

SIGNIFICANT NEW RECORDS OF THE JUNLIAN ODOROUS FROG, *ODORRANA JUNLIANENSIS* HUANG, FEI, AND YE, 2001

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(with three text-figures)

ABSTRACT.– *Odorrana junlianensis* was originally described from Sichuan and Guizhou Provinces in China, and has since been reported from Xizang Province. We refer nine specimens from Yunnan Province in China, Vietnam, and Laos to this species. We supplement the original description using the new specimens, and provide an English translation of the original description. The new specimens of *O. junlianensis* represent the first provincial records from Yunnan and the first country records from Vietnam and Laos.

KEYWORDS.– Ranidae; Laos; Vietnam; Yunnan; south-east Asia; *Rana*

INTRODUCTION

Odorrana junlianensis Huang, Fei, and Ye, 2001 was originally described from Sichuan and Guizhou Provinces, China (Huang et al., 2001) and has since been reported from Xizang Province, China (Fei et al., 2005). The species inhabits swift mountain streams and is distinguished by its large size, enlarged digital discs, and having males with white chest spines that form a figure ‘8’. Recent herpetological surveys in Yunnan Province of China, Vietnam, and Laos have resulted in the discovery of populations that closely agree with the original description of *O. junlianensis* and which share identical or very closely related mitochondrial DNA haplotypes (B. L. Stuart, in preparation). Herein we refer nine specimens from Yunnan, Vietnam, and Laos to *O. junlianensis*, supplement the original description with these new specimens, and provide an English translation of the original description (Appendix 1). The new specimens of *O. junlianensis* represent the

first provincial records from Yunnan and the first country records from Vietnam and Laos.

MATERIALS AND METHODS

Specimens were caught in the field by hand, preserved in 10% buffered formalin, and later transferred to 70% ethanol. Tissue samples were taken by preserving pieces of liver, heart, and/or thigh muscle in 95% ethanol before the specimen was fixed in formalin. Specimens were deposited in the American Museum of Natural History, New York (AMNH) and the Field Museum of Natural History, Chicago (FMNH). Specimens were also examined from the holdings of the Royal Ontario Museum, Toronto (ROM).

Measurements were made with dial calipers to the nearest 0.1 mm. Abbreviations used are: SVL = snout-vent length; HDL = head length from tip of snout to rear of the jaws; HDW = maximum head width; SNT = snout length from tip of snout to anterior corner of the eye; EYE = diameter of the exposed portion of the eyeball;

IOD = interorbital distance at narrowest point; TMP = maximum diameter of tympanum; TEY = tympanum-eye distance from anterior edge of tympanum to posterior corner of the eye; TIB = tibia length; FEM = femur length, from vent to outer edge of knee; HND = hand length, from base of palm to tip of finger III; FTL = foot length, from proximal edge of inner metatarsal tubercle to tip of fourth toe.

Odorrana has been used at both the genus rank and as a subgenus of *Rana* (Frost, 2004). Recent phylogenetic analyses of Asian ranid frogs have recovered a monophyletic *Odorrana*, and the authors of both studies recognized the clade at the genus rank (Jiang and Zhou, 2005; Chen et al. in press). However, neither study included *O. junlianensis*, and so the phylogenetic position of this species remains uncertain. In the interest of taxonomic stability, we follow the original authors (Huang, Fei and Ye, 2001) in treating *junlianensis* as a member of the genus *Odorrana*, pending a phylogenetic analysis that includes this species.

Specimen localities in China, Vietnam, and Laos are shown in Figure 1. Measurements are summarized in Table 1.

