

UNIT – 5

INTRODUCTION TO CLASS AMPHIBIA

1. Salient features of Class – Amphibia

2. Introduction to

i. Order Apoda – Ichthyophis, Urota Salamandra (Salmander) and

ii. Order Anura-Rana

3. Parental care in Amphibia

The term Amphibia is Greek word (Gr. amphi - two, bios- life). These are the first vertebrates which come out from water. These are the lowest and the earliest tetrapods, come on the land and possess two pairs of limbs, cornified skin and bony skeleton. The name amphibian can lead dual mode of life on land as well as in water. Body becomes modified to travel on land while retaining the capacity to swim. Instead of paired fins paired limbs develop.

Salient features of Class - Amphibia:

1. Amphibians are aquatic, only fresh water as well as terrestrial or both.
2. They are cold blooded animals.
3. Body is divisible into head, neck, trunk and tail. Neck and tail may be present or absent.
4. Skin is thin, moist and glandular. Pigment cells (chromatophores present. Scales are absent on the skin.
5. Most amphibians have two pairs of pentadactyle limbs with 45 digits. In some forms limbs are absent. Digits are without claws or nails, but webs may be present in between the digits.
6. Endoskeleton mostly bony.
7. Notochord does not persist.
8. Alimentary canal opens into cloaca. Mouth is armed with jaws having small teeth.

9. Heart is three chambered. There is a double circulation through the heart.
10. Respiration by lungs, skin and mouth lining. Larvae with external gills which may persist in some aquatic adults.
11. Kidneys mesonephric, urinary bladder is large. Urinary ducts open into cloaca.
12. Brain is well developed. Ten pairs of cranial nerves are present.
13. Sexes are separate, fertilization mostly external.
14. Females are mostly oviparous.
15. Development is indirect.

Introduction to order Apoda, Urodela and Anura:

Modern Amphibians belong to three orders namely

- a. Apoda
- b. Urodela
- c. Anura

Order Apoda:

- Apodans are burrowing limbless amphibians living in the tropics.
- They show several interesting primitive features including the retentions of small scales on the skin.
- They are specialized, however, in having very short tail and some features suited to their terrestrial life, such as copulatory organs, Animals are blind.
- Special sensory tentacles take the place of the eyes.
- Eggs are large and yolky and cleavage is meroblastic.
- Eggs are laid on land and the embryos develop al around yolk sac.
- Viviparity is common in the aquatic forms.

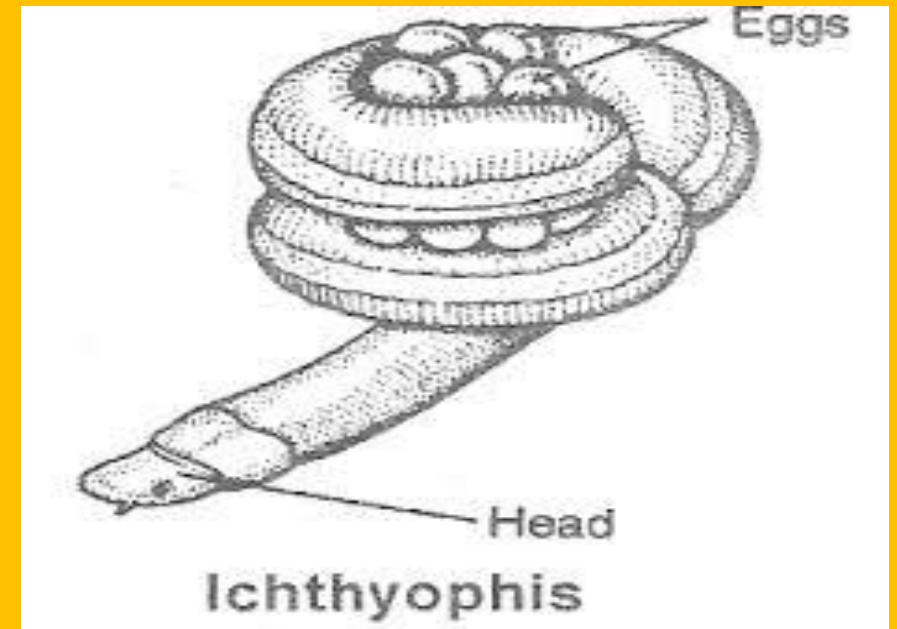
Characteristics of Apoda:

