

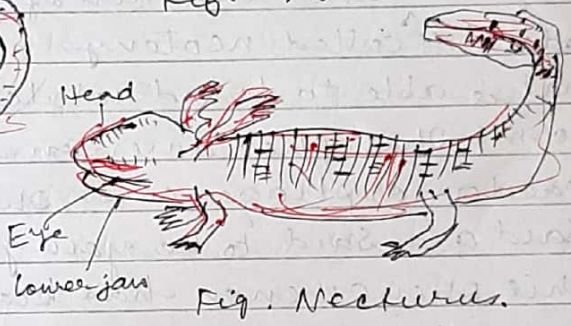
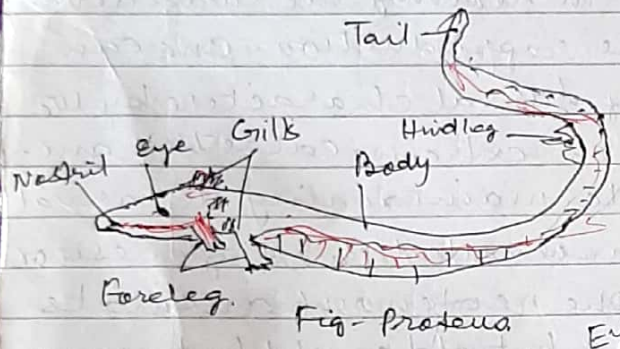
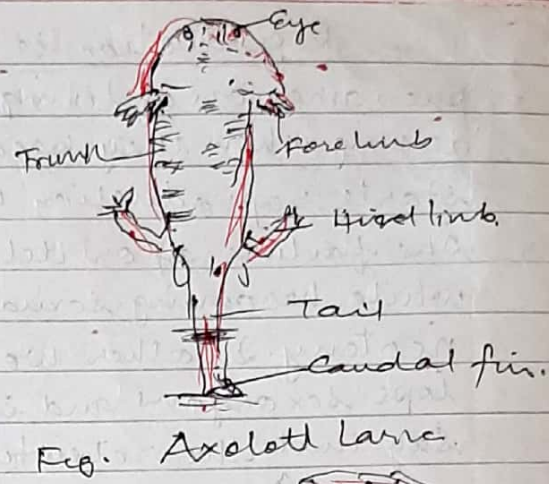
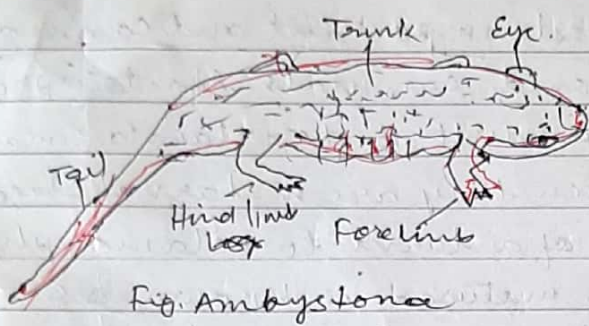
# NEOTENY

Reproduction is most important and common phenomenon of living world. Animals start reproducing when they become adult. But certain animals start reproduction when they are in larval stage. The failure or delay of a larva to metamorphose while becoming sexually matured is known as neoteny. In other words in neoteny the larva develops sex organs and starts reproduction. One can say that the retention of larval characters by the adult is called neoteny. In extreme cases the animal is able to breed while maintaining its larval forms. This phenomenon is called Paedogenesis or paedomorphogenesis. The neoteny animals are said to be young but old or old but young. This phenomenon has been observed in amphibians, both in urodele and Anura. In urodeles this phenomenon is of common occurrence and very conspicuous.

It has long been observed that the larva of spotted salamander sometimes attain the size of 80 mm, while the majority metamorphose when they measure 40 mm. Larva of Triton have been observed with fully developed sexual organs while still possessing functional gills. De Filippi (1861) also reported occurrence of specimens which were sexually mature but still retain their gills. Dumeril (1876) observed that Mexican gill breathing axolotl would metamorphose into lung-breathing terrestrial Ambystoma led to a series of observation and experiments by Marie von Chauvin, Koelliker, Camerano (1896) and many others.

