

***Limnonectes nguyenorum* MCLEOD, KURLBAUM & HOANG, 2015  
(ANURA: DICROGLOSSIDAE), A NEW FROG RECORD  
FROM YEN BAI PROVINCE, NORTHWESTERN VIETNAM**

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**Abstract.** We report Nguyen's fanged frog (*Limnonectes nguyenorum*) for the first time from Yen Bai Province in northwestern Vietnam. Specimens were collected in May 2017 and June 2019 from Mu Cang Chai Species and Habitat Conservation Area, Mu Cang Chai District, Yen Bai Province and identified based on morphological data. Our record extends the known elevation range of the species (up to 1763 m vs. 1000 m in first records) and brings the number of *Limnonectes* species recorded from Yen Bai Province to two and is the first record of *Limnonectes nguyenorum* from Mu Cang Chai Species and Habitat Conservation Area.

**Keywords:** *Limnonectes nguyenorum*, Mu Cang Chai, morphology, new record.

## **1. Introduction**

The fanged frog genus *Limnonectes* Fitzinger is comprised of 74 species which are distributed widely in Asia (Frost, 2019 [1]). *Limnonectes* is one of the most diverse groups of amphibians with 16 of which have been described in the last ten years (Pham *et al.* 2017 [2]). To date, 12 species have been reported from Vietnam (Frost 2019 [1]). Nguyen's fanged frog (*Limnonectes nguyenorum* McLeod, Kurlbaum & Hoang 2015 [3]) has been recorded from three provinces (Ha Giang, Son La, and Vinh Phuc provinces) (McLeod *et al.* 2015 [3]; Ziegler *et al.* 2015 [4]; Pham *et al.* 2016 [5]). This species belongs to the *Limnonectes kuhlii* group which is known to harbour cryptic species; several new species have been recently described from this group based on a combination of morphological and molecular data (Suwannapoom *et al.* 2016 [6]; Pham *et al.* 2017 [2], 2018 [7]).

Mu Cang Chai Species and Habitat Conservation Area (SHCA) in northwestern Vietnam is known to support a high diversity of amphibians with 33 species recorded to date, including several species that are currently believed to be endemic to the mountain

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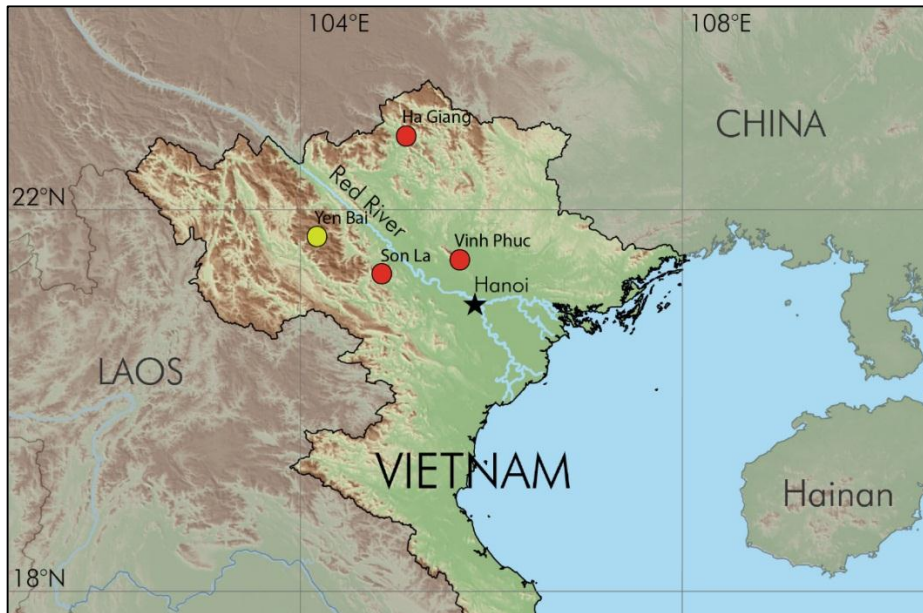
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(Le *et al.* 2018 [8]; Tapley *et al.* 2018 [9]). However, only one species of *Limnonectes* has reported from this area, *Limnonectes banaensis* Ye, Fei, Xie, & Jiang (previously known as *L. kuhlii*, Ohler *et al.* 2000). During fieldwork on Mu Cang Chai SHCA in May 2017 and June 2019, we encountered several *Limnonectes* in small streams near Che Tao and Nam Khat communes, Mu Cang Chai District, Yen Bai Province. Morphological data confirm the identity of the specimens as *L. nguyenorum* and we herein report the first record of the species Mu Cang Chai SHCA and for Yen Bai Province.

