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The diversity and distribution of Herpeto fauna in Sherepalli and Peddagattu- A proposed site for uranium mining project at Nalgonda district, Telangana, India

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Abstract
A detailed study has been conducted for Herpeto fauna under Biodiversity Impact Assessment survey for the proposed Uranium Mining Project at Nalgonda district, Telangana state. During the study, the diversity and distribution pattern of various herpetofauna recorded from the study area. A total of 58 species belonging to 42 genera and 18 families were recorded during April, 2010 to December, 2013 covering various habitats in the Core and buffer zones of the study area. Colubridae was recorded as the most dominant family in terms of number of species, represented by 14 species (24.14%) followed by Gekkonidae with 7 species (12.07). Out of 58 species recorded, eight species comes under Schedule-I species and 18 species were listed under Schedule-II as per Indian Wildlife (Protection) Act, 1972 amended in 2022. The IUCN Red List categorisation also been done for the recorded species and found that four Near Threatened (NT) species and One Vulnerable species found in this region.

Keywords: Herpetofauna, sherepalli, uranium, diversity, habitat, Telangana

Introduction
Reptiles and amphibians (collectively called herpetofauna) constitute important elements of biotic components of various ecosystems because they occupy a variety of habitats/microhabitats Capula M (1989) [3]. Moreover, being ectothermic animals, they are more susceptible to changes in their environment Crump M L (2002) [4]. As herpetofaunal species are less mobile compared to mammals and birds, alteration in their habitats/micro-habitats can lead to drastic changes in the herpetofaunal communities Marks Raissa (2006) [7]. Therefore, they are the best indicators of environmental changes.

Need for Ecology and Biodiversity studies of the region
The Indian government is interested in augmenting nuclear power production to suffice the ever-growing demand for power. Uranium Corporation of India Limited (UCIL) is undertaking mining and processing of Uranium ore on large scale and it is expanding its operation in Nalgonda District of Telangana state, which is endowed with huge uranium deposits. To initiate the continuous operation of mining processes, it is essential and prime requisite to generate baseline data on entire biodiversity of the region to know the Rare, Endangered, Endemic and Threatened (REET) species. It is uncertain whether mining of uranium will affect the flora and fauna of the surrounding areas (Bogoev *et al*., 2010) [2]. Changes in the quality of environment impose stress on amphibians and reptiles, and these animals are reportedly reliable indicators of environmental degradation (Hall and Henry, 1992) [6]. This baseline data can predict the ecological impacts of proposed mining operations in Sherepalli, Lambapur and Peddagattu area.

Study Area
Sherepalli, Lambapur and Peddagattu
These villages are the main core zone habitat for mining activities. The study area was divided into three zones based on the impact magnitude and dimensions of the proposed mine lease area namely 0-5 Km (core zone), 5-15 km (Buffer zone-I) and 15 –30 km (Buffer zone-II). The region has a general elevation of about 520 ft from mean sea level. The study area was lying between 16°53’ to 17°50’ N latitude and 78°45’ to 78° 60’ E longitude and having an area of 4,781.35 sq.km. The forest area forms an area of 9 % of the total geographical area. The study area was bounded on the north by Nalgonda District in South and parts of Mahaboobnagar District on the east by Nalgonda, and on the west by Nalgonda district (Fig.1). The study area forms a fragmented stretch between NSTR and Krishna River associated forests.

Physio graphically the study area consists of flat-topped hills composed of Proterozoic sediments. As it is in close proximity to Nagarjunasagar canal system, majority of the area was under cultivation. However, the rocky exposures at the bottom of the hills generally are composed of granitic rocks. The general drainage pattern is dendritic indicating homogenous nature of formation. The study area as a whole has a gentle slope from West and North West to South East.

The ground flora in the dry deciduous forests in conspicuous only during and after monsoon months and consists of various herbs and under shrubs. The common herbs are *Corchoru surticifolius, Melhania incana, Pavonia zeylanica, P.odorata, Acalypha alnifolia, Aervalanata, Plumbago zeylanica, Andrographis paniculata, Sidaacuta, Evolvulus alsinoides, Phyllanthus virgatus, Pulicaria wightiana, Vernonia albicans, Rhynchosia capitata, Waltheria indica*, species of *Indigofera* and *Crotalaria*.

Methodology

The study was carried out for three years, that is between April, 2010 and December, 2013 in all three seasons covering various habitats in the Core and buffer zones of the study area. The study area was divided into eight sectors, that is North, North-East, East, South-East, South, South-West, West and North-West. Search for the herpetofauna in all sectors was done during rainy, winter and summer seasons.

