

Full Length Research Paper

# Herpetofauna of Thummalapalle uranium mining area, Andhra Pradesh, India

Y. Amarnath Reddy<sup>1</sup>, B. Sadasivaiah<sup>2</sup>, P. Indira<sup>1</sup> and T. Pullaiah<sup>3\*</sup>

<sup>1</sup>Department of Zoology, Sri Krishnadevaraya University, Anantapur 515 003, Andhra Pradesh, India.

<sup>2</sup>Department of Botany, Govt. Degree (Men) & P.G. College, Wanaparthy 509 103, Mahabubnagar, Andhra Pradesh, India.

<sup>3</sup>Department of Botany, Sri Krishnadevaraya University, Anantapur 515 003, Andhra Pradesh, India.

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**The present study on herpetofauna in Thummalapalle uranium mining area resulted in a collection of 52 species belonging to 17 families. Snakes were the dominant group with 20 species. Most species recorded are in the least concerned and not assessed categories, and only two species (*Geochelone elegans* and *Lissemys punctata*) were in the lower risk - least concern category and one species (*Melanochelys trijuga*) was in lower risk - near threatened category of the IUCN Red List of 2012. Density of species in the study area was reported. Forest fires, killing, hunting and road kills are the major threats observed in the study area.**

**Key words:** Herpetofauna, species richness, uranium mining area, Andhra Pradesh.

## INTRODUCTION

The Indian government is interested in augmenting nuclear power production to suffice the ever growing demand for power. One of the largest uranium deposits of the world is located at Thummalapalle, YSR Kadapa district, Andhra Pradesh, India. The mining activity of uranium ore was launched here in 2012. It is uncertain whether mining of uranium will affect the flora and fauna of the surrounding areas (Bogoev et al., 2010). 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).

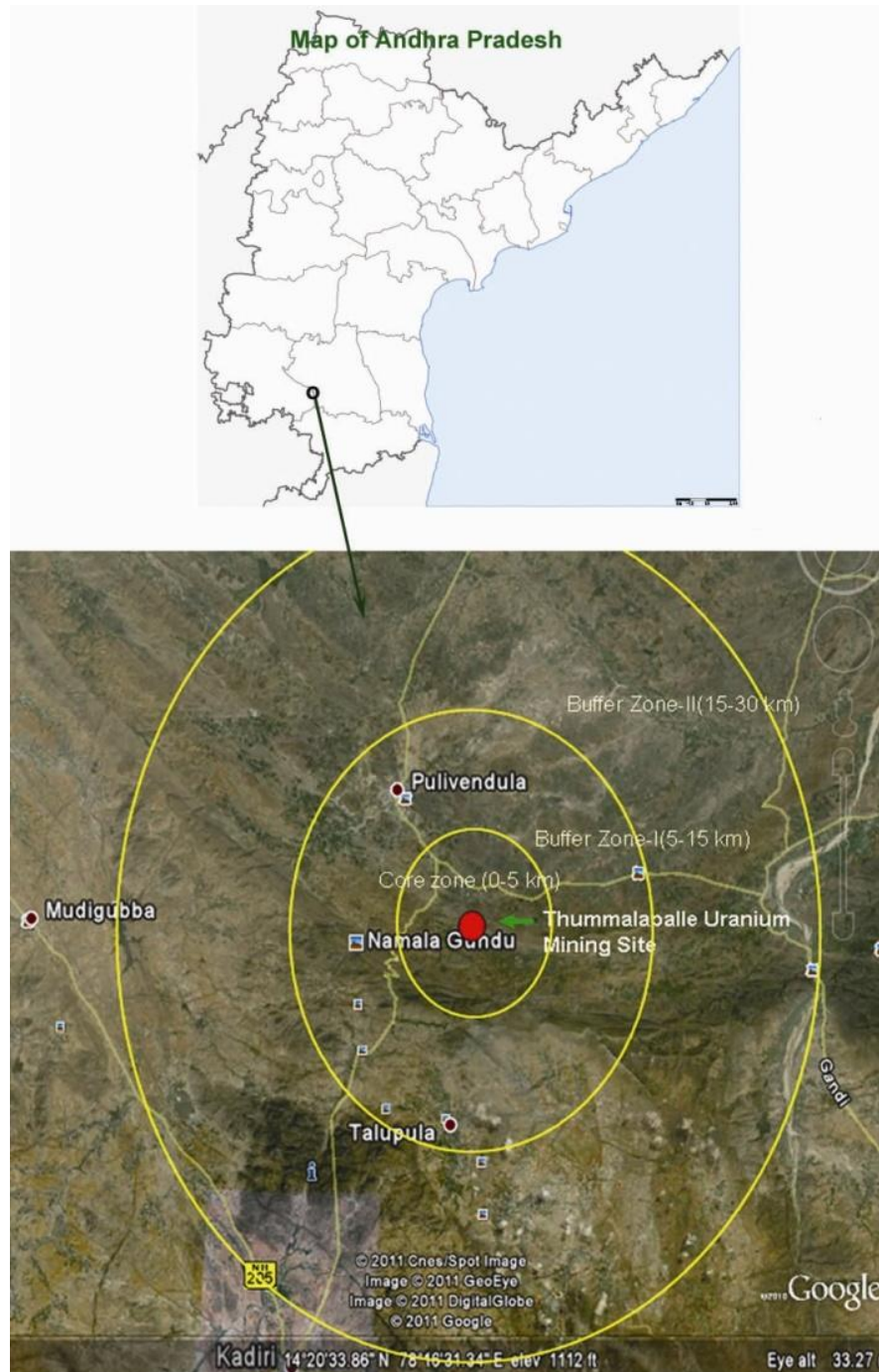
Work on the herpetofauna in an area adjacent to a uranium mine is necessary, in order to demonstrate the effect of mining and to further survey the herpetofauna of YSR Kadapa and Anantapur districts and within Andhra

