

**ORIGINAL ARTICLE**

**AMPHIBIAN DIVERSITY IN DIFFERENT HABITAT OF AGRO ECOSYSTEM IN  
NAGAPATTINAM DISTRICT**

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*Article History: Received 7<sup>th</sup> March,2017, Accepted 3<sup>rd</sup> April,2017, Published 30<sup>th</sup> April,2017*

**ABSTRACT**

Amphibian is one of the important component of freshwater both ecologically and economically ecosystem. This study was implemented at three different types of habitat, (1) agricultural and non agricultural land (2) pond (3) grassland. The data was collected by visual encounter survey using line transect method. Species identification was confirmed with pictorial guide and clarified. The data was analyzed descriptively as well as statistically to calculate species richness, Shannon-wiener biodiversity index and evenness index. A total of 13 species of amphibians belonging to 6 families 9 genera were recorded. This study reveals that the Nagapattinam district lies on the east coramandel coast. It is bordered by the Bay of Bengal. The district lies between 10°25' and 11°40' North Longitude and 76°49' and 80°01' East latitude. Further studies are needed on population structure, microhabitat, habitat, and use by amphibians for better understanding and also impose of several conservation strategies in Tamil Nadu state.

**Keywords:** Amphibian Diversity, Agroecosystem

**1.INTRODUCTION**

Amphibians are habitat specific and highly sensitive animals. So, these are called indicator species of environment and also, they play an important role in ecological cycle of the agricultural fields (Blaustein and Wake, 1990; Vitt *et al.*, 1990; Wyman, 1990; Wake, 1991, Cushman, 2006). Among amphibians, the order Anuran constitute the vast majority (88%) of living species of amphibians and the bulk of their genetic, physiological, ecological, and morphological diversity. Amphibians currently comprising more than 7301 recognized species in the world and 342 species in India (Frost, 2013). Out of the 342 species of known Amphibians from India, 75 species are yet to be evaluated and 81 species are still under the data deficient category (Dinesh *et al.*, 2013). In India 342 species of amphibians which includes 306 species of anurans, 35 species of Gymnophionas and 1 species of salamander (Dinesh *et al.* 2013). The amphibians are diverse and unique, with more than 80% of the 77 amphibian species being endemic from the state of Tamil Nadu, India (Dinesh & Radhakrishnan, 2009). Also, many new species have recently been discovered from India,

especially in Western Ghats (Vasudevan and Dutta 2000; Dutta and Ray, 2000; Biju and Bossyut, 2003; Gururaja *et al.*, 2007; Dinesh *et al.*, 2008; Biju *et al.*, 2009,2010; Joshy *et al.*, 2009; Dinesh *et al.*,2013). Amphibians are more threatened and declining in population than birds and mammals (Stuart *et al.*, 2004).

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 ecosystem and could directly modify an ecosystem, causing a cascading effect for resident biota e.g. space (Crooks, 2002).

Amphibians are of interest because their special physiological (skin permeability) and ecological (compound two phases of life cycle) characteristics happen to be potentially excellent bio-indicators, which in turn makes it very common for amphibian populations to be severely affected when there are serious disturbances to their natural habitats (Blaustein and

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Belden, 2003; Carey and Alexander, 2003; Collins and Storfer, 2003).

Disease, pollution, invasive species, over collecting, global changes and other causes have been documented or proposed to be responsible for particular or widespread amphibian declines (Fahrig *et al.*, 1995; Collins and Storfer, 2003; Muths, 2003; Weldon *et al.*, 2004; Blaustein and Bancroft, 2007). Throughout the history of civilization, human activities have been detrimental to the natural biota, which is particularly evident in the clearing of the forest that houses the greatest diversity of anurans (Duellman & Trueb, 1986). Agricultural intensification has led to a drastic transformation of the landscape, soil depletion and the acceleration of irreversible erosion processes (Sans, 2007). Agriculture can alter natural systems basically in two ways: a) Through direct effects on biological diversity in general (e.g., Fahrig, 2003; Firbank *et al.*, 2008) and amphibian diversity in particular (e.g., Hecnar and M'Closkey, 1998; Peltzer *et al.*, 2006), such as habitat loss and creation of isolated fragments by conversion of natural habitats to arable land (e.g., Joly *et al.*, 2001; Grau *et al.*, 2005) b. Through indirect effects, particularly the deleterious impact of the use of agrochemicals on wildlife (e.g., Smith *et al.*, 2000; Khan and Law, 2005).

