BIO 102 NOTES

ANIMAL DIVERSITY

- Animals vary in complexity and are classified based on anatomy, morphology, genetic makeup, and evolutionary history.
- All animals are eukaryotic, multicellular organisms, and most animals have complex tissue structure with differentiated and specialized tissue.
- Animals are heterotrophs, they must consume living or dead organisms since they cannot synthesize their own food and can be carnivores, herbivores, omnivores, or parasites.
- Most animals are motile for at least some stages of their lives, and most animals reproduce sexually.

Key Terms

- **body plan**: an assemblage of morphological features shared among many members of a phylum-level group
- **heterotroph**: an organism that requires an external supply of energy in the form of food, as it cannot synthesize its own
- **extant**: still in existence; not extinct

Key Points

- Animal cells don't have cell walls; their cells may be embedded in an extracellular matrix and have unique structures for intercellular communication.
- Animals have nerve and muscle tissues, which provide coordination and movement; these are not present in plants and fungi.
- Complex animal bodies demand connective tissues made up of organic and inorganic materials that provide support and structure.
- Animals are also characterized by epithelial tissues, like the epidermis, which function in secretion and protection.
- The animal kingdom is divided into Parazoa (sponges), which do not contain true specialized tissues, and Eumetazoa (all other animals), which do contain true specialized tissues.

Key Terms

- **Parazoa**: a taxonomic subkingdom within the kingdom Animalia; the sponges
- **Eumetazoa**: a taxonomic subkingdom, within kingdom Animalia; all animals except the sponges
- **epithelial tissue**: one of the four basic types of animal tissue, which line the cavities and surfaces of structures throughout the body, and also form many glands

The classification of animal kingdom relies on cell development, morphology and presence/absence of ceolom among other features.

PHYLUM PROTOZOA

In Greek, Protos means first; zoon means animal. Protozoa are first, unicellular animals in animal diversity.

Characteristics

1. They are small , unicellular animals.
2. There is no body symmentry
3. The cell form is constant, oval, elongate or spherical
4. Locomotion is by any of the three organelles; flagella, cilia and pseudopodia
5. Some are free living while others are parasitic
6. Mode of nutrition varies depending of the species; holozoic, saprophytic, saprozoic, holophytic
7. Reproduction is by sexual and asexual

Classification

Protozoans are classified into four subphylla;

1. Sarcomastigophora: The protozoans that utilize pseudopodia and flagella for movement. Sarcodina uses pseudopodium while mastigophora uses flagellum. Examples of sarcodina include *Amoeba proteus* while mastigophora include Trypanosoma, Euglena e.t.c
2. Sporozoa- They are endoparasites incapable of active life outside their hosts. They produce sporozoites which are infective stage of the animals. E.g include Plasmodium species, Eimeria species
3. Cnidospora (Myxozoa)- They possess thick walled spores containing one or more polar capsules with long filaments . They are generally diploid, lack flagella and grow in body cavities and tissues of the host. E.g *Myxobolus pfeifferi*
4. Ciliophora: They are called ciliate because they possess cilia for locomotion e.g Paramecium

PHYLUM PORIFERA

Characteristics

1. Multicellular eukaryotes:, but with little coordination
2. Lack mouth, definite digestive sac, nervous system or sense organs
3. They possess incurrent pores (ostia) in their body wall for water passage
4. Reproduction is asexual or sexual

Types of Canal Systems

1. Asconoids:

2. Syconoids:
3. Leuconoids:

Porifera is divided into three classes;

Class Calcarea-*Clathrina*

Class Hexactinellida- glass sponges

Class Demospongea- 90% of all sponges

PHYLUM CNIDARIAN (COELENTRATA)

Characteristics

1. They are multicellular
2. They are radially symmentrical
3. Diploblastic in body layers (gelatinous and non-cellular mesogloea)
4. They have epidermal, nervous, digestive and muscular tissues but lack specialized organ systems
5. They possess nematocysts
6. Two forms are present; Polyp and medusa

