



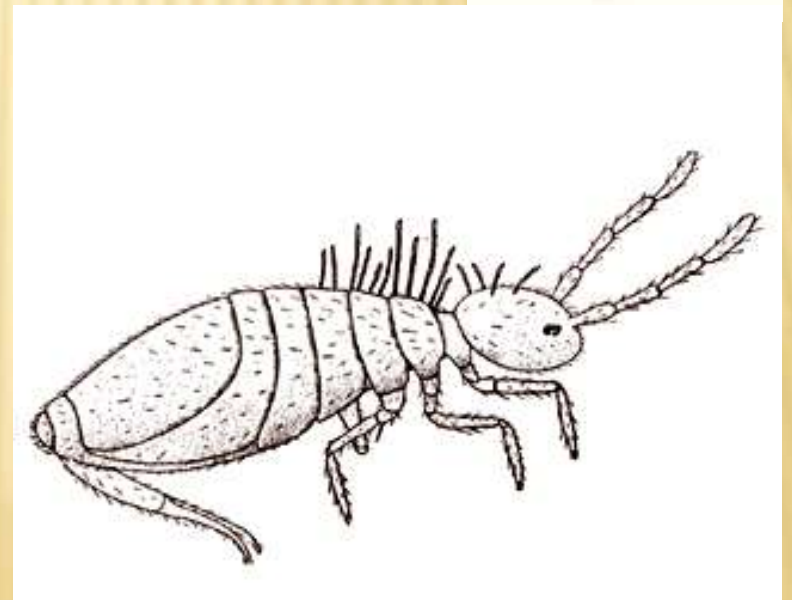
✘ Biology of animals



by Oldřich Nedvěd, Faculty of Science, USB

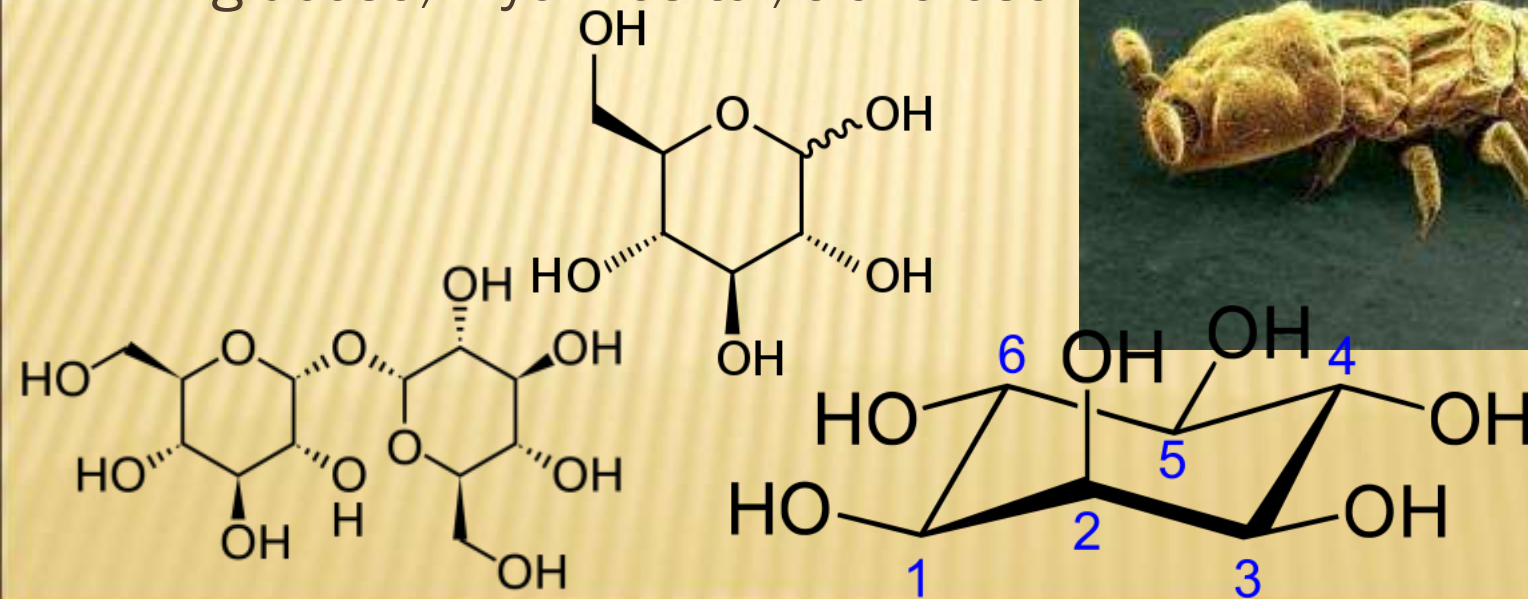
COLLEMBOLA - SPRINGTAILS

- +apterous
- +endognathous chewing mouthparts
- +furcula
- +detritophagous
 - ×leaves, fungi, bacteria



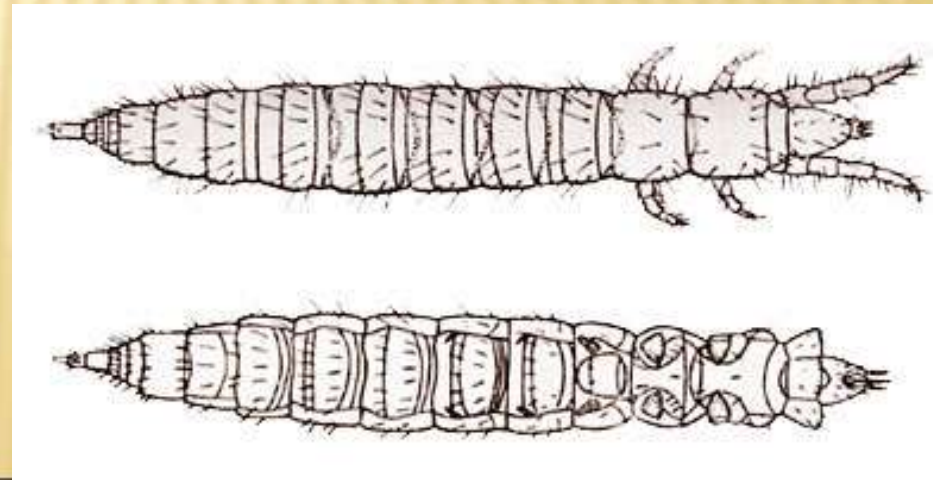
COLLEMBOLA - SPRINGTAILS

- +0,4-10 mm
- +soil, soil surface, water surface
- +Earth including Antarctica
 - × psychrophilous
 - × freeze-tolerant
- +cryptobiosis (anhydrobiosis)
 - × glucose, myo-inositol, trehalose