Pradesh state in India's Eastern Ghats. Studies on Herpetofauna in India include those of Dar et al. (2008), Sarkar et al. (1993), Srinivasulu et al. (2006) and Vasudevan et al. (2001).

## Study area

The study site centre is Thummalapalle uranium mining station and expanded up to 30 km radius from the centre, comprising a circular area of 2827 sq km. Thummalapalle uranium mining station is in the YSR Kadapa district, although a portion of the study area occupies Anantapur district of Andhra Pradesh (Figure 1). The study area encompassed dry deciduous and scrub forests, agricultural land, barren land and human settlements.

\*Corresponding author. E-mail: pullaiah.thammineni@gmail.com.



**Figure 1.** Map of the study area.

The elevation of the study site ranges from 190 to 800 m above Mean Sea Level (MSL). The climate can be considered subtropical, semi-arid with a large number of sunny days. The temperature ranges from 20 to 47°C, average rainfall being 550 to 650 mm. The Maddileru and Sagileru tributaries and several annual, perennial streams, ponds, springs, ditches and several irrigation tanks are present. Black and Red cotton soils are predo-

minant. The forests consist of dry deciduous and scrub types. A large part of the study area (30 km radius) is occupied by agricultural land, crops which includes groundnut (*Arachis hypogaea* L.), rice (*Oryza sativa* L.), banana (*Musa pardisiaca* L.), bengalgram (*Cicer arietinum* L.), mango (*Mangifera indica* L.), papaya (*Carica papaya* L.), sweet orange (*Citrus sinensis* Osbeck), coriander (*Coriandrum sativum* L.), etc.

Table 1. List of amphibians.

Species	Common name	IUCN status	Density
<b>Amphibian</b>			
<b>Bufonidae</b>			
<i>Bufo stomaticus</i> Lüken, 1862	Marbled toad	NA	R
<i>Duttaphrynus melanostictus</i> Schneider, 1799	Common Indian toad	NA	A
<b>Dicroglossidae</b>			
<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	Skittering frog	LC	A
<i>Euphlyctis hexadactylus</i> (Lesson, 1834)	Indian pond frog	LC	A
<i>Fejervarya caperata</i> (Kuramoto, Joshy, Kurabayashi & Sumida, 2007)	Wrinkled fejervarya	NA	F
<i>Hoplobatrachus crassus</i> (Jerdon, 1853)	Jerdon's bull frog	LC	A
<i>Hoplobatrachus tigerinus</i> (Daudin, 1803)	Indian bull frog	LC	A
<i>Sphaerotheca breviceps</i> (Schneider, 1799)	Indian burrowing frog	LC	F
<b>Microhylidae</b>			
<i>Microhyla ornata</i> (Duméril & Bibron, 1841)	Ornate narrow mouthed Frog	LC	F
<i>Uperodon globulosus</i> (Günther, 1864)	Indian balloon frog	LC	F
<i>Uperodon systoma</i> Schneider, 1799	Marbled balloon frog	LC	F
<b>Rhacophoridae</b>			
<i>Polypedates maculatus</i> (Gray, 1833)	Chunam frog	NA	R

## MATERIALS AND METHODS

The study was carried out for three years, that is between September, 2009 to August, 2012. 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 season, winter and summer. 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 Canon 450D SLR camera. Specimens of geckos, agamid, skinks, frogs and toads, except threatened species were collected and deposited in the Department of Zoology, Sri Krishnadevaraya University, Anantapur, India.

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%). Threatened status of recorded species was according to the IUCN Red List of 2012.

