ZSL
LET'S WORK FOR WILDLIFE

EDGE

EVOLUTIONARILLY DISTINCT & GLOBALLY ENDANGERED

Survival Blueprint

El Rincon stream frog
Pleurodema somuncurense

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1. STATUS REVIEW

1.1 Taxonomy:

AMPHIBIA – ANURA – NEOBATRACHIA – LEPTODACTYLIDAE – PLEURODEMA – PLEURODEMA SOMUNCURENSE (CEI, 1969)

The El Rincon-stream Frog was discovered in 1968 and subsequently described as *Telmatobius somuncurensis* (Cei 1969). Later, the species was moved to a new erected monotypic genus *Somuncuria* based on external morphology and osteology of adult frogs (Lynch 1978). Nowadays, updated phylogenetic studies have positioned this species within the genus *Pleurodema* (Ferraro 2009; Faivovich *et al* 2012).

Species of the genus *Pleurodema* are relatively small, plump frogs that mostly occur in strong-seasonal and dry environments. The genus currently comprises 15 species distributed from Panama to southern Patagonia (Frost 2020).

The English name stated by the IUCN is the "El Rincon stream frog" in reference to its discovery site, a spring of the Valcheta stream located at the "El Rincon" ranch (Chipauquil). However, locally it receives other names: the Somuncura frog, the Valcheta frog and the Chipauquil frog in reference to its whole distributional area. We recommend the use of the common names Valcheta frog or Chipauquil frog. These terminologies refer more accurately to the species distribution and differentiates it from another endemic amphibian of the highlands of the Somuncura plateau, *Atelognathus reverberii*, also called the Somuncura frog.

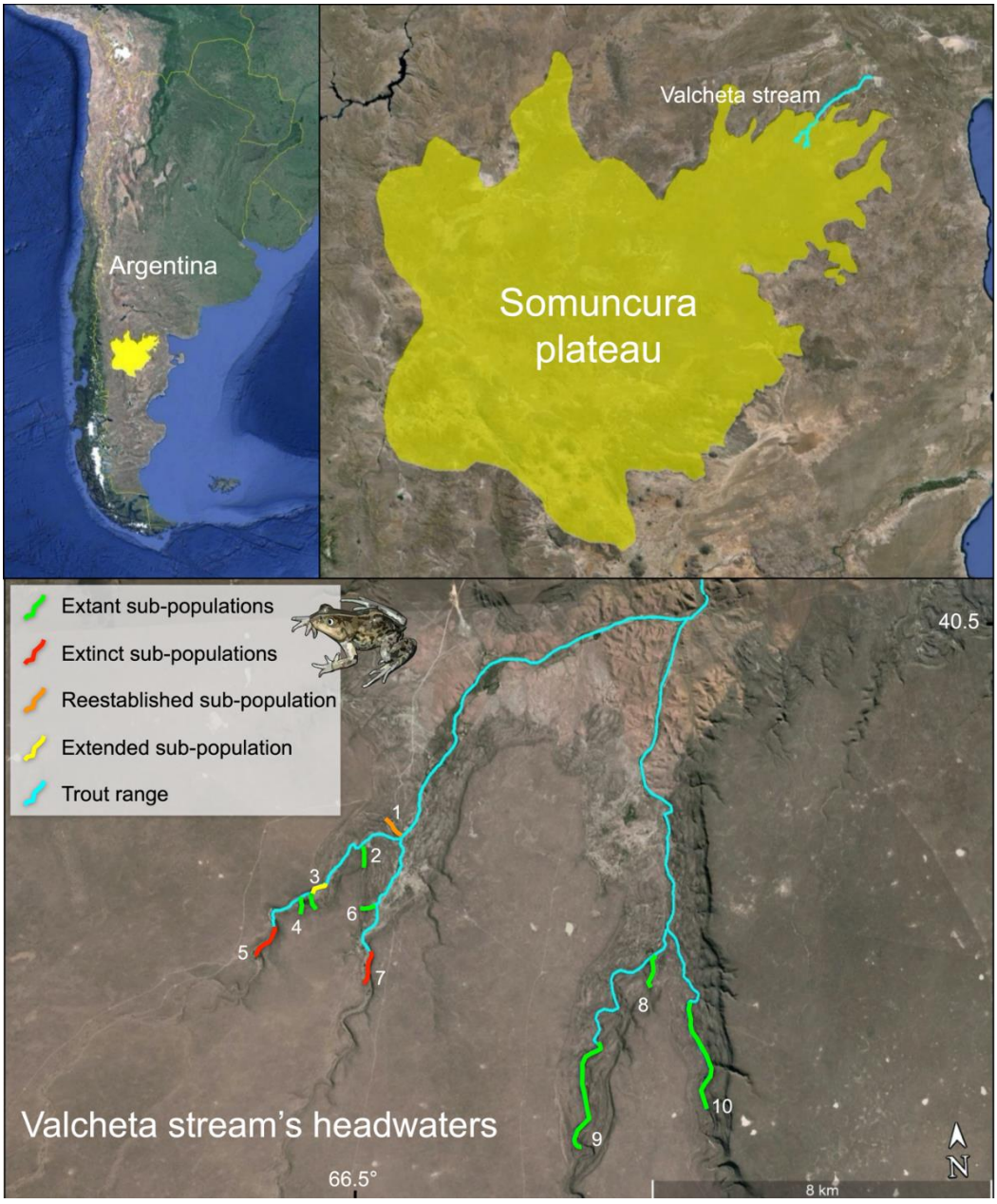
1.2 Distribution and population status:

The species distribution is micro-endemic; it is located at Northern Patagonia, specifically at the northern border of the Somuncura Plateau (40°58'26"S; 66°39'16"W) at middle altitudes (500–800 m.a.s.l.) within the Rio Negro province, Argentina (Cei 1969). 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 (Velasco *et al* 2016). These branches are the El Rincon-stream frog habitat.

