Prof ANIL KUMAR (zoology)

B.Sc HONS Part II Paper III

TOPIC :- essay on Neoteny in Amphibia.

Prof ANIL KUMAR
Associate Professor (Zoology)
R.R.S College MOKAMA (P.P.U)

**Q. Write an essay on Neoteny in Amphibia.**

**Ans.** Reproduction is a characteristic of the adult. But there are instances in the animal world where is young become precious and start reproducing at pre-adult phase. The phenomenon of attainment of sexual matruity leading to reproduction in larval stage pre-adult stage) is called paedogenesis or Neoteny (Coined by kollowann). It is essentially a process of retardation of metamorphosis of larval into adults and the retention of larval characters (psodo-morphosis) beyond the normal limited span of time. Such precocious children are not commonly found in different groups of animals. Some amphibians, specially the urodeles furnish the illustrative

examples of such precocious children. The urodeles are so to say "young but old" or "old but young". Morphologically they retain the larval features but physiologically they are sexually mature.

Kollwann classified neoteny into two categories, which are as yollows.

**1. Partial Neoteny**–Partial neoteny involves the simple postponment of metamorphosis beyond the normal period. Retardation of metamorphosis may be ude to temporary change in ecological condition or due to sudden physiological abnormaly. Wintering of the tadpoles of pelobates fuscus, Hyla arborea, But vulgaris, Rana temporaria, Rana esculenta and many others furnish the typical examples of partial neoteay.

In Alytes the brood usually complete their development within autumn. But the larval which hatched in the months of July or August usually hibernate and retain their larval features up to the next autumn. Majority of the larval remain in this sluggish stage for one or two years after which metamorphosis takes place.

**2. Total neoteny**–In this category the specimens become sexually mature at the larval stage but retain larval characters, like (i) external gills, (ii) tail fin (ii) ill developed eyes, (iv) ill developed fin on the back and (v) very weak limbs. Total neotenic animals are paedogenic. Because paedogenesis involves the capability of reproduction at the tarval stage. In this case of total neoteny the sexually functional larval cease to Metamorphosis.

Total neoteny is seen in many urodele e.g. Mecturus, Amphituma, Triton, vulgaris Ambystoma, Sirch, etc. The phenomon of neoteny has been extensively studied in case of Ambystoma which however, does not show an exolotl, larval of Ambystoma can metamorphose into adult Ambystoma under favourable conditions. Each axolotle larva possesses three of gill-slits, a flat long tail with prominent tail fin. The axolotle larval possess the power of regeneration. Chauvin has experimentally shown that both accidental or experimental damaging of the gill is followed by quick healing without affecting the process of metamorphosis. The axolotl larvel become sexually mature when they attain the age of 6 months only. It has been recorded by Metadorff that the sexually mature axolotle breed during. December of April to June.

The significance and cause of neoteny in Amphibians are not properly understood. Several extrinsic and intrinsic factors are considered to be responsible for such unusual phenomen.

**Extrinsic factors influencing neoteny**–Gadow (1903) advanced the idea that the cause of retention of larval features in axolotl is the abundance of food and other favourable requisites in aquatic life. Shufeldt hotches that deep water and coldness inhibit thyroxine secretion which ecfards metamorphosis. Drying up of swamps, lach of adequate food supply and rise in temperature in surrounding water induce metamorphosis. Weissmann again claimed that the retardation of metanorphosis of the axolotle is possible due to the saline nature of the water of the lakes where they live.

**Intrinsic factors influencing neoteny**–Recent rescarches incline to reveal that the metamorphosis is primarily influenced (i) by varying threshhold levels of thyroxin and its analogs and (ii) by the degree of responsiveness of the larval tissues to hormones.

During early premetamorphic stage in Amphibian development, the level of thyroxine is kept very low in the body in by genetic mechanism (Etkin 1968). Etkin and his collabrators have also established the role of prolactin on metamorphosis. They have shown that the level of prolactin which acts as an in hibitor in the over all control of metamorphosis, remains high at this time. In the light of modern genetics it may be suggested that the structural genes guiding the synthesis of thyroxine are switched off by some operator genes where as the genes guiding the formation of prolactin are 'switched on'. IN such condition of hypothalamus becomes sensitive to the available level of thyroid harmone in the blood stream. The neurosecretory apparatus of the hypothalamus produces substance called thyrotropinrealasing factor (T.R.F.) T.R.F. stimulates the anterior lobe of pituitary to produce thyroid stimulating harmone (T.S.H.) which is turn on hances the rate of thyroid secnetion. As the level of T.S.H. rises during prometamorphosis. The level of prolactin suddenly falls. So the metamorphosis slart. The times of shift in harmone balance is possible determined by the initiation of positive thyroid feed back to the hypothalamus poor secretion of the harmone are responsible for neoteny.

**Conclusion**–Neoteny is looked upon as a consequence of adaptation to neighbouring environments where retention of larval gills and other larval features may be advantageous. Noble (1754) regarded that the retention of larval featurity has nothing to do in the phylogeny of the amphibians.