

Amphibia

First animal to attempt transition from aquatic to terrestrial mode of life.

* Amphibia dual, bio & life i.e. Animal with dual nature of life called amphibia.

General characters:-

- Aquatic, semi-aquatic, No maxilla except Rana concolor
- Carnivorous, tetrapod, oviparous, cold blooded.
- Head, trunk present, Neck & tail may be +ve or absent
- Tetrapod except, (but some are limbless) & pentadactyl.
- Median fin if present without fin ray.
- Skin soft, moist & glandular, chromatophores present
- Skull dicondylic
- Homodont teeth, Tongue often protrusible
- Cloaca present
- Respiration in adult by lung, skin & buccal cavity, but in larva by external & internal (Max^m) gills. In some external gills present throughout the life, showing neoteny.
- Heart - 3 chambered, 3 pairs (3, 4, 6) aortic arch, Renal & hepatic portal system present.
- Poikilothermous.
- Mesonephric kidney, excretion uricotelic.
- Cranial nerves 10 pairs.
- Middle ear with single bone i.e. columnella.
- Lateral line system in larval forms & semi-aquatic forms.
- Sexes separate, male without copulatory organ, fertilization external.
- Originated from Crossopterygii (lobe fish) in Devonian.
- 2500 sp. ranging from mid-palaeozoic (Devonian) to Mesozoic.
- They dominating during carboniferous.
- End exoskeleton absent.

Class

Sub-class I

Stegocephalia (Extinct)

- Pentadactyls
- 5 km with scales & bony plates

Order (I)

Lyxiopterygia

- Orbits, Stemmythia
- Salamanders & Coacodils like
- Teeth large with palates
- dentary like crossbergeria
- Eg - Eryops



Order

Apoda (Gymnophiona) = caecilians

- ~~limbless~~ limbless, blind, elongated, worm like, burrowing, feigned.
- Tail short or absent
- Claws terminal
- dermal bone in skin.
- limb girdle absent.
- Male have pretearable cephalic organ.
- Eg. Ichthyophis, Ureasthyphlus

Sub Order.

Cryptobranchioidea

- Permanently aquatic
- Adults without eye lids & gills.
- Fertilization external.
- Eg. Cryptobranchus, Megalobrycon.

Ptylopocty

- Small
- Tubular ventral
- Notched 8 spinal
- chord in concretory cavity
- Reduced tear secretor g
- Urodelia & Anura.
- Eg - Bryconichthys

Lepospondyli

- Small, eel like
- Callimedial vertebral
- Neural arch & conchium conchium
- Ribs artificial infer ventrally.
- Ancestry of Apoda
- Eg - Biplocaulus, Lysorhynchus

Cheirodela (caudata)

- ligand like amphibian
- Tetrapod, Tail present, limbs weak.
- Tympanum & teeth absent ear skin
- Gills permanent or lost & adult
- No cephalic organ.
- Larva aquatic, adult -like, with teeth

Anura (salientia)

meander

- Permy axial lens
- Hind limbs absent
- 5 pairs external gills
- No eye lids
- Tarsus with horny covering
- Eg - Siren (mud), Pseudis (toad).

Protela

- Without eye lids, permanent
- 3 pairs external gill & 2 pairs gill slits in adult.
- Skull Caithlegensis
- Tarsus with teeth
- Pseudo salmon, Nectus (mud)

Salamandrioida

- Vertebral opisthocoelous.
- Fertilization external
- Teeth in palate & parotoms
- Eg: Salamandra (Congo eel), Anolis (lizard), Puffin (bird).

Amphystomatoida

- Adults with eye lids
- Vertebral amphicoelous
- Fertilization internal
- Eg - Amphystoma

- Amphibia (= Anura):
- Without tail
 - Hindlimbs adapted for leaping & swimming.
 - Adults without gills, Tympanum present.
 - Skin moist scaleless, Mandible toothless.
 - Ribs absent or reduced
 - Fertilization always external.