1. They are limbless, blind, elongated, burrowing tropical amphibians.
2. They are terrestrial in the adult stage.
3. Limbs are absent. Tail is short or absent, cloaca terminal.
4. Body is divisible into head and trunk.
5. The skin is provided with numerous transverse grooves or wrinkles.
6. Copulatory organs are present in male.

e.g. *Ichthyophis*, *Unaçotyphlus*, *Rhinatrema*



e.g. Ichthyophis



Order Urodela:

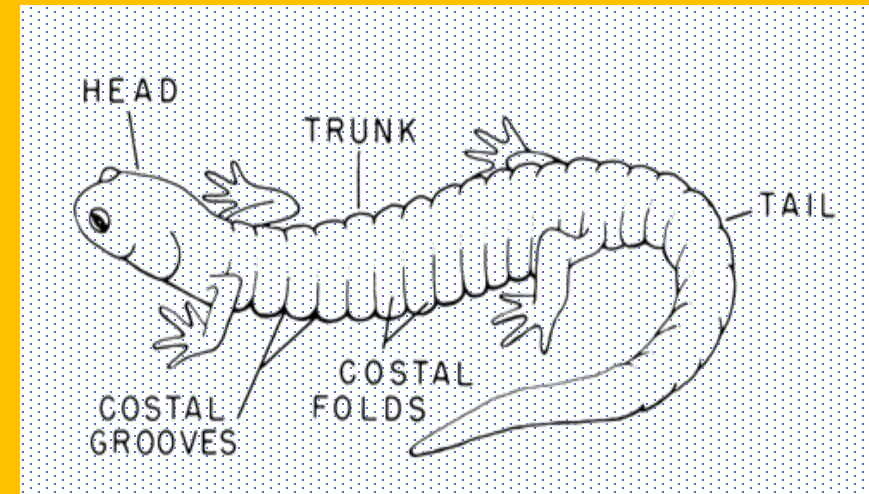
Urodels are called tailed amphibians. They possess four limbs of relatively equal size, except of the Sirens, which lack hind limbs. Number of urodels stay in aquatic life and have external gills.

1. Body is divisible into head, trunk and tail.
2. Tail is useful for locomotion on land and in water.
3. Limbs are two pair, usually weak and almost equal in size.
4. Skin is scale less.
5. Gills are permanent or lost in adult.
6. Males are without copulatory organs.
7. Larvae are aquatic, adult like, with teeth

e.g. *Necturus*, *Proteus*, *Siren*, *Salamander*



Fig. 5.2 Salamander



Order Anura:

Anurans are tail-less amphibians. It mainly includes frogs and toads. The hind limbs of these amphibians are always longer than fore limbs. The smooth skinned are commonly known as frog and warty skinned are known as toads.

1. Body is short and compressed divisible into head and trunk.
2. Tail is absent in adult.
3. Hind limbs and forelimbs are present but hind limbs are long.
4. Adults are without gill.
5. Skin is loosely fitted and scales less,
6. Vocal sacs are present.
7. They are oviparous, fertilization is external.

e.g. Pipa, Frog, Hyla, Rhacophorus



Parental Care in Amphibia:

- Looking after the eggs or the young until they are independent to defend from predators is known as 'parental care'.
- The amphibians are aquatic as well as terrestrial, so they exhibit a great diversity in carrying for their eggs and young ones for their development.
- The amphibian eggs are rather small and without protective membranes or shell.
- The newly hatched embryo is also very small and has to find its own food in water for its further development.
- Since all the amphibians lay eggs in water, the eggs are always exposed to many dangers of being eaten away by aquatic animals inhabiting such areas.
- Taking care of eggs and maintenance of young ones which later develops into adults. The eggs are looked after by both males and females.

