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Key to the sub-Orders and major families of Hymenoptera

1. Abdomen broadly joined at the thorax .....(**Symphyta**, also known as Chalastogastra)
Base of abdomen strongly constricted, pedunculate, and very narrowly joined to thorax .....
..... (**Apocrita**, also known as Clistogastra)

Key to families of s.o. *Symphyta*

(Sawflies, wood wasps, and horntails)

In this sub-order, the abdomen is broadly joined to the thorax, trochanters are 2-segmented, and there are usually at least 3 closed cells at the base of the hind wing.

1. Forewings with 3 marginal cells .....Xyelidae
Forewings with 2 or only 1 marginal cell 2

2. A distinct intercalary vein present between costa and subcosta ..... Pamphiliidae
Intercalary vein absent or present only as a trace 3

3. Fore tibia with only 1 apical spur 4
Fore tibia with 2 apical spurs (Sawflies) 6

4. Parapsidal furrows present; slender forms 5
Parapsidal furrows absent; stout forms (Horn tails) .....Siricidae

5. Abdomen more or less compressed; cenchri absent (Stem Sawflies) .....Cephidae
Abdomen cylindrical; cenchri present (Wood wasps) .....Xiphydriidae

6. Antennae strongly clavate apically; abdomen with distinct pleural sclerites and sharply, abruptly flexed under at the sides .....Cimbicidae
Antennae not clavate; abdomen without distinct pleural sclerites and not abruptly flexed under at the sides (typical sawflies) .....Tenthredinidae

Key to families of s.o. *Apocrita*

(Bees, Ants, Wasps, etc.)

In this suborder the thorax is composed of the "primitive" 3 thoracic segments and the first abdominal segment (**propodeum**) which is firmly attached to the wing-bearing portion of the thorax. The second (apparent first) abdominal segment is greatly restricted and forms the **pedicel** which connects the **propodeum** with the rest of the abdomen (the **gaster**). Trochanters are 1-2 segmented, and there are not more than 2 closed cells at the base of the hind wing.

1. Wings present 2
Wings absent 28

2. Hind wings without an anal lobe 3
Hind wings with an anal lobe 14

3. An erect "scale" or one or two "nodes" between the propodeum (thorax) and gaster (abdomen) .....Formicidae
No erect scales or nodes between the propodeum and gaster 4

4. Costal cell of front wing absent due to fusion of costa with intercalary vein; abdominal sternites membranous 5
Costal cell of front wings present; abdominal segments chitinized 6

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5. Front wing with 2 recurrent veins (Fig.345D).....Ichneumonidae
Front wing with 1 recurrent vein; the second lost (Fig. 345B).....Braconidae

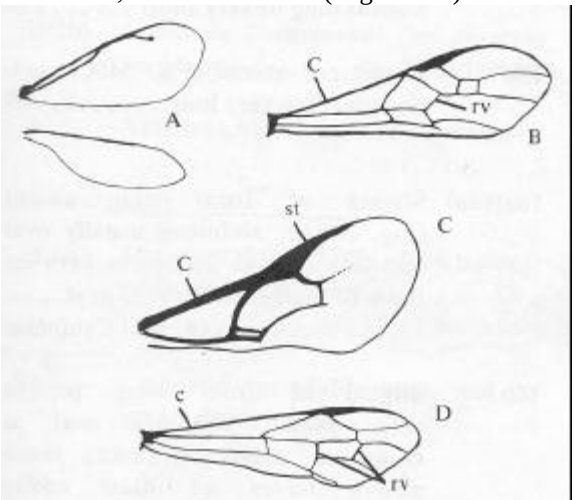

Figure 345 Wings. A, Pteromalidae; B and C, front wings of braconids (Braconidae); D, front wing of ichneumons (Ichneumonidae). c, costa; rv, recurrent vein; st, stigma.

6. Gaster borne on the dorsal surface of the propodeum, far above the hind coxae .....
.....Aulacidae and Gastrupidae
Gaster borne between the hind coxae or slightly above them 7

7. Front wings with the basal vein present and situated close to the stigma 8
Front wings with the basal vein situated far proximad of stigma (about one-third of the length of the costal cell from the stigma) or wanting 10

8. Pronotum without posterior lobes, the lateral extensions reaching the tegulae 9
Pronotum with rounded posterior lobes which terminate some distance from the tegulae (a few genera in various families of bees) 17

9. Second abdominal tergite or sternite, or both, laterally with submarginal "felt lines" (i.e., very dense pubescence regularly arranged in 2 rows, the pubescence of each row lying nearly at right angle to the other); female apterous. Usually heavily pubescent insects (Velvet ants).....Mutillidae
"Felt lines" lacking on the second tergite or sternite of the abdomen. Winged insects (males and females). Yellow jackets and hornets ..... Vespidae

10. Wings longitudinally folded in repose; ovipositor recurved and carried along the mid-dorsal line of the abdomen. Pronotum extends to the tegulae (*Leucopsis* and allies)
.....Chalcididae
Wings not longitudinally folded in repose; ovipositor not recurved and not carried along the mid-dorsal line of the abdomen 11

