Hymenoptera

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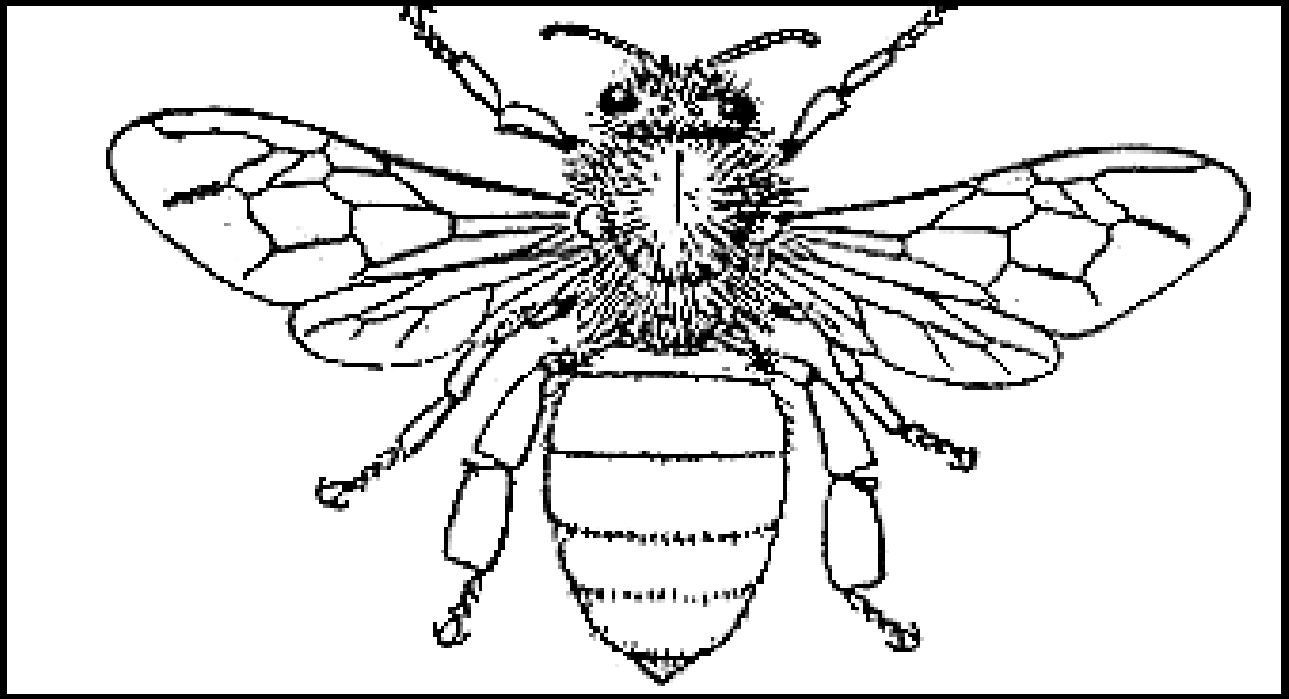
Hymenoptera

Bees, Ants, Wasps and Sawflies

120,000 species



Classification

Hymenoptera

Symphyta

(Chalastogastra)

Tenthredinoidea

Tenthredinidae

Diprionidae

Orussoidea

Orussidae

Apocrita

Parasitica

Evanoidea

Ichneumonoidea

Platygasteroidea

Cynipoidea

Chalcidoidea

Proctotrupoidea

Aculeata

Chrysidoidea

Vespoidea

Apoidea

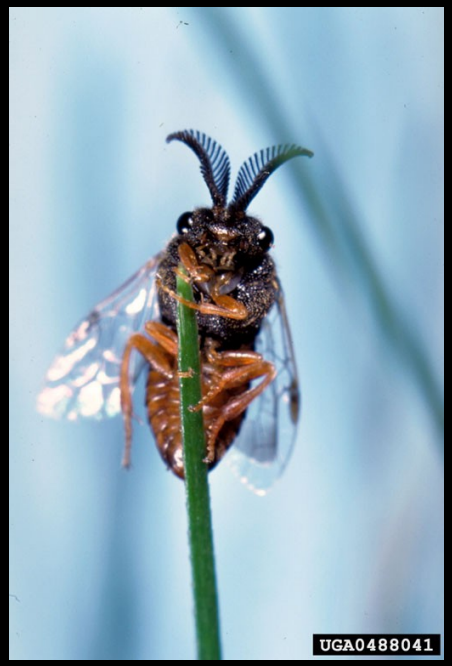
Symphyta

- Abdomen broadly attached to thorax
- First abdominal segment not fused with metathorax
- Trochanter always two segmented
- Foretibia with two spurs
- Ovipositor saw-like
- Atleast three basal closed cells on hind wing
- Larvae eruciform
- Mostly phytophagous

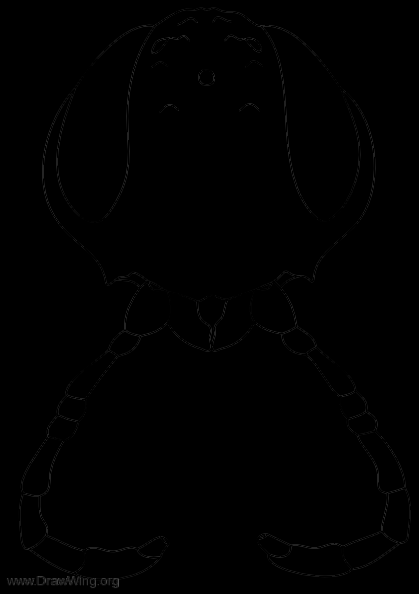
Apocrita

- Abdomen Narrowly attached to thorax
- fused with metathorax to form Propodeum
- Trochanter one or two segmented
- Foretibia with a single spur
- Often modified into sting
- Atmost two or no basal cells on hind wing
- Larvae apodous
- Parasitic, predaceous, phytophagous

- Pests of conifers



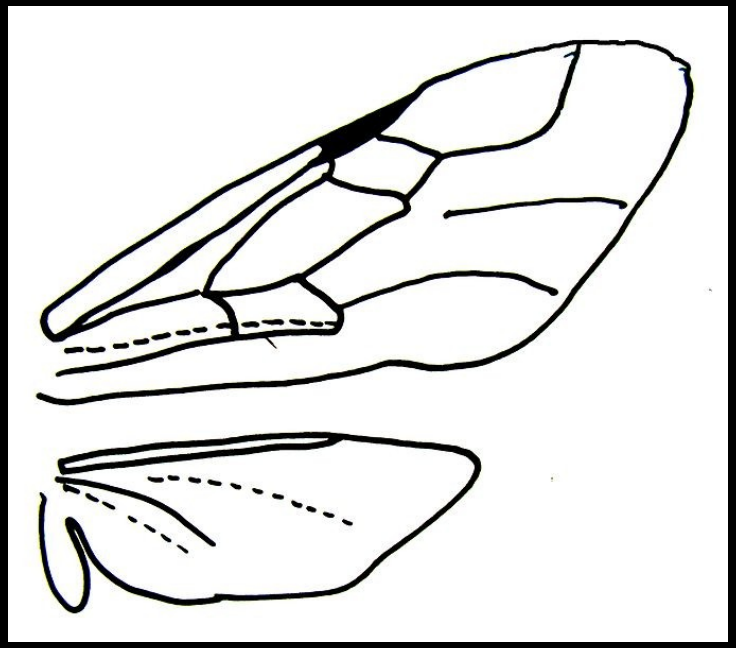
– Antennae inserted below the eyes – under a broad frontal ridge
– 1 submarginal cell in forewing



