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SHORT COMMUNICATION

Current distributional status of the Critically Endangered Valcheta Frog: implications for conservation

Estado atual da distribuição da criticamente ameaçada rã de Valcheta: implicações para sua conservação

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Abstract

The Valcheta Frog, *Pleurodema somuncurense* (Cei, 1969), is a critically endangered species endemic from Somuncura plateau, Patagonia, Argentina. Although this frog is facing several human-related threats, the available information about its population status and trends is scarce. In order to update the range of the species, from 2013 to 2015, we conducted exhaustive surveys in all its geographical distribution, including sites never explored in the past. In 2014, we estimated occupancy and probability of detection with a three-visit survey in 40 sites of headwaters of Valcheta stream. Frogs were present in 58% of sites, and the probability of detection was high. We increased the known range of Valcheta Frog in 160%, by adding new sites occupied by the species. However, the status of the species remains of great concern, since its total range barely reaches 4 square kilometres.

Keywords: threatened amphibians, Somuncura plateau, occupancy models, population decline.

Resumo

A rã de Valcheta, *Pleurodema somuncurense* (Cei, 1969), é uma espécie criticamente ameaçada, encontrada no planalto de Somuncura, Patagônia, Argentina. Embora esta rã enfrente várias ameaças antrópicas, as informações disponíveis sobre seu estado e as tendências de suas populações são escassas. Com o objetivo de atualizar o alcance da espécie, de 2013 a 2015, realizamos pesquisas em toda área geográfica de ocorrência da espécie, incluindo locais nunca antes explorados. Em 2014, estimamos a ocupação e a probabilidade de detecção com amostragem colhida em três visitas a mais de 40 locais situados na cabeceira do córrego Valcheta. As rãs estavam presentes em 58% dos locais e a probabilidade de detecção foi alta. Aumentamos a área de ocupação conhecida da rã de Valcheta em 160%, adicionando novos locais de ocorrência da espécie. No entanto, a situação da espécie continua a ser uma grande preocupação, uma vez que a seu alcance total não chega a 4 quilômetros quadrados.

Palavras-chave: anfíbios ameaçados, planalto de Somuncura, modelos de ocupação, declínio populacional.

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The Valcheta Frog, *Pleurodema somuncurense* (Cei, 1969) is a habitat-specialist amphibian with a very small distributional range. This almost wholly aquatic frog inhabits and breeds only in permanent thermal springs and warm headwaters of the Valcheta stream. Individuals can be found under stones in the current of the stream or in association to soft masses of floating mosses, aquatic and semi-aquatic vegetation (Cei, 1969). Until 2006, the species was only known from eight thermal springs located at the locally called western cold branch of the Valcheta stream, Somuncura plateau, northern Argentinean Patagonia, reaching a range of 1.5 square km (Cei, 1969; Diminich, 2006). The Valcheta Frog is one of most endangered species of Argentina (Vaira *et al.*, 2012) and one of the three amphibians in this country listed as Critically Endangered at the IUCN Red List (Úbeda and Lavilla, 2004) due to: (a) restricted geographical range, (b) specific habitat requirements and (c) combination of threats, including exotic predatory fish species (*Oncorhynchus mykiss* and *Salvelinus fontinalis*), habitat fragmentation and livestock.

Since its description, the Valcheta Frog has been poorly studied. Cei (1969) found the first individuals at the estancias "El Rincón" and "El Ariete". Almost 40 years later, Diminich (2006) reconfirmed the presence of the species at "El Rincón" and in a new site, 3 km downstream (i.e."El Destacamento"), but found no individuals at "El Ariete". Chebez and Diminich (2008) argue about a potential extinction of the sub-population inhabiting "El Ariete" caused by the drought of the springs in the site.

The conservation of the Valcheta Frog is of great concern, and an action plan that ensures the long-term viability of the species is urgently needed (Basso *et al*., 2012). Basic information is an essential input to allocate and evaluate results of management efforts. Based on this goal, in the present work, we present a current distributional status of the Valcheta Frog and we estimate the occupancy and probability of detection of the species. We also discuss the conservation implications of our findings considering the context of human-related threats in the habitats used by this species.

