

# Survey and documentation of amphibian diversity of Palamau district with new record of *Hoplobatrachus tigerinus* and *Uperodon taprobanicus* from Palamau (Jharkhand)

## Abstract

A survey was carried out to document the amphibian diversity of different sites viz. Medininagar town area, Betla forest area, Chhatrapur hilly area and Rajhara coal mines area of Palamau district. The entire study area were located between 23°50'N-24°3'N to 83°55'E-84°07'E. of Palamau district Jharkhand, India. Different survey methods as visual encounter survey (VES), call count survey (CCS) and sweep sampling methods were used for survey and sampling of amphibians from all possible habitats of the study area. A total of eight amphibian species belonging to four families and seven genera were recorded during the study.

Out of the 8 recorded amphibian species maximum 7 amphibian species recorded from Betla forest area (Site-II) and minimum 4 amphibian species recorded from Rajhara coal mines area (Site-IV). The number of recorded amphibian species from Medininagar town area (Site-I) and Chhatrapur hill area (Site-III) were 5 & 6 respectively. The statistical analysis of collected data on amphibian diversity of this district revealed that Shannon-Wiener diversity index was maximum (1.759) for Betla Forest area (Site-II) and minimum (1.37) was for Rajhara Coal Mines area (Site-IV). *Hoplobatrachus tigerinus* and *Uperodon taprobanicus* were recorded first time from this district. This study reveals that this district is rich in amphibian diversity. Further studies are needed on population structure and conservation strategies of amphibians of this area.

**Key words:** amphibian, diversity, ccs, diversity index, *H. tigerinus*, *U. taprobanicus*, ves

Volume 11 Issue 1 - 2026

**Nalinaksh Pankaj**

Department of Zoology, Magadh University, India

**Correspondence:** Nalinaksh Pankaj, Department of Zoology, Magadh University, India, Tel +91 9431801150

**Received:** March 29, 2026 | **Published:** April 16, 2026

## Introduction

Amphibians are group of cold-blooded vertebrates having two life stages namely tadpoles (aquatic stage) and adults (terrestrial or semi aquatic stage). Amphibians comprised of frogs, toads, salamanders, newts & caecilians. Amphibians inhabit a wide range of terrestrial and aquatic habitats include ponds, lakes, streams, wetlands, forests, grasslands as well as rocky outcrops. The various microhabitats types used by different amphibian species include vegetation, burrows and under rocks or logs. The various habitats as well as microhabitats occupied by different amphibian species require certain level of moisture, specific temperature and suitable food source such as insects or other invertebrates. Understanding the habitat requirements of amphibians was crucial for conservation effort and habitat management.

In addition to this role of amphibians as potential biological indicators due to their highly permeable skin and dual mode of life.<sup>1</sup> The amphibian species diversity is determined by the availability of food, moisture and micro-habitat.<sup>2</sup>

There are approximately 8885 known amphibian species worldwide according to <http://amphibiaweb.org>. Order Anura (Frogs & Toads) represented by 7836 species, Order Caudata (Salamander & Newts) represented by 824 species and Order Gymnophiona (Caecilians) represented by 225 species. In India Anurans were represented by 417 species and Salamanders and Caecilians were represented by 3 and 40 respectively. Amphibian fauna of Jharkhand province particularly Palamau region is very less studied as compared to nearby states

like Chhattisgarh, Bihar, Uttar-Pradesh and Madhya-Pradesh. Some researchers as Boulenger, 1890, 1920; Annandale & Rao, 1918; Parker, 1934; Venkateswarlu & Murthy, 1972; Bhaduri, 1944; Inger & Dutta, 1986; Ray, 1998; Sarkar, 1991; Sarkar et al., 2004; Kumar et al., 2021; Pankaj & Nath, 2021,2022,<sup>3-15</sup> had described amphibian fauna of Jharkhand but no comprehensive checklist of amphibian species found in Palamau district is available and hence an updated account of the amphibian species diversity with some new records from this district is provided here.

