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SHORT COMMUNICATION

OCCURRENCE OF TAMDIL LEAF-LITTER FROG *LEPTOBRACHELLA TAMDIL* (SENGUPTA ET AL., 2010) (AMPHIBIA: MEGOPHRYIDAE) FROM MANIPUR, INDIA AND ITS PHYLOGENETIC POSITION

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Occurrence of Tamdil Leaf-litter Frog *Leptobrachella tamdil* (Sengupta et al., 2010) (Amphibia: Megophryidae) from Manipur, India and its phylogenetic position

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Abstract: We present a new state record of *Leptobrachella tamdil* from Manipur State, northeastern India based on three individuals collected from Chakpi stream, Chandel District. This record represents the range extension of the species as well as the easternmost distribution record. We also provide additional morphological data as well as the first time genetic data for the species and inferred its phylogenetic position using mitochondrial 16S rRNA marker gene sequence.

Keywords: 16S rRNA, morphology, northeastern India, phylogeny, range extension.

Leptobranchid frogs are one of the most speciose groups comprising 166 species with four genera namely *Leptobrachella* Smith, 1925, *Leptobrachium* Tschudi, 1838, *Oreolalax* Myers and Leviton, 1962, and *Scutiger* Theobald, 1868. The Tamdil Leaf-litter Frog belongs to the genus *Leptobrachella* which consists of 86 congeners that are presently known from southern China, northeastern India, Myanmar through Thailand, Vietnam to Malaysia, Borneo, and Natuna Island (Frost 2021). *Leptobrachella*

tamdil was originally described as *Leptolalax tamdil* based on two specimens collected from the Tamdil National Wetland, Mizoram, India (Sengupta et al. 2010). It had been known only from its type locality for about a decade. An additional specimen was reported from Dampa Tiger Reserve (DTR) (23.387–23.705N; 92.273–92.431E), Mamit District, Mizoram near the Bangladesh international boundary by Vanlalsiammawii et al. (2020). Herein, we report the occurrence of *L. tamdil* from Chakpi Stream, Chandel District, Manipur State with comments on the taxon's phylogenetic position inferred using partial sequences of mitochondrial 16S rRNA gene.

METHODS

Herpetological surveys were carried out in two different bouts. The first trip was conducted during 16 December 2020 to 5 January 2021, and the second trip during 18 January 2021 to 24 January 2021, with a total

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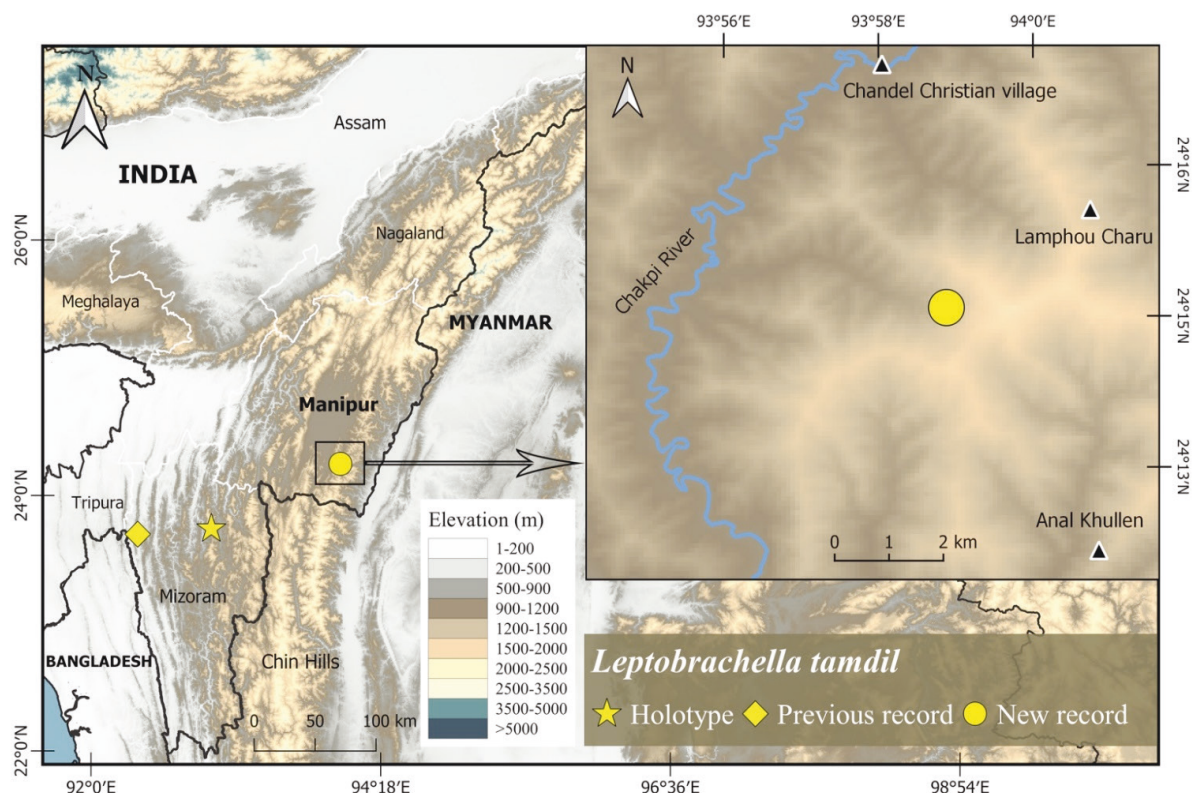