Line transect method was followed. In each part, six line transects of 1 km length was laid. The search for herpetofauna was done along the line transects. Opportunistic observations were also added to this list so as not to miss any species during the survey period. The geographical coordinates of transects was noted and save the path with the help of Etrex GPS of Garmin manufacture. The animals were located by lifting stones, under rocks, fallen leaves, trees and peeling barks of trees during the early hours, afternoon and evening in the day time and before midnight during night time. Photographs of herpetofauna were taken with Nikon D500 DSLR camera. No herpetofaunal voucher specimens were collected and preserved.

The density of each species in the study area was assigned based on percentage of sighting during the survey, abundant (70 to 100%), common (50 to 70%), frequent (20 to 50%) and rare (0 to 20%) (Amarnath Reddy *et al*., 2013) [1]. Threatened status of recorded species was according to the IUCN Red List of 2022.

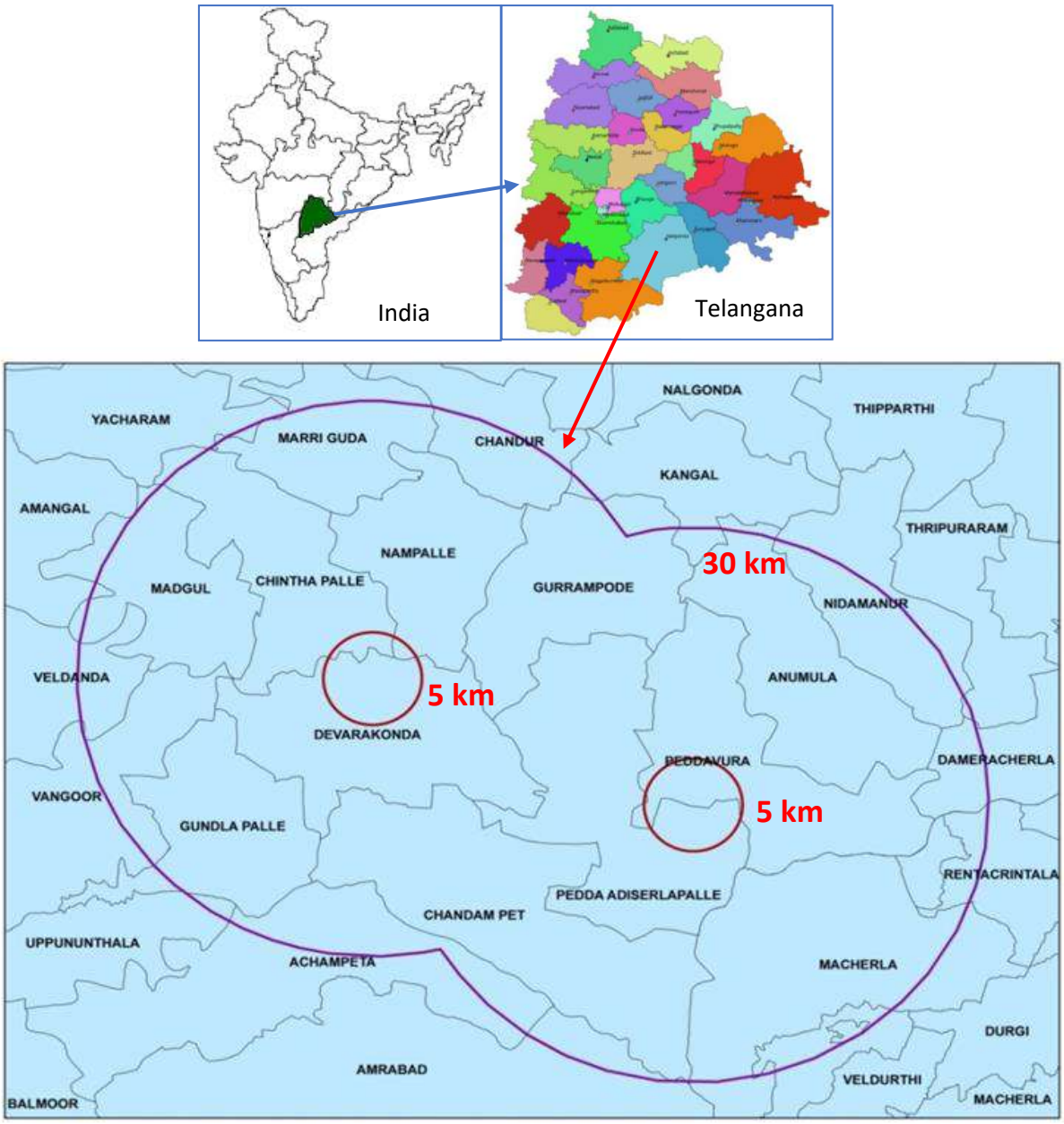

Fig 1: Map showing the core and buffer zones of the study area (Sherepalli and Peddagattu sites)