The species shows a classic metapopulation dynamic (local populations with different degrees of connectivity experiencing process of local colonization and extinction). The whole population is fragmented in at least 9 discrete subpopulations located at the two branches that forms the stream's headwaters, locally called the "Rama Caliente" and the "Rama Fria" (Hot Branch and Cold Branch in English). Historical records show the existence of at least nine subpopulations, of which two had gone extinct (Velasco *et al* 2019a). One of these local populations (the one called "El Destacamento", see map below) was re-established through a reintroduction programme. We also assume the existence of a tenth extinct subpopulation at the site locally called as "Cora" (although not confirmed with historical records). This population might have become locally extinct due to past and current management of livestock in that site. The status of the subpopulations is slightly different in each

branch: in the "Rama Caliente", the species occurs continuously along the first 10 km of each arm. In contrast, in the "Rama Fria", the distribution is heavily fragmented, with sub-populations restricted to 10 springs located no further than 1 km downstream from the main spring (Velasco *et al* 2016).

Exhaustive studies carried out throughout its distribution area indicate that the total area of occurrence is approximately 30 km^2. However, this area encompasses unsuitable habitats for the species. Considering the frog's habitat preferences and aquatic life habits, the estimated occupation is reduced to approximately 1.8 km^2. Therefore, if we only consider the portions of stream occupied, the effective range would be reduced to 2 ha of stream (Velasco *et al* 2016, IUCN 2016).



Map. Location of the Somuncura Plateau in the national context (upper left), the Valcheta Stream in a regional context (upper right) and the known distribution of the El Rincon-stream Frog's subpopulations, indicating their current status in colours: 1. El Destacamento; 2. Los Mapuches; 3. El Rincón I; 4. El Rincón II; 5. El Ariete; 6. Lo de Otero; 7. Cora; 8. Echeverría; 9. Lo de Chico, and; 10. La Tapera.

1.2.1 Global distribution:

Country	Population estimate (plus references)	Distribution	Population trend (plus references)	Notes
Argentina.	The whole population size ranged from 8,261 to 19,925. However, when considering only the breeding population size, the number of adult frogs varied from 3,411 to 6,024 (Velasco *et al* 2019a).	Valcheta stream, Somuncura Plateau, Rio Negro province.	Decreasing. There exist records of local populations extirpated from its wild habitat (IUCN 2016; Velasco *et al* 2019a).	This is an estimate for the whole population of the species. For each subpopulation's estimate, refer to Velasco *et al* (2019a). However, it is worth highlighting that 80% of the known and isolated subpopulations are of less than 1,000 individuals each.

1.2.2 Local distribution:

Country	Region / province	Site	Level of Protection	Population size	Reference(s)	Notes
Argentina.	Rio Negro.	Whole population: Somuncura Plateau, Headwaters of the Valcheta Stream (known range for the species).	One Natural Protected Area (Meseta de Somuncura), but without formal protection.	The whole population size ranged from 8,261 to 19,925. However, when considering only the breeding population size, the number of adult frogs varied from 3,411 to 6,024 (Velasco *et al* 2019a).	Velasco *et al* 2019a.	This is an estimate for the whole population of the species. For each subpopulation' s estimate, refer to Velasco *et al* (2019a). However, it is worth highlighting that 80% of the known and isolated subpopulations are of less than 1,000 individuals each.
Argentina.	Rio Negro.	Subpopulation 1: El Destacamento.	Hot springs fenced for cattle. Trout is absent at the	Ranging from 178 to 431 individuals (including juveniles).	Velasco *et al* 2019a.	Density values were obtained from estimations made in El

			spring, but is present downstream in corridors.			Rincón I through CMR analysis. Other values were later interpolated into the effective habitat. The range of values represents adults and juveniles (including froglets). The breeding population size for each subpopulation is less than half of the values presented here (see Velasco *et al*., 2019a for more detail).
Argentina.	Rio Negro.	Subpopulation 2: Los Mapuches.	Hot springs not fenced and cattle has open access to the springs. Trout is absent at the spring, but is present downstream in corridors.	Ranging from 400 to 966 individuals (including juveniles).	Velasco *et al* 2019a.	
Argentina.	Rio Negro.	Subpopulation 3: El Rincón I.	Hot springs fenced for cattle. No trout in hot springs.	Ranging from 440 to 1,050 individuals (including juveniles).	Velasco *et al* 2019a.	
Argentina.	Rio Negro.	Subpopulation 4: El Rincón II.	Hot springs not fenced and cattle has open access to the springs. No trout in hot springs.	Ranging from 445 to 1,074 individuals (including juveniles).	Velasco *et al* 2019a.	
Argentina.	Rio Negro.	Subpopulation 5: El Ariete.	Hot springs fenced for cattle. No trout in hot springs.	Ranging from 528 to 1,274 individuals (including juveniles).	Velasco *et al* 2019a.	
Argentina.	Rio Negro.	Subpopulation 6: Lo de Otero.	Hot springs not fenced and cattle has open access to the springs. No trout in hot springs.	Ranging from 162 to 391 individuals (including juveniles).	Velasco *et al* 2019a.	
Argentina.	Rio Negro.	Subpopulation 7: Cora.	Hot springs fenced for cattle. No trout in hot springs.	Ranging from 612 to 1506 individuals (including juveniles).	Kacoliris *et al*, obs. pers.	
Argentina.	Rio Negro.	Subpopulation 8: Echeverría.	Hot springs not fenced and cattle has open access to the springs.	Ranging from 312 to 753 individuals (including juveniles).	Velasco *et al* 2019a.	

			No trout in hot springs.			
Argentina.	Rio Negro.	Subpopulation 9: Lo de Chico.	Hot springs not fenced and cattle has open access to the springs. Trout at low densities in hot springs.	Ranging from 3,323 to 8,021 individuals (including juveniles).	Velasco *et al* 2019a.	
Argentina.	Rio Negro.	Subpopulation 10: La Tapera.	Hot springs not fenced and cattle has open access to the springs. Trout at low densities in hot springs.	Ranging from 3,179 to 7,670 individuals (including juveniles).	Velasco *et al* 2019a.	

