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Diversity of Anuran Amphibian Using Visual Encounter Survey Method Implemented in Three Different Habitats

Albiya L [a++*] and M. P. Jeyasekhar [a#]

[a] Department of Zoology and Research Centre, Scott Christian College (Autonomous), Nagercoil, Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Amphibian diversity in the study area of Karode Village is located in Vilavancode Taluk of Kanniyakumari District, Tamilnadu, and was surveyed for three months and 12 weeks nights between October to Dec 2024. The amphibians were surveyed during day and night sessions using the visual encounter survey (VES) method at three sampling sites. A total 4 species were recorded, comprised of 3 families. This study contributed of amphibians at despite limited sampling time and sampling outside of the breeding peak. The information generated from this study could be utilised for conservation and long-term monitoring of amphibians of the lowland.

[++] *Research Scholar;*
[#] *Research Guide and Associate professor;*
**Corresponding author: Email: albiyaalexprince270@gmail.com;*

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1. INTRODUCTION

Amphibians fulfill various critical roles in natural ecosystems, and their decline can threaten other species and disrupt important ecological functions [1,2]. Rapid biodiversity assessment methods were created to address this need. A Rapid Assessment (RA) is an accelerated, targeted, and flexible biodiversity survey, often focusing on species associated with particular vegetation types or topographical features [3]. This is particularly crucial when examining phenomena like the well-documented global amphibian decline, which appears to impact even populations in pristine habitats and continues to affect or even eradicate entire populations with alarming speed [4].

Effective management of amphibian populations in predominantly agricultural landscapes requires an understanding of what factors influence amphibian populations [5].

Amphibians are exposed to different environmental factors during their ontogeny as eggs, larvae, and adults. In some habitats, amphibians contribute considerably to the biomass [6,7]. Therefore it is assumed that the reduction of amphibians must have important consequences for an ecosystem since they are important prey and predators. However, the fundamental difference about the current crisis is that it has not been brought about by stochastic or catastrophic events, but is instead directly attributable to anthropogenic effects [7,8]. With more than 40% of the World's amphibian species in decline. Existing agricultural field and village ponds are not suitable habitats for amphibian population in current trends. Various factors are driving population fluctuation in amphibian species in aquatic either biotic or abiotic factors. These factors may influence the decline of amphibian population in local areas of our study. Land alterations like converting agriculture land to human habitation, uses of pesticides in agriculture field, water contamination in village ponds by using pesticide and chemical fertilizers around the water bodies are some of the causes for decline of amphibian population. Exotic species (water hyacinth) and various plants that invade systems represent a threat to that ecosystemand could directly modify an ecosystem, causing a cascading effect for resident biota [9].

2. MATERIALS AND METHODS

2.1 Description of the Study Area

Kanniyakumari District indeed holds significant geographical and cultural importance, Its strategic location is at the Southernmost tip of peninsular India where the Indian Ocean, Arabian Sea, and Bay of Bengal confluence. This district is situated at the foot of the Western Ghats and is bound by Thirunelveli district in the east, Kerala State in the northwest, and the Bay of Bengal in the southeast. It is also sometimes referred to as "Lands End", Kanniyakumari district is bestowed with many ponds, reservoirs, and agricultural fields, community areas.

2.2 Study Site

The study area of Karode Village is located in Vilavancode Taluk of Kanniyakumari District, Tamilnadu. This village is coordinates 8.3246˚ N, 77.1169˚ E. They are present 10 Ponds, a Community area, and a Rubber Plantation. Three sites were selected in Karode village. In the present study, the diversity of Amphibians was carried out in the Pond, Community area, and Rubber Plantation of Karode village, during the period October – December 2023. The specimens were collected by the visual encounter survey.

2.3 Sampling Methods

The survey was carried out in all possible habitats, such as agricultural fields, ponds, and grasslands. Overall data collection was done by monitoring the night time of the study period. During the survey periods, such as temperature, microhabitat, and water distance from each species sightings, will also be recorded. The four habitats were classified into two categories viz., Agricultural and nonagricultural areas. Only one types of survey method were adopted for the present study to collect the data which was made during the day hours by using the Visual Encounter Survey method (Heyer et al., 1994). The data collections were made during night 6.0 to 8.30 pm for the entire study period. The species were identified by using pictorial guides.