Results and discussion

A total of 58 species belonging to 42 genera and 18 families were recorded during April, 2010 to December, 2013 covering various habitats in the Core and buffer zones of the study area (Table 1, Fig 2). Colubridae was recorded as the most dominant family in terms of number of species, represented by 14 species (24.14%) followed by Gekkonidae with 7 species (12.07). Out of 58 species recorded, eight species comes under Schedule-I species and 18 species were listed under Schedule-II as per Indian

Wildlife (Protection) Act, 1972 amended in 2022. The IUCN Red List categorisation also been done for the recorded species and found that four Near Threatened (NT) species and One Vulnerable species found in this region (Table 2).

The recent studies on herpetofauna in Nallamala Hills, Andhra Pradesh reported 20 spp. of amphibians and 64 spp. of reptiles (Srinivasulu and Das, 2008) [8]; and in Seshachalam Biosphere Reserve, Andhra Pradesh reported eight spp. of amphibians and 34 spp. of reptiles (Guptha *et al*., 2012) [5]. Rainfall is about 520 mm in the study area and is drier during summer. There are aquatic or water dependent species like *Fejervarya syhadrensis, Kaloula taprobanica, Ramanella variegate, Uperodon systoma, Euphlyctis cyanophlyctis* in the reported list. Conservation of water bodies in the study area is much needed for existence of these species. Forest fires during summer, illicit killing of snakes by the local people, hunting of Common monitor lizard (*Varanus bengalensis*) and rodent poisons used in agricultural fields are the major threats to the herpetofauna within the study area. Care should be taken to minimize these hazards and to protect the herpetofauna of the study area. Uranium Mining Corporation Limited wanted to have a base line data on fauna in 30 km radius from the mining site so as to take appropriate measures for protection and conservation of the fauna. Since there are eight schedule -I species under Indian Wildlife protection Act, 1972 amended in 2022 and four Near Threatened and One Vulnerable species as per IUCN red list found in this region, species specific conservation plan need to be prepared as per the forest department guidelines. Periodic assessment of the faunal diversity has to be studied in various phases of the proposed mining activity.

Table 1: Table showing family wise species composition of Herpetofaunal diversity recorded in the study area

Family	Genera	%	Species	%	Individual	%
Bufonidae	2	4.76	3	5.17	51	3.30
Dicroglossidae	1	2.38	1	1.72	18	1.17
Mycrohylidae	3	7.14	3	5.17	28	1.81
Ranidae	5	11.90	5	8.62	87	5.63
Rhacophoridae	1	2.38	1	1.72	19	1.23
Agamidae	2	4.76	4	6.90	811	52.53
Boidae	2	4.76	2	3.45	7	0.45
Chamaeleonidae	1	2.38	1	1.72	9	0.58
Colubridae	12	28.57	14	24.14	110	7.12
Elapidae	2	4.76	2	3.45	15	0.97
Gekkonidae	1	2.38	7	12.07	52	3.37
Geoemydidae	2	4.76	2	3.45	16	1.04
Lacertidae	1	2.38	3	5.17	77	4.99
Pythonidae	1	2.38	1	1.72	1	0.06
Scincidae	3	7.14	6	10.34	223	14.44
Typhlopidae	1	2.38	1	1.72	1	0.06
Varanidae	1	2.38	1	1.72	16	1.04
Viperidae	1	2.38	1	1.72	3	0.19
Total	42		58		1544	

