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# First record of the American bullfrog *Lithobates catesbeianus* (Shaw, 1802) in Mendoza province, Argentina

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Introduction of non-native species by humans is a growing biological concern. The reasons for such introductions are varied and include biological control, human consumption, and pet trade (Kraus, 2009). Impacts include extinction or extirpation of native species, biotic homogenization, disruption of food webs, changes in primary productivity of the ecosystem, changes in soil formation, and vectors of diseases (Kraus, 2009).

The American bullfrog, *Lithobates catesbeianus* (Shaw, 1802), is considered one of the most invasive species in the world (Lowe *et al.*, 2004). This species can act as a vector for pathogens, especially *Batrachochytrium dendrobatidis*, the fungus that causes chytridiomycosis in amphibians. Chytridiomycosis is syndicated as one of the principal causes of global amphibian decline (Berger *et al.*, 1998; Longcore *et al.*, 1999; Ron and Merino, 2000; Daszak *et al.*, 2003). Also, the ecological impacts of bullfrogs on native species and environments include competition with, or removal of, native prey and predators and cascading community and ecosystem changes (Kraus, 2009).

The native range of the American bullfrog extends from eastern Canada, through central and eastern United States, to northeastern Mexico (Frost, 2011). Ecologically, the American bullfrog is a highly adaptable species. This adaptability has led to its success in invading diverse environments ranging from deserts to the tropics (Adams and Pearl, 2007). This species has been widely introduced around the world, and feral populations have been reported in almost all countries of South America (Frost, 2011). Populations of *L. catesbeianus* have recently been reported from Argentina in the provinces of San Juan (Sanabria *et al.*, 2005; Sanabria *et al.*, 2011), Misiones (Pereyra *et al.*, 2006), Buenos Aires (Barrasso *et al.*, 2009), Córdoba (Akmentins *et al.*, 2009; Nori *et al.*, 2011), and Salta (Akmentins and Cardozo, 2010). Here we report a first record of *Lithobates catesbeianus* from Mendoza province, Argentina.

We discovered a well established population of *L. catesbeianus* in Mendoza province, San Carlos department, Capiz locality (33° 41' 11"S, 68° 59' 09" W; elevation: 920 m) and other nearby localities at Tunuyán department (Fig. 1 and Table 1). This record extends the distribution range of this species 270 km S-SE from Calingasta, San Juan, and 400 km W-SW from Villa Dolores, Córdoba. The region is part of the Monte phytogeographic province, which is characterized by an arid climate with mean annual temperature of 17.7°C (mean annual minimum and maximum: -1.4 and 38.0°C, respectively) and mean annual rainfall of 331.2 mm, which occurs mainly in summer (San Carlos meteorological station; Capitanelli, 1999).

This area has been deeply modified for agriculture, and is irrigated by a channel system that connects rivers, streams, and natural spring waters throughout the entire area. Frequently, land holders collect water in artificial ponds to use during water

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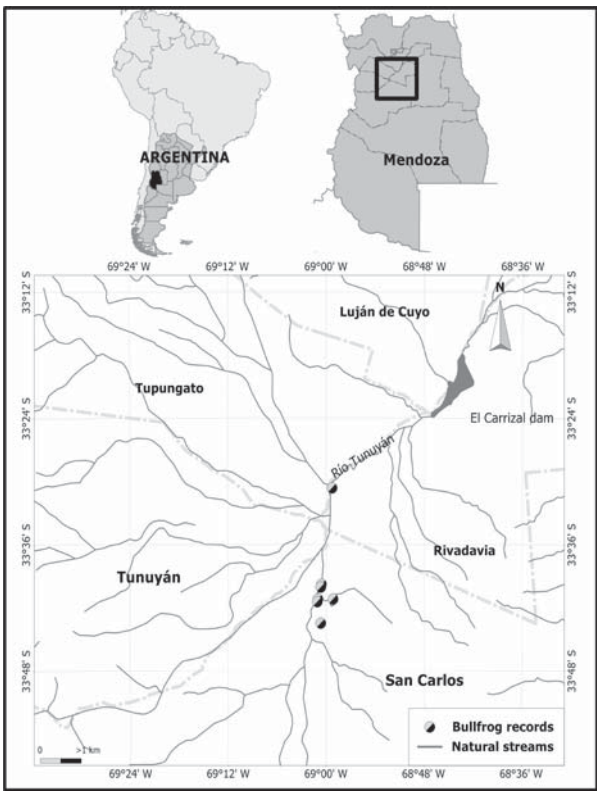


**Figure 1.** Geographic location of the new records of the American bullfrog (*Lithobates catesbeianus*) in Mendoza province, Argentina.

shortages. We found *L. catesbeianus* using artificial ponds for reproduction, as well as irrigation channels for adult and tadpole dispersal between water bodies.

