

Evidence of Sexual Dimorphism in Neonate Henkel's Leaf-tailed Gecko, *Uroplatus henkeli*

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Uroplatus henkeli is one of eleven recognized species of *Uroplatus* endemic to Madagascar. The sex of all species of *Uroplatus* can easily be determined by the presence of large hemipenial bulges in adult males. In addition, adult *U. henkeli* are sexually dimorphic by color (Glaw and Vences 1994; Henkel and Schmidt 1995). It has also been noted that some male *U. henkeli* exhibit a vertebral stripe as neonates; however, many juvenile males do not manifest this trait (Foley and McGinnity 1996). Other than the occasional presence of a vertebral stripe, sexual dimorphism in juvenile *U. henkeli* has yet to be described.

At Riverbanks Zoo and Gardens, two other traits have been consistently noted in neonates: parallel, longitudinally-oriented black striations on the dorsum and a transverse, bilaterally symmetrical black mark at the base of the skull. In a group of ca. 30 *U. henkeli* that were reared from hatching to sexual maturity, these two traits were never observed on the same neonate and seemed to correlate with the sex of the gecko. The presence of the markings was thought to represent a reliable method of determining the sex of neonate *U. henkeli*.

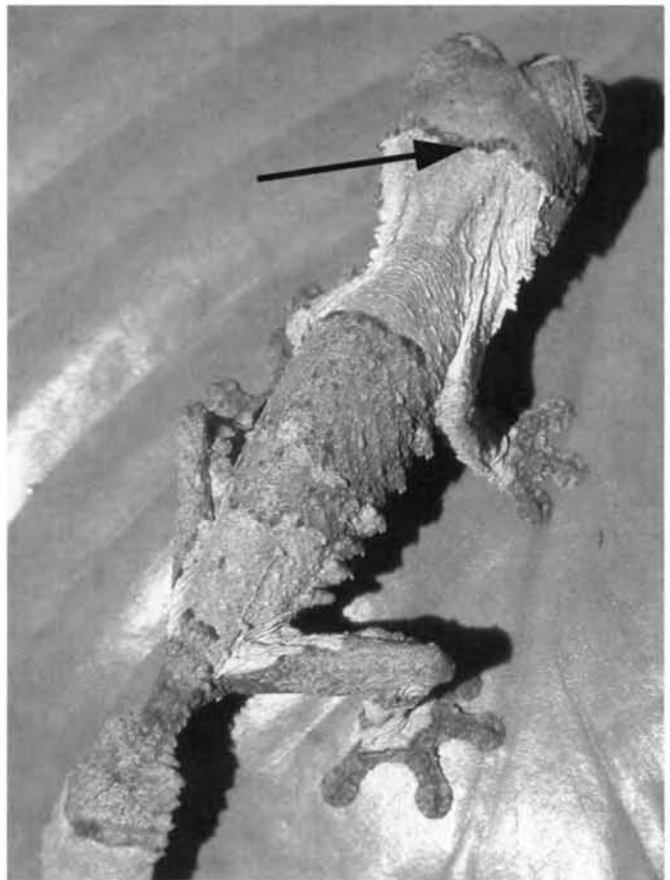


FIG. 2. Female neonate *Uroplatus henkeli* displaying the typical transverse, bilaterally symmetrical black marking at the base of the skull.

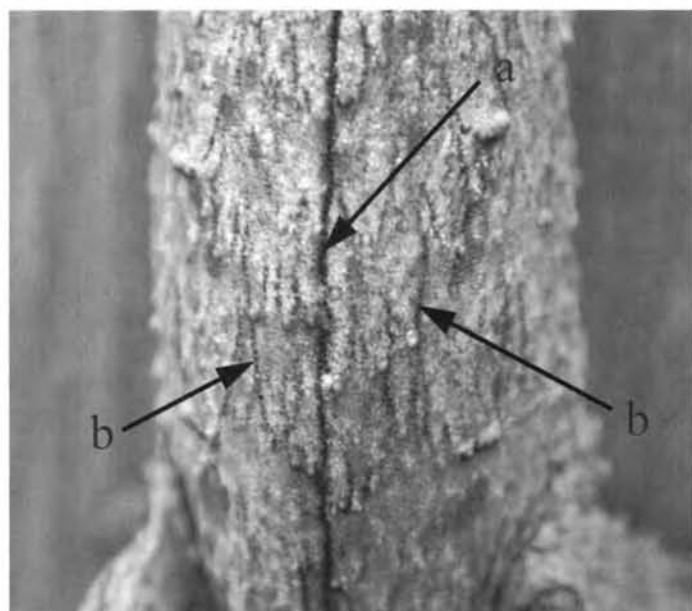


FIG. 1. Male neonate *Uroplatus henkeli* displaying the typical: (a) vertebral stripe and (b) dorsal striations.

To test this hypothesis, 100 hatchling *U. henkeli*, from twelve different bloodlines, were selected for rearing. Of those, 50 exhibited the parallel black striations on the dorsum and were thought to be males, including two that also exhibited the cranial marking (Fig. 1). The other 50 did not exhibit the dorsal striations and were thought to be females. Forty-five of these females also exhibited the black cranial mark at the base of the skull (Fig. 2). All of the neonates were reared until adult external sexual characteristics began to appear (i.e., hemipenial bulges and larger spur size in males), which can take up to nine months to manifest.

The most accurate period to sex neonates was directly after they hatched. During this time the visual characteristics were very apparent. As the geckos grew, these traits often faded and in many cases disappeared altogether. The fading or disappearance of these traits was unique to each gecko and occurred in as little as three months while others retained the markings into adulthood. Also, because of *U. henkeli*'s ability to change color, the markings may not be easily distinguishable, especially during the daylight hours when the markings and ground color tend to lighten. At night, there is significantly more contrast between the markings and the ground color.