Apocrita: Parasitica

- Evanoidea
  - Evanidae
  - Gasteruptiidae
  - Aulacidae
- Ichneumonoidea
  - Ichneumonidae
  - Braconidae
- Chalcidoidea
  - Mymaridae
  - Trichogrammatidae
  - Eulophidae
  - Aphelinidae
  - Encyrtidae
  - Agaonidae
  - Pteromalidae
  - Chalcididae
  - Torymidae

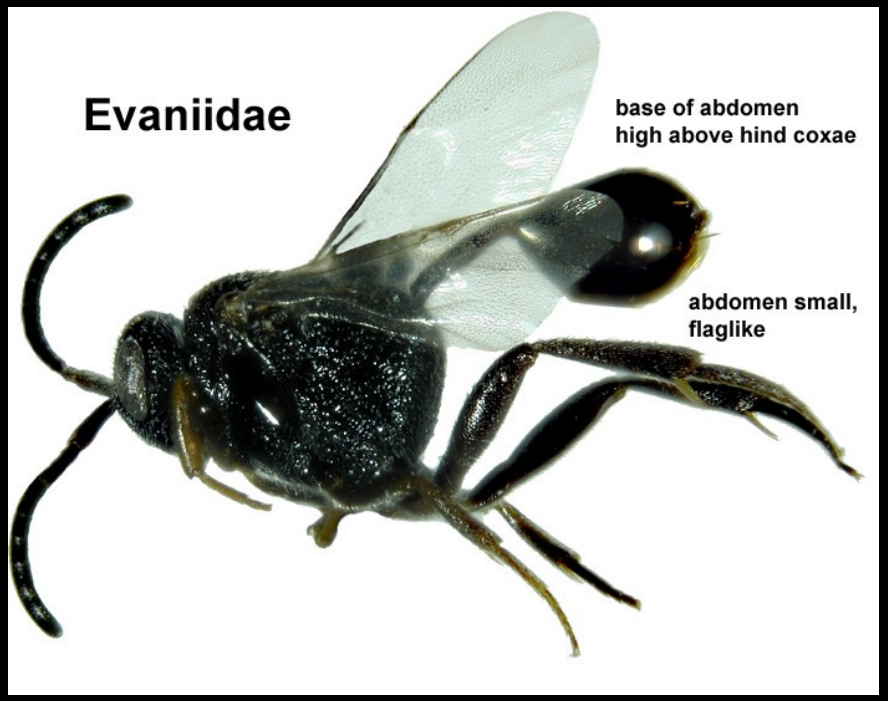
Apocrita: Parasitica
Evanoidea



Evaniidae (Ensign Wasps)

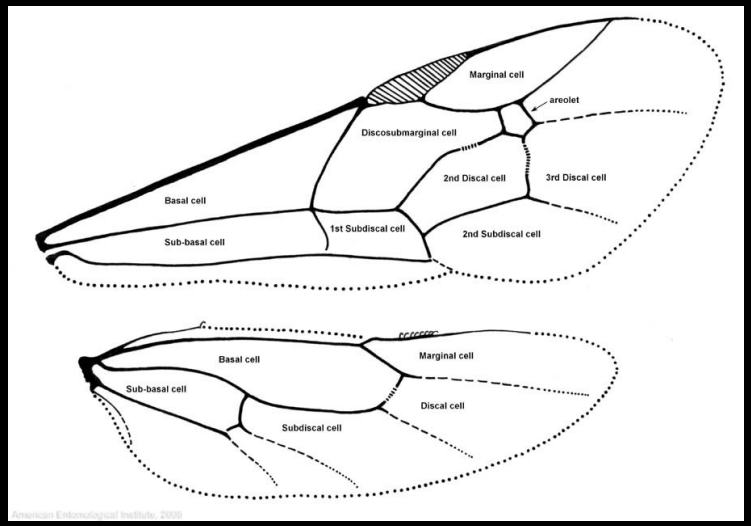
- Small abdomen carried like a flag on slender stalk high above coxae (hence common name for the group).
- All ensign wasps are parasitic on cockroach egg cases
- Black or black & red, spider-like
- Found in buildings or on forest floors

Evania appendigaster



Two genera (*Evania* and *Prosevania*) were introduced into North America for control of the American cockroach and the Oriental cockroach.

Ichneumonoidea



Ichneumonoidea

- **Ichneumonidae**
- **Braconidae**

Ichneumonidae

- One of the largest and diverse families
- "Horsehead" cell in forewing;
- 2 recurrent m-cu cross veins present.
- Antennae long, usually 16 or more segments.
- Ovipositor long, often longer than body
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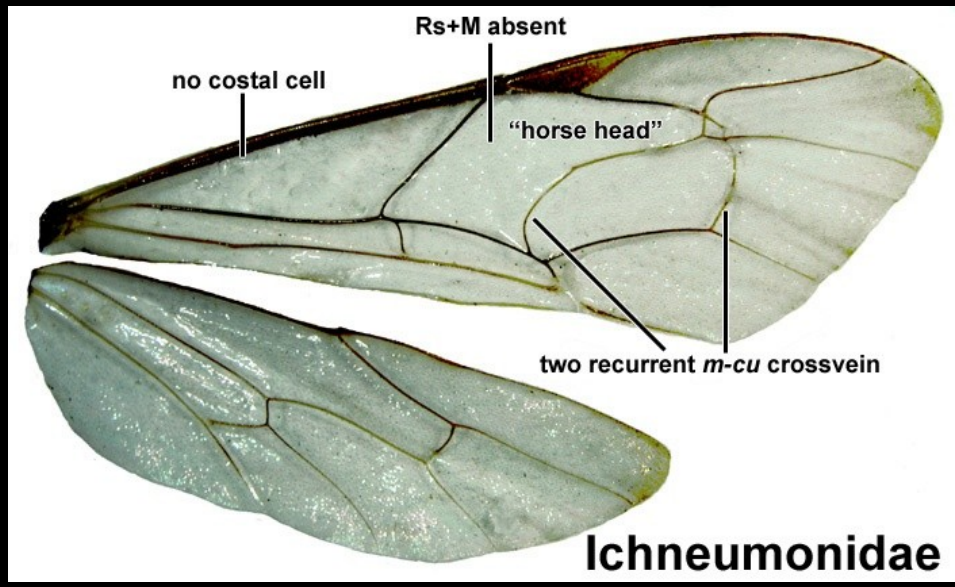

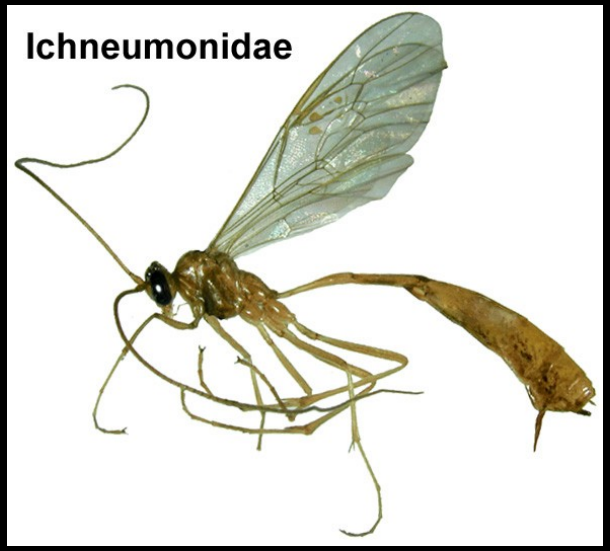

- *Xanthopimpla* spp. Asian pupal parasite of cereal stem borers
- Diversity in morphology, hosts and biology
- Mostly Endoparasites of Lepidoptera