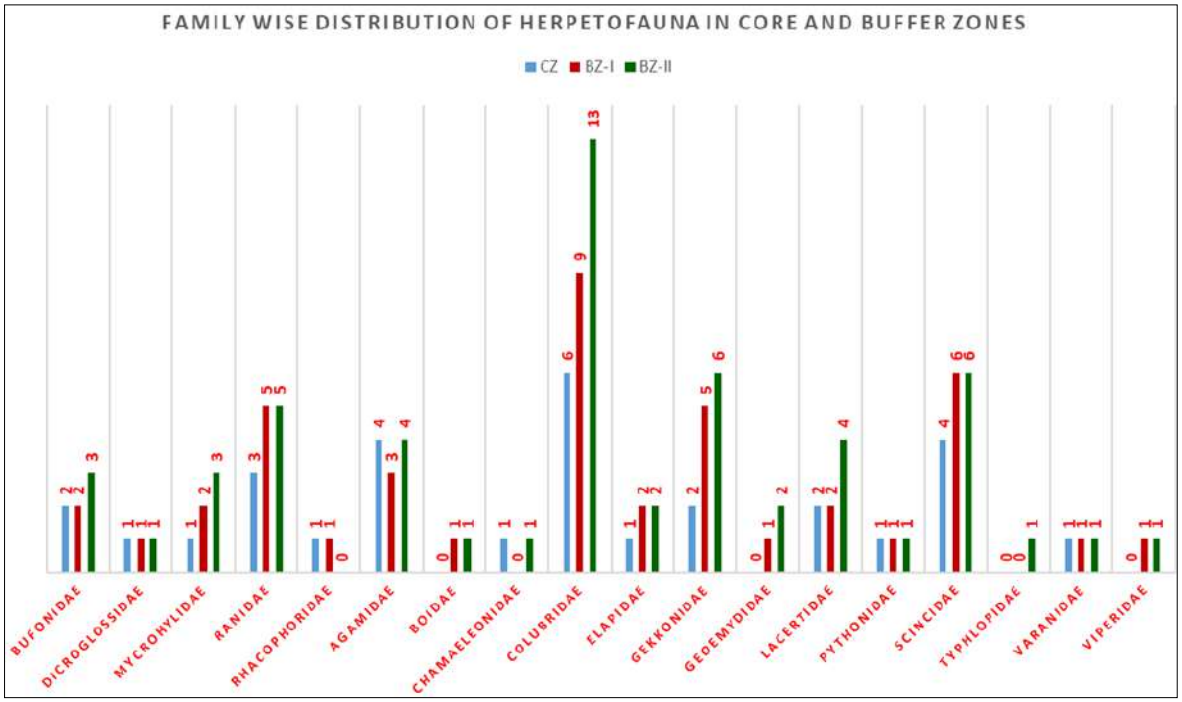

Fig 2: Family wise distribution of Herpetofauna in the core and buffer zones.

