

## Rediscovery of Guttman's Stream Frog, *Pulchrana guttmani* (Brown, 2015) in the mountains of southern Mindanao, Philippines

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The *Pulchrana signata* species complex is distributed across Sundaland and the Philippines (Frost, 2020; AmphibiaWeb, 2020). This group of stream frogs currently comprises 12 nominal species (Arifin et al., 2018), and more species may be described with the detection of putatively new species masquerading in the *P. picturata* group (Brown and Siler, 2014; Chan et al., 2020). Six species of this complex occur in the Philippines with non-overlapping distribution (Brown and Siler, 2014; Brown, 2015) except for *P. grandocula* and *P. guttmani*, which both occur synoptically in southern Mindanao. *Pulchrana guttmani* is known only from its type locality (Mount Busa, Kiamba, Sarangani Province, Mindanao), and it has eluded biologists for more than two decades. To date, *P. guttmani* has the most restricted geographic range of any Philippine ranid frogs and it is the only Philippine frog for which no known sightings of living individuals have been documented since its original discovery.

The holotype of *P. guttmani* was collected during a field expedition on the southern slope of Mount Busa in 1993 (Brown, 2015). It was thought to be a morphologically aberrant individual of the *P. signata* complex (Brown and Guttman, 2002), but it was later found to have a distinct phylogenetic placement (Brown and Siler, 2014) and was formally described from that single specimen more than a decade later (Brown, 2015). No additional individuals have been recorded since the early 1990s, despite some extensive herpetological collections in various regions of Mindanao extending back to the early 1900s (Taylor, 1920). This prompted Brown (2015) to speculate that

the species was either rare and active only at certain times of the year, patchily distributed, surviving only in hard-to-access areas, or that it could possibly be extinct. At present, the species is listed as Data Deficient on the *IUCN Red List of Threatened Species* (IUCN SSC Amphibian Specialist Group, 2018), in view of the lack of information regarding its extent of occurrence, population status, and ecological requirements (IUCN, 2020). As pointed out by Brown (2015), this lack of information could only be ameliorated with field-based surveys in the mountains of southern Mindanao.

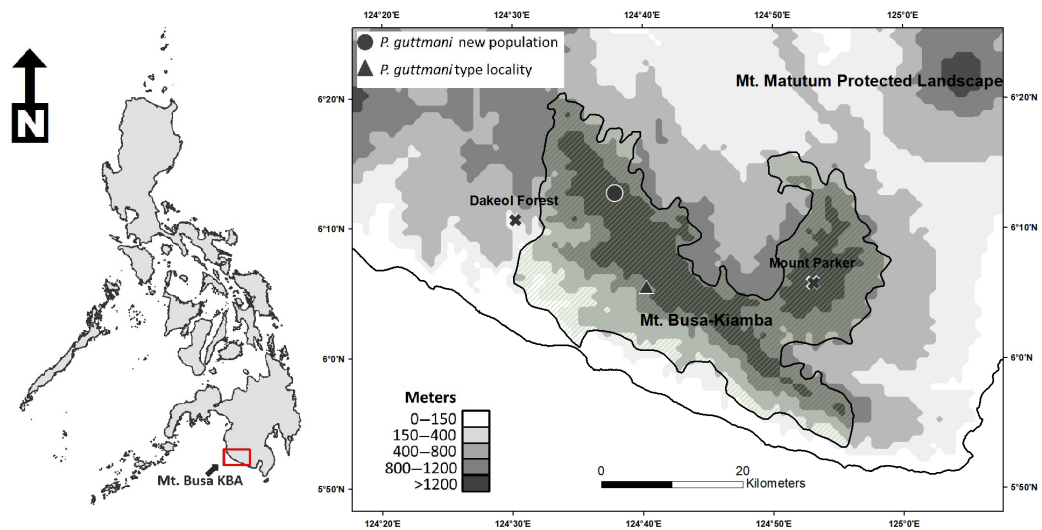
Between June 2018 and August 2020, we carried out targeted herpetological fieldwork at the *P. guttmani* type locality and in other portions of Mount Busa Key Biodiversity Area (KBA 116) and adjacent areas (Fig. 1), particularly on the Maitum side of the mountain range (Dakeol Forest) and on the nearby Mount Parker (locally known as Mount Melibengoy). Despite our extensive repeated visits and surveys in streams across different elevations, we did not discover any populations of *P. guttmani*, seemingly supporting the possibility that the species might be extinct (Pitogo, 2020). Here, we report on our serendipitous encounter with Guttman's Stream Frog on the northern slope of the Busa Mountain Range, providing the first evidence of its continued existence in the wild.