Figure 1. Map showing the type locality (in yellow star), previous record (in yellow diamond), and new record (in yellow dot) of *Leptobrachella tamdil* at Chakpi Stream, Chandel District, Manipur, India.

of 27-days field trip, and covering a total distance of ca. 120km. On 16 December 2020, we encountered the first two adult male individual frogs (MZMU 2224 and MZMU 2225) from the Chakpi Stream bed (24.1454N, 93.5856E; 1,122m) at around 17.40h, the sampling site is located ca. 30km south from Chandel Town, Chandel District, Manipur (Figure 1). The nearest village from the collection site is the Lamphou Charu located at ca. 4km. After a month, on 23 January 2021 at 19.59h, we encountered an adult female (MZMU 2226) at the upper stream bed (24.1453N, 93.5857E; 1,228m) ca. 7m away from the previous collection site. During the present work, the sampling sites were visited four times at day time, dusk, and night time.

Specimens of *L. tamdil* collected in this study were photographed by using Sony DSC-HX400V (50x optical zoom) digital camera. Specimens (MZMU 2224, MZMU 2225, and MZMU 2226) were fixed in 4% formalin, later preserved in 70% ethyl alcohol, liver tissues were stored in 95% ethyl alcohol for molecular processing, and deposited in Museum of Zoology, Mizoram University (MZMU), India. The altitude with the geo-locations was recorded by using global positioning system device (Garmin Montana 650-GPS navigator). A digital

thermo hygrometer (Kusam Meco KM 918) was used for measurement of temperature and relative humidity. The morphometric parameters of the specimens were measured by using Mitutoyo™ (505–730) dial calipers and are given to the nearest 0.1mm. The sex was determined through dissection. The parameters from Sengupta et al. (2010) and Vanlalsiammawii et al. (2020) were followed to measure the frog specimens (Table 1).

Genomic DNA was extracted from the 95% ethanol preserved liver tissues of the frog specimens using QIAamp DNA Mini Kit (Cat No.ID:51306) following the manufacturer protocol. PCR reaction was prepared for 20μL reaction mixture contained 1X amplification buffer, 2.5 mM MgCl₂, 0.25 mM dNTPs, 0.2 pM each forward and reverse primer, 1μL genomic DNA, and 1U Taq DNA polymerase with a pair of partial 16S rRNA primers: forward (L02510- CGC CTG TTT ATC AAA AAC AT) (Palumbi 1996) and reverse (H03063- CTC CGG TTT GAA CTC AGA TC) (Rassmann 1997). The PCR thermal regime for amplification was 5 min at 95°C for initial denaturation, followed by 35 cycles of 1 min at 95°C for denaturation, 30s for annealing at 50.3°C, elongation for 1 min at 72°C, and a final elongation for 5 min at 72°C. PCR products were checked by gel electrophoresis on a 1.5% agarose gel

Table 1. Detailed morphological (in mm) and eggs data of *Leptobrachella tamdil* from Chandel District, Manipur, India.

