

General Characteristics and BSCII
Classification: - (Amphibia) ✓

8. AMPHIBIA

8.1 Characters

The primitive amphibians were the first vertebrates to initiate the conquest of land in the Devonian period. They arose from the crossopterygian fishes.

Characteristic Features

1. The integument is moist, glandular and devoid of scales (except Apoda).
2. Two pairs of limbs are present.
3. Limbs are pentadactyle (five-digitated).
4. Paired fins are absent.
5. Paired nostrils are present.
6. The eyelids are movable.
7. Teeth are present in the jaws.
8. The skeleton is mostly bony.
9. The skull possesses two occipital condyles.
10. Ribs, when present, are never attached to the sternum.
11. The heart is three-chambered, with two auricles and a ventricle.
12. RBC are oval and nucleated.
13. Respiration is by means of gills, lungs, integument or the buccal cavity, separately or in combination.
14. Renal portal and hepatic portal systems are well developed.
15. Kidney is mesonephric and urinary ducts open into the cloaca which also receives the genital ducts.
16. A urinary bladder developed from the hind region of the gut is present.
17. There are ten pairs of cranial nerves arising from the brain. The cerebral hemispheres are large but the cerebellum is ill developed.
18. Ova are small and numerous.
19. Fertilization may be external or internal.
20. Cleavage is holoblastic but unequal.
21. Mostly oviparous, i.e., lay eggs.
22. Development is indirect, and usually there is metamorphosis.

- 23 Embryonic membranes are absent.
- 24 They are poikilothermous animals, i.e., the body temperature is variable depending upon the temperature of the environment.
- 25 They lead an amphibious life living both on land and in water (some are permanently aquatic).

11 Classification of Amphibia

The classification of class Amphibia has been a matter of controversy and many authors have classified it differently. Boulenger, Niedeue, Watson, Waller and others have worked extensively on the taxonomy of Amphibia. The scheme of classification as adopted by Noble (1954) is presented here.

12 Outline Classification

Class Amphibia

(A) Extinct Orders

1. Order Labyrinthodontia

Suborder—Embolomeri, e.g., *Palaeogyrius*

Suborder—Rachitomi, e.g., *Eryops*

Suborder—Stereospondyli, e.g., *Cyclortosaurus*

2. Order Phyllospondyli, e.g., *Branchiosaurus*

3. Order Lepospondyli

Suborder—Aistopoda, e.g., *Ophiderpteron*

Suborder—Nectridia, e.g., *Diplocaulus*

Suborder—Adelospondyli, e.g., *Lysorophus*

Suborder—Gastrocentrophori, e.g., *Microbranchus*

(B) Living Orders

4. Order Gymnophiona (Apoda), e.g., *Ichthyophis*

5. Order Urodela (Caudata)

Suborder—Cryptobranchoidea, e.g., *Cryptobranchus*

Suborder—Salamandroidea, e.g., *Amphiuma*, *Desmognathus*

Suborder—Ambystomoidea, e.g., *Ambystoma*

Suborder—Meantes, e.g., *Siren*

Suborder—Proteida, e.g., *Necturus*, *Proteus*

6. Order Salientia (Anura)

Suborder—Amphicoela, e.g., *Liopelma*

Suborder—Opisthocoela, e.g., *Pipa*, *Alytes*

Suborder—Procoela, e.g., *Hyla*, *Bufo*

Suborder—Anomocoela, e.g., *Scaphopus*

Suborder—Diplaslocoela, e.g., *Rana*, *Rhacophorus*

8.4 Extinct Orders

Order 1. Labyrinthodontia

(i) Extinct salamander-like forms (ii) Skull heavily armoured (iii) Large teeth with greatly folded dentine (iv) Girdles were strong. Pelvic girdle V-shaped and pectoral girdle U-shaped (v) From Carboniferous to Triassic