Methods of Parental Care

1. Protection by men of nests, nurseries, or shelters and
2. Direct caring or nursing by parents.

Order - Anura

I. Protection by means of nests or nurseries:

Here the parents construct the nest or nurseries for protecting the eggs and larvae.

(a) Mud nests

- A large frog (*Hyla faber*) known in Brazil as the “Ferreiro”, protects its progeny by building basin-shaped nest or nursery in shallow water on the border of the pond.
- The females scoop mud to a depth of 7.5 to 10 cm. With the help of scooped mud, a circular wall is built around the nest, which emerges above the surface of the water.
- The inside wall is smoothed by the flattened webbed hands and the bottom is also leveled by belly and hands. The eggs and early larvae are, thus, protected from predators (insects, fishes etc.) until they can defend themselves. Heavy rains later destroy the wall and larvae go to the water.

b) Foam Nests:

- A better mode of protecting the offspring during the early stages of development has been adopted by Japanese tree frog (*Rhacophors schlegelii*).
- The male and female make a hole for chamber, a few centimeters above water level. The walls of this chamber are polished.
- The female produces a secretion from cloaca which is beaten into froth.
- The eggs are deposited into the froth.
- After hatching the tadpoles reach the water to complete the development.



c) Nest on Trees:

- The South American tree frog, *Phyllomedusa hypochondrales*, lays eggs in a folded leaf nest with margins glued together by cloacal secretion.
- The tadpoles after hatching fall straight into water below.
- Another tree frog *Hyla resinifictrix*, lines a shallow tree cavity with bee wax obtained from hives of certain stingless bees.
- When this cavity is filled with rain water, females lay eggs in. This nest is relatively free from predators.



(d) Direct development:

- In some tree frogs such as *Hylodes* and *nebulosa* the eggs are laid in a nest made of dry. The metamorphosis is completed within the eggs and tiny adults emerge out from eggs, were beings no larval stage.



II. Direct caring by parents:

(a) Transferring tadpoles by males:

- Some species of small frogs e.g. *Phylllobates* and *Dendrobates* of South America deposit their eggs on ground.
- The tadpoles hatching out attach themselves to the back of one of the parents by means of their sucker – like lips and flattened abdomen.
- Thus they are carried from one place to the other and in this way they can even go from one pool to the other and this is particularly when one pond is to dry up.



(b) Eggs carried by the male round the legs:

- In the European midwife toad *Alytes obstetricans*, the male carries the eggs with its limbs, especially hind limbs.
- The eggs are held together by an elongated gelatinous filament. When the eggs are ready to hatch the male enters into the water.



(c) On the back of female:

- In Brazilian tree frog *Hyla goeldi* the female carries the eggs on her back.
- The eggs are placed by the male on the back skin of the female extended into narrow folds. The eggs remain exposed.



(d) Eggs carried in brooding pouches:

- In *Pipa Americana* the eggs are carried on the back of the mother. In breeding season, the back skin of female becomes thick, soft, spongy and vascular.
- The male presses fertilized eggs against female's back, where they sink into tiny individual pits.
- Each egg sinks into a small pouch, over which develops an operculum.
- There are about 100 eggs which develop in these pouches. Complete metamorphosis occurs within these pouches. The tiny toads emerge out about eighty days after egg-deposition.



(e) Eggs carried by female on her belly:

In case of the Ceylonese *Rhacophorus reticulatus* the female carries eggs on her belly, which bears shallow impressions.

(i) Eggs carried in the mouth:

The male of the terrestrial South American Darwin's frog, *Rhinoderma darwini*, takes two fertilized eggs into his large vocal sacs, where they undergo complete development and emerge out as fully developed froglets.

