

CHAPTER 10: ANIMALIA

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CHAPTER 10

heterotrophs
motile
metozoa (multicellular)
free live
ANIMALIA

Word Animalia is derived from Latin word "Anima" meaning life / soul. Size ranges from microscopes to huge giants as blue whales. They basically are eukaryotic, multicellular ingestive heterotrophs who lack cell walls.

CLASSIFICATION OF ANIMALS :-

Although without a circulatory system, they're classified upon 3 basic things - (a) Tissues (absence or presence)

(b) no of tissue layers (c) body symmetry (d) Body cavity
They're classified upon these bases on two kingdoms:

(1) Parazoa

- (1) division of labor in cells
- (2) Inorganized tissues (not changed into organs or its system)
- (3) Asymmetrical (body can't be divided into two halves)

eg: Sponges

(2) Eumetazoa (sub)

- (1) Similar cells perform similar functions
- (2) Tissues are formed into organs and their systems
- (3) Symmetrical

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⇒ Classification upon tissue layers :- Animals are classified upon number of tissue layers in two:

⇒ Diploblastic : These animals have two germ layers: endo and ectoderm; they've tissue level organization. No organs and only one cavity; Gastrovascular cavity.

⇒ Triploblastic :- They've 3 germ layers, ecto, endo and mesoderm.

CLASSIFICATION ON BODY SYMMETRY :-

They're classified upon body symmetry. Eumetazoa are divided into Grade Radiata & Bilateria.

• Grade Radiata :-

It includes animals with radial symmetry having a top and bottom and body parts arranged as spokes or radiate from central body axis. eg: Jellyfish, sea anemone. It's considered as an adaption to sessile life.

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• Grade Bi-lateria :- In bilateral symmetry, a plane through midline of body divides it on right & left halves that are mirror images (roughly) of each other. Front end has head and lower end has a tail. All animals with bilateral symmetry are triploblastic.

⇒ Classification upon Body Cavity :- Animals are also divided upon body cavity;

① Acoelomate :- No body cavity between digestive track and outer body wall.
Triploblastic. eg: Platyhelminthes.

② Pseudocoelomates :- If body cavity develops between mesoderm and endoderm, then it's called Pseudocoelomates. eg : Nematoda

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③ Coelomate :- If body cavity forms within mesoderm and lined up by mesoderm. Body wall and digestive wall separated by coelomic fluid. Organism with coelomates have well developed excretory system and digestive system.
Example : Humans.

- Coelomate can be divided into 2 groups:

① Protostomes ② Deutrostomes.

① Protostomes :- Embryo has some cells called Blastula. In some animals, these form mouth upon development. eg: Molluscs, Annelids and Arthropods.

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② Deutrostomes :- Blastophores (Blastula) forms the anus upon development, these animals are Deutrostomes. eg: Echinoderms, Chordates.

• INVERTEBRATES :- Animals which lack a proper backbone are invertebrates. They are 95% of animal species. They are divided upon many phylums:

- | | |
|--------------------------------|-----------------|
| ① Porifera | ⑥ Arthropoda |
| ② Cnidaria | ⑦ Aschelminthes |
| ③ Platyhelminthes | ⑧ Echinodermata |
| ④ Annelida | |
| ⑤ Mollusca Mollusca | |