Classification of Cnidarian

1. Hydrozoans –e.g
   - *Obelia*
   - *Hydra*
   - *Gonionemus*
   - *Physalia*
   -
2. Scythozoans e.g
   - jellyfish
   - *Mastigias Aurelia*
3. Cubozoans e.g
   - sea wasps - *Chironex*
4. Anthozoans e.g
   - sea anenomes
     - coral reefs
     - coral reefs
     - , sea fans

PHYLUM PLATYHELMINTHES

- Characteristics
  1. They are long slender body worms
  2. They are aceolomates
  3. They are dorsoventrally flattened
  4. They are unsegmented
  5. They are triploblastic animals; endoderm, mesoderm and ectoderm

6. They show cephalization
7. carnivorous, freeliving and parasites

Classification

Class Turbellaria - planarians

- Characteristics
  1. free living, mainly marine, but freshwater and terrestrial
  2. locomotion via cilia and muscular contractions for swimming
  3. gastrovascular cavity
  4. They posses protonephridia with flame cells. Protonephridial system in a freshwater turbellarian at top right.
  5. paired nerve cords (ladder). Nervous system of *Dugesia* at bottom right
  6. They are monoecious; reproduce both sexually and asexually

Class Monogena

mainly external parasites of fish; no intermediate host (direct development)

Class Trematoda - flukes

- Characteristics
  1. endoparasites, use suckers to attach to host
  2. mouth
  3. reproductive system is the primary organ system
  4. most adults are hermaphroditic (schistosomes are dioecious)
  5. indirect life cycle, usually involves two or three hosts
     A. intermediate (first) host, usually a mollusc)
     B. final (or definitive) host
- Examples
  1. *Clonorchis*
     A. Chinese liver fluke
  2. *Schistosoma*
     1. blood flukes, cause schistosomiasis

Class Cestoda –

Characteristics

1. ribbon-like, highly specialized parasites; 1 mm-25 m long;
2. proglottids
3. scolex
4. no mouth, no digestive system--microvilli on tegument

- Examples
  1. Beef and pork tapeworms.
     A. *Taeniarhynchus saginatus*: the beef tapeworm *Taenia*-the pork tapeworm

PHYLUM NEMATODA

Characteristics;

- They are round worms
- The outmost body wall is complex, impermeable and resistant cuticle
- The germ layered body
- Possess pseudocoel
- No circulatory or respiratory organs
- Sexes are separate
- Some are free-living while others are parasitic

- free living
  - *Anguillula*: the vinegar eel

    Caenorhabditis: a soil nematode

parasitic

2. *Ascaris lumbricoides*: giant intestinal roundworm
3. *Necator* hookworms
4. *Tricinella*
5. *Wuchereria*: filarial worms (elephantiasis)

PHYLUM ANNELIDA

- Characteristics
  1.
  2. They are bilaterally symmetrical
  3. Metermerically segmented (segmentation)
  4. They possess hydrostatic skeleton
  5. They possess longitudinal and annular muscles
  6. They possess paired setae
  7. They have nephridia for excretion
  8. They posses well developed nervous system
  9. They posses closed circulatory system

CLASSIFICATION

Class POLYCHAETA e.g Nereis, Arenicola

- mainly marine, mobile or and sessile
- carnivores, detritus feeders, and filter feeders
- The possess parapodia
- mostly dioecious e.g Nereis, Arenicola

Class OLIGOCHAETA e.g earthworms

- few setae: use muscles for locomotion
- mainly freshwater and terrestrial
- most are deposit feeders, fertilize and aerate the soil

- hermaphroditic, but cross fertilize
- They possess clitellum

Class HIRUDINEA (leeches)

- mostly freshwater
- predators: invertebrates and blood
- no setae
- example include *Hirudo medicinalis*

PHYLUM MOLLUSCA

- Characteristics
  1. They have reduced coelom
  2. ventral muscular head-foot, visceral mass enclosed by mantle
  3. dorsal shell (absent in primitive mollusc)
  4. well developed organ systems; open circulatory system in most
  5. radula usually present – tiny teeth used for scraping food particle