Voucher number	MZMU2224	MZMU2225	MZMU2226	Vanlalsiammawii et al. (2020)	Sengupta et al. (2010)	
				MZMU 1631	ZSI A10962 (Holotype)	ZSI A10963 (Paratype)
Sex	Male	Male	Female	Male	Male	Female
Locality	Chandel, Manipur			Dampa Tiger Reserve, Mizoram	Tamdil National Wetland, Mizoram	
SVL	28.7	27.8	33.2	31.3	32.3	31.8
IN	2.7	2.7	2.9	3.2	3.2	3.1
HL	9.8	9.9	11.4	9.2	8.7	8.8
HW	9.6	9.2	11	10.5	12.0	12.0
HD	4.2	4	4.3	4.4	5.2	4.8
ED	4	4.2	4.8	4.3	4.5	4.6
IO	3.9	3.8	4	4.8	5.1	5.8
E-S	3.5	3.9	4.4	4.6	4.7	4.7
E-N	2.1	1.7	2.2	2.5	2.8	2.7
UE	3	3.2	3.8	3.1	3.4	3.5
TL	12.6	12.7	15	14.2	16.0	15.7
IMT	1.8	1.5	1.8	1.8	1.9	1.8
IPT	1.8	1.5	2	2.1	2.2	1.8
A-G	14	13.6	16.3	13.7	13.8	13.8
BW	9.9	8.3	10.5	9.8	9.7	11.9
No. of eggs				n= 105		
Diameter of eggs				1.4–1.5		

containing ethidium bromide. Samples were sequenced using Sanger's dideoxy method and sequencing reactions were carried out in both directions on a sequencer (Agrigenome Labs Pvt Ltd., Kochin, India). The generated partial 16S rRNA sequences were deposited in the GenBank repository (accession numbers: MW665130.1; MW665131.1; MW665132.1). In our dataset of 16S rRNA, we included 34 congeneric sequences obtained from National Centre for Biotechnology Information (NCBI) database and our generated sequence of *Duttaphrynus melanostictus* (MW165455.1) sample was used as an outgroup. All sequences were aligned by using Muscle algorithm in MEGA 7 (Kumar et al. 2016), the Kimura 2 (K2P) and genetic distances (Kimura, 1980) were calculated using MEGA 7 (Kumar et al., 2016). The Bayesian Inference (BI) phylogenetic tree (Figure 2) was constructed in MrBayes 3.2.5 using GTR+I+G model. The MCMC (one cold and three hot chains) was run for one million generations by sampling every 1,000 generations and set the burn-in to 25%. The analysis was terminated when the standard deviation of split frequencies was less than 0.001. The percentage of trees in which the associated taxa clustered together is shown next to the branches (Ronquist & Huelsenbeck 2003). The generated

phylogenetic tree was further illustrated using Figtree 1.44v (Rambaut 2014).

