

Environmental education and population genetics of the Marine Otter (*Lontra felina*) at the Peruvian coast

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1. Introduction

The historical distribution of the marine otter *Lontra felina* has been reduced due to anthropogenic factors such as hunting, habitat modification and contamination (UICN_OSG 1998). Therefore, it is considered an endangered species by international organizations such as The World Conservation Union (IUCN), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species (CMS) and it is protected by Peruvian law.

Marine otters occur along the Pacific coast of South America from 6° S (today more probably 8°S, personal observation) to 56°S in Peru, Chile, primarily on habitats with rocky outcroppings and caves above the water at high tide (Larivière 1998; Red List of Threatened Species Version 2009.1). Research on the population status in Peru has been limited to some basic census surveys. There is still discussion about the real population number as estimates vary from 200 to about 700 for the Peruvian coast (UICN 1976, in Castilla & Bahamondes, 1979; Apaza et al., 2004). A first population genetic analysis on marine otters has been carried out (Valqui 2010) but to deepen the knowledge about the species' genetic variability and population structure is of great relevance to future conservation measures. The present project is divided into three major parts:

1.1. Environmental education. Educational seminars are held at fishing ports aiming at fishermen and at schoolchildren, the stakeholders of the fisheries in the future.

1.2. Population genetics field work. Covering the Peruvian distribution range of the marine otter, samples are taken to deepen the knowledge about population genetics for this endangered mustelid, standing as an example of non-invasive genetic research.

1.3. Conservation biology course. By teaching a course at the Universidad Peruana Cayetano Heredia the knowledge of population genetics techniques applied at the Zoological Institute of the CAU is transferred to students from three different Peruvian universities. (*See separate report for details*)

2. Results

2.1 Environmental education

The NGO Pro Delphinus works regularly in projects of environmental education with schoolchildren in Pucusana since 2001 and has worked with similar projects in 30 schools along the Peruvian coast. 2800 kids have assisted and participated in their workshops. In cooperation with the *Pro Delphinus*, between December 2010 and January 2011 two environmental education workshops were held at the “Colegio 6009 Miguel Grau” in the fishing port of Pucusana (Figure 01 and 02). *Proyecto Lontra felina* was invited to participate in two 5th grade classes (of 30 students each), where the charismatic marine otter was presented to sensitize schoolchildren about the importance of the conservation of its coastal environment. Drawing material, stickers, key rings and puppets were used as working materials. The cooperation with the *Proyecto Lontra felina* will be maintained, as at present *Pro Delphinus* is continuing with the environmental education work in Pucusana and other fishing ports in Peru and the flagships species character of the marine otter can still be exploited. The main goal is to awake the awareness of the kids -as future stakeholders of the fisheries in the future- towards the importance of sustainable fishing and conservation of the marine ecosystem.



Figure 01. Environmental education.



Figure 02. Sticker.

2.2 Population genetics field work

Between January 13th 2010 and January 28th 2011 a 4-people team traveled by a 4x4 pickup truck (Figure 03) along the geographic distribution of *Lontra felina* at the Peruvian coast, covering a driving route of 2255 km. After arriving as far as possible with the truck, the target place was reached by foot (Figure 04). Between the port of Salaverry (8°13' S – 78°59'W) and Punta Peña Roja (14°26' S – 76°00' W), 23 locations were visited (Figure 05 and 06, Table 1).



Figure 03. Pickup truck.
(Foto: Carlos Calvo)



Figure 04. Walking the coast.

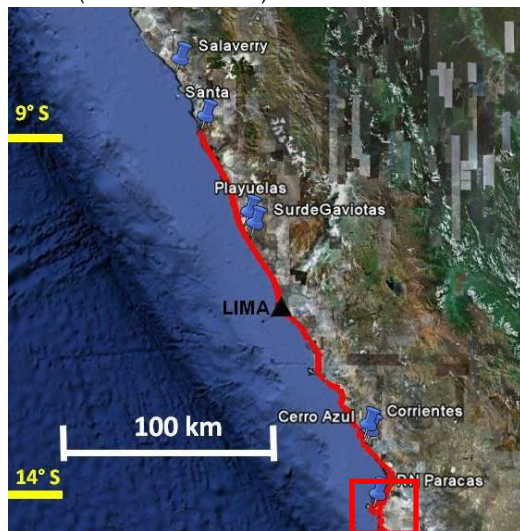


Figure 05. Total sampling range.

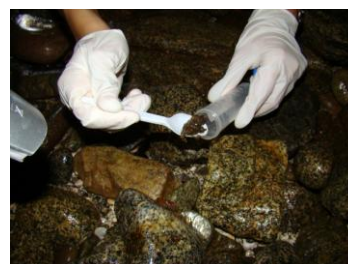


Figure 06. Sampling area RN Paracas.

