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First record of *Theloderma khoii* Ninh, Nguyen, Nguyen, Hoang, Siliyavong, Nguyen, Le, Le & Ziegler, 2022 from China, with confirmation of *Rhacophorus orlovi* Ziegler & Köhler, 2001 in China (Anura, Rhacophoridae)

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Abstract

We report the first country record of *Theloderma khoii* Ninh, Nguyen, Nguyen, Hoang, Siliyavong, Nguyen, Le, Le & Ziegler, 2022 from China based on a specimen collected from Wenshan Prefecture, southeastern Yunnan, China. Morphologically, the specimen from Wenshan Prefecture agrees well with the type specimens of *T. khoii* from Vietnam except for having a smaller body size, and phylogenetically clustered with the type specimens of *T. khoii* from Vietnam. In addition, we confirm the distribution of *Rhacophorus orlovi* Ziegler & Köhler, 2001 in China based on three specimens collected from Honghe Prefecture, southern Yunnan, China. Morphologically, the specimens from Honghe Prefecture agree well with the type specimens of *R. orlovi* from Vietnam except for having a slightly larger body size in adult females, and phylogenetically clustered with the specimens of *R. orlovi* from Vietnam (including the type locality of *R. orlovi*).

Key Words

16S rRNA, Honghe Prefecture, Wenshan Prefecture, Yunnan

Introduction

The genus *Theloderma* Tschudi is a poorly known group of tree frogs which presently comprising 28 species distributed throughout Southeast Asia, southern China and northeastern India (Hou et al. 2017; Poyarkov et al. 2018; Du et al. 2022; Frost 2022; Ninh et al. 2022). To date, ten species have been reported from China (Du et al. 2022), namely *T. albopunctatum* (Liu & Hu), *T. baibungense* (Jiang, Fei & Huang), *T. bicolor* (Bourret), *T. corticale* (Boulenger), *T. gordoni* Taylor, *T. hekouense* Du, Wang, Liu & Yu, *T. lateriticum* Bain, Nguyen & Doan, *T. moloch* (Annandale), *T. pyaukkya* Dever, and *T. rhododiscus* (Liu & Hu). *Theloderma khoii* Ninh, Nguyen, Nguyen, Hoang, Siliyavong, Nguyen, Le, Le & Ziegler, 2022 is a species which was described recently from Ha Giang Province, Vietnam, and is currently known only from its type locality.

The genus *Rhacophorus* Kuhl & Van Hasselt currently containing 44 species with a distribution range from

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India, Bangladesh, Bhutan, Myanmar, Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia and Philippines, as well as extreme southern and south-western China (Jiang et al. 2019; Frost 2022; Kropachev et al. 2022). *Rhacophorus orlovi* Ziegler & Köhler, 2001 is a species which was described from Ha Tinh Province, Vietnam, and was previously recorded in China by Li et al. (2013) based on only molecular data of two specimens from Maguan County, Wenshan Prefecture, Yunnan Province, without morphological description and detailed collection information. Subsequently, Gao and Sun (2016, 2017) put this species in the checklist of biological species of Yunnan Province without mentioning any information of specific localities or voucher specimens. Poyarkov et al. (2021) also recorded *R. orlovi* from China without reference to any voucher specimens or specific localities. Frost (2022) considered that *R. orlovi* is possibly distributed in China.

During our field surveys in Yunnan, China, a specimen of *Theloderma* was collected from Xichou County, Wenshan Prefecture, southeastern Yunnan, in 2012, and three specimens of *Rhacophorus* were collected from Hekou County, Honghe Prefecture, southern Yunnan, in 2021 (Fig. 1). Detailed morphological comparisons and molecular analysis indicated the specimen from Xichou County to be *T. khoii*, and the specimens from Hekou County to be *R. orlovi*. Herein, we report the new record of *T. khoii* for China and confirm *R. orlovi* in China.

Materials and methods

Specimens were collected, euthanized, and then fixed in 75% ethanol for storage after taking photographs. Liver tissue samples were preserved in 99% ethanol for molecular analysis. All specimens were deposited at Kunming Institute of Zoology, Chinese Academy of Sciences (KIZ).

Genomic DNA was extracted from liver tissue preserved in 99% ethanol using the standard phenol-chloroform extraction protocol (Sambrook et al. 1989). Partial fragment of the mitochondrial 16S rRNA was amplified via the polymerase chain reaction (PCR) using the primers 16SAR: 5'-CGCCTGTTTAYCAAAAACAT-3' and 16SBR: 5'-CCGGTYTGAACTCAGATCAYGT-3' (Palumbi et al. 1991). The product was purified and sequenced by Tsingke Biotechnology (Beijing) Co., Ltd. The new sequences were deposited in GenBank. Species of the genera *Nyctixalus* Boulenger and *Zhangixalus* Li, Jiang, Ren & Jiang were selected as outgroups respectively according to Li et al. (2019) and Du et al. (2022). Homologous and outgroup sequences were obtained from GenBank (Table 1). Sequences were aligned using MAFFT 7 (Katoh and Standley 2013). The technical computation methods for the best substitution model selection, Bayesian inference and Maximum likelihood phylogenetic analyses were the same as those in Liu et al. (2021).

