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A PRELIMINARY STUDY ON SPECIES DIVERSITY OF ANURA IN AND AROUND SELECTED BENGALURU URBAN LAKES AND SURALIHALLA, AGUMBE, KARNATAKA, INDIA

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ABSTRACT

Bengaluru city is a center of urbanization in Karnataka. Series of anthropogenic activity has created variation in the environment leading to habitat loss for flora and fauna. Habitat destruction is affecting decrease in number of frog species sharply. For the conservation of frogs in urban, creating awareness to public regarding the importance of frogs to balance the ecosystem in condition is essential. In the present study an attempt was made to understand and comparatively access the locally occurring Anuran species at selected study area of Bengaluru urban lake and Surahalihalla, Agumbe, Karnataka by field survey.

KEYWORDS*: Anura, Checklist, Species Richness, Bengaluru Urban Lakes, Western Ghats.*

INTRODUCTION

Herpetology helps in studying the amphibians and reptiles which are the most important component of the ecosystem. They are threatened worldwide and are declining rapidly, hence conservation of these species groups has become more intense, and the study concerning them is scanty.

In phylum amphibians, Frogs and Toads are grouped under order Anura. Frogs and toads are highest in number observed in all types of habitats like semi-aquatic, fossorial(burrowing forms), terrestrial, semi-arboreal and arboreal. India a mega diversity country comprises a high diversity of amphibians[1]. Amphibian studies in India started during pre-independent period and most of the studies are limited to surveys and taxonomy [2]. Taxonomic information about the amphibian fauna of India is available in the "Fauna of British India" series, which includes 124 anurans [2]. In 'Systema Nature' 1758 Linnaeus has defines amphibians as "foul and loathsome animals" because of their cold temperature body, light color shade, rough skin, and eye, unique odor and distinct vocal". Amphibians first colonized on land during Mid Devonian period.

Amphibians have unique role in the environment like links to food chains, key indicator species and due to their level of sensitivity throughout their life cycle even a minor change in the environment can be observed through them[3][4]. Such responses have been used to indicate habitat fragmentation, ecosystem stress, impact of pesticides and various

anthropogenic activities. India harbors more than 342 species of amphibians which includes 306 species of anura [5]. The amphibians of the Western Ghats are diverse and unique, with more than 80% of the 181 amphibian species being endemic to the region [6].

MATERIALS AND METHODOLOGY

Study Area

Bengaluru Urban District (12.97^0N & 77.56^0 E) and Range of Agumbe Rainforest in Suralihalla, Agumbe (13^0.51' N & 75^0.08' E) of Karnataka was selected for present study. Bengaluru had about 250 lakes earlier, but due to urbanization it has decreased to 146 lakes which are under BBMP division and 8 lakes under Forest Department division. Bengaluru lakes are connected to each other for water flow maintenance. The effect of urbanization has taken some heavy toll on the Beauty of Bengaluru lakes.

Biodiversity assessment represent by numerical strength and morphological identification of Anuran species from nine different lakes in Bengaluru Urban District, Karnataka viz; Bheemanakuppe Ramsagara lake (12^0.91' N & 77^0.43' E), Hosakere Lake (12^0.92' N & 77^0.48' E), Malathalli Lake (12^0.96' N & 77^0.49' E), Komghatta Lake (12^0.93' N & 77^0.46' E), Jakkur Lake (13^0.04' N & 77^0.58' E), Rachenahalli Lake (13^0.08' N & 77^0.61' E), Hebbal Lake (13^0.06' N & 77^0.61' E), Kaikondarahalli Lake (12^0.94' N & 77^0.58' E), Lalbagh Lake (12^0.91' N & 77^0.67' E).

Data Collection

For this study, we categorized study area into different zones based on habitat, for about 500mm (25mm interval) in all different habitats of selected zones, with help of **Tags/Flag** as a landmark, habitat was searched according to habitat order and time constrict during February 2019 to May 2019. We followed time constraint method; in this method, rigorous search is conducted in all probable microhabitats such as boulders, logs and mosses looking for the animals. The search was conducted on trials during early morning (06:00 to 11:00), afternoon (12:00 to 15:00), Evening (16:30 to 19:00) hours and In Agumbe Night walk (20:30 to 22:30) hours. On locating animals, data on species and number of individuals were recorded by Photography. Amphibians (especially frogs) were searched along the stream with the help of search light during dusk to night hours (18:30 to 20:30).