During night sampling on 2 September 2020 at 20:30 h in the high-elevation streams of Bulul Tbotu, Lake Sebu, South Cotabato (Fig. 1), a small population of what seemed to be individuals of *P. grandocula* were observed perching on overhanging riparian vegetation up to 2 m above the stream. However, their brightly coloured bodies caught our attention, so we captured four individuals for closer inspection. All individuals exhibited the typical characteristics of *P. grandocula* except for the distinctly expanded terminal finger disks (mean diameter of the 3<sup>rd</sup> finger disk  $3.6 \pm 0.1$  mm vs.  $1.5 \pm 0.1$  mm for adult *P. grandocula* at Mount Busa), larger body size (mean snout-vent length  $77.8 \pm 2.2$  mm vs.  $54.7 \pm 4.1$  mm for

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**Figure 1.** Topographic map of the Mount Busa Key Biodiversity Area in southern Mindanao, Philippines showing the type locality of *Pulchrana guttmani* and the new locality where we found the new population.

adult *P. grandocula* at Mount Busa), and brightly coloured body (Table 1; Fig. 2). The first two traits agree well with the description of *P. guttmani* (Brown, 2015) and readily distinguish the species from the more common *P. grandocula* in the field. We carefully compared our observations of *P. guttmani* to the *P. grandocula* specimens of Pitogo (2020) from Mount Busa.

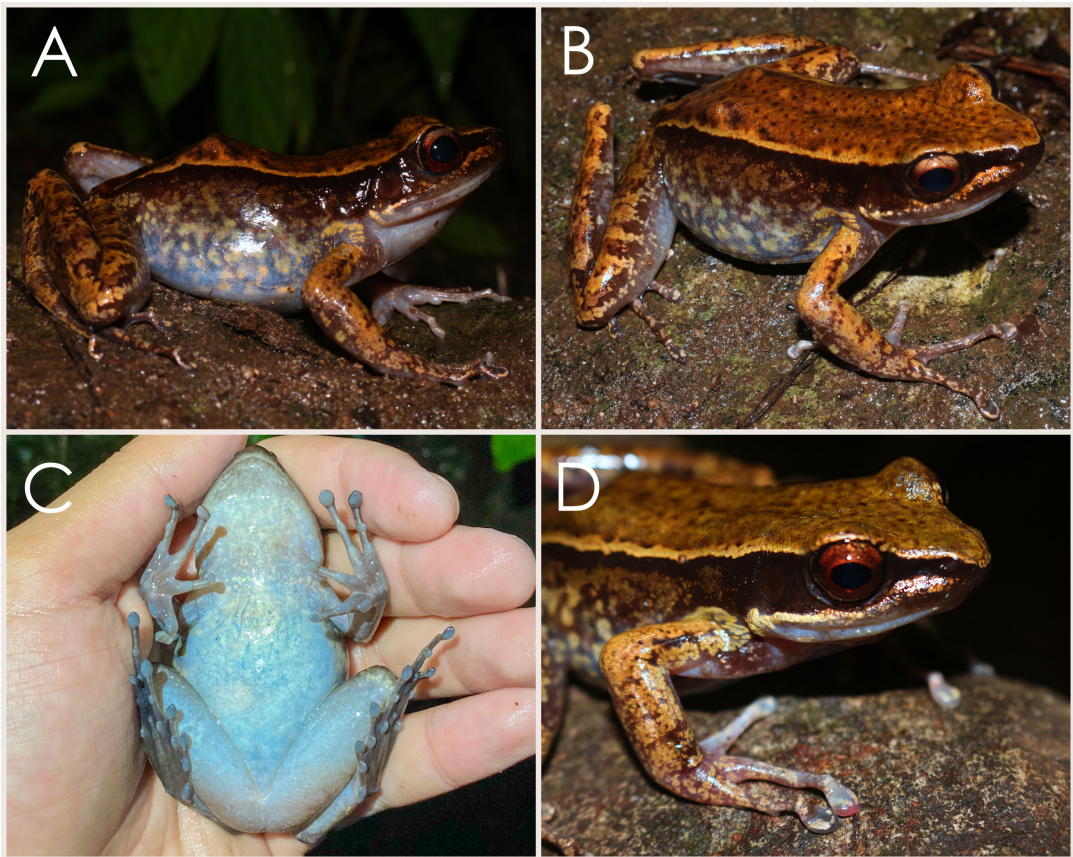
All four individuals also exhibited little variation in colour pattern: bright yellow to golden brown dorsum with small dark spots and a few mostly round blotches; two continuous straight golden yellow lines bordered posteriorly by black lines from the tip of the snout, continuing dorsolaterally to the sacral region; dark brown tympanum (the area surrounding the tympanum is dark, making the tympanum less conspicuous); irregular golden brown blotches on a dark brown flank and on the bluish grey belly and throat; light to dark ventral surfaces of digits and palmar surfaces of manus and pes; and less conspicuous dark brown transverse limb bars. Some aspects of the colouration did not exactly match the original description of *P. guttmani*, but Brown (2015) based his description on only a single preserved female specimen. The presence of transverse tibial bars and a black flank could be variable traits in *P. guttmani*, just like several aspects of colour pattern in *P. grandocula* (Brown and Guttman, 2002).