## 2. Content

### 2.1. Materials and methodology

Field surveys (Fig. 1) were conducted in Mu Cang Chai SHCA, Yen Bai Province, northwestern Vietnam, in May 2017 and June 2019 by Dzung Trung Le, Yen Thi Do, Anh Ngoc Dao, Nam Hai Nguyen, Huy Quoc Nguyen, Hai Nam Tran, Tien Quang Phan (hereafter YTD *et al.*). Specimens were collected from 19:00 to 24:00. After taking photographs specimens were euthanized in a closed vessel with a piece of cotton wool containing ethyl acetate, fixed in 85% ethanol and subsequently stored in 70% ethanol (Simmons, 2002 [10]). Specimens were deposited in the Museum of Biology, Hanoi National University of Education (HNUE), Hanoi, Vietnam.



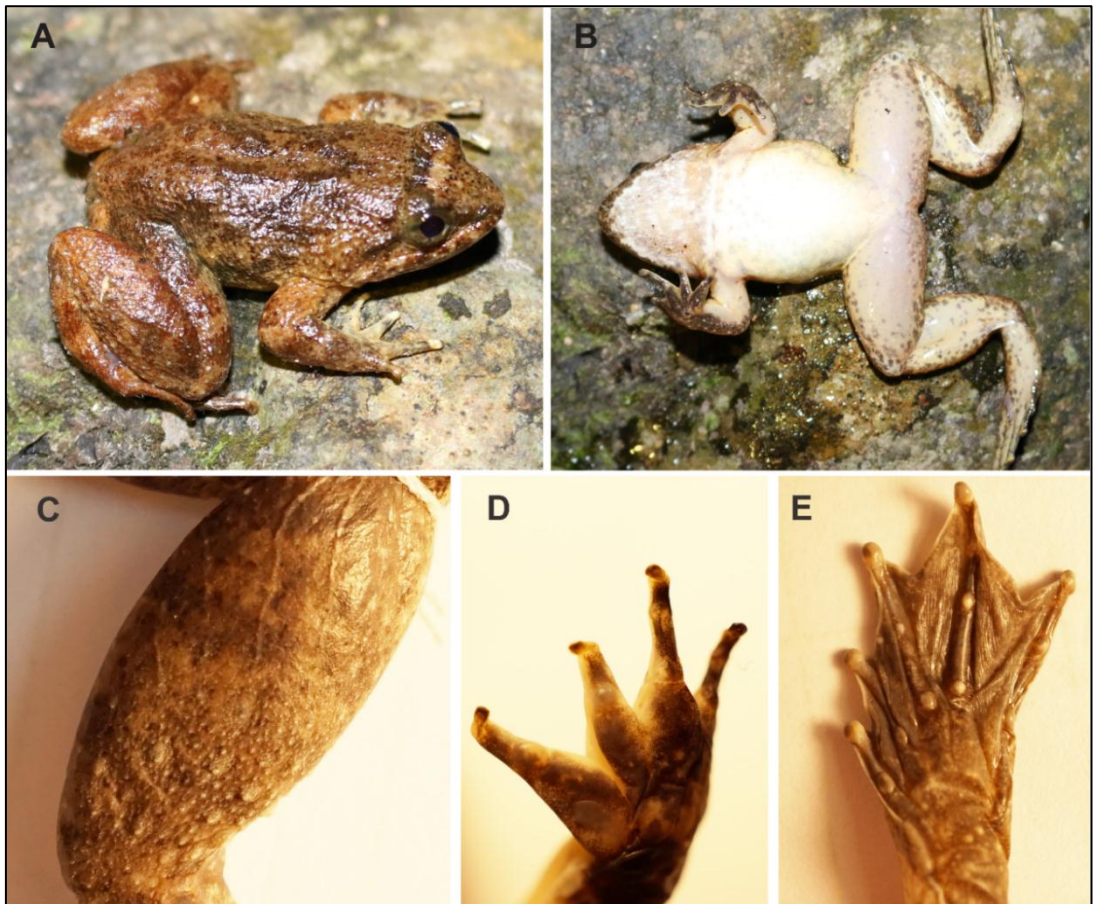
**Figure 1. Distribution of *Limnonectes nguyenorum* in Vietnam: Red circles – previously recorded sites; Yellow circle – Mu Cang Chai Species and Habitat Conservation Area, Yen Bai Province**

Measurements were taken with a digital calliper to the nearest 0.1 mm. Morphological terminology followed McLeod (2008) [11]: SVL = snout–vent length; HW = head width; HL = head length; MN = mandible–nostril distance; MBE = mandible–behind eye distance; MFE = mandible–front eye distance; IFE = distance between anterior corners of eyes; IPE = distance between posterior corners of eyes; IN

= internarial distance nostril; EN = eye–nostril distance; ED = eye diameter; NS = nostril–snout distance; SL = Snout length; IUE = internarial upper eyelid; UEW = upper eyelid width; FLL = forearm length, from elbow to base of outer palmar tubercle; HAL = hand length, from base of outer palmar tubercle to tip of third finger; TFL = third finger length; FL = thigh length, from vent to knee; TL = shank length; FOL = foot length, from base of inner metatarsal tubercle to tip of fourth toe; FTL = fourth toe length; IMT = length of inner metatarsal tubercle; ITL= inner toe length; TW = maximum shank width; a.s.l., above sea level. For webbing formula, we followed Glaw and Vences (2007) [12].

