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A NEW SPECIES OF *CALLUELLA* STOLICZKA, 1872 (ANURA: MICROHYLIDAE) FROM TAMAN NEGARA, PAHANG STATE, PENINSULAR MALAYSIA

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***ABSTRACT.* –** A new species of microhylid of the genus *Calluella* Stoliczka, 1872, is described from Sungai Relau, Taman Negara, Pahang State, Peninsular Malaysia. *Calluella minuta*, new species, is compared with congeners from Malaysia and other parts of south-east Asia. The new species is diagnosable in showing the following combination of characters: SVL 32.7 mm in the largest of the three specimens known; dorsum warty; no dermal fold across forehead; tympanum present; toe tips obtuse; webbing on toe IV broad up to median subarticular tubercle, webbing reaching tip of all toes as narrow sheaths; outer metatarsal tubercle present; and dorsum yellowish-brown with darker variegations.

***KEY WORDS.* –** *Calluella minuta*, Microhylidae, systematics, new species, Taman Negara, Malaysia.

INTRODUCTION

Calluella Stoliczka, 1872 (Anura: Microhylidae) is a relatively small genus, with six nominal species, its members known from southern China, south to Indo-Malaya and Indo-China (Frost, 1985; Inger et al., 1999; Iskandar & Colijn, 2000). Most species are poorly known, being represented by one or a few specimens, except arguably *C. guttulata* (Blyth, 1856) in Vietnam (Inger et al., 1999) and *C. yunnanensis* Boulenger, 1919 from southern China (Yang, 1991: 225).

We conducted herpetofaunal inventory of the poorly-known north-west portion of Taman Negara, Pahang State, Peninsular Malaysia, between 17 – 19 October 2001, and collected two specimens of a *Calluella* which do not fit the description of any known species. A third specimen was found in the collection of the Raffles Museum of Biodiversity Research, National University of Singapore, collected by J. R. Hendrickson in 1958 and identified as *C. volzi* (van Kampen, 1905).

The species is allocated to *Calluella* for showing the following characters diagnostic for the genus (see Parker, 1934: 27-28; Inger, 1966: 118-119): wide head and flattened body; eyes reduced; maxillary and vomerine teeth present; toes with reduced webbing; pupil circular; tongue large, oval and entire; paired dermal ridges across palate; and a large compressed inner metatarsal tubercle under each foot.

MATERIAL AND METHODS

The two specimens from the type series that were collected in 2001 were photographed prior to euthanasia, fixed in formalin ca. 14 h after collection and subsequently washed in water and transferred to 70% ethanol about a week after collection. Sex was determined through dissection. The following measurements were taken with Mitutoyo™ dial vernier callipers (to the nearest 0.1 mm), 23 mo after collection: snout-vent length (SVL, from tip of snout to vent); tibia length (TBL, distance between surface of knee and surface of heel, with both tibia and tarsus flexed); head length (HL, distance between angle of jaws and snout-tip); head width (HW, measured at angle of jaws); head depth (HD,

greatest transverse depth of head, taken posterior of the orbital region); eye diameter (ED, horizontal diameter of the eyes); interorbital distance (IO, least distance between upper eyelids; internarial distance (IN, distance between nostrils); eye to snout distance (E-S, distance between anterior-most point of eyes and tip of snout); eye to nostril distance (E-N, distance between anterior-most point of eyes and nostrils); eye to tympanum distance (E-T, distance between posterior-most point of eyes and anterior edge of tympanum); axilla to groin distance (A-G, distance between posterior edge of forelimb at its insertion to body to anterior edge of hindlimb at its insertion to body); body width (BW, greatest width of body); and tympanum diameter (TD, vertical and horizontal). In addition, measurements of digits, taken on the left limbs, from the base to tip. Colour notes on the holotype were taken from Fujichrome Velvia 50 ASA 35 mm slide transparency film, and compared with colour swatches of F. B. Smith (1975; 1981).