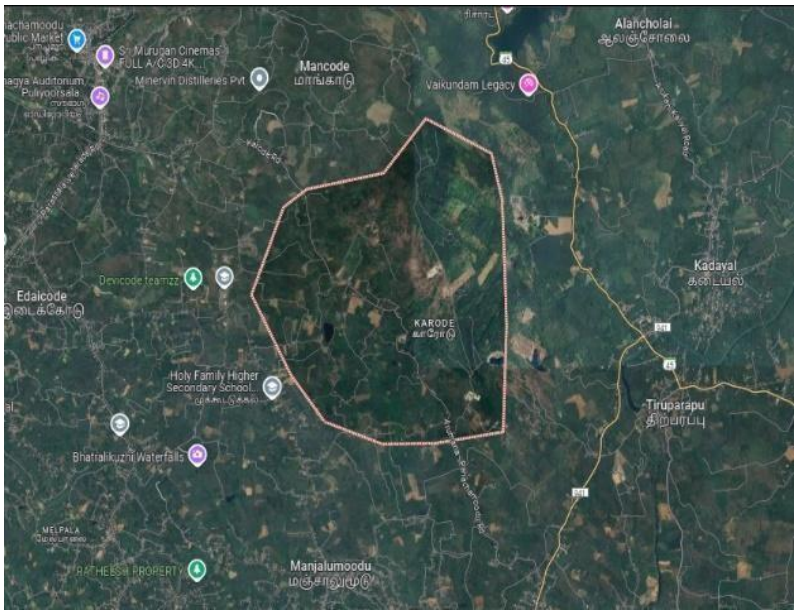

Image 1. Study area

3. RESULTS

***Duttaphrynus melanostictus*:** The species grows to almost 20 cm long. The top of the head has several bony ridges, along the edges of the snout, in front of the eye. The eyes are broader than the upper eyelid width.

***Minervarya keralensis*:** It's commonly located in Kanniyakumari, Anamalai, kerala, Thiruvananthapuram, and Ponmudi. Barred upper and lower lip. Numerous ridges on the back. Fingertips are not dilated into a disc.

***Hoplobatrautus tigerinus*:** It is a common frog found in Mainland, India, and Pakistan. It is green, black, yellow, and white colors are present. Skin smooth, granular with longitudinal folds. Fingers without webbing.

***Pseudophilautus kani*:** The Kani bush frog or Kani Brown-eared shrub frog. It is endemic to India, where it has been observed in the western Ghat mountains and Tamil mountains.

A total of 1312 individuals belong to 4 species from 3 families. The 4 species of amphibians are 1. *Duttaphryus Melanostictus, 2. Minervarya Keralensis, 3. Hoplobatrautus Tigerinus, 4. Pseudophilautus kani.,* the highest number of species belonged to the family Dicroglossidae 2 species and the lowest number only one species was recorded from the family Rhacophoridae.

Table 1. Identification of amphibians in family-wise distribution

No	Family	Species
1	Bufonidae	*Duttaphrynus melanostictus*
2	Dicroglossidae	*Minervarya Keralensis*
		Hoplobatrautus Tigerinus
3	Rhacophoridae	*Pseudophilautus kani*

Table 2. Present and absence of amphibian diversity in three habitats

Species	Habitat		
	Channel	Betal plantation	Rubber plantation
Duttaphrynus melanostictus	+	+	+
Minervarya Keralensis	+	_	_
Pseudophilautus kani	_	+	_
Hoplobatrachus Tigerinus	+	_	_

