ZSL
LET'S WORK FOR WILDLIFE

EDGE

EVOLUTIONARILLY DISTINCT & GLOBALLY ENDANGERED

Survival Blueprint

Lake Lerma Salamander, *Ambystoma lermaense*

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1. STATUS REVIEW

1.1 Taxonomy:

Kingdom: Animalia
Phylum: Cordata
Class: Amphibia
Order: Caudata
Family: Ambystomatidae
Scientific name: *Ambystoma lermaense* (Taylor, 1940)
Synonym: *Siredon lermaensis* Taylor, 1940
Common name: Lake Lerma Salamander

1.2 Distribution and population status:

1.2.1 Global distribution:

Country	Population estimate (plus references)	Distribution	Population trend (plus references)	Notes
Mexico	Unknown	The three wetlands that form the Natural Protected Area: Área de Protección de Flora y Fauna Ciénegas del Lerma, and the Guadalupe Victoria wetland in the municipality of Capulhuac.	According to the IUCN (2015) the current population trend is decreasing. (IUCN SSC Amphibian Specialist Group. 2015. *Ambystoma lermaense*. The IUCN Red List of Threatened Species 2015)	

1.2.2 Local distribution:

Country	Region / province	Site	Level of Protection	Population size	Reference(s)	Notes
Mexico	State of Mexico	Natural Protected Area: Cienegas del Alto Lerma, and Guadalupe Victoria wetland	Special protection by Mexican Law	Unknown	• Shaffer, H.B., Parra-Olea, G. & Wake, D. 2008. *Ambystoma lermaense*. The IUCN Red List of Threatened Species. Version 2015.2. <www.iucnredlist.org>. Downloaded on 24 **August 2015**. SEMARNAT, DOF. (2010). Diario Oficial de la Federación. Norma Oficial Mexicana 059-SEMARNAT-2010. Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo.	Figure 1

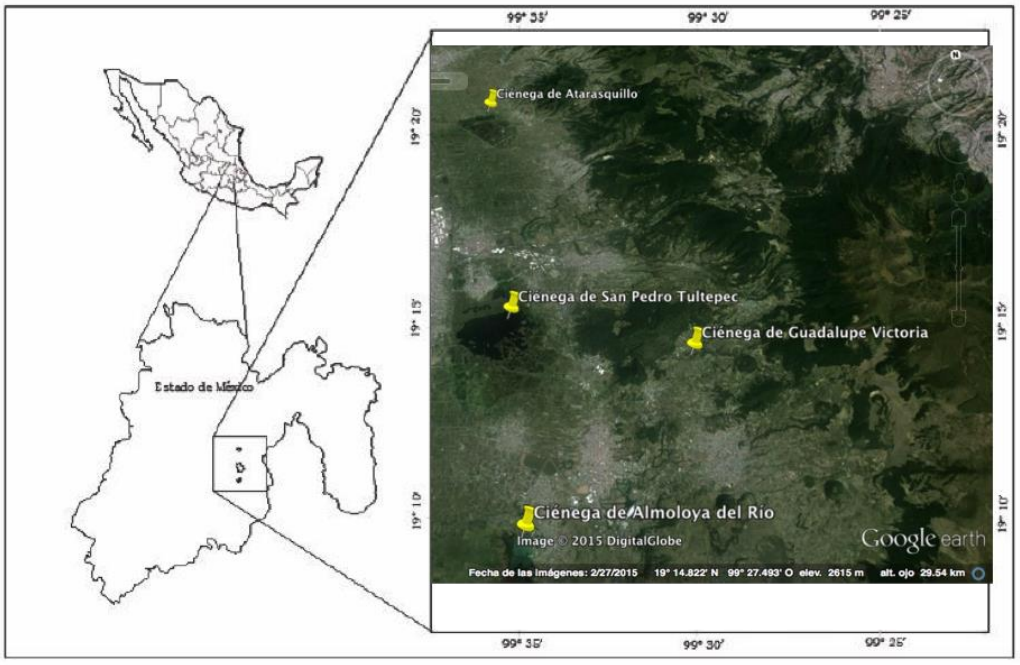

Figure 1. The three wetlands that form part of the Natural Protected Area as well as the wetland Guadalupe Victoria where *A. lermaense* is also found.

1.3 Protection status:

Ambystoma lermaense is listed as endangered B1ab(iii,v)+2ab(iii,v) by the Red List of the IUCN (2015) because its area of occupancy is approximately 300 km^2. Furthermore, the individuals of the species are in a single location, and its habitat is under continuous degradation.

a) *Ambystoma lermaense* is listed under the Special Protection category of the Mexican NOM-059 of the Ministry of the Environment (SEMARNAT 2010).

