

## Unit 8: Biodiversity

### Content Outline: Animal Kingdom - Vertebrate Animals (8.15) – Part 1

- I. Phylum: Chordata -These are animals possessing a notochord.(These are the higher grade animals.)
  - A. Four general characteristics of all Chordates
    1. They possess a **notochord** - This is a flexible support rod running dorsally. (It reduces to intervertebral discs.)
    2. They also possess a *dorsal, hollow nerve chord*.
      - a. This structure develops into the Central Nervous System (CNS) – brain and spinal cord.
    3. **Pharyngeal slits** -This allows water passage to bypass the digestive tract.
    4. They possess a *muscular post-anal tail*. (This, over millions of years, has reduced to tail bones in humans and great apes.)
  - B. These are all **Deuterostome** development. (Blastopore makes the anus first) organisms.
- II. **Vertebrates** -These are chordates that possess a hard *backbone surrounding and protecting the nerve cord*.
  - A. These are mostly large and active animals.
  - B. They possess a very high degree of **Cephalization**.
  - C. They have an *axial skeleton* supported by the backbone. (This helps lead to larger size and better movement.)
    1. There ribs to protect the visceral mass.
    2. The skeleton *grows as the organism grows*.
    3. Axial refers to “central” that all appendages come off of in an outward fashion.
  - D. The skeleton has *two pair of appendages*. (There is one anterior and one posterior.)
  - E. Notochordal Discs in between vertebrae (They are jelly filled *cushions* that provide us with greater flexibility.)
  - F. They have an *advanced respiratory system*. (This means *more oxygen can be obtained* which then leads to larger and more active bodies.)
  - G. They have an *advanced circulatory system*. (A better way to *move nutrients, oxygen, and waste* □ bigger body.)
  - H. They have an *advanced digestive system*. (This allows for organisms to be able to eat different foods □ get more nutrients □ more active and larger bodies.)
  - A. They have an *advanced nervous system*. (This allows them to control larger more active body quickly when responding to the environment.)

## FISH

- III. Jawed Fish
  - A. Class: **Chondrichthyes** - These are the cartilaginous fish such as Sharks and Rays. (“Chondro” means “cartilage; “ichthe” means “fish”)
    1. The teeth are the only bones; the body is made of cartilage. **Please remind students of ossification.**
    2. They have scaled skin. (Prevents **desiccation** “water loss”.)
    3. They have muscular fins and powerful jaws. (This is great for predators.)
    4. They have highly advanced vision and olfaction (sense of smell) (This is also great for predators.)
    5. They have a **lateral line system** used for hearing. (It detects water vibrations.)
  - B. Class: **Osteichthyes** - These are the boney fish, such as bass, catfish, and trout. (“osteo” means “bone”)
    1. These are the most abundant vertebrates.
    2. They have an *endoskeleton made of calcium carbonate*, just like humans.
    3. They have a **lateral line system** for hearing.
    4. Gills with **operculum** covering .(This structure allows them to breath while being still as it creates water movement and thus keeping the gills constantly exposed to fresh oxygenated water.)
    5. They have a **swim bladder for buoyancy**. (This makes them more versatile movement in an obstacle-ridden environment, such as a swamp or river.)
    6. The female’s eggs are laid outside the body and then fertilized by the male’s sperm.
    7. Fish have a *two chambered* hear in close proximity to the gills.

