

the Sistema de Autorização e Informação sobre Biodiversidade (SISBIO-ICMBio).

**MARIA EDUARDA DE ARAÚJO ALMEIDA**, Universidade Federal de Campina Grande - Centro de Saúde e Tecnologia Rural, Laboratório de Herpetologia, Avenida Universitária, s/n, CEP:58708-110, Patos, Paraíba, Brazil (e-mail: eduardaaraujo64@gmail.com); **JOSÉ HENRIQUE DE ANDRADE LIMA**, Universidade Federal de Pernambuco, Laboratório de Herpetologia, 50670-901, Recife, Pernambuco, Brazil; **GABRIEL NÓBREGA DE ALMEIDA MARINHO** and **MARCELO NOGUEIRA DE CARVALHO KOKUBUM**, Universidade Federal de Campina, Grande-Centro de Saúde e Tecnologia Rural, Laboratório de Herpetologia, 58708-110, Patos, Paraíba, Brazil.

**LIMNONECTES LEPORINUS (Giant River Frog). ENDOPARASITES.** *Limnectes leporinus* lives along the banks of small rivers throughout Borneo (Inger et al. 2017. A Field Guide to the Frogs of Borneo. Natural History Publications (Borneo), Kota Kinabalu, Malaysia. 228 pp.). Goldberg and Bursley (2019. Comp. Parasitol. 86:149–152) reported the nematodes *Amphibiocapillaria bufonis*, *Cosmocerca ornata*, *Oswaldocruzia* sp., *Physaloptera* sp., and the acanthocephalan *Pseudoacanthocephalus bufonis* in *L. leporinus* from Malaysia. In this note we add to the helminth list of *L. leporinus* by reporting the nematode *Meteterakis japonica*.

One adult male *L. leporinus* (88 mm SVL) collected 29 March 1984 from Sarawak, Malaysia, Kapit District, Nanga Tekalit, Sekentut (1.63333°N, 113.5667°E; WGS 84) and deposited in the Field Museum of Natural History (FMNH 219049) was examined for gastrointestinal helminths. The specimen had been preserved in 10% formalin and stored in 70% ethanol. The body cavity was opened by a longitudinal incision and the digestive tract was removed and opened. The esophagus, stomach, small intestine and large intestine were examined for helminths under a dissecting microscope. One helminth was found in the large intestine. It was placed in a drop of lactophenol on a glass slide, a cover slip was added, and identification was made after study under a compound microscope. Identification as *Meteterakis japonicus* was made based on the original description (Wilkie 1930. Ann. Mag. Nat. Hist. 6:606–614) and information in Gibbons (2010. Keys to the Nematode Parasites of Vertebrates, Supplement Vol. CABI Oxfordshire, UK. 416 pp.). The *M. japonicus* was deposited in the Harold W. Manter Parasitology Laboratory (HWML), The University of Nebraska, Lincoln, Nebraska, USA as *M. japonica* (HWML 111604). *Meteterakis japonica* is widely distributed in Asia and has been reported from anurans in China (Hsu 1933. Parasitol. 24:512–541), Japan (Telford 1997. The Ecology of a Symbiotic Community, Volume 2. Krieger Publishing Company, Malabar, Florida. 143 pp.), Borneo (Myers and Kuntz. 1969. J. Fish. Res. Bd. Canada 26:793–797), Java (Purwaningsih et al. 2015. Zootaxa 3974:507–516), and scincids, viperids and colubrids from Japan (Kagei 1973. The Snake 5:141–150; Sata 2015. Comp. Parasitol. 82:17–24). *Meteterakis japonica* in *L. leporinus* is a new host record.

We thank A. Resat for permission to examine *L. leporinus* and J. Mata for facilitating the loan.

**STEPHEN R. GOLDBERG**, Whittier College, Department of Biology, Whittier, California 90608, USA (e-mail: sgoldberg@whittier.edu); **CHARLES R. BURSEY**, Pennsylvania State University, Shenango Campus, Department of Biology, Sharon, Pennsylvania 16146, USA (e-mail: cxb13@psu.edu).

**LITHOBATES CATESBEIANUS (American Bullfrog). DIET.** *Lithobates catesbeianus* is a generalist predator known to consume a wide variety of terrestrial, semi-aquatic, and aquatic prey items



FIG. 1. A gravid female *Lithobates catesbeianus* from Arizona, USA with an adult male *Cyprinodon macularius* in its stomach.

