SHORT COMMUNICATION

Defense behavior of *Gonocephalus grandis* and *Aphaniotis fusca* (Squamata: Agamidae)

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A variety of animal taxa, including amphibians and reptiles, display death-feigning behavior (thanatosis). When performed, the animal pretends to be dead, thereby avoiding threat or attack by a potential predator (Duellman and Trueb 1986, Toledo et al. 2010). Thanatosis is known for various tropical Asian species of snake, such as Coelognathus radiates (Boie, 1827), Macrocalamus chanardi David and Pauwels, 2005, and Xenochrophis piscator (Schneider, 1799) (Vogel and Han-Yuen 2010), Pseudoxenodon macrops (Blyth, 1855) (Bhosale and Thite 2013), Aplopeltura boa (Boie, 1828) (Jablonski and Hegner 2016) and Erythrolamprus miliaris (Linnaeus, 1758) (Muscat et al. 2016). However, this behavior is more, or less rare in lizards (Purkayastha and Das 2010, Patel et al. 2016). Here, I report for the first time, deathfeigning, mouth-gaping, and biting behaviors of two agamid lizards.

Gonocephalus grandis (Gray, 1845) (Great Anglehead Lizard) is large, whereas Aphaniotis fusca (Peters, 1864) (Dusky Earless Agama) is a small. The snout-vent lengths of male and female G. grandis reaches 160 and 137 mm, respectively, and 73 and 64 mm in A. fusca (Grismer 2011). Both species are native to Indonesia, Malaysia, Singapore, and Thailand. The range of G. grandis, extends to Laos and Vietnam, and the lizard occurs at elevations up to 1400 m a.s.l. (Inger and Manthey 2010). The species inhabits primary and secondary forests, and commonly perches on branches or trunks of large trees adjacent to rivers (Ibrahim et al. 2008, Shahriza et al. 2012). In contrast, A. fusca is found in shady, closed canopy, dipterocarp forests in the lowlands and hills (Daicus and Hashim 2004, Grismer 2011), and around peat swamps (Sukumaran et al. 2006). It frequently perches on tree trunks, vines, and twigs adjacent to water (Grismer 2011, Shahriza and Ibrahim 2014).

On 23 July 2017, between 19:00 and 20:00 h, a juvenile *Gonocephalus grandis* and an adult female *Aphaniotis fusca* were captured at Sungai Sedim Recretional Forest (SSRF) ($05^{\circ}25'$ N, $100^{\circ}46'$ E; elevation < 150 m a.s.l.). The juvenile *G. grandis* was captured in leaf litter on the dry

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forest floor, approximately 1 m away from the main river. The area was shady, sheltered by trees and covered creeping plants and bushes. A gravid female A. fusca was captured while perched (head up) on small twigs, about 0.5 m above the ground, beside a big granite boulder. The area was shady and covered with herbaceous vegetation about 2 m from the river. Air temperature $(30^{\circ}C)$ and relative humidity (55%)were measured by using thermo hygrometer. In the laboratory, the snout-vent length (SVL), tail length (TaL), total length (ToL), and head width (HW) of each lizard was measured with digital callipers. SVL = distance from tip of snout to cloaca; TaL = distance from cloaca to tip of tail; ToL = SVL + TaL; and HW = greatest width of head. The SVL, TaL, ToL, and HW of G. grandis are 7.2, 11.4, 18.6, and 1.2 cm, whereas these values in A. fusca are 6.7, 11.8, 18.5, and 1.3 cm, respectively. The life specimen and defensive posture presented by both lizards were photographed by using Olympus digital camera, model SP800UZ with 30× optical zoom. Later, both specimens were euthanized using tricane, fixed with 10% formalin, stored in 70% ethanol and deposited at the School of Pharmaceutical Sciences in Universiti Sains Malaysia (USM) for references. The voucher number for G. grandis and A. fusca were 17USM-SS-GG01 and 17USM-SS-AF01, respectively.

I maintained the lizards in a glass terrarium $(60 \times 30 \times 30 \text{ cm})$ for about 15 hours before photographing them. When released in the laboratory, both individuals tried to escape. I approached the lizards by touching their bodies with blunt forceps. At first, neither lizard responded. However, after touching them repeatedly, each lizard became aggressive, and performed mouth-gaping behavior (Figures 1A, 2A), in which it opened its mouth wider, exposing the serrated teeth and tongue. *Aphaniotis fusca* exhibited the blue color of its oral cavity. Both lizards widened their eyes, displaying fierce faces. They stretched out their fore- and hind limbs, and sometimes moved their

tails up and down. This behavior lasted about 60 s. When I brought the blunt forceps near the jaws, they bit the forceps for 30–50 s.

Both Aphaniotis fusca and Gonocephalus grandis engaged in death-feigning postures with either the ventral surface upward (Figures 1B, 2B) or downward (Figures 1C, 2C). This behavior occurred when the lizards were recaptured in the laboratory and placed on tree bark to be photographed. The species shared several behavioral characteristics, as follow: ventral surface upward, exposing the cloaca area; mouth partially open, exposing serrated teeth; eyes closed; head facing up; and forelimbs stretched out and raised upward, exposing palmar surfaces. However, there are some differences in the death-feigning postures of the two species. In G. grandis, the exposed ventral surface is dirty white mottled with dark-brown on the throat and belly; the hind limbs were outstretched and raised up. In A. fusca, the exposed throat and belly are yellowish, and the oral cavity is blue; the hind limbs are flexed and raised upward. Both individuals were immobilized for about 4 or 5 min, before resuming their ordinary postures. Both lizards also feigned death without turning over (Figures 1C and 2C); they flattened their bodies, such that their throats and bellies touched the substrates. Their heads faced down, both the eyes and mouth were closed, and both fore and hind limbs were outstretched. This posture fully exposed their dorsal surfaces. The dorsal colors and patterns of both lizards resemble their respective habitats (i.e., ground, leaf litter, twigs and branches; Ibrahim et al. 2008, Grismer 2011), thereby camouflaging them.

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Figure 1. (A) A juvenile *Gonocephalus grandis* displaying mouth-gaping behavior. (B) Death-feigning (venter up). (C) Death-feigning (venter down).



Figure 2. (A) A gravid female *Aphaniotis fusca* exhibiting mouth-gaping behavior. (B) Death feigning (venter up). (C) Death-feigning (venter down).

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