ZOOLOGY

# Assessment of Amphibian and Reptilian Diversity in the Wind Energy Project Area of Chillavaripalli and Ellutla Reserve Forests, Ananthapuramu District, Andhra Pradesh

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**Abstract**

The present study was conducted in the Chillavaripalli and Ellutla Reserve Forests of Ananthapuramu District, Andhra Pradesh, India, to assess the diversity and composition of herpetofauna, comprising amphibians and reptiles, in the study area. The field investigations were carried out over a two-year period, from October 2024 to September 2026. Standard scientific survey techniques, including the pitfall trap method and Visual Encounter Survey (VES), were employed to document and assess herpetofaunal diversity. A total of 35 species were recorded, comprising 10 amphibian species belonging to four families and 25 reptilian species representing 11 families. Among the recorded reptilian species, the Bengal Monitor (*Varanus bengalensis*) and Indian Rock Python (*Python molurus*) are listed under Schedule I of the Indian Wildlife (Protection) Act, 1972. The major threats to herpetofaunal diversity in the study area include forest fires, deliberate killing, hunting, and other anthropogenic pressures, particularly livestock grazing and browsing. These findings highlight the importance of effective habitat management and targeted conservation measures to protect the herpetofaunal diversity of the Chillavaripalli and Ellutla Reserve Forests.

**Keywords:** Anantapur; herpetofauna; Indian Wildlife (Protection) Act; Python molurus; Varanus bengalensis

## 1 Introduction

Herpetofaunal species are the indicator species in an environment and also these species help to understand or assess the health of an ecosystem. Herpetofaunal species occupies important trophic level in pyramid of food and they act as keystone species in an ecosystem by controlling population of pests, and standing as prey for many predators. Their loss may affect delicate balance of predator ecosystem dynamics, herpetofauna assist in terrestrial-aquatic linkages in transferring nutrients from aquatic to terrestrial ecosystems [1]. Recent population studies on herpetofauna indicate that, there are 6347 amphibian and 8863 reptile species reported worldwide [2–3] among these species 32.5% of all known amphibians and 22% of reptiles are endangered, 122 amphibians and 22 reptile species currently are extinct from the wild [4]. Like many other groups of animals, the population of herpetofaunal species are under continuous threat due to various factors like habitat loss, fragmentation of habitat and climate change [5–9].

In Andhra Pradesh, several studies were done on herpetofaunal diversity and distribution by various researchers in different parts like Nallamala Hills, Nagarjunasagar, Srisailam Tiger Reserve, Eastern

Ghats, Rayalaseema, Seshachalam Biosphere Reserve [10–22]. This present study on herpetofaunal diversity will provide additional information to the Ananthapuramu district of Rayalaseema region. The main aim of this study is to document the herpetofaunal species and identifying their habitats and status from the study region.

## 2 Study area

Chillavaripalli and Ellutla Reserve Forest is located in Narpala mandal of Anantapur district, Andhra Pradesh, India. It lies between latitude 14°35'10" N to 14°41'50" N and 77°49'00" E to 78°00'00" E at an elevation of 585 m above the sea level (Figure 1). The reserve forest has grasslands and shrubby flora lacking prominent deep-rooted vegetation. The area is amidst unbroken chain of rugged hills. Champion and Seth (1968) [23] have classified these forests as 6A/C1 Southern Tropical Thorny Forests.