## Materials and methods

### Study area

The study was conducted in Palamau district of Jharkhand province. Palamau is located between 23°50'N-24°3'N to 83°55'E-84°07'E, is the western part of Chhotanagpur plateau. It has an average elevation of 215m. On the boarder of districts Chatra in the east, Gadhwa in the west, Latehar in the south and Aurangabad (Bihar) in the south. The Betla National Park is located about 20 km from the main city. This park is known for tigers and part of Palamau tiger reserve. Another major river of this area is river Koel & river Auranga. Medininagar has humid subtropical climate.

Major part of this district is covered with thick forest and northern part is much hilly and mountaneous. Rajhara coal mines also situated in this district. Medininagar forest division covers an area of 154185 hectares bearing primarily tropical moist deciduous, tropical dry deciduous forests and temperate alpine forests. The average annual

rainfall in this area is 1257 mm. More than 80 % of this rainfall occurs during the monsoon season typically between June and September. The average temperature in this area varies throughout the year but generally ranges from 16.9°C in January to 33.8°C in May (World Weather Online, 2018). Trees of *Bambusa vulgaris* (L), *Sesamum indicum*, *Madhuca longiafolia*, *Artocarpus heterophyllus*, *Shorea robusta*, *Tectonia grandis*, and others are present abundantly in these forests. Netarhat plateau covered with forests is also located near Medininagar. The study area included human settlements, agricultural land, streams, forests and mines area.

Four study sites were selected based on their habitat characteristics, pollution level, Anthropogenic interference and other climatic conditions that differ in amphibian species and their habitat preference. All study sites have different geographical conditions differ in amphibian diversity also.

#### Site-1. Medininagar town area

Medininagar, formerly Daltonganj (24°01'48"N, 84°04'12"E) is a city and municipal corporation in Palamau district in the Jharkhand state. It is also the administrative headquarter of Palamau district and divisional headquarters of Palamau division. The city is situated on the banks of the North Koel River. It is the main city in north-western part of Jharkhand. I have surveyed different parts of this township area as GLA college side, redma, Chainpur river side and identified different amphibian species. This area holds moderate amphibian diversity due to less microhabitat area, more anthropogenic intervention, more traffic and more pollution. 5 amphibian species recorded from this area (Figures 1A&1B).



Figures 1A&1B Medininagar town area

**Site-2. Betla forest area:** Famous national park (23°52'12"N, 84°11'24"E) located in Palamau district of Jharkhand India. It is spread over an area of 226.32 sq km. it was declared as national park in 1986. It hosted wide variety of wildlife along with amphibian diversity. Because of large forest cover, less pollution and large microhabitat area that holds great diversity of amphibians. Total 7 amphibian species recorded from this area that was maximum during the study (Figures 2A&2B).



Figures 2A&2B— Betla forest area

#### Site-3. Chhatarpur hilly area

Chhatarpur hilly area (24° 37'47"N, 84°19'84"E) selected as site 3 during the study. A total area of about 30 sq km was selected for amphibian diversity survey and sampling. The main features of this site are hilly as well as very less microhabitat area with harsh and hot weather. Amphibians inhabiting this area often exhibit adaptations to

higher altitude and temperature fluctuations. Sites having streams and ponds and other water bodies provide shelter to different amphibian species, Total 6 amphibian species recorded from this area (Figures 3A&3B).



Figures 3A&3B— Chhatarpur hilly area

#### Site-4. Rajhara coal mines area

The Rajhara coal mines area (24°16'42"N, 84°04'53"E) located in Palamau district Jharkhand. It is approximately 4 km from Kajri railway station. The total study area was approximately 15 sq km. Forests, wetlands and agricultural fields present around this site, provide the dwelling place for wide variety of amphibians. However habitat destruction, pollution and changes in drainage patterns negatively affect amphibian population by reducing suitable breeding sites and increasing mortality rates. Total recorded amphibian species from this area was 4 (Figures 4A&4B).



Figures 4A&4B— Rajhara coal mines area.

#### Sampling:

Observations were mostly carried out in Morning (7:00 AM-11:00 AM) and evening (5:00 PM-9:00 PM) between the months of April 2023 to March 2024. Field survey and sampling was conducted twice in a month at various locations viz. agriculture fields, wetlands, tanks, river banks, roadsides, orchards and municipal dumping area of different study sites. During the sampling and survey visual encounter survey (VES),<sup>16</sup> acoustic encounter survey and Road transect survey was used for rapid assessment and evaluation of larger areas. Estimation of varied types of habitats and microhabitats was done where the amphibian species mainly thrives.