PROTURA

- +apterous
- +sucking mouthparts
- +<1 mm
- +blind
- +no antennae
- +soil
- +fungi



CAMPODEINA

- +apterous
- +endognathous chewing mouthparts
- +blind
- +long cerci on abdomen
- +in soil
- +omnivores
- +5-10 mm



JAPYGINA

- +apterous
- +endognathous chewing mouthparts
- +blind
- +short cerci on abdomen
- +in soil
- +omnivivors
- +5-10 mm
- +10-60 mm



ARCHAEOGNATHA - BRISTLE TAILS

- + = Microcoryphia
- + 6-25 mm
- + apterous
- + large eyes
- + ectognathous chewing mouthparts
- + styli on abdomen
- + long cerci and paracercus
- + on rocks
- + algae, lichens



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ZYGENTOMA - SILVERFISH

- +3-30 mm
- +apterous
- +small eyes
- +ectognathous chewing mouthparts
- +styli on abdomen
- +long cerci and paracercus (terminal filament)
- +soil, animal burrows, ant nests,
- +like high temperature



EPHEMEROPTERA - MAYFLIES

+two pairs of wings

×different

×direct flight muscles

+larvae in water

×gills

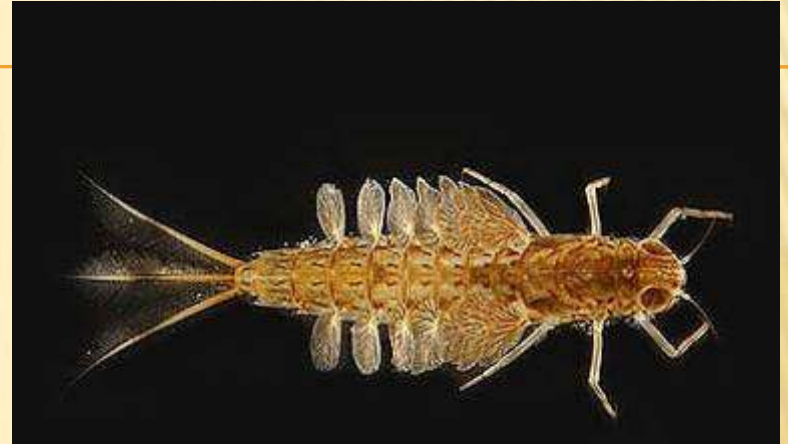
×algae, detritus

×cerci and paracercus

+adults near water

×short living

×no food



ODONATA - DRAGONFLIES, DAMSELFLIES

+two pairs of wings

×equal

×direct muscles

×dense venation

+larvae in water

×predators



×predators

PLECOPTERA - STONEFLIES

- two wing pairs
- bad fliers
- cerci
- larvae in water
 - gills on thorax



EMBIDIINA - WEB-SPINNERS

- +colonies in silk web
- +moss, lichens, detritus
- +short cerci



GRYLLOBLATTODEA - IC

- apterous
- cold adapted
- under stones
- predatory



MANTOPHASMATODEA - HEELWALKERS, GLADIATORS

- discovered in 1990ies
- apterous
- Africa
- predators



DERMAPTERA - EARWIGS

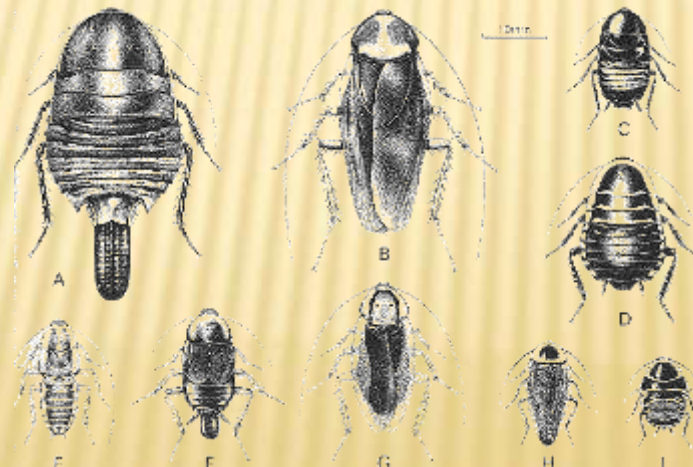
– first pair of wings = tegmina

- second pair large
- cerci short, strong
- egg care



BLATTODEA - COCKROACHES

- +flattened
- +first pair of wings stronger
- +eggs in ootheca
- +omnivivors
- +synanthropic



BLATTODEA - COCKROACHES

- Isoptera – termites
- social
 - castes
 - nests
- wood eating
 - symbiotic bacteria, protozoans
 - cellulose decomposing



MANTODEA - PRAYING MANTISES

- easy moving triagle head
- long prothorax
- raptorial forelegs
- canibalistic
- ootheca



ORTHOPTERA - LOCUSTS, GRASSHOPPERS, KATYDIDS, CRICKETS

- large hypognathous head
- saddle-like pronotum
- jumping hind legs
- Stridulation; tympanum
- Acridoidea - grasshoppers
 - herbivores
 - „migratory“
- Tettigonoidea - katydids
- Grylloidea - crickets
 - predators, omnivores
 - females with ovipositor



