Biofluorescence occurs when organic material absorbs short-wavelength electromagnetic radiation and re-emits part of the absorbed radiation at a longer wavelength. For humans, fluorescence is typically outside of the visual spectrum and can only be detected with the assistance of UV-A light. Biofluorescence is well documented in fauna throughout marine ecosystems; there are relatively few accounts of terrestrial fauna exhibiting biofluorescence. Recently, biofluorescence has been a topic of interest among herpetofauna after the discovery of fluorescence in sea turtles and chameleons (Gruber and Sparks, 2015; Prötzel, et al., 2018). In other recent studies, biofluorescence was reported for the first time in an anuran through means of lymph and gland emissions in pigmentary cells (Taboada et al., 2017a). Shortly after, fluorescent emissions were also reported in Boana atlantica (Taboada et al., 2017b), and B. rufitelus (Deschepper et al., 2018). Here I document biofluorescence in another anuran: Philautus macroscelis (Boulenger, 1896).

While surveying Kinabalu Park, Sabah, Malaysia for reptiles and amphibians on the nights of 4-7 November 2018 (6.0176 °N, 116.5373 °E, approx. 1649 m elevation), a Defiant UV LED handheld flashlight (395 nm) was used to shine each animal to check for signs of fluorescence. When Philautus macroscelis were illuminated, fluorescent markings on the sides of the body and inner thigh (Fig. 1) became visible.

Although the significance of biofluorescence in animals is still not completely understood, many studies have concluded its potential for enhanced visual communication, and conspecific signalling (Arnold et al., 2002; Vukusic and Hooper, 2005; Michiels et al., 2008; Gerlach et al., 2014; Taboada, 2017). Previous research on spectral sensitivity of treefrogs, such as Hyla cinerea, indicates the ability to perceive spectral wavelengths of fluorescent emission under low-light conditions (King et al., 1993).

As the common name “Mossy Bushfrog” suggests, Philautus macroscelis are characterised by their green, moss-like camouflage. If the species can perceive fluorescent emissions under lowlight conditions,
the lateral patterning may serve as a visual signal to supplement acoustic signalling, while still remaining camouflaged from the dorsal view. Acoustic signalling in frogs increases risk of falling prey to predators, parasitoids, and vector insects (McKeever, 1977; Tuttle and Ryan, 1981; Bernal et al., 2006, 2007; Burkett-Cadena et al., 2011). Non-acoustic signals could be beneficial for avoidance of these potential threats while attracting a mate.

Although the sex of frogs was not determined during the survey, both male and female Philautus macroscelis are known to have lateral patterning. If both males and female P. macroscelis exhibit biofluorescence, the characteristic could also be used as an additional morphological trait of the species. However, other than P. macroscelis, fluorescence in other species of Philautus was not examined during these surveys.

Taboada et al. (2017b) predicted that other potentially biofluorescent species of frogs would likely exhibit fluorescence based on high concentration of biliverdin, translucent skin, and white peritoneum. Although the frogs examined during these surveys were not tested for concentration of biliverdin, the species does have clear, translucent patches on its side which do not exhibit florescence; the peritoneum was not examined though it can be disqualified as the source of fluorescence in this particular species because the fluorescent portion of the frog was opaque. Furthermore, the genus Philautus was not included as part of the Taboada et al. (2017b) rhacophorid predictions. It is worth noting that this is the first instance of biofluorescence exhibited in the family Rhacophoridae, and the first documented instance of bioluminescent frog outside of the neotropics.

Acknowledgements. I would like to thank Imran Khimji for providing photos of frogs found on our surveys, including the two used in this note. I would also like to thank Antoine Pelletier, Kayden Phan and Imran Khimji for their assistance in surveys.

References


