

A new species of the *Quasipaa verrucospinosa* complex (Anura: Dicroglossidae) from China and Vietnam

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Abstract. A new species of the *Quasipaa verrucospinosa* complex is described from southern China and northern Vietnam based on morphological and molecular differences. The new species can be separated from other congeners by having a relatively short head; tympanum invisible; dorsum with thick ridges and varying sized round tubercles; supratympanic fold prominent; nuptial spines present on prepollex, fingers I–II, chest, anterolateral belly and lower part of flanks in adult males and iris pale copper. Genetically, the new species is found to diverge from the most closely related taxon, *Q. verrucospinosa*, by a p-distance of 3.4%, and from other species in the genus *Quasipaa* by 4.5%–7.5% in 16S rRNA gene sequences.

Key words. 16S rRNA, Daweishan Mountain, molecular divergence, morphology, Phu Tho Province, taxonomy

INTRODUCTION

The genus *Quasipaa* currently contains 15 species, and most of them are endemic to China and Vietnam (Frost, 2025; Pham et al., 2025). *Quasipaa verrucospinosa* was previously considered to be widely distributed in northern and central Vietnam, as well as southern Yunnan Province of China, Phongsaly and Xekong provinces of Laos, and Nan Province of Thailand (Hu et al., 2005; Nguyen et al., 2009; Nguyen et al., 2020; Suwannapoom et al., 2021; Pham et al., 2022). In their taxonomic revision of the *Quasipaa verrucospinosa* complex in Vietnam, Pham et al. (2025) considered *Q. verrucospinosa* sensu stricto to have

a restricted distribution in northeastern Vietnam (i.e., Lao Cai, Vinh Phuc, Ha Giang, and Tuyen Quang provinces) and described the population from Son La, Thanh Hoa, and Nghe An provinces as *Q. ohlerae* and another population from Quang Binh and Thua Thien Hue provinces as *Q. binhi*. These authors also considered the taxon from Phu Tho Province of Vietnam and Pingbian County, Yunnan Province of China an unnamed species.

As a result of our phylogenetic analyses, the specimens recently collected from Yunnan Province of southern China and Phu Tho Province of northern Vietnam are conspecific with the previously unnamed species in Pham et al. (2025) based on the mitochondrial 16S rRNA gene. In addition, the newly collected specimens can be distinguished morphologically from all other known species of the genus. We therefore describe the unnamed taxon of *Quasipaa* from southern China and northern Vietnam as a new species.

MATERIAL AND METHODS

Sampling. The specimens were collected by hand. After being photographed in life, specimens were fixed and preserved in 75% ethanol for permanent storage. The specimens from China are deposited at Kunming Natural History Museum of Zoology, Kunming Institute of Zoology, Chinese Academy of Sciences (KIZ). The specimens from Vietnam are deposited at the Institute of Biology (IB) (formerly known as the Institute of Ecology and Biological Resources, IEBR), Vietnam Academy of Science and Technology.

Morphological characteristics. Measurements were taken to the nearest 0.1 mm with digital calipers. The following measurements were used (Pham et al., 2025): SVL, snout-

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Table 1. Localities, voucher information, and GenBank accession numbers of samples used in molecular analyses of this study.

Species	Location	Voucher	Genbank No.
<i>Quasipaa phamanhi</i> , new species	Hekou, Yunnan, China	KIZ2025001	PX262646
	Hekou, Yunnan, China	KIZ2025002	PX262647
	Hekou, Yunnan, China	KIZ2025003	PX262648
	Phu Tho, Vietnam	IEBR A.5171	PV475535
	Phu Tho, Vietnam	IEBR A.6363	PV475533
	Pingbian, Yunnan, China	YNU HU20024040	DQ118480
	Pingbian, Yunnan, China	YNU HU20024042	DQ118481
	Pingbian, Yunnan, China	DYJW-PB-003	KF199147
	Phu Tho, Vietnam	IEBR A.6362	PV475532
	Phu Tho, Vietnam	IEBR A.6364	PV475534
<i>Quasipaa acanthophora</i>	Lang Son, Vietnam	IEBR A.5030	OP326694
	Lang Son, Vietnam	IEBR A.5031	OP326695
<i>Quasipaa binhi</i>	Quang Binh, Vietnam	IEBR A.5174	PV475530
	Quang Binh, Vietnam	IEBR A.5175	PV475531
	Kaleum, Xekong, Laos	FMNH 258619	EU979812
	Quang Nam, Vietnam	AMNH A163740	DQ283379
<i>Quasipaa boulengeri</i>	Cao Bang, Vietnam	IEBR A.5007	OP326690
	Cao Bang, Vietnam	IEBR A.5008	OP326691
	Cao Bang, Vietnam	IEBR A.5039	OP326692
	Cao Bang, Vietnam	IEBR A.5040	OP326693
	Cao Bang, Vietnam	IEBR A.5041	PV475543
	Ha Giang, Vietnam	IEBR A.5015	PV475544
	Leshan, Sichuan, China	SCUM 37989	DQ118477
	Hunan, China	YNU HUH01	EU979821
	Maolan, Guizhou, China	YNU HU2003061301	EU979820
	Shizong, Yunnan, China	YNU HU20024060	EU979819
	Shizong, Yunnan, China	YNU HU20024061	DQ118479
	Yihuang, Jiangxi, China	KIZ JX246	EU979817
	Yingchang, Hubei, China	KIZ HUB292	EU979815
	Yingchang, Hubei, China	KIZ HUB293	EU979818
	Lichuan, Hubei, China	KIZ HUB274	EU979816
<i>Quasipaa delacouri</i>	Tuyen Quang, Vietnam	IEBR A.5168	OP326696
	Tuyen Quang, Vietnam	IEBR A.5169	OP326697
	Tuyen Quang, Vietnam	IEBR A.5017	OP326698
	Phu Tho, Vietnam	IEBR A.5020	PV475536
<i>Quasipaa exilispinosa</i>	Wuyishan, Fujian, China	YNU HU20026023	DQ118484
	Wuyishan, Fujian, China	YNU HU20026022	DQ118483
<i>Quasipaa jiulongensis</i>	Wuyishan, Fujian, China	JLJW-WYS-002	KF199149
	Wuyishan, Fujian, China	YNU HU200206036	DQ118485
	Wuyishan, Fujian, China	YNU HU200206037	EU979801
<i>Quasipaa ohlerae</i>	Nghe An, Vietnam	IEBR A.5167	PV475529
	Thanh Hoa, Vietnam	IEBR A.5159	PV475528
	Thanh Hoa, Vietnam	IEBR A.5160	PV475527
	Thanh Hoa, Vietnam	IEBR A.5161	PV475526
	Thanh Hoa, Vietnam	IEBR A.5164	PV475525
	Nghe An, Vietnam	ROM 35181	EU979811
	Nghe An, Vietnam	FMNH 255623	EU979810
	Phongsaly, Phongsaly, Laos	FMNH 258628	EU979808
	Phongsaly, Phongsaly, Laos	FMNH 258389	EU979809
	Jinghong, Yunnan, China	YNU HU 20030724006	EU979805
	Jinghong, Yunnan, China	YNU HU 20030724005	DQ118482
	Doi Phu Kha, Nan, Thailand	AUP 00392	OK178934