On the basis of vertebral Suborder I - Amphicoelous

- vertebral amphicoelous - 9,
- Four subs
- Fertilization internal?
- Eg - Leiopelma, Ascaphus

II - Opisthocaela

- opisthocelous vertebral.
- Ribs free.
- Eg - Alytes (midwife toad), Xenopus

- Anomocaela

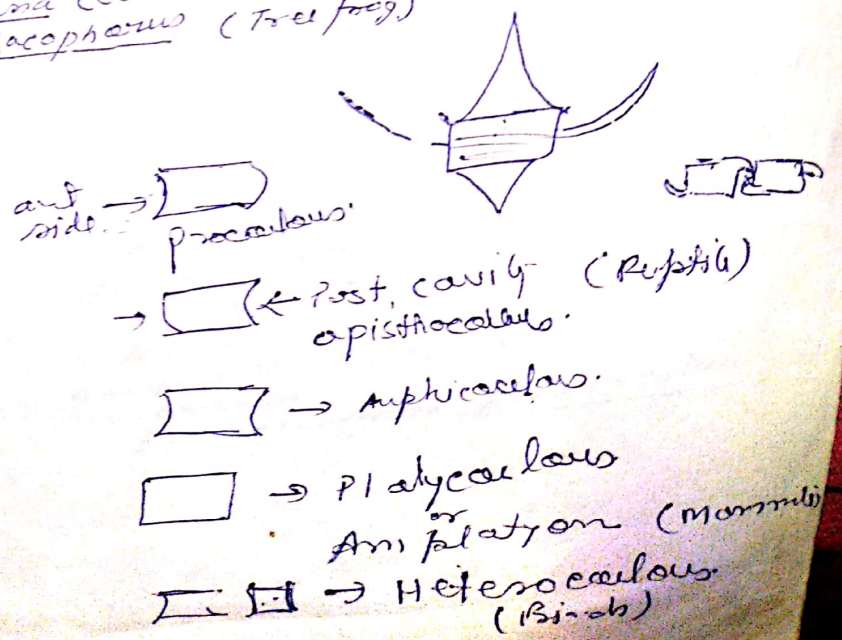
- Procoelous or amphicoelous.
- Ribs absent
- Upper jaw with teeth.

- Procoelata

- Procoelous
- No free ribs.
- Bufo (common toad)
- Hyla (Tree toad)
- Gastrotheca (Marsupial frog)

- Diplasiocaela

- First - 7 - vertebral - procoelous
- 8 - " - Amphicoelous
- 9 - " - convex ant. & bears 2 condyles.
- Pectoral girdle fused to sternum
- Ribs absent
- Eg - Rana (Common frog)
- Rhacophorus (Tree frog)



limbless amphibia :->

- Tropical & sub-tropical regions of America, Africa, Asia, CS. India.
- Burrowing & semi-aquatic.
- Move burrows in moist ground by their strong head.
- In form like, reduced tail, cloaca is terminal.
- Girdle & limbs are absent.
- Dermal scale buried in skin.
- Many (250) vertebrae.
- Reductimentary eye, functionless -> hence called blind worm.
- Sensory tentacles put between eyes & nose by which they can detect their way.
- Protuberant cloaca not in male, so fertilization is external.
- Ichthyophis (♀) shows parental care by curling her body around the egg.
- Larva have three pairs of external gill & a caudal fin.
- Uraeotyphlus (Malabar & Cochin of India) -> Viviparous or Oviparous.
- Typhlonectis (American aquatic form.)

② Salamanders & Newts ->

- Undergo less changes during metamorphosis than frog.
- All possess well developed tail & lateral line system in larval & adult both.
- Limbs weak, mouth with or without teeth.
- Eyelids & tympanum absent.
- Feed on worms, small arthropods & small molluscs.
- Urodela show gradual transition from aquatic to terrestrial life, & divided into two groups.

① Perennibranchs :-

Retain gill, & aquatic throughout life, total neoteny.

② Caudal branches :- ~~two~~

Larva loose gills to become terrestrial adult

I - Perotremata :-

Loose gills, but retain gill slits in adult

- Eg - Amphiuma
- Cryptobranchus

II - Salamandrine :-

Complete absence of branchial organisation.

- Ex - Ambyostoma, Salamandria

Amphiumus
 - Largest caudate, Joint Salamander.
 - No gill slits.

* Cryptobranchus

- Two pairs of limbs are functional with 4 fingers & 5 toes
- No gills but a single gill slits (spiracle) is retained for letting out water during buccal respiration.
- Fertilization external, life - 28 years.

* Amyostoma:-

- Its poisonous skin has saund yellow & orange spots all over the body.
- In Mexico (west USA) larva fail to metamorphose due to lack of water or some hormonal deficiency.
- These larva retain external gills, become sexually mature to produce young ones (paedogenesis)
- These morphologically immature but sexually mature stages are called **Axolotls**.
- On thyroid administration into water, they change into adult.