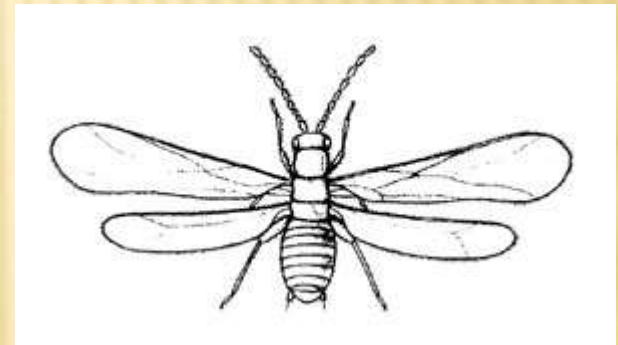
PHASMIDA - STICK OR LEAF INSECTS

- prognathous head
- often apterous
- cryptic
- phytophagous
- large
- pets



ZORAPTERA -

- small
- gregarious
- resemble termites



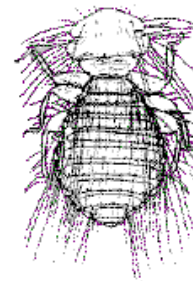
PSOCOPTERA - BARKLICE, BOOKLICE

- small
- many apterous
- detritivorous

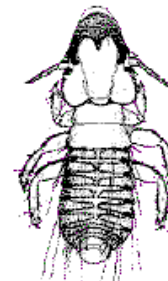


PSOCOPTERA -

- Phtiraptera - lice
- (singular louse)
- small
- apterous
- flattened
- eyes reduced
- prehensile legs
- ectoparasites
 - diseases vector (typhus - Rickettsia)



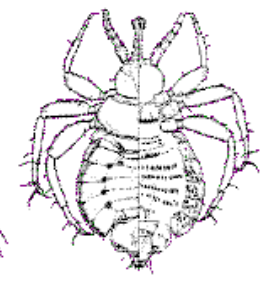
Amblycera



Ischnocera



Anoplura



Rhyncophthirina

THYSANOPTERA - THRIPS

- small
- feather-like wings
- sucking mouthparts

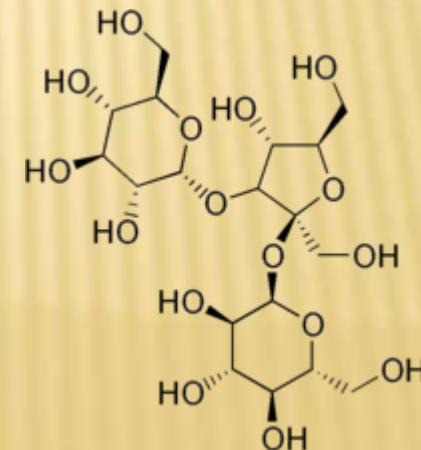
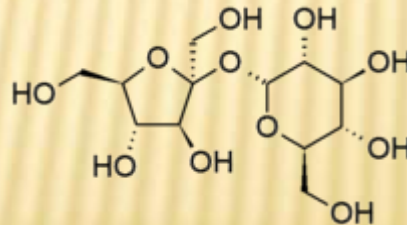


STERNORRHYNCHA - APHIDS, WHITEFLIES, PSYLLIDS, SCALE INSECTS, MEALYBUGS

- small
- long antennae
- long proboscis
- waxy protective structure
- phytophagous
 - phloem
 - honeydew
 - gall makers
 - transmit viruses



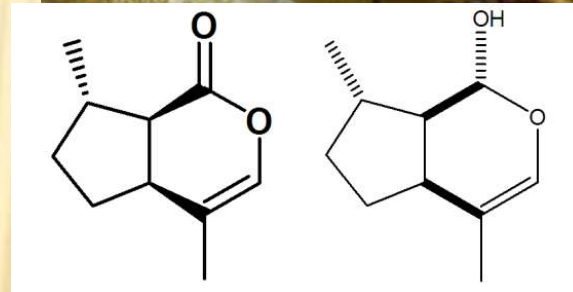
- sucrose: 60 / 10 %
- glucose: 5 / 5 %
- mannose: 5 / 0 %
- fructose: 5 / 25 %
- melezitose: 0 / 40 %



STERNORRHYNCHA

— Aphidoidea – aphids, greenbugs

- sexual and parthenogenetic generations
- alate and apterous generations
- woody plants and herbs
- telescopic generations
- ants
- sex pheromones: (4aS,7S,7aR)-nepetalactone and (1R,4aS,7S,7aR)-nepetalactol
- defensive (E)- β -farnesene