Characteristic	Porifera	Cnidaria	Platyhelminthes	Nemoboda	Annelida	Mollusa	Arthropoda	Echinodermata	Chordata
Habitat	Aquatic	Mostly aquatic	Aquatic, Terrestrial	Aquatic, Terrestrial	Aquatic, Terrestrial	Aquatic, Terrestrial	Aquatic, Terrestrial	Marine	Aquatic, Terrestrial
Body Type	Asymmetric	Radial symmetry	Bilateral symmetry	Bilateral symmetry	Bilateral symmetry	Bilateral symmetry	Bilateral symmetry	Radial (adults) Bilateral (larvae)	Bilateral symmetry
Body organization	Cellular	Tissue	Organ level	Organ level	Organ system	Organ system	Organ system	Organ system	Organ system
Body cavity	Acoelomate	Acoelomate	Acoelomate	Pseudocoelomate	Coelomate	Coelomate	Coelomate	Coelomate	Coelomate
Digestive system	None (filter feeding)	Incomplete	Incomplete	Complete	Complete	Complete	Complete	Complete	Complete
Circular system	None	None	None	None	Closed	Open / Closed	Open	Water vascular system	Closed (invertebrate)
Reproductive system	Sexual / Asexual	Sexual / Asexual	Sexual / Asexual	Sexual	Sexual	Sexual	Sexual	Sexual	Sexual
Respiratory system	None	None (Diffusion)	None (Diffusion)	None (diffusion)	Skin, Gills	Gills, Lungs	Trachea, Gills, Book lungs	Skin, Gills, Tube feet	Gills, Lungs
Excretion	None (diffusion)	Diffusion	Protonephridia	Renette cells	Metanephridia	Nephridia	Malpighian tubules	Tube feet, diffusion	Kidneys
Ecological Role	Filter Feeders	Predators, Symbionts	Free-living Parasitic	Decomposers, Parasites	Decomposers, Burrowers	Grazers, Predators	Predators, Decomposers	Predators, Herbivores	Various omnivores (Predators, Herbivores)

Least ones

) → Pore bearers

(1) PHYLUM PORIFERA :- → Pores are called Ostia.

- (1) Upon embryology, they're separated as an animal phylum.
- (2) They're sessile and attach to the bottoms of oceans and rocks in waters.
- (3) They're exclusively aquatic, quite dominant in oceans. Usually are small in size.
- (4) Body lacks tissues and there's no symmetry.
- (5) They rely on flow of water to deliver their food.
- (6) They also have a central cavity.
- (7) They have 3 dermal layers (1) pinacoderm composed of thin and flat cells.
- (2) Middle layer called mesenchyme contains mesenchyme cells.
- (3) Inner layer choanoderm consists of collar cells known as choanocytes.
- (8) Needle like skeleton.
- (9) Reproduce by budding of gemmules which makes a new sponge. Separate sexes involving eggs and sperm.

Example: Spongilia and Sycon.



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Have deadly stings which cause paralysis in stronger organisms but death in weak ones.

2) PHYLUM CNIDARIA :- General characteristics :-

- (1) Aquatic (entirely), they're marine organisms but few are found in freshwater.
- (2) Mostly sessile but some are motile. (Jellyfish)
Some are also colonial (Obelia).
- (3) They have radial or bi-radial symmetry.
- (4) They are diploblastic, have mesoglea between ecto and endoderm.
- (5) Tissue level organism (tissues are found)
- (6) They've gastrovascular cavity opening in mouth
- (7) Their size varies from microscopic (hydra) to 2 meter in length such as jellyfish.

⇒ STRUCTURE :-

Their gastrovascular cavity opens in mouth. Their mouth is surrounded by tentacles which with body form stings. Tentacles help in locomotion. They've cell organelles of nematocytes which further give rise to stings. Cnidocytes make nematocysts.

⇒ REPRODUCTION :-

Reproduce asexually by budding and sexually by gametes.

They have colonial units "zooids". It has 2 types; one feeds (Polyps) and one reproduces (Medusae).

They protect shores from erosion, used in jewellery.

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→ (Flatworms)

PHYLUM PLATINENTHES :- Characteristics :-

- (1) They are free-living and also a parasite
(planaria) → (tapeworms) ↑
- (2) Their body is dorsiventrally flattened and soft.
- (3) Found in fresh and marine water. Also in gut & liver of animals.
- (4) They're triploblastic and have bi-lateral symmetry.
- (5) Coelom is absent therefore called Acoelomate and the spaces are filled with mesenchyme tissue.
- (6) Some of them have eyespots to detect light.
- (7) Free living flatworms are motile and move using the cilia present underneath.

REPRODUCTION :-

- ① They can reproduce asexually and sexually as well. ② They reproduce by fission process. ↓
- ② Most flatworms are monoecious. This actually means that they've male and female reproductive organs in the same individual.
- ③ Fertilization is internal however their reproduction is complex.