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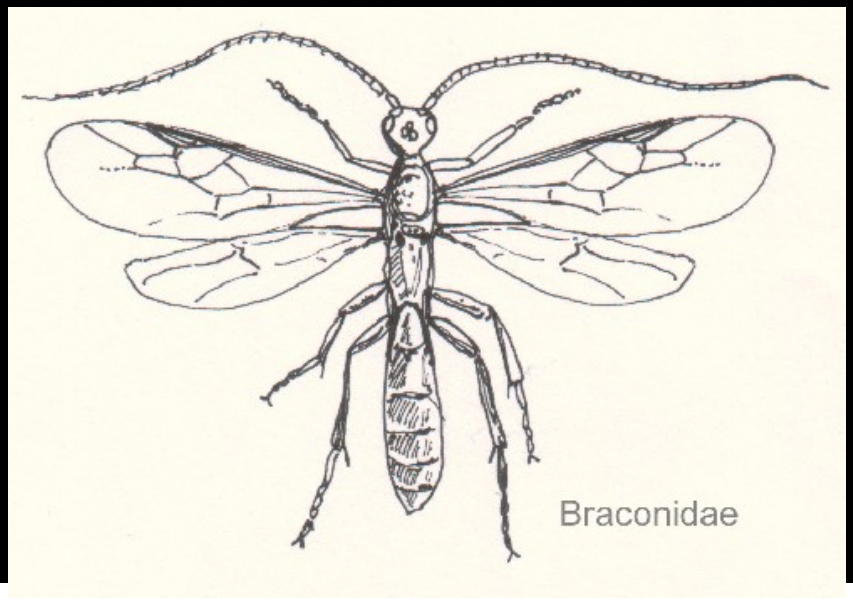
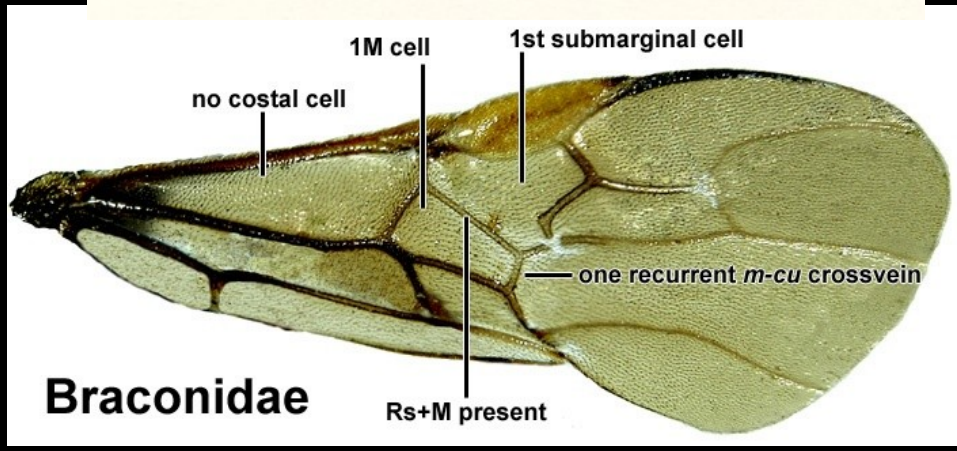
Braconidae

- Braconid biology is very diverse and the family includes parasites of Lepidoptera larvae and eggs, wood boring beetle larvae, sawflies, flies, aphids, bugs, and many other orders of holometabolous insects.





Bracon brevicornis

Chalcidoidea

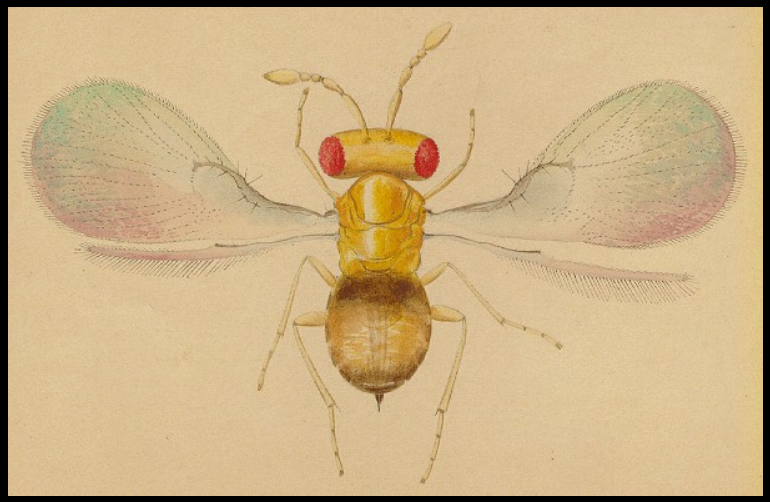
- Parasitic on eggs, larvae
  - Lepidoptera, Diptera, Coleoptera, Hemiptera
- A few are phytophagous
  - Seeds, stem, galls, etc.

Chalcidoidea

- Mymaridae
- Trichogrammatidae
- Eulophidae
- Aphelinidae
- Encyrtidae
- Agaonidae
- Pteromalidae
- Chalcididae
- Torymidae

