

Saving the giant frogs of Peru, *Telmatobius culeus* and *T. macrostomus*

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Abstract

Telmatobius culeus and *T. macrostomus*, are high Andean species of lacustrine frogs, categorized in critical endangered and in endangered of extinction, by the IUCN respectively. Both species are in danger of disappearing since in recent years their populations have been diminished on a large scale. Among the priority threats for both are over-exploitation for consumption and use in the preparation of curative extracts and the high degree of contamination of the bodies of water where they live. Despite the state's efforts to create protected natural areas to mitigate its threats, these have not been effective, and other measures are needed to support the population.

Captive management could be a viable alternative in the recovery and maintenance of these species, however, few initiatives have been unsuccessful and with many deficiencies.

It is intended to manage a viable population of both species in conditions of captivity and achieve their reproduction so that they can be reintroduced in the future. There is currently a space dedicated to the exclusive management of these species, which requires the implementation of aquariums and life support equipment. The specimens will be extracted from their natural environment, for which the previous coordination and permits already exist. Huachipa Zoological Park, has successfully maintained and reproduced *T. culeus* in captivity, so we can manage a viable captive population, also there is an action plan, it is being developed for the conservation of this species. This experience allows us to bet on the management of *T. macrostomus* that lacks previous successful initiatives and urges an immediate management.

1. Introduction

T. culeus, "Lake Titicaca frog" (LTF) and *T. macrostomus* "Lake Junín frog" (LJF) are exclusively aquatic frogs, which present a restricted distribution to Lake Titicaca and to the Central Andes of Peru respectively.

T. culeus is currently categorized as critically endangered by the IUCN and in Peru. It has been included in Appendix I of CITES in the last CoP17, because it has lost more than 80% of its population in the last 15 years by the demand of the species. *T. macrostomus* is categorized as endangered by IUCN and Peruvian legislation; however, data on population density of this species are still scarce and in recent studies conducted and surveys of local people have shown that population is in critical condition.

Both species have the commercial overexploitation as one of its main threats. The species are used for medicinal purposes, aphrodisiacs, folklore and as an alternative food. LJF was overharvesting for consumption, leading to the near extinction and currently the demand of this frog has been replaced by LTF. The carcass is also used in the preparation of aphrodisiac juices in Lima, Cusco, Arequipa and other regions of the country. Álvarez (2006), in an analysis of 28 communities surrounding Lake Titicaca, identified that the utilization volumes of the species make a total of 27,548 frogs per year for consumption.

The high Andean areas of our country are characterized by high mining exploitation, as well as disorderly and uncontrolled population growth. This causes a high contamination of the bodies of water causing the degradation of the habitat of these species becoming the second most important threat for the species.

Although the species are distributed in protected areas, these are insufficient actions to guarantee their conservation, suggesting implementing other strategies. Within the workshops for the conservation of the species, it is proposed as an urgent action, the management of a population in captivity, since there is already successful experience for the frog LTF, it is urgent to take the same measure for LJF.

On the other hand, it requires working with local people to become actors of change. Their participation in the protection of these species within conservation areas, sensitization, and giving them economic alternatives related to experiential tourism, can reduce the pressure for consumption and destruction of the habitats of Andean amphibians. It also proposes the participation of the population in educational workshops or the inclusion of these issues in school and university curricula (Aguilar, 2010).

2. Methodology

Enclosure:

The enclosure will be in the “amphibian exhibition” inside the facilities of the Huachipa Zoological Park. It will have a closed environment of 7m long X 1.7 m wide X 2.5 m high, with controlled temperature to maintain a gradient of cold between 13 -15 °C, for this will have an air conditioning system.

Animals:

The Ministry of Agriculture (Directorial resolution No. 0017-2017-SERFOR/ DGGSPFFS-DGSPFS) approved the conservation plan for the LTF of Huachipa Zoological Park to manage the species in captivity, that include the capture of ten pairs of frogs directly from Lake Titicaca. The extraction will be supervised by the authorities and this will be done using divers and fishing nets.

Also, the extraction of five pairs of LJF was requested, which will be extracted from the wild. If it is not possible to find adult individuals, tadpoles will be collected in the same permit number.

All animals collected will be sampled for chytridiomycosis and for DNA analysis. Likewise, data extraction will be taken as: day of extraction, georeferenced point, methodology used. The animals will be placed individually in plastic bags with oxygen and placed in a box of tecnoport with ice pack and will be sent by air to Lima in the case of the LTF and terrestrial in the case of LJF.

