae Girard, 1971

- Subprotelaterinae Fleutiaux, 1936
 Morostominae Dolin, 2000
 Plastoceridae Crowson, 1972
 Drilidae Blanchard, 1845
 Omalisidae Lacordaire, 1857
 Lycidae Laporte, 1836
 Libnetinae Bocak & Bocakova, 1990
 Dictyopterinae Kleine, 1928
 Lypropaeinae Bocak & Bocakova, 1989
 Ateliinae Kleine, 1928
 Lycinae Laporte, 1836
 Dexorinae Bocak & Bocakova, 1989
 Telegeusidae Leng, 1920
 Phengodidae Leconte, 1861
 Phengodinae LeConte, 1861
 Mastinocerinae LeConte, 1881
 Penicillophorinae Paulus, 1974
 Rhagophthalmidae Olivier, 1907
 Lampyridae Latreille, 1817
 Psilocladinae McDermott, 1964
 Lampyrinae Latreille, 1817
 Luciolinae Lacordaire, 1857
 Photurinae Lacordaire, 1857
 Omethidae Leconte, 1861
 Omethinae LeConte, 1861
 Matheteinae LeConte, 1881
 Driloniinae Crowson, 1972
 Cantharidae Imhoff, 1856 (1815)
 Cantharinae Imhoff, 1856 (1815)
 Silinae Mulsant, 1862
 Dymorphocerinae Brancucci, 1980
 Malthininae Kiesenwetter, 1852
 Chauliognathinae Leconte, 1861
- Elateriformia Incertae Sedis**
 Podabrocephalidae Pic, 1930
Neocrowsonia Kistner & Abdel-Galil, 1986
 Cydistinae Paulus, 1972
 Pterotinae LeConte, 1861
Harmatelia Walker, 1858
Stenocladus Fairmaire, 1878
 Otoretinae McDermott, 1964
- Derodontiformia**
Derodontoidea
 Derodontidae LeConte, 1861
 Peltasticinae Leconte, 1861
 Derodontinae LeConte, 1861
 Laricobiinae Mulsant & Rey, 1863–4
 Nosodendridae Erichson, 1846
 Jacobsoniidae Heller, 1926
- Bostrichiformia**
Bostrichoidea
 Dermestidae Latreille, 1804
 Dermestinae Latreille, 1804 (incl. Marioutinae)
 Thorictinae Agassiz, 1846
 Orphilinae LeConte, 1861
 Trinodinae Casey, 1900 (incl. Thylodriinae)
 Attageninae Laporte, 1840
 Megatominae Leach, 1815
 Endecatomiidae Leconte, 1861
- Bostrichidae Latreille, 1802
 Dysidinae Lesne, 1921
 Polycaninae Lesne, 1936
 Bostrichinae Latreille, 1802
 Psoinae Blanchard, 1851
 Dinoderinae C. G. Thomson, 1863
 Lyctinae Billberg, 1820
 Euderiinae Lesne, 1934
 Ptinidae Latreille, 1802
 Eucradinae LeConte, 1861
 Ptininae Latreille, 1802
 Dryophilinae LeConte, 1861
 Ernobiinae Pic, 1912
 Anobiinae Fleming, 1821
 Ptilininae Shuckard, 1840
 Alvarenganiellinae Viana & Martinez, 1971
 Xyletininae Gistel, 1956
 Dorcatominae Thomson, 1859
 Mesocoelopodinae Mulsant & Rey, 1864
- Cucujiformia**
Lymexyloidea
 Lymexylidae Fleming, 1821
 Hylecoetinae Gistel, 1856
 Lymexylinae Fleming, 1821
 Atractocerinae Laporte, 1840
 Melittommatinae Wheeler, 1986
- Cleroidea**
 Phloiophilidae Kiesenwetter, 1863
 Trogossitidae Latreille, 1802
 Peltinae Kirby, 1837
 Trogossitinae Latreille, 1802
 Chaetosomatidae Crowson, 1952
 Metaxinidae Kolibáč, 2004 (from Cleridae)
 Thanerocleridae Chapin, 1924 (from Cleridae)
 Zenodosinae Kolibáč, 1992
 Thaneroclerinae Chapin, 1924
 Cleridae Latreille, 1802
 Tillinae Leach, 1815
 Hydnocerinae Spinola, 1844
 Clerinae Latreille, 1802
 Korynetinae Laporte, 1836 (incl. Epiphloeinae,
 Enopliinae, Tarsosteninae)
 Acanthocnemidae Crowson, 1964
 Phycosecidae Crowson, 1952
 Prionoceridae Lacordaire, 1857
 Mauroniscidae Majer, 1994
 Melyridae Leach, 1815
 Rhadalinae LeConte, 1861 (incl. Aplocneminae)
 Melyrinae Leach, 1815
 Dasytinae Laporte, 1840 (incl. Gietellinae)
 Malachiinae Fleming, 1821 (incl.