Measurements were taken with a digital caliper to the nearest 0.1 mm. Morphological terminology for *Theloderma khoii* followed Ninh et al. (2022): SVL, snout-vent length; HW, maximum head width (across angle of jaws); HL, head length (from the back of the mandible to the tip of the snout); SNL, snout length (from anterior corner of eye to the tip of the snout); ED, eye diameter; UEW, maximum width of upper eyelid; IN, internarial distance; IOD, interorbital distance; DAE, distance between anterior corners of eyes; DPE, distance between posterior corners of eyes; EN, distance from anterior corner of the eye to the nostril; TYD, tympanum diameter; TYE, distance from anterior margin of tympanum to posterior corner of the eye; FLL, forelimb length (from axilla to elbow); HAL, hand length (from elbow to the tip of third finger); OPT, outer palmar tubercle length; TFL, third finger length; FeL, femur length (from vent to knee); TbL, tibia length (from knee to tarsus); FoL, foot length (from inner metatarsal tubercle to the tip of fourth toe); FTL, fourth toe length; and IMT, inner metatarsal tubercle length. Morphological terminology for *Rhacophorus orlovi* followed Ziegler and Köhler (2001): KRL, snout-vent length; KB, head width; KL, head length; AN, distance between anterior angle of eye to center of nostril; NS, distance between center of nostril to tip of snout; AD, horizontal eye diameter; TD, horizontal tympanum diameter; HaL, length of hand, up to the tip of the longest (3rd) finger; BL, length of the extended hindlimb from cloaca to tip of longest toe; FL, length of foot, exclusive of tarsus, up to the tip of the longest (fourth) toe; and IMT, length of inner metatarsal tubercle.

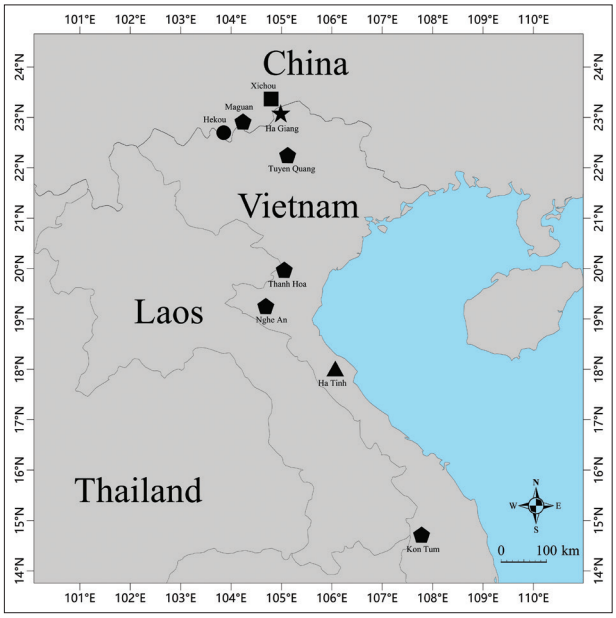

Figure 1. Map showing the type locality (black star) of *Theloderma khoii* and the type locality (black triangle) of *Rhacophorus orlovi* in Vietnam, the new collection site (black square) of *T. khoii* and the new collection site (black dot) of *R. orlovi* in China, and the other localities (black pentagon) of *R. orlovi* whose sequences were used in the phylogenetic analysis.

Table 1. Samples used in molecular analyses of this study.

