REPTILES & AMPHIBIANS

Record of Freshwater Crab, *Fredius reflexifrons* (Ortmann 1897) (Brachyura, Pseudothelphusidae, in the Diet of the Smoky Jungle Frog, *Leptodactylus pentadactylus* (Laurenti 1768) (Anura, Leptodactylidae), in the Amazonian Forest, Brazil

Carla J. Santos-Souza[1], Carlos E. Costa-Campos[1], and Inácia M. Vieira[2]

[1]Laboratório de Herpetologia, Departamento de Ciências Biológicas e da Saúde, Universidade Federal do Amapá, Campus Marco Zero do Equador, 68903-419, Macapá, Amapá, Brazil (dududueducampos@gmail.com)
[2]Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, Macapá, Amapá, Brazil

Decapod crustaceans play a variety of important biological and ecological roles, sharing terrestrial, semi-terrestrial, and semi-aquatic habits and habitats with anurans, which may result in interspecific interactions, including trophic webs via predation (Collins et al. 2012; Wehrtmann et al. 2019). Consumption of decapod crustaceans by anurans has been recorded in the families Bufonidae (Núñez et al. 2020; Silva-Alves et al. 2020), Hylidae (Furtado et al. 2013; Furtado and Costa-Campos 2020; Silva et al. 2021), Leptodactylidae (Santos et al. 2004; Oliveira et al. 2009; Brito et al. 2011; Ferreira et al. 2011; Pazinato et al. 2011) Pipidae (Alves-Pinto et al. 2014), and Ranidae (Quiroga et al. 2015; Vrcibradic et al. 2017).

The Smoky Jungle Frog, *Leptodactylus pentadactylus* (Laurenti 1768), is a large-sized frog, terrestrial and nocturnal, widely distributed along the Amazon basin in Brazil (de Sá et al. 2014; Frost 2022), and commonly associated with forest in low-lying areas around streams (Lima et al. 2012). Previous studies have indicated that *L. pentadactylus* has a generalized diet consisting primarily of arthropods (Galatti 1992; do Couto et al. 2018) and vertebrates, such as other anurans (Duellman 1978; Santana et al. 2018), lizards (do Couto and Menin 2014), and bats (Castro et al. 2011). *Fredius reflexifrons* (Ortmann 1897) is a Pseudothelphusidae freshwater crab, semi-terrestrial, widely distributed in the Amazon basin and found in small streams of the terra firme forest, or in wet areas of the forest floor (Magalhães 2003). In this study, we report the first record of a freshwater crab in the diet of *L. pentadactylus* in the eastern Amazon.

During a herpetofaunal survey conducted in the dry season in the Amazon forest (September 2021) using the active search method, we collected one *L. pentadactylus* on the right bank of Água Fria stream, a large tributary of the Amapari River, at Reserva Extrativista Municipal Beija-Flor Brilho de

Figure 1. Freshwater crab *Fredius reflexifrons* found in the stomach of the Smoky Jungle Frog (*Leptodactylus pentadactylus*) in the Reserva Extrativista Municipal Beija-Flor Brilho de Fogo, Pedra Branca do Amapari Municipality, Amapá State, Brazil. Photographs by Carlos Eduardo Costa Campos.

Reptiles & Amphibians ISSN 2332-4961
https://doi.org/10.17161/randa.v30i1.18391

Fogo, Pedra Branca do Amapari Municipality, Amapá State, Brazil (0.7918 N, -51.9783 W; Fig. 1). We euthanized the specimen with a 2% lidocaine overdose, measured snout-vent length (SVL in mm) using digital calipers (± 0.01 mm precision), and removed the stomach through a ventral incision to analyze the stomach contents and evaluate the diet. We determined the sex through the gonads. The size of the crab is expressed by carapace length (CL) and carapace width (CW), which were measured using the same digital calipers as the frog. The crab was identified following Magalhães (2003).