Different active search methods like turning rocks and logs, peeling bark, digging through leaf litter, and excavating burrows and termite mounds was used extensively in order to get a good and reliable result. Acoustic searching along the wooded trail, degraded forest edges and along water bodies were also performed where visual encounter was not possible.

Flashlights were also used to locate the anuran species in night. The amphibian diversity was also studied by noting the deposited eggs during breeding period. Nesting site, type of nest and egg cluster was helpful in identifying anuran species.

While walking along the main road and various other pony roads and trek routes in the study area species count and photographs were taken for species identification. Hours of heavy rainfall were avoided. Individuals of the same species found more than once in the same site in the same visit was not counted if not observed together at the

same time. In addition, opportunistic observations were also included. Photographs of the representative species and their habitats were taken with a digital camera. Geographic position of study sites were recorded by using GPS mobile software. Coordinates were recorded as latitude and longitude in degrees. The parameters noted during observation include name of the species, number of individuals of that species and habitat in which the species was found. The field data for each individual encountered like locality, date, time, weather condition, habitat, microhabitat and reproductive condition of each individual (if it could be determined), co-existing species (if any) and other behavioral notes were recorded.

Identification of the amphibian species was done using the identification keys available as Inger and Dutta, Dutta, Daniels and Frost, Sarkar et al and Sanyal et al.<sup>17-25</sup> Scientific names and systematic position followed in this paper are after, Frost and common names are obtained from, Dinesh et al. and De.<sup>26,27</sup>

### Data analysis

Community parameters such as species richness, abundance, evenness, dominance and diversity index was calculated. Shannon-Weiner diversity index and evenness were calculated for total samples following Magurran & McGill.<sup>28</sup> Species richness was considered as the total number of species observed and species abundance as number of individual amphibians counted during the sampling. Relative abundance of each species encountered during the survey was also calculated as done by Chettri et al.<sup>16</sup>

Based on these data, relative abundance of each species was obtained. The diversity was analyzed using Shannon–Wiener diversity index ( $H' = - \sum p_i \ln p_i$ ; where  $p_i$  = proportion of total sample belonging to  $i^{\text{th}}$  species,  $\ln$  = natural logarithm (Shannon & Weaver 1949). Similarly, evenness was calculated using the formula: Evenness ( $J$ ) =  $H'/H_{\text{max}}$  where  $H_{\text{max}} = \ln S$ ,  $S$  = number of species,  $H'$  = Shannon–Wiener Diversity (Pielou 1969). Shannon–Wiener diversity index, Pielou’s evenness index, Margalef’s richness index and Simpson’s dominance index was accurately calculated using Past software version 4.08.

## Results

### Species richness, diversity and abundance

The present study focused mainly on survey and recording of amphibian order Anura. A total 139 individuals representing 8 amphibian species belonging to four families and seven genera with photographic evidences (Table 1, Figure 5). Two new amphibian species named *Hoplobatrachus tigerinus* and *Uperodon taprobanicus* also recorded from this district. Among four recorded families of amphibians family Dicoglossidae was represented by 3 species, Bufonidae and Microhylidae were represented by 2-2 species each, whereas Family Rhacophoridae was represented by only 1 species (Table 1).

**Table 1** Amphibian species recorded from Palamau district (Jharkhand) with their habitat preference, occurrence and abundance and IUCN status