 Attalomiminae)
- Cucujoidea (arrangement is new)**
 Boganiidae Sen Gupta & Crowson, 1966
 Paracucujinae Endrödy-Younga & Crowson,
 1986
 Boganiinae Sen Gupta & Crowson, 1966
 Byturidae Jacquelin Du Val, 1858
 Platydascillinae Pic, 1914
 Byturinae Jacquelin Du Val, 1858

- Helotidae Reitter, 1876/Chapuis, 1876
 Protocucujidae Crowson, 1954
 Sphindidae Jacquelin Du Val, 1860
 Protosphindinae Sen Gupta & Crowson, 1979
 Odontosphindinae Sen Gupta & Crowson, 1979
 Sphindiphorinae McHugh, 1993
 Sphindinae Jacquelin Du Val, 1860
 Biphyllidae LeConte, 1861
 Erotylidae Latreille, 1802
 Xenoscelinae Ganglbauer, 1899
 Pharaxothinae Crowson, 1952 (incl. Setariolinae)
 Loberinae Bruce, 1951
 Languriinae Crotch, 1873
 Cryptophilinae Casey, 1900 (incl. Toraminae)
 Erotylinae Latreille, 1802 (incl. Tritominae, Dacninae, Megalodacninae, Encaustinae)
 Monotomidae Laporte, 1840
 Rhizophaginae Redtenbacher, 1845
 Monotominae Laporte, 1840
 Hobartiidae Sen Gupta & Crowson, 1966
 Cryptophagidae Kirby, 1837
 Cryptophaginae Kirby, 1837
 Atomariinae LeConte, 1861 (incl. Hypocoprinae, Alfieriellinae)
 Agapythidae Sen Gupta & Crowson, 1969
 Priasilphidae Crowson, 1973
 Phloeostichidae Reitter, 1911
 Silvanidae Kirby, 1837
 Brontinae Erichson, 1845/Blanchard, 1845
 Silvaninae Kirby, 1837
 Cucujidae Latreille, 1802
 Myraboliidae Lawrence & Britton, 1991
 Cavognathidae Sen Gupta & Crowson, 1966
 Lamingtoniidae Sen Gupta & Crowson, 1966
 Passandridae Erichson 1845/Blanchard, 1845
 Phalacridae Leach, 1815
 Phaenocephalinae Matthews, 1899
 Phalacrinae Leach, 1815
 Propalticidae Crowson, 1952
 Laemphloeidae Ganglbauer, 1899
 Tasmosalpingidae Lawrence & Britton, 1991
 Cyclaxyridae Gimmel *et al.*, 2009
 Kateretidae Erichson, 1846
 Nitidulidae Latreille, 1802
 Calonecrinae Kirejtshuk, 1982
 Maynipeplinae Kirejtshuk, 1998
 Epuraeinae Erichson, 1843
 Carpophilinae Erichson, 1842
 Amphicrossinae Kirejtshuk, 1986
 Meligethinae C. G. Thomson, 1859
 Nitidulinae Latreille, 1802
 Cillaeinae Kirejtshuk & Audisio in Kirejtshuk, 1986
 Cryptarchinae C. G. Thomson, 1859
 Cybocephalinae Jacquelin Du Val, 1858
 Smicripidae Horn, 1879
 Bothrideridae Erichson, 1845
 Teredinae Seidlitz, 1888
 Xylariophilinae Pal & Lawrence, 1986
 Anommatinae Ganglbauer, 1899
 Bothriderinae Erichson, 1845
 Cerylonidae Bilberg, 1820
 Euxestinae Grouvelle, 1908
 Loeblioryloninae Ślipiński, 1990
 Ostomopsinae Sen Gupta & Crowson, 1973
 Murmidiinae Jacquelin Du Val, 1858
 Ceryloninae Bilberg, 1820
 Alexiidae Imhoff, 1856
 Discolomatidae Horn, 1878
 Notiophyginae Jacobson, 1915
 Discolomatinae Horn, 1878
 Aphanocephalinae Grouvelle, 1912
 Cephalophaninae John, 1954
 Pondonatinae John, 1954
 Endomychidae Leach, 1815
 Merophysinae Seidlitz, 1872
 Pleganophorinae Jacquelin Du Val, 1885
 Anamorphinae Strohecker, 1953
 Leiestinae C. G. Thomson, 1863
 Mycetaeinae Jacquelin Du Val, 1857
 Eupsilobiinae Casey, 1895
 Xenomycetinae Strohecker in Arnett, 1962
 Danascelinae Tomaszewska, 2000
 Endomychinae Leach, 1815
 Epipocinae Gorham, 1873
 Stenotarsinae Chapuis, 1876
 Lycoperdininae Redtenbacher, 1844
 Coccinellidae Latreille, 1807
 Microweiseinae Leng, 1920
 (= Sticholotidinae part)
 Coccinellinae Latreille, 1807 (incl. Sticholotidinae part, Chilocorinae, Coccidulinae, Scymninae, Ortaliinae, Epilachninae)
 Corylophidae Leconte, 1852
 Peryptyctinae Ślipiński *et al.*, 2001
