CHAPTER 23

ENVIRONMENTAL STUDIES

Doctoral Theses

01. BISHT (Karan)
Systematics, Reproductive Biology and Biogeography of Toads of the Genera Duttaphrynus and Firouzophrynus.
Supervisor: Prof. Sathyabhama Das Biju
Th 29026

Abstract

The bufonid genera Duttaphrynus and Firouzophrynus represent widespread and morphologically cryptic group of frogs across South and Southeast Asia, yet their taxonomy remains unresolved due to overlapping diagnostic traits, incomplete sampling, and limited molecular data. This has led to ambiguous species boundaries and misidentifications. This thesis addresses these issues through an integrative framework using molecules, morphology and bioacoustics to refine species boundaries and infer evolutionary relationships within these genera. The first chapter presents a comprehensive systematic and biogeographic reassessment of the genus Duttaphrynus, based on extensive unbiased sampling and multilocus genetic data. The results of the integrative phylogenetic analyses restructure the genus, describing three new species, identifying two potential new lineages, resurrecting one species, synonymizing multiple nominal taxa, and providing clarity on the identity and circumscribed distribution of D. melanostictus. Phylogenetic and biogeographic reconstructions further indicate a mid-Miocene origin followed by regionally structured diversification across the Indian subcontinent. The second chapter provides a systematic revision of Firouzophrynus, a lineage previously part of Duttaphrynus. Integrative analyses, clarify species limits, and resolve long-standing taxonomic inconsistencies, including the reassignment of misidentified genetic records from India. The third chapter examines reproductive biology in Duttaphrynus through a detailed case study of Duttaphrynus chandai, documenting explosive breeding behaviour, bioacoustics, and larval development, while placing these within the broader comparative framework. Overall, this thesis attempts to stabilize the taxonomy of two widespread genera, uncovering hidden diversity while addressing taxonomic inflation. In doing so, it provides novel insights into their biogeography and diversification patterns. Thus, this work provides a robust evolutionary framework for future studies. Moreover, it explores the breeding strategy in an endemic toad species, providing knowledge vital for conservation planning.

Contents

1. An integrative systematic and biogeographic reassessment of Duttaphrynus: resolving a two-century taxonomic enigma and describing three new specie 2. Taxonomic and systematic reassessment of the toad genus Firouzophrynus (Anura: Bufonidae) from India 3. Reproductive behaviour and tadpole development in Duttaphrynus: a case study of the endemic Chanda's toad, D. chandai (Anura, Bufonidae), from India. Supplementary Tables. Publications.

02. GOPIKA C

Morphological Characterisation and Systematic Insights from Tadpoles of Indian Anurans.

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Abstract

Tadpoles represent a critical phase in the biphasic life history of amphibians, occupying specialised microhabitats and contributing substantially to survival and diversification. Despite increasing interest in anuran systematics and taxonomy, larval stages of most species remain poorly documented. Tadpole studies aid in species identification, phylogenetic inference, and biodiversity assessments. However, globally, only about 41% of anuran larvae are known to science, and in India, data exist for merely 35% of the 342 species with free-swimming tadpoles. This paucity of larval information continues to constrain our understanding of amphibian diversity, ecology, and systematics. The present study aims to bridge this knowledge gap by documenting and analysing the larval morphology of Indian frogs. Extensive recent field surveys, supplemented by collections spanning over three decades from mainland India and the Andaman and Nicobar Islands, were genetically identified (16S rRNA barcode) and examined morphologically. The thesis, organised into ten chapters corresponding to the Indian anuran families studied, is based on tadpoles representing 120 species. Detailed morphological descriptions are provided for 60 species for the first time, along with redescriptions of several others with previously limited information. Notably, this study identifies diagnosable larval characters at multiple taxonomic levels in relation to phylogeny and larval morphological types. The analyses reveal distinct morphological patterns associated with specialised ecological adaptations such as fossorial, semi-terrestrial, and phytotelmatic lifestyles. Tadpoles are also characterised based on their inferred feeding strategies, reflected in oral disc structure, and classified as filter feeders, carnivores, oophagous types, and surface feeders. The study further provides new insights into the early development and natural history of two Minervarya species from Andaman is lands. This work substantially expands the available data on Indian tadpoles, raising the proportion of species with documented larval stages to 52%, and provides essential morphological and genetic information to support future taxonomic and conservation studies.

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