The term neoteny was coined by Kollmann in 1882, for phenomenon of retention of larval characters beyond the normal period and attainment of sexual maturity.

# NEOTENY



## Types of Neoteny:

Neoteny may be of different degree in different forms. Three types of neoteny have been recognised.

### ① Partial Neoteny:

In partial neoteny the larva attains sexual maturity but it does not breed. Here the metamorphosis is postponed. Eg Tadpole of anura amphibians like Bufo vulgaris, Nyla arborea, Rana temporaria, Rana esculenta etc. The tadpole of midwife toad and the tadpoles of edible green frog can reach extra-ordinary lengths and sexual maturity but never acquired the faculty to reproduce.

### ② Facultative neoteny:

In some cases neoteny is observed only optional. Sometimes the animal may undergo metamorphosis losing all its larval characters if suitable conditions are provided. eg. Axolotl.

### ③ Permanent neoteny:

In permanent neoteny the adult type displaces larval characters. The larval characters include gills.

characters include gills, forelimbs and rudimentary eyes. Ex. Protus, Neotenes, Siren etc.

④ Artificial neoteny: The neoteny produced in the laboratory by preventing metamorphosis is called artificial neoteny. Artificial neoteny is induced by removing the pituitary gland or thyroid gland or <sup>by</sup> keeping the animal to chemical with anti-~~hypert~~ pituitary effect. By this method giant larvae can be obtained. Ex. ~~Toads~~ Toads, frogs etc.

### Factors Causing Neoteny:

When the metamorphosis is prevented, the larva becomes neotenic. Following factors prevent metamorphosis and cause neoteny.

#### ① External factors:

According to some authorities the phenomenon of neoteny is the result of adaptation to the surroundings which make it advantageous for the animal to retain its larval features. Presence of abundant food and other favourable conditions in aquatic habitat may be the cause of this phenomenon (Gadow) 1903. Weismann tried to explain neoteny as cause of reversion. His assumption that all the amphibia were originally gill breathing, aquatic and limbless animals and that the larva reflects the ancestral phylogenetic stage is not tenable. Others believe that the environmental physical factors somehow or other retard metamorphosis. Lack of adequate food supply, rise in temperature and ~~or~~ drying up of water bodies may be responsible of the retardation of metamorphosis. Experiment on the effect of temperature on metamorphosis (Huxley 1928) showed that larvae exposed to temperature range above the 5°C could

metamorphose quickly, while those exposed to temperature range below  $5^{\circ}\text{C}$  failure to metamorphose. In both cases the level of thyroxine concentration was the same.

External physical factors on metamorphosis do not provide any basis to conclude that they are the sole factors for neoteny.

### Internal factors

It has been shown experimentally that a gilled axolotl may change into a form without gills. It has also been experimentally shown that injection of thyroid hormone (thyroxine) or implantation of iodine crystals beneath the skin induced metamorphosis. On the basis of recent researches it has been revealed that the metamorphosis is mainly influenced by the level of thyroxine. In this connection it has been established that prolactin plays an effective role in metamorphosis as its level is high in early stage prior to metamorphosis.

### Significance of Neoteny:

De Beer was of the opinion that neoteny is a common evolutionary process. Weismann considered neoteny as a case of atavism. He assumed that originally amphibians were gill breathing aquatic and limbless and larval features indicate ancestral phylogenetic stage.

Neotenic forms with external gills and sexually matured conditions were considered to be most primitive living amphibians. But now it is believed to be the result of secondary and relatively recent adaptive modification in their embryonic and aquatic larval stage. Thus conclusion may be drawn that the presence of gills in adult amphibians is a secondary specialized feature and not an atavistic feature.