Trichogrammatidae

- Egg parasites
- Most widely used biocontrol agent



Trichogramma chilonis

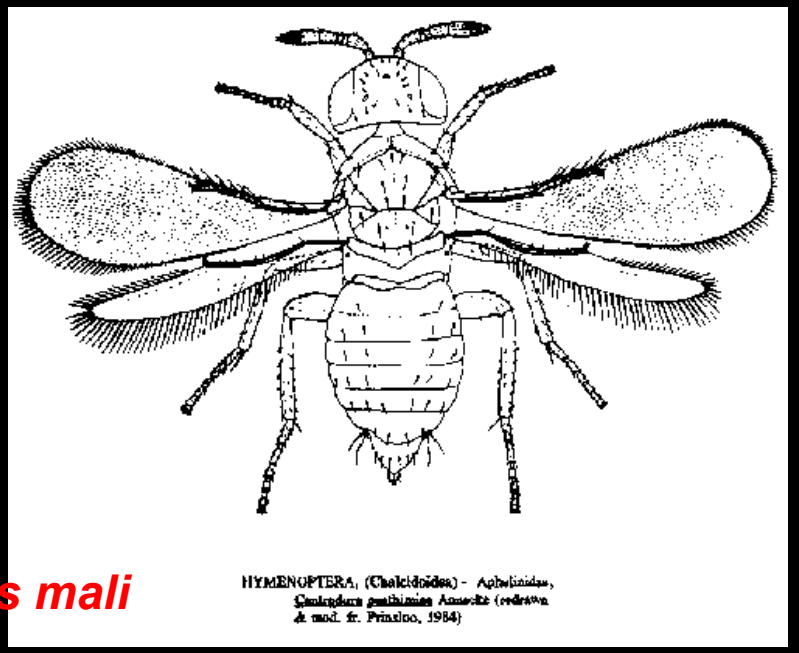
Eulophidae

- **Egg or larval parasites**

Chrysocaris alpinus

Aphelinidae

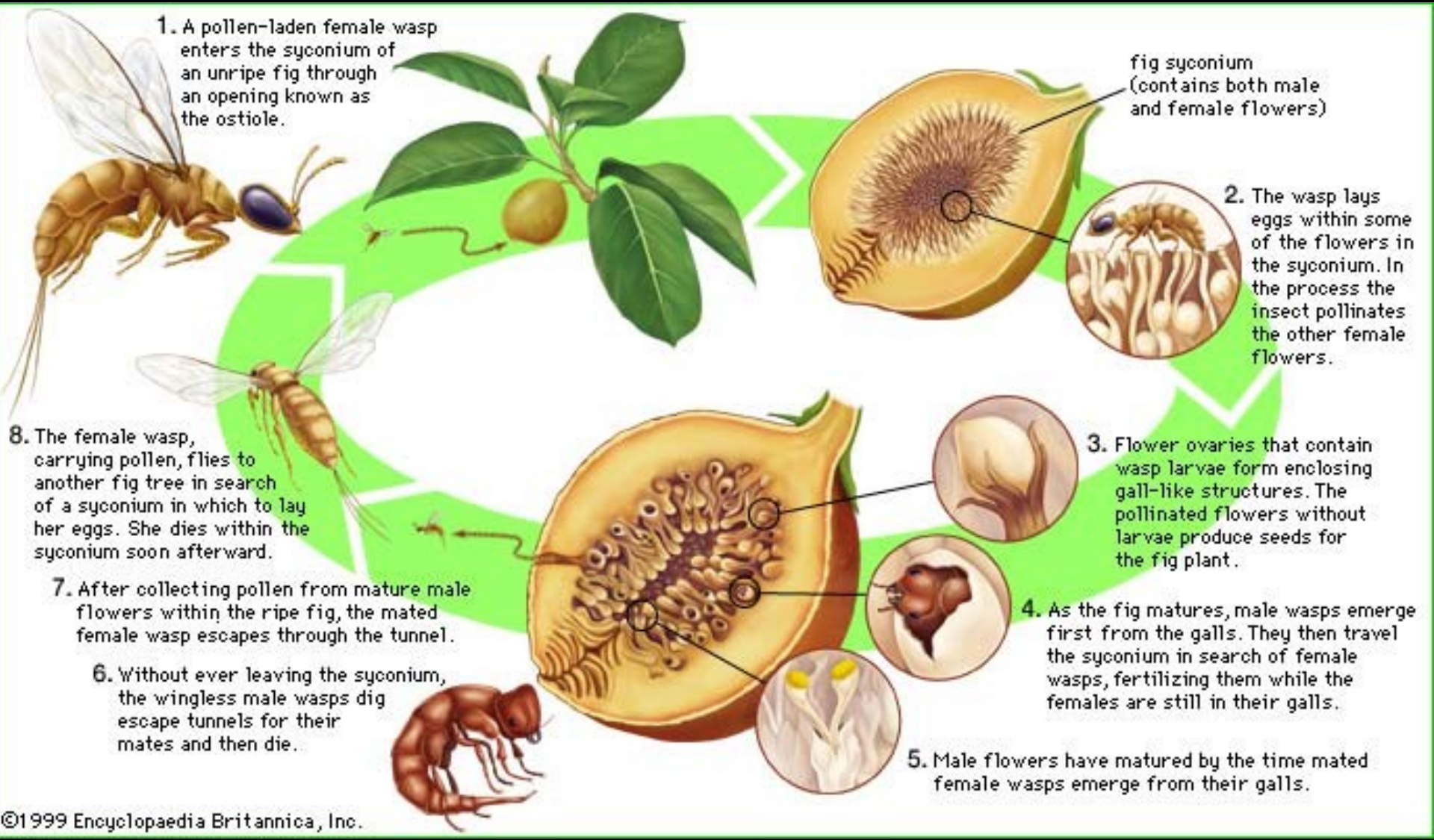
- Usually parasitise sessile hosts like scale insects, aphids, whiteflies, eggs of Hemiptera, Orthoptera & Lepidoptera



Aphelinus mali

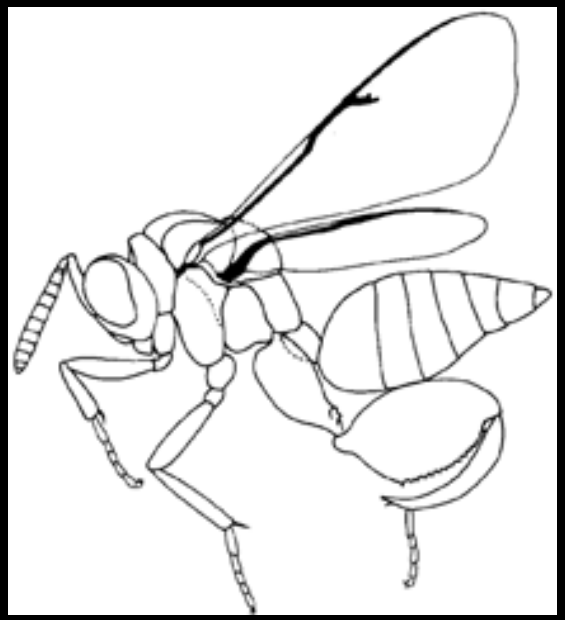
Agaonidae (Fig Wasps)

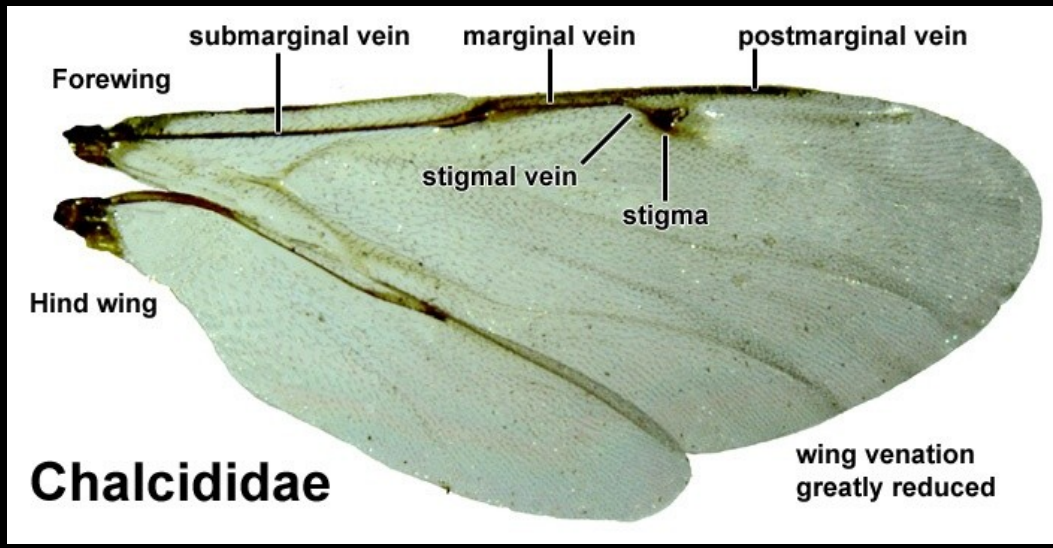
Fig and the Fig Wasp



Chalcididae

- Chalcids parasitize Lepidoptera, Coleoptera, and Diptera;
- some are hyperparasites (parasites of parasites) of Tachinidae (Diptera) and Ichneumonidae.