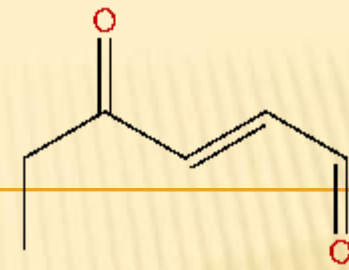
AUCHENORRHYNCHA - CICADAS, LEAFHOPPERS, PLANTHOPPERS, SPITTLEBUGS

- proboscis
- jumping hindlegs
- sap sucking
 - phloem or xylem
 - froth



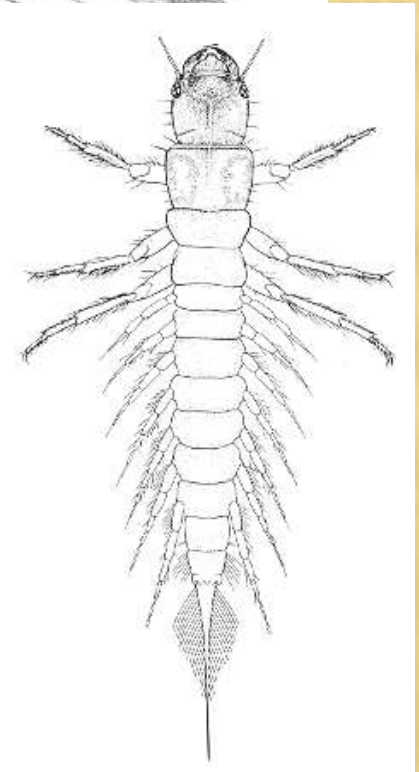
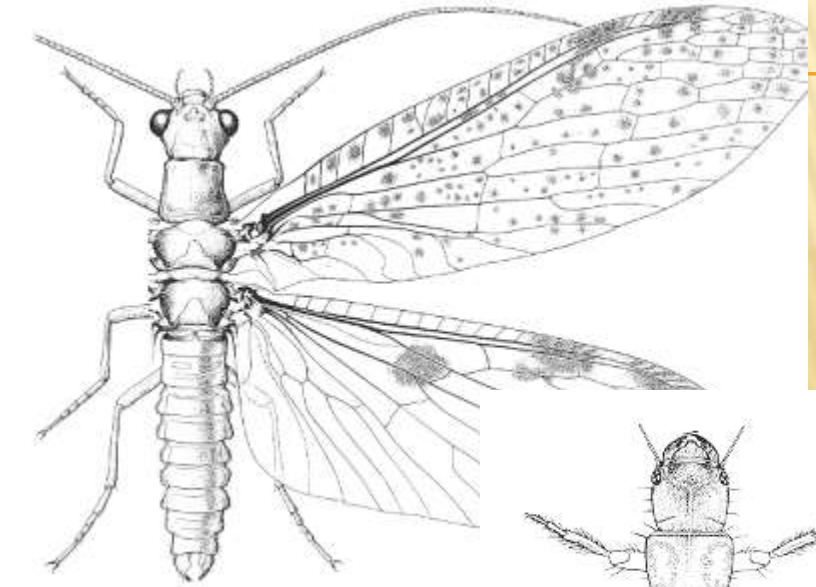
HETEROPTERA - TRUE BUGS

- flat hemielytrae
- terrestrial, aquatic, semiaquatic
- proboscis
- phytophagous
- predatory
- blood sucking
 - Chagas disease (Trypanosoma)
- C6 and C8 (E)-4-oxo-2-alkenals