1.4 Ecology, behaviour and habitat requirements:

Ambystoma lermanese is a neotenic salamander, which means that the individuals do not have to complete metamorphosis into a fully developed adult to breed and reproduce. Neotenic individuals live in the water, while metamorphosed adults live in the grasslands around the wetlands, but often stay in the water. Length of adult *A. lermaense* individuals ranges between 126 and 354 mm, and body weight ranges between 22 and 178g. Our surveys suggest that the breeding season of *A. lermaense* is between the months of April and May. However, Aguilar et al. (2002) collected a female with eggs in July. According to Aguilar et al. (2002), in their ex situ study clutch size was 841 eggs but fertility was low (26%). The average ovum diameter was 2.40 ± 0.36 mm, and the external capsule diameter was 7.59 ± 0.64 mm. Embryo development to hatching took approximately 10 days at a temperature of between 16.5 and 21 ºC. Embryo mortality was 10% and the hatchling size ranged from 9 to 10 mm.

During our surveys, we observed that although males in the larval stage can fertilize the eggs, metamorphosed adults were also present around the females, suggesting that these males can return to water to fertilize eggs.

Our surveys suggest that *Ambystoma lermaense* lives in water bodies within the Toluca Valley at an elevation of 2,800–3,000m above sea level. Water depth of the ponds where we found the species ranges from 20 to 160 cm, and water temperature ranges between 10 and 21 ºC. *A. lermaense* also requires aquatic vegetation such as *Typha latifolia* and *Schoenoplectus acutus* to lay their eggs. There are no studies on the diet of *A. lermaense*. However, close species such as *Ambystoma mexicanum* feed primarily on species of the taxonomic groups Cladocra, copepods, rotifers, and ostracodos. We found species of these taxonomic groups in the habitat of *A. lermaense*.

1.5 Threat analysis:

Proximate threats

In general the threats are habitat loss, water pollution, water extraction and exotic species. The level of threat varies among the wetlands.

Almoloya del Río: In this wetland one of the proximate threats is the presence of introduced common carp (*Cyprinus carpio*). This species of fish not only competes for food with *A. lermaense* adults, but also feeds on small larva of *A. lermaense*. In addition, in this wetland there have been illegal sewage disposals that on occasion are activated, leading to pollution being discharged into the wetland.

Capulhuac: In this wetland the major threat is water pollution. This wetland is right next to a sewage canal. During the rainy season the water level of the canal raises and connects to the wetland, polluting *A. lermanese* habitat. Another threat in this wetland is the loss of habitat due to rubbish accumulation and compaction to create solid surfaces to build roads and houses. This promotes the expansion of urbanization at the expense of the wetland habitat.

Guadalupe Victoria: At this wetland the proximal threat appears to be poor management of the habitat. There are no exotic species present and the water does not appear to be polluted. However, the community around this wetland would like to start an ecotourism project in which visitors can row, fish, and conduct other activities in the wetland.

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)*
Mexico	Fishermen	Commercial and development	Commercial	+/-	Critical
Mexico	Land owners	Community	Community development	+/-	High
Mexico	CONANP Natural Protected Area Manager	Conservation and governmental	Conservation and management of protected areas	+	Critical
Mexico	Community authorities	Community and development	Community development	+/-	Critical
Mexico	Municipality authorities	Government		+/-	Medium
Mexico	Universidad Autonoma Metropolitana	Research	Research and conservation	+	High
Mexico	NGO Grupo efferus A.C.	Conservation	Practitioners	+	High
Mexico	NGO Agrupación Dodo A.C.	Conservation	Practitioners	+	High
Mexico	Zoological Society of London	Conservation	Practitioners	+	High

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	This species is part of the pre-Hispanic culture in Mexico. Axolotl was the brother of Quetzalcoatl and there are legends about why axolotl can live and stay in the water. *A. lermaense* were also part of the diet of local communities	The older generations know about the place of *A. lermaense* in Mexican culture as well as traditional uses of this species. If this knowledge is not passed on the younger generations this socio-cultural component will be lost	Use the importance of *A. lermaense* in Mexican culture to raise awareness for the conservation of this species.
Economic implications	Because *A. lermaense* are part of the Mexican diet, this can have an economic value	If the management of *A. lermaense* is not implemented correctly, and there is an excessive use of this species, the populations can be affected	If the management of *A. lermaense* is regulated correctly, then this species can be a source of income for some communities or at least can be part of the local diet, which could be sustainable
Existing conservation measures			

Administrative/political set-up	Even though *A. lermaense* inhabits a Natural Protected Area, law enforcement is a problem in Mexico. The threats to the wetlands are still present and the government is not interested in mitigating such threats, or in the conservation of biodiversity	If the threats to the wetland habitat are not mitigated soon, the populations of this and other species will be reduced to the point of extinction due to the destruction of its habitat.	Use this problem to raise funds for the conservation and restoration of the wetlands, and to raise awareness about the importance of the conservation of the wetlands and its biodiversity
Local expertise and interest	There is local interest in conserving *A. lermaense*, and also to be able to use it as a food source. There is one researcher working at the Universidad Autonoma del Estado de Mexico that worked on physiological aspects of *A. lermaense*, but she is not currently working on the species		The interest of local communities is very important to implement a long-term conservation action plan, in which local people can participate.
Cultural attitudes	*A. lermaense* is still seen as part of the local culture		If populations of *A. lermaense* are managed properly there is a possibility that local communities could use this species again in culinary and medicinal culture