Lasiochalcidia igiliensis,

Scelionidae

- Orthoptera, Mantodea, Hemiptera, Embioptera, Coleoptera, Diptera, Neuroptera, Lepidoptera

Scelionid emerging from egg of Gerrid

Classification

Hymenoptera

Symphyta

(Chalastogastra)

Tenthredinoidea
- Tenthredinidae
- Diprionidae

Orussoidea
- Orussidae

Apocrita

Parasitica

Evanoidea
Ichneumonoidea
Platygasteroidea
Cynipoidea
Chalcidoidea
Proctotrupoidea

Aculeata

Chrysidoidea
Vespoidea
Apoidea

Apocrita: Parasitica

Bethylidae

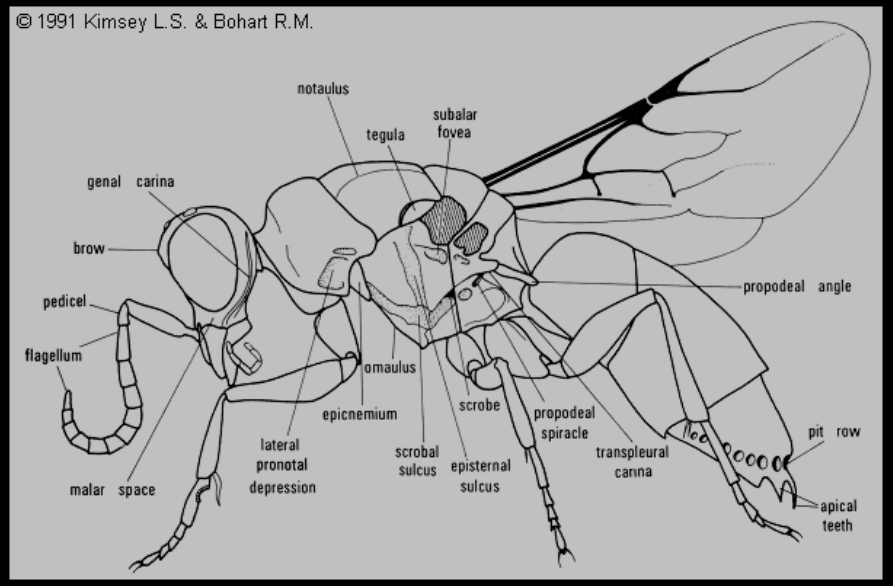
- Small to medium sized
- Females in many wingless and antlike
- Metasoma with 6 or 7 visible terga
- Antenna 12 – 13 segmented
- Head usually oblong and elongate
- Body black

Goniozus nephantidis

2200 species

Chrysididae (Cuckoo Wasps)

- Green or blue-green with pitted thorax.
- Metasoma with 3 – 5 visible terga
- Last metasomal tergum dentate apically
- Head not elongate
- Do not sting.



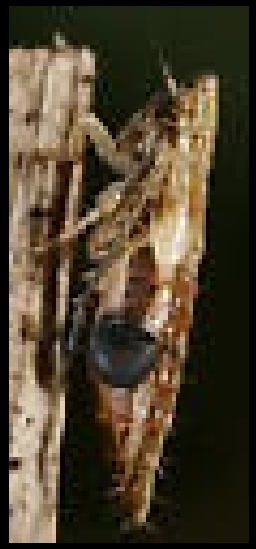
- Body metallic blue or green, usually with coarse sculpturing
- Antennae with 12 (females) or 13 segments (males)
- Rear corners of thorax pointed
- Tip of abdomen in many has tooth-like projections
- Hindwings with no closed cells
- Abdomen concave beneath, allowing chrysidids to curl up into a ball when disturbed

- Cuckoo wasp larvae are ectoparasites or cleptoparasites of bee and wasp larvae, although some feed on walkingstick eggs.

Chrysis krombeini
Chrysis dorsalis

Dryinidae

- Antennae usually 10 segmented
- Front tarsi in female usually pincerlike chelae
- Head large, Mandibles broad, strongly toothed
- Many are ant mimics – associated with myrmecophylic hoppers
- Parasitic on Auchenorrhyncha
- Polyembryoni present



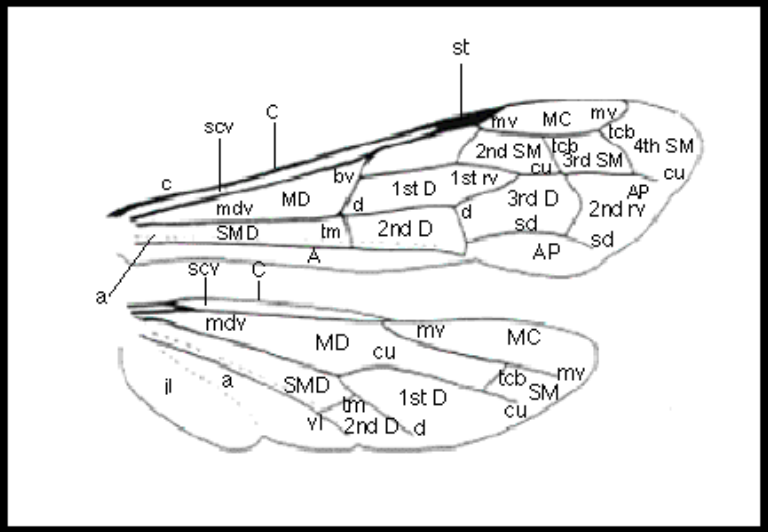
Dryinius trifascians

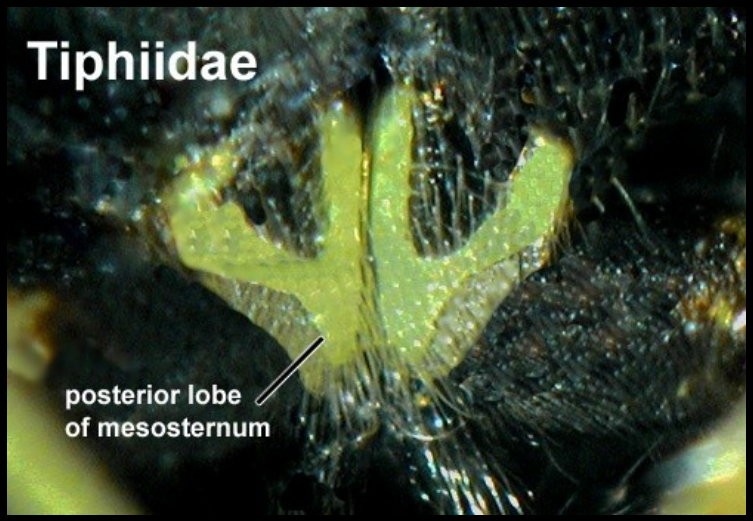
Vespoidea

- Tiphiidae
- Mutillidae
- Scoliidae
- Pompilidae
- Vespidae
- Formicidae

Tiphiidae

- Usually black and somewhat hairy.
- Apex of abdomen with an upcurved spine
- Jugal lobe of HW at least half as long as cell M+Cu
- Most have two platelike lobes that extend from the mesosternum over the bases of the middle coxae.