Taxon	Voucher No.	Locality	GenBank No.
Rhacophorus annamensis	VNMN 4090	Dak Nong, Nam Nung, Vietnam	LC010566
Rhacophorus baluensis	FM235958	Sabah, Malaysia	KC961089
Rhacophorus bengkuluensis	UTA A-62770	Lampung, Sumatra, Indonesia	KM212948
Rhacophorus bipunctatus	CAS229913	Putao, Kachin, Myanmar	JX219445
Rhacophorus borneensis	BORN:22410	Maliau Basin, Sabah, Malaysia	AB781693
Rhacophorus calcaneus	VNMN 4093	Dak Lac, Chu Yang Sin, Vietnam	LC010573
Rhacophorus catamitus	ENS 14726	Sumatra, Indonesia	KX398877
Rhacophorus exechopygus	VNMN 4107	Gia Lai, Kon Ka Kinh, Vietnam	LC010585
Rhacophorus helenae	AMS R 173230	Binh Thuan, Vietnam	JQ288087
Rhacophorus hoabinhensis	VNMN A.2016.16	Hoa Binh, Vietnam	LC331097
Rhacophorus indonesiensis	MZB:Amp:23619	Indonesia	AB983367
Rhacophorus kio	VNMN 4110	Gia Lai, Kon Ka Kinh, Vietnam	LC010589
Rhacophorus lateralis	SDB.2010.330	Karnataka, Bygoor, India	KC571277
Rhacophorus malabaricus	Rmal-In	Madikeri, India	AB530549
Rhacophorus margaritifer	ENS 16162	Java, Indonesia	KX398889
Rhacophorus modestus	ENS 16853	Sumatra, Indonesia	KX398904
Rhacophorus nigropalmatus	Rao081203	Malaysia	JX219438
Rhacophrus norhayatiae	NNRn	Endau Rompin, Johor, Malaysia	AB728191
Rhacophorus orlovi	VNMN 4114	Xuan Lien, Thanh Hoa, Vietnam	LC010597
Rhacophorus orlovi	VNMN 3067	Huong Son, Ha Tinh, Vietnam	LC010598
Rhacophorus orlovi	VNMN 4116	Ngoc Linh, Kon Tum, Vietnam	LC010599
Rhacophorus orlovi	VNMN 4115	Pu Huong, Nghe An, Vietnam	LC010600
Rhacophorus orlovi	VNMN 24628	Ha Tinh, Vietnam	LC545588
Rhacophorus orlovi	VNMN 24626	Ha Tinh, Vietnam	LC545589
Rhacophorus orlovi	TQ.2018.20	Tuyen Quang, Vietnam	LC548743
Rhacophorus orlovi	TQ.2018.56	Tuyen Quang, Vietnam	LC548744
Rhacophorus orlovi	AMNH A161405	Huong Son, Ha Tinh, Vietnam	DQ283049
Rhacophorus orlovi	RAO 03309	Maguan, Yunnan, China	JX219435
Rhacophorus orlovi	LJT R44	Maguan, Yunnan, China	KC465840
Rhacophorus orlovi	KIZ 20210506	Hekou, Yunnan, China	OP393173
Rhacophorus orlovi	KIZ 20210507	Hekou, Yunnan, China	OP393174
Rhacophorus orlovi	KIZ 20210508	Hekou, Yunnan, China	OP393175
Rhacophorus pardalis	FMNH273243	Sarawak, Bintulu, Malaysia	JX219454
Rhacophorus poecilonotus	ENS 16480	Sumatra, Indonesia	KX398920
Rhacophorus pseudomalabaricus	SDB.2011.1010	Kerala, Kadalar, India	KC593855
Rhacophorus reinwardtii	Rao081205	Malaysia	JX219443
Rhacophorus rhodopus	SCUM 060692L	Mengyang, Yunnan, China	EU215531
Rhacophorus robertingeri	VNMN 4123	Gia Lai, Kon Ka Kinh, Vietnam	LC010613
Rhacophorus spelaeus	IEBR A.2011.1	Khammouan, Lao	LC331095
Rhacophorus translineatus	Rao6237	Medog, Tibet, China	JX219449
Rhacophorus vampyrus	VNMN 4125	Hon Ba, Khanh Hoa, Vietnam	LC010616
Rhacophorus verrucopus	6254 Rao	Medog, Tibet, China	JX219436
Theloderma albopunctatum	VNMN JR2887	Vinh Phuc, Vietnam	KU244375
Theloderma annae	NAP05558	Hoa Binh, Vientam	MG917766
Theloderma asperum	ZRC1.1.9321	Malaysia	GQ204725
Theloderma auratum	ZMMU A5828	Gia Lai, Vietnam	MG917767
Theloderma baibungense	YPX31940	Motuo, Tibet, China	KU981089
Theloderma bicolor	VNMN 3536	Lao Cai, Vietnam	KJ802915
Theloderma corticale	MVZ 223905	Vinh Phuc, Vietnam	KU244364
Theloderma gordoni	MVZ 226469	Vinh Phuc, Vietnam	KU244363
Theloderma hekouense	GXNU YU000496	Hekou, Yunnan, China	OL843967
Theloderma horridum	KUHE 52582	Negeri Sembilan, Malaysia	LC012861
Theloderma khoii	VNMN 012757	Ha Giang, Viet Nam	LC641701
Theloderma khoii	VNMN 012758	Ha Giang, Viet Nam	LC641702
Theloderma khoii	KIZRao201204	Xichou, Yunnan, China	OP393172
Theloderma lacustrinum	NCSM 84683	Vientiane, Laos	KX095246
Theloderma laeve	NAP01644	Lam Dong, Vietnam	KT461907
Theloderma lateriticum	VNMN 1216	Bac Giang, Vietnam	LC012851
Theloderma leporosum	LJT W46	Malaysia	KC465841
Theloderma licin	MVZ 9458	Indonesia	KU244368
Theloderma moloch	GXNU YU000115	Yingjiang, Yunnan, China	MT509809
Theloderma nebulosum	ROM 39588	Kon Tum, Vietnam	KT461887
Theloderma palliatum	NAP02516	Lam Dong, Vietnam	KT461903
Theloderma petilum	HNUE MNA2012.0001	Dien Bien, Vietnam	KJ802925
Theloderma phrynoderma	CAS247910	Myanmar	KJ128283
Theloderma pyaukkya	GXNU YU000116	Yingjiang, Yunnan, China	MT509810
Theloderma rhododiscus	CIB GX200807017	Jinxiu, Guangxi, China	LC012842
Theloderma ryabovi	VNMN 3924	Kon Tum, Vietnam	LC012860
Theloderma stellatum	Stel1	Chanthaburi, Thailand	KT461918
Theloderma truongsonense	VNMN 4402	Khanh Hoa, Vietnam	LC012847
Theloderma vietnamense	AMS R174047	Mondol Kiri, Cambodia	JN688171
Nyctixalus pictus	KUHE 53517	Malaysia	LC012863
Nyctixalus spinosus	ACD 1043	Mindanao, Philippine	DQ283114
Zhangixalus dennysi	SCUM 060401L	Shaoguan, Guangdong, China	EU215545
Zhangixalus dugritei	SCUM 051001L	Baoxing, Sichuan, China	EU215541

Results

Inferred from partial 16S rRNA fragments, the sequence of the specimen collected from Xichou County, Yunnan, China, clustered with the sequences of the type specimens of *Theloderma khoii* from Vietnam (Fig. 2). There was no genetic distance (uncorrected p-distance) between the sequence of the specimen from Xichou County and the sequences of the type specimens of *T. khoii* from Vietnam. The sequences of the specimens collected from Hekou County, Yunnan, China, clustered with the sequences of the specimens of *R. orlovi* from Vietnam (including the type locality of *R. orlovi*) and from Maguan County, Yunnan, China (Fig. 3). The genetic distance (uncorrected p-distance) between the sequences of the specimens from Hekou County and the sequences of the specimens of *R. orlovi* from Vietnam was 0.4%, the genetic distance (uncorrected p-distance) between the sequences of the specimens from Maguan County and the sequences of the specimens of *R. orlovi* from Vietnam was 0.5%, and there was no genetic distance (uncorrected p-distance) between the sequences of the specimens from Hekou County and the sequences of the specimens from Maguan County.

Morphologically, the specimen from Xichou County agrees well with the type specimens of *T. khoii* from Vietnam except for having a smaller body size and the specimens from Hekou County agree well with the type specimens of *R. orlovi* from Vietnam except for having a slightly larger body size in adult females.

