* CHAPTER - I *

* INTRODUCTION *

I. INTRODUCTION

Frog is commonly studied as a vertebrate type in educational institutions all over the world. However, of recently, the frog has in addition become a commercially important animal. Froglegs is a table-delicacy in foreign countries, especially U.S.A. and France, and this is an item earning valuable foreign exchange for India. According to Jhingran (1975) the export of frozen froglegs from India to foreign countries is worth millions of rupees, the maximum so far being worth rupees 32.8 million in 1970. Frog is also considered valuable as a controllar of rice pests. However, indiscriminate catching of frogs for export as well as for experimental purposes in zoological studies has resulted in the depletion of frog-wealth in India, and this has necessiated measures to conserve frogs. One important measure to compensate this depletion of frogs can, however, be to culture frogs on a large scale in future. It appears, therefore, that the frog has great potentialities as a culturable species.

In India, Rana tigrina is a commenly found species of frog and therefore it was selected for the present investigation. From the point of view of the possibilites of its culture it was thought that it should be subjected to the same kinds of studies as the other commercially

important animals like the farm-mammals and the fishes. In these animals, investigators have considered that the determination of adequate diets for their maintenance and better growth is an important aspect. A similar study is thus necessary now on Rana tigrina also.

The species tigrina is characterised by a strong cutaneous fringe along the outer side of fifth toe, the skin of the back is thrown into longitudinal folds, and a strong fold marks the upper broder of the tympanum. The colour above is in general olive green, with dark spots, and often with a light vertebral line. The under parts are white (Gadow, 1901).

Most of the investimations on the food of frogs have been restricted so far to observations on the gut-contents. Thus Liu & Chen (1932) studied the gut contents of Rana limnocharis and Rana nigromaculata. Cott (1936) and Smith (1949) studied the gut contents of Rana temporaria. As far as the species Rana tigrina, which is being studied in the present work, is concerned, a review of literature on its food in the text books on vertebrate zoology shows that the species is carnivorous with a greater bias towards insects and is usually considered as insectivorous. The list of food-items on which it feeds consists of insects, earth worms, spiders, snails, crabs and some times even young frogs and fishes. Wadekar (1963) observed during the study of gut contents of Rana tigrina that it

prefers live moving animals chiefly insects as food. No special selection of food-items is seen, the type & the number of prey caught depends on the availability of these insects during certain seasons rather than any particular preference. He studied gut-contents of frogs collected from a pond on the outskirts of the Baroda city. The list of food-items found in the study includes earwigs, beetles, bugs, ants, butterflies from among the insects, and in addition sometimes young frogs. Rarely mice, birds and Geckos were also taken. Kharat S.B. Manjarekar M.D. Dumbare R.B. and Dalvi C.S. (1983) studied the gut contents of the specimens of Rana tigrina collected from rice fields and found that they consume land crabs, rice-skippers, rice-earhead bugs, stem-borer moths and rice grasshoppers which are all pests of rice crop.

The study of gut contents, however, indicates only what the animal eats and not necessarily what it digests. However, proper maintenance and growth of frogs will necessiate food-items which are highly digestible and such food-items must be provided. To find out what such food-items are, investigators, incase of farm mammals and fishes, when faced with similar problem studied rate of passage and digestibility of different food-items for the species concerned. Thus Ewing and Smith (1917) studied rate of passage and digestibility of foods in the steer, while Balch (1951) and Blaxter

et al. (1956) made similar studies incase of cow and sheep, respectively. Like the farm animals, fishes being commercially important, a study of rate of passage and digestibility of different food items was made by Ranade and Kewalramani (1966) in case of 3 species of commercially important inland species Labeo rohita , Cirrhina mriqala and Catla catla. A similar study was therefore, thought to be necessary on Rana tigrina which is becoming commercially important on an increasing scale. The present work was, therefore, undertaken on the rate of passage of variety of food-items and their digestibility in case of Rana tigrina, So as to determine its adequate diet. The only work available so far on the rate of food passage in case of frogs, is by Langley (1881), Patterson (1933) and Wolvekamp and Tinberger (1942). Langley (1881) found that a frog required 24 hours to remove a small worm from its stomach, while Patterson (1933) found that in Rana catesbiana a frog is retained in the alimentary canal for 48 to 68 hrs. Wolvekamp and Tinberger (1942) found that an earth worm passes through the alimentary canal in twenty four hours but their main objective was to study p^H during the passage of food. Savage (1961) found that in tadpoles a coloured meal passed within 6¼ hrs. through the alimentary canal of Rana temporaria and in 3¾ hrs. in case of tadpoles of Rana bufo. However, no work has been done

on the rate of passage of food-items in Rana tigrina. The present work is undertaken on Rana tigrina for the first time and that too with reference to several food items with the objective of determining its suitable diet.

It is of interest that while it is clear that insects which possess an exoskeleton which is chitinous, form the bulk of diet for frogs and while it is usually held that the enzyme equipment of a species has some co-relation with its food, no attempt has been made so far to investigate whether chitin can be digested by Rana tigrina. Jeuniaux (1961) mentions that it was thought for a long time that, in animals, chitinases were present in snails only and that the distribution of these enzymes among invertebrates appears to be much extensive. Chitinases have been found by Tracey (1951) in earth worms, in soil amoebae (1955) and by Jeuniaux from intestinal bacteria in Helix (1950), & (1954), in the digestive tube of Porcellio (1956) and in exuvial fluid of Bombyx (1955). The presence of chitinolytic enzymes among vertebrates had, however, never been suspected antil Jeuniaux (1961) found chitinolytic activity in some species of vertebrates, which and included Gold fish, Lizard, and Bat. He concluded that the species where chitinase has been found are insectivorous or eat chitin covered preys, at list

occaisonally. In contrast he did not find any trace of chitinase in the turtle and the Rabbit which are typical phytophagous animals. In 1982, Jeuniaux found chitinolytic activity in the gastric mucosa and pancreas of Rana temporaria and Bufo marinus. It was thought, therefore, that if Rana temporaria possesses chitinolytic activity it will not be surprising if it is present also in Rana tigrina whose main bulk of the natural food is also insects. It is surprising, however, that no observations are available of this nature in case of Rana tigrina. Although the objective of the present study on Rana tigrina was to study rate of passage of different foods and their digestibility, the observation during the course of the study that chitinous exoskeleton is in some cases digested, prompted us to at least detect if there is any chitinolytic activity or not, as it may throw some light on the digestibility of food-items for Rana tigrina.

Another aspect in addition to the study of digestibility and time of retention of food which is of importance incase of commercially important animals is the determination of actual effect of different food-items on growth for confirmation that the diet devised is actually utilized for growth by these animals.

Some studies of this nature have been made incase of fishes, but comparatively little work of this nature

is available on frogs. Hans Mann (1966) studied the utilization of food by Tilapia melanopleura to find out the requirement of protein for growth. Shell (1966) studied the relationship between rate of feeding, rate of growth and rate of conversion of food-items in feeding trials with two species of Tilapia. Incase of Rana tigrina same work is available on the growth of tadpoles, thus T. J. Pandian (1985) studied effect of temperature on the growth of tadpoles of Rana tigrina, while Hota Ashok and Madhab, C. Dash Pasha (1981) studied the effect of the food level and the larval density on the growth of the tadpoles of Rana tigrina. No work is, however, available on the effect of specific foods on the growth of Rana tigrina adults. The present work has been undertaken on the adult specimens of Rana tigrina, to demonstrate the comparative utility of certain foods for their growth.

**