The stomach contents of an adult male *L. pentadactylus* (SVL = 133 mm) contained a freshwater crab, *F. reflexifrons* (CL = 29.3 mm, CW = 45.6 mm; Fig. 1), occupying a volume of 442.24 mm^3. The frog was fixed in 10% formalin, conserved in a 70% alcohol solution, and housed in the Herpetological Collection of the Universidade Federal do Amapá (CECC 3793). The state of decomposition of the crab was not advanced allowing identification to the species level based on morphological characters (description of body, dentations of the carapace and shapes of chelipeds and pereiopods) and its geographic distribution (Magalhães and Rodríguez 2002; Magalhães 2003; Magalhães et al. 2005). The crab was fixed and conserved in 70% ethanol and housed in the Collection of the Fauna of Amapá at the Instituto de Pesquisas Científicas e Tecnológicas (IEPA 2176).

Fredius reflexifrons is widely distributed in the Amazon basin in Brazil and Peru, and in some coastal river basins of the Guianas and northern countries in South America (Magalhaes and Rodríguez 2002). The carapace is slightly convex, smooth with an anterolateral margin and a notch next to the external orbital angle, followed by 1–5 granules and 16–20 minute and blunt teeth. The cephalic spine is longer than the mesial lobe, distinctly acuminate, pointing in the caudo-lateral direction; the cephalic lobe is projected apically, rounded distally, with a patch of very small spines along the mesial and cephalic sides. The auxiliary lobe on the caudal side, is slightly shorter than the cephalic lobe and continuous with the cephalic spine; a field of apical spines are developed, forming an elongated curved patch along the lateral side, delimited by cephalic and caudal borders of the apex. Finally, the first male gonopods are robust, stronger at the base, and narrower at the middle (Magalhães 2003; Magalhães et al. 2005).

Consumption of decapod crustaceans, such as crabs and shrimps, by anurans has previously been recorded in aunrans. Although *L. pentadactylus* is a generalist and opportunistic predator (do Couto et al. 2018), as seen in other *Leptodactylus* species (Queiroz et al. 2019; Santana et al. 2019), this is the first record of predation of a freshwater crab *F. reflexifrons* by an *L. pentadactylus* and the fourth report for the *Leptodactylus* species in the Neotropical region: 1) *Pachygrapsus gracilis* – *L. fuscus*, Brito et al. 2011; 2) *Trichodactylus panoplus* – *L. latrans*, Oliveira et al. 2009; 3) mangrove crab not identified – *L. latrans*, Ferreira et al. 2011; 4) unidentified decapod crustacean - *L. latrans*, Pazinato et al. 2011).

Literature Cited

Alves-Pinto, H.N., V.K. Verdade, and M.T. Rodrigues. 2014. Morphometric variation of *Pipa pipa* (Linnaeus, 1758) (Anura: Pipidae) with notes on diet and gonad development. *Herpetology Notes* 7: 347–353.

Brito, A.L.R., R.P. Silva, and M.E.B. Fernandes. 2011. *Leptodactylus fuscus* (Whistling Frog). Habitat and Diet. *Herpetological Review* 42: 88.

Castro, I.J., C.R. Silva, A.J.S. Da Costa, and A.C.M. Martins. 2011. Predação oportunista de *Artibeus planirostris* (Spix, 1823) e *Carollia perspicillata* (Linnaeus, 1758) (Chiroptera, Phyllostomidae) por marsupiais e anuro na APA do Rio Curiaú, Amapá, Brasil. *Acta Amazonica* 41: 171–174. https://doi.org/10.1590/S0044-59672011000100020.

Collins, P.A., R.P. Carnevali, D. Carvalho, and V. Wiliner. 2012. Dynamics of decapod crustaceans in a trophic web of continental aquatic environments in Southern South America, pp. 159–185. In: J.A. Daniels (ed.), *Advances in Environmental Research*. Nova Science Publishers, Hauppauge, New York, USA.

de Sá, R.O., T. Grant, A. Camargo, W.R. Heyer, M.L. Ponssa, and E. Stanley. 2014. Systematics of the Neotropical genus *Leptodactylus* Fitzinger, 1826 (Anura: Leptodactylidae): phylogeny, the relevance of non-molecular evidence, and species accounts. *South American Journal of Herpetology* 9: 1–128. https://doi.org/10.2994/SAJH-D-13-00022.1.

