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Ultraviolet Reflectance in the Small Skink *Carlia pectoralis*

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Many vertebrates have ultraviolet (UV) vision (Jacobs 1992; Tovée 1995). Among lizards, the anoles (family Polychrotidae) are most well-studied in terms of visual communication involving UV light. In *Anolis carolinensis*, the visual pigments have been characterized and one (SWS1[Ac]), has been found to be most sensitive at 358 nm, in the UV region of the spectrum (Kawamura and Yokayama 1998). Evidence for the behavioral use of UV reflectance comes from a study of the dewlaps of five other *Anolis* species (Fleishman et al. 1993). Two species (*A. krugi* and *A. cristellatus*) had highly UV reflectant dewlaps (Absolute reflectance > 35% at 365 nm), while another two species (*A. evermanni* and *A. gundalachi*) had low UV reflectant dewlaps (< 22%). A further species (*A. pulchellus*) was intermediate in dewlap reflectance (25%). Importantly, the species with highly UV reflectant dewlaps live in microhabitats exposed to direct sunlight, while the two low reflectant species live in closed-canopy forest, suggesting a strong link between UV visual communication and environmental light regimes. However, UV sensitivity of photoreceptors only broadly matched the spectral radiance of the habitats, suggesting only a modest amount of coevolution between the dewlap 'signal' and the photoreceptor 'receiver' (Fleishman et al. 1997). Also, the desert iguana (*Dipsosaurus dorsalis*) produces femoral gland secretions that are highly reflectant to UV, and behavioral experiments suggest that that species is visually sensitive to the near UV and can locate UV reflectant markers (Alberts 1989). To our knowledge, UV reflectance and communication has not been reported in any other group of lizards.

The small, leaf-litter dwelling Australian skink, *Carlia pectoralis*, is a member of a genus that exhibits considerable sexual dichromatism (Greer 1989). In this species, breeding males possess orange lateral stripes which attract females and are also used in aggressive contests with other males (Blomberg and Owens, unpubl.). Interestingly, however, breeding males also have a grey-blue gular (throat) region. Because *C. pectoralis* lives in open sunlight and appears to rely heavily on color in social interactions, we hypothesized that the gular region, which is dull in the visual part of the spectrum, may be reflective in the UV.

We measured the UV reflectance of the gular region, midlateral stripe, and brown dorsal region of a breeding male *C. pectoralis* using an S2000 optical spectrometer (Ocean Optics, Dunedin, Florida, USA), with a dual deuterium-tungsten lamp. The deuterium lamp is optimized for wavelengths between 200 and 400 nm, while the tungsten lamp is optimized for wavelengths between 350 and 750 nm. A 'labsphere' certified standard was used as the white standard. All measurements were taken in a darkened room in order to minimize interference from extraneous light sources. Measurements were taken at 45° to the skin, over an area of 3 mm in diameter.

As predicted, the gular region of male *C. pectoralis* is highly reflectant in the ultraviolet region, with a peak at 338 nm, whereas other regions of the body show negligible UV reflectance (Fig. 1). Our results are important for two reasons. Firstly, UV reflectance may be much more prevalent than previously expected, and may not be limited to groups that are thought to rely primarily on vision (UV or visual spectrum) for communication, such as anoles. Our

