**Nota**

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# Predation of the frog *Physalaemus biligonigerus* (Anura: Leptodactylidae) by a giant water bug (Hemiptera: Belostomatidae) in the Brazilian Pantanal

**Alvaro Aragão[1], João E. Almeida-Junior[1], Diego J. Santana[1,2], Juan F. C. Carrillo[3]**

[1] Universidade Federal de Mato Grosso do Sul, Cidade Universitária, Instituto de Biociências, Avenida Costa e Silva, s/n, Bairro Universitário, CEP 79090-900, Campo Grande, Mato Grosso do Sul, Brazil.

[2] Field Museum of Natural History, Negaunee Integrative Research Center and Keller Science Action Center 1400, Chicago, IL, 60605, USA

[3] Universidade Estadual de Campinas (UNICAMP), Departamento de Biologia Animal, Instituto de Biologia, Caixa Postal 6109, 13083-970, Campinas, São Paulo, Brazil.

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ABSTRACT

Amphibians play a fundamental role in aquatic and terrestrial food chains. They are frequently preyed upon by vertebrates and, less commonly, by invertebrates. Among invertebrate predators, aquatic insects of the family Belostomatidae stand out for their predatory efficiency and wide geographic distribution. Here we report a predation event of an adult male *Physalaemus biligonigerus* by an aquatic insect of the genus *Lethocerus*, observed in a temporary pond during an explosive breeding event in the municipality of Aquidauana, Mato Grosso do Sul, Brazil. This kind of records, still poorly documented for anurans in the Pantanal, reinforces the importance of belostomatids as predators influencing the dynamics of anuran populations in temporary aquatic environments.

Key Words: Amphibians; Predator-Prey; Natural History.

Amphibians play a crucial role in both aquatic and terrestrial food webs, acting as predators and prey at multiple trophic levels. Several vertebrate groups, including birds, snakes, mammals, and crocodilians, include amphibians in their diets, particularly adults, which are more visible and accessible (Toledo *et al.*, 2007; González-Maya *et al.*, 2019; Landgref Filho *et al.*, 2019; Hernández-Ruz *et al.*, 2022; Mori *et al.*, 2023). Previous studies have shown that anurans can be preyed upon by a wide variety of invertebrates, including spiders, odonates, and aquatic bugs, which may attack both tadpoles and adults (Toledo, 2005; Nenda *et al.*, 2008; Taffarel *et al.*, 2019; Hernández-Ruz *et al.*, 2022; Howard *et al.*, 2024). Although underreported than predation by vertebrates, attacks by predatory invertebrates can significantly influence amphibian population dynamics, in freshwater environments (especially lentic systems) where these taxa coexist (González-Maya *et al.*, 2019; de Luna *et al.*, 2022).

Among invertebrate predators, aquatic bugs (Belostomatidae) are notable for their efficiency in prey capture and their wide distribution across freshwater habitats (Toledo, 2003; Hernández-Ruz *et al.*, 2022; Mori *et al.*, 2023). These insects use their raptorial forelegs to immobilize prey and a piercing proboscis to inject digestive saliva, enabling a suction-based feeding mechanism (Toledo, 2005;

Author for correspondence: alvarolimabio@gmail.com

Ohba *et al.*, 2008; Maffei *et al.*, 2014). Belostomatids are known to prey upon both tadpoles and adult anurans, with records involving species of the several genera including *Dendropsophus*, *Scinax*, *Leptodactylus*, *Physalaemus*, *Pseudis*, *Atelopus*, and *Boana* (Nenda *et al.*, 2008; González-Maya *et al.*, 2019; Landgref Filho *et al.*, 2019; Taffarel *et al.*, 2019; Hernández-Ruz *et al.*, 2022; Howard *et al.*, 2024; Ceron *et al.*, 2017; Gambale *et al.*, 2014). Records of *Physalaemus* predation by aquatic insects of the family Belostomatidae have been increasing across South America. Nenda et al. (2008) reported *Belostoma* sp. preying upon an adult *P. cuvieri* in Argentina, while Schalk (2010) documented the predation of *P. biligonigerus* by a belostomatid in Bolivia. Subsequently, Taffarel et al. (2019) recorded species of *Lethocerus* preying upon *P. biligonigerus* and *P. cristinae* in Argentina, and Sousa-Félix et al. (2025) reported *Belostoma* sp. preying upon *P. cuvieri* in the Brazilian Cerrado.

