Erasmus+
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ALIVE

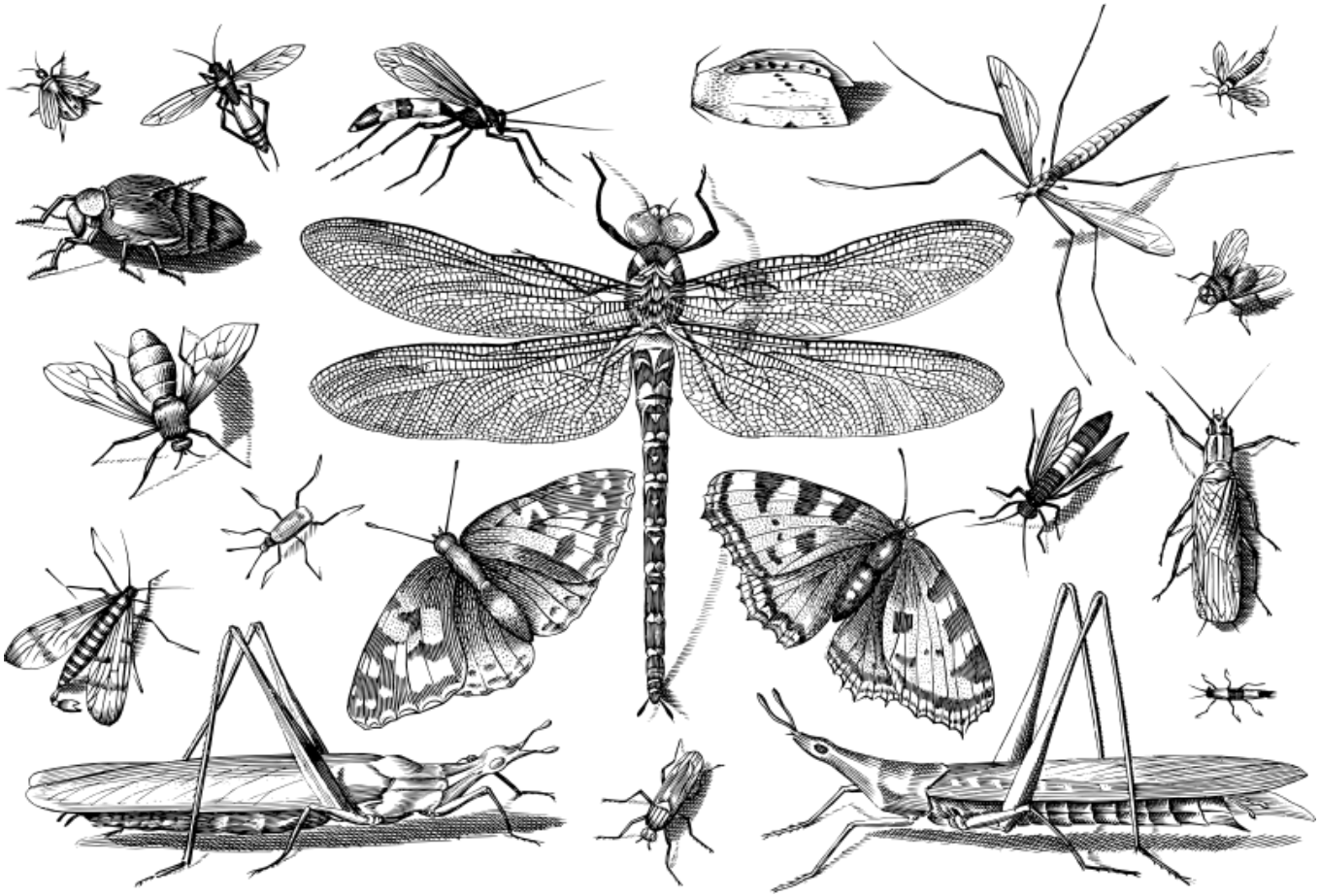
The importance of insects for life on Earth

World of living animals

OUTLINE

- What is an insect?
- Insect anatomy and physiology
- Insect behaviour
- Insects as pests
- Useful insects
- Endangered insect species
- Summary

WHAT IS AN INSECT?



WHAT IS AN INSECT?