## RESULTS

We recorded 52 species belonging to 17 families, and 12 species were amphibians (Table 1; Figure 2) and 40 species were reptiles (Table 2; Figures 3 and 4). The amphibians belong to four families; the family Dicroglossidae was the largest family with 6 spp., the other families were Microhylidae (3 spp.), Bufonidae (2 spp.) and Rhacophoridae (1 spp.). In the 40 species of reported reptiles, a major portion (20 species, 4 families)

were occupied by snakes, the other reptiles were testudines (3 spp.) and agamid (3 spp.), geckos (7 spp.), chamaeleon (1 sp.), skinks (3 spp.), lacertids (2 spp.) and varanid (1 sp.).

Among the reported 12 species of amphibians, 5 spp. were abundant, 5 spp. were frequent and 2 spp. were rare. In the 40 species of reptiles, 9 spp. were abundant, 15 spp. were common, 12 spp. were frequent and 4 spp. were rare. *Bufo stomaticus*, *Duttaphrynus melanostictus* were found in arid habitats; *Polypedates maculatus* is an arboreal species, *Euphlyctis* spp. and *Hoplobatrachus* spp. preferred aquatic habitat, while the remaining species of amphibians were found in moist and shady habitats. In the reported 20 species of snakes, only five species (*Naja naja*, *Bungarus caeruleus*, *Daboia russelli*, *Echis carinatus* and *Trimeresurus gramineus*) were venomous.

According to the IUCN (2012), eight of the detected amphibian species are in least concerned, four species were in the not assessed (4 spp.) categories. For reptiles, five of the detected species are in least concerned, 31 species are in not assessed and one species in the data deficient categories. All three Testudines reported in the study are somewhat in more threatened than all other herpetofauna. The star tortoise (*Geochelone elegans*), Southern Flap-Shelled turtle (*Lissemys punctata punctata*) are in lower risk - least concerned category and Indian Black Turtle (*Melanochelys trijuga*) is in lower risk - near threatened category.

## DISCUSSION

Our search in the Thummalapalle Uranium Mining area



Figure 2. Amphibians.

Table 2. List of reptiles.

Species	Common name	IUCN status	Density
<b>Reptiles-1</b>			
<b>Emydidae</b>			
<i>Melanochelys trijuga</i> (Schweigger, 1812)	Indian Snail-Eating Turtle	LR - nt	F
<b>Testudinidae</b>			
<i>Geochelone elegans</i> (Schoepff, 1792)	Star tortoise	LR - lc	F
<b>Trionychidae</b>			
<i>Lissemys punctata</i> (Schoepff, 1792)	Southern Flap-Shelled turtle	LR - lc	C
<b>Gekkonidae</b>			
<i>Calodactyloeds aureus</i> (Beddome, 1870)	Golden Gecko	NA	F
<i>Cnemaspis mysorensis</i> (Jerdon, 1853)		NA	F
<i>Hemidactylus platyurus</i> (Schneider, 1792)	Flat tailed Gecko	NA	F
<i>Hemidactylus brooki</i> Gray, 1843	Brooke's Gecko	NA	C
<i>Hemidactylus giganteus</i> Stoliczka, 1871	Giant Southern Tree Gecko	NA	A
<i>Hemidactylus maculatus</i> Duméril & Bibron, 1836	Spotted Rock Gecko	NA	C
<i>Hemidactylus triedrus</i> (Daudin, 1802)	Blotched Gecko	NA	A
<b>Lacertidae</b>			
<i>Ophisops jerdoni</i> Blyth, 1853	Snake-eyed Lacerta	NA	C
<i>Ophisops leschenaultii</i> (Milne-Edwards, 1829)	Leschenault's Lacerta	NA	C
<b>Scincidae</b>			
<i>Lygosoma punctata</i> (Gmelin, 1799)	Spotted supple Skink	NA	R
<i>Eutropis carinata</i> (Schneider, 1801)	Keeled Grass Skink	NA	A
<i>Eutropis macularia</i> (Blyth, 1858)	Bronze Grass Skink	NA	A
<b>Agamidae</b>			
<i>Calotes versicolor</i> (Daudin, 1802)	Indian Garden Lizard	NA	A
<i>Psammophilus dorsalis</i> (Gray, 1831)	Peninsular Rock Agama	LC	A
<i>Sitana ponticeriana</i> Cuvier, 1844	Fanthroated Lizard	NA	A
<b>Chamaeleonidae</b>			
<i>Chamaeleo zeylanicus</i> Laurenti, 1768	Indian Chameleon	NA	R
<b>Varanidae</b>			
<i>Varanus bengalensis</i> (Linnaeus, 1758)	Common Monitor Lizard	LC	C
<b>Reptiles - 2 (Snakes)</b>			
<b>Boidae</b>			
<i>Eryx conicus</i> (Schneider, 1801)	Common Sand Boa	NA	F
<i>Eryx johni</i> (Russell, 1801)	Red Sand Boa	NA	F
<b>Colubridae</b>			
<i>Ahaetulla nasuta</i> (Lacepede, 1789)	Common Vine Snake	NA	C
<i>Boiga trigonata</i> (Schneider, 1802)	Common Cat Snake	LC	C
<i>Dendrelaphis tristis</i> (Daudin, 1803)	Bronze back Tree snake	NA	A
<i>Elaphe helena</i> (Daudin, 1803)	Common Trinket Snake	NA	C
<i>Enhydryis enhydryis</i> (Schneider, 1799)	Smooth Scaled Water Snake	LC	C
<i>Lycodon aulicus</i> (Linnaeus, 1754)	Common Wolf Snake	NA	C
<i>Lycodon striatus</i> (Shaw, 1802)	Barred Wolf Snake	NA	R
<i>Oligodon arnensis</i> (Shaw, 1802)	Banded Kukri Snake	NA	F
<i>Oligodon taeniolatus</i> (Jerdon, 1853)	Streaked Kukri Snake	LC	F
<i>Ptyas mucosa</i> (Linnaeus, 1758)	Indian Rat Snake	NA	A
<i>Argyrogena fasciolatus</i> (Shaw)	Banded Racer	NA	F
<i>Amphiesma stolatum</i> (Linnaeus, 1758)	Striped Keel Back	NA	F
<i>Xenochropis piscator</i> (Schneider, 1799)	Checkered Keel Back	NA	C
<b>Elapidae</b>			
<i>Bungarus caeruleus</i> (Schneider, 1801)	Common Krait	NA	C
<i>Naja naja</i> (Linnaeus, 1758)	Spectacled Cobra	NA	C

