BIO356 Laboratory of Vertebrate Animals Biology-I

1. BASIC CONCEPTS OF VERTEBRATE BIOLOGY

SUB-SYSTEMATICS GROUPS OF CHORDATA

PHYLUM: CHORDATA

I. GROUP: ACRANIA – PROTOCHORDATA

II. GROUP: CRANIATA

SUBPHYLUM: VERTEBRATA

SUPER CLASS: AGNATHA

CLASS: Myxini

Cyclostomata

Jawless Fishes

CLASS: Petromyzontida

SUPER CLASS: GNATHOSTOMATA

SUBPHYLUM: UROCHORDATA (TUNICATA)

CLASS: Chondrichthyes

CLASS: Thaliacea

CLASS: Actinopterygii

Osteoichthyes

CLASS: Sarcopterygii

SUBPHYLUM : CEPHALOCHORDATA

SUPER CLASS: TETRAPODA

CLASS: Leptocardia

CLASS: Amphibia

CLASS: Reptilia

CLASS: Aves

CLASS: Mammalia

Some Fundamental Features Used in Animal Classification

1. Levels of Organizations
2. Symmmetry
3. Body Cavity (Coelom)
4. Embryological Development (Germ Layer)
5. Embryonic Development of the Mouth
6. Segmentation
7. Skeleton
8. Sexuality
9. Digestive System
10. Larvae
11. DNA, RNA and Proteins

2. ANIMAL SYMMETRY

Symmetry is balanced distribution of paired body parts in animals.

1. **Asymmetry:** An animal that is **irregular in shape** and **has not got general body plan**

Spherical Symmetry: Any plane passing through center divides the body into equivalent halves.

Radial Symmetry: The animal can be divided into **similar halves** by more than two planes passing through the **longitudinal axis.**

Bilateral Symmetry: An animal can be divided into **two mirrored portions (left and right)** along sagittal plane.

BODY PLAN

- Some terms such as **anterior, posterior, dorsal, ventral, medial, frontal , proximal, lateral, distal** are used to show the regions of bilaterally symmetrical animals.

3. BODY CAVITIES

- A body cavity is **an internal space of an animal body.**
- A true body cavity is called a **coelom** that is derived from mesoderm.
- Triploblastic animals can be divided into three groups due to the present or absent of coelom Ç

  Acoelomate

  Pseudocoelomate

  Coelomate

Acoelomate: Mesodermal cell completely fill the blastocoel.

- **There is no body cavity between the digestive tract and the external body wall.**
- The region between the ectodermal epidermis and the endodermal digestive tract is filled with parenchyma.
- Platyhelmnintes and Nemertia

Pseudocoelomate: Mesodermal cells line the outer edge of the blastocoel.

- **They have a body cavity which is derived from blastocoel between the gut and body wall.**
- **Mesoderm partially surrounding the cavity.**
- Nematoda (Round worms)

Coelomate: Body cavity is **completely** lined with **peritoneum** (a thin cellular membrane) derived from mesoderm.

- Coelomic cavity is bounded with mesoderm.
- Echinoderms, Arthropods, Annelids, Chordates, etc.

4. GERM LAYERS

- Embryonic germ layers are **endoderm, mesoderm** and **ectoderm.**
- Animal that develops from two embryonic germ layers (endoderm and ectoderm) are called **Diploblastic**.
- Cnidarians are diploblastic animals.

- Animal that develops from three embryonic germ layers (endoderm, mesoderm and ectoderm) are called **Triploblastic**.
- Most animals are triploblastic
- Triploblastic animals are divided into **Deuterostomia** and **Protostomia** according to their particular embryonic development stage.

5. Embryonic Development of Mouth

Protostomia: The mouth develops before the anus at embryonic stage. **Blastopore becomes the mouth.**