Taxonomic account

Theloderma khoii Ninh, Nguyen, Nguyen, Hoang, Siliyavong, Nguyen, Le, Le & Ziegler, 2022

Figs 4, 5

Specimen examined. KIZRao201204, subadult female, collected in April 2012 by Yi Fan from Fadou Township, Xichou County, Wenshan Prefecture, Yunnan Province, China (ca. 23°22'N, 104°46'E, 1600 m elevation).

Description of the specimen from China. Measurements are presented in Table 2. Body size small (SVL 29.4 mm); head strongly depressed, length and width almost equal (HL 12.4 mm, HW 12.7 mm); snout short (SNL 4.9 mm), pointed and truncated; eye large (ED 3.8 mm), pupil circular; canthus rostralis indistinct, loreal region oblique, slightly concave; interorbital distance wider than internarial distance and upper eyelid width (IOD 3.4 mm,

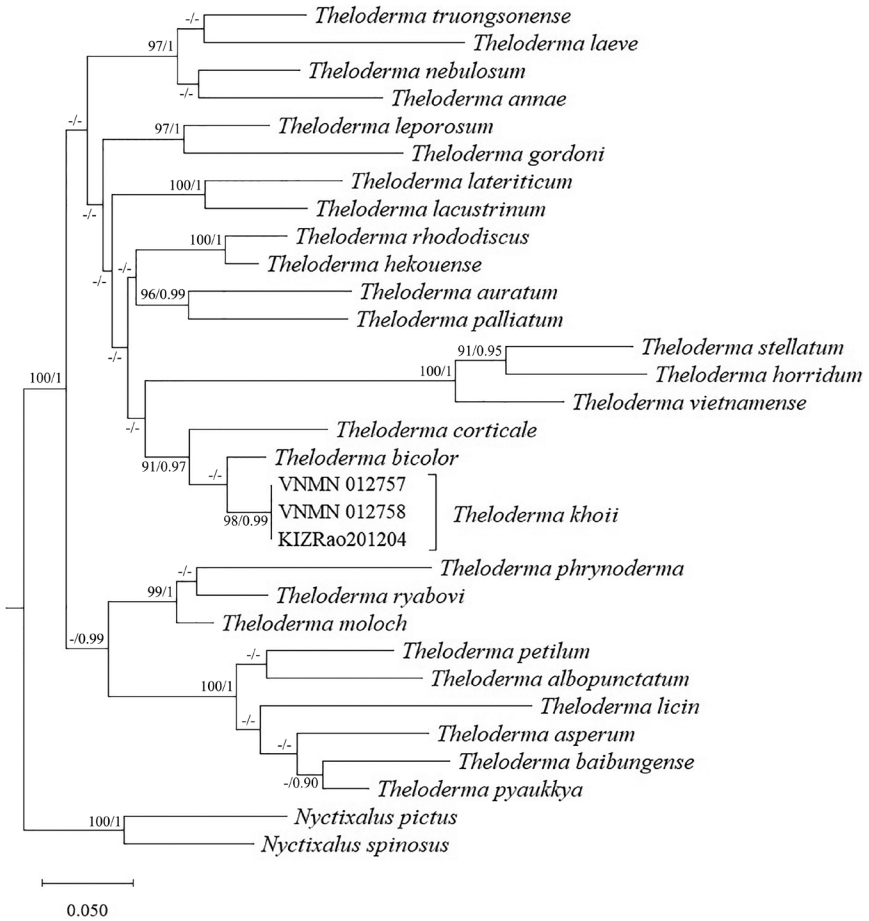

Figure 2. Maximum likelihood tree of the genus *Theloderma* based on partial 16S rRNA fragments. Numbers before slashes indicate ultrafast bootstrap support for Maximum Likelihood analyses (≥ 90 remain) and numbers after slashes indicate Bayesian posterior probabilities (≥ 0.90 remain).