Appeal of species	*A. lermaense* are charismatic and interesting animals and are easy to keep in captivity	*A. lermaense* are often sold as pets	*A. lermaense* are considered charismatic by people. This could help to raise funds and this species could be use as a flagship species to restore and conserve the wetland habitat
Resources	There is the possibility to raise more funds from local government agencies. There is local interest to conserve the wetlands and *A. lermaense*		Given the importance of the wetlands, as well as of *A. lermaense*, there is a good chance of finding funds for the implementation of the conservation action plan. In addition, the interest of local communities will aid in the implementation of the action plan.

2. ACTION PROGRAMME

Vision (30-50 years)	
To remove water pollution from the wetlands of Alto Lerma, increase the area available to migratory birds over the winter months and create a habitat were *A. lermaense* can swim freely and interact with fish and crayfish.	
Goal(s) (5-10 years)	
To assess the distribution and status of the populations of *A. lermaense* across its range, ensure the correct management and protection of the species, and promote the restoration and proper protection of the wetlands	
Objectives	**Prioritisation** *(low, medium, high or critical)*
1. Monitor the status of *A. lermaense* populations across its range	Critical
2. Mitigate threats facing the wetland	Critical
3. Promote genetic exchange among *A. lermaense* populations	High
4. Optimise the management of the National Protected Area to meet the needs of *A. lermaense* conservation	Critical
5. *A. lermaense* action plans produced and endorsed	High

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: **Monitor the status of *A. lermaense* populations across its range**								
1.1 Biannual surveys of the populations of *A. lermaense* across its range	Mexico/Wetlands of Lerma	Critical	£2,500	2016-2017	University researchers/community/CONANP	Development of a population trend and distribution map		Species management
1.2 Assess environmental variables that determine *A. lermaense* presence	Mexico/Wetlands of Lerma	High	£5,000	2016-2017	University researchers/community/CONANP	Water chemistry characteristics, zooplankton and other food item availability		Species and land/water management

Objective 2: **Mitigate threats facing the wetland**								
2.1 Develop a plan for mitigation of threats by site	Mexico/Wetlands of Lerma	Critical		2016-2018	University researchers/community and Municipal authorities/CONANP/communities	Reduction in water pollution, maintenance of wetland surface area, decrease or elimination of introduced common carp	There could be conflict among stakeholders. There could also be disinterest in the objective and it could be seen as a low priority in legislation. Opportunities could include citizen science programs and increased participation by local communities	Land/water management
2.2 Promote citizen science programs among communities to foster threats mitigation	Mexico/Wetlands of Lerma	Critical	£2,000	2016-2018	University researchers/community and Municipal authorities/CONANP/communities	Workshops with communities, printed material to distribute among communities, number of participants in the citizen science programs	There could be conflict among stakeholders and disinterest in the project	Land/water management, education and awareness

Objective 3: **Promote genetic exchange among *A. lermaense* population**								
3.1 Assess the population genetic structure of the populations of *A. lermeanse* across its range	Mexico/Wetlands of Lerma	High	£5,000	2016-2018	University researchers	Population genetic structure of each population, levels of genetic diversity		Species management
3.2 Develop a plan to establish genetic exchange (if needed) among the populations	Mexico/Wetlands of Lerma	High	£5,000	2016-2018	University researchers/CONANP	Based on the results of the previous activity create a detailed plan of the movement of animals to ensure genetic exchange among populations		Species management
Objective 4: Optimise the management of the National Protected Area to meet the needs of *A. lermaense* conservation								
4.1 Review the management plan of the Natural protected area and recommend revisions where needed	Mexico/Wetlands of Lerma	Critical		2016-2017	University researchers/CONANP/Communities	An improved management plan of the Natural Protected Area	Conflict among stakeholders	Law and Policy

Objective 5: *A. lermaense* action plans produced and endorsed								
5.1 Implementation of action plan for each wetland	Mexico/Wetlands of Lerma	High	£5,000		University researchers/community and Municipal authorities/CONANP/communities	Action plan for each wetland, effective protection of wetlands and *A. lermaense*, monitoring of *A. lermaense* populations		Species management
5.2 Evaluation of the action plan	Mexico/Wetlands of Lerma	High	£2,000		University researchers/CONANP	Population trend of *A. lermaense,* citizen science program results		Species management

3. LITERATURE CITED

Aguilar-Miguel X., Casas-Andreu G. y Pineda-Arredondo Eduardo. 2002. Natural History Notes.: *Ambystoma lermaense* (Lake Lerma Slamander). Reproduction and development. Herpetological Review 33: 197.

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