## 2.2. Results

*Specimens examined* (n=2). Two adult males (HNUE MCC.2017.108 and HNUE MCC.2019.51): HNUE MCC.2017.108 collected on 3 May 2017, from a small stream Mu Cang Chai SHCA, near Che Tao Commune, Yen Bai Province (21°43.281'N 103°59.765'E, at an elevation of 1,332 m a.s.l.); HNUE MCC.2019.51 collected on 16 June 2019, from a small stream Mu Cang Chai SHCA, near Che Tao Commune, Yen Bai Province (21°39.462'N 104°05.604'E, at an elevation of 1,763 m a.s.l.).



**Figure 2.** *Limnonectes nguyenorum* (HNUE MCC.108, an adult male) from Mu Cang Chai Species and Habitat Conservation Areas in life: A, lateral view; B, ventral view; C, leg view; and D, planar view and E, palmar view. Photos by Y. T. Do.

**Description.** Morphological characters of the specimens (Fig. 2) from Mu Cang Chai SHCA, Yen Bai Province agreed with the descriptions of Mcleod *et al.* (2015) [3] and Pham *et al.* (2016) [5]: SVL 40.7-41.5 mm in the males; head slightly enlarged (HL/SVL 0.37-0.39); head longer than wide (HL 15.4-15.8 mm, HW 14.4-15.0 mm); canthus rostralis indistinct and rounded, lores flat; distinct supratympanic fold; tympanum not visible; Finger tips rounded, relative length of fingers decreasing III–IV–II–I; no webbing on fingers. Toe tips rounded, relative length of toes decreasing IV–III–V–II–I. Full webbing between toes, inner metatarsal tubercle oval; skin on head and venter smooth; skin on throat, dorsal surfaces of forelimb, thigh, and dorsum feebly crenulate; pericloacal area, dorsal surfaces of shank and foot covered with small heterogeneous sized tubercles tipped with translucent spinules; Coloration in life: dorsum, head and body greyish yellow-brown; dark horizontal stripes between the eyes dorsum and dorsal surfaces of limbs yellow-brown; supratympanic fold dark brown, tips of tubercles white; dorsal surface of thighs and tibias.

Based on the current understanding of systematics, taxonomy, and species distributions in Indochina, *L. nguyenorum* and *L. bannaensis* are the only sympatric species of the *L. kuhlii* Complex in Vietnam (McLeod *et al.* 2015 [3]). The species *L. nguyenorum* differs *L. bannaensis* by having a smaller size and heterogeneously sized tubercles on the leg vs. smooth appearance in *L. bannaensis* (McLeod *et al.* 2015 [3] and this study). The only other geographically proximate and closely related taxon with which *L. nguyenorum* could be confused based on size and general appearance is *L. taylori*, which is known from northwestern Thailand, northwestern Laos, and eastern Myanmar (McLeod 2010 as “Lineage 12”, Matsui 2010b). The species *L. nguyenorum* differs *L. taylori* by having smaller size and heterogeneously sized tubercles on the leg and *L. taylori* has most closely clustered tubercles giving the leg a rough appearance (McLeod *et al.* 2015 [3]).

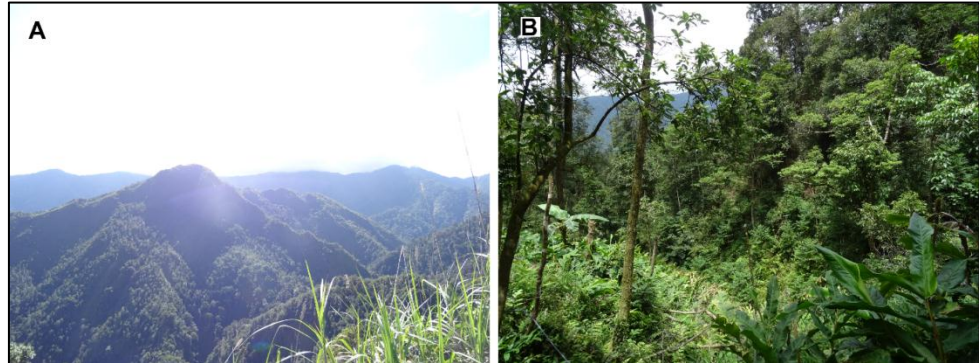
**Natural history.** Specimens were collected from 20:00 h to 24:00 h in the middle of smalls, a shallow stream near Che Tao Commune (Fig. 3). The stream was bordered by the secondary forest above. The air temperature was 24°C and ambient humidity was 80%.