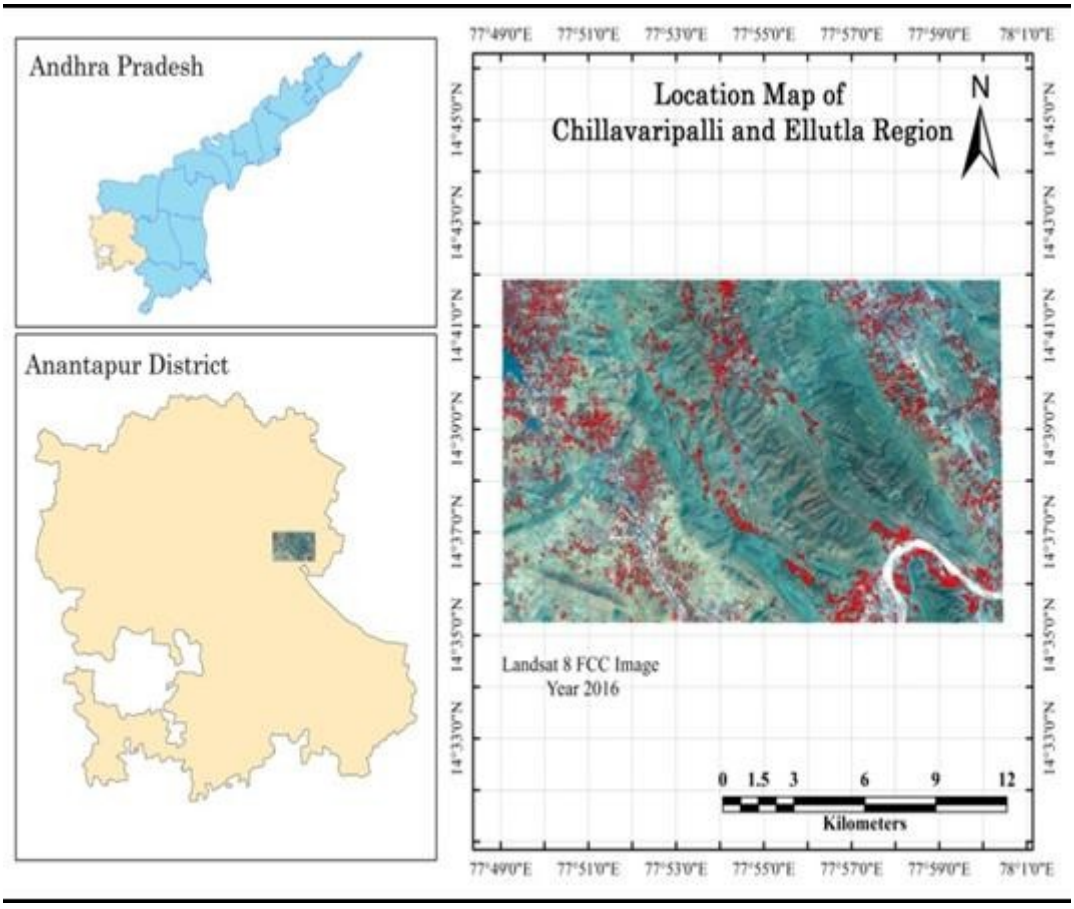



**Figure 1.** Location map of Chillavaripalli and Ellutla Reserve Forests.

### 2.1 Vegetation of the study area

The top canopy of study area comprises *Albizia amara, Chloroxylon swietenia, Feronia limonia, Canthium didynium, Wrightia tinctoria etc.,* Middle canopy comprises of *Cassia fistula, Bauhinia racemosa, Acacia arabica, Acacia sundra, Dichrostachys cinerea, Dolichandrone falcata, Cassia carandus etc. Shrubs comprise of Randia dumetorum, Gymnosporia montana, numularia, Ixora arborea, Cadaba fruticosa, Cassia auriculata, Euphorbia antiquorum, Acacia ferruginea, Acacia planifrons, Acacia torta, Acacia horrida, Ziziphus glabrata, Scutia myrtina, Rhus mysurensis, Canthium coromandelianum, Capparis sp. Senna alexandrina,* Grasses that represent are *Cymbopogon coloratus, Heteropogon con-*

*tortus, Panicum repens, Cynodon dactylon etc.* [2]. Typical habitats of the study area are shown in Figure 2.