Taxon	Common name	Total	Relative abundance	Occurrence in study sites	Habitat preference	IUCN Status
<b>Family- Bufonidae</b>						
<i>Firouzophrynus melanostictus</i> (Schneider, 1799)	Common Asian toad	3	2.15%	Only III	AL, FF, HS & OL	LC
<i>Firouzophrynus stomaticus</i> (Lutken, 1864)	Marbled toad	33	23.74%	I, II, III & IV	AL, HMH & OL	LC
<b>Family – Dicoglossidae</b>						
<i>Hoplobatrachus tigerinus</i> (Daudin, 1803)	Indian bull frog	22	15.83%	I, II, III & IV	AL & WB	LC
<i>Sphaerotheca breviceps</i> (Schneider, 1799)	Indian burrowing frog	4	2.87%	Only II	AL, GL & HMH	LC
<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	Skittering frog	38	27.34%	I, II, III & IV	WB & PF	LC
<b>Family - Microhylidae</b>						
<i>Kaloula pulchra</i> (Gray, 1831)		5	3.59%	I & II	AL, BH, FF & HMH	LC
<i>Uperodon taprobanicus</i> (Parker, 1934)		2	1.44%	II & III	AL, BH, FF & HMH	LC
<b>Family – Rhacophoridae</b>						
<i>Polypedates maculatus</i> (J.E.Gray, 1830)	Common tree frog	32	23.04%	I, II, III & IV	HS, TSHMH & UA	LC
<b>Total Species Richness = 8</b>						
<b>Total Abundance = 139</b>						

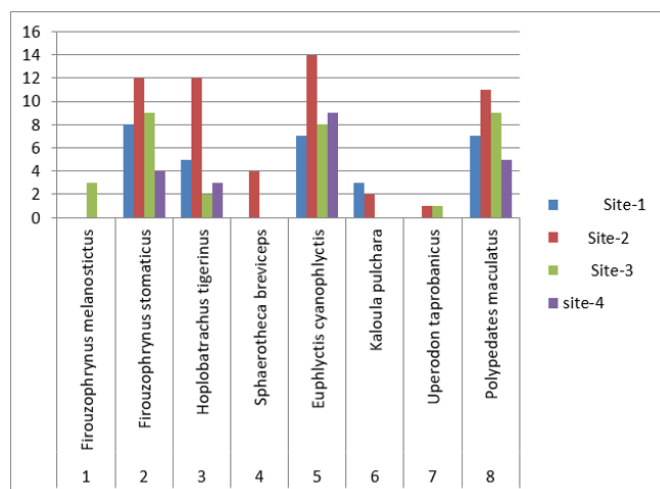
**Abbreviations:** AL, agricultural land; BH, burrowing habitat; FF, forest floor; GL, grasslands; HS, human settlement; HMH, human modified habitat; OL, open land; PF, paddy fields; TS, trees and shrubs; UA, urban areas; WB, water bodies



**Figures 5 (A-H)**—A. *Firouzophrynus melanostictus* B. *Firouzophrynus stomaticus*  
 C. *Hoplobatrachus tigerinus* D. *Sphaerotheca breviceps*  
 E. *Euphlyctis cyanophlyctis* F. *Kaloula pulchra*  
 G. *Uperodon taprobanicus* H. *Polypedates maculatus*

The amphibian population in the study area was found to be diverse when tested using various diversity indices. Site wise diversity indices for recorded amphibian species shown in (Table-2). Species diversity (E Mayr) is one of the fundamental concepts of ecology that has been used to characterize communities and ecosystems structure and functioning.<sup>29</sup>

Diversity is the basic concept that is used to denote the community structure. It has been defined by the indices used to measure it. Relative abundance of amphibian species in the study area shows sparse distribution (Table1). Barring a few species, relative abundance of most species was low. Most species were observed only once or twice during the entire course of our study. Out of the eight amphibian species, four species contributed less than 3% population. Almost majority of the total abundance was contributed by species *Euphlyctis cyanophlyctis* (27.34 %) followed by *Firouzophrynus melanostictus* (23.74 %). The abundance of *Polypedates maculatus* and *Hoplobatrachus tigerinus* was 23.02 % and 15.82 % respectively. Species wise abundance of each sites of Palamau district described (Table-1, Figure 6). This result supports well established community pattern i.e. a community is dominated by few common species.<sup>30-33</sup>



**Figure 6** Species wise abundance at different sites of Palamau district (Jharkhand)

The species accumulation curve was rising even at the end of the study period indicating likelihood of detection of additional species from the study area. It indicates that there was a probability of encountering few additional species in the study area with the increasing sampling effort (Tables 1&2) (Figures 5&6).

