

Defensive behaviour exhibited by the green and black poison frog (*Dendrobates auratus*) in response to simulated predation

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Anurans exhibit a broad range of defensive behaviours that have evolved to cope with the risk of predation. Deimatic behaviours are characterised as postures or displays exhibited by prey that are intended to startle or warn predators and ultimately discourage predation (Edmunds, 1974). Body raising is one type of deimatic behaviour in which anurans outstretch their legs vertically or laterally and the body is raised off the ground. In certain aposematic species, this behaviour is thought to enhance the colour signal as a warning to predators. This defensive behaviour has been described in certain members of Hylidae, Leptodactylidae, Leiuperidae, and Bufonidae (Toledo et al., 2011) and one member of Dendrobatidae, *Ameerega flavopicta* (formerly *Epipedobates flavopictus*) (Toledo et al., 2004).

Dendrobates auratus is an aposematically coloured, chemically defended member of Dendrobatidae that is naturally distributed throughout Central America (Savage, 2002). Herein, we report deimatic body raising behaviour by way of vertical stretching of the legs by captive-raised *D. auratus*. Although the frogs were captive-born and raised, they are derived from a Costa Rican lineage.

Between 30 September 2015 and 13 November 2015, and as part of a larger lab-based study on the effects of predation pressure on behaviour, one mature *D. auratus* individual (SVL = 28.3 mm) began exhibiting body raising in response to simulated predation attempts that were conducted daily. No frogs were harmed during the experiment. Simulated predation included gently picking up and releasing individual frogs with a pair of 3" pressure sensitive forceps (Williams et al., 2000). Body raising consisted of the individual *D. auratus* extending its front and rear legs and pointing its snout towards the ground resulting in a back arching stance (Fig. 1). Within one week of the adult's initial behaviour, three juveniles in the same terrarium, exposed to the same predation treatment, began displaying a similar behaviour. Initially, the juveniles only exhibited the behaviour occasionally, but by the end of the 1.5 months of predation treatment all four frogs exhibited the behaviour daily. Furthermore, the behaviour was originally observed only following simulated predation attempts, but by the end of the experiment it was observed prior to the predation treatment, where all individuals immediately body raised when they were exposed from under cover objects in their terrarium. On the basis of our observations,



Figure 1. Adult *Dendrobates auratus* exhibiting body raising behaviour by vertical stretching of the legs.

it appears that body raising in *D. auratus* is in response to stress from predation attempts. Given that the dorsal surface of *D. auratus* contains the highest concentration of alkaloid defences (Saporito et al., 2010), body raising may provide increased exposure of this chemically defended region to a potential predator while increasing the conspicuousness of their aposematic colouration.

REFERENCES

- Edmunds, M. (1974). *Defence in Animals: A Survey of Anti-predator Defences*. Harlow, UK: Longman. 357 pp.
- Saporito, R.A., Isola, M., Maccachero, V.C., Condon, K., and Donnelly, M.A. (2010). Ontogenetic scaling of poison glands in a dendrobatid frog. *Journal of Zoology* 282:238-245.
- Savage, J.M. (2002). *The Amphibians and Reptiles of Costa Rica*. Chicago, Illinois: University of Chicago Press. 934pp.
- Toledo, L.F., Guimaraes, L.D., Lima, L.P., Bastos, R.P., and Haddad, C.F.B. (2004). Notes on courtship, egg-laying site, and defensive behaviour of *Epipedobates flavopictus* (Anura, Dendrobatidae) from two mountain ranges of central and southeast Brazil. *Phyllomedusa* 3: 145–147.
- Toledo, L.F., Sazima, I., and Haddad, C.F.B. (2011). Behavioural defences of anurans: an overview. *Ethology Ecology and Evolution* 23:1–25.
- Williams, C.R., Brodie, E.D. Jr., Tyler, M.J., and Walker, S.J. (2000). Antipredator mechanisms of Australian frogs. *Journal of Herpetology* 34: 431–443.

Accepted: 20 February 2016