

## **Biodiversity and the Case for Preservation of the Sibinacocha Watershed**

### **Biodiversidad y una recomendación para la conservación de la cuenca del lago Sibinacocha.**

**Katherine L. Doyle<sup>1</sup>, Peter Zahler<sup>2</sup> & Constantino Auca Chutas<sup>3</sup>**

<sup>1</sup>Biology Department, University of Massachusetts, Amherst, MA 01003, USA, [kdoyle62@hotmail.com](mailto:kdoyle62@hotmail.com)

<sup>2</sup>Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA 01003, USA, [pzahler@hotmail.com](mailto:pzahler@hotmail.com)

<sup>3</sup>Universidad de San Antonio Abad del Cusco (UNSAAC), Peru, [taucca@hotmail.com](mailto:taucca@hotmail.com).

#### **Abstract**

A survey of small mammals and birds in the Carabaya region of the southern Peruvian Andes resulted in the discovery that the Lake Sibinacocha watershed has an extremely high biodiversity, both in terms of species richness and abundance. Recent anthropogenic changes in the Carabaya region, especially related to the completion of the Transoceanic Highway, are likely to negatively impact biodiversity in the area. We strongly recommend that the Lake Sibinacocha watershed be considered for legally protected status to help ensure the conservation of this unique, highly diverse, and still relatively pristine high-elevation ecosystem.

Una inspección de mamíferos pequeños y pájaros en la región de Carabaya de los Andes peruanos del Sur tuvo como resultado el descubrimiento que la cuenca del lago Sibinacocha tiene una biodiversidad extremadamente alta en términos de la riqueza y abundancia de especies. Los cambios antropogénicos recientes en la región de Carabaya, especialmente los relacionados con la culminación de la Carretera Transoceánica, muy probablemente afectarán negativamente la biodiversidad de la zona. Nosotros recomendamos enfáticamente que la cuenca del lago Sibinacocha sea considerada para protección legal para ayudar a asegurar que se conserve este extraordinario, altamente diverso, y aún relativamente pristino ecosistema andino.

*Key Words:* Andes, Peru, mammals, birds, puna

#### **Introduction**

The Andean Mountain zone of South America is designated one of 25 biodiversity hotspots by Conservation International. It has a higher diversity of animal and plant life than any other part of the world. For example, in a region that encompasses only 1.3% of the earth's land surface, 17% of all the world's species of birds have been recorded; of these, 40% are considered endemic (Fjelda and Krabbe 1990). The high puna region is considered to have more endemic bird species than the much larger Central Asian desert uplands (Vuilleumier 1997). Additionally, 32 of the estimated 47 species of central Andean alpine (puna) rodents are endemic (Reig 1986). Despite the great diversity and high level of endemism, few studies have been performed on these or the many other unique and fascinating high-elevation taxa of this region.

Much of the central Andes has been long dominated and impacted by land uses associated with subsistence agriculture and domestic livestock grazing regimes (Young 1997). The region also has a very low density of protected areas. Thus there is the potential for increased habitat degradation and endangerment of diversity in this harsh and highly sensitive puna environment (Messerli et al. 1997). However, parts of the puna region remain essentially scientifically undocumented, and there is no baseline of data with which to determine changes in ecosystems or conservation needs. One of these locations is the Lake Sibinacocha watershed.

Despite being one of the largest bodies of water (15 km long) in the Andean mountain chain, Lake Sibinacocha has essentially been unstudied. Lake Sibinacocha lies on the edge of the remote Carabaya region of southern Peru (13.8°S; 71.1°W) at approximately 4,860 m. Despite its remoteness, Lake Sibinacocha is not immune to the pressures of human encroachment, and in fact the Carabaya region is currently under threat from increased road construction and mining activities. A major road is currently under construction through the center of the Carabaya. This project, the Transoceanic Highway, represents the culmination of decades-long development efforts, both to access the Peruvian Amazon and to improve the linkages between Brazil and Pacific Basin economic markets.

The Transoceanica's presence in this ecologically sensitive and unique region represents a dire threat to the local environment (Foreman and Alexander 1998; Trombulak and Frissell 2000) and an uncertain future for its population from the uncontrolled development that has already begun to occur. Other potential threats include overgrazing, hunting, and disturbance from uncontrolled tourism. Little is known of the biodiversity of this region. To determine potential effects of increased human activity and make sensible management recommendations, it is critical to have at least basic knowledge of the region's fauna (Gudynas 1989). Therefore, we decided to conduct a survey to create a baseline of data that can be continued to monitor anthropogenic and climatic effects and changes, and that can be used to determine if conservation action is needed.

