Order Hymenoptera*

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Abstract

An updated classification of the order Hymenoptera is provided with the current numbers of genera and species described so far specified. The order is composed of 2 suborders, 27 superfamilies, 132 families, 8423 extant genera with an additional 685 extinct genera. Considered one of the most species-rich insects orders a total of 153088 extant species have been described, in addition to 2429 extinct species.

Key words: Hymenoptera, wasps, bees, ants, classification, diversity
Introduction

The present list concerns the current classification and described diversity of the order Hymenoptera which includes all wasps, bees and ants. Classification of extant superfamilies follows Sharkey (2007) and Sharkey et al. (2011). The number of described and here included genus-group and species-group taxa are, unless otherwise stated, updated until April 2012, while family-group taxa are updated until August 2013. In the counts for fossil genera and species, only extinct taxa are included, not fossil representatives of extant taxa.

The taxa of Hymenoptera are divided into two suborders (Symphyta and Apocrita), with 27 superfamilies (9 superfamilies in Symphyta and 18 in Apocrita) and 132 families. It is noteworthy that 17 of these families have been described since year 2000 and that 16 of these newly recognized families represent now extinct families only known from fossils. New genera and species are frequently encountered and our most recent estimate total 8423 extant genera with an additional 685 extinct genera. Considered one of the most species-rich insect orders, behind only Coleoptera and Lepidoptera, there is a total of 153088 extant and described species, in addition to 2429 extinct described species.

Diversity estimates based on described species for some of the parasitic wasp families can be misleading. There is a rich literature on the family Cynipidae with much ongoing research, but the classification is currently changing and many new species are being described especially from the northern Neotropical and Oriental regions. At the same time several groups remain without modern revisions, and there is a wealth of synonyms particularly due to separate names of morphologically different generations in the subfamily Cynipinae. Diversity counts for Figitidae and several other large families of parasitic Hymenoptera also bear little relationship to the actual diversity. All major groups of Figitidae (most of the subfamily Eucoilinae, the major genera in Charipinae, plus some genera of Figitinae, Anacharitinae and Aspicerinae) remain without modern revisions, and there are very few current workers in the group. To exemplify this, of the 919 currently formally valid species names in Eucoilinae, current researchers have examined less than 50% of the types and assessed the generic combination—at most 400 species are confirmedly valid and actually recognizable. Even in Europe, the historically best known area, at least 50% of the species present in collections are in fact still undescribed, and for the rest of the world, this ratio is much higher (Forshage, pers. obs.). For real numbers of species of Figitidae, the only figure someone has dared to estimate is an approximately 14,000 (Nordlander, 1984).

Classification

Order Hymenoptera Linnaeus, 1758 (2 suborders) (8,423 (and †684) genera, 152,677 (and †2,428) species)

Suborder Symphyta 1 (9 superfamilies, 25 families)
   Superfamily Anaxyeloidea Martynov, 1925 (1 family)
      Family Anaxyelidae Martynov, 1925 (1 (and †12) genera, 1 (and †32) species)
   Superfamily Cephoidea Newman, 1834 (2 families)
      Family Cephidae Newman, 1834 (21 (and †3) genera, 160 (and †6) species)
      † Family Sepulcidae Rasnitsyn, 1968 (†15 genera, †38 species)
      † Superfamily Karatavitoidea Rasnitsyn, 1963 (1 family)
         † Family Karatavitidae Rasnitsyn, 1963 (†5 genera, †6 species)
   Superfamily Orussoidea Newman, 1834 (2 families)
      Family Orussidae Newman, 1834 (16 (and †2) genera, 82 (and †3) species)
      † Family Paroryssidae Martynov, 1925 (†4 genera, †10 species)
   Superfamily Pamphilioidea Cameron, 1890 (3 families)
      Family Megalodontesidae Konow, 1897 (1 (and †1) genera, 42 (and †1) species)

Family Pamphiliidae Cameron, 1890 (10 (and †3) genera, 291 (and †5) species)
† Family Xyelydidae Rasnitsyn, 1986 (†8 genera, †20 species)