Species	Location	Voucher	Genbank No.
<i>Quasipaa ohlerae</i>	Doi Phu Kha, Nan, Thailand	AUP 00393	OK178935
	Doi Phu Kha, Nan, Thailand	AUP 00531	OK178936
	Doi Phu Kha, Nan, Thailand	AUP 00532	OK178937
	Doi Phu Kha, Nan, Thailand	AUP 00533	OK178938
	Doi Phu Kha, Nan, Thailand	AUP 00534	OK178939
	Doi Phu Kha, Nan, Thailand	AUP 00561	OK178940
<i>Quasipaa shini</i>	Huaping, Guangxi, China	YNU HU20025002	DQ118486
	Huaping, Guangxi, China	YNU HU20025001	DQ118487
	Jinxu, Guangxi, China	SCUM 060702L	EU979802
<i>Quasipaa spinosa</i>	Zhejiang, China	Sample No. 003	FJ432700
	Lushan, Jiangxi, China	KIZ C21	EU979800
<i>Quasipaa taoi</i>	Kon Tum, Vietnam	IEBR A.4997	OP326684
	Kon Tum, Vietnam	IEBR A.4998	OP326685
	Ngoc Linh, Kon Tum, Vietnam	ROM 37390	EU979804
	Kaleum, Xekong, Laos	FMNH 258383	EU979803
<i>Quasipaa verrucospinosa</i>	Vinh Phuc, Vietnam	IEBR A.5155	PV475537
	Lao Cai, Vietnam	IEBR A.5172	PV475541
	Lao Cai, Vietnam	IEBR A.5173	PV475542
	Tuyen Quang, Vietnam	IEBR A.5025	OP326686
	Tuyen Quang, Vietnam	IEBR A.5026	OP326687
	Tuyen Quang, Vietnam	IEBR A.5027	OP326688
	Tuyen Quang, Vietnam	IEBR A.5028	PV475538
	Vinh Phuc, Vietnam	MVZ 226340	EU979851
	Vinh Phuc, Vietnam	MVZ 223858	EU979813
	Vinh Phuc, Vietnam	MVZ 223934	EU979850
	Vinh Phuc, Vietnam	K732	KR828033
	Ha Giang, Vietnam	IEBR A.5022	PV475539
	Bac Kan, Vietnam	IEBR A.5176	PV475540
	Thai Nguyen, Vietnam	TN3	MH828726
<i>Quasipaa yei</i>	Shangcheng, Henan, China	YNU HU200205151	DQ118488
<i>Nanorana parkeri</i>	Yunnan, China	NC_026789	KP317482
<i>Nanorana arnoldi</i>	Yunnan, China	SCUM050410CHX	EU979838

vent length, from the tip of the snout to the cloaca; HL, head length, a parallel line with the vertebral column from the posterior margin of the mandible to the tip of the snout; HW, maximum head width, at the rictus; RL, rostral length, from the anterior corner of the orbit to the tip of the snout; NS, the distance from the nostril to the tip of the snout; EN, the distance from the anterior corner of the orbit to the nostril; IND, internarial distance, the distance between the nostrils; IOD, interorbital distance; ED, eye diameter; UEW, maximum width of the upper eyelid; DAE, the distance between the anterior margins of the orbits; DPE, the distance between the posterior margins of the orbits; MN, the distance from the posterior margin of the mandible to the nostril; MFE, the distance from the posterior margin of the mandible to the anterior margin of the orbit; MBE, the distance from the posterior margin of the mandible to the posterior margin of the eye; UAL, upper arm length, from the axilla to the elbow; FAL, fore arm length, from the elbow to the tip of the third finger; FeL, femur length, from the vent to the knee; TbL, tibia length, from the knee to the tarsus; TbW, maximum tibia width; FoL, foot length,

from the tarsus to the tip of the fourth toe and IMT, inner metatarsal tubercle length. Sex was determined by the presence of nuptial pads in males.

Principal component analysis (PCA) was used to determine whether the potential new taxon and its closely related species occupied unique positions in morphospace. Characteristics used in the PCA were from SVL, HL, HW, MN, MFE, MBE, RL, ED, UEW, IND, IOD, DAE, DPE, NS, EN, UAL, FAL, FeL, TbL, TbW, FoL, and IMT. Morphometric data for *Quasipaa verrucospinosa* were from our previous study. PCA was performed using the `prcomp` command in R 4.2.2, and the scatter plot was plotted using the `ggplot2` package in R 4.2.2 (R Core Team, 2022).

Molecular analysis. Total genomic DNA was extracted from liver tissues. A fragment of mitochondrial 16S rRNA gene was amplified and sequenced using the primers L2188 (Matsui et al., 2006): 5'-AAAGTGGGCCTAAAAGCAGC CA-3' and 16H1 (Hedges, 1994): 5'-CTCCGGTCTGAAGTCA AGATCACGTAGG-3'. The experimental protocols of

amplification and sequencing followed Liu et al. (2021). Sequences were edited and manually managed using SeqMan in Lasergene 7.1 (Burland, 2000) and MEGA 12.0.9 (Kumar et al., 2024).

All new sequences have been deposited in GenBank and other sequences of congeneric species and outgroup were downloaded from Genbank (Table 1). Sequences of *Nanorana parkeri* and *Nanorana arnoldi* were used as outgroup taxa as per Pham et al. (2025).

Sequences were aligned using MAFFT 7 (Katoh & Standley, 2013). Genetic divergences (uncorrected p-distance) were calculated in MEGA 12.0.9 (Kumar et al., 2024). The best substitution model TIM2+F+I+G4 was selected using the Akaike Information Criterion in ModelFinder (Kalyaanamoorthy et al., 2017). A Bayesian inference (BI) and a maximum likelihood analysis (ML) were used to construct phylogenetic trees. The BI was performed in MrBayes 3.2.7 (Ronquist et al., 2012) and the ML was performed in IQ-TREE 1.6.12 (Nguyen et al., 2015). The technical computation methods for BI and ML were the same as those used by Liu et al. (2024).

RESULTS

For the PCA analysis on the males of the potential new taxon and *Quasipaa verrucospinosa*, the first two principal components accounted for 85.53% of the total variance, the loadings for PC2 were heavily loaded on MN, MFE, MBE, IOD, and NS (Table 2), and differentiation between the males of the potential new taxon and *Q. verrucospinosa* was found along the PC2 axis (Fig. 1), indicating that these mensural characteristics differentiate the males of the potential new taxon from the males of *Q. verrucospinosa* in a statistically significant manner. For the PCA analysis on the females of the potential new taxon and *Q. verrucospinosa*, the first two principal components accounted for 78.07% of the total variance, the loadings for PC2 were heavily loaded on HL, MN, MFE, MBE, and IOD (Table 2), and differentiation between the females of the potential new taxon and *Q. verrucospinosa* was found along the PC2 axis (Fig. 1), indicating that these mensural characteristics differentiate the female of the potential new taxon from the females of *Q. verrucospinosa* in a statistically significant manner. In terms of other morphological characteristics, the potential new taxon is mainly distinguishable from its congeners by invisible tympanum, dorsum with thick longitudinal ridges, the presence of nuptial spines in adult males, tibio-tarsal articulation reaching to or beyond snout tip and copper iris (Table 3).

Phylogenetically, the BI and ML recovered a consistent topology (Fig. 2). The sequences of the specimens from Yunnan Province of China and Phu Tho Province of Vietnam clustered together and formed a distinct clade that was found to be sister to *Q. verrucospinosa* with strong support. The genetic divergence between this clade and *Q. verrucospinosa* was 3.4 % in 16S rRNA mtDNA gene (Table 4).

Table 2. Factor loadings of first two principal components of 22 mensural characteristics of *Quasipaa phamanhi*, new species, and *Q. verrucospinosa*.