Data collection was made using Direct Method (visual encounter survey-VES) and Indirect method:

- In **Direct Method/ visual encounter survey (VES)**, on encountering a species, Photography was majorly done using **Canon EOS 200D DSLR camera** with 18-55 mm Lens and 55-250mm Lens and **Sony Cyber shot Digital camera** was used as an assistant/spare camera.

- In **Indirect Method**, includes tracking an animal using it's **mating calls** as it was **pre-monsoon period** more number species was encountered using this method. This visual encounter helped to record data on field survey. No Species were sampled under this study.

Data Analysis

Taxonomical information and Photography information in the field was compared. Every photo documented individually was cross checked with standard literatures [7] [8]. We have estimated species richness and abundance of amphibians in total. Number of species was obtained as cumulative number of species observed and abundance as total number of

individuals observed during the study. Based on these data, we estimated distribution pattern and species Richness using Shanon Weiner Index method $[H^1 = -\sum_{i=1}^{S} (pi * ln\ pi)]$ and Pieloeis Evenness Index $[E = H/ ln\ (S)]$

Species of Frogs were identified based on external morphology like skin texture, color of scales, digits, shape of head, shape of snout, mouth, Foot characteristics, webbing and disc structure in feet, eye pupils and vocal sac[9][10]

RESULTS

Table 1: Family-Wise Checklist of Order Anura

Sl.no.	FAMILY	NUMBER OF SPECIES
01.	Dicroglossidae	06
02.	Rhacophoridae	04
03.	Ranixalidae	01
04.	Ranidae	03
05.	Bufonidae	02
06.	Microhylidae	02

Table 2: Species-Wise Checklist of Order Anura

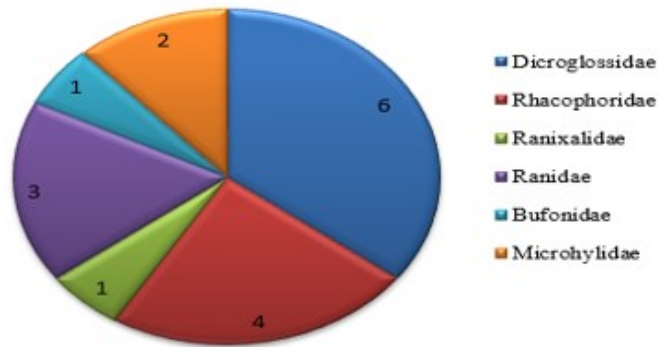|	Order: ANURA	
Sl.no.	Scientific name	Common name
	Family DICROGLOSSIDAE	
01.	*Euphlyctis alaysii*	Aloysius Skittering Frog
02.	*Euphlyctis cyanophlyctis*	Common Skittering Frog
03.	*Zakerana caperata*	Wrinkled Zakerana Frog
04.	*Minervarya granosa*	Granular Fejervarya Frog
05.	*Sphaerothea breviceps*	Burrowing Frog
06.	*Hoplobatrachus tigerinus*	Indian Bull Frog
	Family RHACOPHORIDAE	
07.	*Rhacophrous malabaricus*	Malabar Gliding Frog
08.	*Raorchestes ponmudi*	Ponmudi Bush Frog
09.	*Polypedates occidentalis*	Western Tree Frog
10.	*Pseudophiloutus amboli*	Amboli Bush Frog
	Family RANIXALIDAE	
11.	*Indirana beddomii*	Beddome's Leaping Frog
	Family RANIDAE	
12.	*Clinotarsus curtipes*	Bicolored Frog
13.	*Hylarana temporalis*	Bronze Frog
14.	*Hylarana aurantiaca*	Golden Frog
	Family BUFONIDAE	
15.	*Duttaphrynus melanostictus*	Indian Toad
	Family MICROHYLIDAE	
16.	*Uperdon mormorata*	Narrow mouthed frog/ Indian Dot frog
17.	*Microhyla ornate*	Oriental Microhylaro