RESULTS

The collected specimens are identified as *L. tamdil* based on the original morphological diagnostic features (Sengupta et al. 2010), and the new specimens showed genetic homogeneity on the phylogenetic tree with the mean intra-species K2P genetic distance of 0.0%. Our recently collected specimens are diagnosed in showing the following combination of characters: SVL between 27.8–28.7 mm in males and 33.2mm in the only female; dorsum tuberculate; eyelids with tubercles; tympanum and supratympanic fold distinct; supratympanic fold extending to posterior edge of tympanum; macroglands, including preaxillary, pectoral, femoral and ventrolateral glands present; Finger II > I; toe tips not dilated, bearing dermal fringes; relatively long hind limbs, with heels in contact when limbs are held perpendicular to body; dorsum with dark blotches; flanks with small dark blotches; dark tympanic mask present; venter pale; labial bars present and limbs with dark cross-bars (Sengupta et al. 2010). Current location extends the range of the species by ca. 122km aerial distance northeast from the

Table 2. Genetic distance among *Leptobrachella* species using 16S rRNA partial gene sequence. Only the species showing low genetic distances with *L. tamdil* are provided in the table.

	Species	K2P distance																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	<i>L. tamdii</i> MW665131.1																				
2	<i>L. tamdii</i> MW665132.1	0.00																			
3	<i>L. tamdii</i> MW665130.1	0.00	0.00																		
4	<i>L. laui</i> MH406903.1	0.09	0.09	0.09																	
5	<i>L. liui</i> MH923370.1	0.09	0.09	0.09	0.04																
6	<i>L. puhaatensis</i> KY849587.1	0.09	0.09	0.09	0.07	0.09															
7	<i>L. wulingensis</i> MT530316.1	0.10	0.10	0.10	0.08	0.06	0.08														
8	<i>L. petrops</i> MH055903.1	0.09	0.09	0.09	0.07	0.09	0.00	0.08													
9	<i>L. bourreti</i> KR018124.1	0.10	0.10	0.10	0.09	0.07	0.09	0.02	0.09												
10	<i>L. minimus</i> JN848369.1	0.11	0.11	0.11	0.07	0.08	0.09	0.08	0.09	0.09											
11	<i>L. mangshanensis</i> MH277365.1	0.10	0.10	0.10	0.05	0.02	0.09	0.08	0.09	0.08	0.08										
12	<i>L. dorsospina</i> MW046194.1	0.10	0.10	0.10	0.09	0.07	0.09	0.03	0.09	0.03	0.09	0.08									
13	<i>L. nyx</i> MH055818.1	0.10	0.10	0.10	0.08	0.07	0.09	0.07	0.09	0.08	0.06	0.07	0.08								
14	<i>L. pluvialis</i> MT644610.1	0.10	0.10	0.10	0.07	0.07	0.09	0.08	0.09	0.08	0.05	0.07	0.09	0.04							
15	<i>L. purpuraventra</i> MK414531.1	0.11	0.11	0.11	0.10	0.07	0.09	0.04	0.09	0.03	0.10	0.08	0.03	0.08	0.08						
16	<i>L. sulyangensis</i> MK829650.1	0.12	0.12	0.12	0.10	0.09	0.10	0.05	0.10	0.04	0.11	0.10	0.04	0.10	0.10	0.04					
17	<i>L. alpinus</i> MH406905.1	0.12	0.12	0.12	0.10	0.09	0.11	0.05	0.11	0.05	0.11	0.09	0.05	0.10	0.10	0.05	0.06				
18	<i>L. shangsiensis</i> MK095461.1	0.12	0.12	0.12	0.08	0.08	0.10	0.09	0.10	0.10	0.06	0.09	0.09	0.05	0.05	0.09	0.11	0.11			
19	<i>L. aspera</i> MW046202.1	0.12	0.12	0.12	0.10	0.10	0.10	0.08	0.10	0.09	0.08	0.10	0.10	0.06	0.06	0.10	0.11	0.11	0.06		
20	<i>L. bijie</i> MK414539.1	0.12	0.12	0.12	0.09	0.08	0.10	0.05	0.10	0.05	0.10	0.09	0.04	0.10	0.10	0.03	0.04	0.06	0.10	0.11	

