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Amphibian diversity (Order: Anura) at northern and central parts of Telangana, India

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Abstract
The present paper deals with amphibian diversity at two districts of Telangana state during the period 2010 to 2014. A rapid survey method was involved in careful visual estimation and amphibians were recorded in all possible habitats of the study area. A total of 14 species of amphibians belonging to 4 families 9 genera were recorded. This study reveals that the Northern and Central Telangana area is rich in amphibian diversity and support many more species. Further studies are needed on population structure, habitat use by amphibians for better understanding and also impose of several conservation strategies in Telangana state.

Keywords: Amphibians, diversity, Telangana, careful visual estimation.

1. Introduction
The first vertebrate animals are amphibians and they have two life stages namely tadpoles (occur in water) and adults (on land) [13]. As it is known that amphibians are comprised of frogs, toads, caecilians and salamanders those are extremely varied [12]. The amphibian fauna comprises 6639 species in the world [15]. In India 311 species belonging to existing orders, namely Caudata, Anura and Gymnophiona were reported [36]. In Eastern Ghats 20 species belonging to 14 genera were identified [33]. About 30 % - 57% of the amphibians in India are threatened and disappeared due to lose of natural habitats [37]. Amphibian related studies were carried out in state of Andhra Pradesh [20, 18, 30, 26, 10, 14, 8, 21] on population status and distribution. These above studies were comprehensive on amphibian diversity mostly from Nallamala Hills and Nagarjunasagar Srisailam Tiger Reserve [35, 24, 38, 33]. Further, some of the authors presented herpetofaunal and amphibian studies from Eastern Ghats region of Central Telangana only [33, 38]. Hence, the purpose of this study is to provide additional information on amphibian diversity from Nizamabad (Northern Telangana) and Medak (Central Telangana) Districts of Telangana state.

2. Materials and Methods
2.1 Study Area
The present study was carried out at Nizamabd and Medak districts of Telangana state. In Nizambad three different villages viz., Yellampet 18.40329 N & 78.49387 E (Macharedyy mandal), Lonka Thanda 18.45274 N & 78.1192 E (Gandari mandal), Baswapur 17.56525 N & 78.89408 E (Bhiknoor mandal) and in Medak Dongala Dharmaram village 18.06220 N & 78.49656 E of Ramayampet mandal were covered during the period 2010 to 2014. The study areas were comprised with dry deciduous, rocky scrub jungle and agricultural landscapes. Agriculture is the backbone of these villages predominantly with paddy, sugarcane, maize, turmeric, cotton, groundnut, sunflower and pulses. The irrigation systems such as Nizamsagar, Sree Ram Sagar, Pocharam, Ramadugu and Nallavagu are the main sources of irrigation [17].

2.2 Methods
The method involves rapid surveys and careful visual estimation of amphibians in all the possible habitats, such as agricultural fields, wet lands, rocky areas and open lands [22]. The observations were mostly carried out during day between 6:00 hrs to 9:00 hrs and 21:00 hrs to 24:00 hrs. The parameters noted during observation include name of the species, village name and habitat in which the species was found. The species were identified by using [32, 9, 11].

3. Results and Discussion

A total of 14 species (one species un-identified) belonging to 4 families 9 genera were recorded with photographic evidences (Table 1 & Plate 1). Among the four different villages, the highest number of species were recorded in Lonka Thanda with 11 species, followed by Dongala Dharmaram (10 species), Yellampet (9 species) and 8 species from Baswapur (Table 2). Among the 4 families recorded, highest number of species belonged to the family Ranidae (6 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 habitats and human interference as the structure and diversity of an amphibian community is determined by the availability of food, moisture and micro habitat [5]. The habitat of study areas were vastly cultivated with paddy fields [17], 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 [13]. In the present study we identified variety of amphibian species utilizing five different habitats namely Agricultural land (9 species), Open land (7 species), Human settlements and Water bodies (5 species) and Scrubland (4 species) (Table 2). Among these maximum number of species was observed in the Agriculture land (30%) followed by Open land (23%), Human settlements and Water bodies (17%) and Scrubland (13%) (Fig. 1).

In the state of Telangana very little information about amphibians has been reported. Murthy (1968) reported 6 species from Nagarjuna valley which is now submerged under Nagajunasagar Reservoir [23]. So far amphibian diversity in different regions of Telangana has been reported by some of the authors; 19 species belonging to 4 families from Nagarjunasagar Tiger Reserve [38], 18 species belonging to 4 families with 11 genera from the same region [23] and 20 species belonging to 12 genera in 4 families [33] and justified a annotated checklist with remarks on nomenclature, taxonomy, habitat use, adaptive types and biogeography of the amphibians. A recent literature shows the presence of 8 species belonging to 7 genera in 4 families from Seshachalam Biosphere Reserve [2] and 12 species belong to 4 families at Thummalapalle [24]. However, speckled records were made by several authors from different parts of united Andhra Pradesh [3, 25, 26, 16, 29, 28, 14, 4, 30, 1, 6, 7, 9, 18, 19, 27]. In the present study an attempt has been made on amphibian diversity in two different locations of Telangana state thus adding to the distributional range of species. In this paper we presented study areas are well potential habitats to determine of amphibian diversity, nevertheless, furthermore exclusive studies needed from different locations of Telangana state to better understanding of their distributional ranges.