Example: Dugesia (Planaria)
Fasciola (Liver fluke)
Taenia (Tapeworm)

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→ Roundworms

(4) PHYLUM ASCHELMINTHES (NEMATODA) : Characteristics

(1) Free living or may be parasites. Also found in soil, human and animal muscles and intestines.

(2) Less than 5cm or maybe microscopic but some of them are 1m+ in length (usually parasites)

(3) Triploblastic (3 germ layers) and bi-lateral symmetry.

(4) Cylindrical bodies with bent ends.

(5) Organ level of organization.
(system)

(6) Pseudocoelom; body cavity not fully lined by tissue

(7) They are dioecious; separate male and females.

(8) Internal fertilization occurs.

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2nd largest
phylum } → soft bodies.

(5) PHYLUM MOLLUSCA :- (Viscera - Internal organs)

- (1) Found in fresh, marine waters and moist areas.
- (2) Free living, motile or sessile.
- (3) They're triploblastic and show bi-lateral symmetry.
- (4) No segmentation.
- (5) Organ system level of organization.
- (6) Coelomate; ~~they~~ Body has 2 parts, dorsal visceral region, head and ventral muscular foot.
- (7) Whole animal is in a shell called Mantle which acts as a shell and it's made of CaCO_3 .
- (8) Shell may be external (snail) or internal (cuttlefish).
- (9) They've a complete digestive system.
- (10) Nervous system is formed of nerve cells.
- (11) Dioecious reproductive system.
- (12) They've feather like gills which perform respiration & also excretion. ↓ (Tentacles)
- (13) Fertilization maybe internal or external.
- (14) They've tongue like structure (Radula).
- (15) Development → Indirect (Larva stage).
- (16) Sexes maybe separate. Development has a stage of larva and larva is called:
"Trochophore Larvae".

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segmented (metamerically)

(6) PHYLUM ANNELIDA :-

- (1) They're segmented bodied worms.
- (2) Found in soil, freshwater and marine. (Neries)
- (3) Coelomate, Bilateral symmetry and triploblastic
- (4) Closed circulatory system and complete digestive system.
- (5) They've locomotory organs of setae and chaetae.

REPRODUCTION :-

They reproduce sexually. Most of them are hermaphrodite and some have separate sexes. Fertilization is external. Development may be direct or indirect.

ABILITY TO REGENERATE :-

They can regenerate. This special ability of them helps to recover from injuries.

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(7) PHYLUM ARTHROPODA :-

- (1) Largest phylum of animalia
- (2) Found in all types of habitat. Body is segmented
- (3) Some crawl while some fly.
- (4) Triploblastic, coelomate, bi-lateral symmetry
- (5) Digestive system = Extra cellular and complete
- (6) Exo skeleton (chitin) - Have muscles attached.
- (7) Excretory system → complete.
- (8) Respiratory system :-
 - Aquatic = Gills (Prawn)
 - Terrestrial = Lungs (Spider)
 - Tracheal = Cockroach
- (9) Sexes are separate - Dimorphous
- (10) Open circulatory system
- (11) Dioecious with internal fertilization
- (12) Development — Direct / Indirect.

DIAGRAM :-



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(8) PHYLUM ECHINODERMATA (skinny)

- (1) They're free living and marine animals.
- (2) They're lazy and usually stay at bottom of oceans.
- (3) Their symmetry varies upon life stage:
Larva = bi-lateral adults = radial
- (4) Bodies maybe flattened (sea-urchin), star shaped (starfish), elongated (sea-cucumber).
- (5) Coelomate, Triploblastic and Deutostomes
- (6) Organ System Lvl of organization
- (7) No segments
- (8) Water Vascular System is used to gas exchange, feeding, removing waste and locomote.
- (9) Nervous System → Proper with nerves
- (10) Locomotory organs → Tube feet
- (11) Fertilization is external and separate sexes.

ABILITY TO REGENERATE :-

Their larvae and adults can regenerate their lost parts.