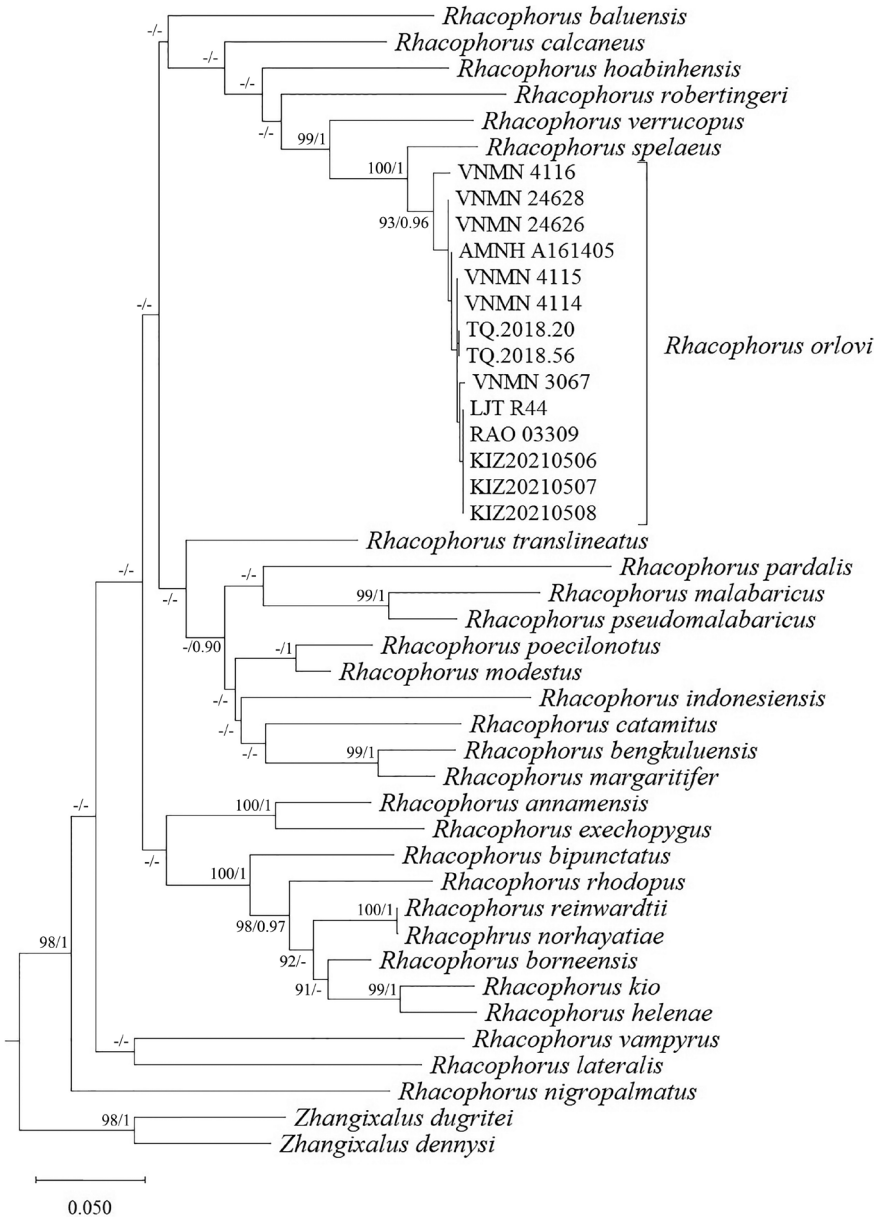

Figure 3. Maximum likelihood tree of the genus *Rhacophorus* based on partial 16S rRNA fragments. Numbers before slashes indicate ultrafast bootstrap support for Maximum Likelihood analyses (≥ 90 remain) and numbers after slashes indicate Bayesian posterior probabilities (≥ 0.90 remain).

IN 2.7 mm, UEW 2.7 mm); distance between anterior corners of eyes (DAE 6.5 mm) about 60.2% distance between posterior corners of eyes (DPE 10.8 mm); nostril oval, nearer the tip of snout; tympanum distinct, diameter (TYD 2.1 mm) less than eye diameter, tympanum separated from eye by distance (TYE 0.9 mm) 42.9% of tympanum diameter; pineal ocellus absent; supratympanic fold distinct, interrupted, extending from behind eye to beyond level of axilla, composed of large irregular glandular ridges; vomerine teeth arranged in two small oblique groups between choanae and widely separated from each other; tongue large, accounting for almost half of mouth, heart-shaped, dorsal surface smooth, notched and free posterior.

Forelimbs slender (FLL 6.3 mm, HAL 16.2 mm); relative length of fingers: I < II < IV < III; tips of fingers

Table 2. Measurements (in mm) of the specimen of *Theloderma khoii* from Xichou County, Yunnan, China. For abbreviations see Materials and methods.

	KIZRao201204		KIZRao201204
SVL	29.4	TYD	2.1
HW	12.7	TYE	0.9
HL	12.4	FLL	6.3
SNL	4.9	HAL	16.2
ED	3.8	OPT	1.1
UEW	2.7	TFL	6.9
IN	2.7	FeL	15.7
IOD	3.4	TbL	15.8
DAE	6.5	FoL	13.3
DEP	10.8	FTL	7.0
EN	3.4	IMT	1.7

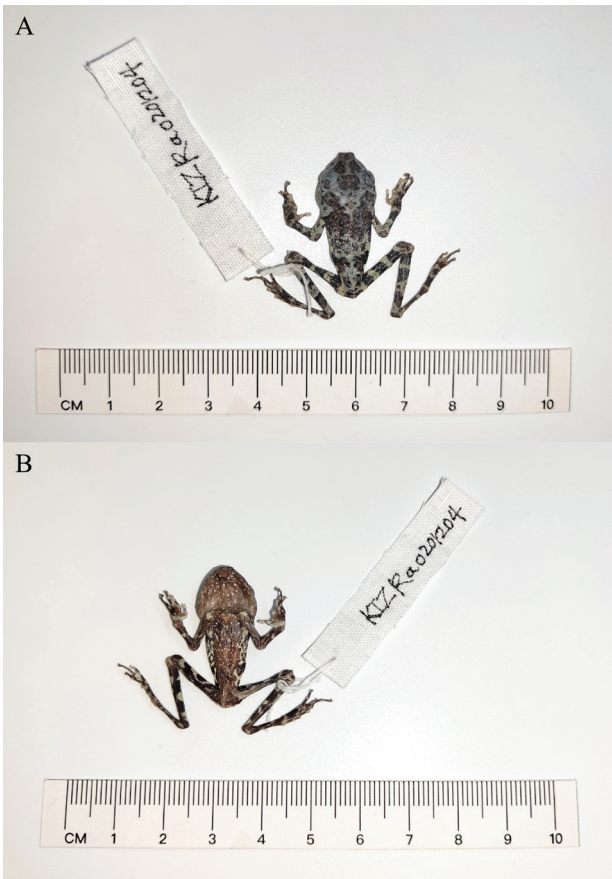

Figure 4. The specimen of *Theloderma khoii* from Xichou County, Yunnan, China, in preservative. **A.** Dorsal view; **B.** Ventral view.

