NATURAL HISTORY NOTE

Biofluorescence in the Skeletal System of the Granite Night Lizard (*Xantusia henshawi*), in Baja California, Mexico

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Biofluorescence in wildlife has been reported for numerous species, including mammals, birds, reptiles, amphibians, and invertebrates (Lawrence 1954, Babu et al. 2002, Honkavaara et al. 2002, Maxwell and Johnson 2002, McGraw and Nogare 2004, Lagorio et al. 2015). The phenomenon typically occurs when tissues absorb electromagnetic radiation (i.e., light) at relatively high wavelengths and re-emit that light at a lower wavelength, resulting in the emission of light that fluoresces. Recent studies have revealed biofluorescence in several amphibian (Deschepper et al. 2018, Whitcher 2020, Alvarez et al. 2022) and reptile species (Gruber and Sparks 2015, Seiko 2019, Fuentes Magallón et al. 2021) under ultraviolet light (UV) excitation (Lamb and Davis 2020). However, nearly all reports have reported that biofluorescence has been restricted to the skin/scales of herpetofauna, or in some cases, the eyes of frogs (Alvarez et al. 2022, Alvarez and Perpignani 2024). Goutte et al. 2018 found the bones of pumpkin toadlets (*Brachycephalus* spp.) fluoresced, and Prötzel et al. (2018) found that the bones of chameleons (*Calumma* spp.) also fluoresced and suggested that the phenomenon may be a part of interspecific communication. Here we report on another squamate that possesses bones that fluoresce when exposed to UV light.

As part of a herpetofaunal workshop targeted to capture and identify herpetofauna in the northwestern region of Baja California, we attempted to find and capture the Granite Night Lizard (*Xantusia henshawi*) among expansive boulder and exposed bedrock formations on the Meling Ranch, Baja, California, Mexico. The site (30.966912 N, 115.745535 W) was comprised of a mix of chaparral and patches of grazed grassland, with a perennial arroyo flowing north/south through the site. Boulder fields were common in this area and Granite Night Lizards are equally common in appropriate microhabitat (the species is typically saxicolous). Our surveys began approximately 8 PM on 30 April 2025, where we searched boulder faces and cracks in boulders that were approximately 2 cm or less in width. Lizards we detected were captured by lizard loop (formerly lizard noose), and by hand.

We examined adult Granite Night Lizards with a white light—a 480-lumen (COAST® PX1 LED) flashlight. Lizards held in the hand were also exposed to a 365 nm ultraviolet (UV) light (®Convoy C8 + 365nm UV LED Flashlight with Patented Glass Filter) for 5 to 10 seconds. We immediately noted that granite night lizards showed biofluorescence that we described as light blue, nearly entirely from the skull, vertebrae (dorsal side), and from the hyoid bone (ventral side) (Figs. 1 and 2).

Authors have reported biofluorescence from the skin of several reptiles (Gruber and Sparks 2015, Seiko 2019, Fuentes Magallón et al. 2021) and the bones of chameleons (Prötzel et al. 2018). The role of biofluorescence has been a subject of much speculation and consideration by researchers (Honkavaara et al. 2002, Lagorio et al. 2015, Prötzel et al. 2018). Interspecific communication, and even general interaction (i.e., avoidance, attraction, identification, etc.) among conspecifics has been suggested by several authors (Lim et al. 2007, Sparks et al. 2014, Marshal and Johnsen 2017, Prötzel et al. 2018, Lamb and Davis 2020). Currently it is unclear how biofluorescence in these squamates may affect each individual, either positively or negatively.

Prötzel et al. (2018) and Alvarez et al. (2022) reported that researchers should attempt to test additional wavelengths of light (e.g., blue light: 440-460 nm) or the use of ocular filters (yellow/orange, particularly for photography), which may increase detection probability in the field (Lamb and Davis 2020, Kong et al. 2023), potentially facilitating survey efforts for these declining species. In the case of the Granite Night Lizard, detectability does not appear to increase with the field use of a UV light (pers. obs.). Based on work by Moncrief and Dooley (2013) however, we suggest that it may be valuable to use UV light when investigating the fecal samples of predators of this species to determine if the species is present. This may be equally important for the similar and closely related Sandstone Night Lizard (*X. gracilis*)—a highly endemic species in California, and a California species of special concern. If the Sandstone Night Lizards also possess bones that fluoresce, it may be possible to detect additional predators that may be impacting this highly restricted lizard.

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Fig. 1. Dorsal side of Granite Night Lizard showing vertebral and skull fluorescence under UV light (665 nm). Photo by Jeff Alvarez.

Fig. 2. Ventral side showing hyoid bone fluorescing (arrow) under UV light (665 nm). Photo by Jeff Alvarez.

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NATURAL HISTORY NOTE

Further Evidence of Range-wide Overwintering in the Larvae of the California Tiger Salamander (*Ambystoma californiense*)

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With some exceptions, the larval form of biphasic amphibians transition through a larval phase lasting one to three seasons, or more, following hatching from the egg (Gilbert and Frieden 1981, Duellman and Trueb 1994, Dodd 2013, Petranka 1998). Metamorphosis normally follows the larval phase and can be highly variable among amphibians in timing and duration, becoming extreme in the urodels—permanently remaining in the larval form (i.e., neoteny, paedogenisis, and paedomorphosis; Gould 1977, Alberch et al. 1979). Facultatively paedomorphic salamander populations vary both locally and annually in their frequency of metamorphs and paedomorphs (Eagleson 1976, Patterson 1978, Sexton and Bizer 1978, Collins 1981, Semlitsch 1985). Semlitsch (1985) and Whitman (1994) reported that facultatively paedomorphic individuals retain the ability to metamorphose, suggesting that populations can be a mix of terrestrial adult forms as well as paedomorphs. In California, members of the Ambystomidae show signs of paedomorphosis with members of the genus *Dicamptodon* known to be paedomorphic (Stebbins and Cohen 1995). Other Ambystomids in California, particularly the non-native Barred Tiger Salamander (*Ambystoma mavortium*) also shows signs of paedomorphism (Petranka 1998). Additionally, the California Tiger Salamander (*A. californiense*) has been reported to overwinter as larvae, but the behavior was thought to be isolated to areas of the eastern San Francisco Bay Area (i.e., Alameda, Contra Costa, Alameda, and Santa Clara counties; Alvarez 2004, Wilcox et al. 2015). Here in we report on overwintering larvae of the California Tiger Salamander in a disparate area relative to initial reports, and remark on management implications.

Focal surveys for California Tiger Salamander larvae in eastern Merced County were conducted for five consecutive years from 2017 to 2021 within the range of the Central Valley Recovery Unit of the California Tiger Salamander (management unit determined by the U.S. Fish and Wildlife Service [USFWS 2017]). Surveys were conducted in vernal pool grassland habitat, specifically in aquatic features, including natural playa pools, as well as human-made cattle

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