Table 2. Contd

<b>Viperidae</b>			
<i>Echis carinatus</i> (Schneider, 1801)	Saw-scaled Viper	NA	F
<i>Trimeresurus gramineus</i> (Shaw, 1802)	Bamboo Pit Viper	DD	R
<i>Daboia russelli</i> (Shaw, 1797)	Russell's Viper	NA	C



Figure 3. Reptiles.

PLATE - 3  
REPTILES- II



*Bungarus caeruleus*



*Boiga trigonata*



*Enhydris enhydris*



*Eryx jhoni*



*Lycodon aulicus*



*Naja naja naja*



*Oligodon arnensis*



*Vipera russelii*

Figure 4. Reptiles II.

reported 52 species (12 spp. of amphibians and 40 spp. of reptiles). Andhra Pradesh is one of the largest states in India. The state, to our knowledge has recorded 99 species of herpetofauna. Our study is very small in area compared to that of the state, but the studies reported 52 species of herpetofauna (53% of the recorded herpetofauna of the Andhra Pradesh).

The recent studies on herpetofauna in Nallamala Hills, Andhra Pradesh (which is about 200 km from the Mining site) reported 20 spp. of amphibians and 64 spp. of reptiles (Srinivasulu and Das, 2008); and in Seshachalam Biosphere Reserve, Andhra Pradesh (which is about 100 km from the Mining area) reported eight spp. of amphibians and 34 spp. of reptiles (Guptha et al., 2012).

During our investigation in the Thummalapalle uranium mining area, we recorded *Fejervarya caperata*, which is a new distributional record to Andhra Pradesh State (Amarnath Reddy et al., 2011) recently. The Golden gecko (*Calodactylodes aureus*) is endemic to Eastern Ghats of India (Sindhi, 2012). Several individuals of this species were reported under rocky boulders of Kalasamudram and Batrepalli forest of the study area by us (Amarnath Reddy et al., 2013). There was no record of this species for more than century until rediscovery of it in the Seshachalam and Velikonda ranges of Eastern Ghats (Daniel and Bhushan, 1985; Daniel et al., 1986). Recently, it was reported from Niyamgiri hills of Orissa (Dutta et al., 2005) and Papikonda hills of Andhra Pradesh (Javed et al., 2007).

The Indian Star tortoise (*Geochelone elegans*) is reported in the present studies. It is a common species in arid parts of the Indian Sub continent. The tortoise has popularity nationally and internationally as a pet, and in illegal international trade (Vyas and Parasharya, 2000).

Rainfall is about 550 mm in the study area and is drier during summer. There are aquatic or water dependent species like *Euphyctis* spp. *Hoplobatrachus* spp. *Enhydryis enhydryis*, *Xenochropis piscator*, *Lissemys punctata* and *Melanochelys trijuga* 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 mining is only underground there may not be threat to fauna. However, periodic assessment of the faunal diversity has to be studied.

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