do Couto, A.P. and M. Menin. 2014. Predation on the lizard *Alopoglossus angulatus* (Squamata: Gymnophthalmidae) by the Smoky Jungle Frog, *Leptodactylus pentadactylus* (Anura: Leptodactylidae) in Central Amazonia. *Herpetology Notes* 7: 37–39.

do Couto, A.P., R. Silveira, A.M.V.M. Soares, and M. Menin. 2018. Diet of the Smoky Jungle Frog, *Leptodactylus pentadactylus*, (Anura, Leptodactylidae) in an urban forest fragment and in a preserved forest in Central Amazonia, Brazil. *Herpetology Notes* 11: 519–525.

Duellman, W.E. 1978. The biology of an equatorial herpetofauna in Amazonian Ecuador. *University of Kansas Museum of Natural History, Miscellaneous Publication* 65: 1–352.

Ferreira, R.B., H.R. Rangel, and T. Silva-Soares. 2011. *Leptodactylus latrans* (Butter Frog). Diet. *Herpetological Review* 42: 88–89.

Frost, D.R. 2022. *Amphibians Species of the World: An Online Reference*. Version 6.1. https://doi.org/10.5531/db.vz.0001 <http://research.amnh.org/herpetology/amphibia/index.html>.

Furtado, M.F.M. and C.E. Costa-Campos. 2020. Diet composition of *Lysapsus bolivianus* Gallardo, 1961 (Anura, Hylidae) of the Curiaú Environmental Protection Area in the Amazonas river estuary. *Herpetology Notes* 13: 113–123.

Furtado, M.F.M., C.E. Costa-Campos, S.S. Queiroz, K.J.G Corrêa, and I.M. Vieira. 2013. Ocorrência de *Macrobrachium amazonicum* (Crustacea; Decapoda) na dieta de *Lysapsus bolivianus* (Anura; Hylidae). *Biota Amazônia* 3: 185–187. https://doi.org/10.18561/2179-5746/biotaamazonia.v3n3p185-187.

Galatti, U. 1992. Population biology of the frog *Leptodactylus pentadactylus* in a Central Amazonian rainforest. *Journal of Herpetology* 26: 23–31. https://doi.org/10.2307/1565017.

Lima, A.P., W.E. Magnusson, M. Menin, L.K. Erdtmann, D.J. Rodrigues, C. Keller, and W. Hödl. 2012. *Guia de Sapos da Reserva Adolpho Ducke, Amazônia Central*. Second Edition. Editora INPA, Manaus, Brasil.

Magalhães, C. and G. Rodríguez. 2002. The systematic and biogeographical status of *Fredius reflexifrons* (Ortmann, 1897) and *Fredius fittkaui* (Bott, 1967) (Crustacea: Brachyura: Pseudothelphusidae) from the Amazon and Atlantic Guianas river basins. *Acta Amazonica* 32: 677–689. https://doi.org/1809-43922002324689.

Magalhães, C. 2003. Família: Pseudothelphusidae e Trichodactylidae, pp. 143–297. In: G.A.S. Melo (ed.), *Manual de Identificação dos Crustáceos Decápodos de Água Doce Brasileiros*. Edições Loyola, São Paulo, Brasil.

Magalhães, C., F.A. Abrunhosa, M.D.O. Pereira, and M.A. Melo. 2005. New records of *Fredius denticulatus* (H. Milne-Edwards, 1853) and *F. reflexifrons* (Ortmann, 1897), and the eastern limits of the distribution of pseudothelphusid crabs (Crustacea: Decapoda) in Brazil. *Acta Amazonica* 35: 93–96. https://doi.org/10.1590/S0044-59672005000100014.

Núñez, K., M. Duré, G. Zárate, F. Ortiz, and M. Mendoza. 2021. Diet of *Melanophryniscus paraguayensis* (Anura: Bufonidae): an endemic species to Paraguay. *Herpetological Conservation and Biology* 16: 251–258.