Character	Male		Female	
	PC1	PC2	PC1	PC2
SVL	0.252	0.091	-0.265	-0.080
HL	0.231	0.190	-0.162	-0.411
HW	0.252	0.043	-0.254	-0.091
MN	0.160	-0.370	-0.163	0.403
MFE	0.111	-0.437	-0.144	0.360
MBE	0.105	-0.435	-0.161	0.364
RL	0.244	-0.084	-0.243	-0.024
ED	0.211	-0.235	-0.163	-0.131
UEW	0.227	-0.012	-0.242	-0.089
IND	0.220	-0.078	-0.252	0.148
IOD	0.177	0.302	-0.166	-0.394
DAE	0.224	-0.160	-0.249	0.097
DPE	0.227	0.152	-0.246	-0.030
NS	0.020	-0.335	-0.231	-0.035
EN	0.219	-0.002	-0.117	0.110
UAL	0.255	-0.083	0.000	-0.300
FAL	0.246	0.103	-0.242	0.001
FeL	0.210	0.155	-0.237	0.057
TbL	0.251	-0.051	-0.266	0.012
TbW	0.211	0.192	-0.234	-0.096
FoL	0.240	0.075	-0.236	0.158
IMT	0.224	0.171	-0.214	-0.196

TAXONOMY

Quasipaa phamanhi, new species (Figs. 3–6, 7A)

Type materials. Holotype: adult male (KIZ2025001), Liangzi Village, Yaoshan Township, Hekou County, Honghe Prefecture, Yunnan Province, China (22°48'54"N, 103°44'28"E, 1200 m a.s.l.), coll. S. Liu, 22 March 2025. Paratypes: 1 adult male (KIZ2025002) and 1 adult female (KIZ2025003), same data as holotype; 2 adult males (IEBR A.5171 and IEBR A.6363), Na Mountain, Quang Khe Commune, Ha Hoa District, Phu Tho Province, Vietnam (21°33'12"N, 104°53'19"E, 420 m a.s.l.), coll. D. X. Vu, 15 December 2021.

Diagnosis. Size large, SVL 80.9–108.5 mm; head short, HL/SVL 0.32–0.37, broader than long, HL/HW 0.74–0.85; vomerine teeth distinct; tympanum invisible; dorsum with

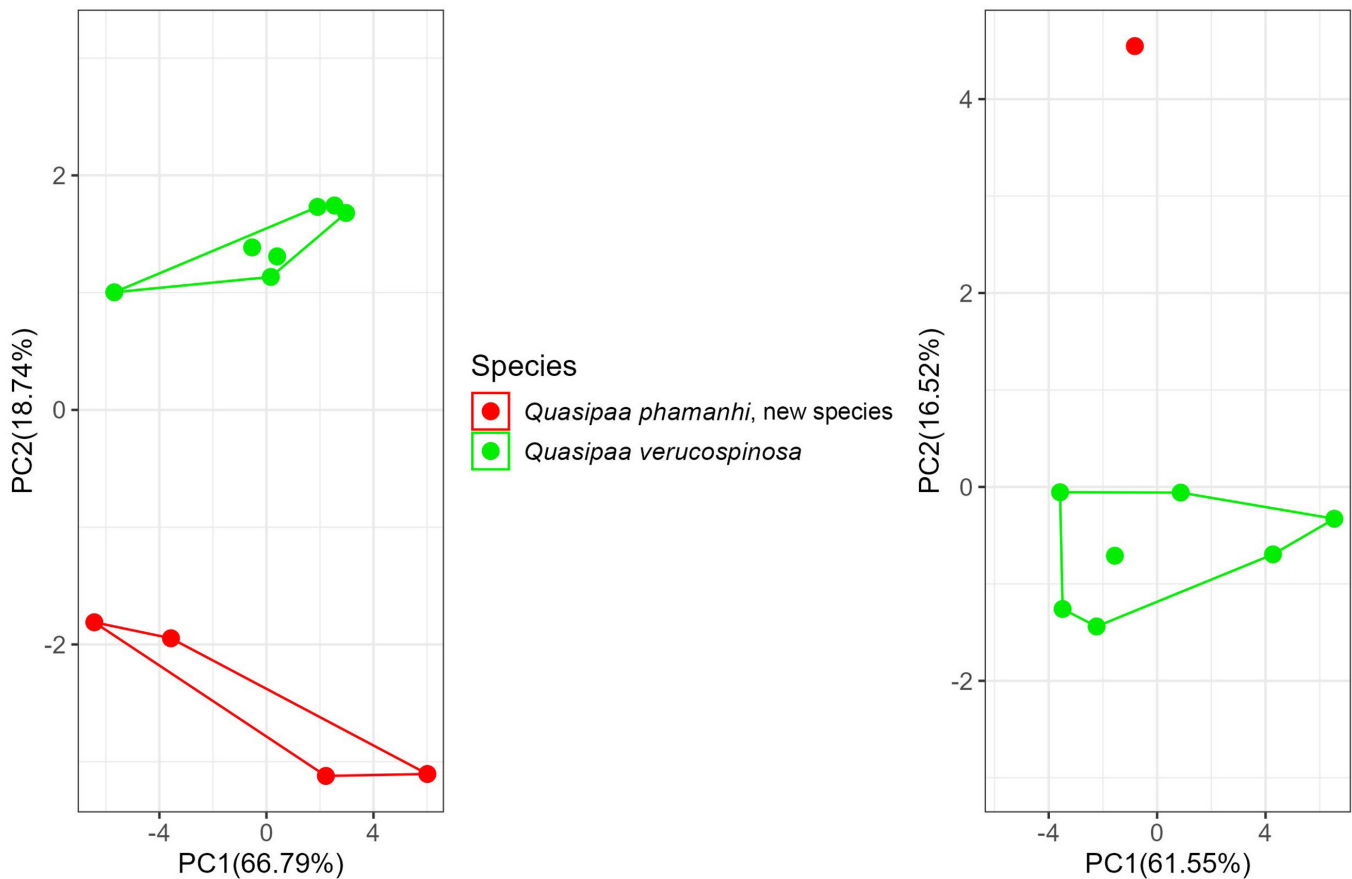


Fig. 1. PCA based on 22 mensural characteristics (SVL, HL, HW, MN, MFE, MBE, RL, ED, UEW, IND, IOD, DAE, DPE, NS, EN, UAL, FAL, FeL, TbL, TbW, FoL and IMT) for males (left) and females (right) of *Quasipaa phamanhi*, new species, and *Q. verucospinosa*.

thick longitudinal ridges and varying sized round tubercles; supratympanic fold thick; dorsolateral fold absent; adult males with nuptial spines on prepollex, fingers I–II, chest, anterolateral parts of belly, and lower part of flanks; relative finger lengths $III > I > IV > II$; finger tips not expanded, toe tips slightly expanded; toes fully webbed to distal end of terminal phalanx; tibio-tarsal articulation reaching to or beyond snout tip when limb adpressed along body; iris copper on upper half and greyish on lower half in life.

Description of holotype. Adult male, size large (SVL 80.9 mm); habitus robust; head large (HL/SVL 0.33, HW/SVL 0.44), wider than long (HL/HW 0.74); snout round, projecting beyond lower jaw; rostral length greater than eye diameter (RL/ED 1.45); nostril oval, closer to eye than to snout tip (NS/EN 1.36); canthus rostralis distinct; loreal region oblique, slightly concave; eyes relatively large (ED/HL 0.35), pupil in diamond shape; internarial distance greater than interorbital distance and upper eyelid width (IND/IOD 1.44, IND/UEW 1.10); tympanum invisible; supratympanic fold prominent, thick; choanae oval; vomerine teeth distinct, in two oblique ridges; vocal sac openings small, on floor of mouth at corner on each side; tongue cordiform, notched posteriorly.

Forelimbs short (UAL/SVL 0.17, FAL/SVL 0.47); fore arms stout; relative finger lengths: $III > I > IV > II$; webbing between fingers absent; narrow dermal ridges present on inner side of fingers II and III; tip of fingers swollen, not expanded; subarticular tubercles prominent, distal ones small

and round, proximal ones large and oval, formula 1, 1, 2, 2; supernumerary tubercles absent; inner metatarsal tubercle large, oval; outer metatarsal tubercle small, oval.

