ABSTRACT

The amphibian fauna of India is represented by about 200 species of which 80 are included in the family Ranidae. *Rana limnocharis* is one of the common ranids found in India and is widely distributed in agricultural areas. Due to its availability in agricultural areas the species is rightly termed as Paddy Field Frog. Though a common frog, yet little is known on the biology of the species. Hence, the present study deals with diagnosis, description, distribution, species complex, polymorphism and inheritance of mid-dorsal stripe, food, morphometrics, sex ratio, size at first maturity, clutch size, breeding, development, tadpole morphometrics, ontogeny of teeth row structures, growth of developmental stages and population dynamics and growth in natural population.

The species is a small ranid with a maximum snout-vent length of 38.0 mm. Like most other ranids, the males are comparatively smaller than the females and there is distinct sexual dimorphism.

Distribution status of the species has been determined by reviewing published informations. The species is widely distributed in most of the Asiatic countries (India, Pakistan, Sri Lanka, Nepal, Bhutan, Myanmar, Afghanistan,
Thailand, Vietnam, Bangladesh, Taiwan, Philippines, China, Japan, Indonesia and Malaysia).

The species forms a Complex and about 12 species are included within the species complex. They are distributed in most of the Asiatic countries.

The species is polytypic in nature and is represented by three morphotypes. This is based on the presence or absence and the nature of a mid-dorsal stripe. Different morphotypes are (1) individuals with wide mid-dorsal stripe, (2) with narrow mid-dorsal stripe and (3) non-striped. In addition to the above three categories, another form is also identified as having interrupted stripe (stripe not continuous from the tip of the snout to vent). Such individuals have been considered as either wide-striped or narrow striped, depending upon the width of the stripes. The result indicated that the narrow mid-dorsal striped morphotypes are maximum in nature. Of 1500 collected specimens, 465 are without mid-dorsal stripe (31%), 975 are with narrow mid-dorsal stripe (65%) and 60 are with wide mid-dorsal stripe (4%).

Studies on inheritance of mid-dorsal stripe indicated that the proportion of narrow-striped is more in comparison with the other two morphotypes. Froqlets obtained
from various crosses indicated the highest proportion of narrow striped (from 62% to 100%) followed by non-striped (from 0% to 38%) and less proportion of wide-striped (from 0% to 10%).

The larval oral morphology is suited for capture of micro-organisms and the larvae depend mostly on algal matter, protozoans and crustaceans. As the species is an inhabitant of agricultural fields, the major food items of adults comprised of arthropods, dominated by insects and some other aquatic and terrestrial organisms. This indicates that the species is a natural predator of insects of agricultural fields.

Morphometric analysis of 27 parameters of 51 males and 42 females has been performed. Mean, Standard Deviation, Standard Error, Correlation Coefficient (r value), Regression analysis and Test of Significance (Z test) are accomplished using computer programmes and calculator. It is concluded that there are significant differences between males and females, not only in size but also in all 27 parameters selected for the study.

Sex ratio of the species has been analysed from 2427 specimens captured during 1978 - 1992. The data indicated that the males are more (1587) than the females (840) and the cumulative sex ratio of male: female is 1.889:1.
Size at first maturity has been determined from specimens collected during 1986-1992. Snout-vent length was measured separately of 332 males and 192 females. It is observed that the snout-vent length of smallest and largest males were 20.0 and 33.5 mm respectively. The range of snout-vent length (mean) of males was 22.417 ± 1.940 - 28.822 ± 2.140 mm. Similarly, the snout-vent length of smallest and largest gravid females were 25.0 and 38.0 mm respectively. The range of snout-vent length (mean) of females was 28.333 ± 2.787 - 34.969 ± 2.591 mm. This indicated that, the females are larger in size than the males. The snout-vent length of smallest mature male and gravid female are considered as the size at first maturity.

Clutch size was calculated from the number of eggs laid by gravid females in the laboratory. The minimum clutch size was found to be 632 while the maximum clutch size was counted as 1950. Analysis of body size in relation to clutch size revealed no correlation. Regression relationship between snout-vent length of female and clutch size has been accomplished and shown in Fig. 41. However, there is significant variation between snout-vent lengths of amplexing males and females.

Breeding data indicates that maximum gravid females and mature males are available during monsoon period (June-August) and this is indicative of seasonal breeding of the
species. Further, maximum number of juveniles were collected during June-October and less number during November to January. However, no froglets were collected during February and March. This confirms that the species breeds mainly during monsoon.

Studies on life history has been conducted in laboratory conditions. A total of 46 developmental stages have been identified and compared with corresponding Gosner stages. Most of the important stages have been photographically represented and the characteristics of each stage has also been described. The species completes its life history (egg laying through metamorphosis) within 33 days.

Thirteen morphometric parameters of 22 developmental stages (Gosner stage 25 to 46) comprising of 110 tadpoles, have been measured for morphometric analysis. Mean, Standard Deviation and Standard Error of each morphometric parameter of all the 22 developmental stages have been calculated and graphically analysed.

Larvae from external gill stage till the initiation of metamorphosis have been utilised for the studies on ontogeny of teeth row structure. It is observed that the labial teeth appear during operculum development stage (Gosner stage 23). The number and rows of teeth gradually increased
with the development of the tadpole and the maximum number of teeth rows have been observed during late phase of toe development (Gosner stage 37 and 38). Subsequent developmental stages indicated reduction in teeth row structure and number. There was complete disappearance of teeth at forelimb emergence stage (Gosner stage 42).

Developmental stages (fertilized eggs through metamorphosed froglets) have been measured and the time periods of development from one stage to another have also been determined. This data has been utilised for establishing the growth curve of developmental stages in relation to time period of development. It is concluded that the growth is exponential till well developed hindlimb stage, after which there is reduction in size of the tadpole due to the loss of tail.

Population dynamics and growth in natural population are based on measurement of specimens collected from nature over a period of 12 months, during 1987-88. Based on the size, the juveniles, matured males and gravid females were divided into various size groups. Juveniles were divided into two groups (8.0 - 11.0 mm and 12.0 - 16.0 mm), males into three size groups (17.0 - 22.0 mm; 23.0 - 30.0 mm and 31.0 - 36.0 mm) and females into three size groups (17.0 - 22.0 mm; 23.0 - 30.0 mm and 31.0 - 38.0 mm). Female size groups were
comparable with males. It is concluded that the females are comparatively larger than the males of the same age group. Number of various size groups of juveniles, males and females were calculated for every month of the year. Variations of size of all the groups have graphically been analysed to show the variations in size groups of both males and females.