Moreover, direct competition for prey between Belostomatids and vertebrates has been documented, with simultaneous predation events involving snakes and birds (Toledo, 2003; de Luna *et al.*, 2022). Despite several studies on the predatory behavior of belostomatids, records involving vertebrate prey remain scarce, especially in natural environments. Reports of attacks on adult anurans are even rarer, highlighting the importance of new records. In this context, we present a predation event involving a belostomatid and an adult individual of *Physalaemus biligonigerus* in the Brazilian Pantanal, contributing novel data on interactions between aquatic insects and anurans.

On January 17, 2025, at approximately 21:44 p.m., we observed an immature giant water bug (*Lethocerus* sp.) preying upon an adult male *Physalaemus biligonigerus* (Fig. 1) in a temporary pond during a breeding explosion event at Fazenda Aguapé, municipality of Aquidauana, Mato Grosso do Sul, Brazil (20°06'46.8"S, 55°58'01.7"W, WGS84, 130 m. a.s.l.).

At the moment of observation, the giant water bug had already captured the anuran. We assumed that the anuran was vocalizing at the time of capture, as its vocal sac appeared flaccid and other individuals of the same species were calling nearby. When we observed the scene, the anuran was still alive and struggling to escape; this active behavior lasted for approximately five minutes. Subsequently, both individuals remained motionless for about three minutes. After this period, we collected both specimens. Throughout the collection and transport process, the water bug did not release its prey at any point. We estimate that the insect held the anuran under control for approximately one hour. It is important to emphasize that at no time was any attempt made to forcibly remove the anuran.

The *P. biligonigerus* individual measured 31.7 mm in total length (Snout-vent length), and the water bug measured 44.1 mm in total length. Both specimens were collected under the appropriate authorization (SISBIO: 89284-2) and are deposited in the zoological collection of the Federal University of Mato Grosso do Sul (ZUFMS), catalogued as ZUFMS-AMP20779 (*P. biligonigerus*) and ZUFMS-HEM00944 (*Lethocerus* sp).

Such records are essential for understanding the ecological role of belostomatids as relevant predators in aquatic ecosystems, particularly in temporary water bodies where explosive breeding events of anurans occur (Toledo, 2003; Ceron *et al.*, 2017; de Luna *et al.*, 2022; Hernández-Ruz *et al.*, 2022). Although invertebrate predation has historically received less attention than predation by vertebrates, it is increasingly recognized as an important ecological factor in structuring amphibian communities (Toledo, 2005; Toledo *et al.*, 2007). Belostomatids, especially those of the genus *Lethocerus*, are efficient predators of both tadpoles and adult frogs, with records involving species such as *Dendropsophus minutus*, *Dendropsophus nanus*, *Scinax fuscovarius*, *Rhinella crucifer*, *Physalaemus cristinae*, *Physalaemus biligonigerus*, *Physalaemus cuvieri*, *Physalaemus nattereri*, *Pseudopaludicola mystacalis* and *Nyctimantis siemersi* (Nenda *et al.*, 2008; Schalk, 2010; Batista *et al.*, 2013; Landgref Filho *et al.*, 2019; Taffarel *et al.*, 2019; Macedo *et al.*, 2021; Mori *et al.*, 2023; Howard *et al.*, 2024; Souza-Felix *et al.*, 2025). These studies demonstrate that belostomatids are recurrent predators of *Physalaemus* species across different Neotropical environments and reinforce their role in trophic interactions involving anurans.

