

## **DO PINHEAD CRICKETS HAVE THE AMINO ACID PROFILE TO SUPPORT GROWTH IN LA HOTTE BUSH FROGS (*ELEUTHERODACTYLUS BAKERI*)?**

*Barbara Todd BS, GC*

*Philadelphia Zoo, 3400 W. Girard Avenue, Philadelphia, PA 19104, USA.*

### **Abstract**

The Philadelphia Zoo has been working with Haitian frogs since 2010. La Hotte bush frogs (*Eleutherodactylus bakeri*) were collected in order to develop captive husbandry/breeding protocols. *E. bakeri* was once a very common frog in southwestern Haiti, but due to habitat destruction, the species is now considered Critically Endangered (Hedges *et al.*, 2004). This species is small compared to other species of frogs typically kept at zoos. Wild adult females are approximately 4 centimeters long and may weigh up to 4 grams when gravid, while males are somewhat smaller. Females can lay communal nests with individual clutches of up to 30 or more per female (Hedges *et al.*, 1987; Hedges and Thomas, 1992; C. Martinez Rivera, Philadelphia Zoo, Philadelphia, PA, personal communication) and have a seasonal reproductive cycle from May to November. In captivity, reproduction typically begins in June, about a month after the onset of an artificial rainy season (C. Martinez Rivera, Philadelphia Zoo, Philadelphia, PA, personal communication). Froglets in this species are extremely tiny when they hatch. At this stage, springtails are offered as the only dietary item. As the froglets grow, they transition to a diet of pinhead crickets.

We began our breeding colony with 32 *E. bakeri*. The animals did well in captivity, and the first eggs were laid in June 2011. By September of that same year, our colony had grown to 1200 *E. bakeri*. The rate of reproduction exceeded the Zoo's expectation, and holding capacity for this species was quickly challenged. The decision was made to temporarily cease reproduction and focus on other aspects of captive management including veterinary care and husbandry. Of note and concern is that even though Zoo-hatched frogs survived to maturity and reproduced themselves, these individuals did not achieve the same adult size as founders.

In 2015, the population of frogs had dropped to a level the Zoo was comfortable with managing, and the decision was made to start breeding the animals again. The frogs were housed in the same area and under the same conditions originally used for the wild-caught (founder) animals. Subsequent to this effort to restart reproduction, the frogs produced several small clutches of eggs, and froglets emerged; however, none of the froglets survived.

The Zoo has been investigating husbandry issues that may be impacting survival and growth. The potential for nutrition to be an important or primary factor, in both the smaller size of zoo-hatched frogs and the more recent failure of froglets to survive to maturation, has been under investigation and discussion.

Specifically, we have been investigating the role of amino acids (AA): Is the AA profile affecting reproduction and the survivability of early stage froglets? Are limiting AA in the current diet impacting longer-term growth and resulting in smaller adult size?

AA are extremely important for growth. Much work has been done in livestock and laboratory animals to identify the limiting order of amino acids (from food) for growth (Anderson & Warnick, 1966; Fernandez *et al.*, 1994; Panemangalore *et al.*, 1970). Although the order in which the top three dietary amino acids become limiting varies as to the one that is most limiting for a specific grain. The top three limiting AA are consistently lysine, threonine and methionine in chicks and lysine, threonine and isoleucine in rats.

To date, we have done initial analysis of pinhead crickets and have identified several important issues with prey of this size.

1. Pinhead crickets purchased from suppliers are not true pinheads - the youngest we were able to acquire were 3 day olds.
2. The first 10-day old pinhead samples we submitted to Midwest Laboratories were described by their analyst as non-homogeneous, since legs and other parts of the exoskeleton were apparent after grinding to the laboratory specifications. Heterogeneous mixtures have higher variation within samples.
3. The second set of 10-day old pinhead samples were collected more carefully - separating fecal and shed contaminants from insects prior to submission for analysis.

Our initial findings indicate that pinheads, as a sole food item, may be deficient in the amino acids needed to support growth.

No nutritional analysis currently exists for springtails, and that work remains to be done.

### **Literature Cited**

Anderson JO and Warnick RE (1966) Sequence in which essential amino acids become limiting for growth of chicks fed rations containing cottonseed meal. *Poult Sci* 45(1): 84–89.

Fernandez SR, Aoyagi S, Han Y, Parsons CM, and Baker DH (1994) Limiting order of amino acids in corn and soybean meal for growth of the chick. *Poult Sci* 73(12): 1887–1896.

Hedges B, Thomas R, and Powell R (2004) *Eleutherodactylus bakeri*. In: The IUCN Red List of Threatened Species. <http://www.iucnredlist.org/details/56449/0>. Accessed August 13, 2017

Hedges, SB, Thomas R, and Franz R (1987) A new species of *Eleutherodactylus* (Anura, Leptodactylidae) from the Massif de la Hotte, Haiti. *Copeia* 1987(4):943-949.

Hedges SB and Thomas R. (1992) Two new species of *Eleutherodactylus* from remnant cloud forest in Haiti (Anura: Leptodactylidae). *Herpetologica* 48(3):351-358.

Panemangalore, M, Guttikar, MN, Rao, MN, and Swaminathan, M (1970). Sequence in which essential amino acids become limiting for growth of rats fed rations containing cottonseed meal. *J Sci Food Agric* 21(8): 437–438.