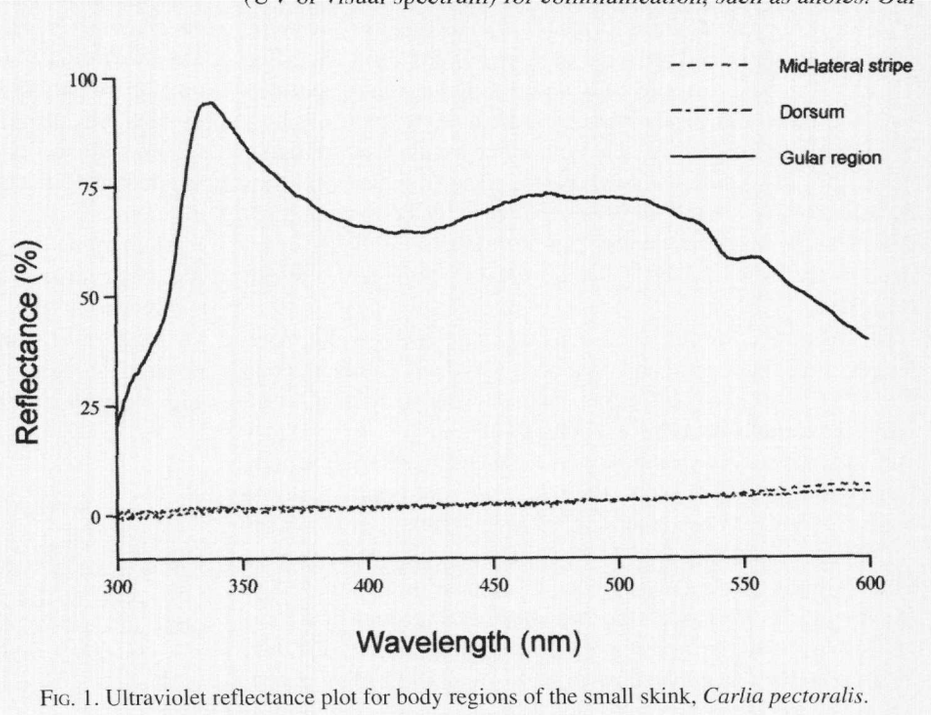

FIG. 1. Ultraviolet reflectance plot for body regions of the small skink, *Carlia pectoralis*.

results suggest that skinks, which are known for their use of chemoreception (e.g., Cooper and Vitt 1984; Cooper and Vitt 1986a, b, c; Nicoletto 1985), can also be highly visually oriented, and may use UV reflectant regions of the body for communication. Secondly, our results suggest that communication in *C. pectoralis* is more complex than previously suspected. Previous studies have concentrated on the adaptive significance of coloration of the orange lateral stripes, which are not UV reflective (Fig. 1; Blomberg and Owens, unpubl.). The role of the gular region in *C. pectoralis* behavior is not known. Casual observation of skinks in the field suggests that it could be related to the "head-nodding" behavior, perhaps as an "amplifier" trait that allows the head nod to be seen over a wider area by flashing in the UV spectrum (Zahavi and Zahavi 1997).

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HERPETOLOGICAL HISTORY

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A Clarification of the Type Locality and Collector of the Holotype of *Sauromalus obesus* (Baird) 1858

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The western chuckwalla, *Sauromalus obesus*, was originally named *Euphryne obesus* by Spencer F. Baird in 1858, and later properly emended to *Euphryne obesa* (Baird 1859). The genus *Euphryne* was eventually synonymized with *Sauromalus* by Cope (1875). In a recent comprehensive study of the genus *Sauromalus*, Hollingsworth (1998) placed *S. obesus* in the synonymy of *S. ater*. As an aside, while I accept the conspecificity of these two nominal taxa, I argue elsewhere (Montanucci 2000) that the name *S. obesus* should be given precedence over *S. ater*.

In Baird's original description (1858:253), the only collection information is the following: "Abundant in the canons of the Colorado, of California, collected by Maj. Thomas, Mex. Boundary Survey, and Lt. Ives' Expedition. Type No. 4172." One might reasonably conclude from Baird's brief statement that the type locality is "canons of the Colorado, of California" and that Major Thomas is the collector. Subsequently, Baird (1859:6) listed USNM 4172 from Fort Yuma without explicitly stating it was the type specimen. He also listed A. Schott as the collector of this specimen, and Major Thomas as the collector of USNM 2774, also from Fort Yuma. Hence, Baird's two published works are incomplete and seemingly contradictory in regards to the type locality and collector of the type specimen (Fig. 1).

***Euphryne obesus*, Baird.**—**Width of head nearly equal to distance from nose to ear. Tail shorter than the body. General color of the young, olive green, with five broad transverse bars above from head to base of tail, and about as many on the tail; these rings yellow, dotted with red. Beneath pea green dotted with black. With increasing age, the bands become obsolete and disappear, the general color becoming reddish olive.**

The largest and heaviest of American *Iguanidæ*, sometimes exceeding a foot in length. Abundant in the canons of the Colorado, of California, collected by Maj. Thomas, Mex. Boundary Survey, and Lt. Ives' Expedition. Type No. 4172

21. EUPHRYNE OBESA, Baird.

PLATE XXVII.

Euphryne obesus, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—Width of head nearly equal to distance from nose to ear. Tail shorter than the body. General color of the young, olive green, with five broad transverse bars above from head to base of tail, and about as many on the tail; these rings yellow, dotted with red. Beneath, pea green, dotted with black. With increasing age the bands become obsolete and disappear, the general color becoming reddish olive.

2774 Fort Yuma. Major Thomas.—4172. Do. A. Schott.

FIG. 1. Upper: Description of *Euphryne obesus* from Baird (1858). Lower: Description from Baird (1859). The dash serves to divide the two USNM specimens and their respective collectors. Do. is an abbreviation for "ditto" in reference to the locality. The absence of a period after 2774 is an omission; other numbers on the page are followed by a period. USNM 2774 was erroneously assigned to a chuckwalla specimen; see text for further explanation. Courtesy: David H. Lewis.