CLASSIFICATION

Class GASTROPODA

- These include snails and slugs
- marine, freshwater and terrestrial; mainly herbivores and carnivores
- coiled shell (may be lost)
- They undergo torsion – (anticlockwise rotation of the viscera mass and shell through 180 degree so that mantle cavity becomes interior
- gills in aquatic species; vascularized mantle in terrestrial forms

Class BIVALVIA e.g clams, oysters, scallops

- 30,000 species of clams, oysters, scallops, mussels
- paired, hinged shells mainly filter feeders, possess gills & siphons
- sedentary, infaunal and epifaunal, scallops semi-nektonic

Class CEPHALOPODA e.g octopus

- Characteristics
  - beak-like jaws; foot has evolved into tentacles
  - closed circulatory system
- well-developed brain

Class Polyplacophora (chitons)

They are marine linpets

Class Monoplacophora they are extinct e.g Neopilina species

PHYLUM ARTHROPODA

- arthropods are related to annelids
- over 80% of all described species are arthropods, most are insects
- about 800,000 species have been described; some estimate there may be as many as 6,000,000 species

Characteristics

1. segmented body (metamerism), but with tagmatization
2. jointed appendages
3. rigid exoskeleton (cuticle) of mostly chitin; thin and flexible at joints
4. growth by molting (ecdysis)
5. metamorphosis
6. open circulatory system

CLASSIFICATION

Subphylum Chelicerata

- Characteristics
  1. two tagmata: cephalothorax and abdomen
  2. no antennae
  3. 6 pairs of limbs
     A. chelicerae
     B. pedipalps
     C. pairs of walking legs

Class ARACHNIDS

Spiders, Scorpions

some characteristics

1. chelicerae: preoral pincers--poisonous fangs in spiders
2. mainly carnivorous
3. mites and ticks are ectoparasites-transmit Lyme disease, Rocky Mounted spotted fever, etc.

Subphylum CRUSTACEA

Characteristics

1. biramous appendages
2. two pair of antennae
3. one pair of mandibles
4. 40,000 species

Subphylum UNIRAMIA

- Characters
  1. one pair of antennae
  2. all appendages are uniramous
  3. includes the insects and four other classes (myriapods)
  4. more information is available from the

Class DIPLOPODA - millipedes

1. two pairs of legs per segment
2. body round in cross section
3. mainly herbivorous, also scavengers

Class CHILOPODA - centipedes

1. one pair of legs per segment
2. carnivorous
3. appendages of first trunk segment modified into poison fangs

Class HEXAPODA (or Insecta)

- 750,000 named species, perhaps as many as 30 million total

- Characteristics
  1. Three part body - head, thorax, abdomen
  2. Three pairs of legs, all attached to thorax
  3. One pair of antennae
  4. usually 1 or 2 pairs wings
  5. elaborate mouthparts - mandibles, etc.
  6. tracheae metamorphosis

Orders classified by mouthparts--more than 25 orders are recognized, including

1. Thysanura: silverfish
2. Odonata: dragonflies
3. Orthoptera: grasshoppers and crickets
4. Blattaria: cockroaches
5. Isoptera: termites, social insects
6. Phthiraptera: lice
7. Coleoptera: beetles
8. Hymenoptera: ants, bees, wasps: social insects, pollination
9. Lepidoptera: moths and butterflies, pollination
10. Siphonaptera: fleas
11. Diptera: flies

PHYLUM ECHINODERMATA

- 6,000 spp.; all marine
- Characteristics:

1. endoskeleton of $CaCO_3$; under epidermis (mesodermal)
2. adults with pentaradial symmetry
3. water vascular system with tube feet
4. no head or brain

CLASSIFICATION

Class ASTEROIDEA: sea stars

Class OPHIUROIDEA: brittle stars

Class ECHINOIDEA: sand dollars and sea urchins

Class HOLOTHUROIDEA

Class CRINOIDEA: sea lilies

PHYLUM CHORDATA

Characteristics

1. Notochord (usually replace by vertebral column)
2. Dorsal hollow nerve cord
3. Pharyngeal gill slits
4. Postanal tail

Subphylum UROCHORDATA (Truncates)