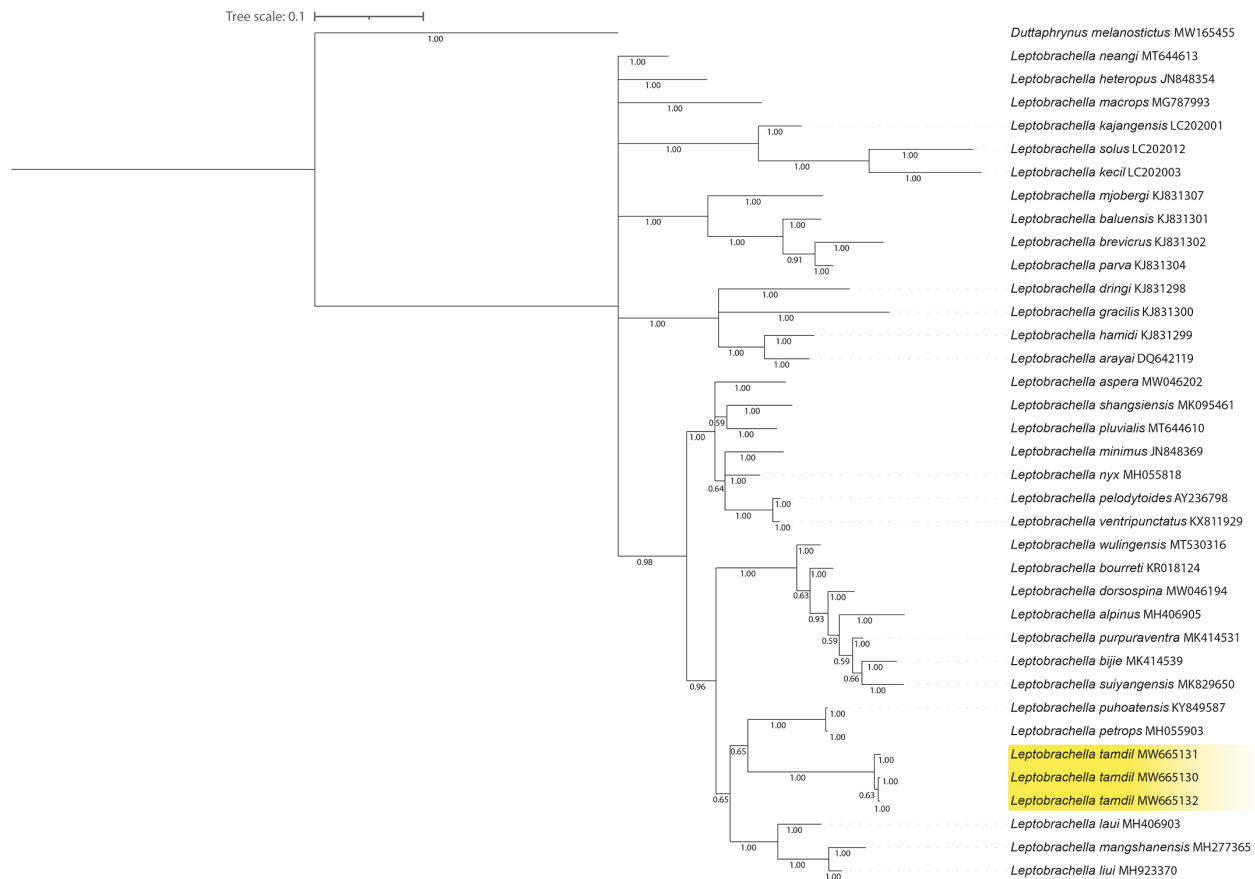


Figure 2. Bayesian inference phylogenetic relationship among *Leptobranchella* species using partial 16S rRNA gene sequences. The numbers at nodes represent Bayesian posterior probabilities.

type locality at Tamdil National Wetland, Mizoram, India.