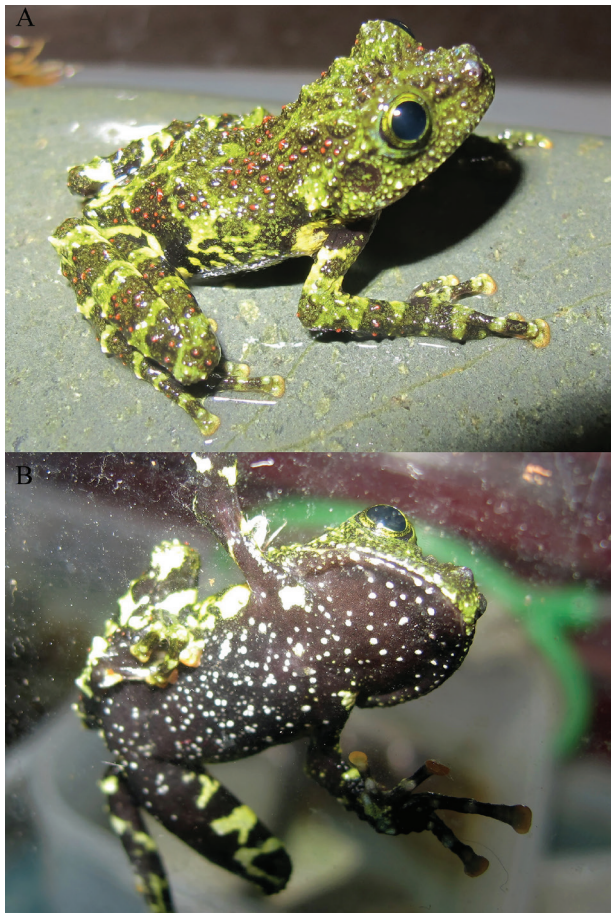

Figure 5. The specimen of *Theloderma khoii* from Xichou County, Yunnan, China, in life. **A.** Dorsolateral view; **B.** Ventral view.

dilated into large, rounded and flattened discs; subarticular tubercles large and distinct, with indistinct supernumerary tubercles; formula of subarticular tubercles: 1, 1, 2, 2; outer edge of fourth finger distinctly serrated. Hindlimbs slender, tibia longer than femur length and foot length (TbL 15.8 mm, FeL 15.7 mm, FoL 13.3 mm), tibiotarsal articulation reaching posterior edge of snout when hindlimbs pressed forward; relative length of toes I < II < V < III < IV; webbing formula I(1/3) – (1)II(0) – (1/2)III(0) – (1)IV(1) – (1/3)V; tips of toes dilated into rounded, flattened discs, smaller than discs on fingers; large subarticular tubercles roundish, formula of subarticular tubercles: 1, 1, 2, 3, 2; large inner metatarsal tubercle oval and raised (IMT 1.7 mm), outer metatarsal tubercle absent; outer edge of fifth toe with five distinct serrations.

Dorsal surface of head, body, and limbs very rough, with large irregular glandular ridges ordered symmetrically in middle vertebral region; a large, horn gland behind head roughly in X-shape; large conical tubercles on back of thighs near vent; lateral parts of body become granular, dense small tubercles below eye and 4–5 large tubercles behind tympanum on each side; throat and chest relatively smooth; belly and ventral surface and underside of thigh with thickened flat granules; axillary region and underside of tibia smooth.

Coloration in life. Dorsal surface of head and body green with irregular olive patches; tips of most tubercles red on olive patches and light green on other regions; dorsal surfaces of limbs green with dark olive bands, tips of tubercles red on bands and light green on other regions, finger and toe discs light green; lateral surface of head green, iris yellowish green with irregular black reticulation; tympanum dark olive; flanks light yellow with black patches and strips; ventral surface of head and body brownish black with many small white dots; a light yellow patch on anterior region of the base of forelimb on each side; ventral surface of limbs brownish black with some small white dots on ventral thigh and some light yellow patches on other regions of ventral limbs.

Distribution. This species is currently known only from the type locality in Ha Giang Province, northeastern Vietnam, and Xichou County, Wenshan Prefecture, southeastern Yunnan, China.

Rhacophorus orlovi Ziegler & Köhler, 2001

Figs 6, 7

Specimen examined. KIZ20210506, subadult female; KIZ20210507–KIZ20210508, two adult female; all collected on 18 May 2021 by Shuo Liu from Guiliang