## 2. MATERIALS AND METHODS

### STUDY AREA



Fig. 1. Study area Map Showing 10 villages

The present study was carried out at Nagapattinam district of Tamil Nadu state. In Nagapattinam ten different villages viz 1. Arupathy. 2. Eswarankoil. 3. Parasalur. 4. Madapuram 5. Akkur 6. Thalachankadu 7. Karuvi .8. Thirukadaiyur. 9. Ananthamankalam. 10. Porayar. In various habitats and micro habitats of Nagapattinam District, Tamil Nadu. The study was carried out only for a growth period of 12 months from Oct 2015 to Dec 2016. The study areas were comprised with dry deciduous, grassland rocky scrub jungle and agricultural landscapes. Agriculture is the backbone of these villages predominantly with agricultural cultivated and non cultivated, pond. Grassland etc.

## METHODS

The survey was carried out all possible habitats, such as agricultural fields, pond, Grassland. Overall data collection was done monitoring on morning time of study period. During the survey periods, such as temperature, microhabitat, and water distance from each species sightings, vegetation type and soil types also will be recorded. The four habitats were classified in to two categories viz., Agricultural and non agricultural areas. Only one types of survey methods were adopted for the present study to collect the data which was made during the day hours by using Visual Encounter Survey method (Heyer *et al.*, 1994). The data collections were made during morning 6.0 to 10.30 am for the entire study periods. The species were identified by using pictorial guides.

### Visual Encounter survey method (VES)

The selected village ponds were regularly monitored for diversity and density of amphibian population in the study area. Visual Encounter Survey Method was applied estimating the amphibian population (Heyer, 1994). All the areas were walked thoroughly for amphibians. Time constrained VES involves systematic search of an area or habitat for a prescribed time (Campbell and Christman, 1982). VES was used as formalized by Crump and Scott (1994), the aim of this study was maximize the species inventory.

### Identification of amphibians

Amphibians were identified with published keys from Daniel and Seakar (1989) and Daniels (2005) also new species descriptions from the recent literatures were used. The fine classification of amphibian families proposed by Frost *et al.* (2013) was used in the present work and nomenclature.

## 3. RESULT AND DISCUSSION

A total of 1312 individuals belongs 10 species from 5 families. The 10 species of amphibians are 1. *Polypedates maculatus* 2. *Duttaphrynus melanostictus* 3. *Euphlyctis hexadactylus* 4. *Euphlyctis cyanophlyctis*. 5. *Fejervarya limnocharis* 6. Unidentified. 7. *Hoplobatrachus crasus* 8. *Microhyla ornate* 9. *Ramanellvariegata* 10. *Hoplobatrachus tigerinus* 11. Unidentified species 12. Unidentified species 13. Unidentified species among the ten different villages the highest number of species were recorded in agriculture paddy cultivated land Parasalur and E. Koil, karuvi, Ananthamangalam 8 species, followed by 1. Arupathy .2. Eswarankoil 3. Parasalur. 4. Madapuram 5. Akkur 6. Thalachankadu 7. Karuvi. 8. Thirukadiu .9. Ananthamankalam. 10. Porayar (Fig. 1). Cultivated area presented in 8 species. None cultivated agricultural area 4 species presented. Grassland absent of frog pond 3 species present among the 5 families recorded, highest number of species belonged to the family Dicroglossidae 4 species and lowest number only one species was recorded from the family Rhacophoridae

Many habitat types may occur within an area, amphibians may utilize only a few of these. The number of individuals that represents each species in community may vary from place to place depending on the amount of rainfall, available

**Table 1. List of Amphibian species recorded during the study January 2016 to Dec 2016**

S. NO	Family	Name of the species	Common name	IUCN status	IWPA(1972) Status <sup>(41)</sup>
1	Bufonidae	<i>DuttaphrynusMelanostictus</i>	Common Indian Toad	Lest Concern	Schedule IV
2	Dicroglossidae	<i>EuphlyctisCyanophlyctis</i>	Skipper frog	Lest Concern	Schedule IV
3	Dicroglossidae	<i>Euphlyctishexadactylus</i>	Indian pond frog	Lest Concern	Schedule IV
4	Dicroglossidae	<i>Hoplobatrachustigerinus</i>	Indian bull frog	Lest Concern	Schedule IV
5	Microhylidae	<i>Microhyla ornate</i>	Ornate narrow mouthed frog	Lest Concern	Schedule IV
6	Microhylidae	<i>Ramanella variegata</i>	Narrow mouthed Frog	Lest Concern	Schedule IV
7	Ranidae	<i>Fejervaryalimmocharis</i>	Indian Cricket Frog	Lest Concern	Schedule IV
8	Rhacophoridae	<i>Polypedatesmaculatus</i>	Common Tree Frog	Lest Concern	Schedule IV
9	Dicroglossidae	<i>Hoplobatrachus Crassus</i>	Jerdon's bullfrog	Lest Concern	-

