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Short Communication

First report of overwintering in tadpoles of *Odontophrynus occidentalis* (Anura: Odontophrynidae) from Argentina

Melina Jesús Rodriguez-Muñoz,[1,3] Ana Paula Galdeano,[1,3] Tomás Agustín Martínez,[1,3] Rodrigo Acosta,[1] Juan Carlos Acosta,[1,2] and Graciela Blanco[1,2]

[1] GABINETE DIBIOVA (Diversidad y Biología de Vertebrados del Árido). Departamento de Biología, FCEFN, Universidad Nacional de San Juan. Avenida Ignacio de la Roza 590, Rivadavia J5400DCS, San Juan, Argentina. E-mail: melina.rodriguez26@gmail.com.

[2] Centro de Investigaciones de la Geósfera y la Biósfera (CIGEOBIO), CONICET – UNSJ, Facultad de Ciencias Exactas Físicas y Naturales. J5402DCS, Rivadavia, San Juan, Argentina.

[3] Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET). C1425FQB, Ciudad Autónoma de Buenos Aires, Argentina.

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Palavras-chave: atividade invernal, anfíbios, chaco árido, estágio de desenvolvimento, San Juan.

Fellers *et al.* (2001) defined overwintering in anuran larvae as spending the winter (i.e., June–September in the Southern Hemisphere) as tadpoles. Several environmental factors influence growth and development rates in larval anurans (Saha and Grupta 2011). Among them are temperature (Kaplan 1980, Saidapur and Hoque 1995), photoperiod (Saidapur 1989), rainfall (Lynch and Wilczynski 2005), food quality (Alvarez and Nicieza 2002), and hydroperiod (Ryan and Winne 2001).

We know little about larval overwintering sites in anurans and this is one of the major gaps in our understanding of amphibian ecology. Because of this, it is not possible to make a universal statement about the physicochemical environmental requirements of overwintering amphibians. Two factors that should be important are temperature and dissolved oxygen (Glenn *et al.* 2008).

Overwintering tadpoles have been reported in at least 17 genera and 40 species of frogs in the northern and southern hemispheres. Included are: *Rana* (= *Lithobates*), *Ascaphus, Alytes, Alsodes, Atelognathus, Batrachyla, Hylorina, Calyptocephalella, Chaltenobatrachus,* and *Polypedates* (Martof 1956, Bradford 1983, Díaz and Valencia 1985, Thiesmeier 1992, Úbeda 1998, Úbeda *et al.* 1999, Hulse *et al.* 2001, Logares and Úbeda 2004, 2006, Cuello and Perotti 2006, Tattersall and Ultsch 2008, Navas *et al.* 2010, Basso *et al.* 2011, Hsu *et al.* 2012). In South America, larval overwintering has only been reported for temperate species such as *Alsodes gargola* Gallardo, 1970 (Logares and

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Úbeda 2004, 2006), *A. tumultuosus* Veloso *et al.*, 1979, and *A. montanus* (Lataste, 1902) (Díaz and Valencia 1985) and two species of *Atelognathus* [*A. nitoi* Barrio, 1973 (Úbeda *et al.* 1999) and *A. patagonicus* (Gallardo, 1963) (Cuello and Perotti 2006, Cuello *et al.* 2014)]. Basso *et al.* (2011) suggested that overwintering might occur in *Chaltenobatrachus grandisonae* (Lynch, 1975). Herein, we report the occurrence of overwintering in tadpoles of *Odontophrynus occidentalis*.

The study area corresponds to the western part of the Chaco Ecoregion (Cabrera and Willink 1980, Márquez *et al.* 2014, Morrone 2014). In the Arid Chaco, rainfall is low (300 mm at its western limit) and there is a marked summer regime because 70% of the rains occur in the warmer months, from November–February. The annual air mean temperature is 17.1°C, with a mean monthly air temperature of the warmest month (January) of 26°C, but frequently, the maximum temperatures exceed 40°C. Winters are temperate; the mean monthly air temperature of the coldest month is 12°C (Karlin *et al.* 2013).