1.3 Protection status:

The whole distribution of El Rincon-stream Frog lies within the Natural Protected Area (NPA) "Meseta de Somuncura", Rio Negro Province (Decrees 356/1986, 1437/2004, 465/2008; Law 2669). Also, it is sympatric with the Naked characin (*Gymnocharacinus bergii*), an endemic fish declared Natural Monument (Provincial Law N°2783/94) acting as an umbrella species for endemic species in the area. However, the status of "Protected Area" does not ensure the protection of native species since the land belongs to private owners. This situation commonly typifies protection frameworks known as "paper parks" (i.e. an area declared as a protected area but with no active management ensuring implementation of its conservation mandate).

1.4 Ecology, behaviour and habitat requirements:

The El Rincon-stream Frog is a small, aquatic amphibian. It reaches a snout-vent length of approximately 35 mm in males and 44 mm in females, with this sexual dimorphism in adults the only characteristics that differentiates both sexes (Cei 1969). It displays several adaptative traits important for an aquatic life: well-developed webbing on its hind legs, eyes positioned dorsally and smooth and loose skin.

The Somuncura plateau is characterized by a unique combination of two different habitats: the Patagonian steppe and the Monte shrublands (León *et al* 1998). This frog inhabits at the headwaters of the Valcheta stream, located at the northern edge of the Somuncura plateau. The stream is born from innumerable thermal springs, where water pours from basaltic valleys (Miquelarena *et al* 1983;

Miquelarena *et al* 2011; Ortubay *et al* 1997). At the headwaters the stream consists in two main branches, the "Rama Caliente" and the "Rama Fria", each one of them formed by two arms. Both the "Rama Fria" and the "Rama Caliente" join approximately 12 km downstream at a site locally called "La Horqueta" (the Fork). The climate is arid and extreme, with annual temperature ranging from -25 to 35°C (Wegrzyn *et al* 1992). However, the water temperature ranges between 18 and 26°C (Velasco *et al* 2018) at the springs and drops as it flows 80 km downstream into a small lagoon called Curico. The whole system conforms an isolated endorheic basin. The species' populations are restricted upstream from "La Horqueta", specifically on each of the four arms of the Chipauquil streams.

In the "Rama Caliente" the species inhabits stream banks up to 5 km downstream from the main springs. By contrast, in the "Rama Fria" the species is restricted to thermal springs on rocky slopes reaching no more than 500 meters downstream from each spring (Velasco *et al* 2016). Individuals can be found under stones in the stream's bed or in association to soft masses of floating mosses, aquatic and semi-aquatic vegetation (Cei 1969). In all cases the species prefers different microhabitats, although the presence of high abundance of aquatic vegetation is essential for reproduction (Velasco *et al* 2017)

The breeding season for this species ranges from September to March (Velasco *et al* 2017). Breeding activity occurs during the night (between 22:00-02:00 hours) and is not associated with rainfall. This frog uses a narrow range of microhabitats for oviposition (warm, shallow waters, with almost 100% vegetation cover of *Cardamine cordata* and *Hydrocotyle bonariensis*). Egg clutches consist of a single gelatinous string of 56–113 eggs attached to aquatic vegetation. Egg shaft is transparent while yolk, embryos and tadpoles are highly pigmented (Velasco *et al* 2017). It shows indirect development. Tadpoles hatch approximately three days after spawn and metamorphose during the same breeding season.

1.5 Threat analysis:

The El Rincon-stream Frog is listed as "En Peligro" (Endangered) in the Argentinian National Red List, with a SUMIN value of 22 (Basso *et al* 2012). Also, it is listed as Critically Endangered in the IUCN Red List by criteria B1ab (iii, iv) (IUCN 2016).

The species faces a wide range of threats generally associated with global amphibian decline.

Threat	**Description of how this threat impacts the species**	**Intensity of threat** *(low, medium, high, critical or unknown)*
Emerging diseases.	Infection by chytrid fungus, *Batrachochytrium dendrobatidis*, has been reported for the El Rincon-stream Frog. Samples of wild individuals would indicate that this disease is widely	LOW

	distributed throughout the species' range (Arellano *et al* 2017). However, the species does not show any symptoms associated with chytridiomycosis. Although this threat is currently considered as low intensity, it must be continually monitored to detect any change (for example, in synergy with other threats under the worse scenario of climate change) that could derive in a higher concern. So far, no Ranavirus analyses have been conducted for the species, although indirect evaluations based on necropsies of dead individuals showed no clinical signs of this disease (Kacoliris *et al* 2018).	
Stream modifications.	Water canalization is common at the headwaters. Different degrees of modification have been used at the area: drains, hoses and pipes made by locals and landowners for domestic use (Kacoliris *et al* 2018). At the "El Rincón" ranch one dam is used for hydroelectric energy generation. Although the effects of these activities have not been studied in detail yet, in some sites with canalizations the subpopulations are healthy. Damming is less common but it is present at two springs where there are records of the species: "El Destacamento" and "El Rincón". At the "El Rincón", the dam does not seem to be having a significant effect on that local population of this species. However, in "El Destacamento", as the dam is bigger and planned to create a water reservoir, it has resulted in a larger livestock impact on the frog's habitats. It could therefore be postulated that both, the combination of the dam and livestock, are the main causes of the disappearance of the local population that inhabited the area (Kacoliris *et al* 2018). In the frame of habitat restoration activities conducted by the Wild Plateau Initiative, the dam at the El Destacamento was removed and the area was fenced allowing the rapid recovery of the habitat (see Arellano *et al.* (2018)). Thus, although in combination with other threats (e.g. poor livestock management), stream modifications can have an impact on frog subpopulations, the modifications alone are unlikely to have a high impact.	LOW
Intentional fires.	Landowners and other locals often use fire intentionally to encourage the regrowth of pastures (Kacoliris *et al* 2018). We do not know the direct effect of this action in terms of population parameters and/or fitness of the individuals. However, we recorded indirect (although not disastrous) effect on the availability of resources (food and shelter) for the species. Moreover, ashes have been found in the stomach content of frogs (Velasco *et al* 2019b). This may have some effect on the frogs' health and survival.	MEDIUM
Pollution.	This threat has not been assessed in detail. We believe that this threat was of greater historical significance when the chemical bathing of sheep for septic purposes was common	UNKNOWN