1. mainly sessile & solitary adults
2. filter feeders
3. mobile "tadpole" larva.
4. paedomorphosis

Subphylum CEPHALOCHORDATA

- lancelets
- 45 species
- filter feeders
- no obvious head, no eyes

SUBPHYLUM VERTEBRATA

- Characteristics
  1. pronounced cephalization
  2. endoskeleton of cartilage or bone

3. vertebrae (except for most primitive)

Superclass AGNATHA

- 80 species
- a paraphyletic group of **jawless** fishes
- includes the first vertebrates, the ostracoderms, which have an external skeleton of bone
- living forms are elongate, scaleless, slimy parasites and scavengers that lack bone

Superclass GNATHOSTOMATA

- Characteristics
  1. vertebrates with jaws that are modified gill supports
  2. teeth - modified dermal scales
  3. more efficient, paired pelvic and pectoral fins
  4. three semicircular canals
  5. more proficient predators than the jawless fish

CLASS CHONDRICHTHYES -

- Characteristics
  - internal skeleton of cartilage (cartilaginous fish) e.g sharks, rays, skates

CLASS OSTEICHTHYES

- bony fishes--30,000
- Characteristics
  1. skeleton contains bone
  2. single external gill opening covered with operculum
  3. swim bladder or lung e.g bony fishes

CLASS AMPHIBIA:

- Characteristics
  1. Amphibians today include salamanders, toads and frogs
  2. Amphibians usually shed eggs in water for external fertilization
  3. aquatic larvae with external gills metamorphose to adults
  4. Dermal respiration
  5. Amphibians gave rise to the amniotes

Order Gymnophiona (Apoda) - Caecilians

1. elongate bodies that lack limbs
2. annular rings
3. wormlike burrowers

Order Caudata (Urodela) - salamanders

They have long tail, usually with two pairs of limbs

Order Anura (Salienta) - frogs and toads

They possess tailless, elongate hindlimbs, head and trunk fused

CLASS REPTILIA

- turtles, alligators, lizards, snakes--7,000 species
- internal fertilization; oviparous & ovoviparaous
- impervious, dry scaly skin
- well developed lungs
- ectothermic; behavioral thermoregulation

CLASS AVES

9,100 species; hummingbird to Andean condor to ostrich

- *Characteristics*
  1. internal fertilization and oviparous
  2. Endotherms
  3. Feathers (modified reptilian scales)
  4. Fusion of bones makes skeleton more rigid
  5. Horny bill that lacks teeth (toothed fossils)
  6. Four chambered heart
  7. Lungs with one-way air flow.
  8. Eat wide variety of food.
  9. complex social behavior.

Class MAMMALIA:

- *Characteristics*
  1. hair - protection from heat loss
  2. mammary glands
  3. differentiated teeth
  4. endotherms
  5. 4 chambered heart;

Monotremes

1. egg layers
2. cloaca for excretory, digestive, and reproductive tracts
3. Platypus

Marsupials (Subclass Metatheria):

- brief gestation period
- embryo continues development attached to a nipple, usually in a pouch

Cephalization :- is the evolutionary trend toward concentrating nervous tissue, the mouth and sense organs toward the front end of an animal i.e the head region allowing brain to be located in one place.

Classification of human

Kingdom – Animalia
phylum – Chordata
class – Mammalia
Order – primates
~~Family~~
Sub order – Haplorhini
Infra order – Simiiformes
family – Hominidae
Sub family – Homininae
Tribe – Hominini
Genus – Homo
Species – Sapiens
Linnaeus, 1758

- prolonged lactation and parental care
- Marsupials include: opossum, kangaroo, koala

Placental Mammals (Subclass Eutheria):

- placentals
- Young develop to an advanced stage prior to birth
- 19 of the 26 orders of mammals are placentals.