We searched for tadpoles of the stream-breeding frog *Odontophrynus occidentalis* Berg, 1896 in the Río La Majadita (30°42'47.016" S, 67°29'44.015" W; 976 m a.s.l.) in San Juan Province of the Chaco ecoregion in Argentina in July 2018. We also undertook subsequent field trips to the study area to observe the frogs. *Odontophrynus* from this region originally was identified as *O. barrioi,* but this species was placed in the synonymy of *O. occidentalis* by Martino *et al.* (2019). We searched the headwaters of the Río Majadita by day looking for tadpoles in every potential habitat (e.g., under rocks and vegetation, and in crevices). We used dipnets to catch the tadpoles and determine the developmental stages (Gosner 1960).

The six tadpoles of *Odontophrynus occidentalis* were collected on 16 July 2018 in the headwaters of Río La Majadita were in Stages 35–36 (Gosner 1960). In subsequent field trips, we found the following: 15 tadpoles in August 2012; an amplectant pair of the species in April 2014; one metamorph in September 2014; and 53 tadpoles in October 2014 in La Mesada Stream (31°1'18.768" S, 67°17'42.719" W; 867 m a.s.l.). We observed tadpoles in advanced stages and metamorphs in the spring when they are more frequently observed than adults (Juan Acosta pers. com.). The advanced stages and metamorphs found in the spring may not be young of that year and possibly overwintered as larvae. Also, the wide range of sizes and stages of individuals found in October 2014 (Figure 1) might reflect the co-occurrence

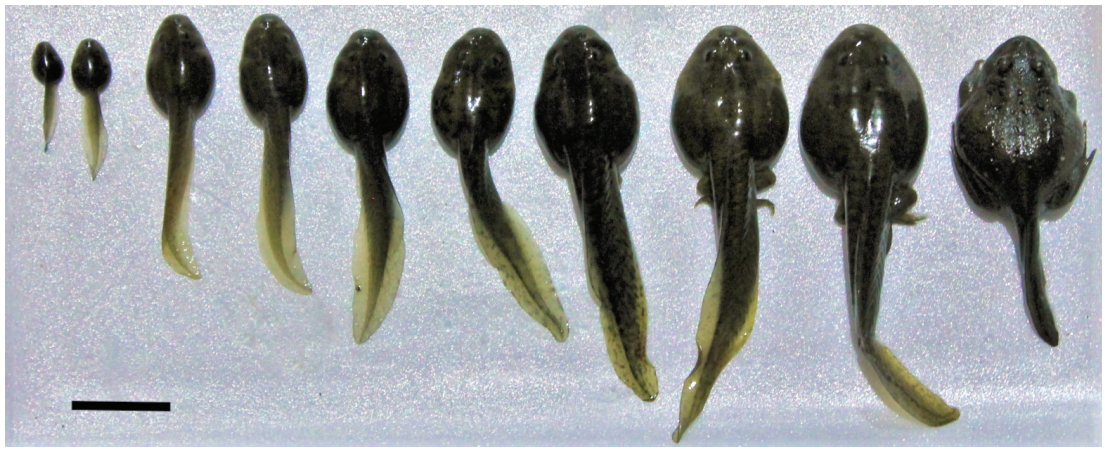

Figure 1. *Odontophrynus occidentalis* ranging from Gosner (1960) Stages 21–45 captured in October 2014 in La Mesada Stream. Scale bar: 2 cm.

of overwintering larvae and young of the year. Our observation of an amplectant pair of frogs in the early autumn suggests that offspring from this mating may overwinter as larvae.

Grenat *et al.* (2011) reported long developmental times for tadpoles of *Odontophrynus. cordobae* Martino and Sinsch, 2002 in nature (2–13 mo after oviposition) when the larvae overwinter. This protracted development is similar to that reported by Fernández and Fernández (1921) for *Odontophrynus* sp. from northern Córdoba (11–13 mo), and by Gallardo (1963) for *O. americanus* (Duméril and Bribon, 1841) from Buenos Aires (7 or 8 mo). Given the relatively prolonged development of other species of *Odontophrynus*, we speculate that overwintering in *O. occidentalis* may reflect a long developmental period.

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