Topic 05

Zoology

Learning Objectives

At the end of this module, students will be able to:

- Describe zoology in terms of the life sciences.
- Interpret selected animal phylogenetic relationships.
- Describe ways animals reproduce offspring.
- Contrast meiosis from mitosis
- Recognize trophic levels and the energy pyramid

Outline

a. Zoology overview
b. Animal characteristics
c. Animal phylogeny
d. Animal reproduction
e. Animal trophic levels

Definition

Zoology

Zoology is the scientific study of the behavior, structure, physiology, classification, and distribution of animals.

It encompasses all aspects of scientific knowledge about animals. Zoology is broken into many branches because there many ways to study animals.

Definition

Phylogenetic Tree

It is a diagram representing the evolution and relationships among living organisms. The diagram illustrates how different species evolved from a series of common ancestors.

Sometimes the phylogenetic tree is called the "Tree of Life" or a "Dendrogram."

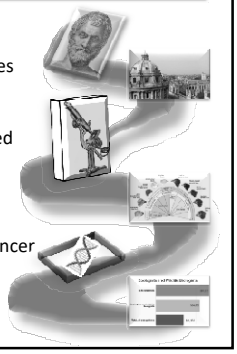
Definition

Trophic Levels

Trophic levels each of several hierarchical levels in an ecosystem, comprising organisms that share the same function in the food chain and the same nutritional relationship to the primary sources of energy.

05.a Zoology history

350 *bce*	Animal observations
1600's	European university studies
1800's	Microscope
1859	Natural Selection published
1860	DNA discovered
1962	Double helix discovered
2008	Genome sequencing of cancer
2014	Genetic fingerprinting
2020	Current employment



05.a Zoology overview

Special Expertise
Comparative anatomy
Animal physiology
Ethology
Entomology
Invertebrate zoology
Vertebrate zoology
Soil zoology
Mammalogy
Biological anthropology
Palaeontology

Human Issues
Malnutrition
AIDS: HIV/AIDS
Malaria
Air pollution
Displacement

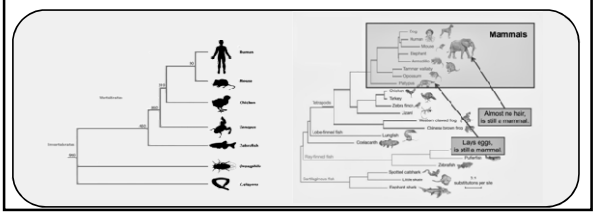
Wildlife Issues
Endangered species
Recognition
Disease controls
Animal health

05.a Zoology overview

Zoologists study issues like endangered species, impacts of viruses, disease control, animal behavior and human displacement.

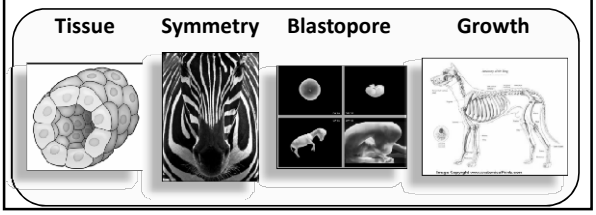
05.b Animal Characteristics

Characteristics of animals:
1. all animals eat other organisms
2. all animals move
3. all animals are multicellular



05.b Animal Characteristics

Distinctions of animals:
1. defined tissues vs. undefined tissues
2. radial symmetry vs. bilateral symmetry
3. protostomes vs. deuterostomes
4. molting vs. growth of skeletal elements



05.b Animal Characteristics

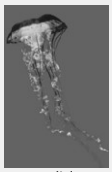
Tissue: defined *vs.* undefined

Example: humans *vs.* sponges

05.b Animal Characteristics

Symmetry: radial *vs.* bilateral

Example: jellyfish *vs.* butterfly


radial


bilateral

05.b Animal Characteristics

Blastopore: protostomes *vs.* deuterostomes

This happens during the embryonic stage. A dent forms in one side of the embryo. This dent (blastopore) deepens to become the stomach (archenteron).

