https://doi.org/10.22201/fc.25942158e.2023.4.783

FIRST RECORD OF DIET AND CLUTCH OF TREEFROG *HYALINOBATRACHIUM VIRIDISSIMUM* (TAYLOR, 1942; ANURA: CENTROLENIDAE) IN MOUNTAINOUS CENTRAL VERACRUZ, MÉXICO

PRIMER REGISTRO DE DIETA Y NIDADA DE LA RANA ARBORÍCOLA *HYALINOBATRACHIUM VIRIDISSIMUM* (TAYLOR, 1942; ANURA: CENTROLENIDAE) EN EL CENTRO MONTAÑOSO DE VERACRUZ, MÉXICO

Tonantzin Carmona-Zamora[1]* & Aurelio Ramírez-Bautista[1]

[1]*Laboratorio de Ecología de Poblaciones, Centro de Investigaciones Biológicas, Instituto de Ciencias Básicas e Ingeniería, Universidad Autónoma del Estado de Hidalgo, km. 4.5 carretera Pachuca-Tulancingo, 42184, Mineral de La Reforma, Hidalgo, México*

**Correspondence: carmonatonantzin@hotmail.com*

Received: 2023-08-24. **Accepted:** 2023-10-28. **Published:** 2023-11-28.

Editor: César Antonio Ríos-Muñoz, México.

Abstract.– In this note, we report the diet and clutches of two specimens of the frog, *Hyalinobatrachium viridissimum*, as well as the larval development stages and morphological attributes in a transformed environment (grazing area) in the state of Veracruz, Mexico. This report contributes to the knowledge of the natural history of the species, and therefore, to its conservation.

Key words.– Frog, egg clutch, habitat, prey.

Resumen.– En esta nota, reportamos la dieta y puesta de huevos de dos especímenes de la rana, *Hyalinobatrachium viridissimum*, así como su estadio de desarrollo y atributos morfológicos en un ambiente transformado (pastizal para ganado) en el estado de Veracruz, México. Esta nota contribuye al conocimiento de la historia natural de la especie, y por lo tanto, para su conservación.

Palabras clave.– Rana, dieta, hábitat, presas, puesta de huevos.

The diet of amphibians provides information about their natural history and environmental fluctuations in their habitat, this is reflected in the quantity and quality of the food resource within and among seasons and/or years (Anderson et al., 1999). The energy flow and food webs of the animal communities are related with their morphology, physiology, and behavior (Solé & Rödder, 2010). Amphibians feed on different types of prey, mainly arthropods, some species are specialists or generalists, in addition, the amphibians can practice cannibalism (Stebbins & Cohen, 1995; Wells, 2007). However, the diet of amphibians can change during their different stages of development (ontogeny), for example, some species of amphibians in the tadpole (larvae) stage have an exclusively herbivorous diet, while in the adult stage, they feed on plants and arthropods (Duellman & Trueb, 1986; Stebbins & Cohen, 1995).

Hyalinobatrachium viridissimum is a small tree frog, which belongs to the Centrolenidae family; this species is characterized by having green skin except in the ventral region where the skin is translucent, and it allows to see internal organs (Lee, 1996). The species is distributed in humid and cloud forest environments in the states of Chiapas, Oaxaca, Veracruz, Puebla, and Tabasco in Mexico, as well as in the Motagua-Polochic-Jocotán system through the lowlands of Guatemala and Honduras (Mendoza-Henao et al., 2020), at an elevation from 20 to 1275 masl (Morrone, 2017; Mendoza-Henao et al., 2020). It has been reported that the average size of snout vent length (SVL) of adult male is 21.7 mm, while for adult female is from 22.4 to 24.11 mm (Mendoza-Henao et al., 2020). Eggs of the species generally are deposited in the underside of leaves and the clutch size is between 14 and 30 eggs (Salazar-Nicholls & Del Pino, 2015). The diet of *H. viridissimum* is insectivore for tropical forest in Puebla state, Mexico (Luría-Manzano & Ramírez-Bautista, 2019).

During field work sampling, on 16th September 2022 around of 23:50 h, were found three male of *H. viridissimum* on leaves of a tree, they were close to two clutches near of a water body in an area of cattle pasture in the region of Coatepec, Veracruz (19° 28'

Figura 1. Puesta de huevos de rana *H. viridissimum*. A) Puesta de huevos en el estadio de desarrollo embrionario 12vo en el envés de la hoja. B) Puesta de huevos en el estadio de desarrollo embrionario 21ero en el haz de la hoja.

Figure 1. Clutch of the treefrog *H. viridissimum*. A) Clutch in 12th development state, in underside of leave. B) Clutch in 21st development state, on top of the leave.

14.62800" N, 96° 58' 13.29600" W; 1,231.3 m a.s.l.). These specimens were subjected to stomach lavage using the stomach flushing method (Solé et al., 2005); of these, all of them had food in their stomach, except for one specimen, its stomach was empty. In addition, data were taken on the individuals' length (SVL) with a digital caliper (± 0.02 mm) and weight (g) with a digital scale (±0.01; Table 1). The stomach contents were identified to order level with the key of Triplehorn & Johnson (2005; Table 1), and after that, frogs were released at the capture site.

The two clutches were placed at two meters high from the stream. The identification of the embryonic development stages of *H. viridissimum* was determined with the support of the Larval Development Table by Salazar-Nicholls & Del Pino (2015). The first clutch size was found on the underside of a leave, it had 24 eggs in the state 12th of development (Fig. 1A) and the second clutch was found on top of the leave with 25 eggs in the development state number 21 (Fig. 1B).