Sources of data on character states and distribution of congeneric species of *Calluella* include the following works: Berry (1975: 110-111), Fei et al. (1999: 290-291), Inger (1966: 118-121), Inger & Stuebing (1997: 93-95), Kiew (1984), Manthey & Grossmann (1997: 46-50), Nieden (1923: 89-90), Parker (1934: 27-32), Taylor (1962), van Kampen (1923: 95-97), Wu et al. (1987: 60-61) and Yang (1991: 224-226). Museum abbreviations for Raffles Museum of Biodiversity Research, National University of Singapore, Singapore is ZRC (the abbreviation used in Leviton et al., 1985, is USDZ*), following local usage; FRIM = Forest Research Institute Malaysia, Kepong, Malaysia; and DWNP = Zoological Museum of the Department of Wildlife and National Parks, Kuala Lumpur.

SYSTEMATICS

Calluella minuta, new species
(Fig. 1)

***Material examined.* –** Holotype - ZRC A.10888 (ex-DWNP A.0971) from forest trail along Sungai Relau (04º 40' 46.3"N; 102º 03' 21.2"E), Merapoh, Taman Negara, Pahang State, Peninsular Malaysia, altitude 167 m ASL, coll. N. Yaakob, I. Das & B.-L. Lim, 17 Oct.2001. Adult male.

Paratypes - FRIM 0579 (ex-DWNP A.0970), paratopotype, other data as for holotype; adult female; ZRC 1.2919 from Kuala Tahan, Taman Negara, Pahang State, Peninsular Malaysia; coll. J. R. Hendrickson, 12 Oct.1958.

***Diagnosis.* –** A small (SVL 32.7 mm in the largest of the three specimens known, an adult male) species of *Calluella*, diagnosable from congeneric species in showing the following combination of characters: no dermal fold across forehead; tympanum present; toe tips obtuse; webbing on toe IV broad up to median subarticular tubercle; webbing reaching tip of all toes as narrow sheaths; outer metatarsal tubercle present; and dorsum yellowish-brown with darker variegations.

***Description of holotype (adult male).* –** A small species of *Calluella*, SVL 30.9 mm; body rounded, roughly triangular, depressed; head wider than long (HW/HL ratio 1.65); snout obtusely pointed when viewed dorsally and laterally; projecting slightly beyond mandible; nostrils laterally positioned, nearer tip of snout than to eye (E-N/E-S ratio 0.59); internarial distance greater than distance from anterior margin of eye to nostril (IN/E-N ratio 1.21); eye small (ED/HL ratio 0.73); its diameter less than eye to nostril distance (ED/E-N ratio 2.53); interorbital width greater than upper eyelid width (IO/UE ratio 2.47); canthus rostralis obtuse; loreal region vertical; maxillary teeth present; a weak 'W'-shaped notch (= symphysial knob) on anterior edge of mandible; mouth extends to posterior corner of eye; choanae located against anterior of palate, partially visible when viewed from below; vomerine teeth set on two straight transverse ridges behind choanae and exceeding level of their outer edges, separated by a narrow mesial diastema; paired dermal ridges across palate; tongue oval, smooth, slightly nicked apically, free for approximately half its length; pupil rounded; tympanum distinct; supratympanic fold from posterior corner of orbit to before insertion of forelimbs; a second dermal fold starts slightly behind midorbital area, crosses well over tympanum, and terminates around middle of torso; dorsum with rounded warts arranged symmetrically from scapular region to middle of dorsum, interrupted as raised tubercles on posterior third of its length; oval, paired median subgular vocal sac.

Fore limbs short; fingers free of web or skin fringes; three metacarpal tubercles; relative length of fingers (measurements in parentheses, in mm): 3 (5.0) > 2 (3.7) > 4 (3.3) > 1 (2.7); finger tips pointed; subarticular tubercles prominent, rounded, numbering one on first and second fingers, two on third and fourth fingers; fleshy palmar tubercles; nuptial pads absent on fingers; no enlarged glands on lower arm.