	(Kacoliris *et al* 2018). However, recent observations suggest this activity is still carried out by some locals. Nowadays, and considering the low density of residents in Chipaquil, we believe that contamination should not be highlighted as an important threat, although it should be controlled in a precautionary manner, especially considering recent poisoning of dogs by poison used against foxes and pumas (Kacoliris *et al* 2018).	
Livestock grazing, trampling and eutrophication.	The presence of livestock (especially cows, but also horses, sheep and goats) has a high impact on the habitat quality of this species. These animal feed on the tenderer shores' vegetation, reducing shelter and reproduction sites for the El Rincon-stream Frog. Moreover, cattle trample the streams' bank and even the stream floor, degrading the shores and impeding aquatic vegetation regrowth (Kacoliris *et al* 2018). Cows' faeces, in addition to the trampling and absence of vegetation, promote a eutrophication process, most evident in the thermal springs, the habitat preferred by the frogs.	CRITICAL
Trout predation.	Rainbow trout (*Oncorhynchus mykiss*) were introduced in the Valcheta stream in 1928 (Macchi & Vigliano 2014) and are currently widespread across the watercourse (Quiroga *et al* 2017). As the El Rincon-stream Frog was discovered several decades after the introduction of trout, it is difficult to assess the real impact this invasive fish on the El Rincon-stream Frog in the past. However, when comparing the impact of trout introduction on the sympatric Naked Characin, we can assume a strong decline of frogs in the stream. The case of the Naked Characin is explained in Quiroga (2019), who estimated that the species declined 70% across its range in the 50 years after introduction of trout. Since the Naked Characin is currently sharing the same refuges with the El Rincon-stream Frog (sites where waterfalls impede the access of trout) and have similar habitat requirements, we can assume the trout poses a similar risk. As the first study of the El Rincon-stream Frog's distributional range was conducted by Velasco in 2016, we do not have a historical record of this decline, but we assume that it has been high. This assumption is supported by studies of several other frog species (Karssing *et al* 2012, Ortubay *et al* 2006). Moreover, a recent study showed that trout have a negative effect on the presence and abundance of native amphibians in the Valcheta stream, including the El Rincon-stream Frog (Velasco *et al* 2018). As a result, the presence of trout may be blocking local population connectivity, promoting isolation and disrupting the metapopulation's equilibrium, thus reducing long-term species viability (Velasco *et al* 2018).	CRITICAL
Small scale agriculture.	Currently, locals grow fruit trees and recently corn. Some have small greenhouses where they produce vegetables,	HIGH

	using canals to channel water to their crops. This has a low to minimal effect on the species, so far. However, in 2018 we detected that some landowners started to produce pastureland with the help of the INTA (National Institute of Agricultural Technology) to increase cattle production (refer to Bueno et al 2018), potentially having a high impact on the El Rincon stream frog's habitat. Previous experience of the creation of pastureland made at El Rincon farm, led to the extinction of a local population of El Rincon-stream Frog. It is difficult to know if the cause of the extinction was related to pastureland creation or, more likely, the association of higher cow abundance.	
Mining.	In 2018 we found out that at least three uranium and vanadium mining projects owned by Blue Sky Mining Company are being established near the Somuncura plateau (refer to Verley & Geo 2012; Thorson *et al* 2018). Local journalists state that the mining company has been working in the area since 2009 (http://appnoticias.com.ar/app/el-negocio-del-uraniopor-leonardo-salgado/). According to online reports from the company, this is a highly profitable mining project (https://blueskyuranium.com/news/2019/blue-sky-uranium-announces-a-positive-preliminary-economic-assessment-for-the-ivana-uranium-vanadium-deposit-amarillo-grande-project-argentina). This is favoured by the increasing development of uranium energy in the Rio Negro province. The local community is concerned that these uranium mines might drain water from the Valcheta stream to use for mining. However, little information is available about the commencement of this mining project and how it will be developed. This uncertainty means we must consider the current intensity of this threat as UNKNOWN, however, if mining activity commences in the future, the threat may be considered as CRITICAL.	UNKNOWN
Climate change.	In considering climate change, the potential for increased frequency of droughts and/or floods could influence the species' habitat availability and quality. Recent observations recorded by the team supported reports from locals, that water levels have dropped in recent years, a potential result of climate change. However, the absence of systematic records documenting the effect of a water level drop on frogs, led us to consider this threat's intensity as UNKNOWN.	UNKNOWN

1.6 Stakeholder analysis:

Country	**Stakeholder**	**Stakeholder's interest in the species' conservation**	**Current activities**	**Impact** *(positive, negative or both)*	**Intensity of impact** *(low, medium, high or critical)*
Argentina.	Secretaría de Ambiente, Desarrollo Sustentable y Cambio Climático de Rio Negro (Secretary of Environment, Sustainable Development and Climate Change of Rio Negro Province).	This is the regional authority in charge of environmental protection and legislation.	This institution oversees regulations at the NPA "Meseta de Somuncura". Also, it has obtained funding from the CFI (Federal Inversions Council, in Spanish) to protect the Naked characin as a Natural Monument. It also provides permits and facilities to carry out research and conservation at the area.	POSITIVE	CRITICAL
Argentina.	Ministerio de Ambiente y Desarrollo Sostenible de la Nación (Ministry of Environment and Sustainable Development).	This is the national authority in charge of environmental protection and legislation. The conservation of native species and the environment is one of its objectives.	Argentina has created a wide conservation project targeting important endangered species at a National level of different taxonomic groups called the "Programa Extinción Cero" (Zero Extinction Programme). This programme's aim is to invest and support conservation and research. One of the target species is the Naked characin, sympatric species with the El Rincon stream frog.	POSITIVE	HIGH
Argentina.	Chipauquil community.	Until 2013, when the Iniciativa Meseta Salvaje started working at	The local community current livelihoods are dependent on livestock. One family	BOTH	CRITICAL

