

**Conserving the last of the wild: pumas and wild camelids in the
semiarid landscapes of the Argentinean Andes
2nd Preliminary report (Jan 2008-Jan 2010)**



| GRANTEE INFORMATION | |
|---|------------------------------|
| GRANT: Rufford Foundation – Booster Grant | |
| PRIME CONTACT/JOB TITLE: Emiliano Donadio – PhD candidate | |
| ORGANIZATION/INSTITUTION: University of Wyoming | |
| EMAIL: emiliano@uwyo.edu | REPORT DATE: May 2010 |
| ACADEMIC ADVISOR: Steven W. Buskirk, marten@uwyo.edu, University of Wyoming | |

SECTION 1: EXECUTIVE SUMMARY

In the semiarid landscapes of South America numbers of the only two native large herbivores, guanacos and vicuñas, dramatically declined, perhaps by more than 90%, during the last century. Historically, guanacos and vicuñas were the main prey of the puma. This predatory interaction has been lost through most of the original zone of distribution of these species following the widespread reduction of guanaco and vicuña populations. The consequences of such loss on the biological diversity of temperate South America remain unknown.

In the Argentinean Andes, at 3,000-6,000 m elevation, San Guillermo National Park harbors virtually intact plant and vertebrate communities that are seriously altered almost everywhere else in southern South America. The 150,000-ha park, established in 1998, is the core of the San Guillermo Biosphere Reserve, which encompasses almost 1,000,000 ha. Notably, San Guillermo National Park protects the largest coexisting populations of guanacos and vicuñas - and their only effective predator, the puma. Our preliminary work in San Guillermo National Park shows that camelids compose most of the diet of pumas, reflecting the high densities of camelids and the almost total absence of exotic herbivores in the park. Because of this, San Guillermo National Park appears as a unique conservation jewel, where key native wildlife species still interact as they used to do it before Spaniards colonized the continent.

This study attempts to understand, through experimental and observational research, whether predation by a top native predator, the puma, on native large herbivore prey species, guanacos and vicuñas, influences biodiversity and the structure and function of biological communities. Understanding how the interaction camelid-pumas affects biodiversity and biological communities will provide us with unique insights into the functioning of semiarid communities and ecosystems in which the effects of humans are minimal.

Our preliminary data suggest that pumas and camelids interact strongly. A high percentage of vicuña carcasses (73%, $n = 59$) showed signs of puma predation suggesting that pumas account for most of vicuña mortality. Results from marked vicuña newborns, monitored from birth to death or 12 months of age, show that pumas also kill a large number of juvenile individuals (at least 50% in 2008, $n^1 = 4$, total individuals marked = 7; at least 42% in 2009, $n^1 = 12$, total individuals marked = 42, and; 75% in 2010, $n^1 = 4$, total individuals marked = 41 [this cohort is still under study]). Vicuñas seemed to respond to this predation pressure by increasing vigilant and decreasing foraging times in areas with tall vegetation or complex topographical structures (i.e. canyons with rocky outcrops where pumas could hide). For instance, preliminary analysis showed that in tall grass habitats with high plant cover individual and group vigilant budgets were higher than in open planes with short grasses and low vegetation cover. In fact, individual vicuñas in tall grass habitats tripled the amount of time spent vigilant when compared to vicuñas in the open plains. Likewise, the

¹ n refers to number of marked newborn carcasses that showed clear signs of puma predation; in some cases cause of death could not be determined; therefore *at least* represents a conservative estimate

percentage of vicuñas vigilant within groups at any given time was 4.5 higher than that of vicuñas groups grazing in the open plains. The effects of such behavioral differences on vegetation are being studied. Our first experimental observations suggest that grasses increase 3 to 5 times in height in sites where vicuñas do not graze. We are currently conducting experiments that will allow us to evaluate the effect of this change in vegetation on small fauna (rodents, lizards, beetles, spiders).

Results from this research will be used to (1) highlight the importance of conserving interactions among species as the best strategy to conserve biological communities and the landscapes they inhabit, (2) emphasize the role of San Guillermo National Park as an ecological reference system, stressing the importance of conserving the area as pristine as possible, and (3) strengthen efforts to restore semiarid systems where they have been altered; restoration attempts will be successful only if data revealing the main characteristics of these systems become available. San Guillermo NP stands as one of the last wild places where such information can be gathered.

