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Predation on a gymnophthalmid lizard by the Brazilian Dumpy Frog, *Stereocyclops incrassatus* (Microhylidae, Gastrophryninae)

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Few of the over 7200 species of frogs eat other vertebrates (Measey et al., 2015; Paluh et al., 2020). This is especially true for the approximately 700 species of the family Microhylidae, many of which specialize on small prey such as ants and termites. Knowledge of vertebrate predation by microhylid frogs is limited to a handful of records including predation on another frog by the Malagasy genus *Rhombophryne* (Scherz et al. 2015) and on both a frog and lizard by the New Guinean genus *Asterophrys* (Zweifel, 1972; Paluh et al., 2020). While generating x-ray computed tomographic scans (CT-scans) for a broad swath of global frog diversity (e.g., Keeffe et al., 2020; Paluh et al., 2020), we discovered a specimen of the Brazilian Dumpy Frog, *Stereocyclops incrassatus* Cope, 1870, that contained a mostly complete lizard in its gut, as well as two other isolated limbs of a second lizard. This frog species is found in the leaf litter of the Atlantic Forest of eastern Brazil (Moura et al., 2010) and consumes a diverse range of terrestrial arthropods, including ants, beetles, isopods, worms, spiders, and millipedes (Teixeira et al., 2006). Ours is only the second published record of a microhylid frog eating a lizard and the first record of *Stereocyclops* preying on a vertebrate.

We generated a CT-scan of an adult specimen of *S. incrassatus* (AMNH A-73552; snout–vent length, SVL = 50.4 mm; Fig. 1) that was collected in the Brazilian state of Espírito Santo by Werner C.A. Bokermann in November 1964. Scanning was completed at the Nanoscale Research Facility of the University of Florida on a Phoenix V|tome|X M CT scanner with the X-ray tube set to 70 kV, 200 mA, and a detector capture time of 0.200098 seconds, averaging 3 images/rotation and a voxel resolution of 33.54 µm. Segmentation and visualization were performed using VG Studio Max 3.4 (Volume Graphics, Heidelberg, Germany; https://www.volumegraphics. com). The resulting image stacks and 3D mesh files are available on MorphoSource (https://www.morphosource.org/media/000164499). The lizard identified in the gut of this specimen appears to be an adult (SVL approximately 24 mm) based on the ossification of the mespodial elements and co-ossification of the exoccipital and otic region. In addition, there are two isolated limbs (a forelimb and a hindlimb) that are anatomically similar to the complete lizard specimen and likely represent the same species (Fig. 1).

We identified this lizard as a member of the Family Gymnophthalmidae because of its hyoid morphology. Its basihyal does not contact the glossohyal, which differentiates the Gymnophthalmidae from other morphologically similar lizard taxa, such as the Mabuyidae, and closely related taxa, such as the Teiidae (Presch, 1980; Paluh and Bauer, 2017; Hernández-Moreales et al., 2020). There are seven gymnophthalmid species distributed across Espírito Santo (Costa and Bérnils, 2018): *Caparaonia itaiquara* Rodrigues et al., 2009, *Ecpleopus gaudichaudii* Duméril & Bibron, 1839, *Heterodactylus imbricatus* Spix, 1825, *Leposoma scincoides* Spix, 1825, *Micrablepharus maximiliani* (Reinhardt & Lütken, 1862), *Placosoma glabellum* (Peters, 1879), and *Vanzosaura multiscutata* (Amaral, 1933). Based on previous work by one of us (Hernández-Morales et al., 2019, 2020) and other literature (Rodrigues et al., 2009), we made osteological comparisons between this lizard specimen and the gymnophthalmids known from Espírito Santo; because of the lack of osteological data for *P. glabellum* and *V. multiscutata*, we used *P. cordylinum* Tschudi, 1847 and *V. rubricauda* (Boulenger, 1902) as proxies.

We identified the lizard in the gut of this *Stereocyclops incrassatus* as belonging to the gymnophthalmid genus *Leposoma* Spix, 1825, of which *L. scincoides* is the only known species in Espírito Santo. Both this lizard and