		the area, the locals had no information on the El Rincon-stream Frog apart from its documented presence at their local stream. For the community this species was just a frog, while the Naked characin was considered a signature species. Now, the community is beginning to appreciate the natural beauty of the area and the endemicity of the species as a possible ecotourism attraction.	started a small trout fishery downstream from "La Horqueta". Another activity developed at the area is small scale agriculture, mainly including the growing of fruit trees, corn and other vegetables. All these activities have different degrees of negative impact on the conservation of the El Rincon stream frog. Conversely, tourism is attracted by the presence of the Naked characin, the large number of archaeological sites and the paleontological reservoirs (petrified forest) near Valcheta. These can be used to promote ecotourism, producing a positive impact on the conservation of this species.		
Argentina	INTA Rio Negro (stands for National Institute of Agricultural Technology in Spanish)	This governmental institution oversees the development of agricultural activities and technology. It has marginal interest in the conservation of the El Rincon stream frog.	INTA is currently developing research and experimental farming at the Valcheta basin, including Chipauquil. Their goal is to scale-up regional livestock farming, increasing productivity and generating profit for the local farmers.	NEGATIVE	LOW
Argentina	Regional tourism enterprises (i.e.	These agencies offer tours to the	The tourism enterprises are	BOTH	HIGH

	Valcheta and Las Grutas tourism agencies)	Somuncura plateau. They use the endemism of the area to generate profit from ecotourism. However, Chipauquil settlement has low resources to exploit ecotourism and currently earn only a small profit from these activities.	currently offering tours to the Somuncura plateau. However, their activities do not involve the local community, and consequently, the local people must still rely on their traditional, and often unsustainable economic activities.		
Argentina	Trout fishing enterprisers	The nearest fishing enterprise is called "La Isla" and it is located a few kilometres downstream from "La Horqueta". Other trout fishing enterprises are settled in the lower section of the Valcheta stream. They rely on trout presence in the river to generate profit, but agreed with the removal of trout upstream from "La Horqueta", to improve the situation of the El Rincon-stream Frog and the Naked characin.	Their activities focus on trout fishing tourism. However, this activity is still underdeveloped in this area. The owners of "La Isla" have been participating in our conservation workshops. They agreed with the conservation activities proposed and provided valuable historical information on the distribution of native species, not recorded in the literature.	BOTH	LOW
Argentina	Local NGOs	Some local NGOs (i.e. Felix de Azara Foundation) aim to promote research on natural history and conservation of endemic species in Argentina.	These NGOs have provided support during the development of the El Rincon-stream Frog project.	POSITIVE	HIGH
Argentina	International NGOs	International NGOs and funders	These NGOs provided, and may	POSITIVE	HIGH

		(i.e. ZSL EDGE of Existence programme, Fondation Segré, Rufford, Amphibian Ark, Conservation Leadership programme, National Geographic Society and others) aim to support conservation projects focused on the species in Argentina.	continue to provide, support for the El Rincon-stream frog project. They contribute not only with funding but with training, outreach and other important means of support.		

1.7 Context and background information that will affect the success of any conservation action for this species:

	Description	Barriers to conservation	Opportunities for conservation
Socio-cultural effects and cultural attitudes.	The community of Chipauquil is a very small settlement associated with the headwaters of the Valcheta stream (or Chipauquil streams for the local community). It is composed of less than 60 people scattered though a wide range of land, that includes the valleys of the Valcheta stream and the highlands of the Somuncura plateau. The members of this community come from different sectors with varied interests: park rangers, school staff, indigenous groups, long-term settled families, large landowners and local politicians). As a result, some of the community members often disagree because of conflicts of interests (i.e. land property conflict, political and economic interests). Only a few of these community members are actually settled in the area. Most of them have had limited access to secondary or even primary education. The area lacks basic infrastructure (has no drinking water, lacks waste disposals and sewers, rely on fuel-dependant electricity or hydroelectric and fuel-dependant heating or firewood). As a result, most young people inhabiting Chipauquil choose to migrate to bigger cities (i.e. Valcheta, Las Grutas, San Antonio, Viedma) searching for a better life quality. This has resulted in an aging population in the Chipauquil community, and	As the locals are culturally and economically attached to their traditional lifestyle, it might be hard to change their behaviour.	Thanks to the work of the "Iniciativa Meseta Salvaje" (IMS), along with the help of the local school staff, park rangers and regional government, the locals see rural tourism and ecotourism as a potential source of income.

	subsequent population decline. The provincial government created a local Development Commission to improve the life quality of the community and promote locals to stay at the settlement, but it suffers from a lack of resources and bad management. Because of their livestock-dependent economy, they perceive some native animals (foxes, condors, pumas and guanacos) as a threat to their economy and often takes measures against these animals (hunting and poisoned baits).		
Economic implications.	The species has no direct monetary value. It is one of the only three amphibian species that inhabit the area and is the only endemic amphibian. However, the area has high ecotourism value given large local flora and fauna endemism (i.e. plants, lizards, fish, invertebrates) including two Critically Endangered and unique species: The El Rincon-stream Frog and the Naked characin. In addition, the area has been declared important for both its palaeontological and anthropological sites. Also, the area is declared of importance for bird conservation (IBA). Conversely, the conservation of the species may be at odds with economic interest of uranium mining for nuclear energy development in the province. The Somuncura plateau is one of the most profitable uranium reservoirs in the region. The uranium deposits are very shallow and apparently need low inversions to extract. This has led to the development of around six mining	The mining projects may drain water from the Valcheta stream, as the lower sector of the stream is located outside the limits of the NPA Meseta de Somuncura. This might affect the water dynamic of the stream and impact the El Rincon stream frog.	Given the natural value of the area, ecotourism could become the main source of income for the local community. This may lower or even stop the pressure of their current economic activities and position the endemism as a conservation priority for the locals.