The dominant native plants of these streams and channels include *Eupatorium sp*., *Scirpus sp*., *Juncus sp*., *Cortaderia rudiuscula*, *Typha dominguensis*, and many floating-leaf emergent plant species like *Nasturtium nasturtium-aquaticum* and *Hydrocotyle ranunculoides*. It is also common to find the invasive species *Tamarix gallica* in river and stream banks, and planted trees of *Salix* spp. on the margins of main irrigation channels.

**Table 1.** Additional localities near Capiz for *L.catesbeianus* from Mendoza province

| Localities | Latitude | Latitude |
|---|---|---|
| Bridge over Tunuyán river | 33° 30' 38" S | 68° 59' 12" W |
| Irrigation channel | 33° 39' 47" S | 69° 00' 34" W |
| Bridge over San Carlos stream | 33° 41' 12" S | 69° 01' 00" W |
| Giménez pond | 33° 43' 29" S | 69° 00' 38" W |

On 3 February 2011, we surveyed the area searching for amphibians in an artificial pool (2.25 ha) and its surrounding waterways. During six hours at night (from 7 pm to 1 am), we collected adult frogs and tadpoles of *L. catesbeianus* by hand and hand net. The captured frogs were euthanized by immersion in 40 % ethanol, fixed in 10% formalin, and preserved in 70% ethanol. Larvae were preserved in 10% formalin. All specimens of *L. catesbeianus* were deposited at the Herpetological Collection of the Instituto Argentino de Investigaciones de las Zonas Áridas (CH-IADIZA 343, 344-1 to 344-22, 345).

We observed tadpoles of *L. catesbeianus* in the artificial waterways and pools. These environments provide a suitable habitat for the larvae to complete their development and for adults to thrive and reproduce. We captured 52 tadpoles of *L. catesbeianus* representing various stages of development (Fig. 2). Also, we captured one adult male and 22 juveniles. American bullfrog's males vocalized actively during our field surveys.

Other amphibian species present in the area were adults of *Rhinella arenarum* and a juvenile of *Leptodactylus latrans*, which were released at the capture site. We did not find tadpoles of these two species in the surveyed water bodies. Akmentins *et al*. (2009) and Sanabria and Quiroga (2010) reported that *L. catesbeianus* eat amphibians, snakes, mammals, and invertebrates, and Barrasso *et al.* (2009) reported *Leptadactylus latrans* as part of its diet. In accordance to this, local people from Capiz pointed out that in the past the Rana criolla (*L. latrans*) were more abundant than today and that they have disappeared from several sites.

In a recent publication about the invasion of *L. catesbeianus*, Nori *et al*. (2011) reported 12 localities that can be assumed to contain feral populations from Argentina and modeled the potential invasion areas of *L. catesbeianus* in Argentina using data from the native range of this species. In the prediction map, Mendoza shows an area with a high probability of invasion by *L. catesbeianus* at 70 km NE from the locality reported here. Although the authors indicate that factors such as low precipitation or high altitudes could be limiting the species' ability to invade the west and south of Argentina, other factors like local environmental conditions where frog farms are located can be important for successful establishment of new populations. The new locality reported

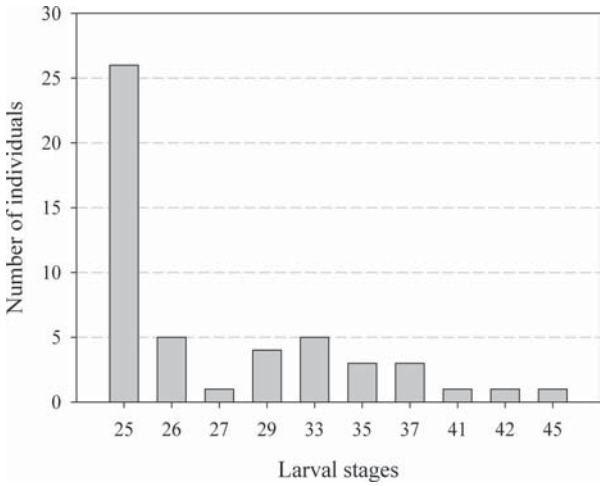


**Figure 2.** Tadpole stages found at the surveyed area. Stages classified according Gosner (1960).

here is located in a highly vegetated and shaded area with many natural springs and irrigation channels, which represent suitable conditions for this species but are not captured by traditional modeling procedures. Clearly, predictive models are developed with environmental parameters under natural conditions, the new area is not detected by the model because is an artificial ecosystem. These ecosystems provide local conditions that allow the reproduction of bullfrog.

Akmentins and Cardozo (2010) mentioned that the lack of government regulation or control over frog-farming facilities is the most probable source of feral populations in Argentina. According to local people from Capiz, *L. catesbeianus* was first introduced at least 20 years ago when specimens were released from a frog farm located close to the sites reported here (33° 40' 37" S, 68° 58' 49" W). Also they expressed that teachers from a school of Capiz encouraged the students to breed bullfrogs in channels and streams near their homes. Thus, a combination of factors, including a lack of awareness by the people about the risks of species introduction, and relaxed governmental policy in controlling frog farms, are likely to be the origin of the introduction of *L. catesbeianus* in this region of Mendoza.

