

Anti-predator behavior of Philippine Water Skink *Tropidophorus grayi* Günther, 1861 in Naglahao Falls, Municipality of Irosin, Sorsogon Province, Bicol Peninsula, Philippines

Cyrus Job P. Dela Cruz¹ and Luzie Doering²

¹Bicol University College of Agriculture and Forestry Graduate Program,
Guinobatan, Albay Province, Philippines

²Brandenburgische Technische Universität, 0304,
Cottbus-Senftenberg-Platz der Deutschen Einheit 1, Cottbus, Germany.

Corresponding author: cjpdc.haynayanatbuhayilang@gmail.com

Lizards are ideal taxa in studying defensive behaviors, comparatively because they are prey for a wide range of vertebrate (Dubeux *et al.*, 2019, Alcantara *et al.*, 2014, Birkhead & Benny, 2014, Brito *et al.*, 2014) and invertebrate predators (Sy & Alaban, 2014). Moreover, this group has evolved a broad defensive tactics in surviving potential predators (Dappen, 2010, Nunes *et al.*, 2012, Brock *et al.*, 2014, Patel *et al.*, 2016). In literatures, there are two basic defensive behaviors that are known: primary defense involves cryptic coloration and locomotor escape (Nunes *et al.* 2012) and secondary defenses such as gular expansion, locomotor escape, cloacal discharge, threat display (mouth opened and trying to bite), tail wave, autotomy, and death-feigning (Dappen 2010, Santos *et al.*, 2010, Nunes *et al.*, 2012, Patel *et al.*, 2016, Brock *et al.*, 2014) when primary defenses failed.

Here, we report an observation on anti-predator behavior of Philippine Water Skink *Tropidophorus grayi* Günther, 1861 documented in Naglahao Falls, Municipality of Irosin, Sorsogon province, Bicol peninsula, Philippines.

Tropidophorus grayi is a Philippine endemic semi-aquatic lizard commonly found in moist habitats such as rocks, dead woods, humus in secondary growth forests, leaves piled on forest floor and plant roots along riverbanks and streams (Gaulke, 2011, Supsup *et al.*, 2016).

The observation of *Tropidophorus grayi* was based on a visual encounter and captured by hand during a day survey of Naglahao Falls, Barangay Patag, Municipality of Irosin, Sorsogon Province, Bicol peninsula, Philippines (12°43'16.6" N, 124°04'54.4" E, WGS 84) on 27 July 2019. The specimen was identified on site and was photographed. No voucher specimens were collected; however, photographic documentation of the

species has been deposited at the digital archive of the Lee Kong Chian Natural History Museum, National University of Singapore (Voucher number: ZRC [IMG] 2.425).

A single individual of *Tropidophorus grayi* was encountered on a running stream near Naglahao Falls. The *T. grayi* first escaped upon notice and displayed immobility when observed in a distance (approximately 2 m away from the 2 observers), blending with the color of the wet rock (Figure 1A). When caught, the skink immediately initiated a death-feign behavior. The skink maintained immobility with its eyes slightly closed, body in rigid posture and all limbs relaxed for about 15 s (Figure 1B). Furthermore, it was also observed that *T. grayi* exhibited tail waving by moving its tail in circular counter-clockwise motion while death-feigning, more likely using the tail to lure a predator. When released slowly on a moist rock, the skink remained in death-feign for 2 s then escaped immediately to a running stream water.

The authors considered that the following behaviors displayed by *T. grayi* were anti-predatory behavior following the functional approach of Endler (1991) in presenting the diversity of defensive tactics exhibited by snakes and lizards. Endler (1991) stated that a predatory event maybe divided in six stages: detection, identification, approach, subjugation, and consumption. Seeing the initial stages of a predatory sequence, reptiles such as snakes and lizards may avoid being consumed by avoiding being detected by their potential predators (Martins, 1996). One important defensive tactic in avoiding detection are cryptic coloration and immobility. The *T. grayi* observed used cryptic coloration and immobility as primary defense mechanism. This behavior are also observed in other sit-and-wait foraging lizards that inhabit open environments (Nunes *et al.*, 2012, Machado *et al.*, 2007).

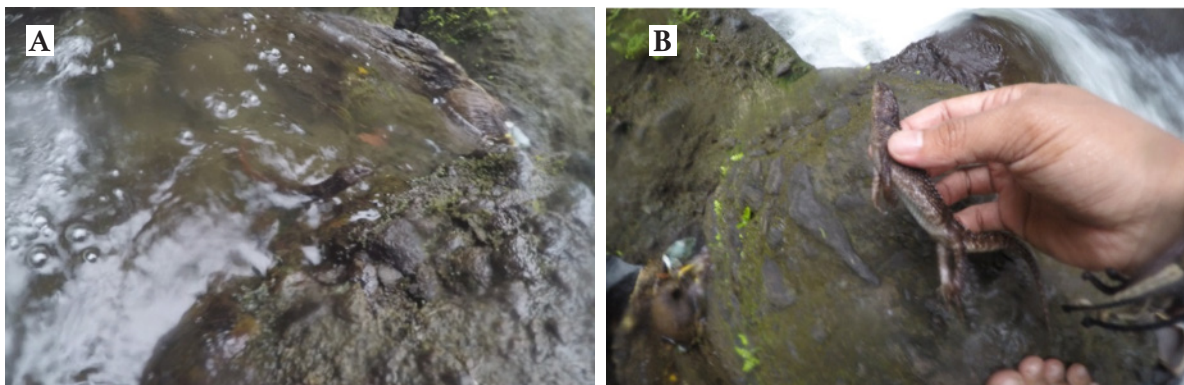


Figure 1. *Tropidophorus grayi* exhibiting crypsis (A) and thanatosis (ZRC [IMG] 2.425) (B).

