



VARIATION IN HABITAT USE AND BREEDING PATTERN OF RANID AND RHACOPHORID

Zoology

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ABSTRACT

Ranids are confined to permanent ponds rich with hydrophytes or thick vegetation nearby. *Polypedates maculatus* is arboreal in nature and frequently encountered near human habitation. Breeding activities differ greatly in between ranids and rhacophorids and also in sympatric species of ranid. Ranid amplexing pairs move and eggs are laid in scattered manner and adhered to aquatic plants. Foam nest in rhacophorid is adhered to twigs above the water level. There is no correlation between body size and clutch size. Variation in pigmentation or characteristic colouration are observed in tadpoles of ranids and rhacophorids. Different teeth row formulae are observed in tadpoles at the same stage of development.

KEYWORDS

Foam nest, Teeth row

INTRODUCTION

Out of 210 species of amphibians found in India, ranids are represented by 90 species and rhacophoridae by 54 species. Liem (1970) categorised three families: Ranidae, rhacophoridae and hyperoliidae. The close relationship between three families was demonstrated by Inger (1966). Within ecological communities, environmental resources are partitioned according to dimension and differences in comparative sizes of the organisms (Schoener, 1965). Both ranids and rhacophorids are wetland species (Brockelman, 1975, Brouce, 1969). Literature is reviewed on habitat and breeding aspects of two ranids, *Euphlyctis hexadactylus* and *Rana taipehensis* and one Rhacophorid *Polypedates maculatus* to provide a comparative analysis of these groups. The present study is aimed at the breeding variation in allied families in more or less similar habitat. Breeding activities differ greatly in two families and also in sympatric species of ranids. Difference in habitat utilization and breeding pattern are studied.

HABITAT:

Ranids are spotted in restricted pockets where permanent source of stagnant water is found. *Polypedates* live in trees (Liem, 1970), tree holes (Taylor, 1962) or among grass and weeds near water. This species lives near perennial water and in house where water is at hand and can be seen all the year round (McCann, 1940). Anurans of Odisha are seasonal breeders and found in areas with temperature and rainfall fluctuation

CLUTCH SIZE:

The term clutch stands for full complement of eggs of single female, irrespective of whether she lays them all at once or over longer period of time (Woodruff, 1976). Publication on clutch size of anurans have been made by Mohanty (1994) on *L. limnocharis* and Rath (1995) on *P. maculatus* to report no of eggs per clutch.

BREEDING:

Breeding data are available for *Bufo melanistictus*, *Hoplobatrachus tigerinus*, *Hoplobatrachus crassus*, *Euphlyctis cyanophlyctis*, *Polypedates maculatus* and *Microhyla ornata*, (Inger and Greenberg, 1956). Reproductive pattern could be of two types, continuous (acyclic) and potentially continuous (seasonal) breeders (Gopalakrishnan and Rajasekarasetty, 1978). Premating congregation has been observed in both groups. There is no mating combat during monsoon (Heyer, 1973). Construction of foam nest in rhacophorids has been reported by Ikeda (1897) and Bhaduri (1932).

TADPOLES:

The radiation of tadpoles into a variety of microhabitat and modes of life has been accompanied by modification of their ovoidal body form (Orton, 1953, Duellman and Trueb, 1986). Morphological parameters of tadpoles show the differentiation between ranids and rhacophorids and in between two species of ranids. Comparative analysis of two Indian ranids and rhacophorids is made to ascertain the similarities and dissimilarities in habitat use, breeding and development. Cumulative data during the period of study reveal the correlation between body size and clutch size. Poikilothermic nature of amphibian has made the group seasonal breeder. Occasional breeding habit is observed. Morphological parameters of tadpoles mark the differentiation between species. Reproduction capabilities are different in similar

habitat.

METHODOLOGY:

Distribution of species of both families is ascertained by visiting perennial waterbodies of the state Odisha. Amplexing, mating calls and eggs laying in the wild are observed as a part of breeding behaviour. Amplexing pairs are collected during night time and day time availability. Clutches are transferred in a rearing tray with conditioned water. Hydrilla plants are introduced in to the rearing tray of ranids. Tadpoles are collected from natural environment for laboratory studies. Tadpoles were preserved in 10% formaldehyde for the study of teeth row structure. Breeding data were analysed statistically to obtain SD, SE, Correlation coefficient and linear regression relationship.

RESULT:

E. hexadactylus is large sized frog bright green or mid brown coloured, rudimentary webbed with snout vent length (SVL) 55-85 mm in male and 56-120 mm in female. A broad dark blotch is present along the middle of the back with elongated dark patches on either side. They frequently change colour from green to brown. *R. taipehensis* is small sized frog and olive or yellow green coloured with two cream dorso lateral lines. SVL of male measures 20- 35 mm and female 18-45 m. *P. maculatus* is a medium sized frog with two cream dorso lateral lines. SVL of male and 43-84 mm in female. Head is longer than broad with bluntly pointed snout. Dorsal side is brownish, yellowish white or greenish with or without irregular dark brown patches. There is a large brown marking on the head, from behind the eyes, extending to the dorsum. They change colour to grey chocolate brown.