Table 2: Table showing Herpeto faunal species recorded in the study area

S. No	Order	Family	Scientific name	Common name	IUCN Status	IWPA Status
1	Anura	Bufonidae	*Bufo melanostictus* (Schneider, 1799)	Common Indian toad	LC	
			Bufo scaber (Schneider, 1799)	Toad	LC	
			*Duttaphrynus hololius (*Günther, 1876*)*	Toad	LC	
2		Dicroglossidae	*Fejervarya syhadrensis* (Gravenhorst, 1829)	Paddy field frog	LC	
3		Mycrohylidae	*Kaloula taprobanica* (Parker, 1934)	Painted Kaloula	LC	
			Ramanella variegate (Lesson, 1834)	Termite nest frog	LC	
			Uperodon systoma (Schneider, 1799)	Marbaled Baloon frog	LC	
4		Ranidae	*Euphlyctis cyanophlyctis* (Schneider, 1799)	Skittering frog	LC	Sch-II
			Fejervarya limnocharis (Gravenhorst, 1829)	Padddy Field Frog	LC	
			Hoplobatrachus tigerinus (Daudin, 1803)	Indian bull frog	LC	Sch-II
			Rana hexadactyla (Lesson, 1834)	Indian pond frog	LC	
			Sphaerotheca breviceps (Schneider, 1799)	Burrowing frog	LC	
5		Rhacophoridae	*Polypedates maculatus (*J.E.Gray, 1830)	Common tree frog	LC	
6	Squamata	Agamidae	*Calotes rouxii* (Dumeril and Bibron, 1837)	Roux's Forest Lizard	LC	
			Calotes versicolor (Daudin, 1802)	Common garden lizard	LC	
			Citana ponticeriana (Cuvier, 1829)	Fan throated lizard	LC	
			Psammophilus blanfordanus (Stoliczka, 1871)	Blanford' s rock agama	LC	
7		Boidae	*Eryx johnii* (Russell, 1801)	Red Sand Boa	NT	Sch-I
			Gongylophis conicus (Scheider, 1801)	Common sand boa	NT	Sch-II
8		Chamaeleonidae	*Chamaeleo zeylanicus* (Laurenti, 1768)	Indian Chameleon	LC	Sch-I
9		Colubridae	*Ahaetulla nasuta* (Daudin, 1803)	Green vine snake	LC	Sch-II
			Amphiesma stolatum (Linnaeus, 1758)	Buff striped keelback	LC	Sch-II
			Argyrogena fasciolata (Shaw, 1802)	Banded Racer	LC	Sch-II
			Boiga trigonata (Schneider, 1802)	Common Cat Sanke	LC	Sch-II
			Coelognathus helena (Daudin, 1803)	Common Trinket snake	LC	Sch-II
			Coluber bholanathi (Linnaeus, 1758)	Racer snake	DD	Sch-II
			Dendrelaphis tristis (Daudin, 1803)	Bronzeback tree snake	LC	Sch-II
			Lycodon aulicus (F.Boie, 1827)	Common wolf snake	LC	Sch-II
			Lycodon straitus (Shaw, 1802)	Barred wolf snake	LC	Sch-II
			Macropisthodon plumbicolor (Cantor, 1839)	Green keel back	LC	Sch-II
			Oligodon arnensis (Shaw, 1802)	Common Kukri	LC	Sch-II
			Oligodon taeniolatus (Jerdon, 1853)	Russel's kukri	LC	Sch-II
			Ptyas mucosus (Linnaeus, 1758)	Indian rat snake	LC	Sch-I
			Xenochrophis piscator (Schneider, 1799)	Checkered keelback	LC	Sch-II
10		Elapidae	*Bungarus caeruleus* (Schneider, 1801)	Common krait	LC	Sch-II
			Naja naja (Linnaeus, 1758)	Common Indian Cobra	LC	Sch-I
11		Gekkonidae	*Hemidactylus brookii* (Gray, 1845)	Brook's gecko	LC	
			Hemidactylus frenatus (Schlegel, 1836)	Common House Gecko	LC	
			Hemidactylus giganteus (Stoliczka, 1871)	Giant Leaf-toed Gecko	LC	
			Hemidactylus leschenaultii (Dumeril and Bibron, 1836)	Leschenault's Leaf-toed Gecko	LC	
			Hemidactylus reticulatus (Beddome, 1870)	Reticulated Gecko	LC	
			Hemidactylus Spp	Wart rock gecko	LC	
			Hemidactylus triedrus (Daudin, 1802)	Termite hill gecko	LC	
12		Geoemydidae	*Lissemys punctate* (Lacepede, 1788)	Indian flapshell turtle	VU	Sch-I
			Melanochelys trijuga (Schweigger, 1812)	Indian Black Turtle	LC	
13		Lacertidae	*Ophisops leschenaultii* (Milne-Edwards, 1829)	Leschenault's Snake Eye	LC	
			Ophisops minor (Deraniyagala, 1971)	Snake eye	LC	
			Ophisops sp	Lacertid	LC	
14		Pythonidae	*Python molurus* (Linnaeus, 1758)	Indian rock Python	NT	Sch-I
15		Scincidae	*Eutrophis beddomii* (Jerdon, 1870)	Beddomes Skink	LC	
16		Scincidae	*Eutrophis nagarjunii* (Sharma, 1969)	Sharma's skink	LC	
			Eutropis macularia (Blyth, 1853)	Bronzed grass skink	LC	
			Lygosoma albopunctata (Gray, 1846)	Spotted supple skink	LC	
			Lygosoma punctatum (Gmelin 1799)	Skink	LC	
			Mabuya Carinata (Schneider, 1801)	Common skink	LC	
17		Typhlopidae	*Ramphotyphlops braminus* (Daudin, 1803)	Common blind snake	LC	Sch-II
18		Varanidae	*Varanus bengalensis* (Daudin, 1802)	Bengal Monitor lizard	NT	Sch-I
19		Viperidae	*Daboia resselli* (Shaw and Nodder, 1797)	Russel's viper	LC	Sch-I

Indian cobra (*Naja naja*)

Common Sand Boa (*Eryx conicus*)

Red Sand Boa (*Eryx johnii*)

Racer snake (*Coluber bholanathi)*

Fig 3: Snake diversity recorded in the study area

Common garden lizard (*Calotes versicolor*)

Fan-throated lizard (***Sitana ponticeriana***)

Blanford's rock agama (*Psammophilus blanfordanus*)

Common garden lizard (*Calotes versicolor*)

Sharma's Skink *(Eutropis nagarjunii)*

Fig 4: Reptilian diversity recorded in the study area

Indian toad (*Duttaphrynus melanostictus*)

Indian bull frog (*Hoplobatrachus tigerinus*)

Common tree frog (*Polypedates leucomystax*)

Skittering frog (*Euphlyctis cyanophlyctis)*

Common house gecko (*Hemidactylus frenatus*)

Reticulated gecko (*Coleonyx reticulatus)*

Fig 5: Amphibian and Gecko's diversity recorded in the study area

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