**Figure 2.** Habitats of the study area: (a, b) thorn-scrub vegetation on the rocky hills.

## 3 Methodology

Field surveys were conducted from 22 October 2024 to 16 September 2026. Sampling was undertaken three times per week during the rainy season and once per week towards the end of the season, covering a total of 90 survey days. Standard methods, including pitfall trapping and visual encounter surveys (VES), were used to assess herpetofauna diversity across the different habitats in the study area [25, 26]. Specimens and individuals were located by examining beneath stones, rocks and fallen leaves, as well as on trees and beneath peeling tree bark. Searches were carried out during the early morning, afternoon and evening, and before midnight during night surveys. Photographs were taken to assist with subsequent species identification. Species were identified using standard field guides [27, 28]. The relative density of each identified species was estimated from the average percentage of sightings. Species were categorised as follows:

- Abundant: 70–100%
- Common: 50–70%
- Frequent: 20–50%
- Rare: 0–20%

The classification followed the method described in reference [22].

## 4 Results

A total of 35 herpetofauna species, comprising amphibians and reptiles from 15 families, were documented in the study area. The complete checklist of recorded amphibians and reptiles is presented in Table 1.

The records included 10 amphibian species and 25 reptilian species.

### 4.1 Amphibian diversity

The amphibians represented four families:

- Bufonidae – 2 species
- Microhylidae – 1 species
- Ranidae – 6 species
- Rhacophoridae – 1 species

Ranidae was the most species-rich amphibian family in the study area, accounting for 60% of the recorded amphibian species (Table 2).

### 4.2 Reptilian diversity

The 25 reptilian species represented 11 families:

- Agamidae – 3 species
- Boidae – 2 species
- Colubridae – 8 species
- Elapidae – 2 species
- Gekkonidae – 3 species
- Geoemydidae – 1 species
- Lacertidae – 1 species
- Pythonidae – 1 species
- Typhlopidae – 1 species
- Varanidae – 1 species
- Viperidae – 2 species

Colubridae was the most species-rich reptilian family recorded in the study area, representing 32% of the reptilian species.

**Table 1.** Checklist of herpetofaunal species of the study area.

| S. No. | Common name | Scientific name | Family | Habitat and distribution | IUCN Status | Density |
|---|---|---|---|---|---|---|
| **Amphibians** | | | | | | |
| 1 | Common toad | *Duttaphrynus melanostictus* | Bufonidae | Bush lands, meadows, arid areas, The species spawns and larval development takes place in still waters. | LR-lc | A |
| 2 | Ferguson's Toad | *Duttaphrynus scaber* | Bufonidae | Dry scrubland, grassland and rural farmland areas. Larvae are aquatic and occur in stagnant waters. | LR-lc | A |
| 3 | Indian narrow-mouthed frog | *Microhyla rubra* | Microhylidae | Dry forest, shrub land and grassland, agricultural land and often close to human habitation. Larvae are aquatic and occur in stagnant waters | LR-lc | A |