SECTION 2: RESEARCH PROGRESS

To evaluate our working hypothesis, we set several research goals. These goals, as well as the progress achieved for each of them, are described below.

Goal 1: To analyze the spatial distribution of puma predation on SAC in the semiarid landscapes of the Argentinean Andes.

Activity 1A: Compare topographic and vegetation features associated with camelid carcasses (puma kills vs. non puma kills) that may define risky habitats for SAC

1) Carcass collection is currently underway and measurements of variables associated to sites of carcass collection are being taken. Fifty nine fresh vicuña carcasses had been collected by December 31st 2009. We expect to collect an additional 25 carcasses before the project ends. Preliminary analyses of carcasses show that pumas are the main mortality factor for vicuñas. Overall, adult vicuñas killed by pumas were in good nutritional condition. Preliminary analysis of topographic and vegetation features associated with puma kills is not matching predictions, as most kills were found in flat areas with short vegetation and far from rocky areas.

Goal 2: To investigate whether a behaviorally mediated trophic cascade triggered by pumas, and mediated by the risk of predation perceived by SAC, creates a mosaic of habitats that differ in the structure of vegetation, and abundance and diversity of plants, small vertebrates and invertebrates

Activity 2A: To assess behavioral responses of camelids to puma predation

1) Foraging behaviour in risky and safe habitats – preliminary work showed that camelids did not respond to the food we offered them. Trials utilizing a new food substrate will be conducted during 2010.

2) Vigilant behaviour in risky and safe habitats – Observations are underway in both types of habitats; no problems encountered regarding this activity. We included a third habitat type, where we are also conducting surveys. Preliminary data showed that habitat structure (i.e. vegetation cover and height) seems to be the main factor driving camelid vigilant budgets, while group size appears to have no influence.

Activity 2B: To analyze the impact of camelids on vegetation and fauna

1) Exclosures construction – Exclosures construction is finished. Thirty six (36) 400 m² exclosures are in place and operating since February 2009. In February 2010, a year after exclosures were finished, we conducted the first surveys inside and outside exclosures. We measured plant height and cover (10,000 vegetation points), invertebrate and lizard abundance and diversity (270 pitfall traps operated during to periods of 4 nights) and small rodent abundance and diversity (270 Shermann traps operated for 4 nights). Data collected is currently being analyzed. A second and final survey will be conducted before the project ends.

Activity 2C: To analyze camelid use of risky and safe habitats

1) By conducting 50 500 m-long sample lines which will extend perpendicularly from rocky cliffs into the open areas; a first set of transects has been conducted. Preliminary analysis suggests that camelids are less likely to use areas regarded as risky.

SECTION 3: PROJECT ACCOMPLISHMENTS

3-1: Training, educational and outreach accomplishments:

From January 2008 to present, ten biology undergraduate students from six different Argentinean universities, three biology graduate students (from Mexico and Argentina), two veterinarians (from Spain), six park rangers, and three provincial conservation agents received, and some of them continue receiving, intense training in different field (transect sampling, behavioral observations, vegetation sampling, scat collection and identification, track identification, and field necropsies, small vertebrate and invertebrate trapping, marking and handling) and lab techniques (transect and behavior data analysis).

During 2008 & 2009, I presented a talk titled: *The ecological importance of the protected areas of northwestern Argentina* at the Argentinean Institute for Research in Arid Zones (Mendoza province, May 2008), National University of Cuyo (Mendoza province, June 2008), Argentinean National Park Service Northwestern Region (Salta province, August 2008), Laguna Los Pozuelos National Monument (Jujuy province, August 2008), and National University of San Luis (San Luis province, November 2008) [all in Argentina]. This talk highlights the importance of conserving several protected areas of northwestern Argentina based on the persistence in those areas of ecologically important interactions. The presentation emphasizes the outstanding conservation status of San Guillermo National Park (my study site) and warns against the uncontrolled development of open-pit large-scale mining operations nearby the park.