**Table 1. Measurements (in mm) of *Limnonectes nguyenorum* from Yen Bai Province, Vietnam**

Characters	HNUE MCC.2017.108	HNUE MCC.2019.51	Min – Max (n = 2)
SVL	40.7	41.5	40.7–41.5
HW	15.0	14.4	14.4–15.0
HL	15.8	15.4	15.4–15.8
MN	13.7	14.4	13.7–14.4
MFE	11.0	11.4	11.0–11.4
MBE	7.7	7.6	7.6–7.7
IFE	7.5	6.2	6.2–7.5
IPE	9.4	9.4	9.4
IN	3.0	2.9	2.9–3.0



<b>EN</b>	3.9	3.1	3.1–3.9
<b>EL</b>	4.1	4.2	4.1–4.2
<b>TYD</b>	-	-	-
<b>TYE</b>	-	-	-
<b>NS</b>	2.5	2.7	2.5–2.7
<b>SL</b>	6.4	5.4	5.4–6.4
<b>IUE</b>	3.4	3.5	3.4–3.5
<b>UEW</b>	3.0	2.9	2.9–3.0
<b>FLL</b>	7.5	8.2	7.5–8.2
<b>HAL</b>	9.2	8.6	8.6–9.2
<b>TFL</b>	4.3	4.4	4.3–4.4
<b>FL</b>	18.7	19.3	18.7–19.3
<b>TL</b>	18.6	20.3	18.6–20.3
<b>FOL</b>	17.5	20	17.5–20.0
<b>FTL</b>	10.2	12.6	10.2–12.6
<b>IMT</b>	1.5	1.7	1.5–1.7
<b>ITL</b>	3.8	3.5	3.5–3.8
<b>TW</b>	3.7	4.6	3.7–4.6



**Figure 3. Habitat of *L. nguyenorum* from Mu Cang Chai Species and Habitat Conservation Area, Yen Bai Province: A, Landscape; B, Habitat**

### 2.3. Discussion

Specimens from Yen Bai differ from the type specimens of *L. nguyenorum* from Ha Giang (McLeod *et al.* 2015 [3]) and specimens from Son La (Pham *et al.* 2016) [5] in having a smaller size in males: SVL 40.7–41.5mm versus 43.5–43.8 mm (type specimens), versus 46.1–46.5 mm (Son La's specimens) and tubercles present on the dorsum that were absent in the type specimens (McLeod *et al.* 2015 [3], Pham *et al.* 2016 [5]). Our finding increases the number of *Limnonectes* species known from Mu Cang Chai SHCA and Yen Bai Province to two (Nguyen *et al.* 2009 [13] and this study). We expect that Mu Cang Chai SHCA and Yen Bai Province contains additional diversity within the genus *Limnonectes*. *Limnonectes nguyenorum* was discovered at an

elevation of 900 m (McLeod *et al.* 2015 [3]) and the highest elevation record for this species previously was 1300 m (Son La Province, Pham *et al.* 2016 [5]). Our record extends the known elevational distribution of the species to 1763 m. Several new species of amphibian have been recently described from Mu Cang Chai SHCA and the surrounding area of Hoang Lien NP (Nguyen *et al.* 2013 [14]; Rowley *et al.* 2013 [15]; Matsui *et al.* 2017 [16]; Tapley *et al.* 2017 [17]; Tapley *et al.* 2018 [9]) indicating that the diversity of amphibians in this area is underestimated. Further study is necessary to document the true amphibian diversity of Mount Fansipan.

### 3. Conclusions

The species Nguyen's fanged frog (*Limnonectes nguyenorum*) was recorded for the first time from Yen Bai Province in northwestern Vietnam. Specimens were collected in May 2017 and June 2019 from Mu Cang Chai SHCA, Mu Cang Chai District, Yen Bai Province and identified based on morphological data. Morphologically, *L. nguyenorum* is very similar to *L. bannaensis* and *L. taylori* but it differs from the latter by size and heterogeneously sized tubercles on the leg. Our record extends the known elevation range of the species (up to 1763 m vs. 1000 m in first records) and brings the number of *Limnonectes* species recorded from Yen Bai Province to two and is the first record of *L. nguyenorum* from Mu Cang Chai SHCA.

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