IMPORTANCE OF ECHINODERMS : (5 LO BASED)

- ① They are eaten as food. Sea urchins are poisonous
- ② Starfish are scavengers and clean seawater but also damage oyster beds.
- ③ Their dried skeleton is used as fertilizer. It's high in calcium and nitrogen.

(9) PHYLUM HEMICHORDATA :-

- (1) Due to their similarities to chordates, they're called Prochordates.
- (2) They're marine and few are slow moving, others are sessile.
- (3) Unsegmented body with bi-lateral symmetry.
- (4) Open circulatory system and complete digestive system.
- (5) Coelomate and Triploblastic.
- (6) Ciliary feeders.
- (7) Dioecious.
- (8) Indirect development.
- (9) External fertilization.
- (10) Organ system lvl of organization.
- (11) Sexes may be separate or unisexual.
- (12) Fertilization is external.
- (13) Development might include larval stage.

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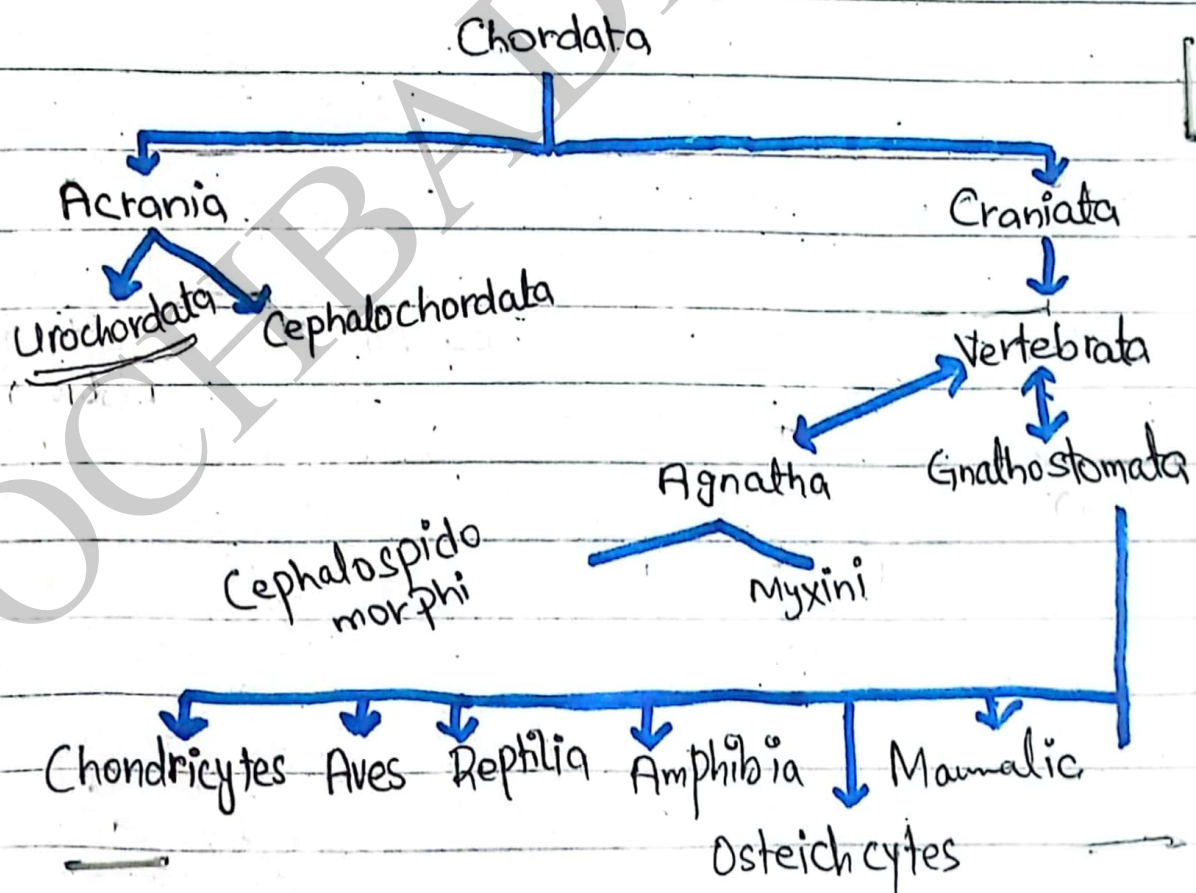
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Representatives are called Chordates
Most Advanced
(10) PHYLUM CHORDATA :- All chordates are with 4 characteristics ; (a) Notochord (b) Nerve chord (c) Gill slits (d) Post anal tail