| S. No. | Common name | Scientific name | Family | Habitat and distribution | IUCN Status | Density |
|---|---|---|---|---|---|---|
| 4 | Indian bull frog | *Hoplobatrachus tigerinus* | Ranidae | Inhabiting mostly freshwater wetlands, It is absent or uncommon in forested areas and coastal regions (Fugler, 1983). Breeding takes place during the monsoon season, when adults congregate at ephemeral rainwater pools. | LR-lc | A |
| 5 | Skittering frog | Euphlyctis cyanophlyctis (Schneider, 1799) | Ranidae | Wet lands The species breeds, and the larvae develop, in suitable water bodies. | LR-lc | A |
| 6 | Cricket frog | Fejervarya caperata (Kuramoto, Joshy, Kurabayashi & Sumida, 2007) | Ranidae | grassy or shrubby vegetation, species breeds in rainwater ponds, flooded fields, lowland swamps, tree holes, and roadside ditches | LR-lc | F |
| 7 | Indian Pond Frog | Euphlyctis hexadactylus (Lesson, 1834) | Ranidae | It is a largely aquatic species, found in most types of water bodies, and in various habitats, where it is associated with aquatic vegetation. | LR-lc | A |
| 8 | Indian Burrowing Frog | *Sphaerotheca rolandae* | Ranidae | It is a largely sub-fossorial species found in loose soil within dry forest, scrubland and agricultural areas. | LR-lc | R |
| 9 | Jerdon's bull frog | *Hoplobatrachus crassus* | Ranidae | It is a terrestrial species of seasonally flooded dry grasslands, open plains and arid areas. Breeding, and presumably larval development, takes place in many different types of water bodies. | LR-lc | A |
| 10 | Common Indian tree frog | *Polypedates maculatus* | Rhacophoridae | Dry and moist forests, grasslands, and agricultural areas and close to human habitations. | LR-lc | R |
| **Reptiles** | | | | | | |
| 1 | Peninsular rock agama | *Psammophilus dorsalis* | Agamidae | Found in a variety of habitats, including dry and moist forests, and shrub lands. | LR-lc | A |
| 2 | Forest lizard | *Calotes spp.* | Agamidae | Arboreal, very rarely comes to the ground; this species is known to be diurnal. Feed on insects and other small animals, although a few also feed on plant matter as adults. | LR-lc | C |
| 3 | Peninsular rock agama | *Psammophilus dorsalis* | Agamidae | | | |
| 4 | Red sand boa | *Eryx johnii* | Boidae | Found in dry, semi-desert scrub plains and rocky dry foothills. It prefers loose sand, or sandy soil | LR-nt | F |
| 5 | Checkered keel back | *Xenochrophis piscator* | Boidae | Widespread species also the most widespread fresh water snake. This is also the most common snake in and around human habitat | LR-lc | C |

| S. No. | Common name | Scientific name | Family | Habitat and distribution | IUCN Status | Density |
|---|---|---|---|---|---|---|
| 6 | Indian rat snake | *Ptyas mucosa* | Colubridae | Remain hidden in dark and silent places like rat holes, termite mounds, wood caves, including rainforest, scrub lands, semi-desert, dry, moist and mixed forests | LR-nt | C |
| 7 | Indian garden lizard | *Calotes versicolor* | Colubridae | An oviparous, arboreal, insectivorous lizard found in India and across Asia. The lizard is very successful due to its ability to thrive in urban and other highly human-influenced environments, and thus occupies a very widespread geographic range. | LR-lc | C |
| 8 | Green vine snake | *Ahaetulla nastua* | Colubridae | Choose dense bushes and plantation to stay at a place without showing any movement. Hides in dense green vegetation of low height. Found both in hills and plains. Lives in variety of forests including mixed, dry and moist deciduous forests. Not found in deserts. | LR-lc | C |
| 9 | Common sand boa | *Gongylophis conicus* | Colubridae | Common Sand Boa genus of Burrowing Boas species of Indian subcontinent. Found commonly in agricultural lands and seen frequently during disturbing any kind of land having sandy soil. | LR-nt | C |
| 10 | Common cat snake | *Boiga trigonata* | Colubridae | Most widely distributed Boiga species of Indian subcontinent. This species can be found in almost all kind of forests and wide range of elevations. | LR-lc | C |
| 11 | Brook's gecko | *Hemidactylus brookii* | Colubridae | Thrives in warm, humid areas where it can crawl around on rotting wood in search of the insects it eats. The animal is very adaptable and may prey on insects and spiders, displacing other reptiles | LR-lc | C |
| 12 | Bronze back tree snake | *Dendrelaphis tristis* | Colubridae | This oviparous (egg laying animal snake. harmless snake prefers the tree tops to life on the ground. | LR-lc | A |
| 13 | Bark gecko | *Hemidactylus leschenaultii* | Colubridae | Most common in anthropogenic habitats. | LR-lc | **C** |
| 14 | Spectacled cobra | *Naja naja* | Elapidae | habitats but generally prefer open forest edges, fields, and the areas around villages, | LR-nt | C |
| 15 | Common Krait | *Bungarus caeruleus* | Elapidae | Its range comprises a wide variety of habitats. It is found in fields and low scrub jungle, as well as inhabited areas. | LR-nt | **C** |