Our generated partial 16S rRNA gene sequences of *L. tamdil* (MW665130.1; MW665131.1; MW665132.1) were compared with the congeners sequences obtained from NCBI database. From the estimated K2P genetic distances (Table 2), we inferred that *L. laui* (MH406903.1) to be the closest species by showing 9% genetic distance with the sequences of *L. tamdil* (MW665130.1; MW665131.1; MW665132.1). Moreover, the phylogenetic relationship revealed that *L. tamdil* formed a distinct lineage within the monophyletic clade comprising *L. puhoatensis* + *L. petrops* (Figure 2); the former taxon (*L. puhoatensis*) is known only from its type locality in Pu Hoat Nature Reserve, Vietnam, and the later (*L. petrops*) is recorded only from four Provinces (Tuyen Quang, Lai Chau, Thanh Hoa, and Phu Tho) in Vietnam (Frost 2021).

DISCUSSION

Live individuals of *Leptobranchella tamdil* were found in the secondary forests, ca. 30km south of Chandel Town. Chandel District is surrounded by tropical semi-evergreen and moist deciduous/secondary forest, subjugated by

Schima wallichii, *Albizzia* sp. and *Macaranga denticulata*. The forest in the moist valleys is lofty, while steep slopes are covered with canopy (Singh et al. 2000; Forest Survey of India 2019). Chakpi's slow-flowing streams where sampling was carried out, is surrounded by the subtropical semi-evergreen and the sub-tropical hill forests, predominantly subjugated by *Juglans* sp., *Albizzia chinensis*, *Quercus* sp., *Macaranga denticulata*, and *Schima wallichii* based on the classification of Champion & Seth (1968). Specimens were collected from beneath weathered sedimentary rocks and on the exposed sand stones in the vicinity close to slow-flowing stream. This is quite similar to the previous collection site of the species from Dampa Tiger Reserve, Mizoram State by Vanlalsiammawii et al. (2020). During the collection period, atmospheric temperature and relative humidity were 12.9°C and 83.6 %, respectively. Chakpi offshoots offer a unique ecosystem and congenial breeding grounds for many rare amphibian species especially near stagnant and flowing water. In Chakpi, streams were bounded by sedimentary rocks and weathered huge boulders and logs which provide suitable breeding spot for several



Image 1. *Leptobrachella tamdil* from Chandel District, Manipur State, India: A—Three adult individuals, left to right – (Male, MZMU2224; Male, MZMU 2225; Female, MZMU 2226) | B—Microhabitat at Chakpi Stream | C—Adult female individual MZMU 2226.

anuran species. Sympatric frog species includes *Amolops* cf. *indoburmanensis* and *Sylvirana* cf. *lacrima* that were observed at the upper reaches of the elevated stream bed. The present study found a gravid female (MZMU 2226) with 105 eggs. We suggest that the breeding season is likely to start during dry season (December to January) as hinted by the presence of gravid females and deposition of eggs. The egg diameter of *L. tamdil* range between 1.4–1.5 mm (N= 10). The conservation status for the species remains unclear. Deuti (2013) categorized this species as data deficient (DD), but later Dinesh et al. (2020) corrected that to not assessed (NA). Thus, the proper assessment of its conservation status is lacking. The microhabitat of *L. tamdil* consisted primarily of intermediate-flowing stream within tropical semi-evergreen forest (Sengupta et al. 2010; Vanlalsiammawii et al. 2020). Other aspects of *L. tamdil* such as the breeding biology, tadpole morphology, diet, and general

life history remain largely unknown and considerable works are needed to shed more light on this species. Legitimately, the present record of *L. tamdil* from northeastern part of India represents the northeastern-most locality with the highest altitude (1,220–1,228 m), against the records in Mizoram at 745 m (Sengupta et al. 2010) and 449 m (Vanlalsiammawii et al. 2020). This study provides a range extension of *L. tamdil* away from the type locality in Mizoram, north-east towards Manipur, and it is likely present in the adjacent country of Myanmar and possibly in Assam, Nagaland, and Tripura states. The new individuals represent the latest range of SVL (27.8–33.2 mm), and the breeding season might be commencing from late winter as indicated by the presence of gravid female. Further observations are necessary to know more information about the biology of *L. tamdil*.