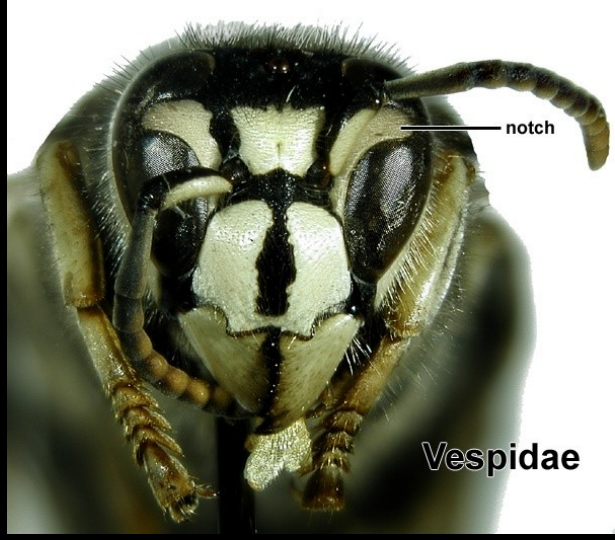


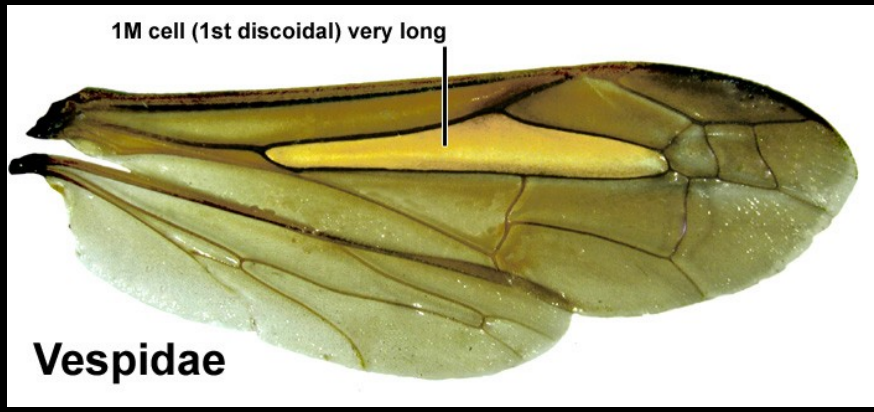


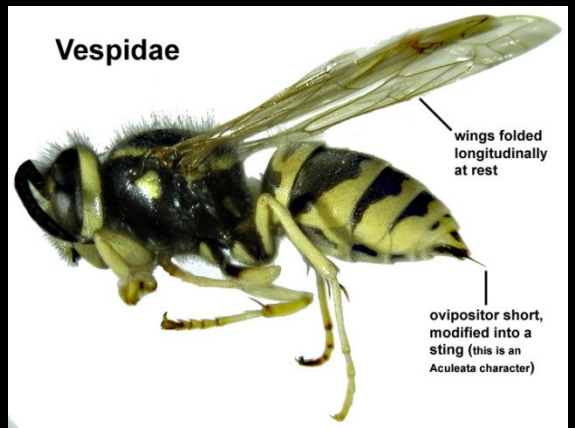
- Some are parasites of soil inhabiting scarab beetle larvae.

Vespidae

- Long first discoidal cell.
- Wings folded longitudinally (at rest).
- Antennae clavate
- 2 submarginal cells
- Eye sometimes notched.
- The family includes some eusocial species (hornets, paper wasps, yellow jackets)







- But many others, like the potter wasps, are solitary (not social).
- Both the social and solitary species feed the larvae or provision the nest with insect prey (or with pollen and nectar in some groups).

Vespidae - Subfamilies

- Euperagiinae (North America & Mexico)
- Masarinae (Pollen wasps)
- Eumeninae (Potter wasps)
- Stenogastrinae (Hover wasps)
- Polistinae (Paper wasps)
- Vespinae (Hornets & Yellow Jackets)

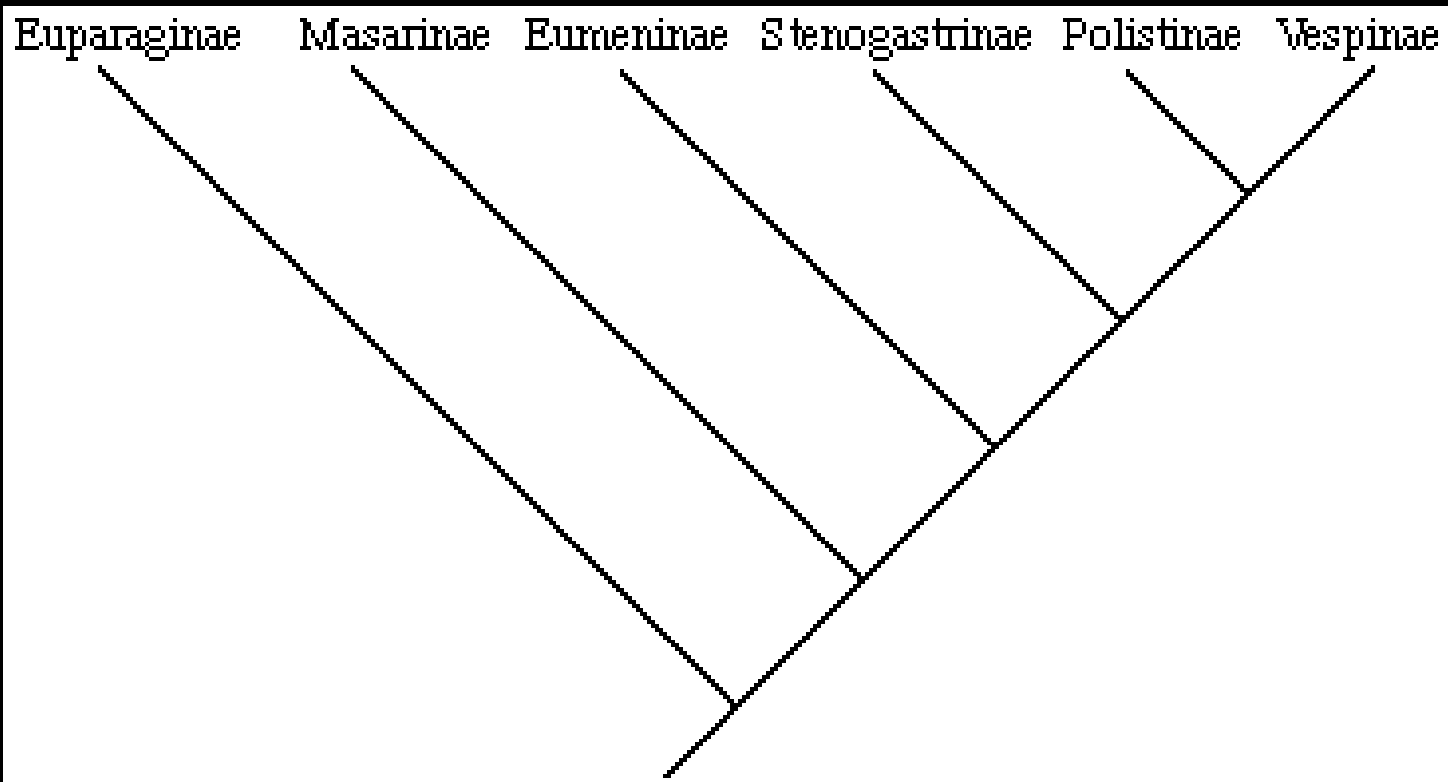


Fig 1. The phylogeny proposed by Carpenter (1982).