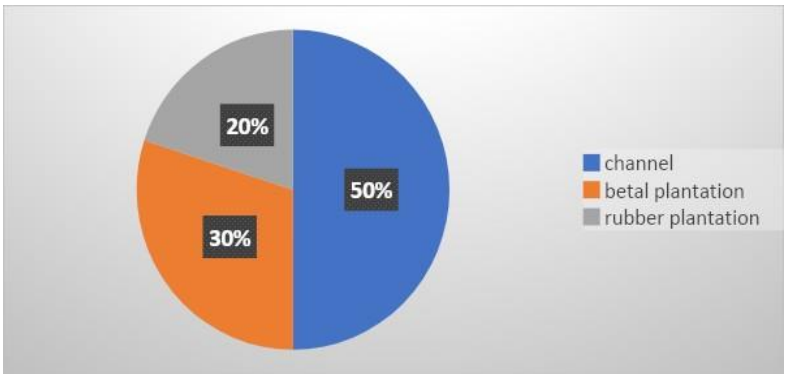

Fig. 1. Percentage of amphibian species in three habitats

Table 3. Monthly distribution in amphibian diversity

Species	Month wise distribution			
	October	November	December	Total number amphibians
Duttaphrynus melanostictus	04	24	12	40
Minervarya Keralensis	08	21	06	35
Pseudophilautus kani	01	07	03	11
Hoplobatrachus Tigerinus	02	06	05	13
	15	58	26	99

Table 4. Physical conditions in each habitat type

Habitat	pH	Temperature
Channel	5.27	27.5±0.5
Betal plantation	5.26	28±1
Rubber Plantation	5.14	32.5±1.5

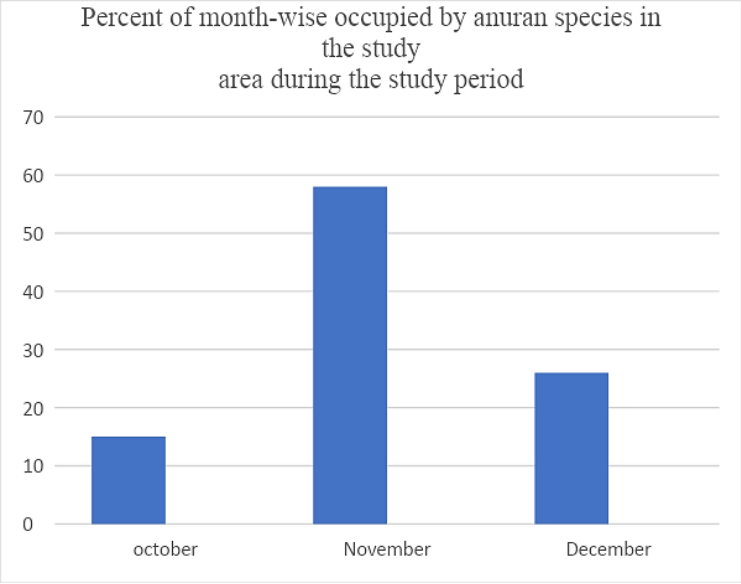

Fig. 2. Percent of month-wise occupied by anuran species in the study

4. DISCUSSION AND CONCLUSION

Biodiversity conservation can be complicated by a variety of factors and a lack of knowledge on how the multitude of life forms are distributed in space and time is probably the primary one. Even though India's biodiversity is the most well-documented among the tropical and third-world countries. Several new species of amphibian population are declining and disappearing worldwide at an increasing rate as compared to pre-1980 decades even from the protected areas [10]. In the present study, a survey on the population diversity of different amphibian species was carried out located in Karode village, Kanniyakumari district for the period of October 2023 to December 2023. During the period of study 4 different amphibian species such as *Duttaphrynus melanostictus, Minervarya Keralensis, Pseudophilautus kani, Hoplobatrachus Tigerinus* habitats and human interference as the structure and diversity of an amphibian community is determined by the availability of food, moisture and micro habitat [10]. Amphibians typically inhabit both aquatic and terrestrial environments, with water availability being crucial for their life cycle. Aquatic habitats are especially important for feeding, breeding, and the metamorphosis of tadpoles. However, many other habitats face challenges due to a lack of water sources, alterations to their environment, and habitat cleaning, which contribute to declining amphibian populations. Changes in habitat and climate also affect the distribution and structure of amphibian populations. This study found that anuran species prefer aquatic habitats, such as ponds, as well as cultivated areas [11].

In the present study we identified a variety of amphibian species utilizing four different habitats. Among these maximum number of species was observed in Channel (50%) Betal plantation (30%) and Rubber Plantation (20%). the Anuran population was estimated by habitat wise distribution and enumerate the population.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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