| S. No. | Common name | Scientific name | Family | Habitat and distribution | IUCN Status | Density |
|---|---|---|---|---|---|---|
| 16 | Termite hill gecko | *Hemidactylus triedrus* | Gekkonidae | Nocturnal and terrestrial; inhabits open forests and scrub land. It shelters during the day in rock cracks and rodent burrows. | LR-lc | A |
| 17 | Reticulated ground gecko | *Hemidactylus reticulatus* | Gekkonidae | Most specimens of this terrestrial, nocturnal gecko have been found in dry deciduous forests in leaf-litter, under rocks, in termite mounds, in open scrub, and in rocky outcrops. | LR-lc | C |
| 18 | Brahminy skink | *Eutropis carinata* | Gekkonidae | This is the only snake which is not known for male individuals, the whole population consists only female. | LR-nt | **A** |
| 19 | Indian pond terrapin | *Melanochelys trijuga* | Geoemydidae | typically forages on aquatic vegetation along the edges of water bodies This is omnivorous turtle | LR-lc | R |
| 20 | Snake eyed lizard | *Ophisops spp.* | Lacertidae | This is a diurnal species found on well-vegetated, Rocky Mountains, on hardy soils near small streams or semi-perennial wadis, found climbing through vegetation and over rocks. | LR-nt | R |
| 21 | Indian rock python | *Python molurus* | Pythonidae | Mostly found in forested areas, including forests and, but is also found in grasslands, marshes, streams and rivers. | LR-lc | R |
| 22 | Common worm snake | *Typhlops braminus* | Typhlopidae | They are completely fossorial, habits and appearance similar to earthworms. | VU | **C** |
| 23 | Monitor lizard | *Varanus bengalensis* | Varanidae | Variety of habitats, from desert areas to floodplains, scrubland to forests, at moderate elevations It can also inhabit agricultural areas | LR-nt | C |
| 24 | Saw scaled viper | *Echis carinatus* | Viperidae | Found on a range of different substrates, including sand, rock, and soft soil and in scrublands. Often found hiding under loose rocks. | LR-nt | F |
| 25 | Russell's viper | *Daboia russelii* | Viperidae | Mostly found in open, grassy or bushy areas, but may also be found in scrub jungles, on forested plantations and farmland. It is most common in plain. | LR-nt | C |

LR-nt, Lower Risk/near threatened; LR-lc, Lower Risk/least concern; VU, Vulnerable; A, abundant; C, common; F, frequent; R, rare.

**Table 2.** Family-wise density distribution of herpetofaunal species.

| Family | No. of species | % of species | Abundant | Common | Rare | Frequent |
|---|---|---|---|---|---|---|
| Amphibians | | | | | | |
| Bufonidae | 2 | 20 | 2 | | | |

| Family | No. of species | % of species | Abundant | Common | Rare | Frequent |
|---|---|---|---|---|---|---|
| Microhylidae | 1 | 10 | 1 | | | |
| Ranidae | 6 | 60 | 4 | | 1 | 1 |
| Rhacophoridae | 1 | 10 | | | 1 | |
| Reptiles | | | | | | |
| Agamidae | 3 | 12 | 1 | 1 | | 1 |
| Boidae | 2 | 8 | | 1 | | 1 |
| Colubridae | 8 | 32 | 1 | 7 | | |
| Elapidae | 2 | 8 | | 2 | | |
| Gekkonidae | 3 | 12 | 2 | 1 | | |
| Geoemydidae | 1 | 4 | | | 1 | |
| Lacertidae | 1 | 4 | | | 1 | |
| Pythonidae | 1 | 4 | | | 1 | |
| Typhlopidae | 1 | 4 | | 1 | | |
| Varanidae | 1 | 4 | | 1 | | |
| Viperidae | 2 | 8 | | 1 | | 1 |

The relative density of each identified species was estimated based on the average percentage of sightings. Accordingly, the species were categorised into four groups: abundant (70–100%), common (50–70%), frequent (20–50%) and rare (0–20%).

