

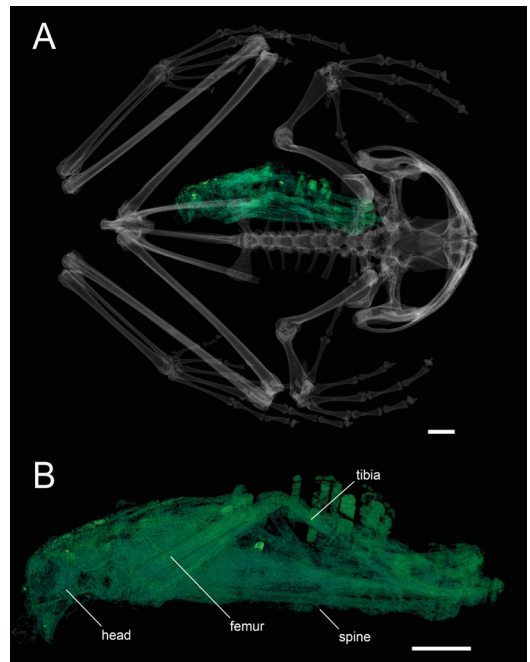
## First dietary record of *Gastrotheca guentheri* (Boulenger, 1882), the lone anuran with true mandibular teeth

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Within extant amphibians, all salamanders and caecilians are thought to possess mandibular teeth, while all living frogs lack dentition on the lower jaw with the notable exception of *Gastrotheca guentheri* (Duellman and Trueb, 1986). When Boulenger (1882) first described *G. guentheri*, he recognized the uniqueness of its mandibular teeth and thus placed this species in a monotypic genus (*Amphignathodon*) and its own family (Amphignathodontidae). Duellman et al. (1988) used immunological data to demonstrate that the species is embedded within the genus *Gastrotheca*, and this placement has been supported by cranial osteology, external morphology, reproductive biology, and advertisement call (Duellman, 2015). Recently, Wiens (2011) used a molecular phylogeny and ancestral state character reconstruction to demonstrate that mandibular teeth were lost in the ancestor of crown-group frogs more than 200 million years ago and subsequently regained in *G. guentheri*, seemingly in violation of Dollo's Law that posits structures lost over evolutionary time cannot be regained. The function of the mandibular teeth in *G. guentheri* remains unknown, but Wiens (2011) suggested the teeth may play a role in the capture of large prey. Yet, to date, there are no dietary records known for this species or any other *Gastrotheca*. Unfortunately, *G. guentheri* was always a rare species endemic to the cloud forests of Colombia and Ecuador, and a living specimen has not been documented since 1986 (Chasiluisa et al., 2018).

In order to study its skeletal anatomy, we loaned an adult female specimen of *Gastrotheca guentheri* (KU 164226, 71.5 mm snout–vent length, 32.7 mm head width) that was collected on 03 April 1975 from

Pichincha, Ecuador (-0.2452778 S, -78.7261111 W). We performed high-resolution X-ray computed tomography scanning of the entire body using a GE v|tome|x M 240 at the University of Florida's Nanoscale Research Facility; we used a 180 kv x-ray tube and diamond-tungsten target with the voltage and current set to 90 kv and 200  $\mu$ a, respectively. While reconstructing the skeleton using the region-growing and smoothing tools of VG StudioMax (Volume Graphics, ver. 3.2.4),



**Figure 1.** A) Dorsal view of *Gastrotheca guentheri* (KU 164226) with a large orthopteran in its gut. B) Lateral view of orthopteran. Images are based on computed tomography scanning. The orthopteran insect was segmented and artificially coloured by a density gradient using VG StudioMax. Scale bar equals 5 mm.

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we identified a large prey item in its stomach that was swallowed head first (Figure 1A). Based on its distinctive leg morphology (large femora and tibia with spines; Figure 1B), we identify this prey item as an orthopteran insect. The approximate total length of the orthopteran is 40 mm and is therefore over half the snout–vent length of the *G. guentheri* specimen. Large orthopterans and small vertebrates are known to be important prey items in *Ceratophrys cornuta*, a frog species that is characterized as a sit-and-wait predator that often consumes large prey more than half of its snout-vent length (Duellman and Lizana, 1994). Other frog genera that feed on relatively large prey include *Leptobatrachus*, *Chacophrys*, *Pyxicephalus*, *Aubria*, and *Hemiphractus* (Fabrezi and Emerson, 2003). These predatory anurans have evolved odontoid fangs and serrations on the lower jaw that can improve prey capture, but none of these structures are true teeth. This single record of a prey item in *G. guentheri* indicates that it is capable of catching and consuming large, mobile prey and that the mandibular teeth might play a role in prey capture. The diet of other *Gastrotheca* species remains largely unknown but warrants further investigation to identify whether the consumption of large prey is a derived trait of *G. guentheri* related to the evolution of true mandibular teeth.

**Acknowledgments.** We thank Luke Welton (University of Kansas Biodiversity Institute & Natural History Museum) for access to the specimen and one anonymous reviewer for their helpful comments.

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