Hindlimbs moderately long (FeL/SVL 0.56, TbL/SVL 0.57); tibia slightly longer than thigh (TbL/FeL 1.02); tip of toes swollen, slightly expanded; relative length of toes: $IV > III > V > II > I$; toes fully webbed to distal end of terminal phalanx; dermal ridges present on outer side of toes I and V; subarticular tubercles prominent, elongate, formula 1, 1, 2, 3, 2; inner metatarsal tubercle quite elongate; outer metatarsal tubercle absent; tibio-tarsal articulation reaching to snout tip when limb adpressed along body.

Skin texture of holotype in life. Dorsal surface of head with small and medium round tubercles, dorsum with small to large round tubercles intermixed with thick longitudinal ridges; flanks covered by small and large round tubercles; dorsolateral fold absent; dorsal surface of forelimbs covered by small and medium round tubercles; dorsal surface of hindlimbs with small to large round or oval tubercles; ventral surface of skin smooth with some conical tubercles, each tubercle with one black spine, on chest and anterolateral parts of belly.

Colouration of holotype in life. Dorsal surfaces of head and body yellowish brown with some irregular black markings, upper eyelid brick red with dark brown spots; dorsal surface of limbs yellowish brown with some black bars; upper lip

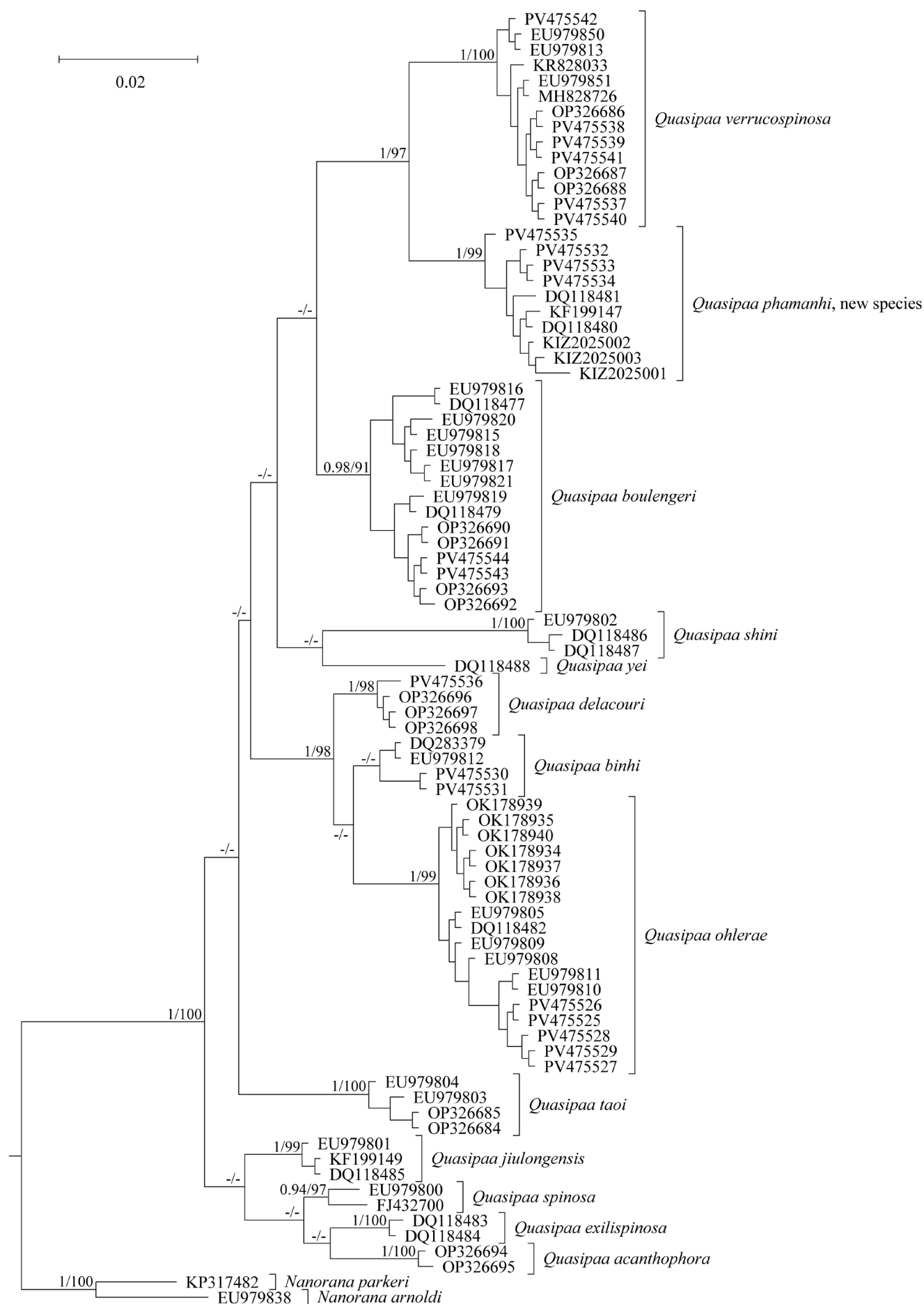


Fig. 2. Bayesian Inference tree of *Quasipaa* reconstructed on the base of 16S rRNA gene sequences. Values before slashes correspond to BI posterior probabilities and values after slashes correspond to ML bootstrap replicates. “-” represents the value below 0.90/90.

Table 3. Morphological comparisons among congeners of the genus *Quasipaa*. Data were obtained from this study, Inger (1970), Dubois & Ohler (2009), Pham et al. (2022, 2025), AmphibiaChina (2025) and Nguyen et al. (2025). “/” indicates missing data.

	Nuptial spines on fingers in males	Nuptial spines on body in males	Tubercles on dorsum	Tympanum	Tibio-tarsal articulation	Iris colouration
<i>Quasipaa phamanhi</i> , new species	I–II	Chest and anterolateral belly	Thick ridges and large round tubercles	Invisible	Reaching to or beyond snout tip	Copper
<i>Quasipaa acanthophora</i>	I–III	Chest	Small tubercles	Indistinct	NA	Copper
<i>Quasipaa binhi</i>	Absent	Absent	Thin and elongate ridges	Visible	Reaching to tip of snout	Green
<i>Quasipaa Boulengeri</i>	I–III	Chest and whole belly	Elongate ridges	Invisible	Reaching to eye	Copper
<i>Quasipaa courtoisi</i>	I–III	Chest	Small tubercles	Slightly visible	Reaching to eye	Copper
<i>Quasipaa delacouri</i>	Absent	Absent	Dorsum smooth	Visible	NA	Green
<i>Quasipaa exilispinosa</i>	I–III	Chest	Small tubercles	Slightly visible	Reaching to eye	Copper
<i>Quasipaa fasciculispina</i>	All fingers	Inner surface of forearms, chest and throat, each chest tubercle with 5–10 black spines	Short thick ridges intermixed with small round tubercles	Visible	NA	Copper
<i>Quasipaa jiulongensis</i>	I–III	Chest	Small tubercles	Invisible	Reaching to tip of snout	Copper
<i>Quasipaa ohlerae</i>	All fingers	Throat, chest, 2/3 anterior part of belly and ventral surface of arms	Thick ridges intermixed with small round tubercles	Visible	Reaching to nostril	Green
<i>Quasipaa robertingeri</i>	I–III	Chest and whole belly	Elongate ridges	Invisible	Reaching to eye	Copper
<i>Quasipaa shini</i>	I–III	Chest and anterior belly, each large chest tubercle with 3–8 black spines	Thick ridges intermixed with round tubercles	Slightly visible	Reaching to anterior corner of eye	Copper
<i>Quasipaa spinosa</i>	I–III	Chest	Small tubercles	Slightly visible	Reaching to eye	Copper
<i>Quasipaa taoi</i>	All fingers	Throat, ventrolateral sides, and ventral surface of arms	Thick ridges intermixed with small round tubercles	Slightly visible	Reaching to tip of snout	Copper
<i>Quasipaa verrucosipinosa</i>	I–III	Chest and 2/3 anterior part of belly	Thick ridges intermixed with small round tubercles	Slightly visible	Reaching to nostril	Copper
<i>Quasipaa yei</i>	I	Around vent	Small ridges or tubercles	Indistinct	Reaching to eye	Copper

