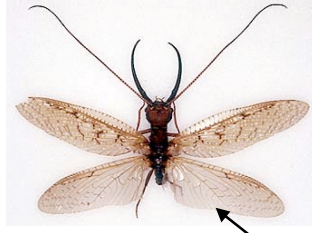


**Megaloptera** (alderflies, dobsonflies)

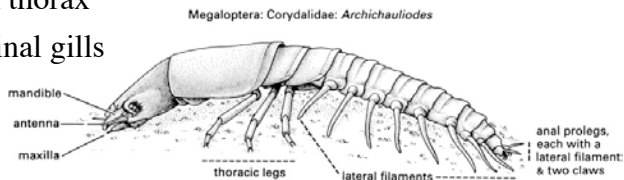
**Adults:**

- Medium to large
- Large compound eyes
- Prognathus, with mandibles
- Antennae are multisegmented
- Prothorax slightly longer than meso- and metathorax
- Fore and hind wings subequal with anal fold in hind wings



**Larvae:** (Hellgrammites)

- Aquatic
- Head prognathus with stout mandibles
- Jointed legs on thorax
- Lateral abdominal gills



**Rhaphidioptera** (snakeflies)

**Adults:**

- Medium sized
- Large compound eyes
- Mandibulate with multisegmented antennae
- Prothorax longer than meso- and metathorax
- Fore wings somewhat longer than similar hind wings, no anal fold



**Larvae:**

- Terrestrial, predaceous
- Prognathus with stout mandibles
- Jointed legs only on thorax



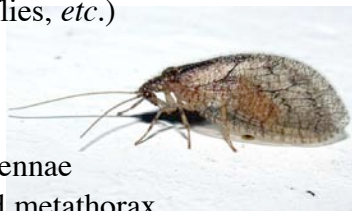
Larvae elongate and usually found under bark.

Fossil forms from Cretaceous (60 mya) look like modern forms

Neuroptera (lacewings, antlions, owlflies, *etc.*)

**Adults:**

- Medium sized
- Large compound eyes
- Mandibulate with multisegmented antennae
- Prothorax often longer than meso- and metathorax
- Fore and hind wings subequal with numerous crossveins and distal “twigging”, no anal fold
- Wings held “roof-like” over abdomen.



**Larvae:**

- Predominantly terrestrial.
- Head prognathus, with slender mandibles and maxillae that usually form piercing/sucking mouthparts.
- Jointed legs only on thorax and lacking abdominal gills

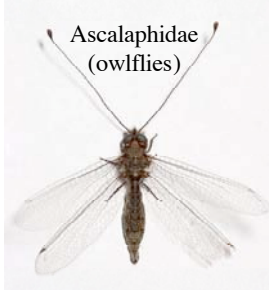


Chrysopidae  
(green lacewings)



Mantispidae  
(mantisflies)

Nemopteridae  
(twist-wing lacewings)



Ascalaphidae  
(owlflies)

Myrmeleontidae  
(antlions)



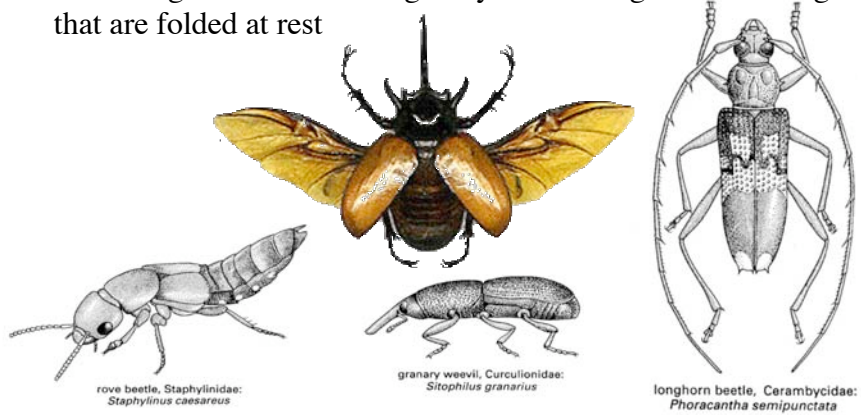
**Coleoptera** (beetles: 164 families)

**Adults:**

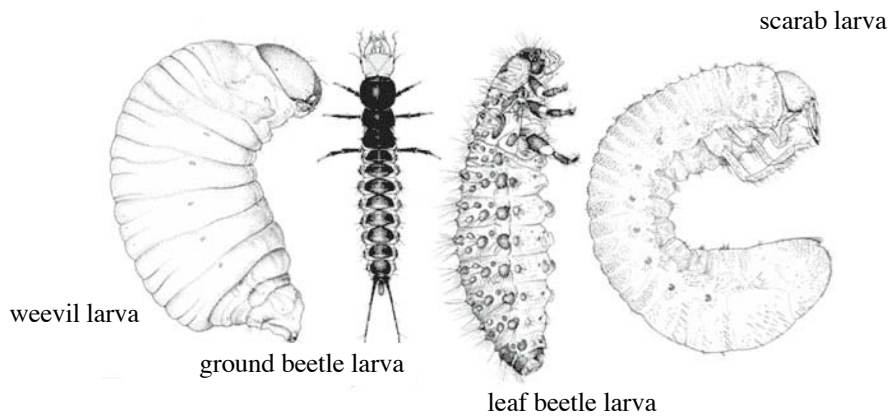
Small (0.5mm) to large (>10 cm), often sturdy and compact

Cuticle heavily sclerotized, providing an armor.