In West African tree frog, *Hylambates breviceps*, the female carries the eggs in her buccal cavity. The eggs are large few in number.

(g) Viviparity:

Some anurans are viviparous. They retain eggs in the oviducts and the female gives birth to living young. E.g.: *Nectophrynoidea* and *Pseudophryne*.



Order – Urodela

- In Urodela, the fertilization is internal and so a least care of progeny is taken.
- Both the types of protection are shown.

1. Protection by means of nests:

(a) In the holes on land or in trees:

- The *Autodox* female lays her eggs in a dry hole on the ground or in a hole on tree.
- Either male or female remain in the hole during the development period to provide moisture and suitable temperature.
- The young ones also remain in the hole for a long period with its parents.

(b) In gelatinous bag in water:

- *Salamandrella keyserlingi*, a small aquatic salamander deposits 50 to 60 small eggs in a gelatinous bag which is attached at one end to aquatic plant just below the water level.
- The larvae when hatched drop down into the water.

II. Direct caring by parents:

(a) Mother coils around the eggs:

- In congo eel *Amphiuma*, the female lays large eggs in burrows in damp soil and carefully guard them by coiling her body around them until they hatch.
- In *Plethodon* (Salamander), the eggs are laid in small packages of about five, beneath the stones and the mothers coil round them till they are hatched.

(b) Mother carries the eggs on her back or round the legs:

- In the dusky salamander, *Desmognathus fuscus*, female carries the string of eggs coiled around her neck, until they are hatched.

(c) Viviparity:

- Salamanders copulate on land and several months later, the female goes to the water and give birth to the young's with forelimbs developed.
- The alpine salamander *Salanmandra atra* gives birth to one or two fully developed young.

Order – Apoda

- In this group fertilization is internal.
- The breeding habits of *Ichthyophis* show the remarkable parental care.
- The female digs a hole close to the surface in a damp soil near water.
- The eggs are deposited there, which are strung together by a mass of thread containing many twisted vitelline membranes round which the mother coils with its snake like body.
- When the eggs are ready to hatch, female takes them to shallow water.



Q.1 Multiple Choice Questions:

1) Which is limbless amphibian

- a. Alytes b. Hyla c. Ichthyophis d. Phyllomedusa

2) Midwife toad is another name for

- a. Alytes b. Hyla c. Rhacophorus d. Rhinoderma

3) Tailed Amphibian belongs to the order

- a. Apoda b. Anura c. Tetrapoda d. Urodela

4) Lack of tail & paired appendages are the characteristics features of order.

- a. Apoda b. Anura c. Tetrapoda d. Urodela

5) Hyla faber (tree frog.) Protects its progeny by building

- a. Mud nest b. Foam nest c. Nest on tree d. None of these

6) Heart of Amphibia is

- a. Two chambered b. Three chambered c. Four chambered d. None of these

7) Respiration in Amphibians is through

- a. Lung b. Skin c. Mouth lining d. All of these

8) Which of the following is example of Order Apoda.

- a. Ichthyophis b. Uraeotyphlus c. Rhonatrema d. All of these

9) Salamander belongs to the order

- a. Apoda b. Anura c. Tetrapoda d. Urodela

10) Which of the following Amphibian shows parental care by direct carrying eggs.

- a. Eel b. Salamander c. Both a&b d. None of these

Q. 2 Define or explain in on sentence:

- a. Parental care b. Amphibia c. Apoda

Q. 3 Give any two examples of:

- a. Anura b. Eurodela c. Apoda

Q. 4 Write short notes on:

- a. Gives salient feature of order Anura.
- b. Gives salient feature of order Apoda.
- c. Gives salient feature of order Urodela.
- d. Describe parental care in Order Eurodela.

Q.5 Write Essay type Answer:

- a. Give the distinguishing characters of Class Amphibia. Give names of orders with two examples.
- b. What is parental care? Give an account Parental care in Amphibia.