**Table 2** Calculated diversity indices of various study sites of Palamau district (Jharkhand)

Diversity Indices	Calculated Values			
	Site-I	Site- II	Site – III	Site – IV
Species richness	5	7	6	4
Abundance	30	56	32	21
Dominance (D)	0.1908	0.1851	0.2097	0.2619
Simpson's index (1-D)	0.8092	0.8149	0.7903	0.7381
Shannon-Weiner index (H')	1.627	1.759	1.642	1.37
Evenness (J)	1.018	0.8299	0.8607	0.9839
Berger-Parker (d)	0.2667	0.25	0.2813	0.4286

### Habitat preferences among species

Present study also identified variety of amphibian species utilizing five different habitats and microhabitats namely – AL- Agricultural land, BH- Burrowing habitat, FF- Forest floor, GL- Grasslands, HS- Human settlement, HMH- Human modified habitat, OL- Open land, PF- paddy Fields TS- Trees and shrubs, UA- Urban areas, WB- Water bodies, Here, Human Settlements includes houses, veranda, drains, etc.; Agricultural land includes cultivated and uncultivated crop fields; Forest floor includes bushes, trees, leaf litter, etc; Water bodies includes streams, ponds and small water puddles; Open land includes land devoid of vegetation. Among these maximum numbers of species was observed in the Agriculture land followed by Forest floor, Human settlements, Water bodies and Open land (Table-1).

This indicates that most of the amphibian species require agriculture based ecosystems for survival. Since this study was conducted in an area with increasing number of human settlements, human settlements contributed to the second most utilized habitat, this also shows that few amphibian species have adapted to human interference.

### Discussion

Amphibian species of Palamau district of Jharkhand province is not available till date. Specific Survey and listing of amphibian species had been carried out in this paper. This paper tries to estimate the amphibian diversity of this district as well as their habitat preference also. This study has managed to photographically document eight amphibian species. Out of the 8 recorded amphibian species *Hoplobatrachus tigerinus* & *Uperodon taprobanicus* were the first record from this district. This suggests that the study area possesses moderate to rich amphibian diversity.

The region has many potential habitats for the amphibians to survive ranging from leaf litters in the forest to wetland, springs and torrential streams. The forest here is of moist evergreen temperate type. Growing human settlements, high pollution level, mining, has resulted in habitat loss of amphibians. Unpredictable rainfall, diseases, upward migration of species along the elevation gradient and drying of springs also has resulted in decreasing population of amphibians in this area.<sup>33</sup>

Number of species found in Palamau district is less than that of nearby states Bihar.<sup>14</sup> These species are very commonly hunted in the region in the name of local medicine and other delicacies by local tribes. Amphibians are important for agriculture also, they play

a key role in ecosystem functioning and act as predator, mainly as consumers of insect pest. Amphibians are mainly seen to be attracted to agricultural land as these kinds of ecosystems can be used for food, home grounds, etc.<sup>34</sup>

Hence there require a protection plan of amphibians in this district. Government bodies, NGOs and other local groups should frame an action plan regarding this. Awareness regarding the present status of amphibians in the Palamau region must be created among the locals.

## Acknowledgments

The author thank the journal for it support in publishing this work.

## Conflicts of interest

The author declare that there are not conflict of interest.

## Funding

None.

