AMPHIBIA
POINEERS OF TRUE VOICE PRODUCTION

- Amphibians are the first vertebrate animals to attempt transition from aquatic mode to terrestrial mode of life.
- But they were not fully successful to become terrestrial but hovered between freshwater and land environments. The name of the class indicates this dual life.
- They are the **earliest tetrapods** descended from fish like ancestors during Devonian period.
- The possible ancestors of amphibians are **osteolepid** fishes.
- They flourished during **carboniferous period**, but most of them are extinct at present.
- Fishes and Amphibians are included under **Ichtyhopsida or Anamniota**
- Study of amphibians is **Batrachology**
- The largest living amphibian is **Andrias davidianus (**Chinese giant salamander)
- The largest frog is **Conaraua goliath (Rana goliath).**

GENERAL CHARACTERS :

- They are cold blooded or **Poikilothermic** or **Ectothermal** animals.
- They lead a dual life. They breed and develop in fresh water. Adults are mostly terrestrial, lung breathing but some are partly aquatic.
- Skin is smooth or rough with **mucous glands** or **paratoid glands.**
- Exoskeleton is **absent**. However in Apoda there are concealed dermal scales.
- Skin colour is due to **Chromatophores.**
- **Skull dicondylic**, with **two occipital condyles to articulate with the atlas.**
- Vertebra are procoelous, amphicoelous or opisthocoelous.
- Upper Jaw or both the jaws are with small **homodont teeth**.
- Tongue is often protrusible.
- Respiration is by lungs, skin or buccal lining in adults and with gills in larvae. The gills persist in adults in aquatic species.
- Heart is three chambered with two auricles and one ventricle.
- Only **mixed blood** flows through the heart.
- Aortic arches are three pairs, carotid, systemic and pulmocutaneous.
- **Renal** and **hepatic portal systems** are **well developed**.
- Cranial nerves are 10 pairs.
- Nostrils are connected to the buccal pharyngeal cavity.
- **Middle ear with tympanum** and **Eustachian recess developed for the first time**.
- **Hardarian gland** secrete oil **and lacrimal gland** secrete tears **appeared first time in Amphibians**
- Hyomandibular is modified into columella auris of middle ear.
- Lateral line system is restricted to larval forms and some aquatic adults.
- Kidneys are **mesonephric.** Urinary bladder is large. Amphibians are **ureotelic.**
- Sexes separate, males **without a copulatory organ** except Caecilians.
- Fertilisation is external.
- Eggs are **mesolecithal** with moderate amount of yolk.
- There is an aquatic larval stage which **metamorphoses** into an adult.
- Evolutionary phenomenon that involves changes in rte and timing of development – **Heterochrony**
- Embryonic or juvenile characteristics of ancestors appear in adults of descendents is **paedomorphosis**
- Somatic development halted before sexual maturity is called as **Progenesis**
- Normal sexual maturity overtakes the slowed somatic development - **Neoteny**

CLASSIFICATION:

- J.Z. Young divided the class Amphibia into 3 sub classes.
  Labyrinthodontia, Lepospondyli and Lissamphibia

Subclass I: Labyrinthodontia

- These are extinct Amphibians
- Enamel and dentine at the base of the tooth was folded
- Some had scales others had dry leathery skin
- The sub class includes the orders
  Order I- **Icthyostegalia (eg:***Ichthyostega)*

Order II-Temnospondyli (Eg:Eryops),
Order III - Anthracosauria (eg:seymouria).

Subclass II: Lepospondyli (spool like vertebrae)

Small salamander like extinct amphibians e.g.; diplocaulus

Subclass III: Lissamphibia

- Modern Living Amphibia without exoskeleton. There are 3 orders in Lissamphibia.

Order 1: Gymnophiona or **Apoda (Gr. Gymnos** : naked, Ophinoess : Serpent : Gr. a : without, Podos : foot)

- Found in tropical and sub tropical regions of America, Africa and Asia.
- These limbless amphibians are known as **blind worms** or **caecilians**.
- **Burrowing** forms with elongated snake like body. Tail is absent.
- Skin is transversely wrinkled. Minute dermal scales are embedded in the grooves of the skin.
- Limbs and limb girdles are absent.
- A small blood vessel called *Ductus Botalli* connects the systemic arch with pulmonary arch.
- Eyes are **rudimentary, lidless and almost non-functional**. They feel their way by means of a **protrusible tentacle** lying between the eye and nostril.
- Males have a **protrusible copulatory organ**.
- Larva has 3 pairs of external gills.
- Parental care is common. (by females)

  E.g. *Ichthyophis, Uroaeotyphlus. gegenophis (scales are absent), Typhlonectes (aquatic & oviparous)*

Order 2: Urodela or Caudata (Gr, Ur-: tail, *delos* : visible; L, *Caude* : tail)

- Salamanders and Newts are included in it.
- Body lizard like, with a distinct post anal tail.
- **2 pairs of weak and equal limbs**.
- Skin without exoskeleton.
- **Teeth present in both the jaws.**
- **Vertebrae are opisthocoelous (amphicoelous) and numerous in number**
- **Ribs are present**
- **Sternum is poorly developed**
- **Vocal cards are absent**
- **Copulatory organs are absent**
- **Fertilization is Internal (**females take the spermatophore by the lips of the cloaca)
- Tympanum is absent. Eyelids are present or absent.
- Gills may be retained through out (Perinnibranchiates) eg: **Necturus** (mud puppy), **Proteus** (cave dwelling blind salamander), **Siren** (mud eel).
- In some gills are lost in the adults (Caducibranchiates) eg: Amphiuma (congo eel), Ambystoma (Larva is **Axolotl,** The development of Axolotl into adult is not possible due to deficiency of Thyroxine or lack of Iodine in the extremely cold waters. It prevents metamorphosis leading to precocious sexual maturity. The Phenomenon is called **neoteny.** It leads to **Paedogenesis).**
- Well developed lateral line system is present.
- They form a transitional group between fishes and amphibians.
- *Necturus* like animals are complete aquatic but animals like *Amphiuma* are transitional forms while *Amblystoma* is a complete lung breathing form in the adult condition.
- As most urodeles occur in North America, the Country is regarded as "**Head Quarters of Urodela**".
- Tylotriton : It occurs in the eastern Himalayan regions and is the only Indian caudate species.

Order 3 : Salentia or Anura (L *Salions* : hopping; Gr. *an*: without, *ura* :tail)

- Specialised successful Amphibia without a tail in the adult.
- Limbs strong, but unequal, Hind limbs longer than the forelimbs and help in leaping and swimming.
- Forelimbs are for support. Hind Limbs with web are useful for swimming.
- Head and trunk fused. Neck is absent. Vertebral column small with 5-9 procoelous Vertebra and a slender Urostyle. (formed by the fusion of last vertebrae)
- Ribs are absent
- Sternum is present
- Teeth present only on upper jaw or absent
- Adults without gills or gill openings

- Vocal cards present
- Eyes are large with eye lids
- Well developed eyelids and tympanum occur.
- In Ascaphus a permanent tubular extension of the cloaca resembles tail and act as copulatory organ
- Fertilisation is always external.
  e.g. **Frogs** and **Toads. Rana tigrina (**common Indian frog**),** *Bufo melanosticus* (common Toad) **Alytes** *(*Commonly called a midwife toad, Males exhibit parental care). *Hyla* (Tree frog), *Rhacophorus (***flying frog)**.