The loss of forest canopy and natural streams were

noted to directly threaten the habitats of the anuran species. Jhum cultivation, forestry effluents, and forest fires are also attributed to it (see Gupta 2000; Shimray 2004; Maithani 2005; Bhattacharya & Nanda 2005; Kerkhoff et al. 2006; Sastry et al. 2007; Jamir & Lianchawii 2013; Reimeingam 2017). The first step towards ensuring the long-term persistence of such anurans is addressing the lack of understanding of range, population trends, ecology, and potential threats. Mitigation measures must be put in place to stop the unchecked depletion of the resources of such little-known species, failing which *L. tamdil* and other such taxa will regrettably be wiped out from Manipur, to say the least (Banita & Bordoloi 2007). Overall, amphibian studies in the northeastern India is the least when compared to rest of the regions of the country and especially amphibian faunal inventorying is scanty in Manipur State. Safeguarding the ecological diversity of the existing areas is most likely to protect viable populations of such fragile wildlife. Surroundings of the Chandel Village include some intact habitats that are suitable for anurans where probable discovery of unique amphibians are reasonably high. Thus, extensive explorations can ascertain the true amphibian richness in the present study area.

References

- Banita, N. & S. Bordoloi (2007). Amphibian fauna of Loktak lake, Manipur, India with ten new records for the state. *Zoos' Print Journal* 22(5): 2688–2690. <https://doi.org/10.11609/JoTT.ZPJ.1557.2688-90>
- Bhattacharya, B. & S.K. Nanda (2005). *Shifting Cultivation in North-east India: Technological Alternatives and Extension Implication*, pp. 65–86. In: Bandopadhyay, A., K.V. Sundaram, M. Moni, P.S. Kundu & M.J. Mrityunjay (eds.). *Sustainable Agriculture: Issues in Production, Management, Agronomy and ICT Application*. Northern Book Centre, Delhi.
- Champion, S.H.G. & S.K. Seth (1968). *A Revised Survey of the Forest Types of India*. The Manager of Publication, Govt. of India, New Delhi, 404pp.
- Deuti, K. (2013). Amphibia, pp. 67–137. In: Venkataraman, K., A. Chatopadhyay & K.A. Subramanian (eds.). *Endemic Animals of India* (Vertebrates). Zoological Survey of India, Kolkata, 235pp+26pls.
- Dinesh, K.P., C. Radhakrishnan, B.H. Channakeshavamurthy, P. Deepak & N.U. Kulkarni (2020). A checklist of amphibians of India with IUCN conservation status. Version 3.0. Online publication is available at www.zsi.gov.in Updated till April 2020.
- Forest Survey of India. (2019). India State of Forest Report 2019. Electronic Database accessible at <https://fsi.nic.in/isfr19/vol1/chapter2.pdf>. Forest Survey of India, Uttarakhand, India. (Accessed on 6 May 2021).
- Frost, D.R. (2021). Amphibian Species of the World: an Online Reference. Version 6.1 (15.04.2020). Electronic Database accessible at <https://amphibiansoftheworld.amnh.org/index.php>. American Museum of Natural History, New York, USA. (Accessed on 25 February 2021).
- Gupta, A.K. (2000). Shifting Cultivation and Conservation of Biological Diversity in Tripura, Northeast India. *Human Ecology* 28(4): 605–629.
- Huelsenbeck, J.P. & F. Ronquist (2001). MRBAYES: Bayesian inference of phylogeny. *Bioinformatics* 17: 754–755.
- Jamir, R.N. & Lianchawii (2013). Sustainable Land and Ecosystem Management in Shifting Cultivation Areas of Nagaland. Directorate of Extension Indian Council of Forestry Research and Education, Dehradun.