Delta unguiculata

Eumenes sp.

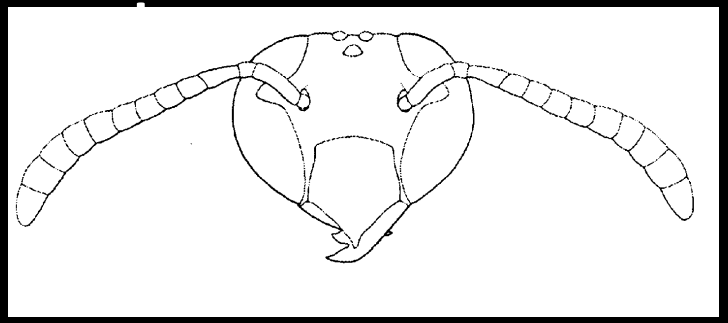
Eumenes fraternus

Rhynchium sp.

Odynerus sp.

Stenogastrinae (Hover wasps)

- Pronotal lobe separated from tegula by a distance several times its length
- Clypeus projecting ventrally in a point or rounded;
- Forewings not longitudinally plaited at



Parischnogaster mallyi

Parischnogaster striatula

Eustenogaster **sp.**

Polistinae (Paper wasps)

- The abdomen is spindle-shaped, often petiolate
- The antennae of males are curled
- Nest often open (the nests of vespines are typically enclosed in several layers of paper)
- Hindwing with jugal lobe

Polistes stigma

Ropalidia marginata

Polybia **sp.**

Ropalidia revolutionalis

Ropalidia montana

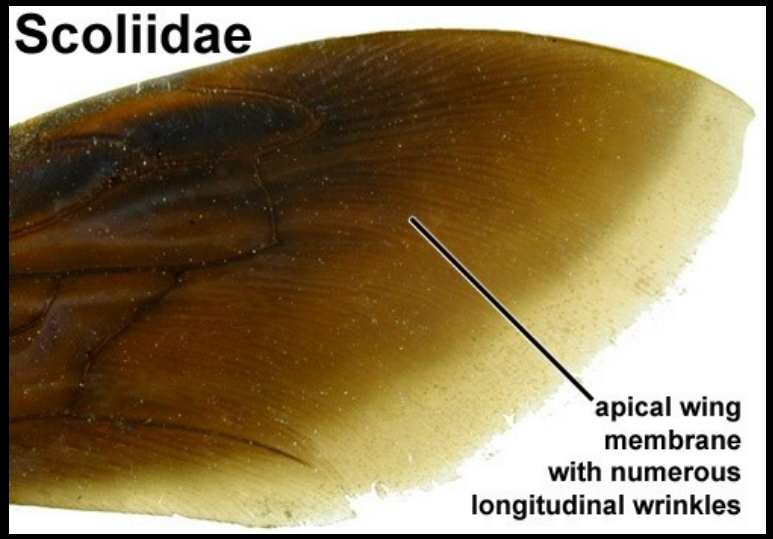
Vespinae

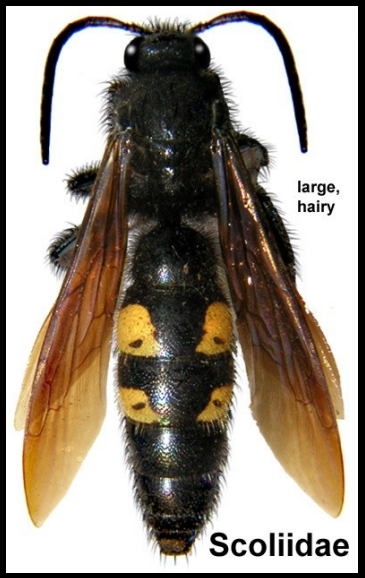
- Hindcoxa with dorsal carina on posterior surface
- Hindwing without jugal lobe;
- Metasoma sessile with first tergum having abrupt declivity
- Shape broad trapezoid in dorsal view

Vespula
Dolichovespula
Vespa
Provespa

Scoliidae

- Wing membrane of forewing with numerous wrinkles at apex.
- May have notch on anterior margin of eye.
- Ectoparasite of scarab grubs living in soil.
- Females burrow in the ground to sting and paralyze a host grub.





Formicidae

- First or first and second abdominal segments node-like or with hump.
- Antennae of females are elbowed; first segment is long.
- This is a large, dominant, extremely diverse family of eusocial insects.
- Their biologies, societies, habitats, diets, etc. are diverse and often complex.

- Eusocial, perennial colonies
- Wingless worker caste
- Metapleural gland in females
- Wings in alates shed after mating
- FW lack cross veins 3rs-m and 2m-cu

Formicinae

- A single node-like or scale-like petiole (postpetiole entirely lacking)
- Apex of the abdomen has a circular or U-shaped opening, usually fringed with hairs (acidopore).
- A functional sting is absent, and defense is provided by the ejection of formic acid through the acidopore

Camponotus compressus

- Antennal sockets are located well behind the posterior margin of the clypeus.
- In most formicines the eyes are well developed
- Antennal insertions are not concealed by the frontal carinae,
- Promesonotal suture is present and flexible.

Classification of Apoidea

APOIDEA

Spheciformes

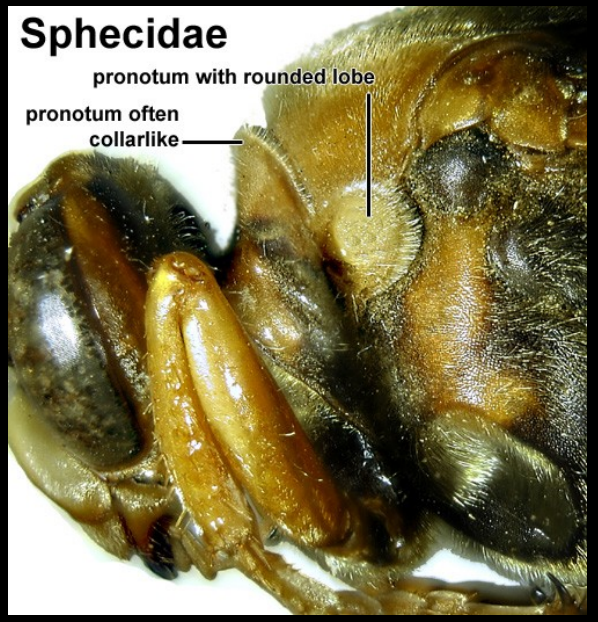
Ampulicidae
Crabronidae
Sphecidae
Heterogynaidae