**Table 2. Presence and Absence of Anurans species in different habitat in the study area**

S. No	Species name	Species Agriculture Paddy cultivated	Agricultural Non cultivated	Pond water	Grassland
1	<i>Fejervaryalimmocharis</i>	*	*	-	-
2	<i>EuphlyctisCyanophlyctis</i>	*	*	*	-
3	<i>Euphlyctishexadactylus</i>	*	-	*	-
4	<i>DuttaphrynusMelanostictus</i>	-	-	-	*
5	<i>Microhyla ornate</i>	-	-	-	*
6	<i>Ramanella variegata</i>	-	-	-	*
7	<i>Hoplobatrachus Crassus</i>	*	*	-	-
8	<i>Hoplobatrachustigerinus</i>	-	*	*	-
9	<i>Polypedatesmaculatus</i>	*	*	*	*
10	Unidentified species1	-	*	-	-
11	Unidentified species2	-	*	-	-
12	Unidentified species3	-	*	-	-
13	Unidentified species4	*	-	-	-

\*=Present ; - = Absent, LIMLIM=

habitats and human interference as the structure and diversity of an amphibian community is determined by the availability of food, moisture and micro habitat (Daniels RJR. 1994.) The habitat of study areas were vastly cultivated with paddy fields (Laxmi NB.2011) these kind of ecosystems well attracted to amphibian species may use of various purpose such as food (insects) and home grounds etc. Amphibians important to agriculturalists, they take play a key role in ecosystem functioning and act as predator, mainly as consumers of insect pest Duellman WE, Trueb L 1994. In the present study we identified variety of amphibian species utilizing four

different habitats namely Agricultural land (8 species), pond (3 species), Non cultivated land(4 species) and grassland (0 species). Among these maximum number of species was observed in the Pond (61.8%) followed by Cultivated (25.4%), Non cultivated (12.0%) and grassland (0.8%) Fig.3. the Anuran population was estimated by habitat wise distribution and enumerate the population. As highest in the Pond habitat of 811 individuals and subsequent highest in he cultivated (333) lands suitable for anuran population in this study (Fig.2). These two habitats water availability in regularly or seasonally, Generally the amphibians are aquatic

and terrestrial inhabitant in which aquatic is more important in their life span for feeding, Breeding and most importantly for metamorphosis tadpoles. Remaining habitats are lack of water source and microhabitat also alteration of habitat or cleaning are the major reason for less population of amphibians in thisfield. There were changing habitat and climates are regulating the population structure inhabitant location also. This study obtained the anuran population are more preferable in aquatic habitat of pond and cultivated habitat.

Fig.2. Distribution of Anuran population in different five habitats in Study area.

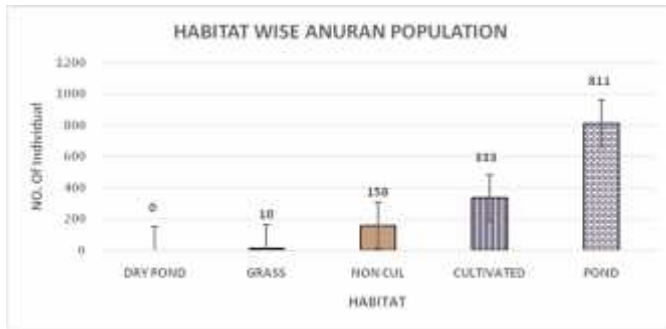
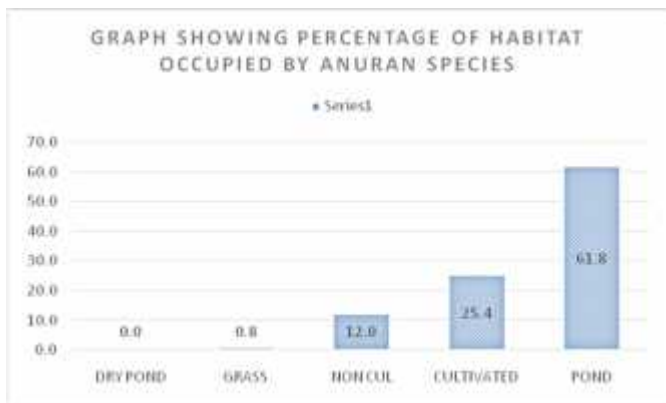


Fig.3. Percent of habitat occupied by anuran species in the study area during the study period



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