(a) Notochord :- Rod like unjointed structure between gut and nervous system later makes the vertebral column .

(b) Nerve chord :- Dorsal, hollow and single ; forms CNS .

(c) Gill slits :- Lateral sides ; opening in pharynx wall . In aquatics, they help to respire and in mammals it forms ear and throat .



- Chordates are divided to two groups :-
 - Acrania : Brain isn't enclosed in cranium (bone case)
 - Craniata : Brain is enclosed in cranium and notochord is also replaced by vertebral column.
- ⇒ Acrania is divided into 2 groups :
- (1) Urochordata :- Larva has notochord and during metamorphosis, notochord disappears and adult has no skeleton.
 - (2) Cephalochordata :- Body is fish like. No head but tail is present. No organ for respiration.

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⇒ Craniata: It's divided into 1 group: Vertebrata.
They're called Vertebrata due to spinal column.

Divided into two: ① Agnatha ② Gnathostomata

• Agnatha: They're basically jawless fishes.

Divided to two: Myxini and Cephalospidomorphi

But body is eel like, rounded with skin, slender.

Sexes are separate. Fertilization is external.

And they don't have larval stage. eg. Hagfish

• GNATHOSTOMATA:- They're into 6 classes:-

① Amphibia ② Reptilia ③ Aves ④ Mammalia

⑤ Chondrichytes

⑥ Osteichthyes

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→ compressed
→ spindle shaped
body

(1) CLASS CHONDRICHTHYES :-

- (1) Mouth is at ventral side.
- (2) They've streamline body.
- (3) They're exclusively marine.
- (4) Endoskeleton is made up of cartilage.
- (5) No air bladder and they've 2 chambered heart.
- (6) 5-7 pair of gills (no upper).
- (7) Dioecious and perform internal fertilization.
- (8) Viviparous and they're cold blooded.

→ Bony fishes.

(2) CLASS OSCISTHETHEYES :-

- (1) Spindle - shaped body and streamlined for motility.
- (2) Endoskeleton is wholly or partly bony.
- (3) Numerous vertebrae.
- (4) Notochord is in reduced form.

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webbed feet present but many lack feet
Body divided in 2 parts: Head and Trunk

(3) CLASS AMPHIBIA :-

- They are said to be originated from fishes.
- Their body is soft, moist and they do not have scales.
- Their body is highly vascular. They perform respiration by stages ; Larva = Gills and Adults = Lungs / skin
- Their heart is 3 or 5 chambered
- They develop by metamorphosis. Most are ^{oviparous}
- Most of them hibernate in winter
- REPRODUCTION :-
 - They have separate sexes and they mostly are oviparous.
 - Fertilization may be internal or external.

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(4) CLASS REPTILIA :-

→ creeping animals

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- (1) They've two pairs of pentadactyl limbs, each with 5 fingers.
- (2) Skin is dry, rough and cornified.
- (3) Incomplete 4 chambered heart with 2 atria and divided ventricle. Crocodiles have complete 4 chambered heart.
- (4) Cold blooded (poikilothermic) and they

• Reproduction :-

① Sexes are separate however

most of 'em are egg laying (oviparous).

② Fertilization is internal

③ Eggs are large, amniotic.

④ Embryo is safeguarded by 3 protective membranes:

① Amnion ② Allantois ③ Chorion

- Voice box
Syrinx ↗ Thought to be originated from septules.