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- **Insects are invertebrates**
- **Insects are arthropods**
  - ✓**Segmented bodies**
  - ✓**Jointed limbs**
  - ✓**Exoskeleton**
- **The most diverse group of animals (>1M described species)**
- **Found in nearly all environments**

INSECTS:
BODY STRUCTURE

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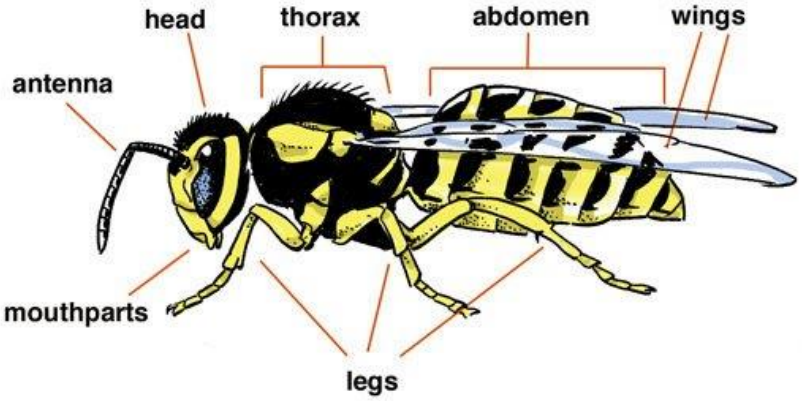
- **Three body regions**
- **Six legs**
- **One pair of antennae**
- **Up to two pairs of wings**
  - ✓**Winged (e.g. bees)**
  - ✓**Wingless (e.g. ticks)**



CAN YOU TELL THE INSECTS?

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Papilio rutulus
(Western tiger swallowtail)

Helix pomatia
(Roman snail)

Lepisma saccharina
(Silverfish)

Euscorpius flavicaudis
(European yellow-tailed scorpion)

Honey bee

Heteropoda vanatoria
(Giant crab spider)

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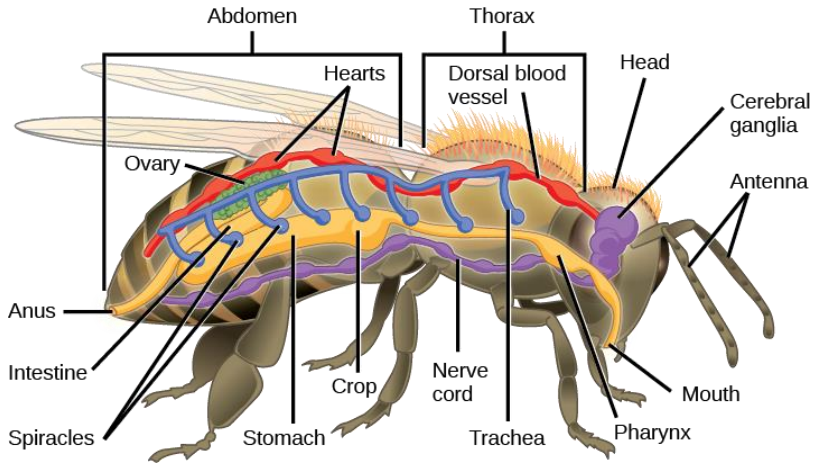
INSECTS: NERVOUS SYSTEM