	projects in the nearby area. In addition to the economic risk of mining, land owners rely heavily on livestock farming to sustain their economies. This activity, although small in scale, has a high impact on this frog's conservation.		
Existing conservation measures.	The NPA Meseta de Somuncura was declared in 1986 (decree 356/1986) and incorporated to the Provincial Natural Protected Areas regimen in 1993 (provincial law 2669). However, its limits were not established until 2004 (decree 1437/2004) and a management plan was only recently approved in 2008 (465/2008). No further conservation management has been implemented until 2013, when IMS started working in the area. Additionally, the Naked characin was declared as Provincial Natural Monument in 1994 by the Provincial Law N°2783/94 protecting this species and its' environment. Both legislations promote the engagement of provincial government in the conservation of this area. The Naked characin has also been selected by a national conservation programme called "Programa Extinción Cero" (Zero Extinction Programme), but the program for this species is currently "on hold". As a result, this fish acts both as a flagship species and an umbrella species for the El Rincon-stream Frog and its habitat. Since 2013, the IMS along with the Secretaría de Ambiente, Desarrollo Sustentable y Cambio Climatico of Rio Negro province (Provincial Agency of Environment, Sustainable Development and Climate Change) started a	Despite being declared a NPA, the area lacks management and law enforcement. In addition, most of the lands where the El Rincon-stream Frog is distributed are private property, so proper management of the area needs the agreement of the land owners. They are farmers that subsist through traditional farming techniques, mostly livestock ranching, with high impact to native biota including frogs.	As a result of the decrease in the population of the local communities, some lands are abandoned or inhabited. This is a good opportunity to buy land to create national reserves and create greater connectivity amongst current protected areas. We currently have an agreement from the National Park agency to go ahead with this activity.

	conservation programme aimed to improve the situation of this frog. It consists of a combination of in situ and ex situ efforts: 1) the creation of a survival colony of this species at ex situ facilities (the objective is to breed the species in captivity and assist a reintroduction programme to recover some extinct local populations in the wild); 2) the creation of several sanctuaries for frogs by restoring key habitat and removing main threats (Arellano *et al* 2018); 3) the enhancement of corridors to connect subpopulations by removing trout in intermediate habitats; 4) the development of an education and capacity building programme to engage local people in conservation efforts, and; 5) the establishment of a previously extinct subpopulation of this species in a restored habitat (Martinez Aguirre *et al* 2019). Finally, the latest efforts are directed towards the promotion of ecotourism as a primary economic source for the locals.		
Administrative/political set-up.	Both the national and provincial administration have recently changed and we still have no information about how receptive they will be to collaboration. However, the Naked characin is a Provincial Natural Monument which means the Province must ensure the preservation of this species and its habitat. Despite being declared a Natural Protected Area, most of the land in the Somuncura plateau belongs to private owners, being until this date effectively, a "paper park". It also required the permits of land owners to work in the area. We have built good and strong relationships with	Shifts in the political administration force long term projects in conservation to re-establish relationships with new politicians and decision makers.	Long term presence of our project in the area and promising conservation results may support relationship development with new governments. Also, good relationships with landowners favour the development of conservation actions in the area. Protection status (although not enforced) of the area and the species force the government and other environmental

	land owners and the local community that will support the development of the action plan for the conservation of the El Rincon-stream Frog.		institutions to work towards the conservation of this natural heritage.
Local expertise and interest	Local expertise has grown since the approval of the management plan for the NPA Meseta de Somuncura in 2008. Park rangers are now permanently settled in the area to register visitors and activities held in the NPA. However, as mentioned, the area currently suffers with population exodus. We, as IMS, have been working with the El Rincon stream since 2013. We have grown as a conservation group since then and we are promoting the engagement of locals at the conservation of the species.	Locals are mostly old farmers, not interested in biodiversity conservation. Most of the children (if not all of them) that attend local school, leave the area once finishing their education.	We are training Park rangers and students from local universities to assist conservation projects and become conservation leaders and ambassadors in the future.
Resources	Scarce resources are available for the conservation of the El Rincon stream frog. Funding from local and international NGOs (Felix de Azara foundation, Amphibian Ark) made possible the settlement of a survival colony at La Plata Museum. Also, other international funding resources (National Geographic Society, Rufford Foundation, Conservation Leadership Programme, Mohamed bin Zayed Conservation Fund, ZSL EDGE of Existence Programme, Fondation Segré) provided funding for field research, management actions and survival colony maintenance. Additionally, the CFI (Federal Inversion Council) provided funding for the conservation of the Naked characin with direct benefits for the El Rincon stream frog.	All the sources of funds and support already granted to IMS were of great aid to cover specific objectives. However, none of them provided long term financial security (currently only projects of one or two years) to support a conservation programme and/or do not cover key assistance, like the purchasing of a truck or land to support reserve creation.	The current achievements of the IMS allow access to new funding sources.