Superfamily Siricoidea Billberg, 1820 (6 families)
† Family Daohugoidae Rasnitsyn & Zhang, 2004 (†1 genus, †1 species)
† Family Praesiricidae Rasnitsyn, 1968 (†6 genera, †8 species)
† Family Protosiricidae Rasnitsyn & Zhang, 2004 (†1 genus, †1 species)
† Family Pseudosiricidae Handlirsch, 1908 (†1 genus, †14 species)
† Family Sinosiricidae Hong, 1975 (†1 genus, †1 species)
Family Siricidae Billberg, 1820 (11 (and †9) genera, 111 (and †13) species)

Superfamily Tenthredinoidea Latreille, 1803 (8 families)
Family Argidae Konow, 1890 (58 (and †1) genera, 897 (and †7) species)
Family Blasticotomidae Thomson, 1871 (2 (and †1) genera, 12 (and †1) species)
Family Cimbicidae W. Kirby, 1837 (16 (and †6) genera, 182 (and †19) species)
Family Diprionidae Rohwer, 1910 (11 (and †2) genera, 136 (and †2) species)
† Family Electrotomidae Rasnitsyn, 1977 (†1 genus, †1 species)
Family Pergidae Rohwer, 1911 (60 genera, 442 species)
Family Tenthredinidae Latreille, 1803 (400 (and †14) genera, 5500 (and †79) species)
† Family Xyelotomidae Rasnitsyn, 1968 (†14 genera, †21 species)

Superfamily Xiphydrioidea Leach, 1819 (1 family)
Family Xiphydriidae Leach, 1819 (28 genera, 146 species)

Superfamily Xyeloidea Newman, 1834 (1 families)
Family Xyelidae Newman, 1834 (5 (and †47) genera, 63 (and †93) species)

Suborder Apocrita (18 superfamilies, 105 families)
† Superfamily Ephialtitoidea Handlirsch, 1906 (1 family)
† Family Ephialtitidae Handlirsch, 1906 (†2 genera, †60 species)
Superfamily Trigonaloidea Cresson, 1887 (2 families)
† Family Maimetshidae Rasnitsyn, 1975 (†9 genera, †11 species)
Family Trigonalidae Cresson, 1887 (16 (and †4) genera, 92 (and †5) species)
Superfamily Megalyroidea Schletterer, 1889 (1 family)
Family Megalyridae Schletterer, 1889 (8 (and †11) genera, 43 (and †40) species)
Superfamily Stephanoida Leach, 1815 (1 family)
Family Stephanidae Leach, 1815 (11 (and †4) genera, 342 (and †8) species)
Superfamily Ceraphronoida Haliday, 1833 (4 families)
Family Ceraphronidae Haliday, 1833 (15 genera, 304 (and †2) species)
Family Megaspilidae Ashmead, 1893 (12 (and †1) genera, 299 (and †12) species)

3. This name has been spelled in two ways: Trigonalaes and Trigonalyidae. The family was proposed as Trigonalaes by Cresson (1887) and is based on the genus Trigonaly. Westwood did not provide the derivation of his genus-group name, but it must be assumed that Trigonaly is to be treated as a noun in the nominative singular. It is presumably a compound word. If Latin, the first part of the name “trigonium” is a noun meaning triangle but the second part is ambiguous; it might come from the Greek “alys” or it might be an arbitrary combination of letters. Only in the latter case does ICZN Article 29.3.3 apply and the stem adopted by Cresson, who establishes the new family-group taxon, must be accepted as the correct spelling, namely Trigonalaes.
† Family **Radiophronidae** Ortega-Blanco, Rasnitsyn & Declòs, 2010 (†2 genera, †2 species)
† Family **Stigmaphronidae** Kozlov, 1975 (†8 genera, †25 species)

**Superfamily Evanioidea** Latreille, 1802 (5 families)
† Family **Andreneliidae** Rasnitsyn & Martinez-Declòs, 2000 (†1 genus, †1 species)
Family **Aulacidae** Shuckard, 1841 (2 (and †10) genera, 185 (and †18) species)
Family **Evaniiidae** Latreille, 1802 (21 (and †9) genera, 449 (and †19) species)
Family **Gasteruptiidae** Ashmead, 1900 (6 genera, 496 species)
† Family **Praeaulacidae** Rasnitsyn, 1972 (†10 genera, †39 species)