Studies of reproductive potential, trophic ecology and prevalence of chytrid fungus infection of this feral population of American bullfrog are needed to better understand the impacts of this invasive species on native biodiversity of Mendoza. Also, it is necessary to determine the actual distribution in the studied area. The finding of some individuals in the Tunuyán river, close to El Carrizal dam, makes it imperative to alert to environmental authorities and take the necessary actions to restrict the spread of this species in a more extensive irrigation system. We suggest a review and update of the legislation concerning exotic species trade in order to prevent the establishment of additional populations of *L. catesbeianus* in Argentina. Furthermore, application of control measures and integrated management of previously established populations of American bullfrog should involve local people, land owners, government decision-makers, and academic institutions.

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## Literature cited

Adams, M.J. & Pearl C.A. 2007. Problems and opportunities managing invasive bullfrogs. Is there any hope?: 679–693. *In*: Gherardi, F. (ed), Biological invaders in inland waters: profiles, distribution and threats. Springer, Dordrecht.

Akmentins, M.S. & Cardozo, D.E. 2010. American bullfrog *Lithobates catesbeianus* (Shaw, 1802) invasion in Argentina. *Biological Invasions* 12: 735-737.

Akmentins, M.S.; Pereyra, L.C. & Lescano, J.N. 2009. Primer registro de una población asilvestrada de rana toro (*Lithobates catesbeianus*) en la provincia de Córdoba, Argentina. Notas sobre la biología de la especie. *Cuadernos de Herpetología* 23: 25–32.

Barrasso, D.A.; Cajade, R.; Nenda, S.J.; Baloriani ,G. & Herrera, R. 2009. Introduction of the American bullfrog *Lithobates catesbeianus* (Anura: Ranidae) in natural and modified environments: an increasing conservation problem in Argentina. *South American Journal of Herpetology* 4: 69–75.

Berger, L.; Speare, R.; Daszak. P.; Green, D.E.; Cunningham, A.A.; Goggin, C.L.; Slocombe, R.; Ragan, M.A.; Hyatt, A.D.; McDonald, K.R.; Hines, H.B.; Lips, K.R.; Marantelli, G. & Parkes, H. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. *Proceedings of the National Academy of Sciences, USA* 95: 9031–9036.

Capitanelli, R.G. 1999. Climas de la Provincia de Mendoza. *Meridiano. Revista de Geografía* 7: 29-40.

Daszak, P.; Cunningham, A.A. & Hyatt, A.D. 2003. Infectious disease and amphibian population declines. *Diversity and Distribution* 9: 141–150.

Frost, D. R. 2011. Amphibian species of the world: an online reference. Version 5.5 (31 January, 2011). Electronic Database accessible at http://research.amnh.org/herpetology/amphibia/. American Museum of Natural History, New York, USA. Accessed 4 May, 2011.

Gosner, K.L. 1960. A simplified table for staging anuran

embryos and larvae with notes on identification. *Herpetologica* 16: 183–190.

Kraus, F. 2009. Alien reptiles and amphibian. A scientific compendium and analysis. Invading nature: Springer series in invasion ecology 4. Springer, New York, USA.

Longcore, J.E.; Pessier, A.P. & Nichols. D.K. 1999. *Batrachochytrium dendrobatidis* gen. et sp. nov., a chytrid pathogenic to amphibians. *Mycologia* 91: 219–227.

Nori, J.; Akmentins, M.; Ghirardi, R.; Frutos N. & Leynaud, G. 2011. American bullfrog invasion in Argentina: where should we take urgent measures?. *Biodiversity and Conservation* 20:1125–1132

Pereyra, M.O.; D. Baldo & E.R. Krauczuk. 2006. La "rana toro" en la Selva Atlántica Interior Argentina: un nuevo problema de conservación. *Cuadernos de Herpetología* 20:37–40

Ron, S.R. & Merino, A. 2000. Amphibian declines in Ecuador: overview and first report of chytridiomycosis from South America. *Froglog* 42:2–3.

Sanabria, E.A.; Quiroga, L.B. & Acosta, J.C. 2005. Introducción de *Rana catesbeiana* (rana toro), en ambientes precordilleranos de la provincia de San Juan, Argentina. *Multequina* 14:65–68.

Sanabria, E.A. & Quiroga, L.B. 2010. *Lithobates catesbeianus* (American Bullfrog). Diet of alien species. *Herpetological Review* 41: 339.

Sanabria, E.A.; Ripoll, Y.; Jordan , M.; Quiroga, L.B.; Ariza, M.; Guillemain, M., Perez, M. & Chávez, H. 2011. American Bullfrog (*Lithobat;s catesbeianus*) invasion in San Juan, Argentina. *Revista Mexicana de Biodiversidad* 82: 311-313.

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