2. ACTION PROGRAMME

Vision (30-50 years)	
The status of El Rincon-stream Frog has improved which is reflected in a lower threat category in the IUCN Red List and its absence in the list of the Top 100 EDGE amphibians worldwide. The subpopulations of this species (including several re-established sub-populations) are effectively protected and thriving in sanctuaries. All of these subpopulations are connected by corridors, free of threats, and supported by local community participation in the protection of native and endemic species in the stream, with the El Rincon-stream Frog as a flagship species. At least a half of its whole range is encompassed within a well-managed Protected Area in 40 years' time.	
Goal(s) (5-10 years)	
Ensure the long-lasting viability of El Rincon-stream Frog by recovering its metapopulation dynamics, which means at least ten viable subpopulations of frogs (of more than 350 individuals each), are connected by natural corridors and thriving in sanctuaries, with the engagement of the local community in this species' conservation, reducing direct threats, by 10 years.	
Objectives	**Prioritisation** *(low, medium, high or critical)*
1. Improve breeding habitat by the creation and/or maintenance of ten breeding sanctuaries for frogs and establish a monitoring system to evaluate its success.	Critical
2. Re-establish three extinct subpopulations of the El Rincon-stream Frog in the created sanctuaries and monitor their recovery and establishment.	Critical
3. Connect seven sub-populations of El Rincon-stream Frog inhabiting the western branches of the headwaters of the Valcheta stream, by removing trout from 6 km downstream.	Critical
4. Connect three sub-populations of El Rincon-stream Frog inhabiting the eastern branches of the headwaters of the Valcheta stream, by removing trout from 4 km downstream.	Critical
5. Double the range of five extant subpopulations of the El Rincon-stream Frog by increasing available habitat.	High

6. Creation of protected areas (at the national level) encompassing the habitats of the El Rincón stream frog.	High
7. Engage local community in biodiversity conservation by promoting eco-tourism as an economic alternative to cattle ranching.	Medium
8. Assess the genetical structure and identity of western and eastern subpopulations of El Rincon-stream Frog, to enhance further management that integrates inbreeding and/or outbreeding depression information into mitigation strategies.	Medium
9. Assess the spatial ecology of this species, mainly the dispersal capacity as a way to enhance management aimed at improving connectivity among sub-populations.	Medium
10. Build capacity among local stakeholders and protected area park rangers, to train local leaders to develop and conduct a monitoring programme for endangered species in the area.	Medium
11. Build a network of environmental agencies and NGOs to foresee the protection of the NPA Meseta de Somuncura and its endemic species.	Medium
12. Search in nearby areas to detect the presence of frogs.	Medium

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: Improve breeding habitat by the creation and/or maintenance of ten breeding sanctuaries for frogs and establish a monitoring system to evaluate its success.								
Fencing key habitat.	Argentina.	Critical.	GBP1400/ year.	3 years.	IMS, Provincial Administration of Natural Resources.	-10 habitats fenced, and demonstrating no livestock impact.	-Local farmers oppose this action as it is detrimental to livestock management.	**Land/Water Management:** -Invasive/ Problematic Species Control.
Restoring habitat.	Argentina.	High.	GBP1000/ year.	3 years.	IMS, Provincial Administration of Natural Resources.	-All sanctuaries have suitable habitat (at least 50% of vegetation coverage and 20% of rock coverage).	-Extreme weather related to climate change (e.g. drought effecting the stream) impedes habitat restoration.	**Land/Water Management:** -Habitat & Natural Process Restoration.
Monitoring.	Argentina.	Low.	GBP800/ year.	Undefined.	IMS, Provincial Administration of Natural Resources.	-Annual reports showing the state of sanctuaries.	-Lack of resources for long-term monitoring programmes.	**Land/Water Management:** -Habitat & Natural Process Restoration. **Improving Knowledge.**

Objective 2: Re-establish three extinct subpopulations of the El Rincon-stream Frog in the created sanctuaries and monitor their recovery and establishment.								
Ex-situ breeding programme.	Argentina.	Critical.	GBP2000/ year.	10 years.	IMS, Provincial Administration of Natural Resources, University of La Plata.	-Ex-situ colony produces new-born frogs to support the reintroduction programme.	-Frogs don't breed and/or produce healthy offspring. -Lack of resources for long-term ex-situ breeding programmes.	**Species Management:** -Ex-Situ Conservation.
Translocation programme.	Argentina.	Critical.	GBP1400/ year.	7 years.	IMS, Provincial Administration of Natural Resources.	-Three founder populations of adult frogs successfully translocated to the restored sites by t1 to t3. -Successful breeding of translocated frogs by t2 to t4. -Re-established populations are viable in the long-term (more than 350	-Frogs cannot thrive in restored habitats. -Lack of resources for long-term translocation programme.	**Species Management:** -Species Recovery -Species Re-Introduction

						individuals) by t5 to t7.		
Monitoring programme.	Argentina.	Medium.	GBP800/ year.	7 years.	IMS, Provincial Administration of Natural Resources.	-Annual reports showing the state of re-established subpopulations.	-Lack of resources for long-term monitoring programmes.	**Species Management:** -Species Recovery. -Species Re-Introduction. **Improving Knowledge.**
Objective 3: Connect seven sub-populations of El Rincon-stream Frog inhabiting the western branches of the headwaters of the Valcheta stream, by removing trout from 6 km downstream.								
Creation of fish barriers downstream.	Argentina.	Critical.	GBP1800/ year.	5 years.	IMS, Provincial Administration of Natural Resources.	-Six fish barriers positioned across the headwaters of the Valcheta stream.	-Fish barriers are not effective. -Fish barriers are broken by flood.	**Land/Water Management:** -Invasive/ Problematic Species Control.
Trout removal (electrofishing and net-fishing of sections of the rivers).	Argentina.	Critical.	GBP2500/ year.	5 years.	IMS, Provincial Administration of Natural Resources.	-Five kilometres of stream without presence of trout.	-Trout removal is not effective enough to eliminate all the trout from the section of the river.	**Land/Water Management:** -Invasive/ Problematic Species Control.
Monitoring.	Argentina.	Medium.	GBP800/ year.	10 years.	IMS, Provincial Administration	-Annual reports showing the	-Lack of resources for	**Land/Water Management:**

					of Natural Resources.	absence of trout at headwaters.	long-term monitoring programmes.	-Invasive/ Problematic Species Control. **Improving Knowledge.**
Objective 4: Connect three sub-populations of El Rincon-stream Frog inhabiting the eastern branches of the headwaters of the Valcheta stream, by removing trout from 4 km downstream.								
Creation of fish barriers downstream.	Argentina.	Critical.	GBP1200/ year.	5 years.	IMS, Provincial Administration of Natural Resources.	-Four fish barriers impede the access of trout to headwaters.	-Fish barriers are not effective. -Fish barriers are broken by flood.	**Land/Water Management:** -Invasive/ Problematic Species Control.
Trout removal.	Argentina.	Critical.	GBP2500/ year.	5 years.	IMS, Provincial Administration of Natural Resources.	-No more trout at headwaters.	-Trout removal is not effective enough to eradicate all of the trout. -Lack of resources for long-term monitoring programmes.	**Land/Water Management:** -Invasive/ Problematic Species Control.
Monitoring.	Argentina.	Low.	GBP800/ year.	10 years.	IMS, Provincial Administration of Natural Resources.	-Annual reports showing the absence of trout at headwaters.	-Lack of resources for long-term monitoring programmes.	**Land/Water Management:** -Invasive/ Problematic Species Control.