## References

1. Beebee TJC, Griffiths RA. The amphibian decline crisis: a watershed for conservation biology? *Bio cons.* 2005;125(3):271–285.
2. Daniels RJR. Geographical distribution patterns of amphibians in the western Ghats, India. *J Biogeogra.* 1992;19(5):521–529.
3. Boulenger GA. The fauna of British India, including Ceylon and Burma Reptilia and Batrachia. Taylor and Francis. 1890.
4. Boulenger GA. A monograph of the South Asian, Papuan, Melanesian and Australian frogs of the genus rana. *Rec Indian Mus.* 1920;20(1):1–126.
5. Annandale N, Rao CRN. The tadpoles of families Ranidae and Bufonidae found in plains of India. *Rec Indian Mus.* 1918;15(1):25–41.
6. Parker HW. A monograph of the frogs of family Microhylidae. Trustees of British Museum. 1934.
7. Venkateswarlu T, Murthy TSN. Fauna of Bihar state (India), 2-Amphibia. *Indian J Zool.* 1972;13(3):129–130.
8. Bhaduri JL. A note on *Rana crassa* Jerdon, with extension of range. *J Bombay Nat Hist Soc.* 1944;44(3):481–484.
9. Inger RF, Dutta SK. An overview of the amphibian fauna of India. *J Bombay Nat Hist. Soc.* 1986;83:135–146.
10. Ray S. Fauna of Valmiki tiger reserve & Fauna of conservation area. Zoological Survey of India Publication. 1998.
11. Sarkar AK. The amphibians of chota Nagpur (Bihar), India. *Rec zool Surv.* 1991;89(1–4):209–217.
12. Sarkar AK, Das S, Ray S. Amphibia: 181-193. In: Fauna of Bihar (including Jharkhand). Zoological Survey of India Publication. 2004.
13. Kumar P, Nath B, Pankaj N. First record of Polypedates Maculatus (Gray, 1830) common Indian tree-frog, in Daltonganj (Palamau), India. *Ele J Bio.* 2021;17(4):190–193.
14. Pankaj N, Nath B. Anurans of gaya district, Bihar, India. *Rep Amphibi.* 2021;28(1):106–109.
15. Pankaj N, Nath B. First record of the Asian painted frog, *Kaloula pulchra* Gray 1831 (Anura: Microhylidae), from Jharkhand, India. *Repti Amphibi.* 2022;29(1):275–276.
16. Chettri B, Bhupathy S, Acharya BK. An overview of the herpetofauna of Sikkim with emphasis on the elevational distribution pattern and threats and conservation issues. *Environmental Science, Biology.* 2011.
17. Inger RF, Dutta SK. An overview of the Amphibian fauna of India. *J Bombay Nat Hist Soc.* 1986;83:135–146.
18. Dutta SK. Amphibians of India and Sri Lanka (checklist and bibliography). Odyssey Publishing House. 1997.
19. Dutta SK. Anuran fauna of Bastar division of Chhattisgarh state, India. *Ambient Sci.* 2015;2(2):31–38.
20. Daniel JC. Notes of amphibians of the Darjeeling area, West Bengal. *J Bombay Nat Hist Soc.* 1962;59(2):666–668.
21. Daniels RJR. Amphibians of Peninsular India. Universities Press (India) Private Ltd. 2005.
22. Frost DR. Amphibian species of the world: online reference. The American Museum of Natural History. 2018.
23. Frost DR. Amphibian Species of the World: An Online Reference. American Museum of Natural History. 2021.
24. Sarkar AK, Biswas ML, Ray S. Amphibia. In: Fauna of West Bengal, Part-2. ZSI Publication. 1992.
25. Sanyal DP, Sur NC. Amphibia. In: Fauna of Sikkim. Part 1, Vertebrates. Zoological Survey of India. 2006.
26. Dinesh KP, Radhakrishnan C, Gururaja KV, et al. An annotated checklist of amphibians of India with some insight into the pattern of species discoveries, distribution and endemism. *Rec zool Surv India.* 2009;302:148–153.
27. De K. Checklist of Amphibian fauna of Darjeeling District, West Bengal. *J Entomo Zoology Studi.* 2016;4(3):387–390.
28. Magurran AE, McGill BJ. Biological diversity: frontiers in measurement and assessment. *Oxford University Press.* 2011.
29. DeJong TM. A comparison of three diversity indices based on their components of richness and evenness. 1975;26:222–227.
30. Heatwole H. A review of structuring in herpetofaunal assemblages. in: herpetological communities. United States Fish and Wildlife Research Report. 1982.
31. Magurran AE. Ecological diversity and its measurement. *Princeton University Press.* 1988.
32. Pankaj N, Nath B. Role of Amphibians to ecosystem services: a review. *Electronic J Biol.* 2023;19(3):1–9.
33. Acharya BK, Chettri B. Effect of climate change on birds, herpetofauna and butterflies in Sikkim Himalaya: A preliminary investigation. Information and Public Relations Department, Government of Sikkim, Gangtok. 2012.
34. Narayana BL, Naresh BG, Surender K, et al. Amphibian diversity (Order: Anura) at northern and central parts of Telangana, India. *J Entom Zoology Studi.* 2014;2(6):153–157.