## Part 2

### AMPHIBIANS

- I. Class: Amphibians
  - A. These are all **tetrapods**. (means “organisms with four legs”)
  - B. They are *scalesless*. (They *must keep skin moist to breath*; therefore they live in moist environments.)
  - C. They have webbed feet for swimming.
  - D. They have a *three chambered heart*. Two – **atria**s (receives blood) and **one ventricle** (pumps blood out)
  - E. They *must have water for eggs to be laid in, just like the fish*.
  - F. They *undergo complete metamorphosis*.
    1. Larva—is a water herbivore; adult – is a terrestrial carnivore.
  - G. About 250 MYA most species go extinct due to Pangaea forming and displacing the water.
  - H. Three orders of amphibians exist
    1. Urodela (means “first tail”)
      - a. They either aquatic or terrestrial.
      - b. These are salamanders and newts.
    2. Anurans (means “no tail”)
      - a. They have powerful hopping legs and a long tongue (great for catching insects).
      - b. These are frogs and toads. (Frogs stay in water mostly; toads on land mostly.)
    3. Apodans (means “no feet”) (They look similar to snakes.)
      - a. They are legless and blind organisms.
      - b. They are cave-dwelling or ground-dwelling.
  - I. Amphibians are important *environmental indicators* of water quality. (Due to the eggs needing clean water.)
    1. Acid rain and pollution are causing large species extinction in our time.
- II. **Amniotes** -These are organisms that *produce a fluid-filled developmental structure* called the **amnion**.
  - A. This includes reptiles, birds, and mammals.
  - B. These *organisms thrived during Pangaea* because they are less dependent on the presence of water.
  - C. **Amniotic egg**
    1. Most have a shell of Calcium Carbonate around to prevent desiccation.
    2. The egg contains four extra embryonic membranes:
      - a. **Amnion** - This is the fluid-filled membrane that the embryo floats in.
      - b. **Allantois** - This membranous sac is for waste collection.
      - c. **Chorion** - This membrane functions in gas exchange. (Oxygen inward and carbon dioxide outward.)
      - d. **Yolk Sac** - This structure is a food source in eggs. (It makes the gonads in mammals.)
      - e. **Albumin** - This is the egg white protein. (It is an extra food source should the yolk sac get depleted.)

## Part 3

### REPTILES

#### I. Class Reptila

##### A. General Characteristics of reptiles:

1. Body covered by *scales of keratin*. (Prevents desiccation.)
2. They have *true lungs* (possessing **alveoli**... small air sacs) and a *three chambered heart*.
3. They are **Ectothermic** - They absorb heat from the surrounding environment. (This keeps their metabolism low... so they do not have to eat as often as birds and mammals.)

##### B. Three Sub-classes exist:

1. Testudines – These are Turtles/Tortoises. (They lay their eggs on land.)
2. Lepidosaurs These are Tuataras and Squamata - these are lizards and snakes.
3. Crocrodilia These are Alligators and Crocodiles. (Alligators have a wide snout; crocodiles have a narrow snout.)

#### II. Class: Aves (Birds)

##### A. This group evolved from Archaeopteryx.

1. Feathered, solid boned, teeth, vertebrate tail, claws on the wing, 6 feet tall predator.

##### B. General characteristics of birds:

1. They have *scales on the feet and face*.
2. **Feathers** (are modified scales of keratin) on aerodynamic wings and body.
3. They have hollow bones.\*
4. They lay eggs with the developing embryo inside the egg.
5. They have a reduced number of organs. (For example, only 1 gonad.)\*
6. Toothless beak of fused keratin. (The shape dictates diet.)\* \* **Exaptions** that eventually lead to flight.
7. **Endothermic** - They generate heat within from food breakdown. (They have fat tissue to help retain the heat.)
8. Lungs have *secondary air sacs*. (2x as much oxygen in one breath)\*
9. They have a *four chambered heart*. (Allows for increased activity.)\*
10. They have excellent eye sight. (Most are predators)

##### C. Two sub – classes exist

1. **Ratites** (These are the *flightless* birds.)
2. **Carinates** (These are birds of *flight*.)
  - a. Types of Carinates: **Passeriforms** (song birds); aquatic; **raptors** (birds of prey)

## Part 4

### MAMMALS

- I. Class: Mammalia
  - A. Mammal general characteristics:
    1. They possess **mammary glands** in the breasts to feed the young high protein milk.
    2. They have **hair** of keratin and a *sub-cutaneous fat layer*, both act as insulation to trap heat. (Endothermic)
    3. They have a *four chambered heart* and most have a *large brain* capable of some level of learning.
    4. Most give live birth. This needs a **placenta** – connection with the mother.
    5. **Different types of teeth** (The organisms diet indicates the type of teeth they possess.)
      - a. Incisors (cut), Bicuspids (puncture), Premolars and molars (grind)
    6. Most show a high level of parental care. The number of offspring is proportional to energy spent on rearing.
  - B. Three orders of mammals exist
    1. Monotremes - These are *egg laying* mammals.
      - a. Duck-billed Platypus and Echidnas (Australia/New Guinea)(They are poisonous, like some reptiles.)
    2. Marsupials - These are the *pouched* animals, such as kangaroos.
      - a. Give early birth and the embryo goes to the marsupium to suckle and finish developing.
      - b. Australia and North America
    3. Placentals - Most furry animals and humans.
      - a. They have long pregnancy because of placenta. (Greater protective development can occur.)