- Fairly decentralized.
- Brain
- Ventral nerve cord
- Ganglia



Nervous system in purple

INSECTS: RESPIRATORY SYSTEM

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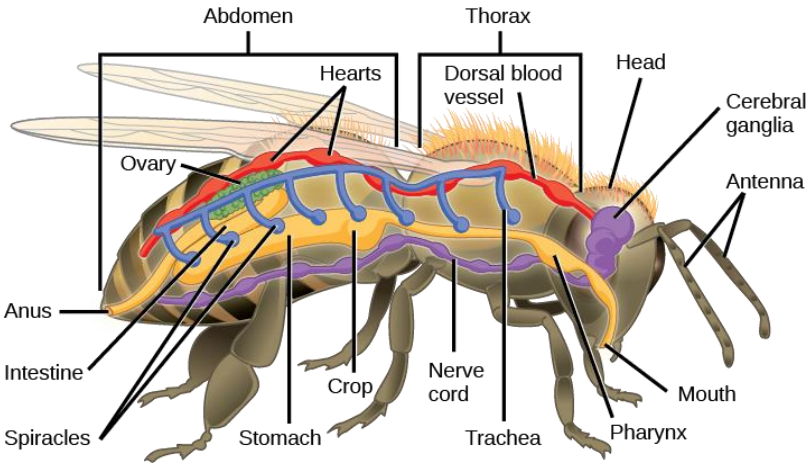
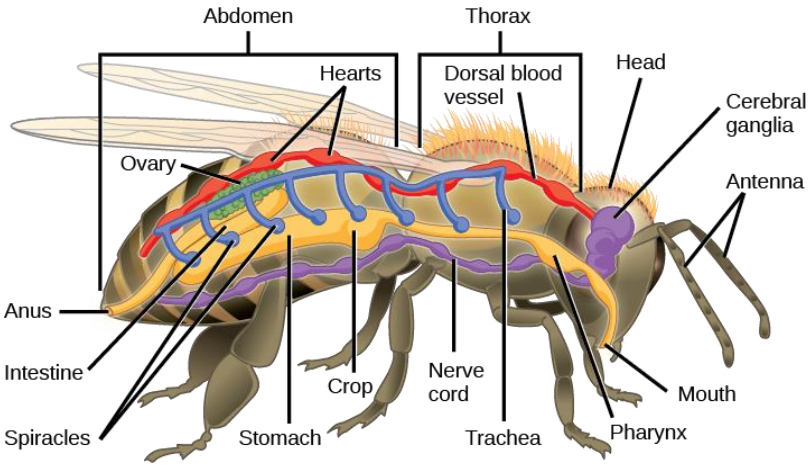
- Breathing without lungs
- Valved holes (spiracles) drive air in/out
- Internally, the tracheal system (a network of tubules) delivers oxygen to tissues



Respiratory system in blue

INSECTS: CIRCULATORY SYSTEM

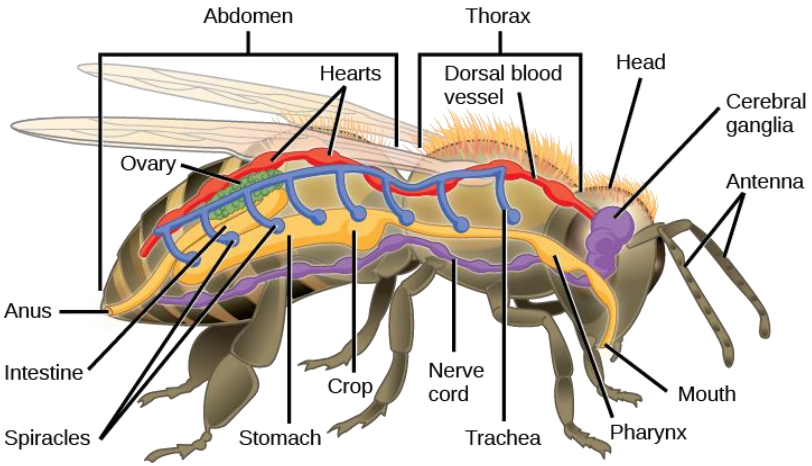
- Open system with multiple "hearts"
- Transports nutrients, salts, waste, and hormones throughout the body
- Primitive immunity
- Hemolymph analogous to blood



Circulatory system in red

INSECTS: FEEDING, DIGESTION, EXCRETION

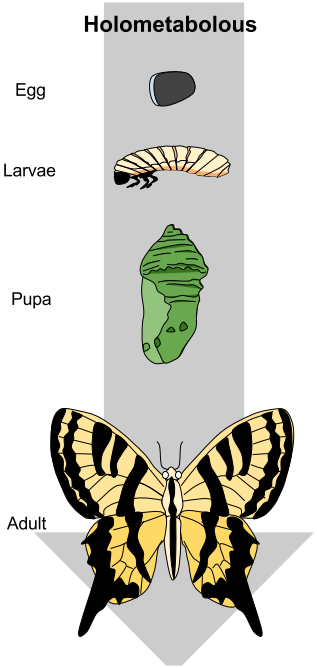
- Adapted mouthparts to diet
- Complete digestive tract
- Foregut stores and grinds food
- Midgut uses digestive enzymes and absorbs nutrients
- Hindgut along with Malpighian tubules function for excretion and osmotic balance