Table 1. Sampling locations

	Date	Location	Code	Pos (S)	Pos (W)	Samples	Direct obs	Tracks	References
N	15.01.	Salaverry	SALV	08°14′	78°59′	-	-	-	Fishermen
O	15.01.	Santa	SAN	08°59′	78°39′	-	-	-	Fishermen
R	16.01.	Playuelas	PLAY	10°14′	78°05′	2	-	√	-
(5)	16.01.	Playuelas2	PLAY2	10°14′	78°05′	-	-	-	-
	16.01.	Gaviotas	GAV	10°22′	78°00′	-	-	-	Local visitors
SUR	17.01.	P. Corrientes	COR	12°57′	76°30′	5	2	√	Valqui 2010
(2)	17.01.	Cerro Azul	CAZ	13°01′	76°29′	-	-	-	Fishermen
R	18.01.	Lagunillas	LAG	13°53′	76°18′	2	-	√	RNP
N	18.01.	La Mina	MIN	13°54′	76°19′	-	-	√ ss	RNP
	18.01.	Los Choros	CHO	13°55′	76°19′	-	-	√ ss	RNP
P	18.01.	Arquillo	ARQ	13°54′	76°20′	1	-	√ 2†	RNP
A	18.01.	Talpo	TAL	13°49′	76°21′	-	-	-	-
R	19.01.	El Erizal	ERI	14°07′	76°16′	1 ss	-	-	Morales
A	19.01.	Sacasemita	SAC	14°09′	76°16′	-	-	√ ss	Morales
C	19.01.	El Ancla	ANC	14°11′	76°15′	-	1	√	Roncal
A	20.01.	El Queso	QUE	14°16′	76°07′	-	1	√	Chuqui huaccta
S	20.01.	Morro Q	MQ	14°19′	76°07′	-	-	√ ss	-
(16)	20.01.	Laguna G	LG	14°08′	76°16′	-	-	-	-
	21.01.	El Negro	NEG	14°23′	76°03′	9	-	√	Chuqui huaccta
	21.01.	Penha Roja	PR	14°26′	76°00′	-	-	-	-
	22.01.	Mendieta	MEN	14°03′	76°15′	-	-	√ ss	Diver
	22.01.	Catedral	CAT	13°56′	76°17′	7	-	√	RNP
	22.01.	Yumaque	YUM	13°54′	76°17′	-	-	-	RNP
(23)	-	-	-	-	-	27			

A total of 52 scat samples were collected in 7 locations (Table 1). Samples of feces (Figure 07) were collected using surgical gloves (Figure 08) and, if necessary, collected with the help of a mechanical arm. Then they were placed into 50 ml tubes, with ethanol at 96% (Figure 09).

**Figure 07. Scat sample.****Figure 08. Collection.****Figure 09. Collection tubes.**

The tubes were refrigerated in a cooler with ice. Date, location name, GPS position and number of samples per location were registered, as well as direct sightings and otter tracks at each location. Local fishermen and Park guards were interviewed to obtain references of marine otter presence (Table 1). Tracks were found in 13 locations (Figure 10), while in 3 of those locations 6 individuals could be sighted directly (Figure 11).



Figure 10. Marine otter tracks.



Figure 11. Marine otter between waves.
(Foto: Carlos Calvo)

In 6 locations no scats or tracks could be found and no otters were sighted, although local fishermen or park guards reported their presence. In those locations either it was too difficult to get to the caves with presumed otter presence (Figure 12) or no samples could be found. Complete animals or parts of them were found in three occasions (Figure 13) and skin samples, hair and/or teeth were collected out of it. From the total of 23 locations visited, 16 are part of the Reserva Nacional Paracas managed by the Peruvian governmental agency SERNANP.



Figure 12. Difficult terrain.



Figure 13. Dead marine otter.

Samples are momentarily held refrigerated at CORBIDI in Lima, Peru. Once the CITES authority in Peru releases the export permission, they will be sent to the Zoological Institute of the Christian-Albrechts-Universität zu Kiel, Germany, for DNA extraction, sequencing and further analyses.

3. Conclusions

3.1 Environmental education

- The marine otter can be used as a flagship species to draw schoolchildren's attention to protect their habitat, the Peruvian coast.
- This educational work should be continued in cooperation with other researchers and institutions working on similar projects.

3.2 Population genetics field work

- Touring 2255 km a linear distance of 900 km at the Peruvian coast was covered.
- 23 locations of the geographic distribution of *L. felina* at the Peruvian coast were visited.
- 52 samples were collected at 7 locations.
- Several locations present difficult conditions, making it impossible to get samples.
- The low-cost character of this field work was made possible due to the support of several institutions and persons who provided camera, GPS, and other field equipment (see acknowledgments).
- Samples were successfully collected and genetic analysis is to follow in the laboratories of the Zoological Institute of the CAU in Kiel.

4. General recommendations

- The results of this study should be considered in further conservation measures regarding *L. felina*.
- The result of this study should be put together with studies done in the southern part of the species' distribution in Chile and Argentina, to provide more solid arguments on otter population management and conservation measures.

5. Future plans

In the next months the export permits for the collected samples will be processed. Once the samples arrive at the Zoological Institute of the CAU, the laboratory work will be taking part. DNA will be extracted from the scat and processed until gene sequences can be obtained. The data will be analyzed to deepen the knowledge on the genetic structure of the marine otter population. This will provide arguments for conservation strategies and improve the species' management.

During the year 2011 we will continue to work in cooperation with the NGO Pro Delphinus, supporting the environmental education with materials (otter key rings, puppets, drawing material, stickers, etc) and ideas (the story of "Calo and Kathy, a marine otter couple and their everyday trouble") as we believe that this work has go along with the students throughout the year

6. Acknowledgments

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8. Tables and Figures

Table 1. Sampling locations.

Figure 01. Environmental education work.

Figure 03. Pickup truck.

Figure 05 Total sampling range

Figure 07. Scat samples.

Figure 09. Collection tubes

Figure 11. Marine otter.

Figure 13. Dead otter.

Figure 02. Sticker.

Figure 04 Walking.

Figure 06 Sampling area Paracas.

Figure 08. Collecting scat samples with gloves.

Figure 10. Tracks of the marine otter.

Figure 12. Difficult terrain.

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