SYSTEMATIC ACCOUNT

Odorrana junlianensis Huang, Fei, and Ye, 2001

Figures 2–3

Material Examined.— CHINA, Yunnan Province, Simao Prefecture, SE of Simao City, 22°42.392'N, 101°3.671'E, 1,500 m elevation, 16 June 2002, N.L. Orlov, R.W. Murphy, D.Q. Rao, and S.Q. Lu: ROM 41475, 41477, subadults; 12 km SSW of Simao City, 22°40.800'N, 100°55.601'E, 1,120 m elevation, N.L. Orlov, R.W. Murphy, D.Q. Rao, and S.Q. Lu: ROM 41480, subadult; and Nanxianhe, 1,200 m elevation, 3 January 2002, D.Q. Rao: ROM 41479, adult female. VIETNAM, Lao Cai Province, Sapa, 22 August 1997, D. R. Frost and C. J. Raxworthy: AMNH 161440, adult male, on a trail beside a large stream; ~ 4 km W of Sapa Village, on tributary of Golden River (=Suoi Vang), 22°18'59"N, 103°49'16"E, 1,200 m elevation, 15 May 1995, R. W. Murphy, N. L. Orlov, T. Mason, R. O. de Sa, A. Lathrop: ROM 38632, subadult. LAOS, Huaphahn Province, Vieng Tong District, Phou Louey National Biodiver-

sity Conservation Area, Phou Louey Mountain, hilly evergreen forest, 20°14'N 103°12'E, 1,200 m elevation, 30 April–02 May 1998, B. L. Stuart: FMNH 255155, adult female, jumped from tree branch 1.5 m above ground into stream pool during the day; FMNH 255156, adult female, in shallow water of rocky stream in forest; FMNH 255157, adult female, on rocky stream bank in forest.

Habitus moderately slender; head length greater than head width; snout obtusely pointed in dorsal view, projecting well beyond margin of lower jaw, round in profile, depressed; nostril lateral, one-half to three-fourths distance from eye to tip of snout; canthus rostralis distinct, slightly constricted behind nares; loreal region concave and oblique; eye diameter 63–70% snout diameter in females, 76% in males; width of upper eyelid greater than interorbital distance; pineal body visible; tympanum distinct, 32–52% eye diameter, separated from eye by distance less than tympanum diameter, tympanic rim elevated relative to skin of temporal region; choanae ovoid; vomerine ridges oblique, posteroventral to choanae, equal in distance from each other as to choanae, each with numerous teeth; tongue cordiform, distinctly notched posteriorly, free for approximately two-thirds its length; male with vocal sac opening on floor of mouth at corner.

Tips of all four fingers expanded into discs, width of finger III disc less than 2 times width of phalanx, approximately one-third tympanum diameter; all fingers with lateral grooves on disc, that on finger I with a wide gap between the lateral grooves, those on fingers II–IV almost touching to form a horseshoe shape; relative finger lengths $II < I < IV < III$; medial callous pads on all fingers from distal edge of proximal subarticular tubercle to base of disc; moveable flap of skin on preaxial side of fingers II and III; subarticular tubercles large, round, one on fingers I and II, two on fingers III and IV; one supernumerary tubercle proximal to proximal subarticular tubercle on fingers II, III, and IV; two palmar tubercles, oval, barely in contact; male with grey nuptial pad along entire dorsal surface of finger I proximal to articulation of proximal phalanx, along medial surface from proximal end of thenar pad to

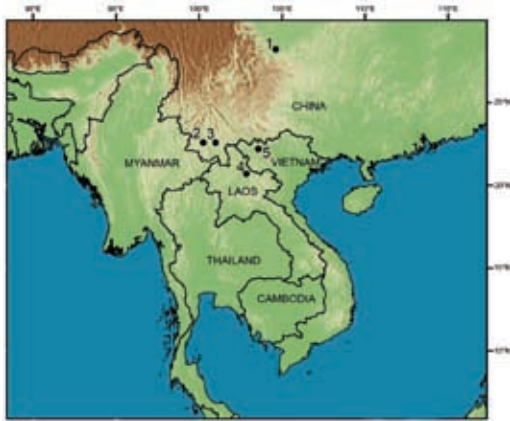


Figure 1. Localities of the holotype and referred specimens of *Odorrana junlianensis*. 1) type locality: Junlian, Sichuan Province, China; 2) Nanxianhe, Yunnan Province, China; 3) Simao, Yunnan Province, China; 4) Phou Louey Mountain, Phou Louey National Biodiversity Conservation Area, Vieng Tong District, Huaphahn Province, Laos and 5) Sapa, Lao Cai Province, Vietnam.

base of disc; forearm robust in male, not robust in females.