Example *Eryops*

Order 2. Phyllospandyli

(i) Small net-like amphibians (ii) Vertebrae tubular (iii) Neural cord and notochord lie in the same common cavity. (iv) Well-developed transverse processes like ribs, but true ribs absent (v) From the Carboniferous to the Permian. Example *Ichthyostega* and *Branchiosaurus*

Order 3. Lepospondyli

(i) Extinct forms from the Lower Carboniferous to the Permian (ii) Vertebrae composed of a single piece (iii) Neural arch fused with the centrum (iv) Ribs articulated with the vertebral column intervertebrally Example *Lysorophus* and *Diplocaulus*

8.5 Living Orders

Order 4. Gymnophiona (Apoda)

- (i) Living limbless amphibians found in tropical countries with burrowing habit
- (ii) Body elongated and worm-like with ring-like grooves
- (iii) Tail short or absent
- (iv) Anus is subterminal.
- (v) The skin contains concealed calcified scales.
- (vi) Vertebrae are amphicoelous.
- (vii) Girdles are absent.
- (viii) Head bears a sensory minute protrusible tentacle.
- (ix) Lidless eyes are covered with opaque skin and are nonfunctional.
- (x) Males have a copulatory organ.
- (xi) Some lay eggs; others are viviparous.

Example *Siphonops*, *Ichthyophis* and *Typhlonectes*

Order 5. Urodela (Caudata)

- (i) Includes all tailed amphibians
- (ii) Body divisible into head, trunk and tail

Amphibia

- (iii) Limbs are of equal size and weakly developed. Sometimes hind limbs are absent.
- (iv) The larvae and aquatic adults have lateral line system.
- (v) Vertebrae opisthocoelous or amphicoelous. Vertebral column long
- (vi) Some retain external gills and are aquatic.
- (vii) Exhibit neoteny
- (viii) Fertilization is internal.

Urodele has five suborders as follows:

Suborder (i) Cryptobranchoidea

- (i) Body flat with fleshy folds on sides (ii) Eyelids absent (iii) Permanently aquatic

Example *Hynobius*, *Megalobatrachus*, *Cryptobranchus*

Suborder (ii) Salamandroidea

- (i) Body lizard-like (ii) Gills absent in adult

Example *Salamandra* and *Triturus*

Suborder (iii) Ambystomoidea

- (i) Adults terrestrial (ii) Two pairs of well-developed limbs

Example *Ambystoma* and *Dicamptodon*

Suborder (iv) Meantes

- (i) Body slender (ii) Hind limbs absent (iii) Aquatic

Example *Siren* and *Pseudobranchus*

Suborder (v) Proteida

- (i) Permanently aquatic with 3 pairs of external gills (ii) Tail with fins

Example *Necturus* and *Proteus*

Order 6. Salientia (Anura)

- (i) Head and trunk fused, neck absent
 - (ii) Tail absent in adult
 - (iii) Forelimbs short, hind limbs long
 - (iv) Vertebral column short
 - (v) Gills or gill slits absent in the adult
 - (vi) Respiration pulmonary, cutaneous or buccal
 - (vii) Fertilization external, development through metamorphosis
- Order Salientia is divided into five suborders.

Suborder (i) Amphicoela

(i) Vertebrae with amphicoelous centrum

Example *Liopelma*

Suborder (ii) Opisthocoela

(i) Vertebrae typically opisthocoelous (ii) Ribs free

Example *Alytes, Pipa*

Suborder (iii) Procoela

(i) Vertebrae procoelous and Urostyle with double condyles

Example *Bufo, Hyla*

Suborder (iv) Anomocoela

(i) Sacral vertebrae procoelous (ii) Pre-sacral vertebrae eight, either procoelous or with free inter-vertebral discs

Example *Pelobates* and *Scaphiopus*

Suborder (v) Diplaslocoela

(i) First seven vertebrae procoelous, 8th vertebra biconcave and 9th vertebra convex anteriorly with a double condyle posteriorly (ii) Ribs absent

Example *Rana* and *Rhacophorus*