 Corylophinae LeConte, 1852
 Latridiidae Erichson, 1842
 Latridiinae Erichson, 1852
 Corticariinae Curtis, 1829
Tenebrionoidea
 Mycetophagidae Leach, 1815
 Esarcinae Reitter, 1882
 Mycetophaginae Leach, 1815
 Berginae Leng, 1920
 Archeocrypticidae Kaszab, 1964
 Pterogeniidae Crowson, 1953
 Ciidae Leach in Samouelle, 1819
 Sphindociinae Lawrence, 1974
 Ciinae Leach in Samouelle, 1819
 Tetratomidae Billberg, 1820
 Tetratominae Billberg, 1820
 Piseninae Miyatake, 1960
 Penthinae Lacordaire, 1859
 Hallomeninae Mulsant 1856/Gistel, 1856 (from Melandryidae)
 Eustrophinae Gistel, 1856 (from Melandryidae)
 Melandryidae Leach, 1815
 Melandryinae Leach, 1815
 Osphyinae Mulsant, 1856 (1840)

- Mordellidae Latreille, 1802
 Ctenidiinae Franciscolo, 1951
 Mordellinae Latreille, 1802
 Ripiphoridae Gemminger & Harold, 1870 (1853)
 Ptilophorinae Gerstaecker, 1855
 Pelecotominae Seidlitz, 1875 (incl. Micholaeminae)
 Hemirhipidiinae Heller, 1921
 Ripidiinae Gerstaecker, 1855
 Ripiphorinae Gemminger & Harold, 1870 (1853)
 Zopheridae Solier, 1834
 Colydiinae Erichson, 1842
 Zopherinae Solier, 1834 (incl. Monommatinae, Usechinae, Pycnomerinae)
 Ulodidae Pascoe, 1869
 Promecheilidae Lacordaire, 1859 (= Perimylopidae)
 Chalcodryidae Watt, 1974
 Trachelostenidae Lacordaire, 1859
 Tenebrionidae Latreille, 1802
 Lagriinae Latreille, 1825 (1820)
 Nilioninae Lacordaire, 1859
 Cossyphodinae Wasmann, 1899
 Phrenapatinae Solier, 1834
 Zolodininae Watt, 1974
 Pimeliinae Latreille, 1802
 Tenebrioninae Latreille, 1802
 Alleculinae Laporte, 1840
 Diaperinae Latreille, 1802
 Stenochiinae Kirby, 1837 (= Coelometopinae)
 Prostomidae C. G. Thomson, 1859
 Synchronidae Lacordaire, 1859
 Stenotrachelidae C. G. Thomson, 1859
 Stenotrachelinae C. G. Thomson, 1859
 Cephaloinae LeConte, 1862
 Nematoplinae Leconte, 1862
 Stoliinae Nikitsky, 1985
 Oedemeridae Latreille, 1810
 Polypriinae Lawrence, 2005
 Calopodinae Costa, 1852
 Oedemerinae Latreille, 1810 (incl. Nacerdinae)
 Meloidae Gyllenhal, 1810
 Eleticinae Wellman, 1910
 Meloinae Gyllenhal, 1810
 Tetraonycinae Böving & Craighead, 1931
 Nemognathinae Laporte, 1840
 Mycteridae Blanchard, 1845
 Mycterinae Blanchard, 1845
 Euryginae J. Thomson, 1860 (= Lacconotinae)
 Hemipeplinae Lacordaire, 1854
 Boridae C. G. Thomson, 1859
 Borinae C. G. Thomson, 1859
 Synercticinae Lawrence & Pollock, 1994
 Tricentenotomidae Blanchard, 1845
 Pythidae Solier, 1834
 Pyrochroidae Latreille, 1807
 Tydessinae Nikitsky, 1986
 Pilipalpinae Abdullah, 1964
 Pedilinae Lacordaire, 1859
 Pyrochroinae Latreille, 1807
 Agnathinae Lacordaire, 1859
 Salpingidae Leach, 1815
 Othniinae LeConte, 1861
 Prostominiinae Grouvelle, 1914
 Agleninae Horn, 1878
 Inoepalinae Grouvelle, 1908
 Dacoderinae LeConte, 1862
 Aegialitinae LeConte, 1862
 Salpinginae Leach, 1815
 Anthicidae Latreille, 1819
 Eurygeniinae LeConte, 1862
 Macratriinae LeConte, 1862
 Steropinae Jacquelin Du Val, 1863
 Copobaeninae Abdullah, 1969
 Lemodinae Lawrence & Britton, 1991
 Tomoderinae Bonadona, 1961
 Anthicinae Latreille, 1819
 Aderidae Winkler, 1927
 Scruptiidae Mulsant 1856/Gistel, 1856
 Scruptiinae Mulsant, 1856/Gistel, 1856
 Anaspidinae Mulsant, 1856
Tenebrionoidea *Incertae Sedis*
 Lagrioidinae Abdullah & Abdullah, 1968 (from Anthicidae)
 Afreminae Levey, 1985 (from Anthicidae)
 Ischaliinae Blair, 1920 (from Anthicidae)
 Rhizonium Sharp, 1876
 Aprostomis Grouvelle, 1912