Moreover, less typical interactions, such as egg predation by cockroaches (Toledo, 2005) and cannibalistic behavior or carnivory among tadpoles (Escalante *et al.*, 2022), highlight the complexity of trophic relationships involving anurans. Tadpole predation on eggs or conspecifics has been documented in species such as *Leptodactylus savagei* and *Dendrobates* spp. (Toledo *et al.*, 2007), showing that predation among amphibians themselves may

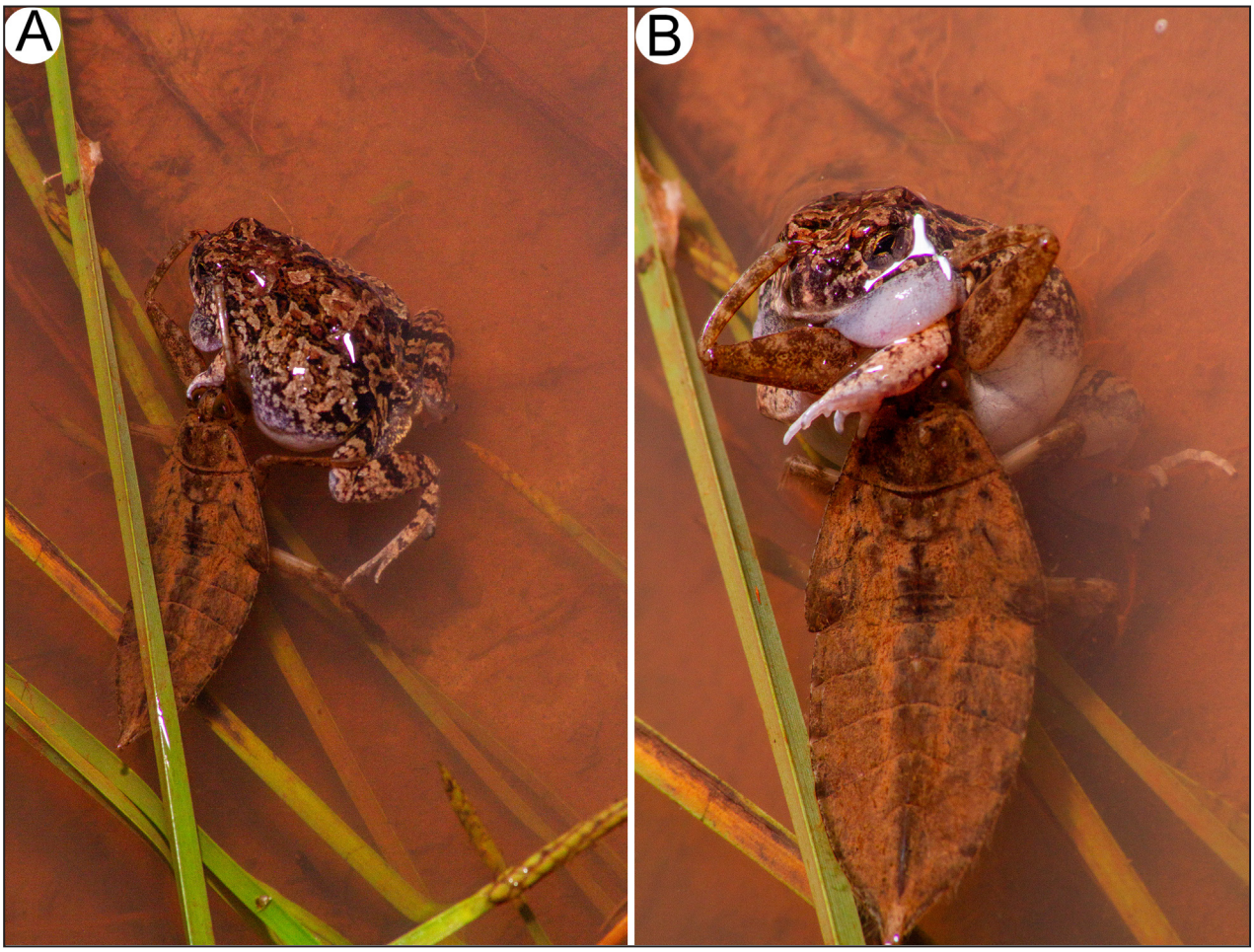


**Figure 1.** (A and B) Predation by an immature giant water bug (*Lethocerus* sp.) on *Physalaemus biligonigerus* (ZUFMS-AMP20779). Specimens collected at Fazenda Aguapé, Pantanal region, municipality of Aquidauana, Mato Grosso do Sul, Brazil.

also be ecologically relevant. Other invertebrates, including spiders (e.g., *Ancylometes*), dragonfly larvae, and scorpions, have been reported preying upon juvenile or adult frogs in various environmental contexts (Toledo, 2005; Maffei *et al.*, 2014; Hernández-Ruz *et al.*, 2022).

Thus, our record from the Brazilian Pantanal broadens the current understanding of interactions between anurans and invertebrate predators. Although the region harbors a high abundance of amphibians (Strüssmann et al., 2011), reports involving the genus *Physalaemus* remain scarce. This observation represents the first documented evidence of *Lethocerus* preying upon *P. biligonigerus* in the Pantanal, providing data that may help elucidate local trophic interactions. Together with previous observations, this study highlights the importance of natural history records as fundamental tools for advancing our knowledge of amphibian–invertebrate relationships in the Neotropical region.

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## Literature cited