(Brennan and Holycross 2006. A Field Guide to Amphibians and Reptiles in Arizona. Arizona Game and Fish Department, Phoenix, Arizona. 150 pp.). The native range of *L. catesbeianus* historically included the eastern United States, but now comprises most of the western United States and numerous other countries (Casper and Hendricks 2005. In Lanoo [eds.], Amphibian Declines: The Conservation Status of United States Species, pp. 540–546. University of California Press, Berkeley, California). They are an efficient, generalist predator and as an invasive species, *L. catesbeianus* has been implicated in the decline of amphibians (Hayes and Jennings 1986. J. Herpetol. 20:490–509), reptiles (Rosen and Schwalbe 1995. In Laroe et al. [eds.], Our Living Resources: A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystems, pp. 452–454. U.S. Department of the Interior National Biological Service, Washington, D.C.), and even birds (Underwood and Letchworth 2016. Proc. 27th Vertebr. Pest Conf., Univ. of Calif., Davis. pp. 380–383). Aquatic and semi-aquatic prey consists of aquatic insects (including larvae), amphibians (tadpoles and smaller anurans), and to a lesser extent fish (Bury and Whelan 1984. Ecology and Management of the Bullfrog. USFWS Resource Publication No. 155; Jancowski and Orchard 2013. NeoBiota 16:17–37), but there is little evidence of high predation pressure on the latter. Here, we report on the predation of a threatened fish by *L. catesbeianus*, and provide an instance where predation severely impacted a fish population in a mesocosm.

On 21 July 2020 we collected a gravid adult female *L. catesbeianus* (220 mm SVL). Gastrointestinal contents included one male *Cyprinodon macularius* (Desert Pupfish, 45 mm total length; Arizona State University [ASU] 20413), as well as several Odonata larvae (Fig. 1). The frog was captured at an enclosed 0.5-acre pond managed by the Arizona Game and Fish Department for native species restoration at Horseshoe Ranch (34.2619°N, 112.0553°W; WGS 84; 998 m elev.), located on the Agua Fria National Monument in Yavapai County, Arizona, USA. The Department has reintroduced three native fishes, *C. macularius*, *Poeciliopsis occidentalis* (Gila Topminnow), and *Gila robusta* (Roundtail Chub), a native frog, *Lithobates yavapaiensis* (Lowland Leopard Frog), and the threatened snake *Thamnophis eques megalops* (Northern Mexican Gartersnake) into the enclosed pond. This is the third endangered fish species, *Gila*

*purpurea* (Yaqui Chub) and *Poeciliopsis occidentalis sonoriensis* (Yaqui Topminnow) being the first two, reported to be predated by *L. catesbeianus* in the wild, or semi-wild conditions in Arizona (Schwalbe and Rosen 1988. *In* Management of Amphibians, Reptiles and Small Mammals in North America, pp. 166–173. General Technical Report RM-166 U.S. Department of Agriculture Forest Service, Fort Collins, Colorado).

To our knowledge there is little peer-reviewed literature on whether bullfrog predation can be detrimental to a fish population, but we are aware of one example. In the late 1970s a small mesocosm pond at Arizona State University had thousands of *C. macularis* but was almost eliminated within one year after fewer than 20 *L. catesbeianus* invaded the pond (Marsh and Sada 1993. Desert Pupfish (*Cyprinodon macularius*) Recovery Plan, U.S. Fish and Wildlife Service, Phoenix, Arizona. 67 pp.; P. C. Marsh, pers. comm.). Our observation suggests that *C. macularius* is vulnerable to predation by *L. catesbeianus* at low densities, in a multi-species semi-natural pond.

**SIDNEY B. RIDDLE** (e-mail: sidney.b.riddle@gmail.com), **CURTIS J. GILL** (e-mail: cgill@azgfd.gov), **EMILY J. KEISTER** (e-mail: ekeister@azgfd.gov), **MASON J. RYAN** (e-mail: mryan@azgfd.gov), and **SHARON L. LASHWAY**, Arizona Game and Fish Department, 7200 E University Drive, Mesa, Arizona 85207, USA (e-mail: slashway@azgfd.gov).