Toes expanded into large triangular disks; width of all toe discs equal to each other, larger than those of fingers, width of toe III disc about 2 times that of base of phalanx; toe V shorter than or equal to toe III; toes I, II, III, and V fully webbed to base of discs; toe IV fully webbed

Table 1. Measurements (mm) of *Odorrana junlianensis* from Yunnan, Vietnam, and Laos. Abbreviations defined in the text.

Measurement	Adult females Yunnan and Laos Range; Mean \pm S.D. (N=4)	Adult male Vietnam N=1
SVL	88.8–98.4; 94.29 \pm 4.13	69.2
HDL	31.7–37.1; 34.6 \pm 2.19	26.0
HDW	31.2–33.5; 34.6 \pm 2.19	23.4
SNT	14.7–16.1; 15.3 \pm 0.98	10.8
EYE	9.2–10.6; 10.2 \pm 0.66	8.2
IOD	7.6–8.9; 8.2 \pm 0.54	7.0
TMP	3.4–4.8; 4.2 \pm 0.68	3.8
TEY	3.8–4.8; 4.4 \pm 0.51	3.4
TIB	56.3–63.9; 60.2 \pm 3.39	41.3
FEM	46.3–46.9; 48.7 \pm 1.67	37.8
HND	25.1–28.5; 26.8 \pm 1.64	18.0
FTL	50.3–55.7; 53.1 \pm 2.26	36.6
	Range; Median	
HDL:HDW	1.00–1.11; 1.09	1.11
SNT:HDL	0.42–0.48; 0.43	0.42
TMP:EYE	0.32–0.52; 0.41	0.46
EYE:SNT	0.63–0.70; 0.67	0.76
TIB:SVL	0.59–0.70; 0.64	0.60

to base of disc or to distal subarticular tubercle, reaching disc as a fringe; movable flap of skin on preaxial side of toe I from disc to proximal subarticular tubercle and on postaxial side of V



Figure 2. Dorsal view of AMNH 161440, male *Odorrana junlianensis*.



Figure 3. Ventral view of AMNH 161440, male *Odorrana junlianensis*.

from disc to level of proximal subarticular tubercle; large, oval inner metatarsal tubercle, no outer metatarsal tubercle; legs long, heels meet when legs at right angle to body.

Skin smooth on dorsum and venter; rectal gland present; tympanic rim formed by tubercles; weak supratympanic fold from posterior corner of eye above tympanum, continuing obliquely posterior of tympanum to above level of arm insertion, sometimes absent; thick, elongate granulations on dorsolateral aspect of flanks; posterior surface of thigh granular to ventral surface; adult male without humeral gland; adult male with prominent white spinules on upper eyelid, anterior portion of tympanic rim, sacrum, hind limb, flank, proximal half of forelimb, dorsolaterally on large tubercles, ventrolaterally from arm insertion to thigh, and along outer margins of belly; adult male with fine white spinules on underside of jaw, as a figure '8' on the pectoral region, fanning out to sides at anterior portion of belly; females without spinules; anus unmodified, directed posteriorly at upper level of thighs.

In preservative, dorsum of male dark green-grey, females rusty-red with bluish-grey mottling; lips dirty cream with dark grey spots; upper surface of forelimbs not banded in male, dark crossbars weakly visible in females; flank grey, mottled with white near venter; inguinal region white with large black spots; anterior portion of thigh brown with dark brown spots in male, with distinct crossbars in females; posterior portion of thigh brown with cream reticulations; throat and pectoral region dark brown; belly creamy white, sometimes with brown flecking; females bear creamy white eggs with dark melanic pole.

DISCUSSION

The Yunnan, Vietnam, and Laos specimens fully agree with the original description of *O. junlianensis* (Huang et al., 2001) except in the grooves on the fingertips. The original description states that "all fingers and toes have grooves on the ventral surface, except for the first finger, where it is not noticeable; the grooves are relatively short and the distance between the groove and the tip of the finger is relatively wide" (Huang et al., 2001). However, in the specimens we ex-

amined, the lateral groove is distinct on all fingers, and the gap between the lateral grooves on fingers II–IV are much smaller than that on finger I. Consequently, the finger disc groove illustrated by Fei et al. (2005:Fig. 262A) resembles the condition of finger I, but not that of fingers II–IV in our specimens.