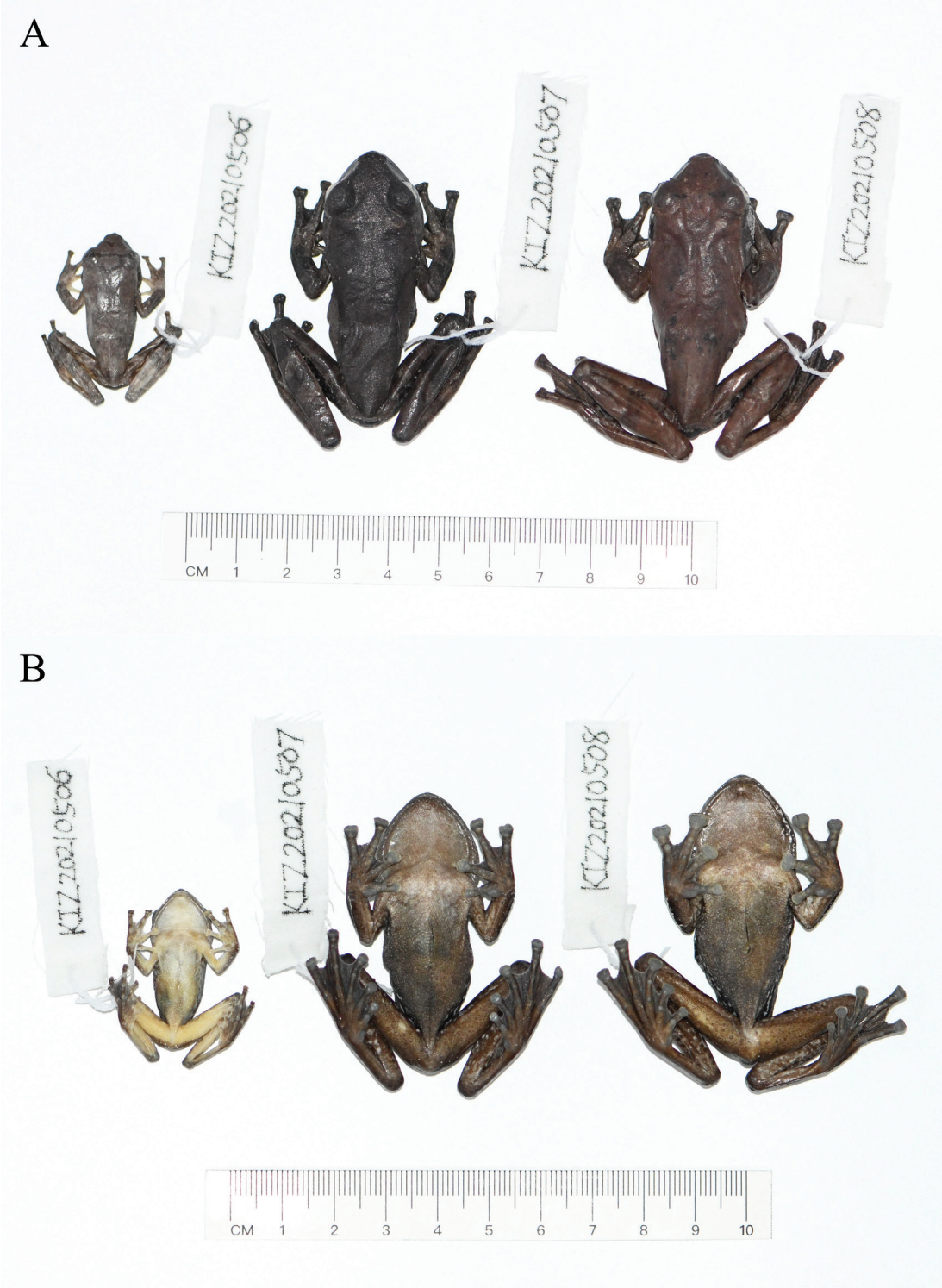

Figure 6. The specimens of *Rhacophorus orlovi* from Hekou County, Yunnan, China, in preservative. **A.** Dorsal view; **B.** Ventral view.

Village, Laofanzhai Township, Hekou County, Honghe Prefecture, Yunnan Province, China (22°41'10"N, 103°49'45"E, 750 m elevation).

Description of the specimens from China. Measurements are presented in Table 3. Body size moderate (KRL 53.9–55.6 mm in adult females); head slightly longer than wide (KL/KB 1.01–1.02); snout slightly pointed, rounded in dorsal and lateral views; nostril closer to tip of snout than to eye (NS/AN 0.59–0.83); canthus rostralis well developed, slightly rounded, constricted; loreal region concave, sloped towards lip; interorbital region slightly convex; interorbital distance longer than upper eyelid length and internarial distance; eye diameter shorter than snout; tympanum distinct, approximately half of eye diameter (TD/AD 0.48–0.52); vomerine teeth in oblique ridges; tongue cordiform, free behind.