- Kerkhoff, E. & E. Sharma (2006). Debating Shifting Cultivation in the Eastern Himalayas: Farmers' Innovations as Lessons for Policy. Kathmandu: International Centre for Integrated Mountain Development.
- Kimura, M. (1980). A simple method for estimating evolutionary rates of base substitutions through comparative studies of nucleotide sequences. *Journal of Molecular Evolution* 16: 111–120.
- Kumar, S., G. Stecher & K. Tamura (2016). MEGA7: molecular evolutionary genetics analysis version 7.0 for bigger datasets. *Molecular Biology and Evolution* 33(7): 1870–1874. <https://doi.org/10.1093/molbev/msw054>
- Maithani, B.P. (2005). *Shifting Cultivation in North East India: Policies Issues and Options*. Delhi: Mittal Publication, New Delhi, 163pp.
- Myers, G.S. & A.E. Leviton (1962). Generic classification of the high-altitude pelobatid toads of Asia (*Scutiger*, *Aelurophryne*, and *Oreolalax*). *Copeia* 1962: 287–291.
- Palumbi, S.R. (1996). *Nucleic acids II: the polymerase chain reaction*, pp. 205–247. In: Hillis, D.M., C. Moritz & B.K. Mable (eds.). *Molecular Systematics, 2nd Edition*. Sinauer Associates Inc., Massachusetts, USA.
- Rambaut, A. (2014). FigTree v1.4.2, A Graphical Viewer of Phylogenetic Trees. Available from <http://tree.bio.ed.ac.uk/software/figtree/>.
- Rassmann, K. (1997). Evolutionary age of the Galapagos iguanas predates the age of the present Galapagos Islands. *Molecular Phylogenetics and Evolution* 7: 158–172. <https://doi.org/10.1006/MPEV.1996.0386>
- Reimeingam, M. (2017). Shifting Cultivation in Manipur: Land, Labour and Environment. *Journal of Rural Development* 36(1): 97. <https://doi.org/10.25175/jrd/2017/v36/i1/112705>
- Sastry, K.L.N., A.K. Kandya, P.S. Thakker, Ajai, L.B. Shangkoopong, S.D. Rajkumari, N.S. Shamungou, K.S. Jagadishwor, Khaizalian, K.S. Thambou & S. Singsit (2007). Nationwide Forest Encroachment Mapping Using Remote Sensing and GIS Techniques - Manipur State. Ahmedabad: Manipur Forest Department and Manipur State Remote Sensing Applications Centre and Space Applications Centre-ISRO.
- Sengupta, S., S. Sailo, H.T. Lalremsanga, A. Das & I. Das (2010). A new species of *Leptolalax* (Anura: Megophryidae) from Mizoram, northeastern India. *Zootaxa* 2406(1): 57–68. <http://doi.org/10.11646/zootaxa.2406.1.3>
- Shimray, U.A. (2004). Women's work in naga society: household work, workforce participation and division of labour. *Economic and Political Weekly* 39(17): 1698–1711.
- Singh, N.P., A.S. Chauhan & M.S. Mondal (2000). *Flora of Manipur*. Vol. 1. Botanical Survey of India, Calcutta, 598pp.
- Smith, M.A. (1925). Contributions to the herpetology of Borneo. *Sarawak Museum Journal* 3: 15–34.
- Theobald, W. (1868). *Catalogue of Reptiles in the Museum of the Asiatic Society of Bengal* (Vol. 32). Baptist Mission Press, Calcutta, 88pp.
- Tschudi, J.J. von. (1838). Classification der Batrachier mit Berücksichtigung der fossilen Thiere dieser Abtheilung der Reptilien. Neuchâtel: Petitpierre, 100pp.
- Vanlalsiammawil, Remruatpuui, V.L. Malsawmhriatzualli, Lalmuansanga, G.Z. Hmar, S. Sailo, Ht. Decemson, L. Biakzuala & H.T. Lalremsanga (2020). An additional record of the Tamdil Leaf-litter Frog *Leptobrachella tamdil* (Sengupta et al., 2010) (Amphibia: Megophryidae) from Dampa Tiger Reserve, Mizoram, India. *Journal of Threatened Taxa* 12(8): 15951–15954. <https://doi.org/10.11609/jot.5999.12.8.15951-15954>



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