The reception will be done by zoo staff and the animals will be transferred to the quarantine area.

Quarantine:

It will have a controlled environment, with a pediluvian in the door and will be maintained between 13 - 15 ° C using an air conditioning equipment. This environment will have two sections: A group of three aquariums of 1m long X 0.4 m wide X 0.50 m high to house *T. macrostomus* and a group with six aquariums of 0.50 m long X 0.40 wide X 0.40 m high, for *T. culeus*. Water will be treated both at the entrance and at the exit. It will be kept free of standard chemical contaminants (chlorine, chloramines, etc.) using carbon filters, water additives, reverse osmosis aeration or filtration / deionization and reconstitution. The filtration of the water will be done through cartridges filters of one micron (1 μ), method that has been successful in the removal of spores of *Bd*. In each aquarium will be placed one pair of animals; of entering tadpoles will be placed together in larger aquariums, according to their size.

Waste water will be transferred to central collection tanks where it will be mechanically filtered. Once the water is collected it will be treated using heat or a hydrochloric solution (common chlorine) which will then be neutralized for at least the minimum time of contact with sodium thiosulfate, for its treatment before being discarded into the waters waste.

In this environment, preliminary examinations and discarding of diseases such as the chytrid fungus, as well as the daily evaluation of the physical and chemical parameters of the water will be carried out. The care of high priority breeding animals will take place before those who are not in breeding programs. Containers that are less likely to have infected individuals, such as animals with prolonged periods in captivity and animals that have already had negative tests for *Bd* and other diseases and which have not shown any clinical signs or lesions, will be treated first. The maintenance of animals newly quarantined will be done at the end, while animals in permanent quarantine will be treated first. This does not mean that the animals will be checked at the end of the day, only that they will be taken care of after the main collection to reduce the risk of transmission of a new disease to an existing clean collection (known without infection). Observations made early in the day will serve to identify potential problems that can be addressed in a timely manner. Amphibians that show any signs of disease will be treated immediately and those who die will be subjected to a detailed necropsy.

Reproduction

After the quarantine process will be finished, the animals will be transferred to the breeding area. The environment will have a display pool of 2 m long X 0.80 m wide X 0.80 m high, built of noble material and set as a lake background for LJF. Following this exhibition there will be four additional environments of 0.90 m long X 0.45 m wide X 0.50 m high for LTF.

3. Budget

Buget category	Item/ quantity	Requested to AArk \$	Others Sources/status
Preliminary field studies	Workshop Lake Junín frog		\$ 3000 financed by DENVER ZOO
	exploration trips		
	Workshops Lake Titicaca frog		\$ 6000 financed by DENVER ZOO
	exploration trips		
Field collection	Airfare:1 (PUNO)	200	
	Food: 1 person \$30/day, 4 days	120	
	Lodging: 1 personas, \$40/day, 4 days	160	
	vehicle rental Puno	200	
	Bus trip	40	
	Food: 1 person \$10/day, 4 days	40	
	Lodging: 1 person, \$15/day, 4 days	60	
	vehicle rental Junin	150	
Shipping	Air cargo	0	\$ 75 financed by PZH (Parque Zoologico Huachipa)
	Land cargo	0	\$35 financed by PZH
<i>Ex situ</i> facility	Remodeling of existing building	0	\$4500 financed by PZH
	1st year keeper salary	0	\$ 7200 financed by PZH
	Air conditioner	550	
	aquariums (6)	1228	
	Exhibitions	0	\$2000 financed by PZH
	Chiller (2) big	1000	
	Chiller (2) small	400	
	Filter system	600	
	Foot baths/solutions	50	
	Wáter quality	0	\$ 50 own funds
Management	Shelf for aquariums	200	
	Food		\$ 988 financed by PZH PZH
Analysis	Aquariums decoration		\$ 100 own funds
	\$5/Bd swab, \$20/test, 30 samples		\$750 requested to DENVER ZOO
Education	graphics for display		\$300 requested to CUNAMA
	Work in schools		\$100 requested to CUNAMA
Total		4998	\$ 25998
Percentage		19.22%	80.78%

4. Schedule of Activities

ACTIVIDAD	2010 - 2018	2015 - 2018	dic-17	jan - apr '18	apr 18	may-18	apr- set '18
Preliminary field studies - Puno	x						
Preliminary field studies - Junin		x					
Purchase of equipment			x				
Building Center	x						
Center Implementation				x			
Field collection <i>T. macrostomus</i>					x		
Field collection <i>T. culeus</i>						x	
Adaptation of animals							x
Educational activities	x						