Table 4. Uncorrected p-distances (%) of 16S rRNA sequences among *Quasipaa* species and outgroups.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 <i>Quasipaa phamanhi</i> , new species														
2 <i>Quasipaa acanthophora</i>	7.5													
3 <i>Quasipaa binhi</i>	5.4	4.2												
4 <i>Quasipaa boulengeri</i>	4.5	6.0	3.8											
5 <i>Quasipaa delacouri</i>	6.1	4.7	1.8	4.2										
6 <i>Quasipaa exilispinosa</i>	6.2	3.3	4.9	5.0	5.2									
7 <i>Quasipaa jiulongensis</i>	5.3	3.6	3.2	3.7	4.1	3.5								
8 <i>Quasipaa ohlerae</i>	5.9	4.9	2.6	5.2	3.0	5.4	4.8							
9 <i>Quasipaa shini</i>	7.5	6.9	6.1	6.0	5.9	6.5	6.0	6.5						
10 <i>Quasipaa spinosa</i>	6.2	3.4	4.1	4.8	4.4	2.5	3.4	4.8	6.8					
11 <i>Quasipaa taoi</i>	6.6	6.4	5.0	4.8	5.4	6.3	4.8	5.4	7.5	5.2				
12 <i>Quasipaa verrucospinosa</i>	3.4	7.1	5.4	5.1	5.6	6.1	5.4	5.2	7.2	5.8	6.3			
13 <i>Quasipaa yei</i>	6.0	5.6	4.3	4.7	3.9	5.2	4.9	4.8	6.0	4.7	5.8	5.8		
14 <i>Nanorana arnoldi</i>	8.9	7.7	8.0	7.8	8.6	8.1	8.4	8.0	9.9	8.1	8.2	8.9	8.9	
15 <i>Nanorana parkeri</i>	8.2	7.2	6.6	7.3	7.2	6.9	7.1	7.4	8.4	7.5	8.6	9.1	7.7	3.6

yellowish brown with several indistinct vertical black bars; iris copper on upper half and greyish on lower half; ventral surface of head light pinkish yellow with some small grey spots, lower lip with some black markings; ventral surfaces of body and forelimbs light yellow; ventral surface of hindlimbs yellow; toe webbing greyish black.

Variation. Measurements of the type specimens are provided in Table 5. Apart from body size, there is no obvious morphological difference between the paratypes and the holotype. The paratypes are also very similar in colouration to the holotype, except that the female paratype has more black markings on dorsum.

Sexual dimorphism. The forearms of males are stout, and males have nuptial spines on the prepollex, fingers I–II, chest, anterolateral belly and lower part of flanks. The forearms of females are delicate, and females do not have nuptial spines.

Etymology. The specific epithet, *phamanhi*, is a patronymic noun honouring Assoc. Prof. Dr. Pham Van Anh from University of Science, Vietnam National University, Hanoi, Vietnam. The designation of this species name honours his contributions to herpetological research in Vietnam, particularly in taxonomy of the anuran species complexes. We propose “Pham Anh’s Spiny Frog” for the common English name, “大围山棘蛙” for the common Chinese name and “Ếch gai sần phạm anh” for the common Vietnamese name of the new species.

Natural history. At the type locality, specimens of the new species were found in a small stream (Fig. 8) at

night between 20:30 and 23:00. There are some primary evergreen broad-leaved forests preserved near the stream, while secondary forests beyond. Other amphibian and reptile species were observed at the type locality of the new species including *Acanthosaura brachypoda*, *Kurixalus lenquanensis*, *Leptobranchella* sp., *Ophryophryne microstoma*, *Pareas hamptoni*, *Polypedates megacephalus*, *Raorchestes hekouensis*, *Trimerodytes percarinatus*, and *Xenophrys lancangica*. In Vietnam, the paratypes were found on the ground of a stream bank. The surrounding habitat was secondary forest of medium-sized and small hardwoods mixed with shrubs and vines. Other amphibian species were found at the sites including *Leptobranchium chapaense*, *Limnodynastes bannaensis*, *Hylarana annamitica*, and *Hylarana maosonensis*.

Distribution. This species is currently known from Hekou and Pingbian counties, Honghe Prefecture, Yunnan Province, China and Ha Hoa District, Phu Tho Province, Vietnam (Fig. 9).

Comparisons. *Quasipaa phamanhi*, new species, differs from *Q. acanthophora* by having thick ridges and large tubercles on dorsum (vs small tubercles) and males with nuptial spines on fingers I–II (vs on fingers I–III).

Quasipaa phamanhi, new species, differs from *Q. binhi* by males with nuptial spines on fingers I–II (vs nuptial spines absent on all fingers), having thick ridges and round tubercles on dorsum (vs thin and elongate ridges) and different iris colouration (copper on upper half and greyish on lower half vs green).

Table 5. Measurements (in mm) of the type specimens of *Quasipaa phamanhi*, new species.

	KIZ2025001 Holotype Male	KIZ2025002 Paratype Male	KIZ2025003 Paratype Female	IEBR A.5171 Paratype Male	IEBR A.6363 Paratype Male
SVL	80.9	86.4	85.5	108.5	98.3
HL	26.4	29.1	27.0	38.8	36.3
HW	35.6	37.7	36.3	45.5	43.9
MN	25.8	28.6	28.4	33.7	32.8
MFE	22.2	23.9	22.4	28.5	27.7
MBE	13.9	15.5	14.1	19.2	17.8
RL	13.3	13.5	13.3	16.6	16.3
ED	9.2	9.4	9.4	13.3	12.4
UEW	6.8	7.2	6.8	8.5	7.6
IND	7.5	7.9	8.2	10.3	9.1
IOD	5.2	5.3	5.7	7.6	7.1
DAE	12.4	12.5	12.9	16.4	14.5
DPE	23.0	24.0	24.4	26.6	25.3
NS	7.9	8.3	7.2	9.4	9.2
EN	5.8	6.1	6.1	7.2	7.1
UAL	13.5	15.9	14.0	26.1	22.9
FAL	37.8	44.1	39.2	49.9	48.4
FeL	44.9	49.6	46.6	53.2	49.4
TbL	45.8	50.1	46.3	59.7	54.2
TbW	14.3	15.4	14.3	19.6	17.4
FoL	60.9	66.2	64.5	76.1	67.2
IMT	6.5	6.9	6.4	9.2	8.6

Quasipaa phamanhi, new species, differs from *Q. boulengeri* by having thick ridges and round tubercles on dorsum (vs elongate ridges), males with nuptial spines on fingers I–II (vs on fingers I–III) and the absence of nuptial spines on lower part of belly in males (vs present).

Quasipaa phamanhi, new species, differs from *Q. courtoisi* by having a smaller size in males (SVL 80.9–108.5 mm vs 126 mm) and males with nuptial spines on fingers I–II (vs on fingers I–III).

Quasipaa phamanhi, new species, differs from *Q. delacouri* by having thick ridges and round tubercles on dorsum (vs smooth), males with nuptial spines on fingers and chest (vs absent) and different iris colouration (copper on upper half and greyish on lower half vs green).

Quasipaa phamanhi, new species, differs from *Q. exilispinosa* by having a larger size (SVL 80.9–108.5 mm in males and 85.5 mm in female vs SVL 44.2–66.5 mm in males and

40.0–63.3 mm in females), thick ridges and large tubercles on dorsum (vs small tubercles) and males with nuptial spines on fingers I–II (vs on fingers I–III).

Quasipaa phamanhi, new species, differs from *Q. fasciculispina* by having a smaller size in females (85.5 mm vs 104 mm) and each chest tubercle with only one black spine in males (vs each chest tubercle with 5–10 black spines).