To our knowledge, the males of only two other *Odorrana* species, *O. margaretae*, and *O. grahami*, also possess white spinules on the chest in a form similar to the figure '8' of *O. junlianensis* (Fei et al. 2005:Pl. 41, 42). *Odorrana margaretae* exhibits white spinules that form a crescent shape, with the apex pointing anteriorly on the chest (not a complete figure '8' as in *junlianensis*) and can further be differentiated by having webbing that does not reach the disc on the preaxial side of toes III and IV (webbing full to disc on preaxial side of III in *junlianensis*) (after Liu, 1950:303–305). *Odorrana grahami* has white spinules completely covering the belly, with some reaching the chest in a non-uniform shape (not a complete figure '8' as in *junlianensis*) and can further be differentiated by lacking expanded discs on the digits (present in *junlianensis*) and having fingers I and II equal in length (finger I > II in *junlianensis*) (after Boulenger 1920:91–93).

Recent fieldwork in northern Vietnam and northern Laos has resulted in the discovery of a number of other frogs previously known only from neighboring regions in China: e.g. the genus *Vibrissaphora* (Dubois and Ohler, 1998); *Megophrys brachykolos*, *M. jingdongensis*, *M. kuatunensis*, *M. pachyproctus*, *Ophryophryne pachyproctus*, *Calluella yunnanensis*, *Amolops chunganensis*, *A. viridimaculatus*, *Philautus albopunctatus*, *Ph. jinxiuensis*, *Ph. longchuanensis* (Orlov et al., 2002); *Bufo cryptotympanicus* (Liu et al., 2000); *Rana nigrotympanica* (Stuart et al., 2005); *Philautus rhododiscus* (Bain and Nguyen 2004); *Polypedates dugritei*, and *Po. omeimontis* (Orlov et al., 2001). Our report of *O. junlianensis* from northern Vietnam and northern Laos is yet another example of the close biogeographic affinities of southern China with adjacent northern Indochina. The new records of *O. junlianensis* increase the known range of the species to more than 1,100 km between Sichuan and northern Laos, and illustrate the need

for increased biodiversity inventory efforts in these border areas.

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LITERATURE CITED

- BAIN, R. H. & Q. T. NGUYEN. 2004.** Herpetofaunal diversity of Ha Giang Province in northeastern Vietnam, with descriptions of two new species. *American Museum Novitates* 3453:1–42.
- BOULENGER, G. A. 1920.** A monograph of the south Asian, Papuan, Melanesian and Australasian frogs of the genus *Rana*. *Records of the Indian Museum* 20:1–126.
- CHEN, L., R. W. MURPHY, A. LATHROP, A. NGO, N. L. ORLOV, T. C. HO & I. L. M. SOMORJAI.** In press. Taxonomic chaos in Asian ranid frogs: an initial phylogenetic resolution. *The Herpetological Journal*.
- DUBOIS, A. & A. OHLER. 1998.** A new species of *Leptobrachium* (*Vibrissaphora*) from northern Vietnam, with a review of the taxonomy of the genus *Leptobrachium* (Pelobatidae, Megophryinae). *Dumerilia* 4(1):1–32.
- FEI, L., C.-Y. YE, J. JIANGPING, X. FENG & Y. HUANG. 2005.** An illustrated key to Chinese amphibians. Sichuan Publishing House of Science and Technology. 340 pp. + 12 pl. [in Chinese.]
- FROST, D. R. 2004.** Amphibian species of the world: an online reference. Version 3.0 (22 August, 2004). Electronic Database accessible at <http://research.amnh.org/herpetology/amphibia/index.html>. American Museum of Natural History, New York, U.S.A.
- HUANG, Y., L. FEI & C.-Y. YE. 2001.** *Odorrana junlianensis*. In: The colour handbook of the amphibians of Sichuan. pp:199. Fei, L. & C.-Y. Ye. Chinese Academy of Sciences, Chengdu. [In Chinese.]
- JIANG, J. P. & K. ZHOU. 2005.** Phylogenetic relationships among Chinese ranids inferred from sequence data set of 12S and 16S rDNA. *The Herpetological Journal* 15:1–8.
- LIU, C.-C. 1950.** Amphibians of western China. *Fieldiana: Zoology Memoirs* 2:1–400; 10 pl.
- LIU, W., A. LATHROP, J. FU, D. YANG & R. W. MURPHY. 2000.** Phylogeny of east Asian bufonids inferred from mitochondrial DNA sequences (Anura: Amphibia). *Molecular Phylogenetics and Evolution* 14:423–435.
- ORLOV, N. L., A. LATHROP, R. W. MURPHY & C. T. HO. 2001.** Frogs of the family Rhacophoridae (Anura: Amphibia) in the northern Hoang Lien Mountains (Mount Fan Si Pan, Sa Pa District, Lao Cai Province), Vietnam. *Russian Journal of Herpetology* 8(1):17–44.
- _____, **R. W. MURPHY, N. B. ANANJEVA, S. A. RYABOV & C. T. HO. 2002.** Herpetofauna of Vietnam, a