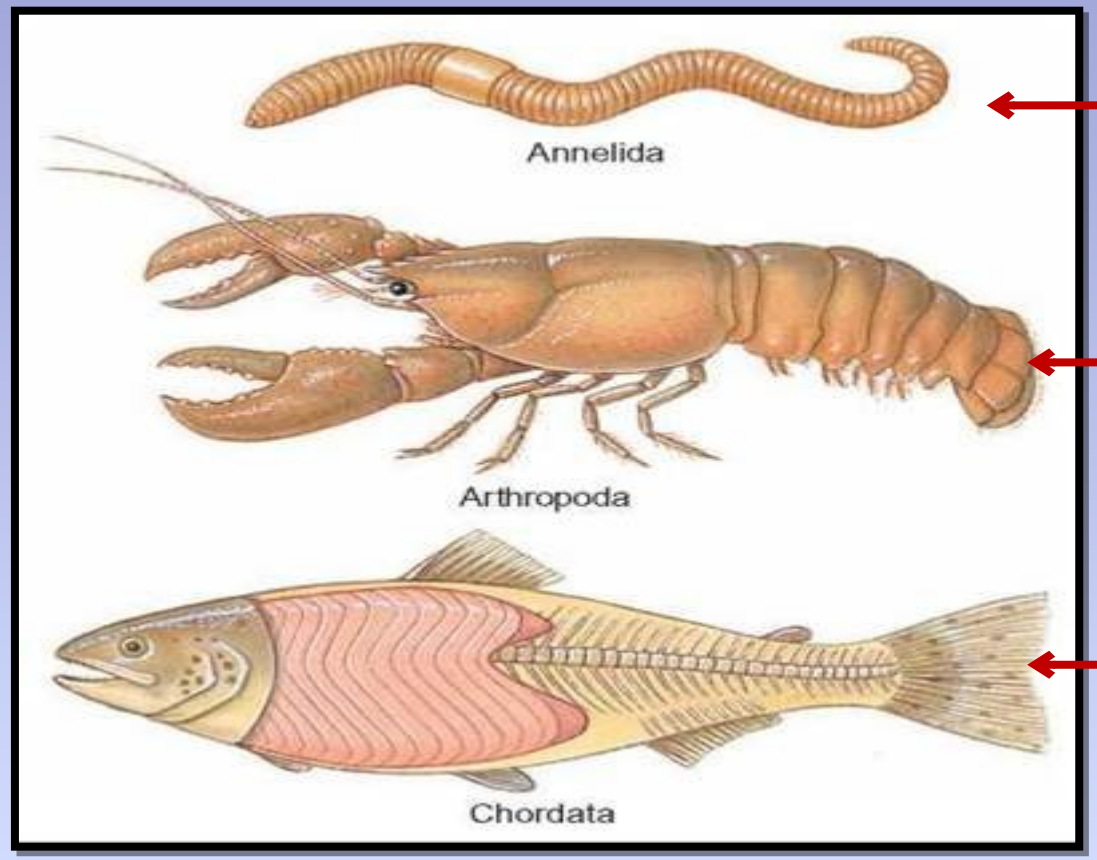
Ex: Mollusks, Annelids, Arthropods

Deuterostomia: The anus develops from the first opening in the embryo and the mouth develops later. **Blastopore becomes the anus.**

Ex: Echinoderms, Hemichordates, Chordates

6. SEGMENTATION (METAMERISM)

It is a serial repetition of similar body segments along the longitudinal axis of the body



Both in internal and external

External

Internal

SKELETON

Endoskeleton

Exoskeleton

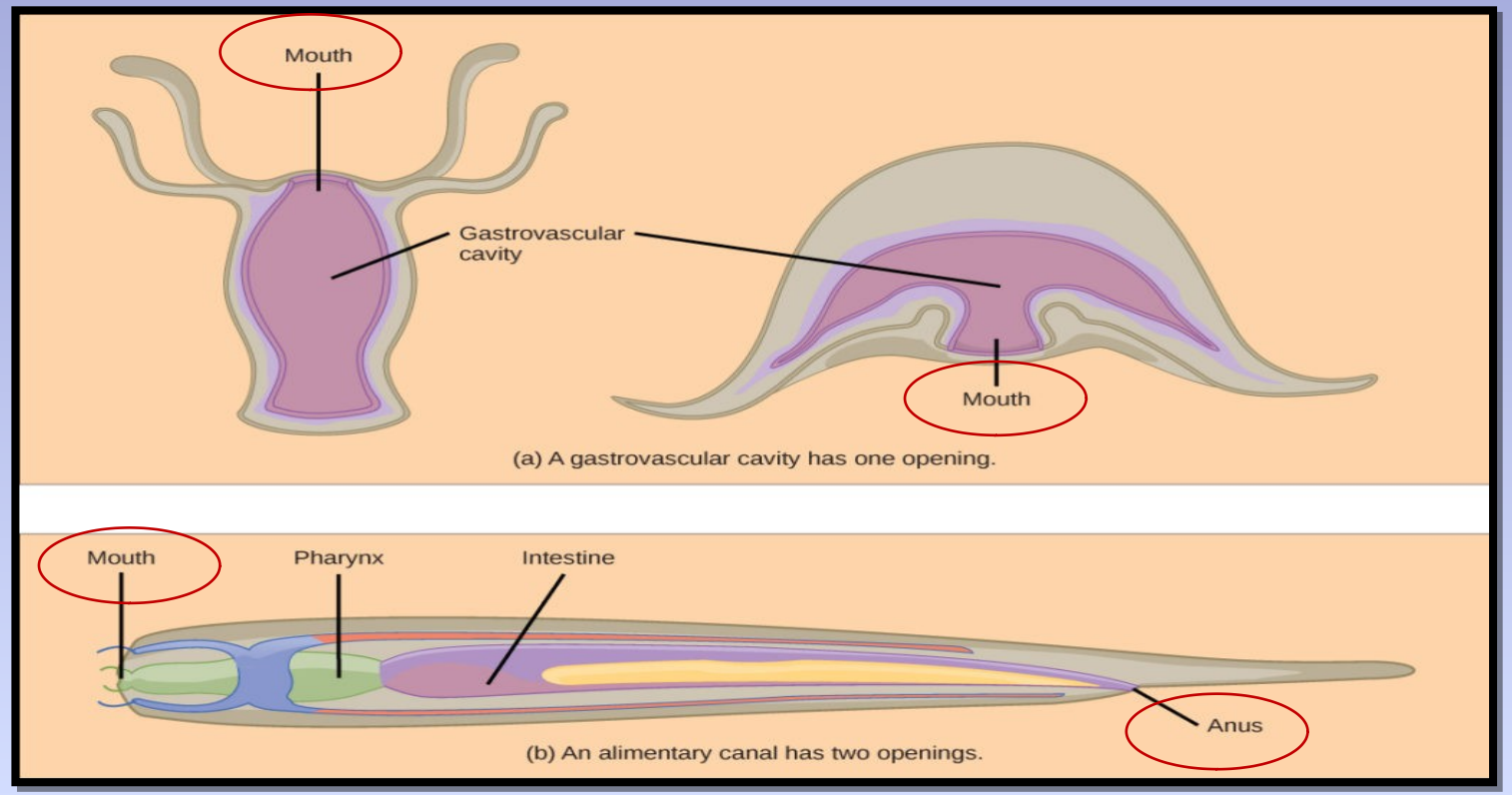
SEXUALITY

Monoecious: Both male and female gonads in the same organisms (Hermaphroditic)