**Superfamily Mymarommatoidae** Debauche, 1948 (3 families)
† Family **Alavarammatidae** Ortega-Blanco, Peñalver, Delclòs & Engel, 2011 (†1 genus, †1 species)
† Family **Gallorommatidae** Gibson, Read & Huber, 2007 (†1 genus, †3 species)
Family **Mymarommatidae** Debauche, 1948 (3 (and †2) genera, 10 (and †10) species)

**Superfamily Proctotrupoidea** Latreille, 1802 (11 families)
Family **Austroniidae** Kozlov, 1975 (1 (and †1) genera, 3 (and †1) species)
Family **Heloridae** Förster, 1856 (1 (and †9) genera, 12 (and †13) species)
† Family **Isocinidae** Rasnitsyn, 1980 (†10 genera, †39 species)
† Family **Jurapriidae** Rasnitsyn, 1983 (†1 genus, †1 species)
† Family **Mesoserphidae** Kozlov, 1970 (†16 genera, †33 species)
Family **Pelecinidae** Haliday, 1839 (1 (and †5) genera, 3 (and †8) species)
Family **Peradeniidae** Naumann & Masner, 1985 (1 genus, 2 (and †1) species)
Family **Proctorenyxidae** Lelej & Kozlov, 1999 (2 genera, 2 species)
Family **Proctotrupidae** Latreille, 1802 (28 (and †15) genera, 403 (and †26) species)
Family **Roproniidae** Bradley, 1905 (2 (and †4) genera, 20 (and †5) species)
Family **Vanhorniidae** Crawford, 1909 (3 genera, 5 species)
† Genera unplaced to family (†2 genera, †3 species)

**Superfamily Diaprioidea** Haliday, 1833 (5 families)
Family **Diapriidae** Haliday, 1833 (190 (and †7) genera, 2048 (and †22) species)
Family **Ismaridae** Thomson, 1858 (1 genus, 29 species)
Family **Maamingidae** Early, Masner, Naumann & Austin, 2001 (1 genus, 2 species)
Family **Monomachidae** Ashmead, 1902 (2 genera, 30 species)

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22. Engel & Grimaldi 2006a.
† Family *Spathiopterygidae*\(^{29}\) Engel & Ortega-Blanco, 2013 (†3 genera and †3 species)
Superfamily **Platygastroidea** Haliday, 1833 (1 family)
   Family **Platygastridae** Haliday, 1833 (236 (and †20) genera, 5385 (and †45) species)
† Superfamily **Serphitoidea** Brues, 1937 (1 family)
   † Family **Serphitidae**\(^{30}\) Brues, 1937 (†3 genera, †9 species)
Superfamily **Cynipoidea** Latreille, 1802 (8 families)
   Family **Austrocynipidae**\(^{31}\) Riek, 1971 (1 genus, 1 species)
   Family **Cynipidae**\(^{32}\) Latreille, 1802 (74 (and †3) genera, 1412 (and †11) species)
   † Family **Gerocynipidae**\(^{33}\) Liu & Engel, 2007 (†3 genera, †5 species)
   Family **Ibaliidae**\(^{34}\) Thomson, 1862 (3 (and †1) genera, 20 (and †2) species)
   Family **Liopteridae** Ashmead, 1895 (10 (and †2) genera, 153 (and †2) species)
   † Family **Protimaspidae**\(^{35}\) Liu & Engel, 2007 (†1 genus, †1 species)
   † Family **Stolamissidae**\(^{36}\) Liu & Engel, 2007 (†1 genus, †1 species)
Superfamily **Chalcidoidea**\(^{37}\) Latreille, 1817 (23 families)
   Family **Agaonidae**\(^{38}\) Walker, 1846 (20 (and †2) genera, 762 (and †4) species)
   Family **Aphelinidae** Thomson, 1876 (29 (and †1) genera, 1078 (and †1) species)
   Family **Azotidae**\(^{39}\) Nikol’skaya & Yasnosh, 1966 (1 genus, 92 species)
   Family **Chalcididae** Latreille, 1817 (90 (and †3) genera, 1469 (and †5) species)
   † Family **Cynipencyrtidae**\(^{40}\) Trjapitzin, 1973 (1 genus, 1 species)
   Family **Encyrtidae** Walker, 1837 (493 (and †2) genera, 4058 (and †3) species)
   Family **Eriaporidae**\(^{41}\) Ghesquière, 1955 (5 genera, 22 species)
   Family **Eucharitidae** Walker, 1846 (57 (and †1) genera, 427 (and †1) species)
   Family **Eulophidae** Westwood, 1829 (334 (and †2) genera, 4969 (and †3) species)
   Family **Eupelmidae** Walker, 1833 (51 (and †4) genera, 931 (and †5) species)
   Family **Eurytomidae** Walker, 1832 (97 (and †1) genera, 1453 (and †3) species)
   † Family **Khutelchalcididae** Rasnitsyn, Basibuyuk & Quicke, 2004 (†1 genus, †1 species)
   Family **Leucospidae**\(^{42}\) Walker, 1834 (4 (and †1) genera, 134 (and †1) species)
   Family **Mymaridae** Haliday, 1833 (96 (and †13) genera, 1437 (and †20) species)
   Family **Ormyridae** Förster, 1856 (3 genera, 125 species)
   Family **Perilampidae** Förster, 1856 (17 (and †1) genera, 284 (and †1) species)
   Family **Pteromalidae** Dalman, 1820 (619 (and †6) genera, 3544 (and †20) species)
   Family **Rotoitidae**\(^{43}\) Bouček & Noyes, 1987 (2 genera, 2 species)
   Family **Signiphoridae** Howard, 1894 (4 genera, 78 species)
   Family **Tanaostigmatidae** Ashmead, 1904 (9 (and †1) genera, 93 (and †1) species)