Prior to this study, *H. viridissimum* egg clutches were recorded in cloud forest (Ocaña-Díaz et al., 2020); another register was reported for a cloud forest environment in the Sierra de Zongolica region (Díaz-García et al., 2021), both cases were in the state of Veracruz; however, nothing exists about the diet of *H. viridissimum*, so this is the first record of the diet of *H.*

Tabla 1. Tamaño (LHC; mm), peso (g; n=3) y órdenes de presas (n=2) regurgitadas por las ranas *Hyalinobatrachium viridissimum* analizadas del pastizal para ganado de la zona centro montañosa del estado de Veracruz

Table 1. Snout vent-length (SVL; mm), weight (g; n=3) and Order of preys (n=2) from the treefrogs *Hyalinobatrachium viridissimum* in cattle pasture (grazing area) in mountainous central Veracruz state.

SVL (mm)	Weight (g)	Number of prey	Prey (Order)
22	0.87	1	Araneae
21	0.83	1	Hemiptera
22	1.1	-	-

viridissimum in a cattle pasture in the mountainous area of the central part of Veracruz.

Finally, it is worth mentioning that the selection of prey in the diet of amphibians can change depending on abiotic (variation in precipitation) and biotic factors (types of prey and their variation between seasons and according to the vegetation cover); therefore, knowing the diet of amphibians is important, since some amphibians survive the transformation of the habitat, and adjust their diet to the available prey according to the fluctuations of the environment in which they live (Luría-Manzano & Ramírez-Bautista, 2017). This allows developing conservation strategies for the species and obtaining knowledge about its intraspecific and interspecific importance in the habitat (Solé & Rödder, 2010). The diet and clutch size records of this species are part of its natural history and inform about its status in a cloud forest environment heavily damaged by anthropogenic effects.

Acknowledgements.– We thank Derian and Danna Ruíz for their help in the field work; to Israel Moreno Lara for his support in revising the work. To CONAHCYT for the scholarship awarded (Number 821860) to Tonantzin Carmona-Zamora for being within the master's program in Biodiversity and Conservation at the CIB of the UAEH. We thank Dr. César Antonio Ríos-Muñoz and an anonymous reviewer for their valuable comments that improved the work significantly, and finally to Dr. Jonathon C. Marshall for the English review.

CITED LITERATURE

Anderson, A.M., D.A. Hauko & J.T. Anderson. 1999. Diet composition of three anurans from the Playa Wetlands of Northwest Texas. Copeia 1999:515-520.

Díaz-García J.M., J. Ramos-Luna, J.A. Giles-Garcia, K. A. Téllez-Ramos & G. Silva-Hernández. 2021. *Hyalinobatrachium viridissimum* (Centrolenidae). Revista Latinoamericana de Herpetología 04:203-204.

Duellman, W.E. & L. Trueb. 1986. Biology of the Amphibians. London.

Lee J.C. 1996. The Amphibians and Reptiles of the Yucatán Peninsula. Cornell university.

Luria-Manzano, R. & A. Ramírez-Bautista. 2017. Diet comparation between rainforest a cave populations of *Craugastor alfredi* (Anura: Craugastoridae): does diet vary in contrasting habitats? Journal of Natural History 51:2346-2364.

Luría-Manzano, R. & A. Ramírez-Bautista. 2019. Dietary composition and selection in the stream-breeding anuran assemblage from a tropical wet forest in Eastern Mexico. Acta Oecologica 98:36-44.

Mendoza-Henao A.M., E. Arias, J.H. Townsend & G. Parra-Olea. 2020. Phylogeny-based species delimitation and integrative taxonomic revision of the *Hyalinobatrachium fleischmanni* species comple, with resurrection of *H. viridissimum* (Taylor, 1942). Systematics and Biodiversity 18:464-484.

Morrone J. J. 2017. Biogeographic regionalization of the Sierra Madre del Sur province, Mexico. Revista Mexicana de Biodiversidad 88:710–714.

Ocaña-Díaz, E., E.A. Suárez-Domínguez, N. López-Mendoza, O.R. Vivanco-Montané & E.A. Bello-Sánchez. 2020. Nuevos registros de puestas de huevos de la ranita de cristal norteña *Hyalinobatrachium fleischmanni* (Anura: Centrolenidae). Revista Latinoamericana Herpetología 3:133-138.

Salazar-Nicholls, M.J. & E.M. Del Pino. 2015. Early development of the glass frogs *Hyalinobatrachium fleischmanni* and *Espadarana callistomma* (Anura: Centrolenidae) from cleavage to tadpole hatching. Amphibian & Reptile Conservation 8:89-106.

Solé, M., O. Beckmann, B. Pelz, A. Kwet & W. Engels. 2005. Stomach-flushing for diet analysis in anurans: an improved protocol evaluated in a case study in *Araucaria* forests, southern Brazil. Neotropical Fauna Environment 4: 23-28.

Solé, M. & D. Rödder. 2010. Dietary assessment of adult amphibians. Pp. 167-169. In C.K. Jr. Dodd (Ed.). Amphibian Ecology and Conservation. Oxford University Press.

Stebbins, R.C. & N.W. Cohen. 1995. A Natural History of Amphibians. Princeton University Press.

Triplehorn, C.A. & N.F. Johnson. 2005. Borror and Delong's Introduction to the Study of Insects. Seventh edition. Brooks/ Cole Cengage Learning. E.U.A.

Wells, K.D. 2007. The Ecology and Behavior of Amphibians. University of Chicago Press.