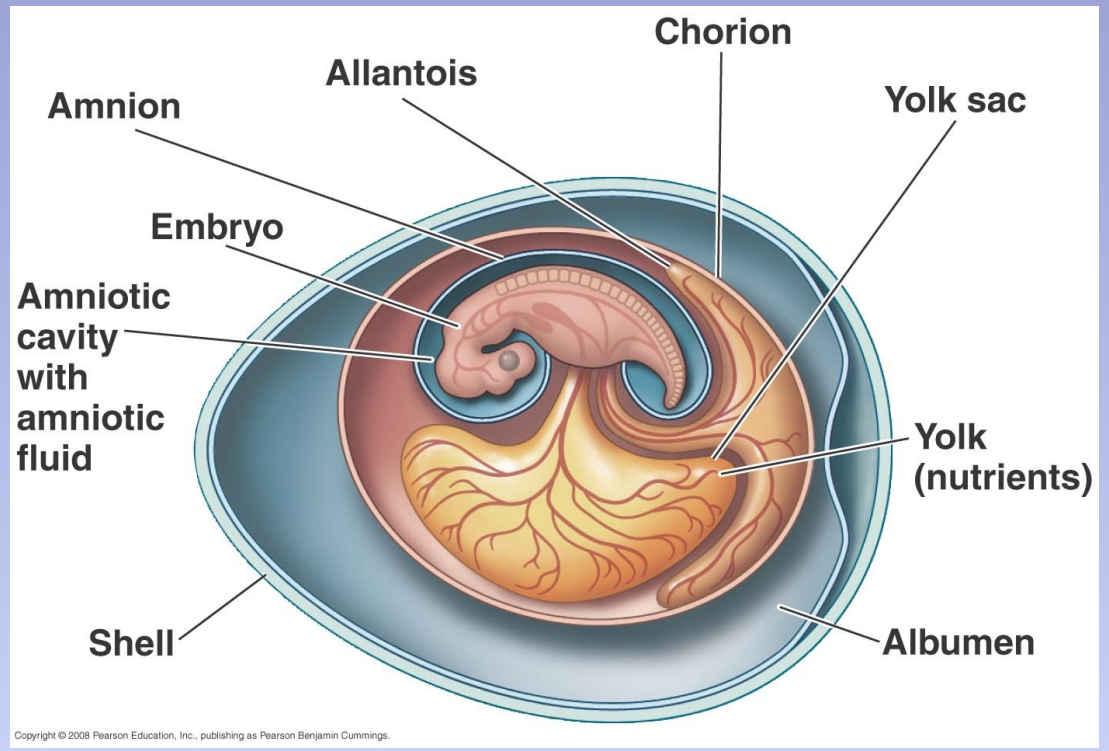
Dioecious: Male and female gonads in seperate individuals

DIGESTIVE SYSTEM-GUT CAVITY

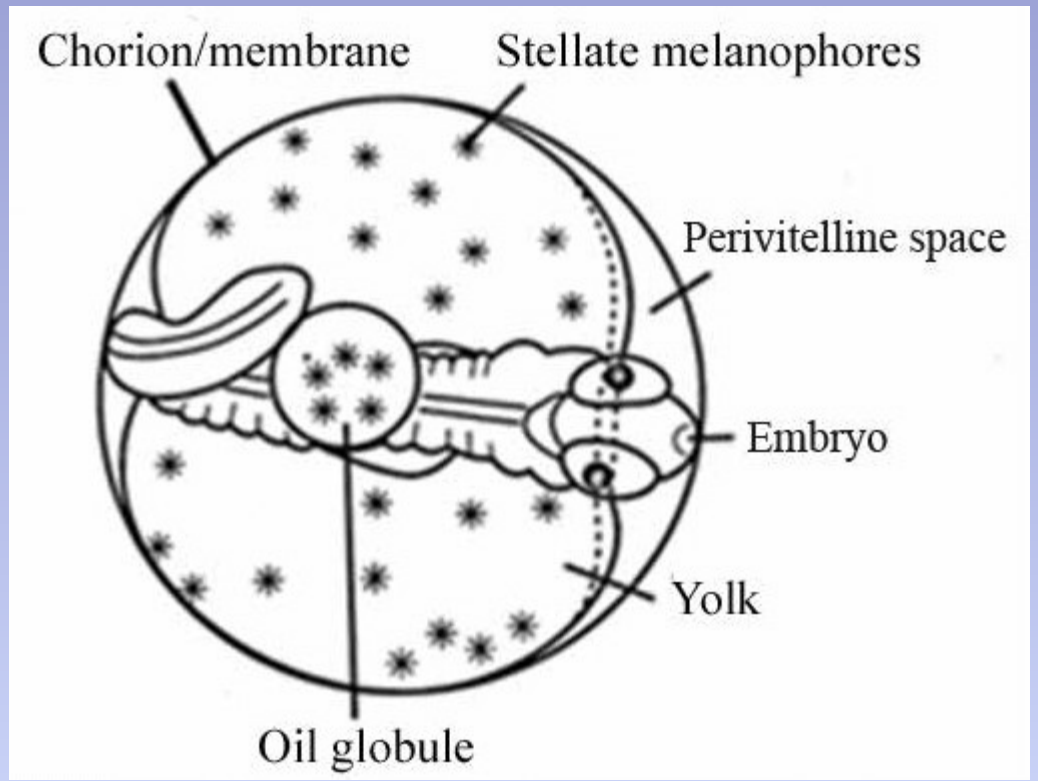
A few diploblasts and triploblasts have a blind or incomplete gut cavity . In these organisms food must **enter** and **exit** the same opening.
Most forms possess a complete gut (Two opening: Mouth and anus