Quasipaa phamanhi, new species, differs from *Q. jiulongensis* by having thick ridges and large tubercles on dorsum (vs small tubercles) and the absence of longitudinal rows of yellow dots on dorsum (vs 4–5 longitudinal rows of yellow dots).

Quasipaa phamanhi, new species, differs from *Q. ohlerae* by males with nuptial spines on fingers I–II (vs on all fingers), the absence of nuptial spines on throat and ventral surface of arms in males (vs present) and different iris colouration (copper on upper half and greyish on lower half vs green).

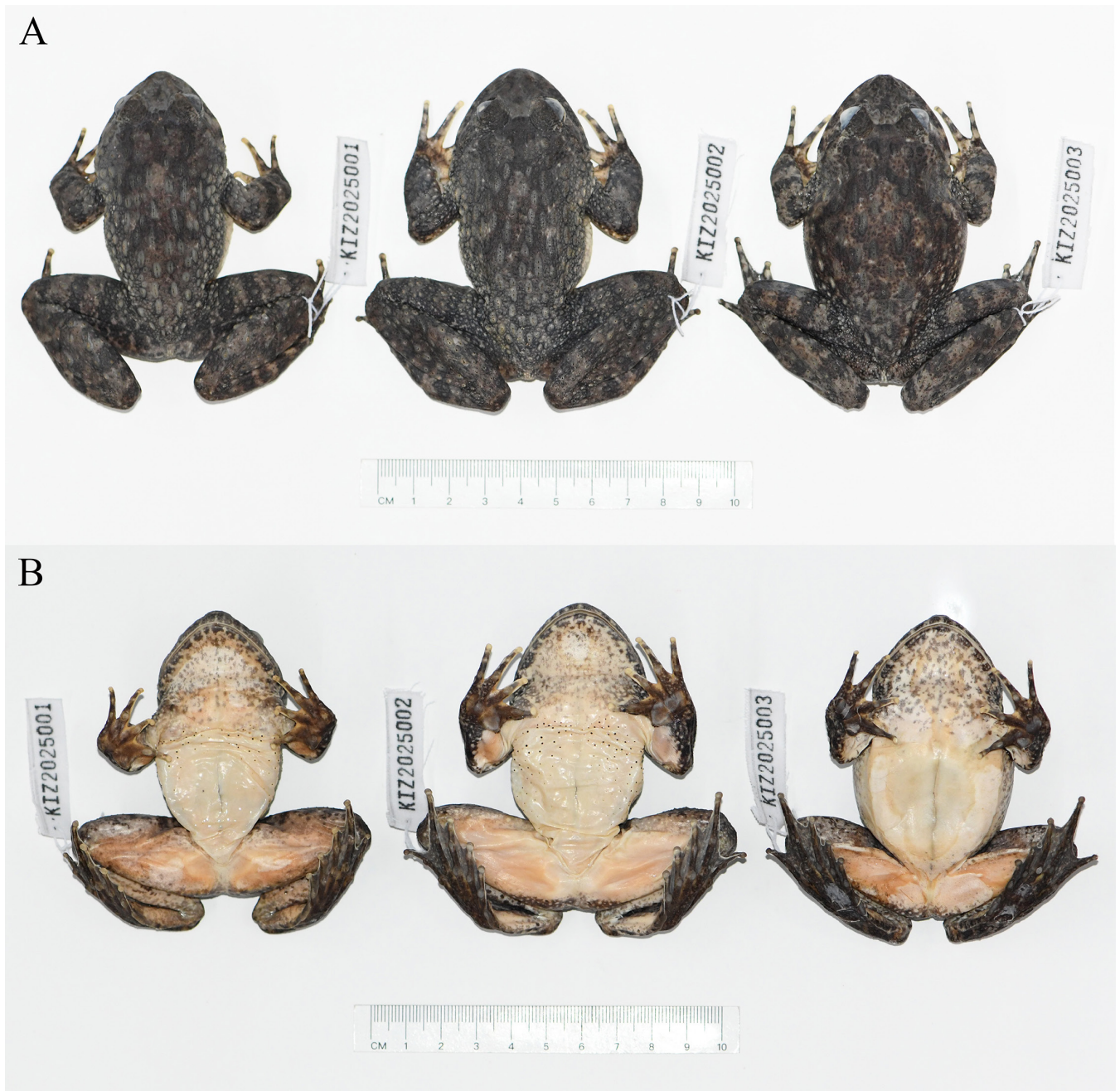


Fig. 3. The type specimens of *Quasipaa phamanhi*, new species, from China in preservative. A, dorsal view; B, ventral view. From left to right: holotype, male paratype and female paratype.

Quasipaa phamanhi, new species, differs from *Q. robertingeri* by having thick ridges and round tubercles on dorsum (vs elongate ridges), males with nuptial spines on fingers I–II (vs on fingers I–III) and the absence of nuptial spines on belly (vs present).

Quasipaa phamanhi, new species, differs from *Q. shini* by males with nuptial spines on fingers I–II (vs on fingers I–III) and each chest tubercle with only one black spine in males (vs each large chest tubercle with 3–8 black spines).

Quasipaa phamanhi, new species, differs from *Q. spinosa* by having a smaller size in females (85.5 mm vs 115.0–152.5 mm) and thick ridges and large tubercles on dorsum (vs small tubercles).

Quasipaa phamanhi, new species, differs from *Q. taoi* by the presence of nuptial spines on chest in males (vs absent) and the absence of nuptial spines on throat and ventral surface of arms in males (vs present).

Quasipaa phamanhi, new species, differs from *Q. yei* by having a larger size in males (SVL 80.9–108.5 mm vs 49.7–64.0 mm), males with nuptial spines on fingers and chest (vs absent) and the absence of nuptial spines around vent in males (vs present).

Quasipaa phamanhi, new species, is phylogenetically sister to and most morphologically similar to *Q. verrucospinosa* sensu stricto. However, *Quasipaa phamanhi*, new species, can be differentiated from *Q. verrucospinosa* sensu stricto