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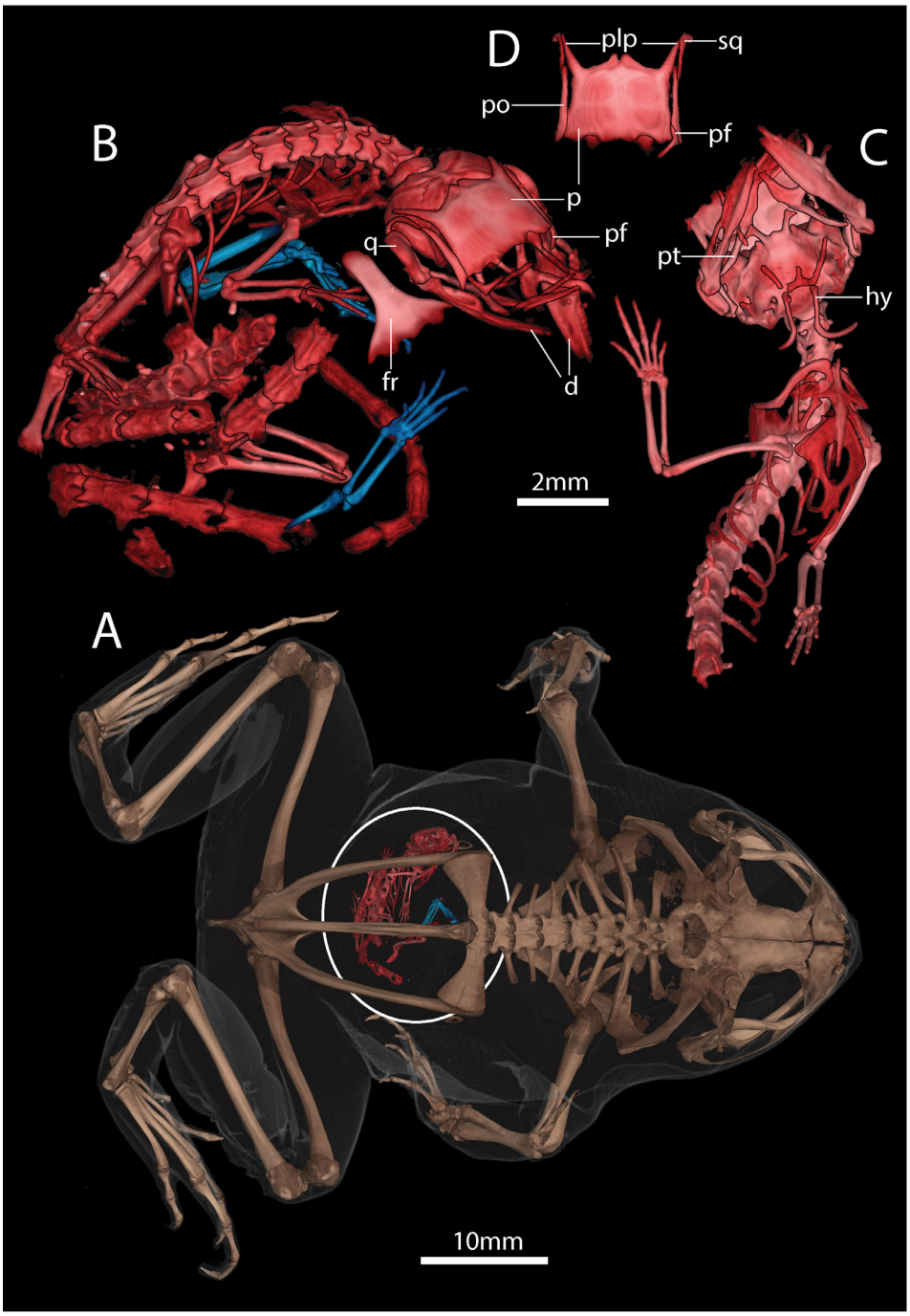

Figure 1. (A) CT-reconstruction of the skeleton of *Stereocyclops incrassatus* (AMNH A-73552) in dorsal view showing stomach contents with gymnophthalmid lizards (white circle). (B) Isolated stomach contents shown in dorsal view, with a nearly complete skeleton shown in red and two isolated gymnophthalmid limbs (manus and pes) in blue. (C) Further segmentation of the anterior skeleton shown in ventral view. (D) Isolated skull roof in dorsal view. Abbreviations: d, dentary; fr, frontal; hy, hyoid; p, parietal; pf, postfrontal; po, postorbital; plp, posterolateral process of parietal; pt, pterygoid; q, quadrate; sq, squamosal.

L. scincoides have a slender posterolateral process of the parietal and a strong interorbital constriction of the frontal (in contrast to *C. itaiquara* and *H. imbricatus*; Rodrigues et al., 2009), a well-developed metacarpal element with two phalanges for the first finger (in contrast to *Micrablepharus maximiliani*), a triradiate postfrontal (in contrast to the boomerang-like postfrontal of *Vanzosaura*), relatively shorter fingers than in *Placosoma*, and lack co-ossification of the postorbital and postfrontal (in contrast to *E. gaudichaudii*). Given that Teixeira et al. (2016) documented *S. incrassatus* to be an opportunistic feeder on arthropods in the leaf litter, it is no surprise that this frog might also occasionally prey on small vertebrates found in that type of microhabitat, including gymnopthalmid lizards. With additional CT-scanning of poorly known species, we anticipate many more unusual dietary records to be discovered across the diversity of frogs.

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