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33. Liu et al. 2007a.
35. Liu et al. 2007a.
39. Heraty et al. (2013) revised the status of this family. The included taxa were previously found in Aphelinidae.
40. Heraty et al. (2013) revised the status of this family. The included taxa were previously found in Tanaostigmatidae.
41. Heraty et al. (2013) revised the status of this family. The included taxa were previously found in Aphelinidae.
42. Engel 2002.
Family **Tetracampidae** Förster, 1856 (15 (and †5 (+†1 from Mymaridae, unpubl.) genera, 44 (and †8 (+†1 from Mymaridae, unpublished) species)

Family **Torymidae** Walker, 1833 (82 (and †5) genera, 900 (and †13) species)

Family **Trichogrammatidae** Haliday, 1851 (97 (and †3) genera, 881 (and †3) species)

Superfamily **Ichneumonoidea** Latreille, 1802 (3 families)

Family **Braconidae** Nees, 1811 (1057 (and †5) genera, 19205 (and †206) species)

Family **Ichneumonidae**44 Latreille, 1802 (1575 genera, 24025 (and †216) species)

† Family **Praeichneumonidae**45 Rasnitsyn, 1983 (†1 genus, †5 species)

† Superfamily **Bethylonymoidea** Rasnitsyn, 1975 (1 family)

† Family **Bethylonymidae**46 Rasnitsyn, 1975 (†2 genera, †17 species)

Superfamily **Chrysidioidea** Latreille, 1802 (9 families)

Family **Bethylidae**47 Haliday, 1839 (84 (and †11) genera, 2340 (and †13) species)

Family **Chrysididae**48 Latreille, 1802 (81 (and †6) genera, 2500 (and †9) species)

Family **Dryinidae**49 Haliday, 1833 (41 (and †2) genera, 1605 (and †19) species)

Family **Embolemidae**50 Förster, 1856 (2 (and †1) genera, 39 (and †9) species)

† Family **Falsiformicidae**51 Rasnitsyn, 1975 (†1 genus, †1 species)

† Family **Plumaxiidae**52 Brothers, 2011 (†1 genus, †1 species)

Family **Plumaridae**53 Bischoff, 1914 (7 genera, 22 species)

Family **Sclerogibbidae**54 Ashmead, 1902 (3 (and †1) genera, 20 (and †2) species)

Family **Scolebythidae**55 Evans, 1963 (4 (and †5) genera, 6 (and †7) species)

Superfamily **Vespoidea**56 Latreille, 1802 (10 families)

Family **Bradydonaenidae**57 de Saussure, 1892 (10 genera, 188 species)

Family **Formicidae**58 Latreille, 1802 (299 (and †132) genera, 12199 (and †620) species)