Small animals that inhabit open environments (e.g. lizards) are more at risk to visually oriented predators and hence cryptic coloration or blending with the coloration of the surrounding is an adaptation to increase the chances of survival (Rocha, 1993).

The anti-predatory behavior of death-feigning or thanatosis has been reported common among lizards as a defense mechanism (Santos *et al.*, 2010, Nunes *et al.*, 2012, Patel *et al.*, 2016). For example, same anecdotal observation was reported by Dappen (2010) in the species Ibiza Wall Lizard *Podarcis pityusensis*, wherein out of the 96 individuals caught, 74 individuals exhibit death-feigning only after seconds of being held or overpowered. By going limp, the lizard might convince a predator that it is dead and increasing the possibility of having a safe escape (Dappen, 2010). Lastly, the observation of tail waving is a well-known defense display and, for example, has been described in *Tropidurus itambere* by Nunes and colleagues (2012) and in *Tropidurus montanus* by Machado and colleagues (2007). It is a defensive behavior of lizards in diverting the attention of a predator by exposing and moving its tail, reducing the risk of predation (Langkilde *et al.*, 2005).

Death-feigning and tail display are “last resort” anti-predatory tactic when the *T. grayi* is overpowered. Further research examining the use of these behavioral displays in response to a variety of natural predators and disturbance are recommended to further clarify the nature of these behaviors.

References

Alcantara, E. P., J. R. S. Dos Santos, A. J. M. G. Ferreira, and R.

W. Àvila. (2014). *Tropidurus hispidus* (Peters' lava lizard). Predation. Herpetological review, 45 (1), 137-138.

Birkhead, R. D. and M. C. Benny. (2014). *Anolis carolinensis* (Green anole). Predation. Herpetological review, 45 (1), 123.

Brito, E. S., S. Fox, and H. Nuñez. (2014). *Liolaemus bellii* (Dusky Lizard). Predation. Herpetological review, 45 (1), 130-131.

Brock, K. M., P. A. Bednekoff, P. Pafilis, and J. Foufopoulos. (2014). Evolution of antipredator behavior in an island lizard species, *Podarcis erhardii* (Reptilia: Lacertidae): The sum of all fears. Evolution, International Journal of Organic Evolution, 1-16.

Dappen, N. B. (2010). *Podarcis pityusensis* (Ibiza Wall Lizard). Death-feigning behavior. Herpetological review, 41 (3), 356-358.

Dubeux, M. J. M., C. N. S. Palmeira, and U. Gonçalves. (2019). *Bothrops leucurus* (Whitetail lancehead). Diet Herpetological review, 50 (2), 386.

Endler, J. A. (1991). Interactions between predators and prey: Behavioural Ecology: An evolutionary approach (Krebs, J. R. and Davies, N. B., eds.) pp 169-196. Blackwell Scientific Publications, Oxford.

Gaulke, M. (2011). Herpetofauna of Panay Island, Philippines: An Illustrated Field Guide. Frankfurt am Main, Germany: Edition Chimaira, 388 pp.

Langkilde, T., L. Schwarzkoff, and R. A., Alford. (2005). The function of tail displays in male Rainbow Skinks (*Carlia jarnoldae*). Journal of Herpetology. 39(2), 325-328.

Machado, L. P., C. A. B. Galdino, and B. M. Sousa. (2007). Defensive behavior of the lizard *Tropidurus montanus* (Tropiduridae): Effects of sex, body size and social context. South American Journal of Herpetology, 2, 136-

140.

- Martins, M. (1996). Defensive tactics in Lizards and Snakes: The potential contribution to Neotropical Fauna. Pp. 185-199 in Del Claro, K. (ed), Anais do XIV Encontro Annual de Etologi. Sociedade Brasileira de Etologia, Universidade Federal de Uberlandia, Brasil.
- Nunes, J. V., T. Elisei, and B. M. De Sousa. (2012). Anti-predator behavior in the Brazillian lizard *Tropidurus itambere* (Tropiduridae) on a rocky outcrop. Herpetological Bulletin Number, 120, 22-28.
- Patel, H., V. Naik, and S. K. Tank. (2016). Death-feigning behavior in two species of *Lygosoma* (Squamata: Scincidae) from India. Phyllomedusa, 15 (2), 191-194.
- Rocha, C. F. D. (1993). The set of defense mechanisms in a tropical sand lizard (*Liolaemus lutzae*) of Southeastern Brazil. Ciência e Cultura, 45, 116-122.
- Santos, M.B., M.C.L.M. Oliveira, L. Verrastro, and A.M. Tozetti. (2010). Playing dead to stay alive: death-feigning in *Liolaemus occipitalis* (Squamata: Liolaemidae). Biota Neotrop, 10(4).
- Supsup, C. E., N. M. Puna, A. A. Asis, B. R. Redoblado, M. F. G. Panaguinit, F. M. Guinto, E. B. Rico, A. C. Diesmos, and N. A. D. Mallari. (2016). Amphibians and Reptiles of Cebu, Philippines: The Poorly understood Herpetofauna of an Island with very little remaining natural habitat. Asian Herpetological Research, 7(3), 151–179.
- Sy, E. Y. and J. Alaban. (2014). *Hemidactylus platyurus* (Flat-tailed House Gecko). Predation. Herpetological review, 45 (1), 124.