MEGALOPTERA - DOBSON FLIES, ALDERFLIES

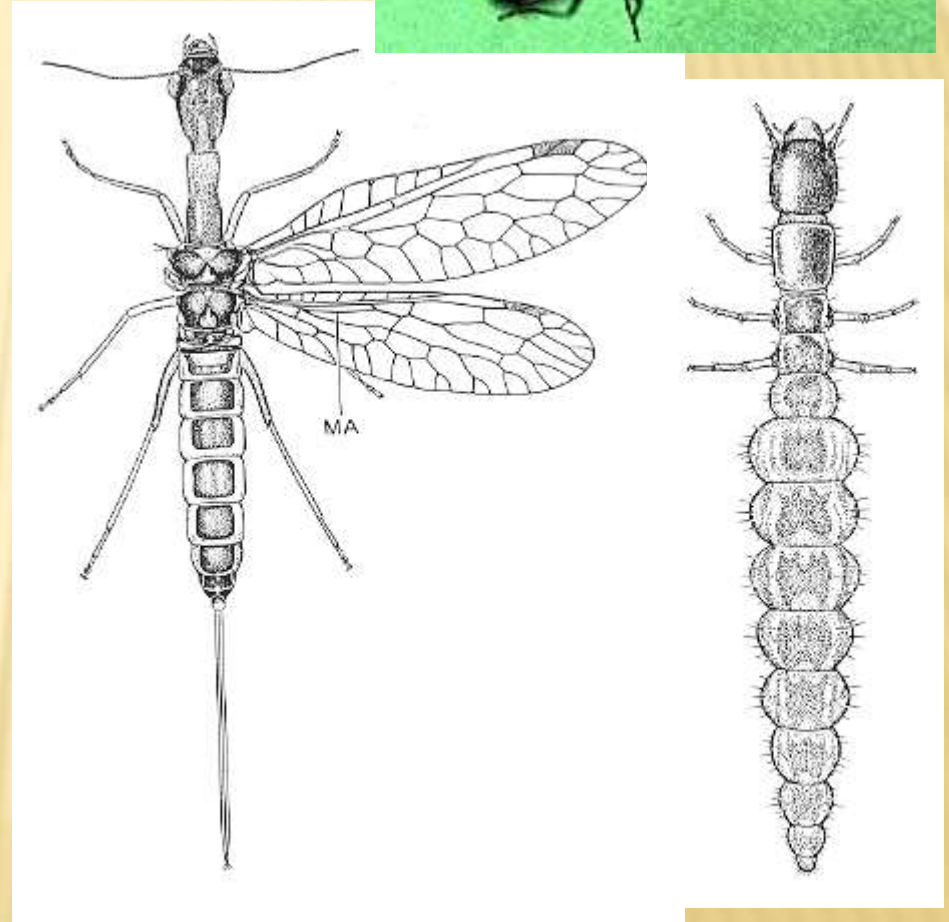
—aquatic larva





RAPHIDIOPTERA - SNAKEFLIES

- long pronotum
- under bark



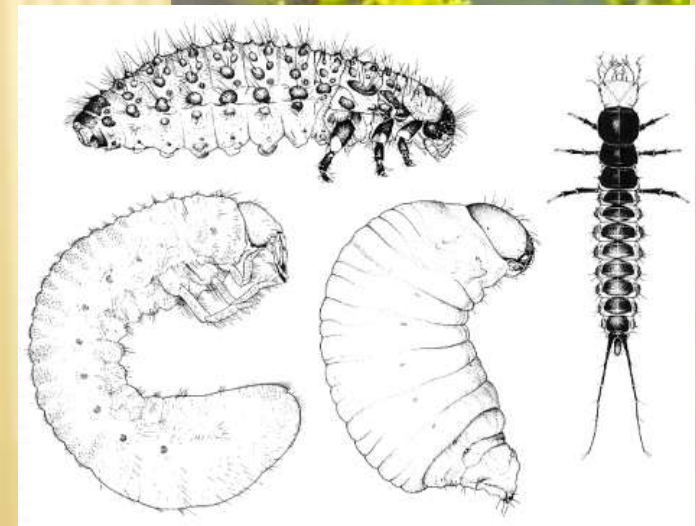
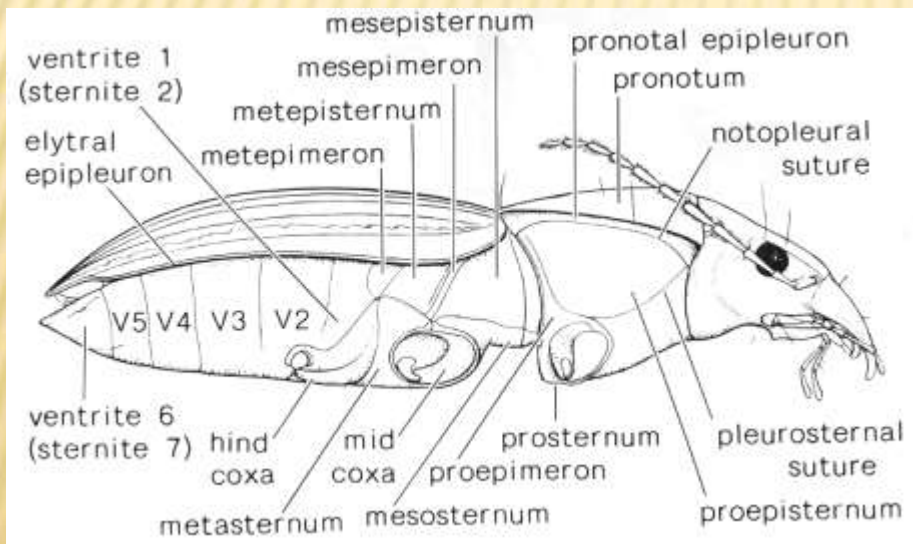
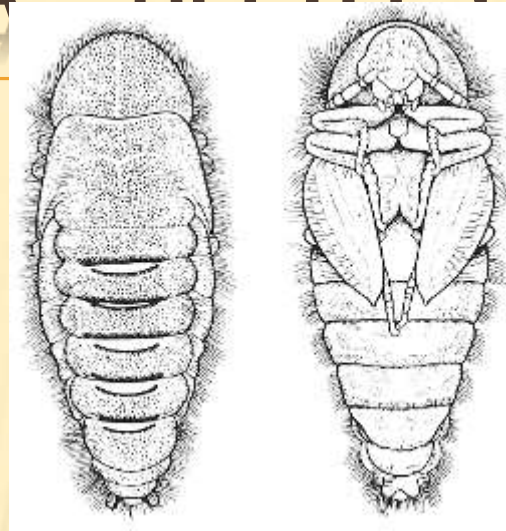
NEUROPTERA - LACEWINGS, ANT LIONS

- very dense venation
- biting-sucking mouthparts



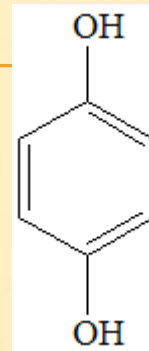
COLEOPTERA – BEETLES WEEVILS

elytra

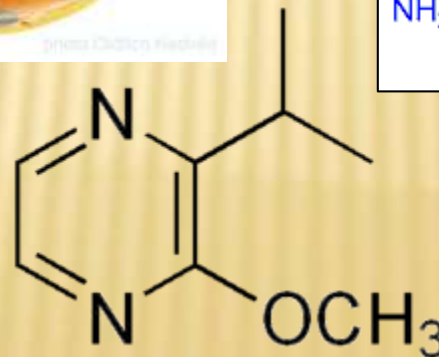
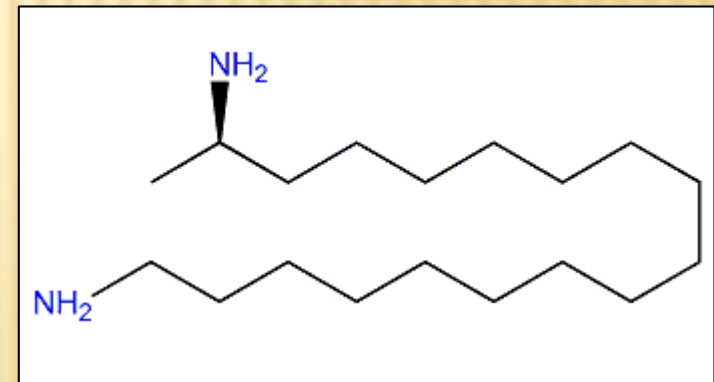