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Table 1: List of Amphibian species recorded during the study.

Family	Image No	Taxon	Common Name	IUCN Status [39]	C I T E S Appendix [40]	IWPA (1972) Status [41]
Bufonidae	1	*Duttaphrynus melanostictus* (Schneider, 1799)	Common Indain Toad	Least Concern	Not listed	Schedule IV
	2	*Duttaphrynus scaber* (Schneider, 1799)	Ferguson's Toad	Least Concern	Not listed	Schedule IV
Microhylidae	3	*Microhyla ornata* (Duméril & Bibron, 1841)	Ornate Microhylid	Least Concern	Not listed	Schedule IV
	4	*Ramanella variegata* (Stoliczka, 1872)	Narrow-mouthed Frog	Least Concern	Not listed	Schedule IV
Rhacophoridae	5	*Polypedates maculatus* (Gray, 1830)	Common Tree Frog	Least Concern	Not listed	Schedule IV
Ranidae	6	*Hoplobatrachus tigerinus* (Daudin, 1803)	Indian Bull Frog	Least Concern	II	Schedule IV
	7	*Euphlyctis hexadactylus* (Lesson, 1834)	Indian Pond Frog	Least Concern	Not listed	Schedule IV
	8	*Sphaerotheca rolandae* (Dubois, 1983)	Indian Burrowing Frog	Least Concern	Not listed	Schedule IV
	9	*Sphaerotheca breviceps* (Schneider, 1799)	Indian Burrowing Frog	Least Concern	Not listed	Schedule IV
	10	*Fejervarya limnocharis (Gravenhorst, 1829)*	Indian Cricket Frog	Least Concern	Not listed	Schedule IV
	11	*Euphlyctis cyanophlyctis* (Schneider, 1799)	Skittering Frog	Least Concern	II	Schedule IV
	12	*Fejervarya species*	---	---	---	---
	13	*Fejervarya species*	---	---	---	---
	14	Un indentified species	---	---	---	---

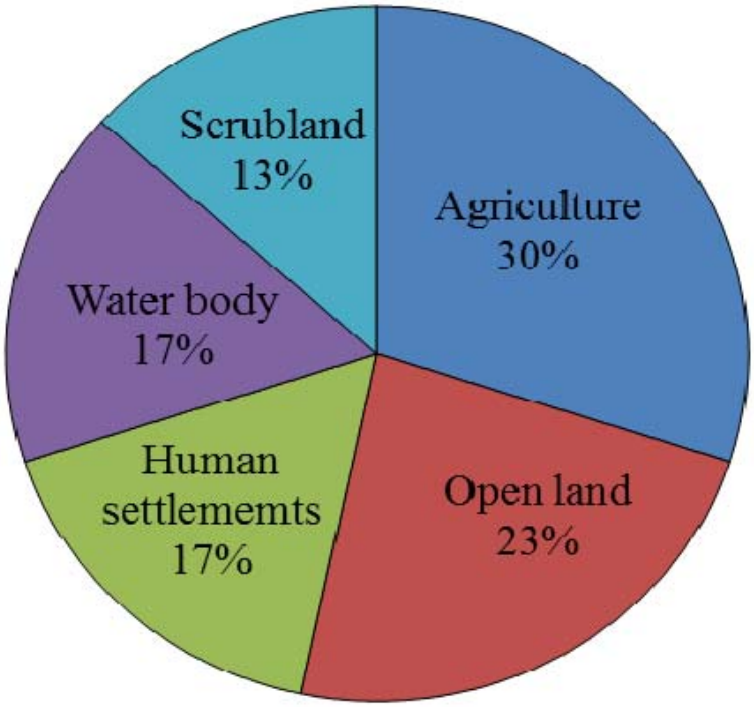

Fig 1: Percent habitat utilization of amphibians recorded during the study period.