* Salamandra salamandra

- European fire or spotted salamander.
- Viviparous.
- Gill or Gill slits absent
- male lays sperm in **spermatophore** which is picked up by ♀ with her cloacal lips to fertilize her eggs internally.
- ♀ give birth of larval which complete their development in water.

* Triton

- Indian salamander found in eastern Himalaya.
- Tail is bilaterally compressed & carries a median vertical fin.

* Plethodon - (Lungless Salamander)

- No lung & gill
- Respire by skin & buccal cavity.
- Found in well oxygenated water of mountains.
- **Nasolabial grooves** help in clearing of nostrils of water being flushed out by glandular secretion.
- Male develop a **nectenic gland** on chin during breeding season, which stimulates female during courtship.

* Amphiuma - (Congo eel)

- Rudimentary limbs, with eel like body.
- Adult has no external gills, but lungs & ~~pairs~~ a pair of gill slits present.

Amphiumus:- (Blind Salamander)
- Found in dark, deep limestone caves of Europe & America.
- Permanent neotonic, eel like,
- 3 pairs of sub branched external gills, 2 gill slits.
- Laterally flattened tail with a caudal fin.
- White unpigmented skin & digenated eyes covered by opaque skin. However if the larvae kept in sub light, they develop functional eyes & pigmented skin.
- Tetrapod.

P.N. ★ Necturus maculosus:- (Mud puppy).

- Dorsocentrally flattened body, which laterally compressed with a fin.
- Tetrapod, with 4 digits.
- 3 pairs of fringed external gills, 2 pairs of gill slits.
- Permanent larval, Nocturnal
- Lateral line system well developed.

P.N. ★ Siren lacertina:- (Mud eel)

- Found in marsh or swamp land of North America.
- Permanent Neotonic, eel like body.
- 3 pairs of external gill & 3 pairs of gill slits.
- Teeth, eyelids & hind limb are absent, but small fore limb with 4 digits are present.

Plethodon cinereus:-

FROG & TOADS

- Anurans are the most successful animals of Amphibia.
- 2,200 sp out of 2,500 Amphibia.
- No tail, hind leg adapted for leaping.
- Frog is usually soft skinned & partly aquatic, whereas a toad is harder skinned & more terrestrial.

Ascaphus truei:- American bell toad.

- Cloacal projection present in ♂ is used as copulatory organ for internal fertilization of ♀ eggs.
- Reduced lung.
- Primitive features like - tail muscles, amphicoelous vertebrae, free ribs, abdominal ribs & post cardiac vein are present.

Vertebral ch, Altaic

Alytes obstetricans:- (Mid-wife toad)

- European toad
- Vertical pupil is characteristics
- Non protrusible disc like tongue.
- No teeth in lower jaw.
- Ribs throughout the life.
- No vocal sacs in male, they show parental care by entangling eggs around their hind legs. & staying in damp soil place until tadpoles hatches into water.

Incus laevis

- African clawed toad.
- It lacks tongue, eyelids, and distinct tympanum.
- Teeth in upper jaw.
- Tercle present under each eye.
- Fingers are free but toes are webbed
- It is used as a test in diagnosis of human pregnancy.
- Female does not exhibit parental care.

Pipa americana - (Surinam toad)

- Aquatic toads of N-S America.
- Tongue, teeth & eyelids are absent.
- It's famous for unique method of parental care.
- The larvae do not develop external gills.

Bufo melanostictus:-

- Occur in all continents except Australia.
- They live on land, remain concealed during day, but become active at night when they feed on worms, snail, insects etc.
- Teeth are absent in both jaw.
- A pair of poison-secreting parotid gland present behind each tympanum.

Hyla arborea:- (Tree or arboreal frog)

- Adapted for tree life
- Glandular adhesive disc or pads present on digits which help them to arboreal life.
- Large vocal sacs.

Rhacophorus or *Polypedates* (Flying frog)

- Found in Africa & S-E Asia.
- * Large webs developed between the digits, digits also have adhesive pads or discs.
- Wide & flattened body serve as a parachute in gliding from higher elevation to a lower one, so they are called as flying frog. They can glide upto 9 or more meters from tree to ground.
- Eggs are usually laid in gelatinous form over water, from where tadpoles drop into water.

Astylosternus:- (African hairy frog)

- The male has extensive vascular hair like, filamentous papillae on groin, flanks & digits.
- The filamentous especially during breeding season.
- There are probably suspensatory & compensatory.
- Larvae are poorly developed.

Rana goliath:- Largest frog (African)

Phyllobates:- Smallest frog. found in Cuba.