COLEOPTERA -

- bombardier beetle
- hydrogen peroxide + hydroquinone + catalase and peroxidase

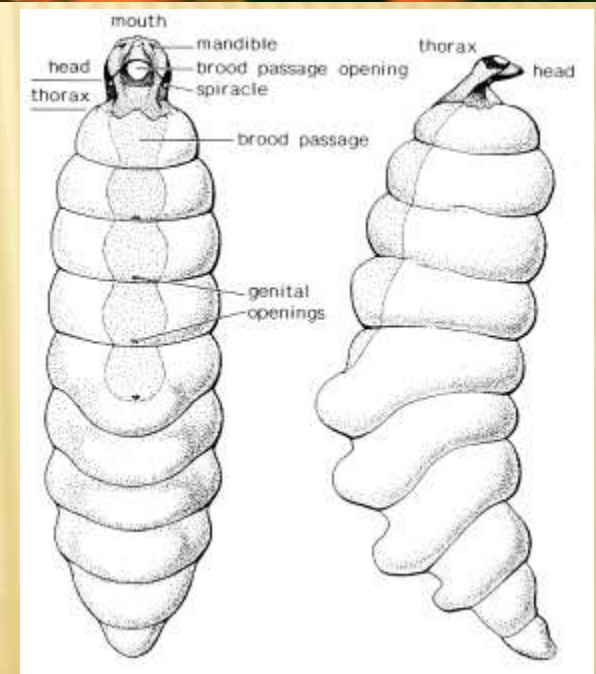
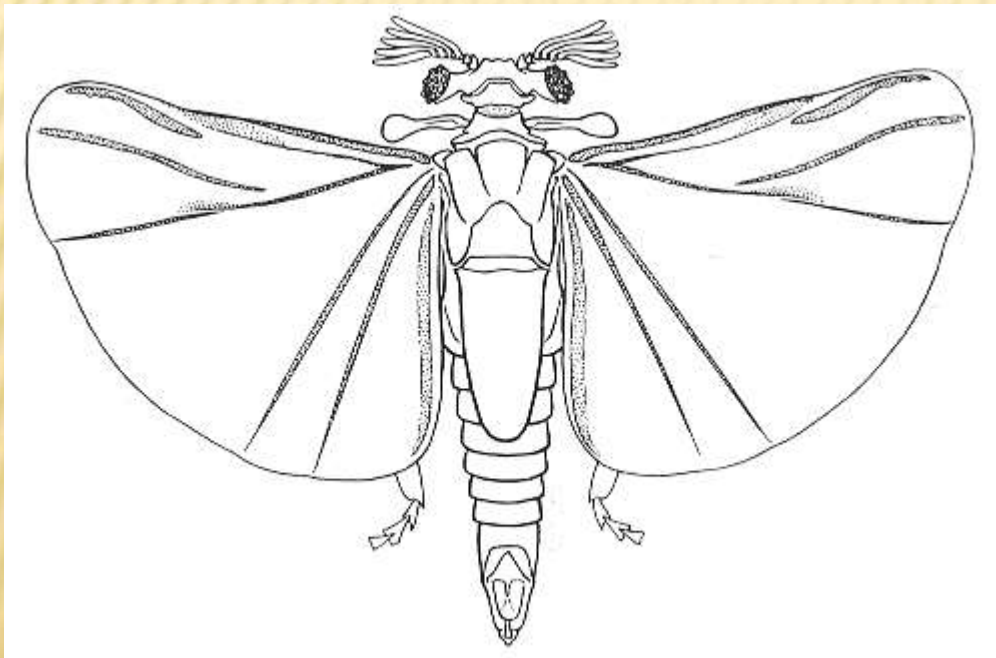


- Ladybird
- Alkaloid
- Methoxypyrazine



STREPSIPTERA -

- males with hindwings
- females apterous
- parasites



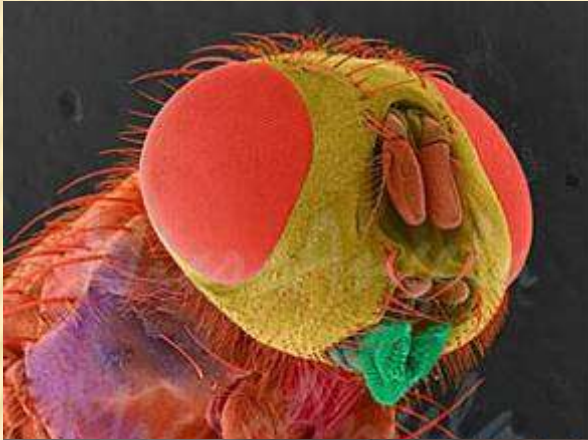
DIPTERA - FLIES, MOSQUITOES, MIDGES

- first wing pair
- licking or sucking mouthparts
 - blood sucking
- apodous larvae



DIPTERA -

- licking or sucking mouthparts



DIPTERA -

—apodous larvae



DIPTERA -

- blood sucking
 - Culicidae – mosquitoes
 - malaria = Plasmodium
 - yellow fever



DIPTERA -

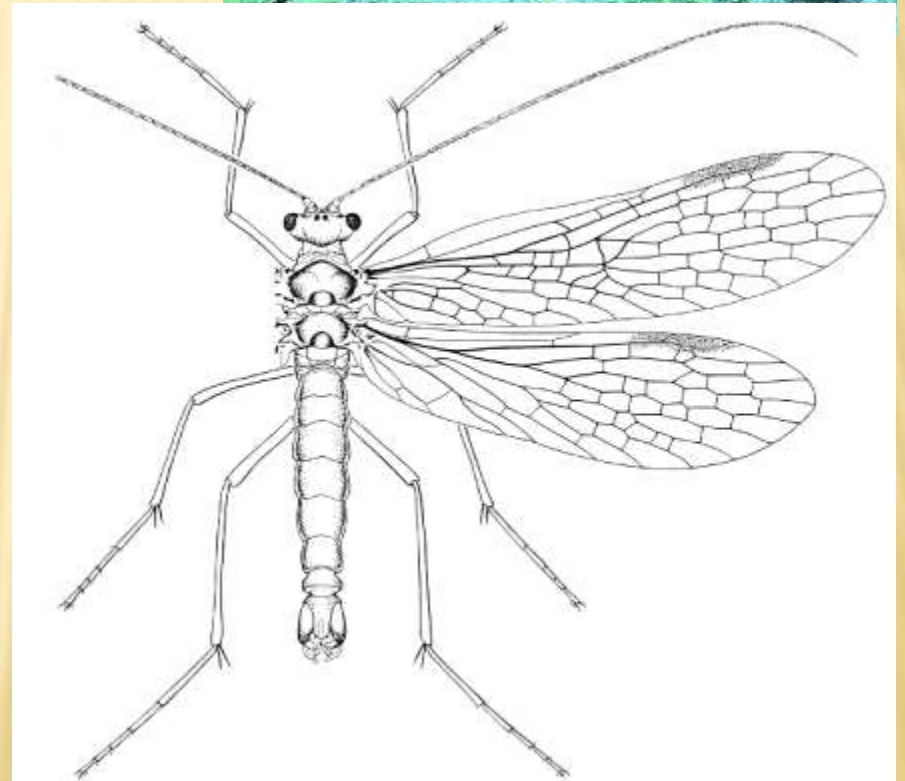
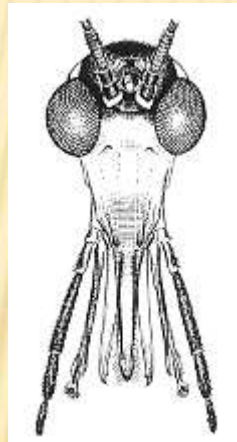
- blood sucking
 - Simuliidae
 - Tabanidae
 - Glossinidae –
Trypanosoma



James L. Castner, U. Fla. Ent. Dep.