Example: insects *vs.* birds

Note: In 2016 a new phylum, Xenacoelomorpha was identified and named. The phylum are free-living, parasitic, and symbiotic. They are small flat-like worms found in marine and brackish water environments.


mouth develops first


anus develops first

05.b Animal Characteristics

Growth: molting *vs.* skeletal elements

Example: snakes *vs.* dogs

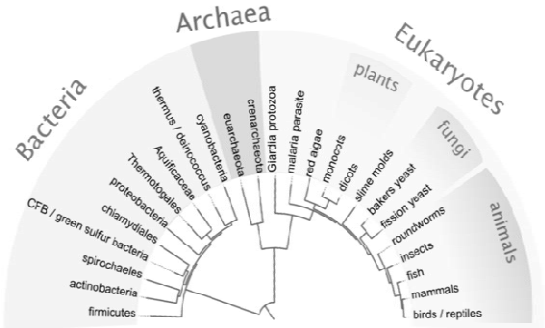

molting


skeletal growth

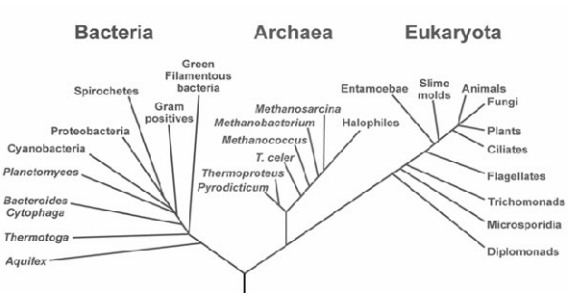
05.c Animal Phylogeny

- A phylogenetic tree is a diagram that represents evolutionary relationships among organisms.
- Phylogenetic trees are hypotheses, not definitive facts.
- The pattern of branching reflects how species or other groups evolved from a series of common ancestors.
- Two species are more closely related if they have a more recent common ancestor
- Species are less related with less recent common ancestors.
- Phylogenetic trees can be drawn in various equivalent styles.
- Rotating a tree about its branch points doesn't change the information it carries.

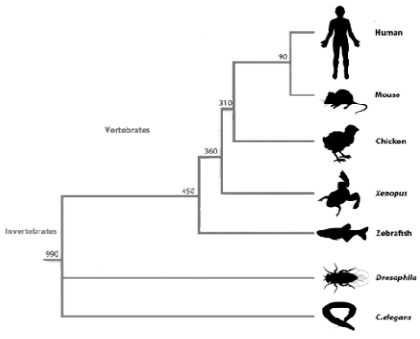
05.c Animal Phylogeny



05.c Animal Phylogeny

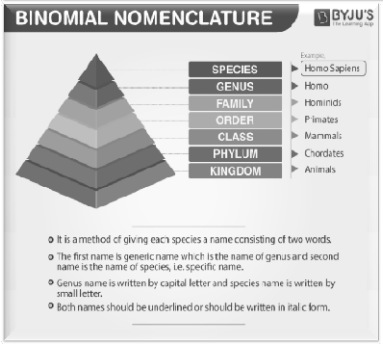


05.c Animal Phylogeny



05.c Animal Phylogeny

Genus species
G. species



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05.c Animal Phylogeny

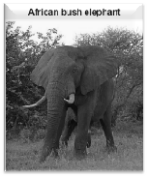
Domestic Dog	Wolf	Coyote
Kingdom: Animalia	Kingdom: Animalia	Kingdom: Animalia
Phylum: Chordata	Phylum: Chordata	Phylum: Chordata
Class: Mammalia	Class: Mammalia	Class: Mammalia
Order: Carnivora	Order: Carnivora	Order: Carnivora
Family: Canidae	Family: Canidae	Family: Canidae
Genus: Canis	Genus: Canis	Genus: Canis
Species: C. lupus	Species: C. lupus	Species: C. latrans
Subspecies: C. l. familiaris		

05.c Animal Phylogeny

Domestic Cat	Lion	Tiger
Kingdom: Animalia	Kingdom: Animalia	Kingdom: Animalia
Phylum: Chordata	Phylum: Chordata	Phylum: Chordata
Class: Mammalia	Class: Mammalia	Class: Mammalia
Order: Carnivora	Order: Carnivora	Order: Carnivora
Family: Felidae	Family: Felidae	Family: Felidae
Genus: Felis	Genus: Panthera	Genus: Panthera
Species: F. catus	Species: P. leo	Species: P. tigris