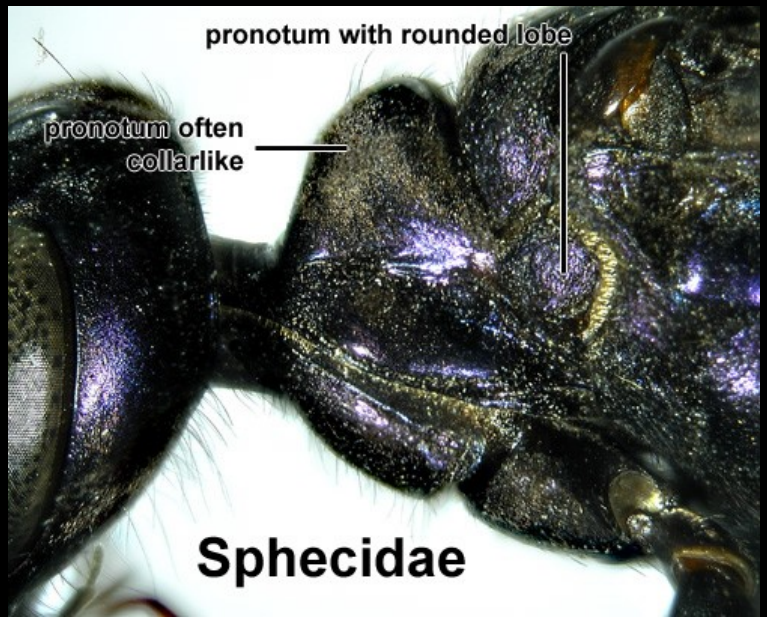
Anthophila (Apiformes)

Stenotritidae
Colletidae
Andrenidae
Halictidae
Melittidae
Megachilidae
Apidae

Sphecidae

- Pronotum short and collar-like, with posteriorly directed rounded lobe.
- Hairs on body if present not plumose
- These are solitary wasps (a few exceptions)
- Females hunt for arthropod prey to feed the larvae, which are in concealed cavities, mud nests, burrows, hollow plant stems, etc.





Sphecidae - Subfamilies

- Sphecinae
- Pemphredoninae
- Astatinae
- Nyssoninae
- Larrinae
- Philanthinae

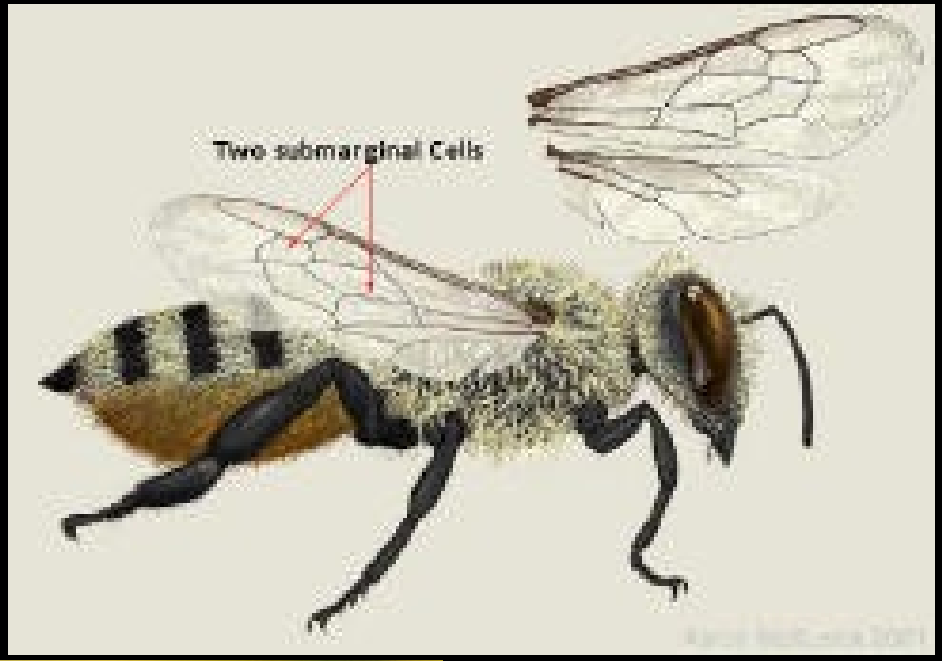
Prey of Sphecidae

- **Sphecini**
  - **Orthoptera, Homoptera (Cicadas)**
- **Sceliphronini**
  - **Spiders**
- **Ammophilini**
  - **Lepidopteran caterpillars**

- Nest in soil, sloping firm soil or sandy clay
- Prey of *Mimesa* consist of cicadellids (20/cell); *Mimumesa* – delphacids and cicadellids (10/cell); *Psen – Nephotettix*
- Other prey – Cixiidae, Flatidae, Psyllidae, Aphididae

Megachilidae (Leaf cutter bees)

- Two submarginal cells of about equal length
- Scopae on ventral aspect of metasoma
- Cut circular bits of leaves – place in tubular nests, lining of nests or stacked.
- Biology



Apidae

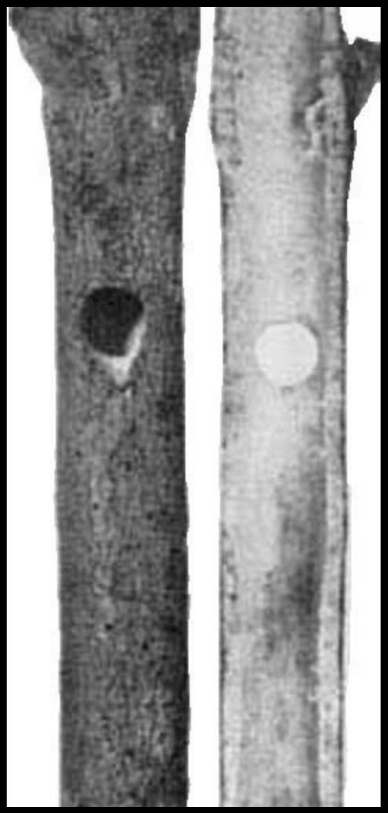
- **A collarlike pronotum without projections that reach the tegulae,**
- **Body hairs that are branched or plumose, and**
- **First segment of the metatarsus often enlarged and flattened.**
- **Front wing with three submarginal cells**
- **Hind wing with jugal lobe shorter than the submedian cell.**

Apidae - Subfamilies

- A large family with considerable variation in appearance and habits.
- Very important as pollinators of many agricultural crops.

- **Subfamilies:**
  - **Xylocopinae**
    - **carpenter bees**
  - **Nomadinae**
    - **Cuckoo bees**
  - **Apinae**
    - **honey bees, bumble bees digger bees, stingless bees, Orchid bees**

Xylocopinae



- Manuelini
- Xylocopini
- Ceratinini
- Allodapini

Manuelia postica

Ceratina sp.

Braunsapis sp.

Apinae

(Honey Bees, Bumble bees, Digger Bees, Stingless bees, Orchid Bees)

- Corbiculate hind legs for carrying pollen
- Social, solitary, communal and cleptoparasitic species

- Apini
- Bombini
- Anthophorini
- Meliponini
- Euglossini

Apini (Honey Bees)

- The true honey bees in a single genus Apis
- 6 to 11 species (8?) and 44 subspecies
- Golden brown or black
- Marginal and submarginal cells in FW
- Absence of spurs on Hind tibia

- *Apis cerana*
- *Apis dorsata*
- *Apis florea*
- *Apis mellifera*
- *Apis laboriosa*
- *Apis andreniformis*
- *Apis koschevnikovi*
- *Apis binghami*

Bombini (Bumble bees)

Anthophorini (Digger bees)

- This is a tribe of robust, fast-flying, pollen-collecting bees.

- The wings are largely bare, the distal parts beyond the veins being strongly papillate