## Methods

During June and July 2000, we conducted a survey of small mammals and birds along an elevational gradient in the Cordillera Carabaya. Four locations were sampled during this expedition. We sampled cloud forest at three locations along the Amazonian slope of the Carabaya region. The fourth location was in the alpine zone on the northwestern side of Lake Sibinacocha. More specifically, the four locations were:

- 1) Study area between the towns of Palca and Puma Chanca. Elevation was approximately 3,160 m. Habitat sampled was a grassy slope with rocks.
- 2) Study area above Puma Chanca. Elevation was approximately 3,940 m. Habitat sampled was a) talus slope, and b) relict *Polylepis* forest.
- 3) Study area in Socapata Valley. Elevation at the first site was approximately 3,050 m. Elevation at the second site was approximately 2,300 m. Both sites contained habitats dominated by cloud forest.
- 4) Study area on the northwestern shore of Lake Sibinacocha. Elevation varied between 4,860 m and 5,120 m. Habitats sampled were primarily heavily grazed grassy alpine slopes and talus fields.

For bird surveys, ATX-type mist nets were used in the first three locations, while in all study areas walking transects involved 50 x 12 Leica binoculars and a Sony TCM-5000 portable tape recorder equipped with a Sennheiser short shotgun microphone.

For small mammal surveys, modified pace lines were created employing Sherman folding box traps, Tomahawk folding squirrel cage traps, and Victor and Museum Special mouse traps. Each trap set consisted of 1, 3, or 4 traps. Sets with multiple traps always had a combination of different trap types. Traps were located where small mammal sign was evident, with many snap

traps placed as blind sets. Bait used in all traps consisted of a mixture of peanut butter, oatmeal, bacon, and sunflower seed.

All trapping and animal handling procedures followed recommended protocol as defined by animal care and use guidelines published by the American Society of Mammalogists (ASM Animal Care and Use Committee 1998). The collections occurred under the Authorization of INRENA Collection Permit N-10-2000-INRENA-DGANPES-DCES.

## Results

A total of 125 individual and fourteen species of small mammals were captured during the expedition, of which eight species of rodents in seven genera were found only at high elevations around Sibinacocha: *Chroecomys jelskii*, *Auliscomys pictus*, *Auliscomys* species, *Calomys lepidus*, *Punomys kofordi*, *Chinchillula sahamae*, *Lagidium peruvianum*, and an unknown species (and possibly genus). Species diversity and number of specimens captured were positively correlated with an increase in elevation -- the alpine total had more small mammal species, and more individual small mammals, than the three cloud forest locations combined. Three of these species are as yet unidentified, and may well be new to science. Final determination of the status of these specimens awaits laboratory analysis. The fact that this alpine environment held more species than any of the locations studied lower down, including relatively intact cloud forest, presents a strong argument for Sibinacocha to be considered a local biodiversity hotspot. We found the highest mammalian species diversity (richness and abundance) at the Lake Sibinacocha site, especially in alpaca corrals and adjacent talus slopes. In contrast to other sampling sites where human activity (primarily forest clearing) appeared to reduce mammalian species diversity, human activity in the form of corrals adjacent to talus slopes in this location appeared to have a positive effect on both species diversity and abundance. However, we found very few small mammals in the surrounding habitat where overgrazing by alpaca herds has likely had a negative impact on small mammal grassland communities.

In addition, we documented the presence of the Andean mountain cat from numerous fresh tracks in snow and mud, from scats, from discussion with herders, and by the local name given to the high pass in the region, Osjollo Ananta, which is the Quechua equivalent of the Spanish "Gato Andino," both of which translate to "Andean Cat." This felid has never before been captured alive by scientists and only rarely photographed (Grimwood 1969; Scrocchi and Halloy 1986; Zeisler 1992; J. Sanderson 1999). While we were unsuccessful in limited efforts to observe the animal directly, we feel that a lengthier stay at Sibinacocha would have a considerable chance of success. Analysis of the fresh scats we obtained is ongoing and should reveal aspects of the animals diet. Other mammals of note at Sibinacocha include large herds of vicuna (*Vicugna vicugna*; 185 observed in a single day), guemel (*Hippocamelus antisensis*; sign), Andean mountain cat (*Oreailurus jacobita*; sign), and puma (*Puma concolor*; pers. comm.).

A total of 47 species of birds were recorded at the Lake Sibinacocha site, including such rare species as diademed sandpiper-plover (*Phegornis mitchellii*) and rufous-bellied seedsnipe (*Attagis gayi*). Other birds of note included Chilean flamingos (*Phoenicopterus chilensis*) and at least eight species of waterfowl, including large numbers of Andean geese (*Chloephaga melanoptera*) and giant coots (*Fulica gigantea*).

## Discussion

Our studies have shown that the Lake Sibinacocha watershed is a rich and complex ecosystem with an extremely high biodiversity. It also falls within an area identified as "a priority area for conservation of organismal diversity" in Peru (Rodriguez and Young, 2000). However, the area currently has no protection status. With the ever-increasing threat of human encroachment into

even the remotest regions, it is critical to identify these pristine areas rich in biodiversity and provide for their protection. We strongly recommend that Lake Sibinacocha be considered for legally protected status to help ensure the conservation of this unique, highly diverse, and still relatively pristine high-elevation ecosystem.

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