



# Pumas and livestock farming: a multi-level approach to conflict resolution in 3 eco-regions of the Chilean Andes



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## Introduction

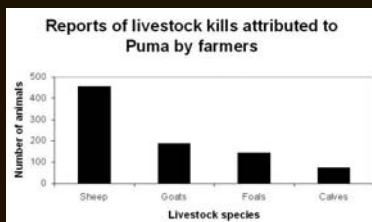
Chile, the narrow ribbon of land that runs north to south for 4000 km to the west of the Andes Mountains, covers a distinctive ecological gradient, ranging from tropical desert to temperate rain forest. Farming systems and cultural attitudes towards wildlife vary along this gradient, influenced by different indigenous cultures and the region's colonial history. The puma (*Puma concolor*), however, is ubiquitous throughout this gradient. Its habit of preying on livestock has created conflict with farmers, even though studies show that livestock make up a low proportion (< 10%) of pumas' diet. All hunting of pumas is prohibited in Chile by wildlife conservation legislation. However, current wildlife management by authorities includes such practices that have been proven ineffective in other countries, such as the translocation of problem animals. We are studying the nature of this conflict across three eco-regions in terms of (i) puma ecology, (ii) scale and patterns of livestock predation, (iii) cultural attitudes towards puma, and (iv) livestock management practices. Our research will evaluate how wildlife management strategies may take into account cultural and ecological contexts to improve stakeholders' attitudes towards pumas, and lead to more effective and appropriate strategies for promoting the coexistence of pumas and livestock.

## Andean Dry Puna (18°-28° S)

The high altitude puna and the pre-cordillera transition zone ecosystems are strongly influenced by the Aymara indigenous culture that has based its economy there for centuries on extensive management of llamas (*Lama glama*) and alpacas (*Vicugna pacos*). The Puma appears to have always been considered a pest, and is excluded from the eight sacred animals of the Aymara, which include the Andean cat (*Oreallurus jacobita*) and the Andean condor (*Vultur gryphus*). Our work in this area aims to collect quantitative data on puma diets through analysis of faeces samples, and to develop ethnozoological knowledge of the Aymara's relationship with the puma. We have also conducted environmental education activities with Aymara school children, including field visits, a climbing wall with carnivore tracks and mural painting activities, to highlight the importance of wildlife and conservation.

## Chilean Matorral (29°-37° S)

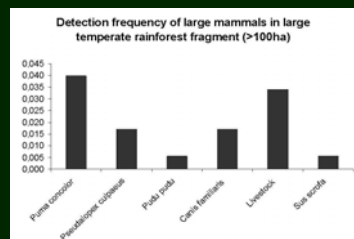
Our study area covers the pre-Andean and Andean ecosystems of Central Chile that experience a Mediterranean type climate. Livestock production in the San José de Maipo catchment is oriented around seasonal transhumance between upland and lowland pastures. Surveys of farmers (n=63) show that they perceive pumas as a threat, although samples of puma faeces that have been collected (n=132) have shown their diet contains a low percentage domestic livestock (7.14%), compared to lagomorphs (96.94%).



During 2006 we interviewed 63 farmers that reported their livestock losses to Puma. Pumas preyed higher number of sheep (n=458), followed by goats (n=187), colts (n=145) and cattle (n=73). Ranchers also reported predation by Andean condor and foxes. We are currently conducting an economic evaluation of the perceived loss by farmers.

## Valdivian Temperate Rainforest (38°-43° S)

This study area is within the Araucania region at the northern limit of the temperate rainforest. We are studying seasonal and diurnal activity patterns of pumas in relation to different landscape elements (continuous and fragmented native forest). We have set up arrays of camera traps, and conducted transects looking for puma sign in large forest fragments (>100ha) and continuous forest (>1000ha). Our preliminary results show that puma activity is highest between 4:00 and 8:00 am (62% of photos, n=8). We have also demonstrated that these large fragments are important puma habitat (7 out of 8 puma images), including for reproduction. These fragments are close to the farmland matrix, and have higher presence of livestock (35% of positive wildlife images, compared with 27% for puma). The detection frequency in such places is consistent with farmers' perceptions of predation risk, ascertained through informal interviews of local livestock owners.



From July (2006) to March (2007) 11 camera trap sites surveyed the large fragment. A total of 176 trapping nights were registered. Camera sites in the large fragment were >5 km from each other and at different altitudes (i.e. 400, 800 and 1000m). Latency to puma detection (i.e. days before photo capture) was 24 ± 18 days and interval between photos 31.3 ± 14.6 days (mean ± SD). Detection frequency, a proxy measure of activity level, was obtained by combining the number of nights a species was registered at one or more cameras in the fragment. This is a conservative approach to assess levels of use, and therefore is thought to underestimate actual animal activity (Hilty & Merendner, 2004). In addition to pumas, the cameras captured 5 native mammal species (two shown on graph), feral dogs (*Canis familiaris*) and the exotic invader, wild boar (*Sus scrofa*).

## Conclusions

This is an ongoing long term multi-level investigation of human-wildlife conflict over 4,000 km of puma's geographic range. We aim to undertake parallel methodologies in all the eco-regions of Chile.

At present we conclude that:

1. Puma conflict with farmers exists in all 3 eco-regions surveyed
2. Attacks are sporadic and Puma management by authorities is not effective nor efficient.
3. Negative attitudes towards puma and perceived livestock loss by farmers does not equate well with our initial results of diet assessment.
4. Camera traps have proven to be useful for monitoring pumas in temperate rainforest and future work will include their use in the 2 remaining eco-regions

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The Puma (*Puma concolor*) is the top predator in all the terrestrial ecogeographic regions of Chile. Camera traps are being used to monitor Puma activity patterns and habitat associations in the temperate rainforest.



The puna supports traditional subsistence livestock farming following Aymara customs. Puma predation is perceived as negative and affecting subsistence economies.



Aymara children painting a climbing wall with an indigenous wildlife theme as part of our programme to increase awareness in the community of wildlife conservation issues.



Transhumant sheep farming is exposed to Puma predation on the montane summer grazing.



A puma kill at our study site. Typical behaviour of hiding prey. We came back the next day to find that parts of the sheep had been eaten by Puma.



Winter conditions of large fragment surrounded by farming activities shown left of photo. The elevation in the forest fragment goes from 400 masl, bordering pasture lands, to high altitude evergreen forest at 1100 masl.



This sub-adult Puma was photographed by one of our camera traps in a forest fragment, accompanied by its mother. The trap is close to farmland where livestock losses have been reported.

3 eco-regions: Allpahuasi, Mediterranean and Temperate Rainforest. These areas are influenced by three distinct cultures: two indigenous, Aymara (Allpahuasi) and Mapuche (Temperate Rainforest) and descendants of European colonists that are rooted from colonial times (i.e. mainly Spanish) and migrants beginning in the early 1900 (Mediterranean and Temperate Rainforest).



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