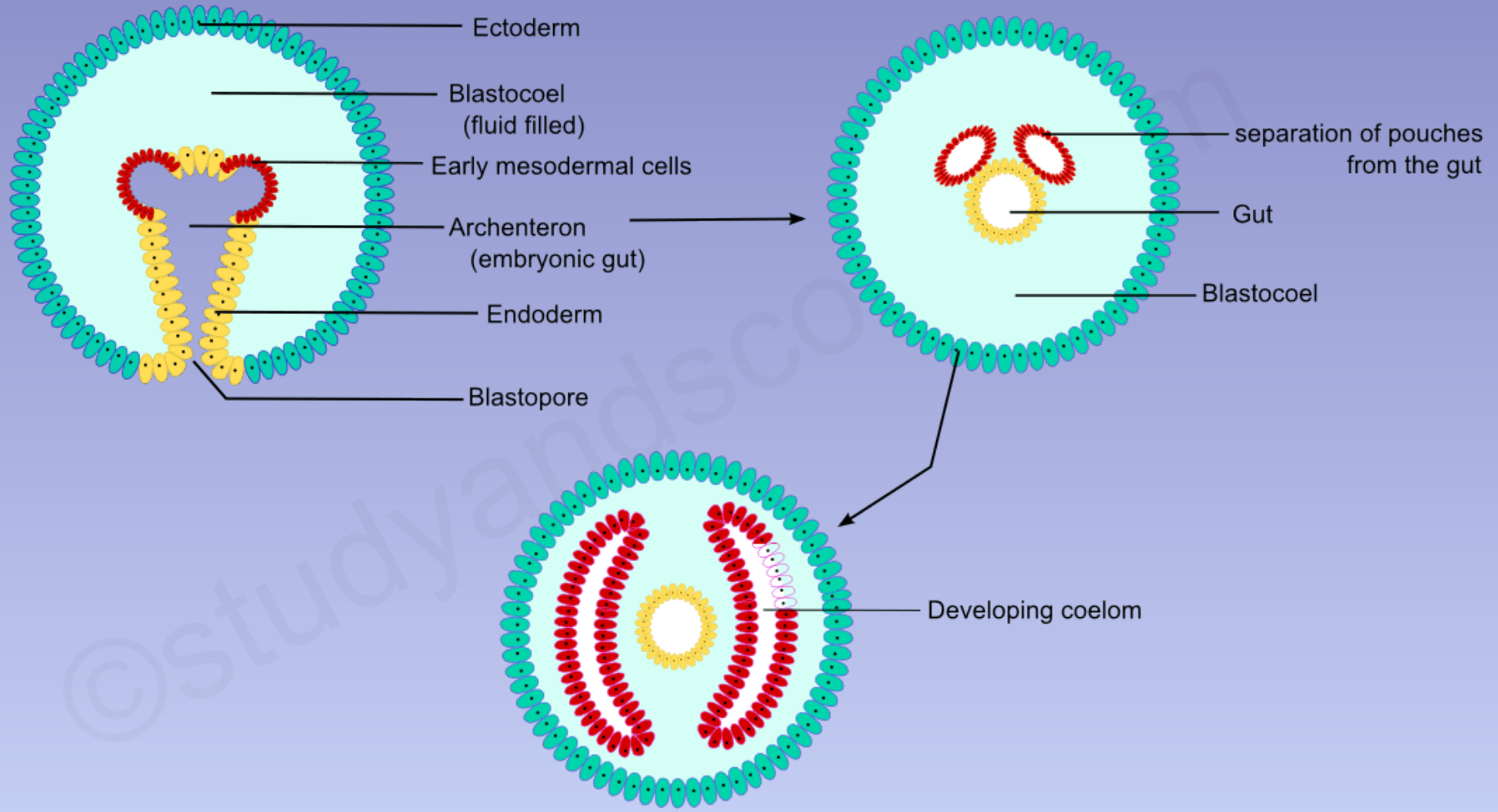
Amniotic Egg and Non-amniotic Egg



Amniotic Egg



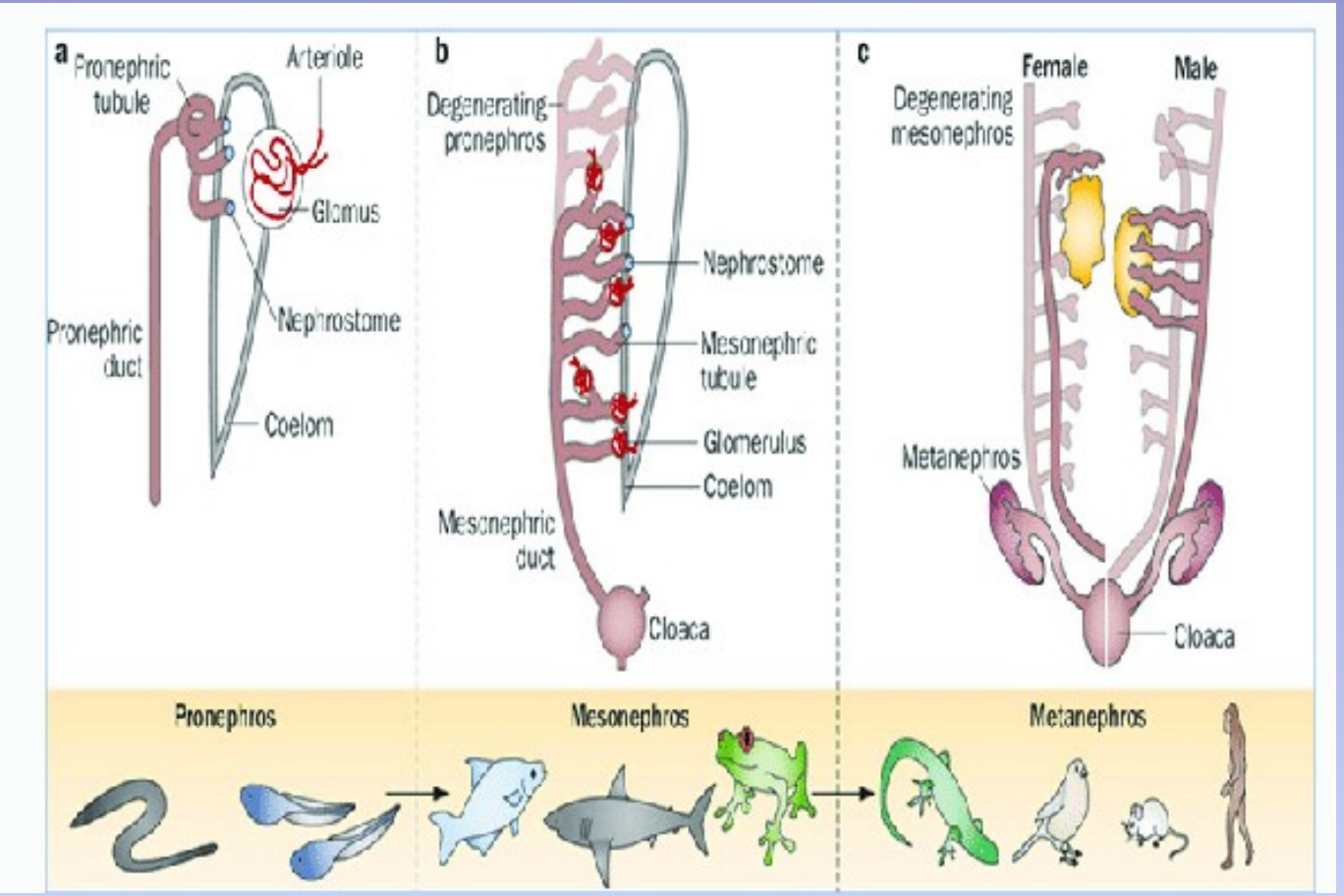
Non-amniotic Egg

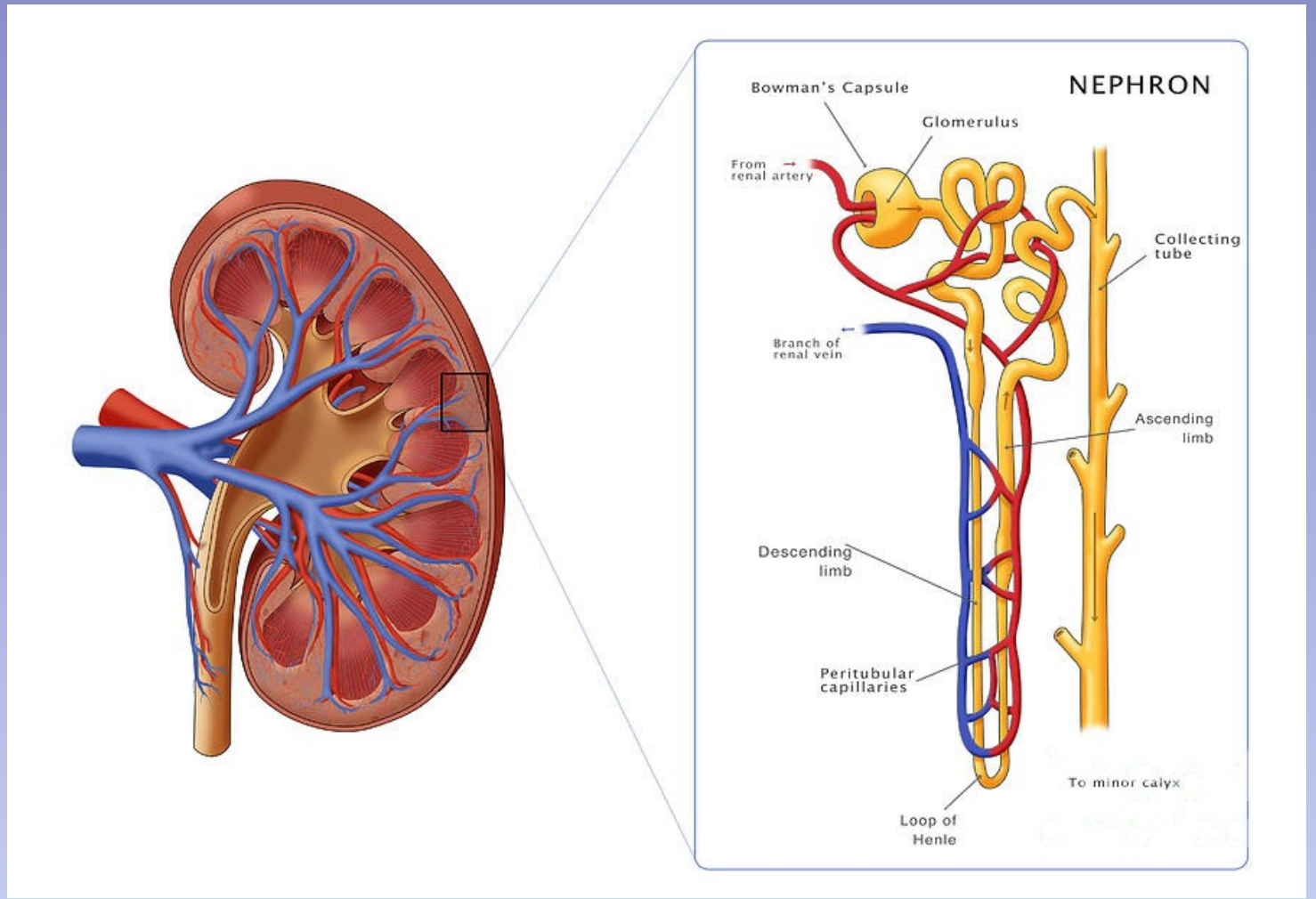


ENTEROCOELOMATE

Ex: Phylum Echinodermata and Chordata

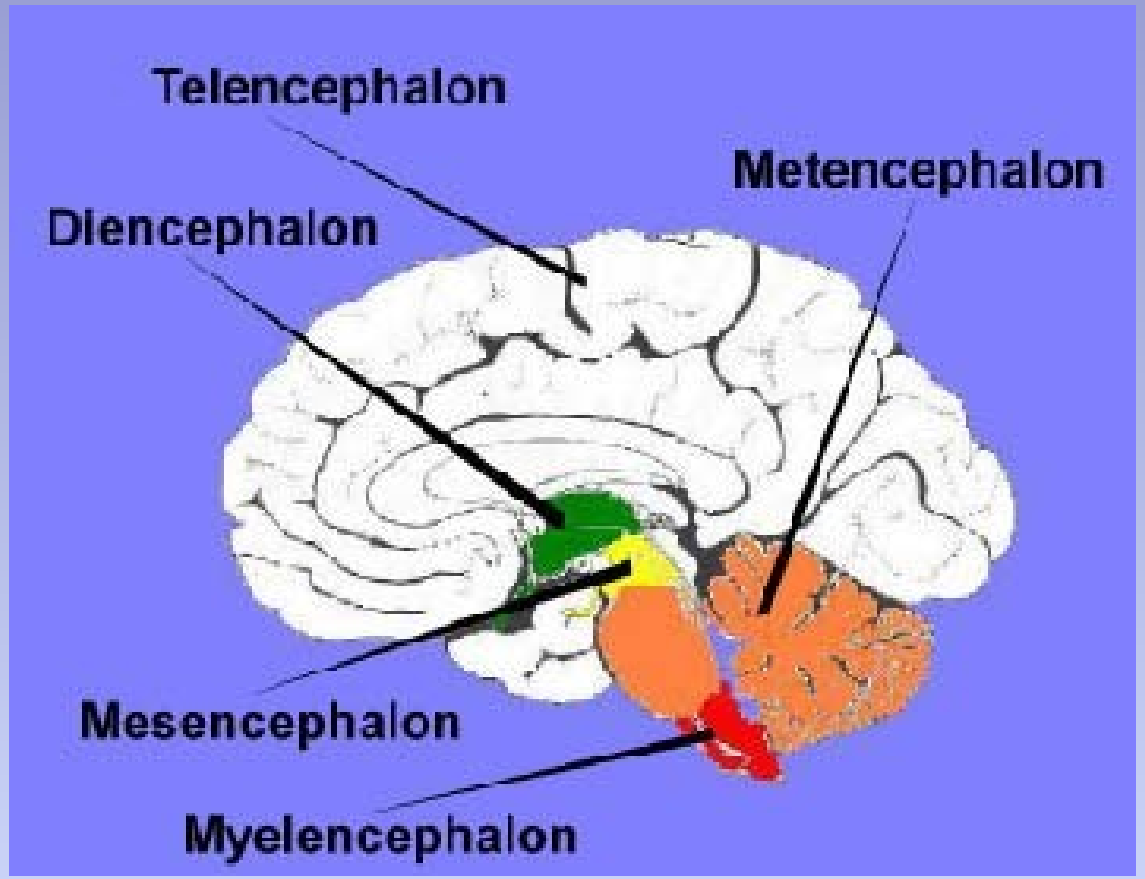
Evolution of Excretory System

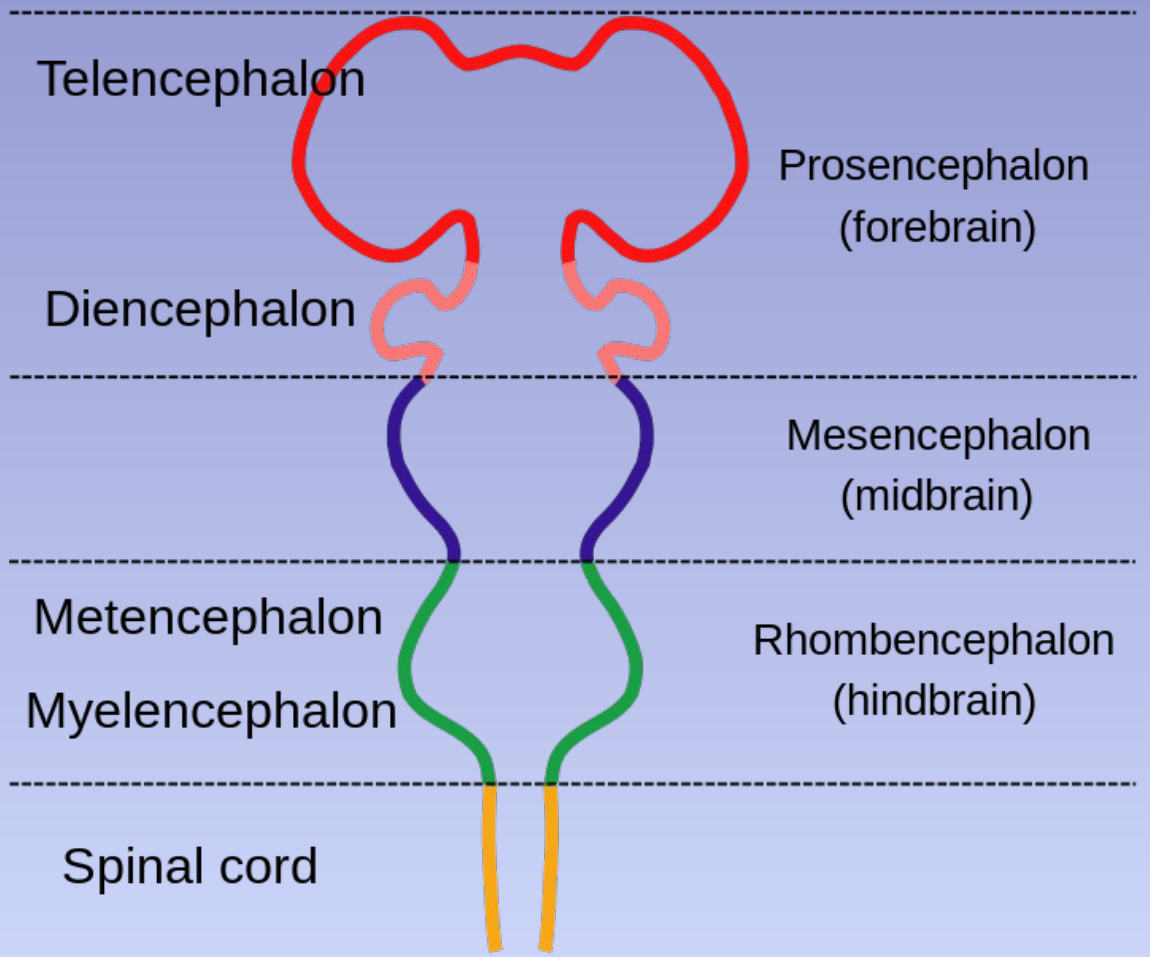




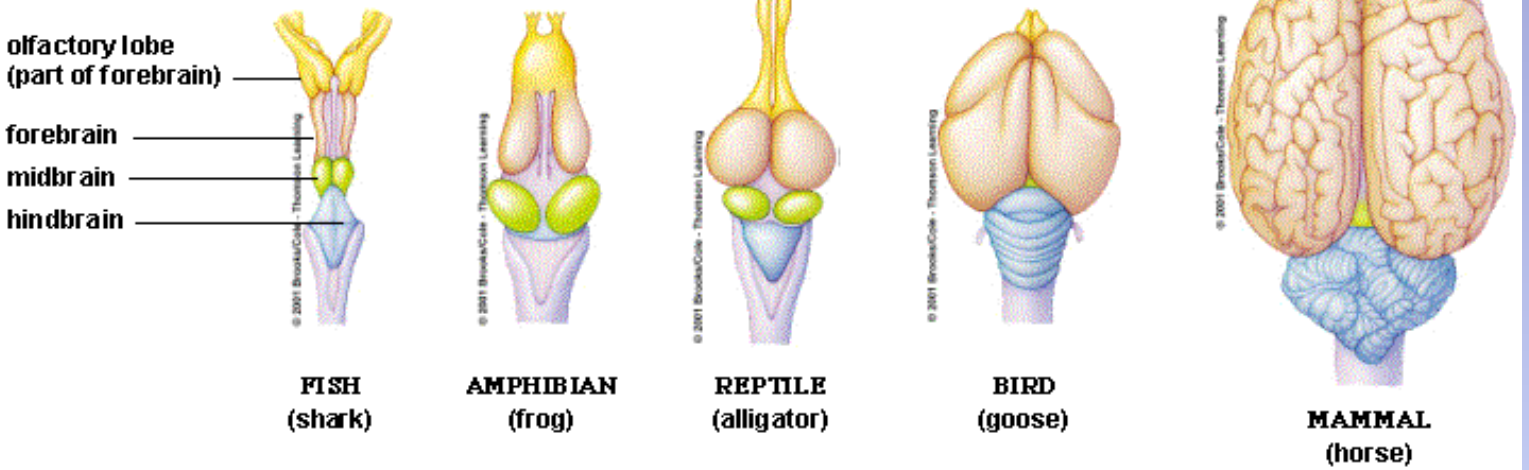
Metanephros Kidney

Brain parts

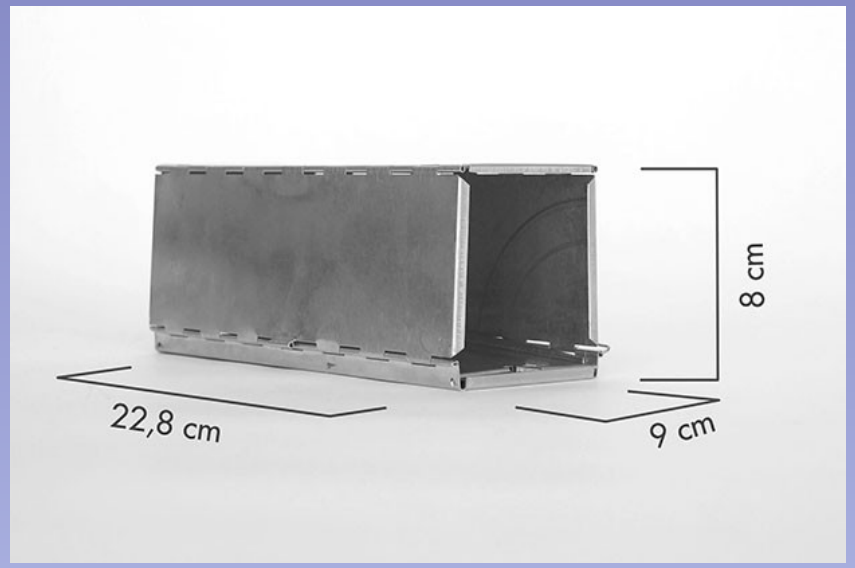

Telencephalon
Metencephalon
Diencephalon
Mesencephalon
Myelencephalon


Telencephalon
Diencephalon