11. Pronotum does not reach the tegulae, being separated from it by a chitinized sclerite, the prepectus; antennae elbowed with never more than 13 segments; wings without closed cells .....Chalcididae
Pronotum extends to the tegulae; prepectus absent 12

12. First segment of hind tarsi one-fourth the length of the following segment; large insects; abdomen of female long and filiform, several times the length of the head and thorax together; abdomen of male much shorter and clavate ..... Pelecinidae
First segment of hind tarsi at least as long as the following segment 13

13. Front wings with a distinct stigma; costal cell narrow, elongate; costal vein strongly developed; abdomen petiolate, the second segment of petiole longer .....Proctotrupidae
Front wings without a distinct stigma; costal cell abnormally wide; costal vein very delicate, not developed; abdomen compressed or swollen dorsally (gall wasps) ..... Cynipidae

14. Hind wings without closed cells; number of antennal segments variable but never 13 segments in male and 12 in female 15
Hind wings with closed cells, at least the median cell closed; antennae with 13 segments in males and 12 in females (Aculeate Hymenoptera) 16

15. Abdomen attached to the dorsal surface of the propodeum; black or black and red insects with the abdomen more or less strongly compressed ..... Evaniidae
Abdomen attached at apex of propodeum between or slightly above the hind coxae; brilliant metallic blue or green insects with the venter of the abdomen strongly concave (Cuckoo wasps) ..... Chrysididae

16. Pronotum narrow and transverse, terminating on each side in a rounded posterior lobe which covers the spiracle but does not reach the tegulae (*if the area in question is densely covered with hair, as in many bees, the pronotum terminates in rounded lobes which do not reach the tegulae*) 17
Pronotum extends laterally to the tegulae but the lateral prolongations do not form rounded lobes and do not cover the spiracles 23

17. First segment of hind tarsi not dilated; plumose hairs absent; females without corbicula (pollen-baskets) on the posterior tibia ..... Sphecidae
First segment of hind tarsi dilated and elongate; plumose hairs present, especially on the thorax; corbicula present on the posterior tibiae of many females 18

18. Hind tibiae without apical spurs; or if apical spurs present, hind wing lacks jugal lobe; corbicula present (Honey bees, Bumble bees) .....Apidae
Hind tibiae with apical spurs; jugal lobe present; corbicula absent 19

19. Hind wing with jugal lobe shorter than submedian cell (Carpenter-bees) ..Anthophoridae
Jugal lobe varied; first submarginal cell rarely divided; if divided the hind wings have a large anal lobe 20

20. Tongue short, its apex divided (bilobed)(Fig. 350B) .....Colletidae
Tongue long or short but its apex is never divided (bifid) but always entire and frequently pointed (Fig. 350A)..... 21

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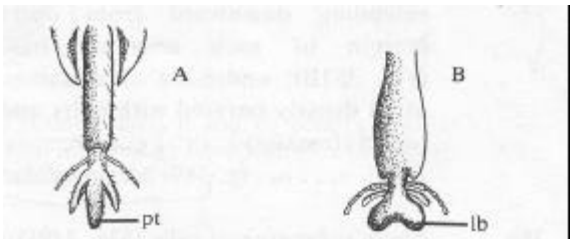

Figure 350 Proboscis. A, pointed glossa (Andrenidae, Halictidae); B, bilobed glossa (Colletidae). lb, lobe; pt, point.

21. Front wings with 3 submarginal cells (Fig. 349A, B, D).....Andrenidae
Front wings with 2 submarginal cells (Fig. 349C).....22