HABITAT:

E. hexadactylus is confined to permanent ponds rich with hydrophytes which are the major source of food for the species. *R. taipehensis* is found in permanent ponds or in thick vegetation nearby. They are nocturnal and hide inside aquatic plants during breeding season. *Polypedates maculatus* like other rhacophorids is arboreal in nature and frequently encountered near human habitation. These rhacophorids are found in open fields during breeding season. This species keep themselves hidden in resting areas during day time. In spite of similar habitat utilisation in ranids breeding specialisation is observed as species specific characteristics.

BREEDING:

Breeding activities vary in both families. *E. hexadactylus* and *P. maculatus* breed in June through September, *R. taipehensis* from April through Aug. In Ranids the breeding is extended up to December. *Polypedates maculatus* produces a dodo-dodo sound when approaches a female, male produces a tak tak sound at other time. Ranids breeding call is like a baby's cry to which females does not respond. Premating congregation has been observed in both families. There is no mating combat. Ranids are found motionless in weed filled water bodies. Cloaca of clasping male comes near female cloaca and rests for more than an hour. Amplexing pairs move and rests for more than an hour. Amplexing pair move and hence eggs are laid scattered. Eggs are adhered to hydrilla or pistia plants. Eggs are laid in batches in *E. hexadactylus* and mature at different times in a year. Sporadic amplexing pairs are also seen in post breeding phase. *R. taipehensis* is a solitary breeder. Eggs are laid single after rainfall and attached to the

roots of aquatic plants. Jelly like substance produced by female *P maculatus* turns to foam with the beating of hind limbs. Males clear the cloaca of female when foam nest construction is completed. Foam nest are adhered to twigs and remain above the water level. The gravid female construct foam nest in the absence of amplexing male with unfertilized eggs. Hatching success of eggs is more than 90 % when laid by amplexing pairs. The fertilised eggs to external gill stage are spent in the foam as a mark of indirect parental care. Developmental hazards are heavy rainfall, insect larvae, description with the rise in temperature and predation by birds. Mortality is high in both families.

CLUTCH SIZE:

Smallest female (SVL- 56 mm) of *E hexadactylus* had more (4700) number of eggs than largest female (SVL-120 mm). The clutch size ranges from 2000- 9000. Clutch size ranges from 750-1500 in *R taipehensis*. Ranid female with more weight have less number of eggs in a clutch than number of eggs produced by female with less weight. Correlation between body size and clutch size is not established. Ranids are also associated with multiple clutch. Number of eggs in clutch varies between 105-650 with an average of 330 in *P maculatus*. The number of eggs in a clutch increases with size of the female Rhacophorids.

TADPOLE:

Variation in pigmentation is found in dorsal, lateral part and tail of *E hexadactylus*. Tail is more pigmented. Tadpole of *R taipehensis* are bottom dwellers and resemble with tadpoles of *P maculatus* except the characteristic colouration. At late tail bud stage of *P maculatus* first movement of embryo is marked inside foam nest. Embryos are released in to water during external gill stage.

DISCUSSION-

Breeding and habitat variations have been analysed in ranids and rhacophorids. During breeding season gravid females are found larger in size than mature males. Studies by Mohanty-Hejmadi and Dutta (1981) on *Rana tigerina* and *Rana crassa* reported the Snout vent length relationship among males and females. Minimum size was considered in the present study attaining sexual maturity. Smallest gravid female was 56 mm and male 55 mm for *E hexadactylus*, female 18 mm and male 20 mm for *R taipehensis* and female 73 mm and male 50mm for *P maculatus*. There is intergeneric, interspecific and intraspecific variation in size during SVL data comparison. Terentjev (1960), Matsui and Ota (1984) reported correlation between body size and clutch size. Similar observation is in *P maculatus*. The present study on the clutch size of Ranids is comparable with the findings of Inger and Bacon (1968) on ranids of South East Asia. In *Rana limnocharis* smallest female (SVL 34 mm) lays 120 eggs (Mohanty, 1994). Other ranids, *Rana tigerina* (Dutta and Hejmadi, 1976), *Rana crassa* (Dutta et al., 1993) are having larger body size and clutch size than *Rana limnocharis*. The SVL and clutch size when compared with *Polypedates maculatus* the clutch size of latter is much smaller and eggs are larger. More eggs are seen in several microhylids. This can be attributed to the fact that small species are more prone to predation. Smaller species need a suitable adaptation to the annual uncertainty of the environment. They produce relatively larger clutch size in order to breed effectively (Kuramoto, 1978). The comparative study of clutch size of *Polypedates maculatus* with ranids concludes the others do not follow the specific pattern of more eggs for larger species as in case of *Polypedates maculatus*. Hatching success in *P maculatus* is 95%. A hatching success of 96.4% for the same species has been reported by Mohanty-Hejmadi and Dutta (1988). In *Polypedates maculatus* the modes and sites of egg lying is more advantageous. Early development takes place in well guarded environment thus ensuring high embryonic survival. There is selective advantage for larger eggs than larger clutch size. Teeth row structure and number varies within and between species. *E hexadactyla* and *R taipehensis* differ in their oral morphology. The keratinised cover is adapted to scratch surfaces of the submerged vegetation. Use of similar habitat is not concerned with breeding pattern. Size of the species is related to breeding output. Clutch size is related to breeding output which does not hold good for intra species.

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