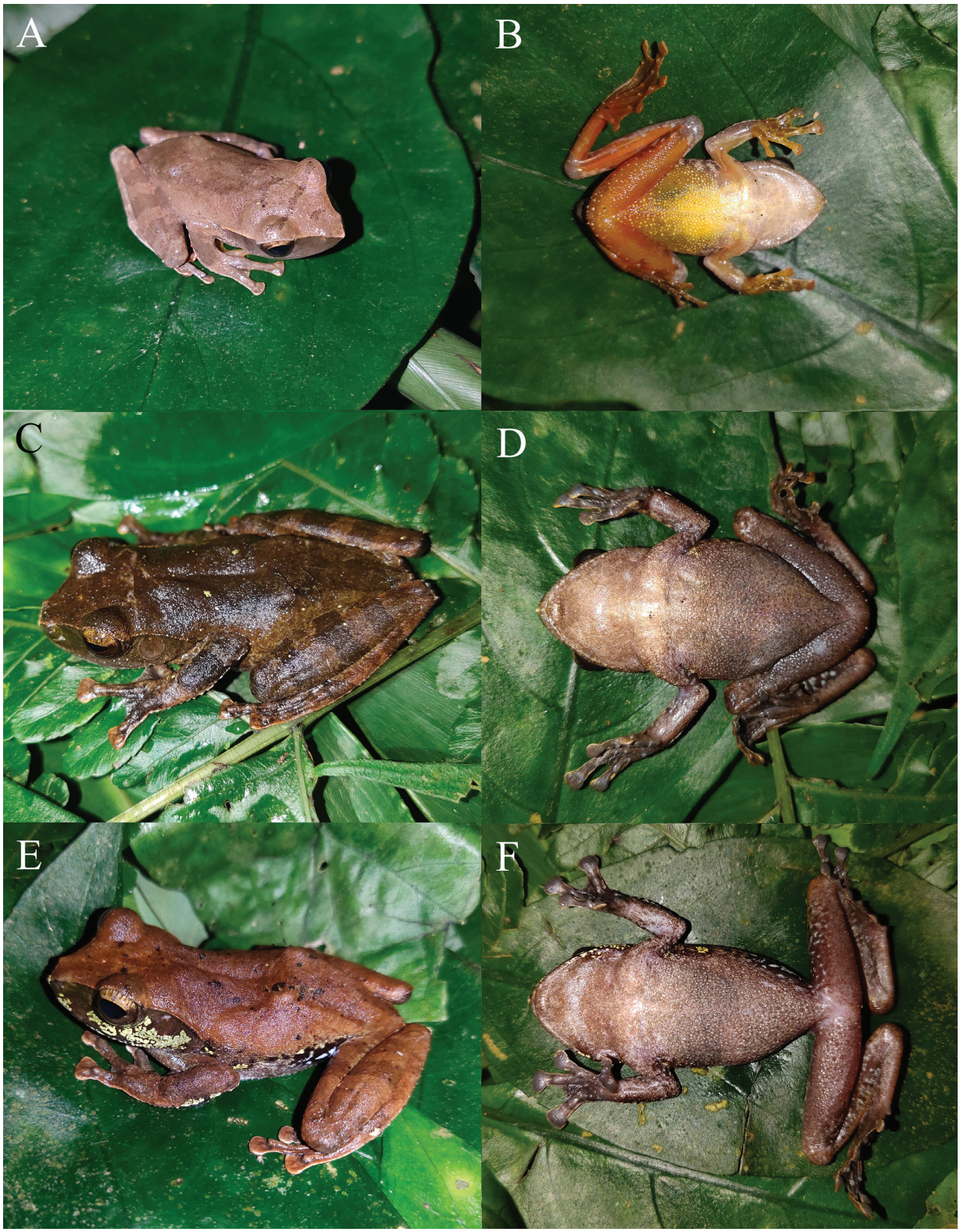

Figure 7. The specimens of *Rhacophorus orlovi* from Hekou County, Yunnan, China, in life. **A.** Dorsolateral view of the subadult female (KIZ20210506); **B.** Ventral view of the subadult female (KIZ20210506); **C.** Dorsolateral view of the adult female (KIZ20210507); **D.** Ventral view of the adult female (KIZ20210507); **E.** Dorsolateral view of the adult female (KIZ20210508); **F.** Ventral view of the adult female (KIZ20210508).

Forelimbs slender, relative lengths of fingers I < II < IV < III; subarticular tubercles large and distinct, with small and distinct supernumerary tubercles; formula of subarticular tubercles: 1, 1, 2, 2; tips of fingers dilated into well developed, broad discs with circumferential groove; disc of third finger approximately equal

Table 3. Measurements (in mm) of the specimens of *Rhacophorus orlovi* from Hekou County, Yunnan, China. For abbreviations see Materials and methods.

	KIZ20210506	KIZ20210507	KIZ20210508
KRL	30.6	53.9	55.6
KB	12.1	19.9	20.9
KL	12.3	20.3	21.1
AN	3.0	5.6	6.0
NS	2.5	3.3	3.9
AD	4.0	6.5	7.3
TD	1.9	3.4	3.6
HaL	9.4	15.8	17.1
BL	53.1	87.1	90.7
FL	13.1	22.5	23.2
IMT	1.4	2.6	2.6

to tympanum diameter; webbing between first and second finger reaching subarticular tubercles; webbing between second and third finger nearly reaching base of disc of second finger and proximal subarticular tubercle of third finger; and webbing between third and fourth finger reaching distal subarticular tubercles. Hindlimbs slender, tibiotarsal articulation reaching between eye and snout tip when hindlimbs pressed forward; relative length of toes I < II < III < V < IV; subarticular tubercles distinct; formula of subarticular tubercles: 1, 1, 2, 3, 2; inner metatarsal tubercle oval, outer metatarsal tubercle absent; discs on toes smaller than those on fingers; webbing between first and second toe reaching base of disc of first toe and subarticular tubercle of second toe; webbing between second toe and third toe reaching base of disc of second toe and distal subarticular tubercle of third toe; webbing between third and fourth toe reaching base of disc of third toe and distal subarticular tubercle of fourth toe; and webbing between fourth and fifth toe reaching bases of discs.

Skin smooth dorsally and laterally with sparse tiny tubercles; supratympanic fold distinct, ending above insertion of arm; skin on throat smooth, on abdomen and inner thighs coarsely granular; weak tubercles and protuberances on outer edges of lower arms and tarsus; tarsal projections on heels indistinct; skin beneath anal opening and on posterior of thigh with few small whitish tubercles.

Coloration in life. Dorsum flesh color, reddish brown, or dark brown, with some black dots or indistinct stripes; dorsal limbs with distinct dark bands; loreal region dark brown with irregular light yellow patches or no patch; iris golden in upper third, bronze in remainder; flanks brown with indistinct reticulation or black and yellow spots; groin and lateral thighs and shanks brownish black with white spots; vent region greyish black; venter greyish in adult females and light yellow to orange in subadult female.

Distribution. This species is currently known from Vietnam and Laos, as well as Maguan County, Wenshan Prefecture, and Hekou County, Honghe Prefecture, Yunnan, China.

Discussion

Theloderma khoii was known previously only from northern Vietnam (Ninh et al. 2022). This is the first record of *T. khoii* from China and from outside Vietnam. The new locality in China is approximately 35 km away from the type locality in Vietnam (Fig. 4). Our work brings the total species number of the genus *Theloderma* to 11 in China and to eight in Yunnan.

The population density of *Theloderma khoii* in China may be very low, or this species is very infrequently encountered due to its cryptic habits. We collected a specimen of this species ten years ago, thereafter, we have conducted many field surveys in southeastern Yunnan, but we have never seen this species again. Since we have only one subadult specimen, we have not described it as a new species. Recently, this species was described and named from northern Vietnam, and we confirmed that the specimen we collected in southeastern Yunnan ten years ago is conspecific with this species. Therefore, we reported the first record of this species in China.

Hou et al. (2017) considered that *Theloderma bicolor* is distributed in Xichou County, Wenshan Prefecture, Yunnan, China, and provided a photograph (fig. 27 B) of *T. bicolor* from Xichou taken by Yi Fan. After verification, we confirmed that the individual in the photograph (fig. 27 B) in Hou et al. (2017) is the same one (KIZ-Rao201204) reported in this study. Therefore, we remove the record of *T. bicolor* from Xichou herein.

Little is known about the natural history of this species in China at present. More field surveys are needed to learn about and protect the populations of this species in China.

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