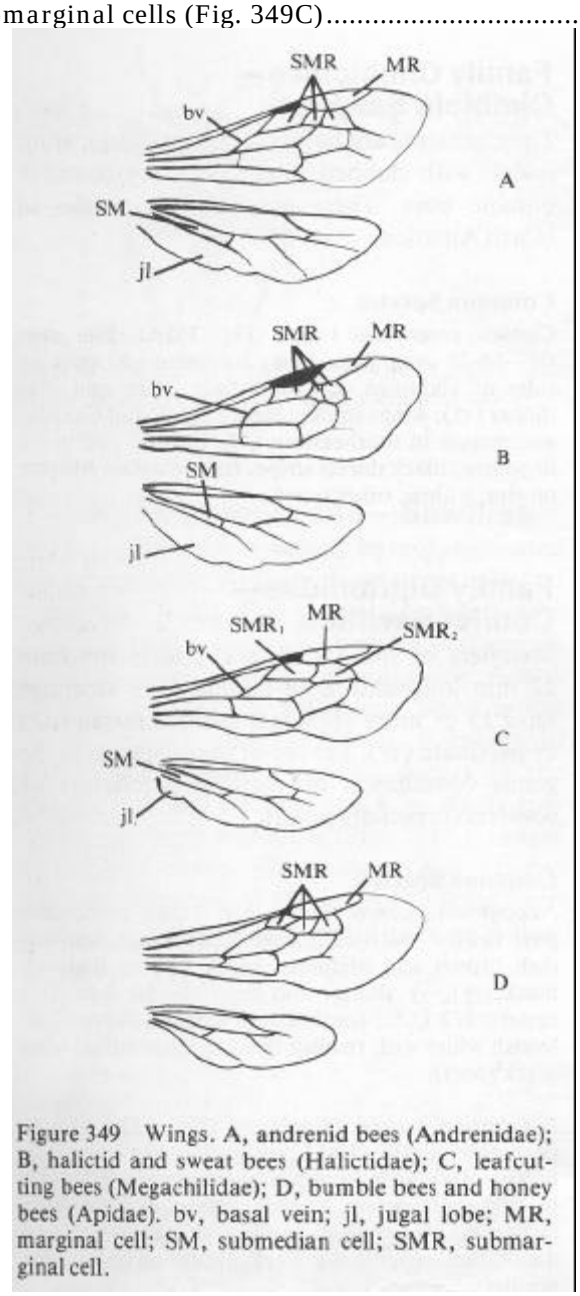

Figure 349 Wings. A, andrenid bees (Andrenidae); B, halictid and sweat bees (Halictidae); C, leafcutting bees (Megachilidae); D, bumble bees and honey bees (Apidae). bv, basal vein; jl, jugal lobe; MR, marginal cell; SM, submedian cell; SMR, submarginal cell.

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22. Labrum not large and free, usually entirely concealed by the clypeus; if visible then strongly inflexed; females (non-parasitic) with a ventral abdominal pollen-collecting brush; pygidial area absent (leaf cutter bees, etc.) ..... Megachilidae
Labrum large, free, uncovered; females without a ventral abdominal pollen-collecting brush; pygidial area usually present .....Andrenidae

23. First discoidal cell of the front wings longer than the submedian cell (Fig. 346B); wings folded longitudinally when at rest (typical wasps) ..... Vespidae
First discoidal cell of the front wings shorter than submedian cell(Fig. 346C); wings never folded longitudinally 24

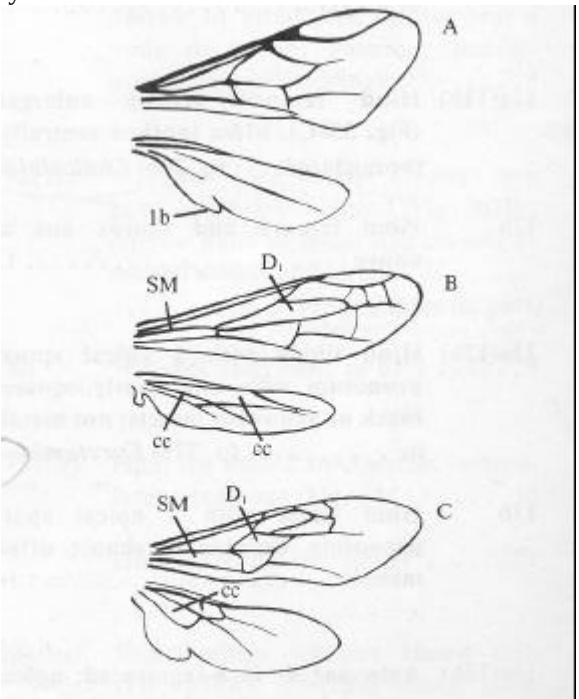

Figure 346 Wings. A, cuckoo wasps (Chrysididae); B, hornets and yellow-jackets (Vespidae); C, Scoliidae. cc, a closed cell; D_1, first discoidal cell; lb, lobe; SM, submedian cell.

24. Episterna of mesothorax divided by a horizontal suture into the upper and lower plate; coxae large and long; legs usually long and spiny (spider wasps) .....Pompilidae
Episterna of mesothorax not divided as above; coxae not large; legs not very long or spiny 25

25. First abdominal segment united by a ball and socket joint to the second, the first forming an almost completely separated node (ants) .....Formicidae
First abdominal segment not united to the second as described above; the first segment does not form anode between the propodeum and gaster 26

26. Mesosternum and metasternum form a continuous flat plate that overlies the middle and hind coxae; apex of abdomen of males with 3 spines between the last exposed tergite and sternite; wings apically with numerous wrinkles ..... Scoliidae
Mesosternum and metasternum not as described above; wings without wrinkles 27

27. Second abdominal tergite or sternite or both, laterally with a submarginal "felt line"; middle coxae more or less contiguous; anal lobe of hind wing often absent (velvet ants) .

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..... Mutillidae
"Felt line" absent; middle coxae not contiguous; anal lobe of hind wing always present .....
..... Tiphiidae

28. The abdominal segment between the propodeum and gaster is in the form of an erect scale or node (ants) ..... Formicidae
Scale or node absent between propodeum and gaster 29

29. Abdomen more or less strongly compressed, with a mid-dorsal keel; last abdominal sternite of female divided and ovipositor issues before the tip of abdomen (gall wasps) ...
..... Cynipidae
Abdomen never strongly compressed, never with mid-dorsal keel; last abdominal sternite of female entire and ovipositor (sting) issues at tip of abdomen 30

30. Ocelli present ..... Tiphiidae
Ocelli absent ..... Mutillidae