Hind limbs short; a few tubercles on dorsal surfaces of thigh and tibia; toes webbed up to middle of phalanges; webbing on toe 1 basal; on toe II basal (inner) and top of outer phalange (outer); toe III distal subarticular tubercles (inner and outer); toe IV median subarticular tubercle (inner and outer); and

Fig. 1. Dorsolateral view of holotype of *Calluella minuta*, new species (ZRC A.10888) in life.

toe V top of outer phalange; relative length of toes (measurements in parentheses, in mm): 4 (13.2) > 5 (7.1) > 3 (5.0) > 2 (4.5) > 1 (1.7); toe obtuse, rounded, but not dilated; subarticular tubercles prominent, rounded, numbering one on first and second toes; two on third and fifth toes; and three on fourth toe; a large, crescentic inner and a small, compressed outer metatarsal tubercles.

Dorsum granular, eyelids and upper surfaces of limbs smooth; supratympanic fold extends from near middle of orbit of eye to around middle of torso; abdomen and inner side of thighs finely glanular.

***Colour.* –** In life, Clay Color (Color 26 of Smith, 1975) or yellowish-brown dorsally, with Warm Sepia (Color 221A) or a dark grey-brown triangular mark, wide anteriorly in interorbital region, diverging to meet two enlarged tubercles above scapular region, and converging around scapular region, becoming indistinct posteriorly as it extends to middle of body as two diverging points; supratympanic and dermal fold dorsal to it with an interrupted pale-edged dark line; flanks slightly darker; throat and undersurfaces of arm and thighs variegated with grey; pectoral and abdominal regions unpatterned cream; posterior of thighs and region around vent dark grey-brown; shanks and tarsus with a dark brown stripe; dark stripe on thigh-tibiotarsal region; digits of fingers and toes with dark bands; palms and soles dark grey; and undersurfaces of fingers pale yellow with some dark grey areas. The female paratype is similar to the holotype, except for a pale yellow throat, the margins of which are variegated with grey.

***Measurements (in mm; holotype followed by the female paratype and male paratype, respectively, in parentheses).* –** SVL 30.9 (25.5, 32.7); HL 6.6 (6.0, 7.1); HW 10.9 (9.3, 11.3); HD 7.4 (5.3, 7.2); BW 17.3 (9.0, 15.2); TBL 14.6 (12.0, 15.6); TD (vertical) 1.8 (0.8, 1.7); TD (horizontal) 1.8 (0.8, 1.2); ED 4.8 (2.5, 3.0); UE 1.9 (1.5, 1.6); IN 2.3 (2.2, 1.7); IO 4.7 (4.1, 4.8); E-S 3.2 (3.0, 3.9); E-T 1.6 (1.0, 1.5); E-N 1.9 (1.8, 1.7); and A-G 12.6 (11.0, 15.1).