The Somuncura plateau, northern Patagonia, Argentina (Figure 1), is characterized by a unique combination of two different habitats: the Patagonian steppe and the Monte shrublands (León *et al.,* 1998). Thermal springs at the edge of the plateau are the origin of Valcheta stream. These springs converge in four branches grouped in two pairs that are locally named as hot and cold branches (maximum water temperatures of 26˚C and 22˚C, respectively). Currently, the management of the region is constrained to some extensive cattle ranching with little real protection for the Valcheta Frog and its habitat (Úbeda and Grigera, 2007; Basso *et al.*, 2012).

During three consecutive summers (2013 to 2015), we conducted exhaustive and extensive surveys in the entire region of hot and cold branches of Valcheta stream, including never explored areas, totalizing an effort of 784 men-hours. Each branch was covered by at least two observers, which conducted a Visual Encounter Survey (VES, Crump and Scott, 1994) searching for frogs, during the peak of activity for the species (between 22h and 02h) and under similar and usual weather conditions. Additionally to these exhaustive surveys, in February of 2014, we conducted a survey aimed at estimating occupancy and detectability (=probability of detection) of this species.

For the occupancy surveys, we selected 10 sites along each branch of the stream (n = 40 sites). We defined each site as a six-meter portion of the bank of the stream. The first site at each branch was placed on a thermal spring randomly selected, and the following nine sites were placed systematically every 50 m along the bank of the stream. We conducted three visits to each site. During the visits, two observers recorded the number of detected individuals through VES method. We conducted a previous survey in January 2014 to define the minimum number of visits needed to get robust estimations (Mackenzie and Royle, 2005). We used R-*unmarked* package to estimate both occupancy and detectability in constant models (i.e. without covariates).

The Valcheta Frog occupied the four branches of the stream. Three of these branches were new areas for the species: warm branches and eastern cold branch (Figure 1). In these new areas, we found all life cycle stages (i.e. adults, juveniles, tadpoles and eggs), confirming the importance of these places. Almost two-third of sites were occupied (27 of 40 sites), with an occupancy of 0.58 ± SE 0.08 and detectability of 0.78 ± SE 0.06. We also found one frog at "El Ariete" where the sub-population was thought to be extinct. However, no individual were found at "El Destacamento", where the species was common in the past. The new warm branches sites are located 3 and 15 km far from previously known sites of the species distribution (Figure 1). These data are important when the extremely small distributional range of the species is considered (Úbeda and Lavilla, 2004), being increased in 160% (from 1.5 to 4 square km).

There are differences in distributional patterns between warm and cold branches. In cold branches, the occurrence of frogs was restricted to 7 thermal springs, and never further than1 km from the spring. In warm branches, the occurrence of frogs was continuous along the stream, and we observed individuals more than 5 km far from a thermal spring (Figure 1). These differences may be related with: (a) differences in water temperature (between 2 to 4˚C higher at warm branches); (b) human-related threats, considering that most local people live along cold branches, and/or; (c) invasive predatory species (Velasco *et al.,* 2016). Cold branches are affected by small dams, irrigation channels, a high livestock density and exotic trees.

