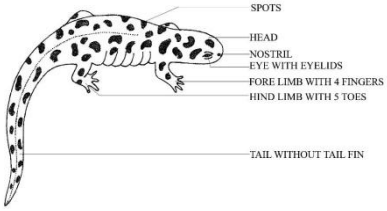
ADAPTIVE FEATURES OF ANURA, URODELA AND APODA

Adaptation is the ability to adapt to the environment. Among the vertebrates, amphibians are the first group to leave aquatic life and enter terrestrial life. They have adapted to different environments for food, shelter and security. Adaptive dispersal of Anurans, Urodela and Apoda members has occurred extensively and displays following adaptations.

TERRESTRIAL ADAPTATION

i. Most **Anurans** and some **Urodeles** adapt very well to terrestrial environments.
ii. Many salamanders in the Urodela group are terrestrial, but return to the water during the time of egg laying.
iii. They live under rocks or under wooden logs or hide under rocks near corners.
iv. They do not have gills, the tail is cylindrical. They are wingless.
v. An excellent example of such an amphibian is the **Tiger salamander** (*Ambystoma tigrinum*).



vi. Some Salamanders are completely terrestrial.
vii. They do not need an aquatic environment for breeding.
viii. They give birth to offspring and fertilization occurs in the ovaries.
ix. **Anurans** are more advanced amphibians with special characteristics than Urodele.
x. Although the **frog** is terrestrial in adulthood, it sometimes lives in aquatic environments.
xi. However, the **toad** never returns to the water except during the time of egg laying.
xii. Some adaptations have been developed to allow less water to be released from the body to adapt to terrestrial environments.

Notable terrestrial adaptations of amphibians are as follows:

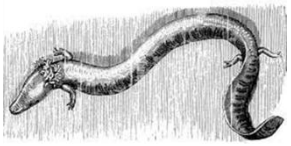
- **Wart/Mole** present on skin helps prevent water evaporation
- They have been suitable for jumping because the hind arm is long.
- Moving to the ground has been facilitated by the growth of strong muscles.
- It has become easier for them to jump because their vertebral column is shorter.
- The lungs have appeared to adapt to aerial respiration.

CAVE ADAPTATION

Cave-dwelling adaptations are developed to prevent lack of light and food. Some of the Salamanders among amphibians live permanently in caves. These include **Proteus** and **Tiphlotriton**. Due to the adaptation of the cave dwellers, some of their limbs have become extinct. The structural changes are mentioned below:

- The body is slender, long and cylindrical.
- Arm are reduced.
- Eyes worn out or missing.
- The skin is supple, free of pigments
- The external gills remaining.

The species **Proteus anguius** lives in dark caves in Austria and Germany. Their eyes are opaque. They are blind because their eyes are covered by skin.



BURROWING ADAPTATION

i. The caecilians of the **Apoda** order are mainly accustomed to burrowing adaptation.
ii. Their bodies are long, cylindrical and worm-like.
iii. They have no arms or girdles.
iv. Their eyes are inactive and blind due to live in the dark environment of the cave.

v. **Sensory tentacles** located near the eyes and nostrils give them guidance in living.
vi. ***Ichthyophis*** is a significant burrowing living amphibian.
vii. They are found in India and Sri Lanka.
viii. They live in wetland holes near ponds.
ix. They do not come to the ground often.
x. After laying the eggs, the female member patches the eggs and guards them.
xi. Tadpole larvae emerge from the eggs.
xii. The larvae have a flattened tail with three pairs of external gills, a pair of gill openings and a caudal fin.
xiii. The larvae's eyes are much better than the full-grown ones.
xiv. However, the gills, gill openings and tail are destroyed during the development.
xv. These changes are very adaptive to the transition from aquatic environment to terrestrial life.

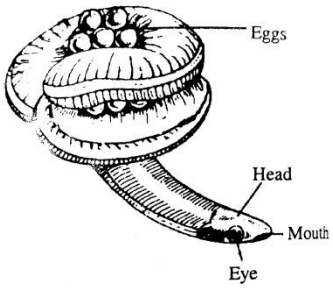


Fig. *Ichthyophis*

ARBOREAL ADAPTATION

i. Some amphibians have chosen arboreal life for easy access to food and safe shelter.
ii. ***Hyla arborea*** is a notable arboreal frog belonging to the order Anura.
iii. They have developed **sucking discs** on the toes to live in the trees.
iv. The surface of the suction disc is uneven due to adhesion.
v. And adhesive substance is secreted from the glandular skin of the suction disc.

VOLANT ADAPTATION

i. ***Rhaccophorus*** is the volant amphibian.
ii. However, they do not complete the actual flight, they can only glide from one tree to another.

iii. Their fingers look like parachutes in a wide position as they are joined by webfeet.
iv. In order to live on land, amphibians have developed arms and lungs to complete aerial respiration.
v. But aquatic environment is more suitable for them for excretion and reproduction.
vi. Like fish, they lay their eggs in water and development also occurs in water. They live like fish in larval stages.
vii. So, it can be said that they are trying to adapt to land with some features that are suitable for living in aquatic ecosystem.

AQUATIC ADAPTATION

Aquatic adaptation was observed in **Newts** and **Salamanders.**

i. Their bodies resemble eels
ii. The gill of larval stage survives up to adult stage for respiration and the lungs are severely reduced.
iii. The development of the branchial circulatory system has developed
iv. The origin of fins occurred on the trunk and tail
v. The skull has acquired a slightly bony condition

Some examples accustomed to aquatic adaptation are

a. Amphiuma
b. Siren
c. Proteus and
d. Necturus

Amphiuma has a very long body and very short legs.

The larval features are fully observed in the **Siren** and their hind arms are destroyed.

The bodies of the **Proteus** are boat-shaped with both external gill and gill opening present in their bodies, and skin respiration occurs.

Necturus contains external gill.