Fore wings modified as a rigid elytra covering the hind wings that are folded at rest



**Larvae:** sclerotized head capsule, opposable mandibles and 5-segmented thoracic legs. Typically no abdominal prolegs or labial silk glands

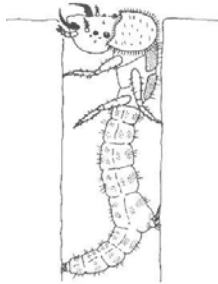


Beetles do not depend on agility to escape predators  
(like dipterans and hymenopterans)

They depend on armor and chemical defenses

Most speciose families: Carabidae  
Scarabaeidae  
Chrysomelidae  
Cerambycidae  
Staphylinidae  
Tenebrionidae  
Curculionidae

Carabidae: Ground beetles

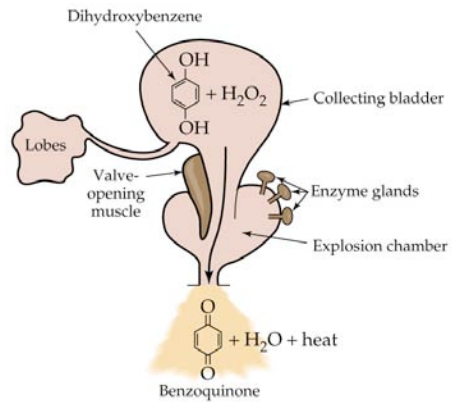


## Bombardier Beetle

Spray at 100°C!

Direct spray at attacker

2-chambered glands

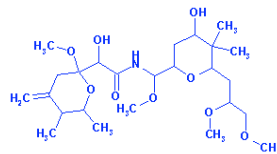


## Staphylinidae (rove beetles)

Characterized by shortened elytra

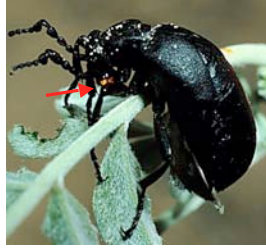


*Paederus eximius* (Nairobi eye)

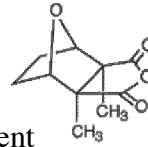


Release pederin (toxic amine)

Meloidae: blister beetles



cantharidin



Blistering agent

Reflex bleeding most highly developed in Meloidae

Hypermetamorphosis:

Larvae parasites in bee nests, grasshopper egg pods, etc.



triungulin larva  
(finds host)



2nd 3rd instars

*Meloe franciscanus*



triungulins mimicking a female bee (produces bee pheromones)

Parasitize *Habropoda pallides*



Male with hitchhikers after a pseudocopulation attempt.

**Scarabaeidae** (scarab beetles)

Compact, robust body

Last segments of antenna often expanded into plate-like structures



Goliath beetle



Includes dung beetles



Often sexually dimorphic

**Lucanidae** -- stag beetles



**Cerambycidae** (long-horned woodborers)

Moderate to large size.

Antennae long

Larvae borrow in wood



**Chrysomelidae** (leaf beetles)

Relatively small, body somewhat oval.

Moderate length, filiform antenna

Phytophagus



*Leptinotarsa decemlineata*

Colorado potato beetle

**Tenebrionidae** (darkling beetles)

Eyes usually notched and antennae filiform



*Tribolium confusum*

mealworm



*Tenebrio molitor*





Very successful in desert environments

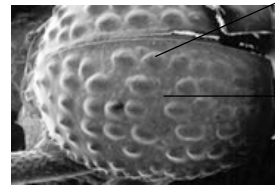


Tok tokkie beetle

The fog harvesters of Namibia



*Sternocara*



hydrophilic

hydrophobic

## Curculionidae (weevils, bark beetles)

Mandibles at the end of a snout

Larvae legless



Includes many serious economic pests

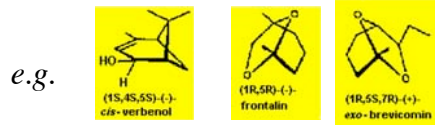
Scolytidae (bark beetles)

[Burrow in cambium layer of bark]



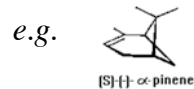
Mass attack of trees

Aggregation pheromones from beetles



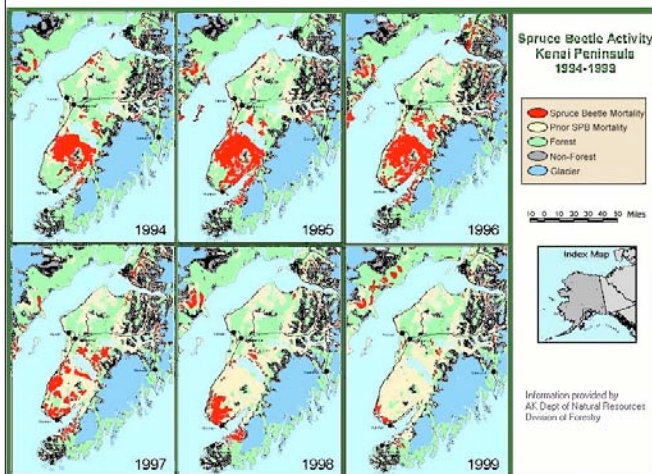
Highly species specific.  
Also inhibitory components

Also chemicals from tree



Components from resin that indicates that a tree have been attacked.

Progression of infestation by spruce bark beetle on the Kanai Peninsula, Alaska



**1920-1990**  
2,500,000 acres of spruce  
(~35,000 acres/yr)

**1990-2000**  
4,000,000 acres

[www.habitat.adfg.state.ak.us/geninfo/kbrr/coolkbayinfo/kbec\\_cd/html/image/maps/beetmap.jpg&imgrefurl](http://www.habitat.adfg.state.ak.us/geninfo/kbrr/coolkbayinfo/kbec_cd/html/image/maps/beetmap.jpg&imgrefurl)