								Improving Knowledge
Objective 5: Double the range of five extant subpopulations of the El Rincon-stream Frog by increasing available habitat.								
Extending current sanctuaries by increasing the fenced area of the stream.	Argentina.	High.	GBP1500/ year.	1 year.	IMS, Provincial Administration of Natural Resources.	-Five enclosures with extended area, demonstrating reduced livestock impact.	- Local farmers oppose this action as it is detrimental to livestock management.	**Land/Water Management:** -Invasive/ Problematic Species Control.
Restoring habitat of extended sanctuaries.	Argentina.	High.	GBP700/ year.	1 year.	IMS, Provincial Administration of Natural Resources.	-Habitat restored (i.e. vegetation regrowth and rock substrate sufficient for frogs).	-Extreme weather related to climate change (e.g. drought of the stream) impedes habitat restoration.	**Land/Water Management:** -Habitat & Natural Process Restoration.
Monitoring programme.	Argentina.	Low.	GBP800/ year.	10 years.	IMS, Provincial Administration of Natural Resources.	-Annual reports showing the state of sanctuaries.	-Lack of resources for long-term monitoring programmes.	**Land/Water Management:** -Habitat & Natural Process Restoration. **Improving Knowledge.**
Objective 6: Creation of protected areas (at the national level) encompassing the habitats of the El Rincón stream frog.								

Identification of important areas and promotion of information to governmental agencies.	Argentina.	High.	GBP1000/ year.	5 years.	IMS, Provincial Administration of Natural Resources, Administration of National Parks.	-Key areas identified. -Process of Establishment of protected area started.	-Difficult for the government to buy private land. -Local community rejection of planned creation of nature reserve in productive lands. -Lack of funds to buy land.	**Land/Water Protection:** -Site/Area Protection.
Objective 7: Engage local community in biodiversity conservation by promoting eco-tourism as an economic alternative to cattle ranching.								
Workshops with local community.	Argentina.	Medium.	GBP2000/ year.	4 years.	IMS, Provincial Administration of Natural Resources, Provincial Tourism Administration.	-A high percentage of local community. engaged in eco-tourism activities.	-Local farmers do not support eco-tourism as it is detrimental to livestock management.	**Education & Awareness:** -Awareness & Communications. **Livelihood, Economic & Other Incentives:** -Alternatives. -Substitution.
Eco-tourism promotion programme.	Argentina.	Medium.	GBP2000/ year.	10 years.	IMS, Provincial Administration of Natural Resources, Provincial	-Information related to tourism in the area available for a wide public.	-Tourists do not find the area interesting for visiting.	**Livelihood, Economic & Other Incentives:** -Alternatives. -Substitution.

					Tourism Administration.	-Number of tourists visiting the area increased.	-Economic incentives of ecotourism do not outweigh those of ranching.	
Objective 8: Assess the genetical structure and identity of western and eastern subpopulations of El Rincon-stream Frog, to enhance further management that integrates inbreeding and/or outbreeding depression information into mitigation strategies.								
Genomic study.	Argentina.	Medium.	GBP2500/ year.	2 years.	IMS, External scientific partners.	-Genetical structure and identity of all sub-populations known.	-Lack of resources to conduct the research.	**Improving Knowledge.**
Objective 9: Assess the spatial ecology of this species, mainly the dispersal capacity as a way to enhance management aimed at improving connectivity among sub-populations.								
Spatial ecology study.	Argentina.	Medium.	GBP1000/ year.	2 years.	IMS, External scientific partners.	-Spatial ecology and dispersal capacity of frogs known.	-Lack of resources to conduct the research.	**Improving Knowledge.**
Objective 10: Build capacity among local stakeholders and protected area park rangers, to train local leaders to develop and conduct a monitoring programme for endangered species in the area.								
Building capacity among locals and Park rangers.	Argentina.	High.	GBP2000/ year.	5 years.	IMS, Provincial Administration of Natural Resources.	-Five to ten local leaders actively participating in conservation actions.	-Lack of interest of locals and/or Park rangers to become leaders in conservation.	**Capacity Building:** -Institutional & Civil Society Development.

Objective 11: Build a network of environmental agencies and NGOs to foresee the protection of the NPA Meseta de Somuncura and its endemic species.								
Activism among NGO's and environmental agencies.	Argentina.	Medium.	1000 pounds/ year.	10 years.	IMS, local NGO's.	-Potential mining projects and their impact are documented in the agenda of environmental agencies and NGOs.	-Environmental agencies and NGOs are cannot act against mining in the area due to higher-level government agenda (nuclear energy development has priority over environmental protection).	**Law & Policy Legislation:** -Making, implementing, changing, influencing, or providing input into formal government sector, legislation or polices at all levels state/provincial, local/community, tribal.
Objective 12: Search in nearby areas to detect the presence of frogs.								
Develop surveys and a citizen science to find new distribution areas.	Argentina.	Medium.	GBP500/ year.	3 years.	IMS, universities, park rangers, local communities.	-Reports about the presence of the El Rincon-stream Frog in new sites.	-The frog is restricted only to the Valcheta stream Stakeholders (i.e. park rangers and local communities) do not engage in this activity.	**Improving Knowledge.**

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