Figure 1: Family-Wise Distribution of Order Anura.
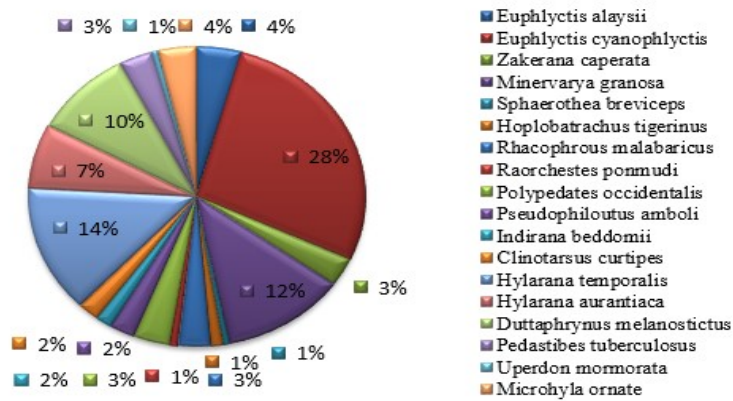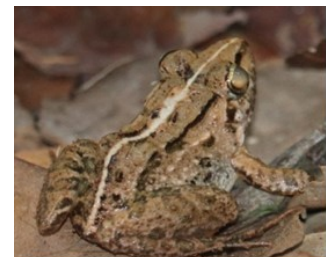

Figure 2: Species-Wise Distribution of Order Anuran.

1. Euphlyctis Alaysii

2. Euphlyctis Cyanophlyctis

3. Zakerana Caperata

4. Minervarya Granosa

5. Sphaerothea Breviceps

6. Hoplobatrachus Tigerinus

7. Rhacophrous Malabaricus

8. Raorchestes Ponmudi

9. Polypedates Occidentalis

10. Pseudophiloutus Amboli

11. Indirana Beddomii

12. Clinotarsus Curtipes

13. Hylarana Temporalis

14. Hylarana Aurantiaca

15. Duttaphrynus Melanostictus

16. Uperdon Mormorata

17. Microhyla Ornate

Figure 3

DISSCUSTION

During the 06 months of preliminary survey, the present work on diversity of Order Anura check-listed. Based on Family-wise distribution in **Order Anura** with total **06** families and **17 species** of frogs and toads, the percentage distribution of species under different family shows Dicroglossidae(35.29%), Rhacophoridae(23.55%), Ranixalidae(5.88%), Ranidae(17.64%), Bufonidae(5.88%), Microhylidae(11.76%). Under this Family **Dicroglossidae,** comprises of 06 species i.e; *Euphlyctis alaysii(4%), Euphlyctis cyanophlyctis(28%), Zakerana caperata(3%), Minervarya granosa(12%), Sphaerothea breviceps(1%), Hoplobatrachus tigerinus(1%)*. Family **Rhacophoridae,** comprises 04 species i.e;

Rhacophrous malabaricus(3%), Raorchestes ponmudi(1%), Polypedates occidentalis(3%), Pseudophiloutus amboli(2%). Family **Ranixalidae**, consitis of 01 speceis *Indirana beddomii (2%).* Family **Ranidae** consistis of 03 species *Clinotarsus curtipes(2%), Hylarana temporalis (14%), Hylarana aurantiaca(7%).* Family **Bufonidae** consist of 01 species *Duttaphrynus melanostictus(10%).* Family **Microhylidae** consist 02 species *Uperdon mormorata(3%), Microhyla ornate(4%).*

Family Dicroglossidae dominate in the present study with 35.29% of anuran data of 06 species. Anurans being the one of the largest among the food chain, they are associated with various habitats. In recorded Anurans frogs are more than toads. Survey/trails were carried out in Day and Night because most of the frogs and toad are active during early morning and late night, depending upon the calls of this animal most of the species were encountered.

Overall, positive and in many cases significant positive correlation is obtained between species distribution and evenness with few negative correlation. Anuran comprises of 9.3822 distribution richness and 5.2364 evenness of family-wise observation. Species-wise, distribution richness is 35.3260 and evenness is 12.4655 with overall sum of individual 473 (N=473). Quality of species occurrence data, as derived from species lists, significantly impacts conservation and management considerations.

While this checklist is not comprehensive, it aims to provide an insight into the Anura(Frogs and toads) diversity in different lakes of Bengaluru Urban District region and in Agumbe Rainforest Research Station Base camp, Surahallihalla, Agumbe. Being a short term preliminary study, only limited areas could be covered during the survey. Rapid urbanization, increasing pollution leading to habitat destruction may be one of the main factor significantly affect the food chain and survival factor of this recorded species group. Such studies will give us an insight into the consequences of human activity on the ecosystem in various aspects and diverge for better conservation strategies.

CONFLICT OF INTEREST

The authors declare no competing interests.

ACKNOWLEDGMENT

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