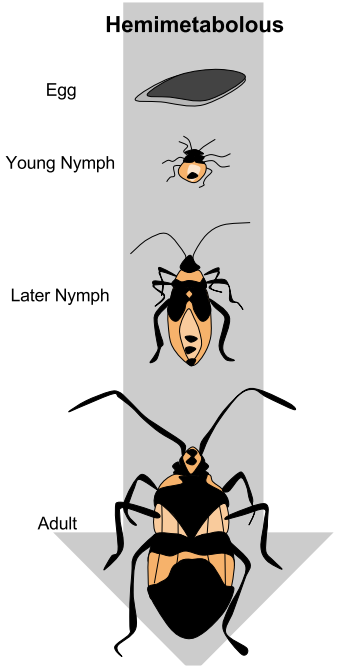


Digestive system in yellow

INSECT LIFECYCLE

- **Most insects reproduce sexually**
- **Female produces eggs fertilized by the male**
- **Key: metamorphosis (complete/incomplete)**





DIVERSE COMMUNICATION STATEGIES

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What?

- Visual (e.g. bioluminescence)
- Audio (e.g. moving appendages)
- Tactile (i.e. touch)
- Chemical (e.g. pheromones)
- Dance

Example purposes

- Attracting mates
- Identify likes
- Predation
- Define territory
- Alert signal

INSECTS AS PESTS

Parasitic insects

Pediculus humanus capitis

Hystrichopsylla talpae

Lucilia cuprina

Q: What species do they parasitize?

INSECTS AS PESTS

Insects transmitting diseases (vectors)

Anopheles gambiae

Glossina morsitans

Ixodes scapularis

Q: What kind of diseases do they transmit?

INSECTS AS PESTS

Insects destroying crops

Myzus persicae

Locusta migratoria migratorioides

Acanthoscelides obtectus

Q: What kind of crops do they feed on?

USEFUL INSECTS

Ecological importance

Insects play vital roles in many ecosystems

- **Aerate the soil**
- **Disperse seeds**
- **Decompose organic matter**
- **Are part of the food-web (predators/pray)**
- **Act as 'indicator' species**

USEFUL INSECTS

Economic importance

- **Insects produce substances of high value (e.g. honey, silk, wax)**
- **Can be pest control agents (including transmission of diseases by other vectors)**
- **Are useful in medicine (e.g. bioactive compound extraction)**
- **Are food sources in many countries**

USEFUL INSECTS

Special case: Pollinators

- **Adults feed on pollen/nectar from flowers**
- **Pollen is transferred between plants**
- **Aid reproduction of plants**
- **Help plant communities maintain diversity**

ENDANGERED INSECT SPECIES

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- **A number of insect species are listed as endangered**
- **Why?**
  - ✓Habitat destruction (e.g. deforestation)
  - ✓Displacement by introduced species
  - ✓Alteration of habitat (e.g. monocultures)
  - ✓Chemical polutants (esp. pesticides)
  - ✓Over-harvesting

ENDANGERED INSECT SPECIES: EXAMPLES

Ornithoptera alexandrae

Bombus fraternus

Gambrinus violaceus

Q: Where are these species found?

ENDANGERED INSECT SPECIES

ALIVE

- **Bees in Trouble? We're in trouble!**
- **Why?**
  - ✓Most crops require pollination to devlop fruits, nuts or seeds
  - ✓European bees to the rescue, yet populations in the USA, Brazil and China still declining
- **What to do?**
  - ✓Avoid using pesticides/artificial fertilisers
  - ✓Preserve wild habitat
  - ✓Promote ecological agriculrure

SUMMARY

- Insects are abundant and everywhere
- They have complex body plans, physiology and behaviour
- They are important to maintain a healthy environment
- They are economically important
- Several endangered insect species exist
- Measures need to be taken

PICTURES – USED SOURCES

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https://commons.wikimedia.org

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https://www.mylearning.org

https://bio.libretexts.org