Oliveira, S.V., A.O. Trindade, D. Pazinato, L. Ribeiro, and L.H. Cappellari. 2009. Registro de *Trichodactylus panoplus* (Crustacea, Decapoda) na dieta de *Leptodactylus latrans* (Anura, Leptodactylidae), no sul do Brasil. *Biodiversidade Pampeana* 7: 44–46.

Pazinato, D.M.M., A.O. Trindade, S.V. Oliveira, and L.H. Cappellari. 2011. Dieta de *Leptodactylus latrans* (Steffen, 1815) na Serra do Sudeste, Rio Grande do Sul, Brasil. *Biotemas* 24: 147–151. http://dx.doi.org/10.5007/2175-7925.2011v24n4p147.

Queiroz, M.S., R.M.P. Couto, and M.C. Miguel. 2019. *Leptodactylus chaquensis* - the voracious generalist frog as a predator of two different anuran species. *Herpetology Notes* 12: 483–486.

Quiroga, L., M.D. Moreno, A.A. Cataldo, J.H. Aragón-Traverso, M.V. Pantano, J.P.S. Olivares, and E.A. Sanabria. 2015. Diet composition of an invasive population of *Lithobates catesbeianus* (American Bullfrog) from Argentina. *Journal of Natural History* 49: 1703–1716. https://doi.org/10.1080/00222933.2015.1005711.

Santana, M.M.S., P.H. Guedes-Lima, V.A.M.B. Figueiredo, T.S. Reis, N.M.C. Cardoso, C.E. Costa-Campos. 2018: Natural History Notes. *Leptodactylus pentadactylus* (South American Bull-frog). Diet. *Herpetological Review* 49: 305.

Santana, D.J., V.G. Ferreira, G.N. Crestani, and M.O. Neves. 2019. Diet of the Rufous Frog *Leptodactylus fuscus* (Anura, Leptodactylidae) from two contrasting environments. *Herpetozoa* 32: 1–6. https://doi.org/10.3897/herpetozoa.32.e35623.

Santos, E.M., A.V. Almeida, and S.D. Vasconcelos. 2004. Feeding habits of six anuran (Amphibia: Anura) species in a rainforest fragment in Northeastern Brazil. *Iheringia, Série Zoologia* 94: 433–438. https://doi.org/10.1590/S0073-47212004000400014.

Silva, I.C.O., P. Soares, A.C.A. Ribas, D.J. Santana, K.M. Campião, and L.E.R. Tavares. 2021. *Scinax fuscovarius* (Anura, Hylidae) diet assessment at Serra da Bodoquena, Mato Grosso do Sul, Brazil. *North-Western Journal of Zoology* 17: 29–33.

Silva-Alves, V.D., G.R. Canale, T.M. da Costa, C.C. Muniz, M.S. Filho, and D.J. da Silva. 2020. Record of the crabs *Poppiana argentiniana* (Rathbun, 1905) and *Valdivia camerani* (Nobili, 1896) in the diet of *Rhinella diptycha* (Cope, 1862) (Anura: Bufonidae), in the Pantanal Mato-Grossense, Brazil. *Herpetology Notes* 13: 309–312.

Vrcibradic, D., A. Diaz, B.N. Cosendey, B.B. Nascimento, and V.N.T. Borges-Júnior. 2017. *Trichodactylus dentatus* (Crustacea, Decapoda, Trichodactylidae) and other prey of a large adult of the exotic American bullfrog, *Lithobates catesbeianus* (Ranidae), caught in a disturbed habitat in southeastern Brazil. *Herpetology Notes* 10: 375–378.

Wehrtmann, I.S., D. Hernández-Díaz, and N. Cumberlidge. 2019. Freshwater crabs as predators and prey: the case of *Ptychophallus uncinatus* Campos and Lemaitre, 1999 (Brachyura, Pseudothelphusidae) from Costa Rica, Central America. *Latin American Journal of Aquatic Research* 47: 18–26. http://dx.doi.org/10.3856/vol47-issue1-fulltext-3.