

**THE BIOLOGY OF THE SRI LANKAN ROCK FROG  
*NANNOPHRYS CEYLONENSIS* WITH SPECIAL REFERENCE TO  
IT'S SEMI-TERRESTRIAL TADPOLES**

A thesis submitted in fulfillment of the  
requirements of the degree of Doctor of Philosophy



by

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## ABSTRACT

The biology of an endemic Sri Lankan rock frog *Nannophrys ceylonensis* and its semi-terrestrial larvae was studied over a three year period. This frog lives on wet surfaces of exposed rocks along streams and roadcuts in restricted areas in the wet zone of Sri Lanka. Terrestrially breeding adults are found in rock crevices where they lay large eggs (mean size 4.0 mm) surrounded by a thick capsule. Eggs are laid separately and are guarded by the father. Eggs hatch at Gosner (1960) stage 21 with external gills. These semi-terrestrial tadpoles too occupy wet rock surfaces. In a laboratory study the hatching success was  $75.7 \pm 9.3\%$  and hatching period (time taken to hatch 90% of the sample) was  $26 \pm 3.7$  hr. Maximum snout-vent length and maximum total length of the tadpoles were achieved at stage 46 and at stages 38-39 respectively. Absorption of the tail began at stages 38-40.

Eggs and semi-terrestrial tadpoles were raised in the laboratory to metamorphosis, under artificial conditions for the first time. Tadpoles of stage 37 and above were cannibalistic when the stocking density was high. Dietary preference was determined in the laboratory offering different food types separately. Feeding behaviour involved three stages; orientation, contact and ingestion. Only two food items, algae and powdered shrimp were assimilated by all stages of tadpoles. The most food was eaten at the tank-water interface. Larger (stage > 32) *N. ceylonensis* tadpoles displayed dominance over smaller tadpoles during feeding. Tadpoles of all developmental stages displayed micro-habitat preference in

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stocking tanks. The most commonly selected resting position was either under a submerged pebble or at the tank-water interface.

Tadpoles feed by scraping off the surface microfilm on the wet rocks where they live. Gut content analysis of the tadpoles shows that their diet includes microflora, microfauna, conspecific eggs and tadpoles. Detritus and mineral particles were also found in their guts. Gut length and the number of gut coils decreases significantly as the tadpoles develop. Absolute gut length decreased by 59% between Gosner stages 26-42. Tadpoles of *N. ceylonensis* shift from primarily herbivory to primarily carnivory as they develop from Gosner stages 32 to 34; later stage tadpoles selectively feed on more animal matter. This dietary shift correlates with the decrease in the length of the gut and the number of gut coils.

This study reports for the first time, quantitative information on breeding biology of any Sri Lankan frog. This frog breeds through out the year but more frequently in the rainy season. Non-breeding adult males and females take refuge in separate crevices in the rock surfaces during the day and emerge at night to forage. Breeding takes place through out the year but more frequent in the rainy season. Males can be polygynic; mating takes place inside crevices. Males exhibit paternal care for multiple clutches of eggs and guard eggs from predators. Paternal care of this species is obligatory; hatching success decreases without it. Females do not contribute to parental care. Males show nest site fidelity and defend territories against conspecifics. A scarcity of suitable nest sites may limit reproductive success in *N. ceylonensis*. Larvae leave their nests at stages 24-25 to live as truly terrestrial tadpoles, foraging on the rock surface near their natal nest.