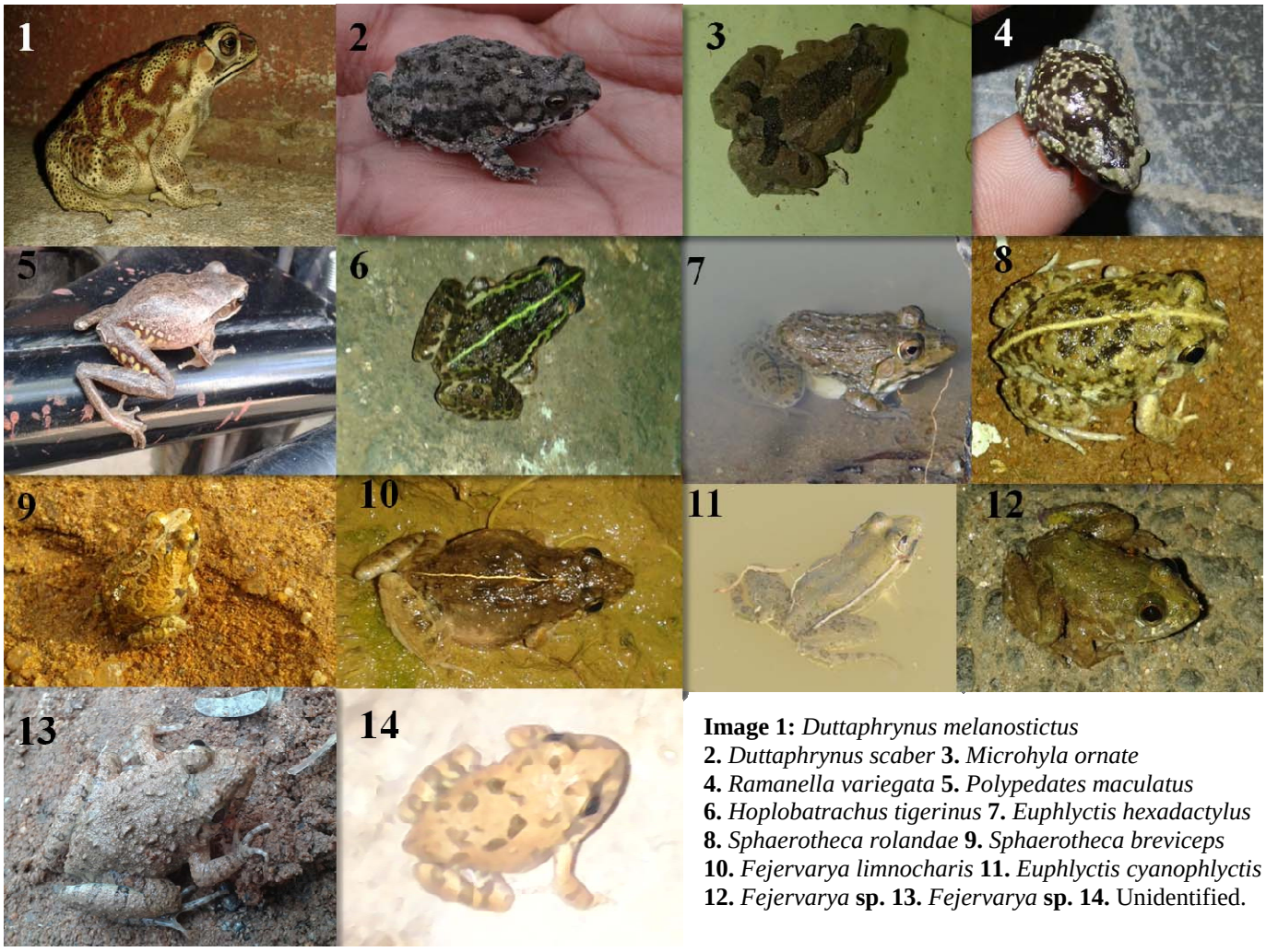

Image 1: *Duttaphrynus melanostictus*
2. *Duttaphrynus scaber* **3.** *Microhyla ornate*
4. *Ramanella variegata* **5.** *Polypedates maculatus*
6. *Hoplobatrachus tigerinus* **7.** *Euphlyctis hexadactylus*
8. *Sphaerotheca rolandae* **9.** *Sphaerotheca breviceps*
10. *Fejervarya limnocharis* **11.** *Euphlyctis cyanophlyctis*
12. *Fejervarya* **sp. 13.** *Fejervarya* **sp. 14.** Unidentified.

Plate 1: Amphibians recorded from different locations of Northern and Central parts of Telangana state.

Table 2: Occurrence and habitat preference of amphibians in different locations recorded during the study.

Image No	Taxon	Location				Habittats preference
		Yellampet	Lonka Thanda	Baswapur	Dongala Dharmaram	
1	*Duttaphrynus melanostictus*	*	*	*	*	Ag, Ol, Hs, Sl, Wb
2	*Duttaphrynus scaber*	*	*	*	*	Ag, Ol, Sl
3	*Microhyla ornata*	*	-	-	-	Ag, Ol, Hs, Sl
4	*Ramanella variegata*	-	-	-	*	Ol, Hs, Sl
5	*Polypedates maculatus*	*	*	*	*	Ag, Hs
6	*Hoplobatrachus tigerinus*	*	*	*	*	Wb
7	*Euphlyctis hexadactylus*	*	*	*	*	Wb
8	*Sphaerotheca rolandae*	*	*	*	*	Ag, Ol
9	*Sphaerotheca breviceps*	-	*	-	-	Ag, Ol
10	*Fejervarya limnocharis*	*	*	*	*	Ag, Ol
11	*Euphlyctis cyanophlyctis*	*	*	*	*	Ag, Wb
12	*Fejervarya species*	-	*	-	-	Hs
13	*Fejervarya species*	-	*	-		Wb
14	Un identified species	-	-	-	*	Ag
Total species		9	11	8	10	

Note: *=presence of species,-=absence of species, Ag=Agriculture, Ol=Open land, Hs=Human settlements, Sl=Scrubland and Wb=Water body.

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