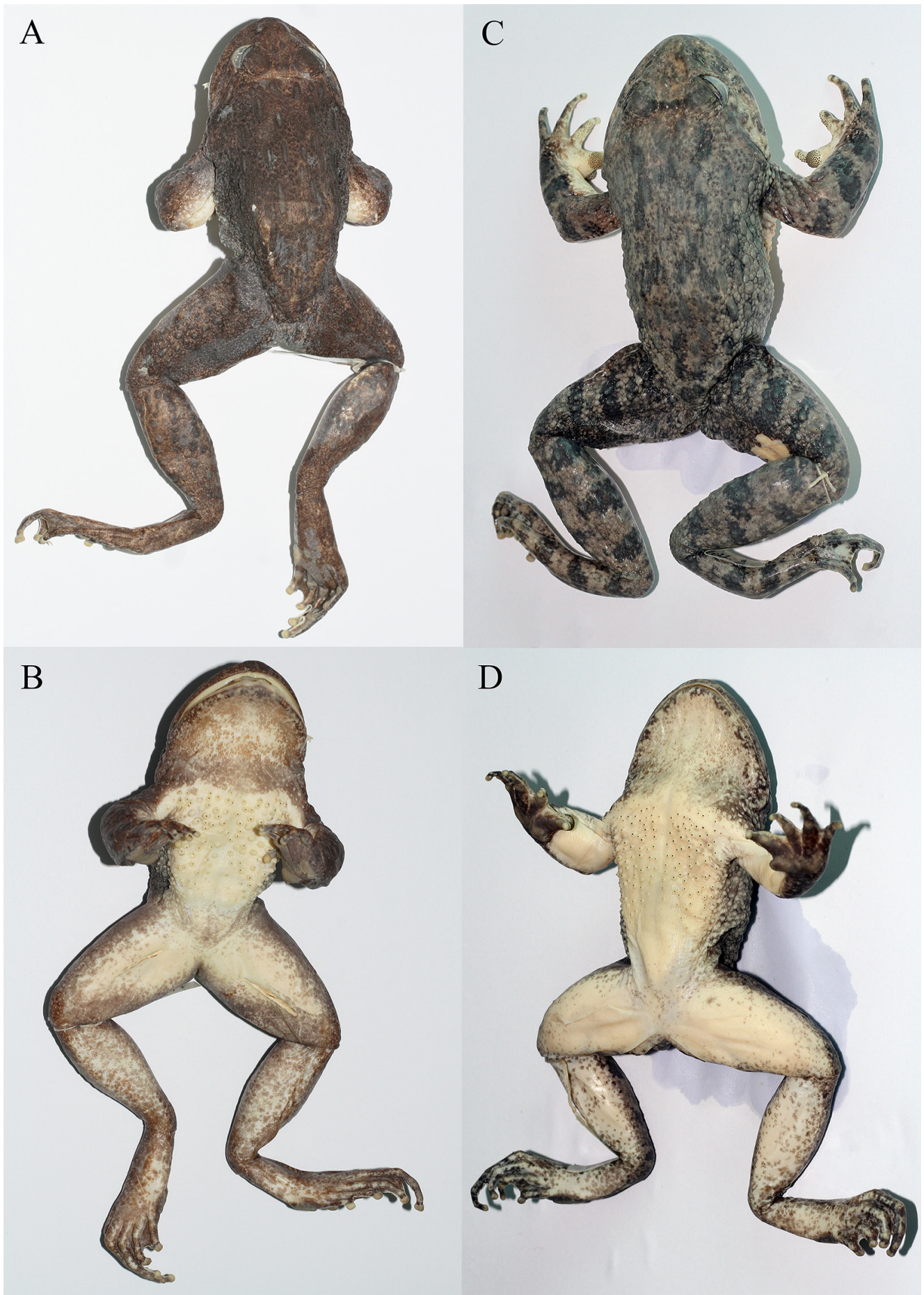


Fig. 4. The type specimens of *Quasipaa phamanhi*, new species, from Vietnam in preservative. A, dorsal view of the paratype IEBR A.5171; B, ventral view of the paratype IEBR A.5171; C, dorsal view of the paratype IEBR A.6363; D, ventral view of the paratype A.6363.



Fig. 5. The holotype (KIZ2025001) of *Quasipaa phamanhi*, new species, in life. A, dorsal view; B, ventral view; C, lateral view of the head; D, close-up view of the palm; E, close-up view of the thumb.

(Table 6, Fig. 7) by having a relatively shorter head (HL/SVL 0.33–0.37 vs 0.37–0.39 in males, 0.32 vs 0.36–0.39 in females), a smaller ratio of head length to head width (HL/HW 0.74–0.85 vs 0.85–0.91 in males, 0.74 vs 0.86–0.91 in females), a greater ratio of tibia length to maximum tibia width in males (TbL/TbW 3.05–3.25 vs 2.56–3.00), tympanum invisible (vs tympanum slightly visible), relatively longer longitudinal ridges on dorsum (longest ones approximately as long as eye diameter vs all ridges obviously shorter than eye diameter), males with nuptial spines on fingers I–II (vs on fingers I–III) and tibio-tarsal articulation reaching to or beyond snout tip (vs to nostril).

DISCUSSION

Due to the morphological similarities, species of the genus *Quasipaa* are difficult to identify and they are usually distinguished from each other by the pattern and number of nuptial spines in the areas of the fingers, chest, chin, and underarms of males during their breeding season (Dubois & Ohler, 2009; Suwannapoom et al., 2021). Previously, *Q. verrucospinosa* was considered to be distributed in southern Yunnan Province of China (Fei et al., 2009, 2012; Suwannapoom et al., 2021; Yuan et al., 2022). Pham et al. (2025) restricted *Q. verrucospinosa* sensu stricto to

Table 6. Morphological comparison between *Quasipaa phamanhi*, new species, and *Q. verrucospinosa*. Data for *Q. verrucospinosa* were obtained from Pham et al. (2025).

	<i>Quasipaa phamanhi</i> , new species		<i>Quasipaa verrucospinosa</i>	
	Males (n=4)	Female (n=1)	Males (n=7)	Females (n=7)
HL/SVL	0.33–0.37	0.32	0.37–0.39	0.36–0.39
HW/SVL	0.42–0.45	0.42	0.41–0.44	0.41–0.44
RL/SVL	0.15–0.17	0.16	0.14–0.16	0.14–0.16
HL/HW	0.74–0.85	0.74	0.85–0.91	0.86–0.91
ED/RL	0.69–0.80	0.71	0.65–0.72	0.65–0.85
TbL/SVL	0.55–0.58	0.54	0.51–0.56	0.51–0.56
TbL/TbW	3.05–3.25	3.24	2.56–3.00	2.78–3.34

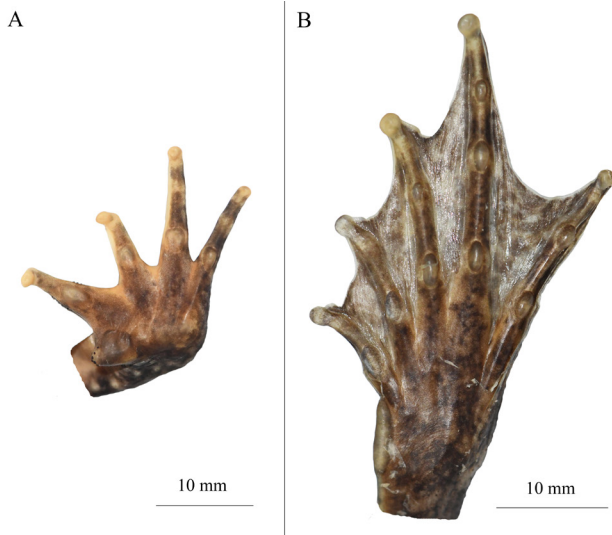


Fig. 6. Close-up views of the palm and sole of the holotype (KIZ2025001) of *Quasipaa phamanhi*, new species, in preservative. A, the left hand; B, the left foot.

only northern Vietnam and considered that the population previously regarded as *Q. verrucospinosa* from Jinghong City, Xishuangbanna Prefecture, Yunnan Province, China to be *Q. ohlerae* and the population previously regarded as *Q. verrucospinosa* from Pingbian County, Honghe Prefecture, Yunnan Province, China to be an undescribed species, based on molecular evidence. Through our observation, we found that the individuals from Xishuangbanna have green irises (Fig. 10), which are consistent with *Q. ohlerae* but different from *Q. verrucospinosa*. Therefore, we agree with Pham et al. (2025) that the population previously regarded as *Q. verrucospinosa* from Xishuangbanna should be assigned to *Q. ohlerae*. In addition, in our phylogenetic analysis, the sequences of the new species described in this study were clustered with the sequences of specimens from Pingbian used in Pham et al. (2025) and this taxon should be identified as *Quasipaa phamanhi*, new species. As for the populations previously regarded as *Q. verrucospinosa* from other regions of southern Yunnan, such as Lvchun and Jinping counties, further studies based on voucher specimens are required to confirm their taxonomic status.