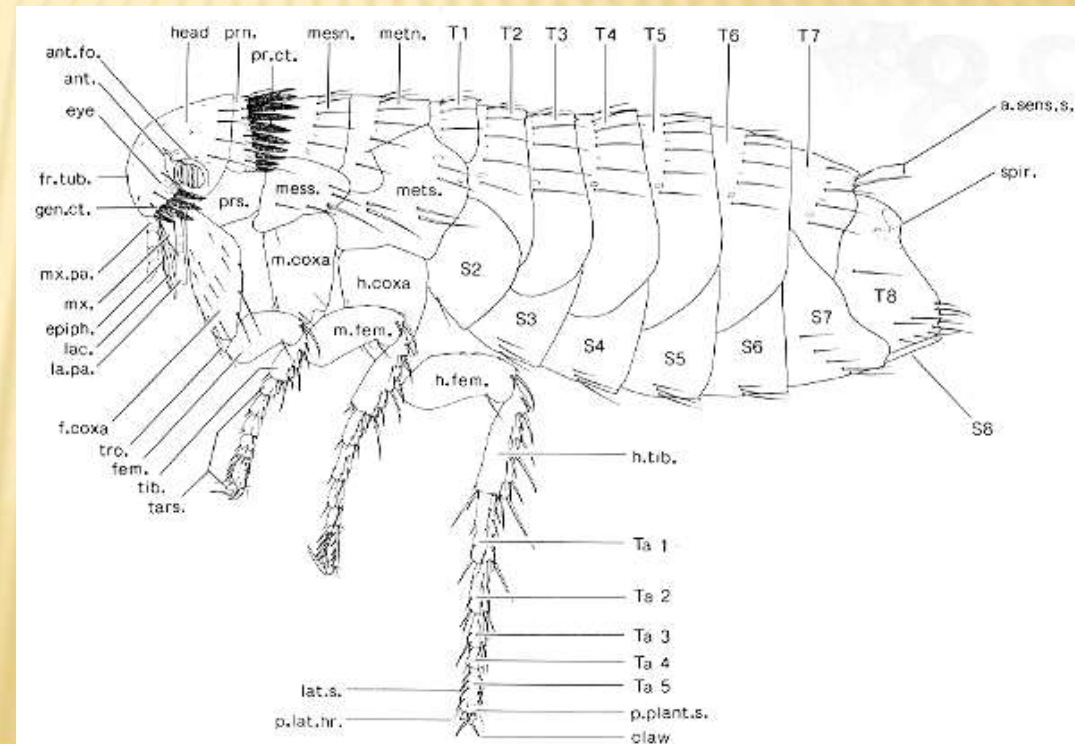
MECOPTERA - SCORPION FLIES

- long snout
- predators and scavengers



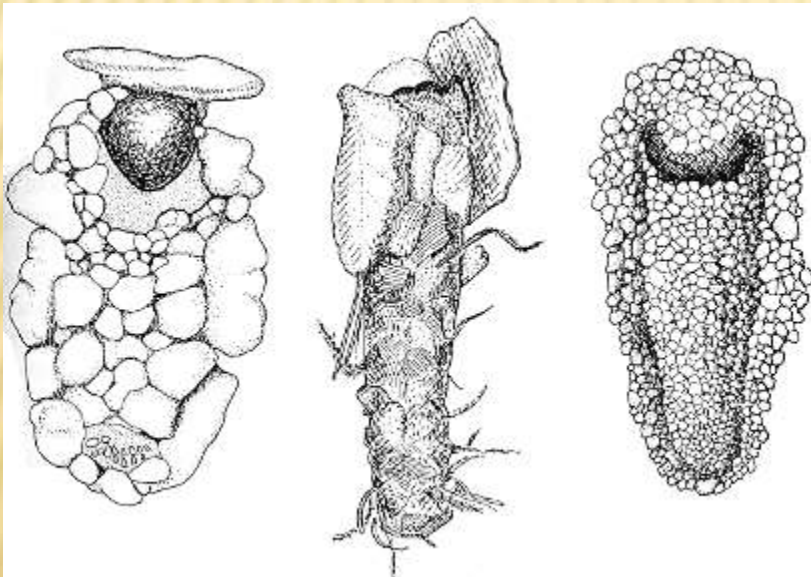
MECOPTERA -

- Siphonaptera - fleas
- apterous
 - blood sucking
 - larvae in host nests
 - plague: *Yersinia pestis*



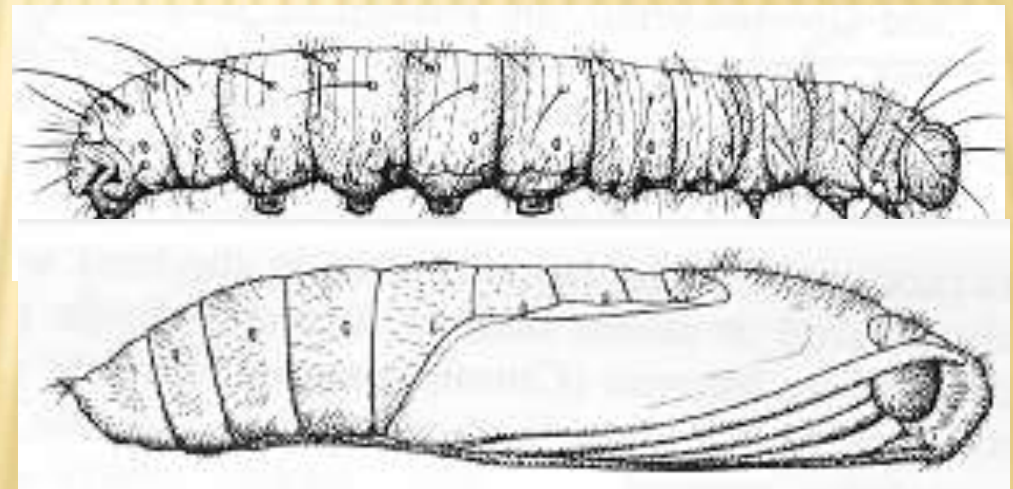
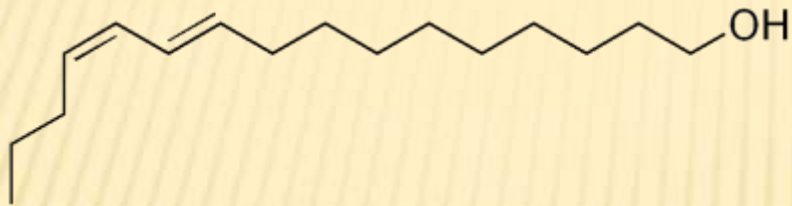
TRICHOPTERA - CADDIS FLIES