Batista, V.G.; Affonso, I.P.; Hanisch, R.F. & Oda, F.H. 2013. Predation on *Eupemphix nattereri* Steindachner, 1863 (Anura, Leiuperidae) by giant water bugs, *Lethocerus delpontei* De Carlo, 1930 and *L. annulipes* (Herrich-Schäffer, 1845) (Hemiptera, Belostomatidae). *Pan-American Journal of Aquatic Sciences* 8: 364-368.

Ceron, K.; Ferreira, V.L.; Tomas, W.M. & Santana, D.J. 2017.

Battle of giants: Predation on giant tadpole of *Pseudis platensis* (Anura: Hylidae) by a giant water bug (Hemiptera: Belostomatidae). *Herpetology Notes* 10: 263-265.

de Luna, M.; García-Barrios, R.; Sommers, P.; Navarro-Azpeitia, C. & Muldoon, J. 2022. Three new records of giant water bugs as predators of herpetofauna in North America, with a compilation of records from the New World. *Herpetology Notes* 15: 741-746.

Escalante, R.N.; Peña Villalobos, D. & Moreno Chinchilla, J. 2022. Predation on Gliding Leaf Frog (*Agalychnis spurrelli*) Eggs by Savage's Thin-toed Frog (*Leptodactylus savagei*) Tadpoles in Sierpe de Osa, Costa Rica. *Reptiles & Amphibians* 29: 83-84.

Gambale, P.G.; Batista, V.G.; Oda, F.H.; Campos, R.M.; Takemoto, R.M. & Bastos, R.P. 2014. Anuran larvae as prey and hosts of invertebrates in Neotropical aquatic habitats. *Revista chilena de historia natural* 87: 1-5.

González-Maya, J.F.; Gómez-Hoyos, D.A.; Seisdedos-de-Vergara, R.; Cruz-Lizano, I. & Schipper, J. 2019. Depredación por el Chinche de Agua (*Abedus* sp.; Belostomatidae) sobre el críticamente amenazado *Atelopus varius* (Bufonidae) en la Zona Protectora Las Tablas, Costa Rica. *Acta Biológica Colombiana* 24: 403-406.

Hernández-Ruz, E.J.; do Nascimento Pereira, F.O.; da Silva Araújo, G.; da Silva Gonçalves, W. & Correa, J.K.C. 2022. Predation on anurans by a giant water bug *Belostoma* sp. (Hemiptera: Belostomatidae) in a forest management area in the eastern Amazon. *Food Webs* 32: e00238.