**LITHOBATES SEPTENTRIONALIS** (Mink Frog). **ELEVATION.** Dodd (2013. *Frogs of the United States and Canada*. Johns Hopkins University Press, Baltimore, Maryland. 982 pp.) gives the highest elevation record of *Lithobates septentrionalis* as 896 m, from Vermont, USA, citing Hoopes (1938. *New Engl. Nat.* 1:4–6). This location (Sterling Pond, Lamoille County) is actually at an elevation of 917 m (U.S. Geological Survey 1997 Mount Mansfield 7.5 minute topographic map), and remains the highest elevation record of *L. septentrionalis* known from Vermont (J. Andrews, pers. comm.). Similarly, the highest elevation record from New York, USA (872 m) reported by Moore (1952. *Am. Nat.* 86:5–22) and Dodd (2013, *op. cit.*) has not been extended (A. Breisch, pers. comm.). Although most records of the species from Gaspésie, Québec, Canada are from lowlands near the coast (Bider and Matte. 1996. *The Atlas of Amphibians and Reptiles of Québec*. St. Lawrence Valley Natural History Society and Ministère de l'Environnement et de la Faune du Québec, Direction de la faune et des habitats, Québec. 106 pp.; S. Rouleau, pers. comm.) Jones and Willey (2012. *Eastern Alpine Guide: Natural History and Conservation of Mountain Tundra East of the Rockies*. University Press of New England, Hanover, New Hampshire. 348 pp.) stated that it occurs in high elevation ponds in the Monts McGerrigle region to “at least” 1000 m, although they did not cite specimens or specific localities.

On 10 July 2020 we collected a *L. septentrionalis* (Peabody Museum of Natural History, Yale University [YPM] 24722) from Speck Pond in the Mahoosuc Range, Grafton Township, Oxford County, Maine, USA (44.56469°N, 70.97275°W; WGS 84) at an elevation of 1036 m. This is the highest elevation reported for the species anywhere in its range. Although *L. septentrionalis* may occur at slightly higher elevation sites in Gaspésie, the Mahoosuc Range locality is likely the highest elevation the species occurs in Maine and the USA based on our review of available habitat.

Although Dodd (2013, *op. cit.*) did not cite specific low elevation records for *L. septentrionalis*, he stated (based on Hoopes 1938, *op. cit.*) that in Maine the species is not found below 300 m elevation. However, we have collected specimens in Maine from as low as 64 m in Grand Lake Stream

Plantation, Washington County (YPM 14378) and from 64 m in Norridgewock, Somerset County (YPM 12662), and the Maine Amphibian and Reptile Atlas Project database contains a photo record from Eddington, Penobscot County at 55 m elevation. In addition, the species occurs to near sea level in Canada (e.g., Mill Lake, Halifax County, Nova Scotia, 7 m elev., Royal Ontario Museum [ROM] 6414; Bider and Matte 1996, *op. cit.*; S. Rouleau, pers. comm).

Specimens collected under Maine Department of Inland Fisheries and Wildlife permits (#2006-259; #2013-259; #2020-259) issued to TBP.

**TREVOR B. PERSONS**, 206 Bigelow Hill Road, Norridgewock, Maine 04957, USA (e-mail: trevor.persons@nau.edu); **PHILLIP G. DEMAYNADIER** (e-mail: phillip.demaynadier@maine.gov) and **DEREK T. YORKS**, Maine Department of Inland Fisheries and Wildlife, 650 State Street, Bangor, Maine 04401, USA (e-mail: derek.yorks@maine.gov).

**LITHOBATES SYLVATICUS** (Wood Frog) and **AMBYSTOMA MACULATUM** (Spotted Salamander). **POSSIBLY FATAL INTERSPECIFIC AMPLEXUS.** *Lithobates sylvaticus* are explosive, coercive breeders whose reproductive success is dependent on female density (Redmer and Trauth, 2005. *In* Lannoo [ed.] *Amphibian Declines: The Conservation Status of United States Species*, pp. 590–593. University of California Press, Berkeley, California). As a result, competition among males can result in the usurpation of an amplexant male by a competing male, or the clasping of multiple males on a single female (Berven 1981. *Evolution* 35:707–722). Males may remain in amplexus with their partner until either successful fertilization, exhaustion, or recognition of their involvement in a non-productive pair (Trauth et al. 2000. *J. Arkansas Acad. Sci.* 54:154–156). As a result of such mating strategies, death to females has been documented stemming from lasting competitive amplexus (Howard 1980. *Anim. Behav.* 28:705–716). Further, *L. sylvaticus* individuals have been documented in interspecific amplexus, including with ambystomatid salamanders (Simovi et al. 2014. *Herpetol. Notes* 7:25–29; Crane and Ferrari 2015. *Herpetol. Notes.* 8:295). To our knowledge, however, fatal interspecific amplexus involving *L. sylvaticus* has not been documented.

On the night of 3 March 2020 at a site in Baltimore County, Maryland, USA (39.6090°N, 76.6360°W; WGS 84) we observed two separate instances of male *L. sylvaticus* amplexing an adult *Ambystoma maculatum*. In the first instance four male



FIG. 1. *Lithobates sylvaticus* males amplexing a dead *Ambystoma maculatum* with a facial injury in Maryland, USA.

PHOTO BY CONNOR KEAN