## 5 Discussion and conservation recommendations

The findings of the present study reveal that the Chillavaripalli and Ellutla Reserve Forests support considerable herpetofaunal diversity, comprising 35 species, including 10 amphibians belonging to four families and 25 reptiles belonging to 11 families. The occurrence of these species across different families indicates the ecological importance of the study area in supporting diverse amphibian and reptilian communities. Among amphibians, Ranidae was the most dominant family, representing 60% of the recorded species, whereas Colubridae was the dominant reptilian family, accounting for 32% of the recorded reptile species. The presence of species with different habitat preferences, including terrestrial, arboreal, aquatic and fossorial forms, highlights the importance of maintaining diverse habitat conditions within these reserve forests.

The relative abundance assessment indicated that 11 species were abundant, 15 were common, five were rare and four were frequent. Although the recorded diversity indicates the availability of suitable habitats for several herpetofaunal species, the occurrence of rarely encountered species requires attention from a conservation perspective. Variations in species abundance may be associated with differences in habitat preferences, availability of food resources, breeding requirements and prevailing environmental conditions. Amphibians, in particular, depend on suitable aquatic and moist microhabitats for breeding and larval development, whereas reptiles utilise a wider range of terrestrial habitats, including rocky areas, scrublands, grasslands and tree vegetation.

During the field surveys, forest fires, killing, hunting and biotic pressures, particularly grazing and browsing, were identified as major threats to herpetofaunal diversity in the study area. Forest fires can adversely affect vegetation cover and the availability of suitable shelter and breeding habitats. Similarly, excessive grazing and browsing may result in the degradation of ground vegetation,

disturbance of microhabitats and reduction in the availability of suitable refuges for amphibians and reptiles. Human-induced disturbances, including the intentional killing of snakes and other reptiles due to fear and lack of awareness, may further contribute to the decline of local populations.

The study area is characterised by dryland vegetation and rugged hill formations, which provide different ecological niches for amphibians and reptiles. Therefore, the conservation of existing vegetation, rocky habitats, grasslands, shrublands and seasonal water bodies is essential for maintaining the ecological integrity of these reserve forests. Any degradation of these habitats may influence the distribution, abundance and survival of herpetofauna species.

Considering the ecological significance of amphibians and reptiles, their conservation should be integrated into the overall management of reserve forest ecosystems. The following measures are recommended to protect and maintain the faunal diversity of the Chillavaripalli and Ellutla Reserve Forests.