Howard, C.; González Quesada, C. & Nuñez Escalante, R. 2024. Predation of a Blue-sided Gliding Leaf Frog (*Agalychnis saltator*) by a Giant Waterbug (*Lethocerus* sp.) in Siquirres, Limón, Costa Rica. *Reptiles & Amphibians* 31: e22652.

Landgref Filho, P.; Aoki, C.; de Sousa, D.L.H.; de Souza, E.O.; Brandão, R.A.; Ávila, R.W. & Oda, F.H. 2019. Escape o sea presa: nuevos registros y conocimiento actual sobre depredadores de ranas Pseudinae (Anura: Hylidae) en América del Sur. *Acta Biológica Colombiana* 24: 397-402.

Macedo, R.H.; Oliveira, R.C.; Lopes, F.S. & Solé, M. 2021. Predation of *Rhinella crucifer* (Anura: Bufonidae) by the giant water bug *Lethocerus grandis* (Hemiptera: Belostomatidae). *Graellsia* 77: e127.

Maffei, F.; Bolfarini, M. & Ubaid, F.K. 2014. Predation of *Scinax fuscovarius* (Anura: Hylidae) by two invertebrates in Southeastern Brazil. *Herpetology Notes* 7: 371-374.

Mori, K.Y.; Keuroghlian-Eaton, S.; Cavalheri, D.G.; Almeida-Júnior, J.E.; Müller, M. & Santana, D.J. 2023. Predation attempt on *Trachycephalus typhonius* (Linnaeus, 1758) by *Caiman yacare* (Daudin, 1802). *Herpetology Notes* 16: 745-747.

Nenda, S.J.; Barrasso, D.A. & Cajade, R. 2008. *Physalaemus cuvieri* (NCN). Predation. *Herpetological Review* 39: 210.

Ohba, S.; Miyasaka, H. & Nakasuji, F. 2008. The role of amphibian prey in the diet and growth of giant water bug nymphs in Japanese rice fields. *Population Ecology* 50: 121-122.

Schalk, C.M. 2010. *Physalaemus biligonigerus* (NCN). Predation. *Herpetological Review* 41: 202.

Sousa-Felix, W., Azevedo, R., Leal, C. R. O., Carvalho, P. S., Santana, D. J., & Ceron, K. 2025. Predation of a Barker Frog, *Physalaemus cuvieri* Fitzinger, 1826, by a Giant Water Bug, genus *Belostoma*, in a Cerrado pond Minas Gerais, Brazil. *Herpetology Notes*, *18*, 867-869.

Strüssmann, C., Prado, C. P., Ferreira, V. L., & Kawashita-Ribeiro, R. (2011). Diversity, ecology, management and conservation of amphibians and reptiles of the Brazilian Pantanal: a review. *The Pantanal: Ecology, biodiversity ad sustainable management of a large neotropical seasonal wetland (WJ Junk, CJ Da Silva & KM Wantzen eds.). Pensoft Publishers. Sofia-Moscow*, 497-521.

Taffarel, A.T.; Boeris, J.M.; Fariña, N.; Torres, P.J.; Krauczuck, E. & Ferro, J.M. 2019. New records of anuran predation by giant water bugs of the genus *Lethocerus* in Argentina (Hemiptera: Belostomatidae). *Current Herpetology* 38: 110-113.

Toledo, L.F. 2003. Predation on seven South American anuran species by water bugs (Belostomatidae). *Phyllomedusa: Journal of Herpetology* 2: 105-108.

Toledo, L.F. 2005. Predation of juvenile and adult anurans by invertebrates: Current knowledge and perspectives. *Herpetological Review* 36: 395-399.

Toledo, L.F.; Ribeiro, R.S. & Haddad, C.F.B. 2007. Anurans as prey: An exploratory analysis and size relationships between predators and their prey. *Journal of Zoology* 271: 170-177.