According to our observations, the only characteristic that was 100% effective in sexing neonate *U. henkeli* was the presence of the black striations on the dorsum of males. All males exhibited this trait while none of the females did. The presence of a vertebral stripe (Fig. 1) also suggested that an individual would be a male but was only present in 38% of males sampled (Table 1).

TABLE 1. Presence of physical characteristics in male and female *Uroplatus henkeli*.

Sex	N	Vertebral stripe	Dorsal striations	Cranial markings
Male	50	19 (38.0%)	50 (100%)	2 (4.0%)
Female	50	0	0	45 (90.0%)

The horizontal black marking on the cranium (Fig. 2) was observed in 90% of the females and 4% of the males (Table 1). Thus our data are strongly suggestive of juvenile sexual dimorphism in *Uroplatus henkeli*.

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LITERATURE CITED

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NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in Volume 36, Number 1 (March 2005).

CAUDATA

ENSATINA ESCHSCHOLTZII OREGONENSIS × **PICTA** (Oregon × Painted Salamander Intergrade). **BEHAVIOR.** *Ensatina eschscholtzii* is the most widespread and common plethodontid salamander in western North America, with the range extending from southern British Columbia to northern Baja California (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Massachusetts. 336 pp.). However, little is known about the climbing behavior of this salamander. In addition, little is known about the climbing behavior of *Batrachoseps attenuatus* or *Taricha granulosa* (Hayes and Hayes 2003, Herpetol. Rev. 34:45–46; Aubry 2000, J. Wildl. Mgmt. 64:1041–1052; Jones and Aubry 1985, Herpetol. Rev. 16:26; Stebbins 1954, Univ. California Publ. Zool. 54:47–124).

An extended period of observation of the climbing behavior of terrestrial salamanders and their use of stumps as habitat was performed from 23 Nov 2001 to 29 Mar 2003. The site is located within the coastal redwood region of Humboldt County, in a semi-rural area of Westhaven, California USA (T8N R1E SW1/4 Sec

31; elev. ca. 100 m) (Sundell and Norman 2003, Herpetol. Rev. 33:4). The stumps were Redwood (*Sequoia sempervirens*) that were logged five decades ago. The forest canopy consisted of old-growth Sitka Spruce and second growth Redwood, with few Red Alder (*Alnus rubra*) and Cascara Buckthorn (*Rhamnus purshiana*) in the understory.

On 29 Jan 2001, two subadult female *E. eschscholtzii* intergrades were found on a Redwood stump (stump #1) covered with introduced English Ivy (*Hedera helix*) under a piece of Redwood bark in site 5. The stump was 6 m diam with Evergreen Huckleberry (*Vaccinium ovatum*) and spruce seedlings present on top of the stump ca. 1 m off the ground. The cover object measured 30 × 20 × 4 cm with a temperature of 11.4°C in the covered litter and English Ivy roots. The first female measured 7.3 cm TL and 3.6 cm SVL (measured to the anterior edge of cloaca), the other female measured 7.6 cm TL and 3.9 cm SVL.

On 16 Feb 2002, an *E. eschscholtzii* adult male intergrade (10.4 cm TL, 4.6 cm SVL) and a *B. attenuatus* were found 1.2 m off the ground on another redwood stump (stump #2), under litter, which was 8°C measured at a depth of 9 cm. The stump measured 5.2 m diam and was covered by False Lily-of-the-Valley (*Maianthemum dilatatum*) and two young spruce trees, which measured 4 cm in diameter.

On 2 Mar 2002, an adult male *E. eschscholtzii* intergrade (9.3 cm TL, 4.5 cm SVL) was found under litter on stump #2. This male was marked as LF2 RF2. The litter temperature was 7.3°C, which was measured at a depth of 9 cm. In addition, springtails, centipedes, and arachnids were located in the litter.

On 16 Mar 2002, an adult female, *E. eschscholtzii* (10.5 cm TL, 5.1 cm SVL) was found on another redwood stump (#3), 4.5 m diam. This salamander was wedged between pieces of outer bark, located 1.6 m off the ground.

The first stump was inspected again on 6 April 2002, and produced a female Rough Skinned-Newt (*Taricha granulosa*) (11.7 cm TL, 4.7 cm SVL). The newt was found under the same piece of bark as the previous *Ensatina* salamanders found on top of stump #1. Also, present under the cover object with the newt was an adult *B. attenuatus*, which escaped capture.

On 16 Nov 2002, a subadult female *E. eschscholtzii* (7.6 cm TL, 4.1 cm SVL), was found under litter on stump #2, with a litter temperature of 10.8°C. Then again, on 25 Jan 2003, an adult male *E. eschscholtzii* (9.6 cm TL, 5.0 cm SVL), was found on the same stump, with a litter temp of 13.0°C. However, this was a recapture of the adult male (LF2RF2), first captured on 2 Mar 2002, on the same stump #2. Again, three more *B. attenuatus* juveniles were located under litter on top of the same stump. The litter had a temperature of 9.8°C at a depth of 9 cm.

On 15 Mar 2003, a subadult Wandering Salamander (*Aneides vagrans*) (7.4 cm TL, 4.1 cm SVL) was located on a Redwood stump (stump #4) with a subadult *B. attenuatus* (7.2 cm TL, 3.2 cm SVL), under a Redwood cover object 78 cm × 40 cm × 28 cm, which was located 1.5 m. above the forest floor. Stump #4 measured 3.1 m diam. The temperature in the interstitial space was 12.0°C.

Finally, on 29 Mar 2003, three more subadult *B. attenuatus* were located under litter on top of stump #2, which had a litter temperature of 11.7°C covering the coiled salamanders.

These observations emphasize the colonization of tree stumps