05.c Animal Phylogeny

Asian Elephant	African Elephant	Hippopotamus
Kingdom: Animalia	Kingdom: Animalia	Kingdom: Animalia
Phylum: Chordata	Phylum: Chordata	Phylum: Chordata
Class: Mammalia	Class: Mammalia	Class: Mammalia
Order: Proboscidea	Order: Proboscidea	Order: Artiodactyla
Family: Elephantidae	Family: Elephantidae	Family: Hippopotamidae
Genus: Elephas	Genus: Loxodonta	Genus: Hippopotamus
Species: E. maximus	Species: L. africana	Species: H. amphibius



05.c Animal Phylogeny

Killer Whale	Common Dolphin	Porpoise
Kingdom: Animalia	Kingdom: Animalia	Kingdom: Animalia
Phylum: Chordata	Phylum: Chordata	Phylum: Chordata
Class: Mammalia	Class: Mammalia	Class: Mammalia
Order: Artiodactyla	Order: Artiodactyla	Order: Artiodactyla
Family: Delphinidae	Family: Delphinidae	Family: Phocoenidae
Genus: Orcinus	Genus: Delphinus	Genus: Phocoena
Species: O. orca	Species: D. capensis	Species: P. phocoena

05.c Animal Phylogeny

Catfish	Pink Salmon	Largemouth Bass
Kingdom: Animalia	Kingdom: Animalia	Kingdom: Animalia
Phylum: Chordata	Phylum: Chordata	Phylum: Chordata
Class: Actinopterygii	Class: Actinopterygii	Class: Actinopterygii
Order: Siluriformes	Order: Salmoniformes	Order: Perciformes
Family: Siluridae	Family: Salmonidae	Family: Centrarchidae
Genus: Silurus	Genus: Oncorhynchus	Genus: Micropterus
Species: S. glanis	Species: O. gorbuscha	Species: M. salmoides

05.c Animal Phylogeny

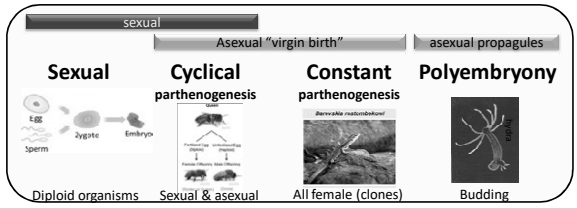
Striped Panray	Largetooth Sawfish	Thresher Shark
Kingdom: Animalia	Kingdom: Animalia	Kingdom: Animalia
Phylum: Chordata	Phylum: Chordata	Phylum: Chordata
Class: Chondrichthyes	Class: Chondrichthyes	Class: Chondrichthyes
Order: Rhinopristiformes	Order: Rhinopristiformes	Order: Lamniformes
Family: Zanobatidae	Family: Pristidae	Family: Alopiidae
Genus: Zanobatus	Genus: Pristis	Genus: Alopias
Species: Z. schoenleinii	Species: P. pristis	Species: A. vulpinuse

05.d Animal Reproduction

Reproduction

Sexual — a haploid gamete combines with another resulting in a diploid organism.

Asexual — reproduction not involving the fusion of gametes.



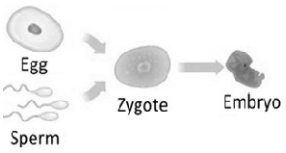
05.d Animal Reproduction

Sexual Reproduction (Meiosis)

Meiosis involves cell division. The only cells that go through meiosis are gametes, or sex cells (sperm in men and eggs in women).

Meiosis is needed for sexual reproduction, Each cycle of meiosis creates four daughter cells with exactly half the number of chromosomes as the parent cell.

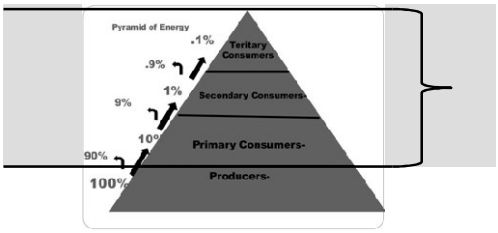
During fertilization, two daughter cells (one from each organism reproducing) will combine to create an embryo with a full set of chromosomes.



05.e

Trophic Levels

Trophic levels are related to food chain (web)



Summary

Expertise | Issues

Zoology overview

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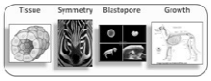
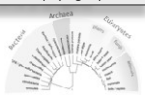


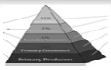
Kingdom
Phylum
Class
Order
Family
Genus
Species

Animal phylogeny



Animal reproduction

Animal trophic levels



Check

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