Family **Mutillidae**59 Latreille, 1802 (210 (and †1) genera, 4302 (and †12) species)

Family **Pompilidae**60 Latreille, 1804 (125 (and †2) genera, 4855 (and †16) species)

Family **Rhopalosomatidae**61 Ashmead, 1896 (4 (and †4) genera, 72 (and †4) species)

Family **Sapygidae**62 Latreille, 1810 (12 (and †1) genera, 66 (and †1) species)

Family **Scoliidae**63 Latreille, 1802 (143 (and †5) genera, 560 (and †17) species)

Family **Sierolomorphidae**65 Krombein, 1951 (2 genera, 11 (and †1) species)

Family **Tiphidae**66 Leach, 1815 (120 (and †5) genera, 2000 (and †17) species)

Family **Vespidae**67 Latreille, 1802 (268 (and †3) genera, 4932 (and †11) species)

45. Kopylov 2012.
49. Olmi & Virla 2006; Engel 2005a; Olmi et al. 2011a.
50. Olmi 2006a; Olmi et al. 2011b; Perrichot & Engel 2011; Ortega-Blanco et al. 2011c.
52. Brothers 2011.
53. Huber 2009; Brothers 2011.
54. Olmi 2006b; Engel & Grimaldi 2006b.
55. Brothers 2006; Engel & Grimaldi 2007b.
56. This equals Scolioidea Latreille, 1802 + Pompiloidea Latreille, 1802 + Vespoidea Latreille, 1802 + Formicoidea Latreille, 1802 sensu Rasnitsyn 1988.
57. Lelej 2003b.
60. Engel & Grimaldi 2006c.
Superfamily Apoidea Latreille, 1802 (13 families)

Family Ampulicidae68 Shuckard, 1840 (6 (and †7) genera, 200 (and †8) species)
Family Andrenidae69 Latreille, 1802 (77 (and †3) genera, 2917 (and †11) species)
† Family Angarosphecidae70 Rasnitsyn, 1975 (†13 genera, †44 species)
Family Apidae71 Latreille, 1802 (209 (and †22) genera, 5749 (and †87) species)
Family Colletidae72 Lepeletier de Saint Fargeau, 1841 (86 genera, 2547 (and †2) species)
Family Crabronidae73 Latreille, 1802 (242 (and †24) genera, 877374 (and †29) species)
Family Halictidae75 Thomson, 1869 (79 (and †7) genera, 4327 (and †22) species)
Family Megachilidae76 Latreille, 1802 (76 (and †6) genera, 4096 (and †34) species)
Family Melittidae77 Schenck, 1860 (15 (and †2) genera, 187 (and †4) species)
† Family Mellitosphecidae78 Poinar & Danforth, 2006 (†1 genus, †1 species)
† Family Paleomelittidae79 Engel, 2001 (†1 genus, †1 species)
Family Sphecidae80 Latreille, 1802 (19 (and †1) genera, 72481 (and †1) species)
Family Stenotritidae82 Cockerell, 1934 (2 genera, 21 species)

Apocrita incertae sedis (3 families)
† Family Archaeocynipidae83 Rasnitsyn & Kovalev, 1988 (†2 genera, †3 species)
† Family Eostephanitidae84 Hong, 2002 (†1 genus, †1 species)
† Family Kuafuidae85 Rasnitsyn & Zhang, 2010 (†3 genera, †3 species)

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63. Osten (2005) ignored Argaman's classification and lists only 43 valid genera for Scoliidae. While Argaman's division of the family into 143 genera is not supported by phylogenetic analysis or proper diagnosis, the family obviously is very diverse and in need of a generic revision based on a phylogeny.
74. Updated August 2013.
78. Michex et al. 2012.
81. Updated August 2013.
References


http://dx.doi.org/10.1080/00222930110059682


http://dx.doi.org/10.1660/062.112.0201


http://dx.doi.org/10.1206/3771.2


http://dx.doi.org/10.1080/002229300750037901


http://dx.doi.org/10.1111/cla.12006.


http://dx.doi.org/10.3897/zookeys.69.738


http://dx.doi.org/10.3897/zookeys.110.918


http://dx.doi.org/10.1017/s1477201907002428