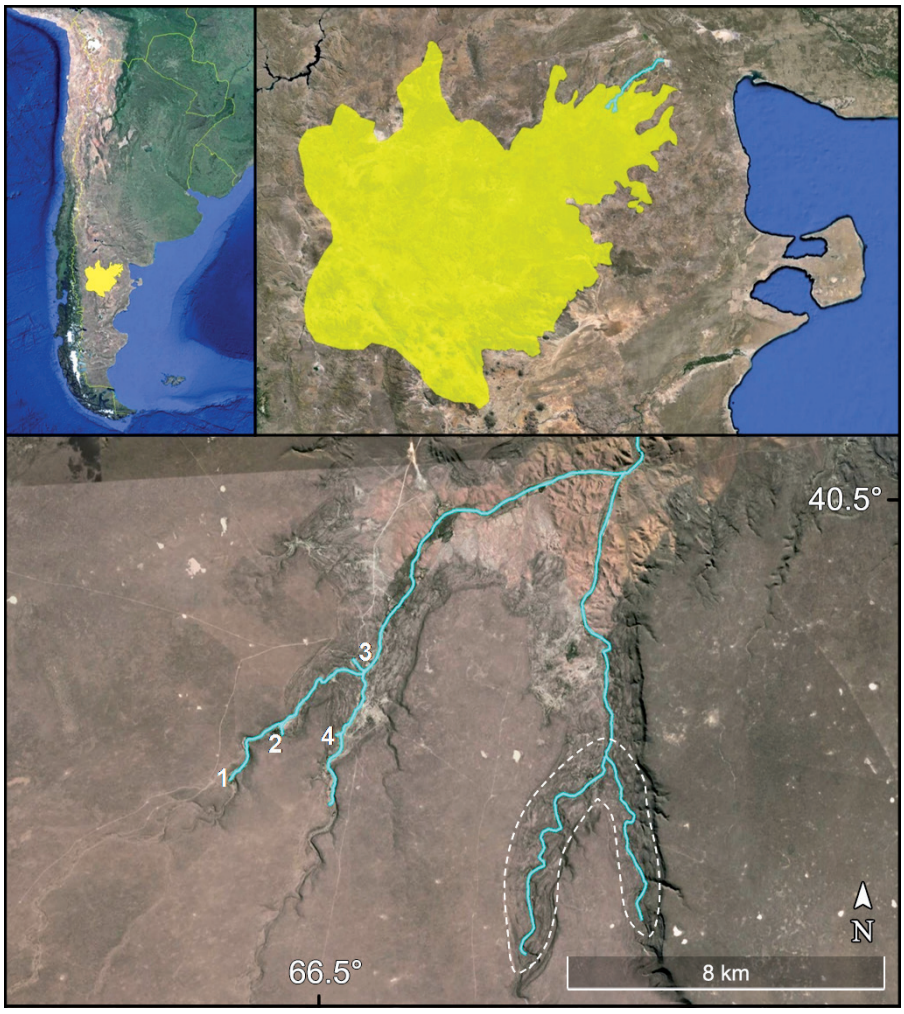

Figure 1. Location of the Somuncura plateau at northern Argentinean's Patagonia (up left) and Valcheta stream in a regional context (up right). At the down map, the current distributional range of Valcheta Frog is shown, remarking previous records at western cold branch: El Ariete (site 1), El Rincón (site 2) and El Destacamento (site 3); and new sites at the eastern cold branch (site 4) and at warm branches (dotted line).

Dams and exotic trees affect the dynamic of the stream promoting the stagnant of the water, which could be related with negative selection by frogs. Additionally, trout are more abundant in cold branches (Ortubay *et al.,* 1997). As seen in other amphibians species (Martín-Torrijos *et al*., 2016), these invasive fishes might be limiting the distribution of Valcheta frog.

Considering the high detectability, the absence of records at most parts of cold branches could be related with a real absence of individuals or with a very small population size. The population decline of the species was inferred by several authors, but without a quantitative analysis (Chebez and Diminich, 2008; Úbeda and Lavilla, 2004). This decline could be related to the impact of human-related activities and unusual climatic events. Before the construction of a small dam, the Valcheta Frog were commonly recorded at "El Destacamento" (Diminich, 2006), but since then, no individual was found in this site. Long-term monitoring is needed to confirm if the species is locally extinct, or if individuals are temporarily absent as consequence of metapopulation dynamics. The drought of key thermal springs located at el "El Ariete" between 1960 and 1990 (Chebez and Diminich, 2008) may be an explanation to the absence of individuals in this site. During our surveys, "El Ariete" had water again, but we only found one individual even after exhaustive searches, suggesting that frogs have recolonized the site, but inferred abundance is still very small to ensure long-term viability of this population.

The current scenario for the Valcheta frog is concerning. Even including new sites from our records, the species maintains a very small range (lesser than 5 square km), mostly fragmented and affected by several threats. Moreover, no individuals were detected at sites where it were common in the past, supporting the hypothesis of decline

or local extinction of sub-populations. In frame of these results, we agree that urgent actions are needed to protect the relict population of Valcheta Frog and its habitat.

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