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NOTES ON *DISCODELES MALUKUNA*

Genus: *Discodeles* (Boulenger)

AMNH No.: 18300, 18301, 18326, 18330

by Gerald W. Scoville



Discodeles malukuna, Kolombangara island



Discodeles malukuna, Gatokae island



Discodeles malukuna, Gatokae island, blending into river bed.



Slopes of Malukuna Village, Guadalcanal highlands, where the holotype was collected.

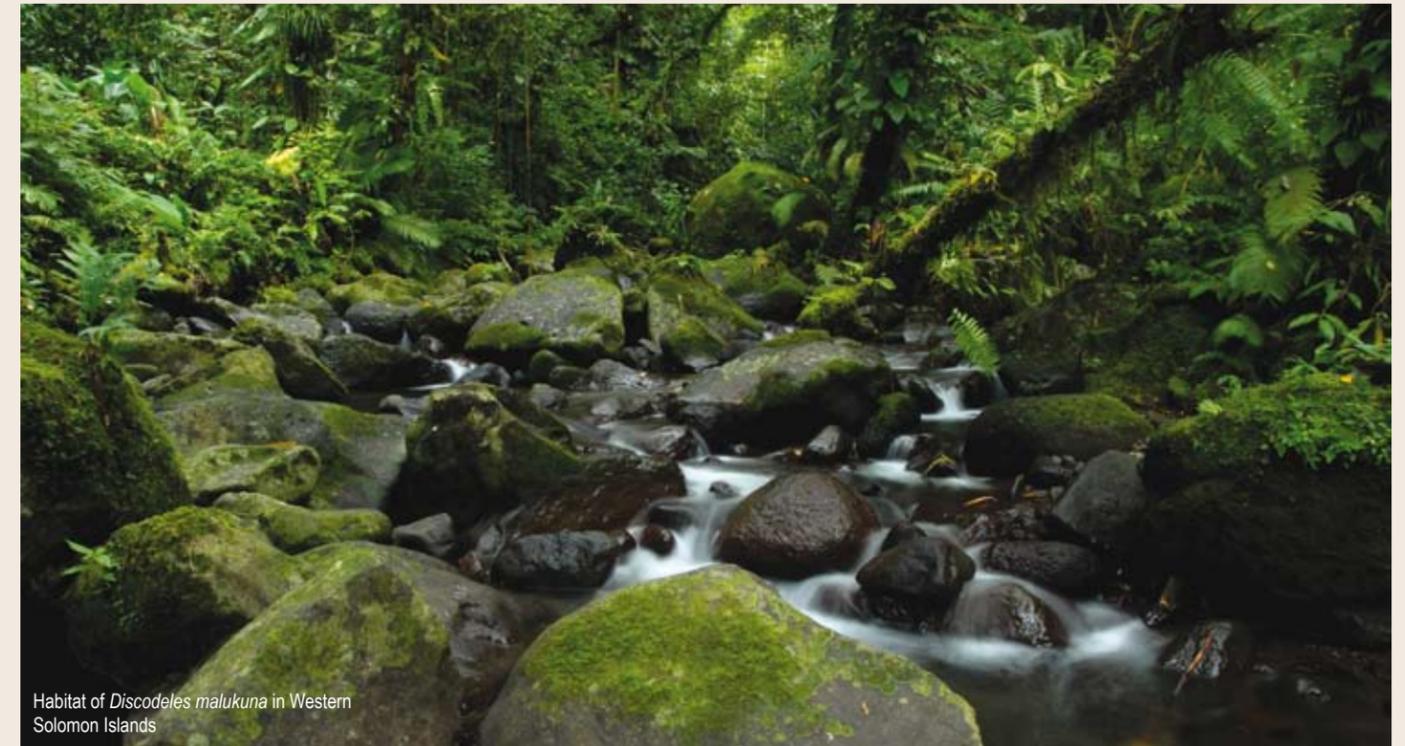
In May of 2004 I had the privilege to accompany the American Museum of Natural History's expedition up the southwest flank of Mount Mbatuvana, Kolombangara Island, to a small clearing in a mature sub-montane forest, approximately 1,100 meters above sea level, just below the edge of the stunted cloud forest. This site was known as the "Professor's Camp." Albert Meek, Jared Diamond and Christopher Filardi have made significant contributions to our understanding of avian ecology and evolution from the upland forests of Kolombangara and this camp specifically. In contrast, I was there to study the behavior of frogs.

One of the most conspicuous frogs in this area is *Discodeles malukuna*. Compared to the other anurans of the upland forest of Kolombangara, *Discodeles malukuna* are robust, heavy bodied frogs (64.5-to-104.0 mm) with wide, truncated heads. They were noted both swimming in the pools near the headwaters of a cascading creek and adjacent to the ridges near the American Museum of Natural History's 2004 camp. These frogs are strong and powerful swimmers, plying the torrent waters of the cascading creek just below our camp. On land, *D. Malukuna*, preferred unimpeded travel routes through open forest, with little dead or down trees or understory vegetation. This species was noted moving intentionally along horizontal benches rather than down cliff faces or adjacent steep terrain. In the forest this frog was deliberate in its movements, making large saltations through the forest, never seeking cover beneath rocks or fallen trees.