Individuals of *P. guttmani* were observed in a hard-to-access small, cool, and fast-flowing stream, 3–4.5 m in width, at an elevation of 1432 m (Fig. 3). Vegetation

along the stream bank was thick and mostly composed of shrubs (*Elatostema*, *Asplenium*, *Angiopteris*, *Impatiens*, *Schismatoglottis*, *Plenasium*). The tree canopy in the area ranged between 10–15 m in height with a canopy cover of 80–90%. We did not observe individuals of *P. guttmani* in streams below 1400 m elevation, where farmed *abaça* plants start to encroach. Our observations suggest that *P. guttmani* is a high-elevation specialist and may have little to no tolerance to disturbance, which may explain its absence from the type locality despite recent, extensive fieldwork in the area (Pitogo, 2020). The forest below 1000 m elevation on the southern slopes of Mount Busa was hard-hit during logging in the early 1990s (Brown, 2015), while farmed *abaça* plants already encroached on the lower montane forests up to 1300 m elevation (Pitogo, 2020). These anthropogenic activities may have played a

**Table 1.** Snout–vent lengths (SVL) and 3<sup>rd</sup> finger disc diameters (3FDD) for four *Pulchrana guttmani* individuals captured in the high-elevation stream in Lake Sebu, South Cotabato, Mindano, Philippines.

<i>P. guttmani</i>	SVL (mm)	3FDD (mm)
Individual 1	72	3.30
Individual 2	82	3.80
Individual 3	77	3.50
Individual 4	80	3.60



**Figure 2.** Two individuals of Guttman's Stream Frog (*Pulchrana guttmani*), the first seen in the wild since 1993. (A) Lateral view of an adult of indeterminate sex (snout–vent length 82 mm). (B) Dorsolateral view of the individual in (A), showing the small dark spots on the dorsum. (C) ventral view of the individual in (A). (D) Head of a second adult of indeterminate sex (snout–vent length 72 mm), showing the distinctive expanded terminal finger disks (diameter of 3<sup>rd</sup> finger disk 3.5 mm). Photos by Kier Mitchel Pitogo (A, C) and Aljohn Jay Saavedra (B, D).

role in the decline and possible extirpation of *P. guttmani* at its type locality. However, a remnant population could still be present in the logistically challenging, unsurveyed areas around Mount Busa.

The new locality of *P. guttmani* is within the proposed strict protection zone (SPZ) of the Allah Valley Watershed Forest Reserve, which was included as an initial component of the National Integrated Protected Areas System (NIPAS) in the Philippines. However, this legal protection provides little guarantee for the continued persistence of *P. guttmani* in the wild, considering the anthropogenic threats we observed inside the proposed SPZ, such as *kaingin* (slash-and-burn agriculture). Thus, we urgently recommend extensive surveys throughout the higher elevations throughout southern Mindanao. Due to its current, restricted distribution and the absence of the

species in low to moderate disturbed areas, we also urge the reclassification of its IUCN Red List status from “Data Deficient” to “Near Threatened”. This change would promote renewed conservation interest and direct studies of populations in their natural habitats (i.e., as opposed to reliance on indirect sources of little practical value), and it would also necessitate the protection of the remaining primary montane forests in southern Mindanao.

Our discovery of *P. guttmani* in the deep forested area of southern Mindanao foreshadows the rich yet understudied herpetological assemblages in the region, particularly in high elevation forests (Brown, 2015; Sanguila et al., 2016; Pitogo, 2020). Unfortunately, the difficult logistics of accessing these areas, security concerns, and bureaucracy still impede fieldwork (Brown et al., 2012). We hope that our discovery can





**Figure 3.** The high-elevation stream on the northern slope of the Busa Mountain Range (locally known as Bulul Tbotu) where we found the new population of *Pulchrana guttmani*. Note the thick understory vegetation along the stream bank. Photo by Kier Mitchel Pitogo.

be a milestone that paves the way for more field-based biodiversity surveys in southern Mindanao, with strong support from local government institutions, grant-giving bodies, and local communities. With this newfound population, we plan for immediate follow-up studies on the natural history of the rare and enigmatic Guttman's Stream Frog to obtain additional specimens and genetic samples to solve the mystery behind its intriguing evolutionary history (Brown and Siler, 2014).

**Acknowledgements.** Our fieldwork in the area was part of the Protected Area Suitability Assessment of the proposed Allah Valley Protected Landscape (AVPL). We thank Leonisa Alfaro, Protected Area Superintendent of the AVPL, for her support and encouragement. This discovery would not have been possible without the help of the staff of the PASu AVPL office and our local Tboli guides. We are very grateful to Rafe Brown for confirming our identification and for his insightful suggestions to improving the manuscript, as well as to John Carlo Redefina Santos for creating the map we used in this paper. Finally, KMP also expresses his profound gratitude to The Rufford Foundation (Project No. 26752-1), United States Agency for International Development (through the Protect Wildlife program), and Idea Wild for the financial support to his Amphibians and Reptiles of Mount Busa project which led to the rediscovery of this important species.

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