Metencephalon
Myelencephalon
Spinal cord
Prosencephalon
(forebrain)
Mesencephalon
(midbrain)
Rhombencephalon
(hindbrain)

Evolution of Vertebrate Brain



Collection of Chordata Sample


8 cm
22,8 cm
9 cm

Identification Keys

Key to the species of *Epinephelus* occurring in the area

1a. Caudal fin of adults emarginate to truncate (slightly rounded on some *E. fuscoguttatus* and juveniles, and convex if broadly spread in adults) . . . . . → 2

1b. Caudal fin rounded (truncate on some *E. fuscoguttatus* from Oceania) . . . . . → 12

2a. Interspinous membranes of dorsal fin not incised (Fig. 14a) . . . . . → 3

2b. Interspinous membranes of dorsal fin incised (Fig. 14b) . . . . . → 6

Fig. 14

3a. Gill rakers elongate, no rudiments, 20 to 23 rakers on lower limb of first gill arch; dorsal-fin rays 17 to 19; colour purplish to brownish grey with yellowish brown dots on head and longitudinal brown lines on dorsal part of body (lines usually lost on large adults) . . . . . *Epinephelus amblycephalus*

3b. Gill rakers not elongate and rudiments often present, 13 to 18 rakers on lower limb of first gill arch; dorsal-fin rays 15 to 17, colour not as above . . . . . → 4

4a. Second dorsal-fin spine of adults elongated, its length 1.6 to 2.4 times in head length; total gill rakers on first gill arch 20 to 23; body depth 2.7 to 3.2 times in standard length; body reddish brown with a white dot on each scale; broad dark red margin on spinous portion of dorsal fin . . . . . *Epinephelus fasciatus*

4b. Second dorsal-fin spine not elongate (third or fourth spines longest); total gill rakers on first gill arch 24 to 28; body depth 2.3 to 2.9 times in standard length . . . . . → 5

5a. Body dark purplish grey with scattered irregular whitish blotches; body depth 2.6 to 2.9 times in standard length . . . . . *Epinephelus multinotatus*

5b. Head, body, and fins bluish grey with numerous blackish dots; large adults with scattered irregular blackish spots and blotches, most smaller than pupil; body depth 2.4 to 2.7 times in standard length . . . . . *Epinephelus cyanopodus*

6a. Lateral-line scales 48 to 54; head and at least front of body with small spots, either yellow (pale in preservative) or brown . . . . . → 7

6b. Lateral-line scales 56 to 76; spots on head and body dark brown or absent . . . . . → 10