Discodeles malukuna fingers lacked webs

and the first and third fingers were nearly the same length. The tips of the fingers were rounded and not dilated, and lacked terminal circummarginal grooves. The toes were only moderately webbed. The most prominent webbing was between the second and third, and the third and fourth toes. The species came in two color types; dark olivaceous or buff-tan with dark, irregular or broken bands or stripes. The skin on the dorsal surface was absolutely smooth, lacking warty tubercles on the dorsum or upper surfaces of the hind limbs. All four individuals that were closely inspected had various amounts of a vibrant, electric, canary-yellow running down the lower third the median area, between their dorsal surfaces and their bellies, continuing down the median area of their legs to the webbing of the hind toes.

When cornered on land and in the water, all individuals exhibited the same defensive behavior posture: they pulled their heads down in a ventriflexed position, touching the substrate with their lower jaw and tucked their heads into alignment with their forefeet, which were extended to just below their eyes. Their hind legs were pulled up behind their vents, and they reduced or closed their eyes, assuming a flat and ovoid profile. With their heads tucked down into the substrate, their snouts appeared shorter than when they were in relaxed positions. After assuming this posture they proceeded to extend either a single leg, or both legs, revealing the yellow webbing between their toes. This display of yellow could be either quick or slow, whereby an individual would flick its webbing open



Habitat of *Discodeles malukuna* in Western Solomon Islands

and "flash" the yellow coloration or slowly spread its toes, exposing the canary-yellow skin, then abruptly close the webbing, eliminating the vibrant coloration from view.

The brilliant yellow coloration of *D. malukuna* toe webbing suggests a number of possible functions. The yellow coloration was visible only when they were escaping or threatened, and never when the frog was in a resting posture. This color pattern may be aposematic or function to misdirect visually-oriented predators, such as birds, to non-lethal areas of the body. Hypothetically, when this frog is leaping, swimming, or assuming a defensive posture, a potential predator would cue upon the brilliant "flash" of yellow. Such flash coloration is thought to disorient predators that witness a sudden and momentary brilliance of coloration followed by immobility (Dickerson 1908; Williams et al. 2000). When the yellow is not visible *D. Malukuna's* flat ovoid posture may be a form of crypsis, offering false cues to predators (Johnson and Brodie 1975), since it mimics the shape of river stones.

Alternately, although not exclusively, the yellow coloration could be used for signaling prospective mates, as a declaration of territory, or to warn kin of potential dangers. This frog is frequently found in or near pools below cascading falls where the use of vocalizations may be hindered by the sound of tumbling water and a signaling regime may be exceedingly useful.

Discodeles malukuna was the last and fourth species of *Discodeles* to be discovered in the Solomon Islands (Brown and Webster

1969). On July 2nd, 1968, T. Preston Webster, collected the first specimen (MCZ 79462) in the central highland mountains of Guadalcanal Island at approximately 2,500 feet above sea level, at what is now the abandoned village of Malukuna. The few specimens collected suggest this is a montane species. This new site record on Kolombangara Island is over 350 kilometers from the Guadalcanal central highlands. The deficient documentation of *D. malukuna* is likely due to lack of survey work in the highland forests and not because this species is rare or difficult to find. It is also possible that the Kolombangara's *D. malukuna* are a distinctly different species from those found in the highlands of Guadalcanal? The frogs of the Solomon Islands surely warrant further investigations.

I was only in the forest of the Solomon Islands for a very short period of time. As a natural historian, I felt like a little boy just before Christmas, there were so many surprises and wonderful secrets just waiting to be unveiled; I cannot wait to get back to those beautiful untrammelled forests.

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Table 1. Measurements taken on *Discodeles malukuna* (n=4). In the first column, ranges are given on the top line with the mean \pm standard error in parentheses below. In the second column, ranges are given with the mean in parentheses.

<i>Discodeles malukuna</i>	Measurements (mm)	Measurements/Snout-vent Length
Snout-vent length	64.5-104.0 (87.1 \pm 9.2)	
Head width	29.0-50.0 (40.5 \pm 4.6)	0.450-0.480 (0.464)
Tibia length	32.5-52.0 (43.1 \pm 4.2)	0.470-0.513 (0.497)
Snout length	11.0-16.5 (14.2 \pm 1.3)	0.159-0.171 (0.163)
Ventral snout length	3.0-4.0 (3.6 \pm 0.2)	0.034-0.050 (0.043)
Tympanum height	4.0-6.0 (5.4 \pm 0.5)	0.058-0.069 (0.062)
Tympanum width	4.0-6.0 (5.3 \pm 0.5)	0.058-0.063 (0.061)
Longest front toe	1.0-3.0 (2.5 \pm 0.5)	
Longest front toe length	11.0-15.0 (12.5 \pm 1.0)	0.130-0.171 (0.146)
Longest hind toe	4	
Longest hind toe length	11.0-27.0 (17.0 \pm 3.5)	0.154-0.270 (0.192)