Notes on the discovery of fluorescence in Australian Scolecophidians in the genus Anilios Gray 1845 (Serpentes: Typhlopidae)

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Fluorescence in terrestrial vertebrates is seemingly quite rare, however it has recently been shown to occur in a number of species of Chameleons; *Archaius, Bradypodion*, *Brookesia*, *Calumma*, *Furcifer*, *Palleon*, *Kinyongia*, *Trioceros* (Prötzel *et al*. 2018.) and in the tree frog Boana punctata (Taboada *et al*., 2017). Here we detail the preliminary inadvertent discovery of fluorescence in Australian blindsnakes, *Anilios bituberculatus* (Peters, 1863) and *Anilios proximus* (Waite 1893). We also give some initial observations of fluorescence in museum specimens held in Australia by using the same ultraviolet emitting Light Emitting Diode (L.E.D) torch. The torch is made up of 51 Light emitting diodes fitting into the reflector, emitting light at 395 Nm.

On the 16th of January 2006 20:45 AEST, one of the authors (A.E) was in south-east of Nhill, Victoria Weather conditions were approximately 26 degrees Celsius with relative humidity of 60%, the sky was clear with lunar cycle two days post full moon. The habitat was typical mallee heathland with a sandy loam. While searching for scorpions with an ultraviolet emitting LED torch, the first Prong-snouted blindsnake *Anilios bituberculatus* was noticed fluorescing in the torch beam, on a patch of bare sand at a distance of approximately twelve metres away. The snakes were fluorescing in a similar manner to the scorpions present but much less luminescent. In total, four *A. bituberculatus* were located that evening, each of the specimens gave off a similar greenish- blue glow.

On 16 December 2008 at 20:40 AEST, one of the authors (S.E) found a road killed *A. proximus* from Beechmont, Queensland which also exhibited limited fluorescence. A live specimen from Beechmont, Queensland was seen and photographed that night at

Figure 1. *Anilios proximus*, Beechmont, Queensland (Image lit with flash) S. Eipper

Figure 2. *Anilios proximus*, Beechmont, Queensland (Image lit with UV emitting LED torch) S. Eipper

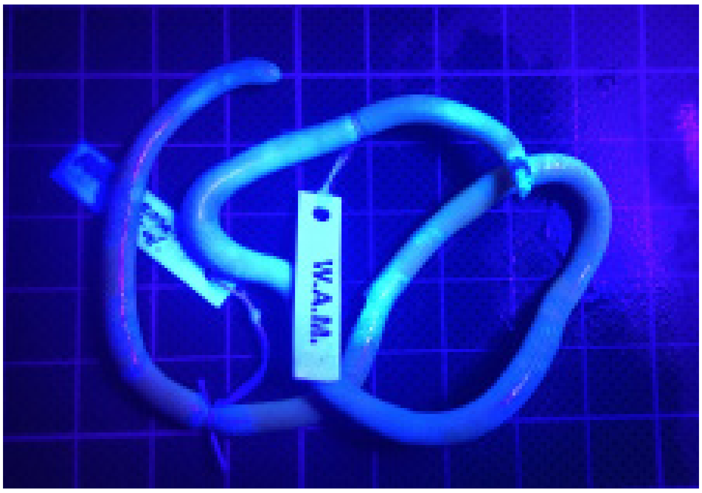

Figure 4. *Anilios margaretae* Neale Junction, Western Australia (Image lit with UV emitting LED torch) S. Eipper

22:17 AEST using only an ultraviolet emitting LED torch as the light source (See figures 1 and 2) weather and habitat conditions were not recorded.

During 2018, museum specimens of 26 species were examined in an effort to determine whether preserved specimens also exhibited fluorescence. We used the same ultraviolet emitting LED torch as the sole light source in the specimen examination laboratories. By switching off all room and desk lighting we arrived with the results detailed in table 1. Some species showed no or limited luminescence while others showed significant luminescence. One specimen of interest was *Anilios margaretae* (R163269) from Neale Junction, Western Australia, apparently plain in normal light, when lit using an ultraviolet emitting LED torch some unusual markings that fluoresced more strongly than other parts of the dorsum that were visually normal under typical light conditions. No signs of damage to the specimen were apparent on examination. (See figures 3 & 4).