Also, I developed the talk *An (im) perfect monitoring: thoughts on biologists, mining and conservation*. This talk deals with ethic challenges faced by biologists working for mining companies and also analyze and evaluate the Environmental Impact Assessments presented by mining companies working nearby San Guillermo National Park. This talk was presented at the Argentinean Meeting of Mammalogy (held in Villa Giardino, Cordoba province, November 2008), the National Park Administration Agency Central Branch (Cordoba province, November 2008), Center for Applied Ecology (Neuquén province, April 2009), National University of La Plata (Buenos Aires province, August 2009), and Department of Zoology, University of Wyoming (Laramie, September 2009).

3-2: Other accomplishments:

My volunteers and I have attended several national and international meetings where we presented preliminary results obtained during this project.

- ✓ **Donadio E.**, M. Ruiz Blanco, R. Crego, S.W. Buskirk & A.J. Novaro. 2010. Birth weight and sex as factors affecting juvenile vicuña survival. [Accepted] 90th Annual Meetings of the American Society of Mammalogists to be held in Laramie, WY, June 2010.
- ✓ Ruiz Blanco M., **E. Donadio**, R. Crego, S. Buskirk & A. Novaro. 2009. Foraging and vigilant budgets in vicuñas *Vicugna vicugna*: habitat type overrides group size. 10th International Mammal Congress, Mendoza, Argentina.

- ✓ **Donadio E.**, D.B. McDonald, A.J. Novaro, J.N. Pauli & S.W. Buskirk. 2008. Effects of introduced prey species on native predator communities: a comparative study in semiarid habitats of Argentina (in Spanish). Proceedings of the XXIII Argentinean Meeting of Ecology, San Luis, Argentina.
- ✓ Crego R.D., C.M. Ruiz Blanco, **E. Donadio**, S.W. Buskirk & A.J. Novaro. 2008. Vigilance and foraging budgets in vicuñas *Vicugna vicugna* and its relationship with habitat structure (in Spanish). Proceedings of the XXIII Argentinean Meeting of Ecology, San Luis, Argentina.
- ✓ **Donadio E.**, C.M. Ruiz Blanco, R.D. Crego, A.J. Novaro & S.W. Buskirk. 2008. Capturing and marking with ear-tag transmitters newborn vicuñas (*Vicugna vicugna*) at San Guillermo Nacional Park, Argentina (in Spanish). XXII Argentine Meeting of the Theriological Society, Villa Giardino, Argentina.
- ✓ **Donadio E.**, M. Vitali, A. Wurstten, V. Salvador, J. Zanon, M.J. Veinticinco, M. Monteverde, A.J. Novaro & S.W. Buskirk. 2008. Wild South American camelids and their importance in the diet of pumas *Puma concolor*. a regional evaluation at seven protected areas of northwestern Argentina (in Spanish). XXII Argentine Meeting of the Theriological Society, Villa Giardino, Argentina.

During 2009, we have also published several articles in peer-reviewed journals (data used in these articles were collected during pilot work also supported by the Rufford Foundation),

- ✓ **Donadio E.**, A.J. Novaro, S.W. Buskirk, A. Wurstten, M. Vitali & M. Monteverde. 2010. Evaluating a potentially strong trophic interaction: pumas and wild camelids in protected areas of Argentina. *Journal of Zoology* 280: 33-40.
- ✓ **Donadio E.** 2009. Ecológicos y mega-minería, reflexiones sobre por qué y cómo involucrarse en el conflicto minero-ambiental. *Ecología Austral* 19: 247-254.
- ✓ **Donadio E.**, M.L. Merino & M.J. Bolgeri. 2009. Diets of two coexisting owls in the high Andes of northwestern Argentina. *Ornitología Neotropical* 20: 136-141.

3-3: Additional support:

Logistical support is being provided by the Argentinean National Park Service, and the Conservation Agency of San Juan Province. Additional funding sources were obtained from Program in Ecology (Summer Fellowships 2007 & 2008), Department of Zoology (George E. Menkens Memorial Scholarship), Posse Project and School of Natural Resources (Plummer Scholarship) – University of Wyoming, National Geographic, Wildlife Conservation Society, CREO, American Society of Mammalogists (Grant-in-Aid of Research), and Cleveland Metropark Zoo.

These extra funds are allowing me to (1) support the project for a 2 to 3 year period, and (2) incorporate new aspects to my project such as studying the direct effects of puma predation on camelid populations by investigating camelid (i.e. vicuñas) juvenile mortality using radio-telemetry technology.