***Etymology.* –** Latin for tiny. The new Peninsular Malaysian species is among the smallest member of the genus.

***Ecological notes.* –** Two specimens from the type series were collected along a road pathway from Merapoh head quarters to the last outpost at Kuala Sungai Juran, in lowland dipterocarp forest, during torrential rains, coinciding with the early Northeast Monsoons. The following species of amphibians were found sympatric with the new species: Bufonidae: *Bufo asper* and *B. parvus*; Megophryidae: *Megophrys nasuta*; Microhylidae: *Kaloula baleata, Microhyla butleri, M. heymonsi, Microhyla* sp. 3 and *Micryletta inornata*; Ranidae: *Amolops larutensis, Fejervarya* cf. *limnocharis, Limnonectes blythii, Rana erythraea, R. hosii, R. laterimaculata, R. miopus, R. nicobariensis, R, raniceps* and *R.* aff. *signata;* and Rhacophoridae: *Polypedates colletti, P. leucomystax, P. macrotis, Rhacophorus pardalis, R. prominanus* and *R. reinwardtii.* Additional amphibians recorded by Berry (1975: 111) from the Pahang portion of Taman Negara include *Ichthyophis* sp. (reported as *I. glutinosus,* this nominal species is now restricted to Sri Lanka, and the identity of the Taman Negara population requires further study), *Calluella volzi* (see below), *Leptolalax gracilis, Leptobrachium hasselti, L. heteropus, Ansonia malayana, A. penangensis, Leptophryne borbonica, Pedostibes hosii, Limnonectes doriae, L. plicatellus, Occidozyga laevis, Rana luctuosa, R. nigrovittata, Nyctixalus pictus, Philautus vermiculatus, Rhacophorus* (presumably aff.) *appendiculatus, Kalophrynus pleurostigma, Kaloula pulchra, Microhyla berdmorei, M. palmipes* and *M. superciliaris*. The record of *Calluella volzi* from the Park by Berry (1975), also cited by Kiew (1990) is based on a specimen collected by John Roscoe Hendrickson, ZRC 1.2919 (ex – JRH 3192), which was made part of the type series.

The stomach and intestines of the holotype contained the remains of large black ants. The eggs, tadpoles as well as call of the new species of *Calluella* remain unknown.

***Remarks.* –** The new species from Merapoh, Taman Negara is compared with all known congeners, listing only opposing suites of characters for congeners:

Calluella brooksii (Boulenger, 1905), distribution: Bidi, in the Bau region of western Sarawak, SVL 51-55 mm in males, 60 mm in females (Manthey & Grossmann, 1997: 46), besides a larger adult size; pupil vertical; tympanum concealed; toes basally webbed; outer metatarsal tubercle absent; and dorsum with scattered black dots; *C. flava* Kiew, 1984, distribution: Camp 5 to Sungai Besar Camp, Gunung Mulu National Park, northern Sarawak, SVL 35 mm in the only specimen known (Manthey & Grossmann, 1997: 46), whose sex was unspecified, toes basally webbed; outer metatarsal tubercle absent; and dorsum orange-yellow; *C. guttulata* (Blyth, 1856), distribution: Southern Myanmar, through the Central Highlands of Vietnam and Laos to the northern Malay Peninsula, SVL 34-45 mm in males, 38-50 mm in females (Manthey & Grossmann, 1997: 46), besides a larger adult size, tympanum concealed; one phalange free of web on toes I, II and V; webbing on toe IV broad up to basal subarticular tubercle, reaching penultimate tubercle as a narrow sheath; and finger II > finger IV; *C. smithi* (Barbour & Noble, 1916), distribution: Sungai Limbang, northern Sarawak, SVL 37-39 mm in females; male size range remains unknown (Manthey & Grossmann, 1997: 46), besides a larger adult size, tympanum concealed; toe tips with disks; outer metatarsal tubercle absent; dorsum smooth; toes basally webbed; and flanks with pink-edged black blotches; *C. volzi* (van Kampen, 1905), distribution: Sumatra; this species is hereby removed from the fauna of the Malay Peninsula (see 'Ecological notes'), SVL 34 mm in the only specimen known, a male (Manthey & Grossmann, 1997: 46), besides a larger adult size, tympanum concealed; toe tips dilated; toes two-thirds webbed; outer metatarsal tubercle absent; dermal fold in interorbital region typically present; and dorsum reddish-brown, with black spots; and *C. yunnanensis* Boulenger, 1919, distribution: Yunnan, Sichuan and Guizhou Provinces of southern China, SVL 30-37.2 mm in males, 40-48.8 mm in females (Yang, 1991: 225), toe tips swollen, toe webbing

described as two-thirds, the webbing membrane between toe III and IV reaching beyond level of distal tubercle of toe III (Parker, 1934: 29); interorbital fold present; and dorsum pale pinkish-grey with traces of a dark lateral band from canthus rostralis to midflanks.

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