checklist. Part I. Amphibia. Russian Journal of Herpetology 9(2):81–104.

STUART, B. L., H. F. HEATWOLE & F. L. TAN. 2005. Record of the little-known *Rana nigrotympanica* Dubois, 1992 (Amphibia: Ranidae) from northern Laos. Hamadryad 30(1&2):108–113.

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APPENDIX 1

“Original description of *Odorrana junlianensis* (translated from the Chinese; Huang, Fei and Ye *In Fei and Ye*, 2001). Several localities within Sichuan and Guizhou Provinces are provided in the original description, but have been omitted here because we were uncertain about the phonetic spellings of these place names.”

“Diagnosis: Males SVL 68–80 mm (mean 73.3); females 87.2–102 mm (mean 97.5); head flat; head length greater than head width; snout length greater than eye diameter; snout blunt, round; pupil horizontally oval; tympanum distinct, approximately 50% of the eye diameter.”

“Dorsum relatively smooth, with small tubercles scattered from snout to vent; small white spinules on side of head, close to jaw, and around tympanum; flank with enlarged warts, relatively widely distributed; dorsolateral folds absent.”

“Fingers with weakly developed discs on tips, only slightly noticeable; finger pad length greater than finger pad width; all fingers and toes have grooves on the ventral surface, except for the first finger, where it is not noticeable;

the grooves are relatively short and the distance between the groove and the tip of the finger is relatively wide.”

“Hindlimb long; tibiotarsal articulation reaches beyond snout when legs extended forward against body; tibia approximately 60% of snout-vent length; ankles cross when thighs held 90 degrees to body; toe V shorter than or equal to toe III; webbing well-developed between toes; no tarsal fold.”

“Dorsum olive-green, usually dispersed with brownish dots; flanks light brown with dark brown spots; forelimbs banded in different colours; venter light yellow or earthy-yellow; throat and chest with greyish-brown tiny spinules; ventral surface of thigh with deep olive to grey-brown spots.”

“Males with light grey, velvety nuptial pad; throat and chest with two triangular spinous clusters in a figure ‘8’ pattern; vocal sac internal, lateral, low; dorsolateral masculinae.”

“Eggs approximately 2.5 mm in diameter, measured in situ; animal pole dark green, almost black, vegetable pole milky yellow.”

“Found from 650–1150 m asl among the vegetation of mountain stream areas. They are associated with large and medium-sized streams. Diurnally, the frog hides between rocks, in stone caves, and in mud burrows near water. At night it is active (air temperature 17 degrees C, water 14 degrees C) within 3–10 m of the stream, and usually alongside it. Breeding season is May to September, hibernation between November to February. It eats insects (Lepidoptera, beetles), so it is important as pest control. It has a 41.8% ‘usefulness rating for the ecosystem’. Found in Junlian, Sichuan and inland to [sic] Guizhou.”

“Holotype CNHM 900073, a female, SVL 102 mm; collected at 104°31'E, 28°11'N at 680 m asl, on May 7, 1990; paratype CIB 590059 a male from Guizhou at 1128 m asl, collected on May 14, 1959.”