(5) CLASS AVES :- Characteristics :-

- (1) They've streamline bodies to reduce friction.
- (2) Their body is divisible to head, trunk, neck and tail.
- (3) Neck is very long and tail is short. They have 2 pair of pentadactyl limbs. Forelimbs are modified to form wings. They have bi-pedal locomotion.
- (4) They are warm-blooded and endoskeleton is light due to hollow bones.
- (5) Beak is present and teeth are absent. They respire through lungs. They are endothermic. Jaws form horny beak and they have 4 chambered heart. They've kidneys to remove waste however no urinary bladder.
- (6) Sexes are separate. Fertilization is internal. They are oviparous.

Running Bird

Kiwi, Ostrich

Flying Bird

Parrot

Aquatic Bird

Duck, Penguin

- (7) Eggs are large with much yolk. ~~The~~

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usually Have hair / fur
on body

(5) CLASS MAMMALIA :

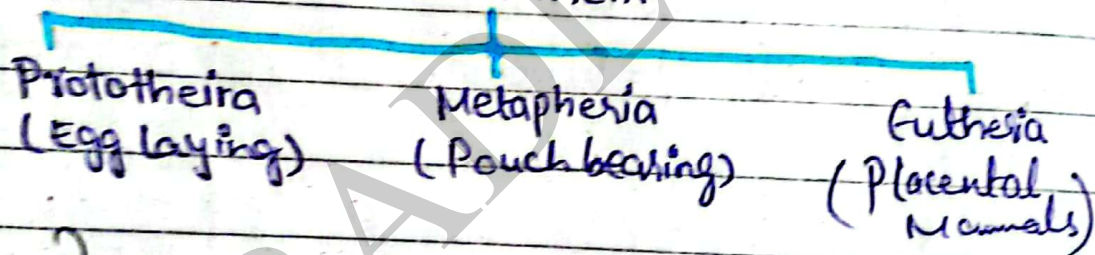
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- Body is shaped in head, neck, tail and trunk.
- ⇒ Two pentadactyle limbs for walking, running, swimming or flying. Glandular skin with hair usually.
- They have ears (external) with 3 bones.
- Heart is 4 chambered and their RBCs are non-nucleated except camel. They're endotherm.
- Voice-Box has larynx and epiglottis.
- ⇒ They usually reproduce by giving birth to new ones (except Prototheria). They are fed by mother's mammary glands. They're classified in 3 classes.

MAMMALIA



- PROTOTHERIA (egg laying) : They serve as a link between reptiles and mammals.

Also called monotremes. Their certain members are water adapted such as ducks and they've webbed feet.

Their reptilian feature is the presence of cloaca & cloacal opening (same opening of digestive and urine).

Their mammalian feature is that they feed young ones by mammary glands.

→ Marsupials.

METATHEIRA :-

They're known for their method of rearing young ones which is really unique as they (females) possess a pouch at abdomen called Marsupium where they keep young ones and feed them through mammary glands inside marsupium. They are found in Australia and America. Kangaroo

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Also called Placental Mammals
EUTHERIA :-

(1) Main differentiating property of them is development of offspring within body of mother and at the time of birth, it's more mature compared to young ones of marsupials and monotremes. They've a crucial organ placenta.

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Characteristic	Agnatha	Chondrichthyes	Osteichthyes	Amphibia	Reptilia	Aves	Mammalia
Examples	Lampreys, Hagfish	Sharks, Rays	Salmon, Tuna	Frogs, Salamanders	Snakes, Lizards	Sparrows, Eagles	Humans, Elephants
Habitat	Aquatic	Aquatic	Aquatic	Aquatic, Terrestrial	Terrestrial	Terrestrial, Aquatic	Terrestrial, Aquatic
Body Type	Elongated, No jaws	Streamlined, Jaws	S. 'mlined, Jaws	Semi-aquatic, Moist skin	Scaly, clawed	Feathers, wings	Hair, Mammary Glands
Body Organisation	Organ System	organ system	organ system	organ system	Organ system	organ system	organ system
Body Cavity				All are Coelomate			
Digestive system				All have complete			