- hairy wings
- aquatic larvae



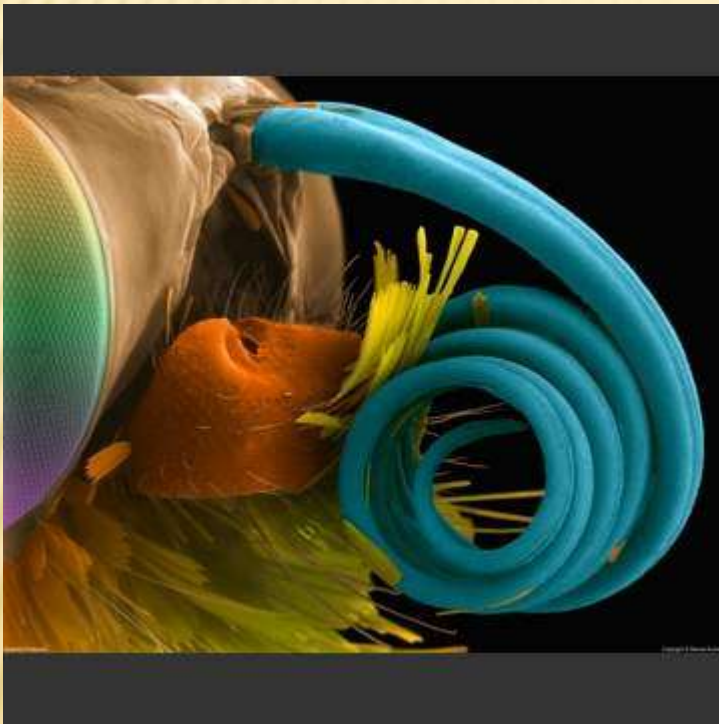
LEPIDOPTERA - BUTTERFLIES MOTHS

- wings with scales
- sucking nectar
- caterpillars with parapodia



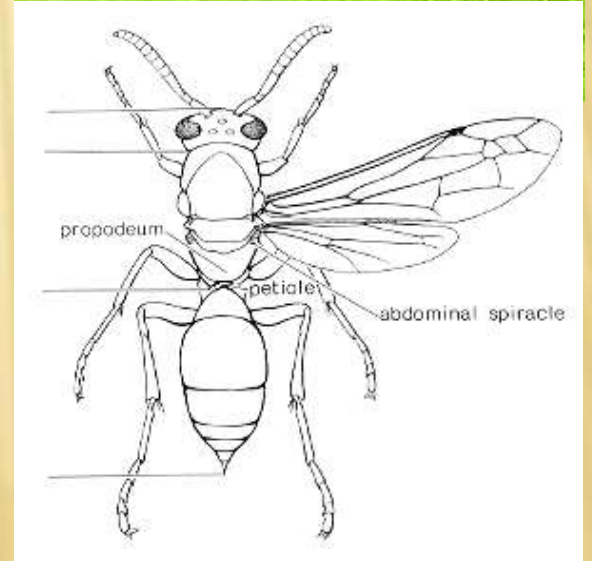
LEPIDOPTERA -

- sucking mouthparts



HYMENOPTERA - SAWFLIES, WASPS, ANTS, BEES

- second wings small
- larvae polypodous or apodous
- parasitoids
- social insects

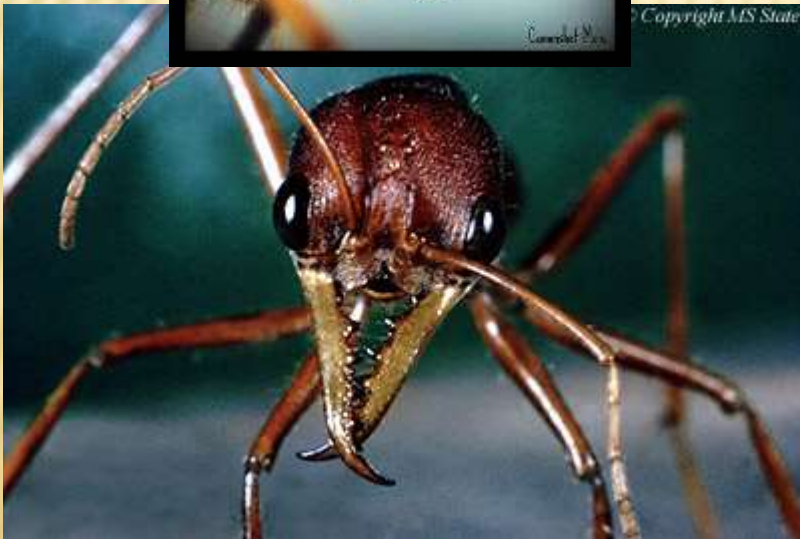


HYMENOPTERA -

- biting and licking mouthparts



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HYMENOPTERA -

- larvae polypodous or apodous



HYMENOPTERA -

- venomous sting
- enzymes, biogenic amines, histamine releasing factors, kinins, toxic polypeptides, norepinephrine, hyaluronidase