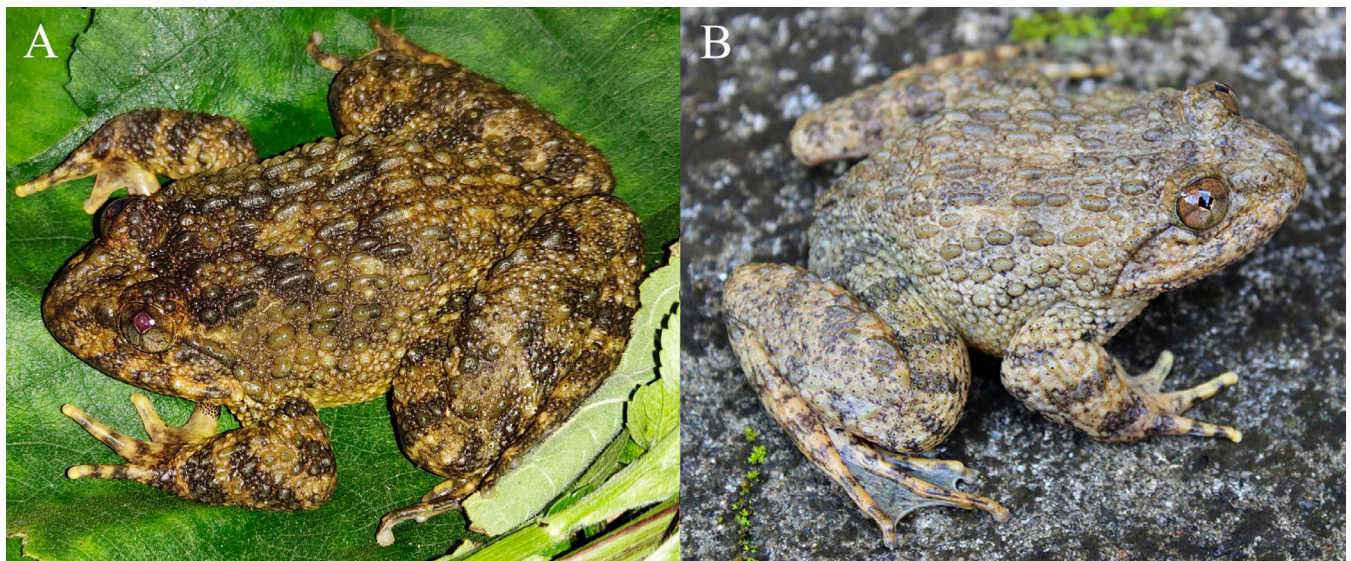


Fig. 7. Comparison between *Quasipaa phamanhi*, new species, and *Q. verrucospinosa*, showing the difference in longitudinal ridges on dorsum. A, the holotype (KIZ2025001) of *Quasipaa phamanhi*, new species, in life; B, an adult male (IEBR A.5153) of *Q. verrucospinosa* in life.



Fig. 8. The habitat of *Quasipaa phamanhi*, new species, at the type locality.

The type locality of *Quasipaa delacouri* is in Bac Kan Province, northern Vietnam (Angel, 1928; Dubois, 1987). Bourret (1937) described *Rana microlineata* Bourret, 1937 from Sa Pa, Lao Cai Province, Vietnam. The species was subsequently regarded as a synonym of *Q. delacouri* (Dubois, 1975). We speculate that *R. microlineata* is likely a valid species and will potentially be resurrected in the future. According to the original description and illustrations in Bourret (1937), *Quasipaa phamanhi*, new species, differs from *R. microlineata* by having rough dorsal skin with thick ridges and round tubercles on dorsum (vs smooth dorsal skin with thin ridges), many different sized round tubercles on dorsal limbs (vs some thin and elongate ridges on dorsal limbs), thick supratympanic folds (vs thin supratympanic folds) and relatively less developed webbing between toes.

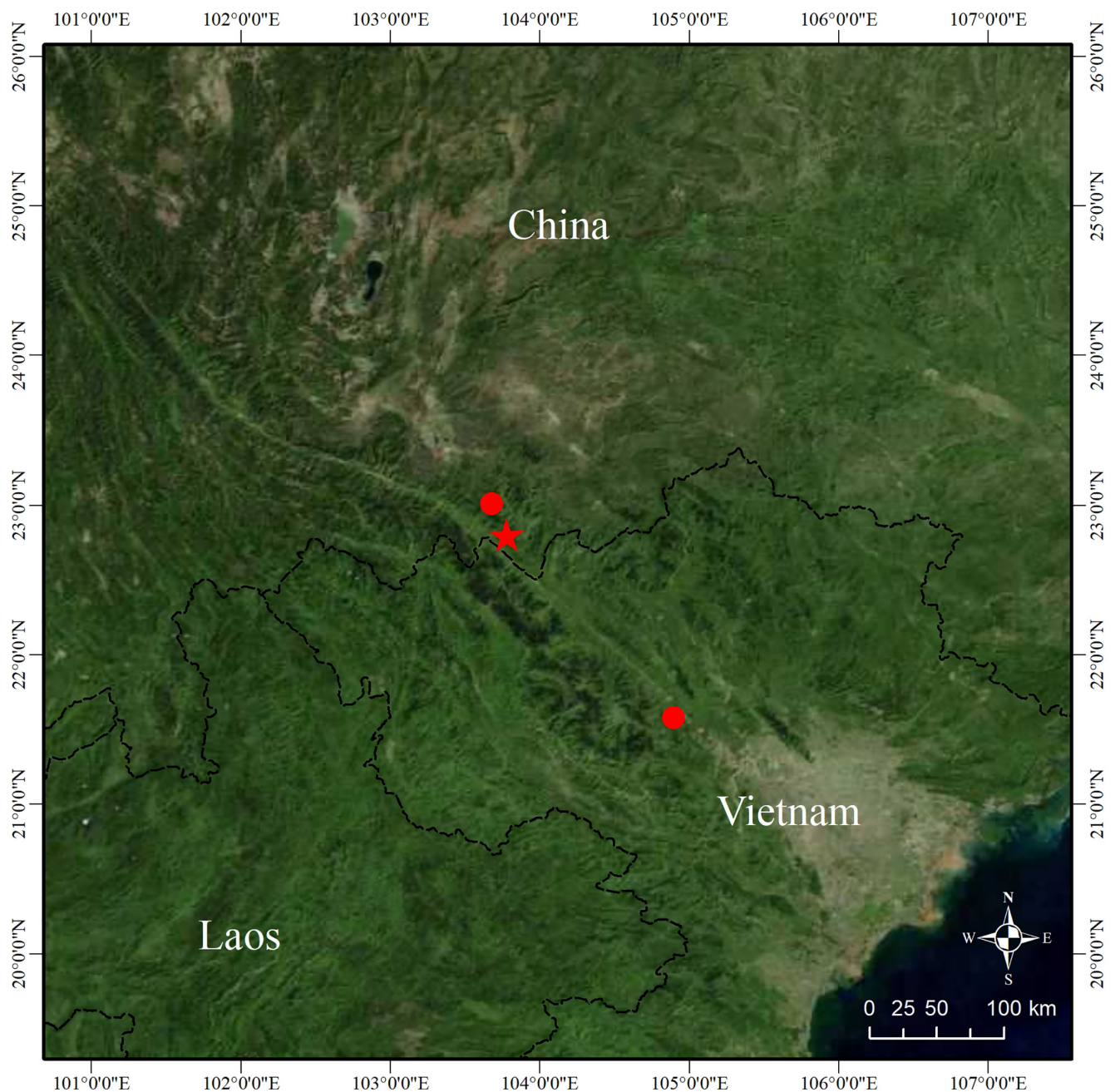


Fig. 9. Map showing the type locality (red star) of *Quasipaa phamanhi*, new species, in Hekou County, Honghe Prefecture, Yunnan Province, China and other known distributions (red dots) of this species in Pingbian County, Honghe Prefecture, Yunnan Province, China and Phu Tho Province, Vietnam, respectively.



Fig. 10. *Quasipaa ohlerae* from Mengla County, Xishuangbanna Prefecture, Yunnan Province, China in life.

Although the type locality of the new species is at the edge of Yunnan Daweishan National Nature Reserve, this species is also distributed within the nature reserve in adjacent Pingbian County. In addition, this species is also found in northern Vietnam. Therefore, we do not suggest that the species be assessed as threatened until further data about distribution and population status are available.

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