### 5.1 Conservation recommendations

1. **Protection and restoration of natural habitats.** Existing natural habitats, including thorn forests, scrublands, grasslands, rocky outcrops and seasonal water bodies, should be protected from degradation. Restoration of native vegetation and maintenance of natural ground cover will help provide suitable shelter, breeding sites and feeding habitats for different herpetofaunal species.
2. **Prevention and management of forest fires.** Forest fires were identified as one of the major threats in the study area. Therefore, appropriate fire-prevention and management measures should be implemented by the Forest Department. Regular monitoring during the dry season, fire-awareness programmes and community participation in fire prevention can help minimise habitat destruction and protect vulnerable fauna.
3. **Regulation of grazing and browsing activities.** Uncontrolled grazing and browsing should be regulated, particularly in sensitive habitats that support amphibian and reptilian populations. Appropriate grazing management practices should be introduced to minimise damage to natural vegetation, soil structure and ground-level microhabitats.
4. **Protection of seasonal water bodies and breeding habitats.** Seasonal ponds, temporary rainwater pools, streams and other natural water bodies are important for amphibian breeding and larval development. These habitats should be protected from pollution, siltation, excessive disturbance and physical degradation. Maintaining the natural hydrological conditions of these water bodies will support amphibian populations and associated wildlife.
5. **Prevention of hunting and indiscriminate killing.** Awareness programmes should be organised among local communities to discourage the killing of snakes, lizards, frogs and other wildlife. The ecological importance of these animals, particularly their role in controlling insect and rodent populations, should be explained through village-level awareness campaigns. Strict implementation of applicable wildlife protection regulations is also necessary.
6. **Conservation of rare and legally protected species.** Special attention should be given to species recorded with low encounter frequency and those identified under relevant wildlife protection schedules. The study reported *Varanus bengalensis* and *Python molurus* as Schedule I species under the Indian Wildlife (Protection) Act, 1972. Their habitats should receive appropriate protection, and their populations should be monitored periodically.
7. **Community participation and environmental awareness.** Local communities should be encouraged to participate in biodiversity conservation activities. Educational programmes involving

village communities, students, nature clubs and local institutions can improve awareness about the ecological importance of herpetofauna. Community-based monitoring can also help identify changes in wildlife occurrence and emerging threats.

8. **Long-term monitoring and biodiversity documentation.** Periodic surveys should be conducted to monitor changes in species composition, distribution and relative abundance. Standardised field methods, including visual encounter surveys and other appropriate ecological survey techniques, should be continued to generate comparable data. Long-term monitoring will help identify changes in population trends and assess the effectiveness of conservation interventions.

9. **Integration of herpetofauna conservation into forest management.** Herpetofauna diversity should be considered an important component of reserve forest management plans. Habitat protection, fire management, regulation of grazing, restoration of native vegetation and monitoring of wildlife populations should be incorporated into conservation programmes. Particular attention should be given to maintaining ecological connectivity between different habitat types.

### 5.2 Ecological significance and future research

Amphibians and reptiles play important roles in maintaining ecosystem stability through their involvement in food-web interactions, regulation of insect and other invertebrate populations, and functioning as prey for birds, mammals and other predators. Amphibians also contribute to nutrient transfer between aquatic and terrestrial environments. Consequently, the conservation of herpetofaunal diversity is essential for maintaining ecological balance in dryland ecosystems.

The present study provides baseline information on the herpetofaunal diversity of the Chillavaripalli and Ellutla Reserve Forests. However, further research is necessary to understand seasonal variations in species occurrence, habitat utilisation, breeding ecology, population dynamics and the influence of anthropogenic disturbances. Comparative studies involving other reserve forests of Ananthapuramu District would provide a broader understanding of regional herpetofaunal distribution and conservation requirements.

In addition, integrating herpetofaunal studies with investigations on avian diversity, mammalian fauna, vegetation composition and other biodiversity components would help develop a comprehensive understanding of ecosystem functioning. Such multidisciplinary research could provide valuable scientific information for developing effective biodiversity conservation and forest management strategies.

## 6 Conclusion

The present investigation demonstrates that the Chillavaripalli and Ellutla Reserve Forests constitute important habitats for amphibians and reptiles in the semi-arid landscape of Ananthapuramu District. The documentation of 35 herpetofauna species belonging to 15 families highlights the biological importance of these reserve forests. However, forest fires, hunting, killing and excessive grazing and browsing represent significant pressures on the existing faunal diversity.

The conservation of these ecosystems requires an integrated approach involving habitat protection, restoration of native vegetation, prevention of forest fires, regulation of grazing activities and active participation of local communities. Regular biodiversity assessments and long-term ecological monitoring are essential for understanding changes in herpetofauna populations and evaluating conservation outcomes.

Therefore, the protection of herpetofauna diversity should be recognised as an integral component of biodiversity conservation and sustainable management of the reserve forest ecosystems of Ananthapuramu District.

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