An additional point of interest, is that only live *Anilios bituberculatus* exhibited fluorescence. Preserved specimens gave little or no apparent signs of fluorescence. Potential explanations for this could be due to the specimens coming from significantly different locations (Eipper, 2012)., different wavelength torches (Blass & Gaffin, 2008), cryptic speciation (Marin et al, 2013), age, position within the ecdysis cycle (Eipper, 2012), preservation practices or a combination of multiple conditions.

The significance of what role fluorescence might play in the ecology of *Anilios* is unclear. Blind snakes have

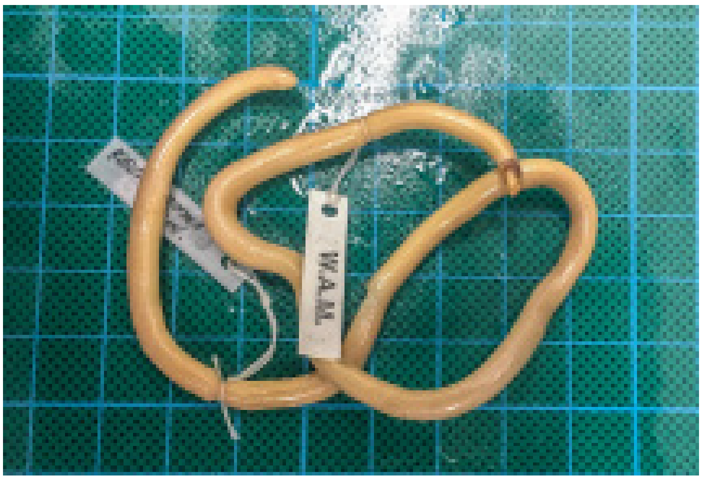

Figure 3. *Anilios margaretae* Neale Junction, Western Australia (Image lit with flash) S. Eipper

Table 1. Specimens examined and reactivity to exposure under ultraviolet emitting LED torch.

Species	Live /dead/preserved	Strong	Weak	Negilible/ Not apparent
Anilios affinis	Preserved		X	
Anilios aspina	Preserved			X
Anilios batillus	Preserved		X	
Anilios bituberculatus	Preserved			X
Anilios bituberculatus	Live	X		
Anilios chamodracaena	Preserved	X		
Anilios diversus	Live		X	
Anilios guentheri	Preserved		X	
Anilios howi	Preserved		X	
Anilios insperatus	Preserved	X		
Anilios leptosoma	Preserved	X		
Anilios leucoproctus	Preserved			X
Anilios ligatus	Preserved		X	
Anilios ligatus	Live			X
Anilios longissiumus	Preserved	X		
Anilios margaretae	Preserved	X		
Anilios micromma	Preserved		X	
Anilios nigrescens	Preserved		X	
Anilios nigrescens	Live			X
Anilios obtusifrons	Preserved		X	
Anilios proximus	Preserved	X		
Anilios proximus	Live		X	
Anilios proximus	Dead		X	
Anilios robertsi	Preserved			X
Anilios silvia	Preserved		X	
Anilios splendidus	Preserved		X	
Anilios torresiannus	Dead			X
Anilios torresiannus	Preserved			X
Anilios troglodytes	Preserved		X	
Anilios weidii	Live			X
Anilios yampiensis	Preserved		X	
Anilios yirrikalae	Preserved			X
Anilios zonula	Preserved	X		
Anilios sp. (Mt Isa)	Dead			X
Ramphotyphlops exoceti	Preserved			X

poor eyesight, are usually fossorial or subterranean and prey upon the larvae of ants and termites (Eipper & Eipper, 2019; Cogger, 2018; Wilson & Swan, 2017). It is potentially a byproduct of another physiological process or as an anti-predation/detection agent allowing the snake to enter the nest galleries of its prey undetected. It could also be an anti-predation strategy while they are exposed on the surface. Many species of birds can see in the UV spectrum (Withgott, 2000) and it may act as a warning to being unpalatable. Further research is required to determine if certain wavelengths show higher or lower rates of luminescence and if preservative degrades or increases the luminescence.

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