

Extended abstract No. 384.

PEATLANDS OF ULLA ULLA (ANMI APOLOBAMBA, BOLIVIA):  
PERCEPTIONS OF THE PARK SERVICE ON THE STATE OF PEATLAND  
CONSERVATION

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**KEYWORDS:** *Bofedales altoandinos*, Apolobamba, Andes, state of conservation, national park service, perceptions of peatlands

## INTRODUCTION

The Integrated Management Natural Area (ANMI) of Apolobamba in Bolivia is located in the eastern region of the Department of La Paz, near the border with Peru. ANMI was created in 1972 as the Ulla Ulla National Reserve of Fauna, and gained international recognition when designated a UNESCO biosphere reserve in 1977. The biosphere reserve helps to protect high Andean (*altoandino*) ecosystems especially unique to the eastern Andes and is home to the largest population of vicuñas in the country. In 2000, the reserve was recategorized as an Integrated Management Natural Area and the total area of the park increased to 484,000 hectares (4840 km<sup>2</sup>). The landscape is characterized by a steep altitudinal gradient, extending from 800 m.a.s.l. up to 6200 m.a.s.l., and has multiple Andean biomes including the *altiplano*, *puna*, and humid forests of the *yunga* (Ribera and Liberman 2006). The area also forms part of the bi-national biological corridor Vilcabamba-Amboro, stretching through Peru and Bolivia, which is considered one of the most diverse hotspots in the world (Pauquet 2005).

ANMI Apolobamba is recognized as an important center of biodiversity, with a high number of endemic plant and animal species. The alpha diversity is not significantly high, but the gamma diversity is high considering the numerous watersheds and semi-isolated mountain tops. The unique Andean biodiversity is now considered highly vulnerable to the impacts of climate change. Despite extreme climate conditions, the high altitude region is also a center for human settlement, including one of the oldest known Andean societies of traditional medicine, the Kallawayas. It is also a culturally historic region for traditional pastoralism of camelids and high altitude agriculture. Centuries of human occupation and use are reflected in the plants and landscape.

The production economy of the high altitude zones (*altoandina* and humid tundra (also termed *pampa*)) in ANMI Apolobamba is exclusively based on camelid production (llamas and alpacas) and sheep. Bi-annual wool harvesting, for both commercial and

domestic use, typically occurs between January and February, and October to December, and are coordinated with communal management practices. Any relic agricultural practices that were implemented following Agrarian Reform have been completely abandoned and pastoralism is the primary production activity, where the pasture grasses and bofedales (Andean peatlands) constitute a production zone of approximately 47,000 hectares. Despite the relative suitability of the high altitude landscape to host pastoral production, the high number of animals (up to 150 individuals per family) contributes to land tenure conflicts, pasture degradation, and spread of pathogens (Pauquet 2005).

The principal threat to conservation in ANMI Apolobamba is aquifer mining, with 27 operating cooperatives mining in the zone. Mercury contamination infiltrates underground aquifers, affecting fish fauna in PN-ANMI Madidi, and poisons human populations that consume local species. Other main threats include including illegal hunting, waste dumping, and introduction of non-native species such as trout and hare. Considering the impact of these intrusive activities, the park has been categorized as 'vulnerable' (Pauquet 2005).

## BOFEDALES IN APOLOBAMBA

Bofedales are also termed *tuberas*, *vegas andinas*, *oconales*, *cenegales*, and *humedales*. They are considered a native pasture zone characterized by varying degrees of permanent soil humidity, densely packed vegetation communities, and a high index of productivity (Alzérreca 1988). In Bolivia, bofedales are found in the Altiplano and throughout the Cordilleras between 3800 and 5000 m. The bofedales in ANMI Apolobamba are found from 4400 m up to 5000 m. Systems are relatively small and localized, forming in a broad range of variable hydrological regimes (e.g. in areas of annual precipitation ranging from 100 mm to 1000 mm). Typically representing an azonal vegetation formation, they are characterized by a mosaic of hard cushion plants, patches of dense grasses, and numerous springs and streams. Large extensions of bofedales typically occur in wide glacier valleys, though some are also found on sloping hillsides where natural springs emerge. The dominant factor contributing to the formation of bofedales is ground and surface water, which constitutes the life force of these ecosystems. These bofedales are minerotrophic (fen in English and neidermoor in German); they are not equivalent to acid bogs or hochmoor found in the northern hemisphere that are less dominated by vascular plants (García and Beck, 2006).

## PARTICIPATORY WORKSHOPS

Participatory workshops were held with parkguards to identify the types of bofedales and indicator species of different states of conservation. During the workshops, parkguards discussed the characteristics of bofedales, and identified in participatory mapping practices the areas and condition of bofedales throughout the park. Broadly speaking, three levels of conservation were identified and are further discussed. Up to 41 species were identified in 'healthy' or well conserved bofedales, dominated by *Distichia muscoides* and *D. filamentosa*. Rutschatz (2000) found around 160 total species in bofedales throughout the Central Andes, of which only 29 species grew in more than 40% of the bofedales, 42 species were observed in 10-40% of these, and 35

species were consistently present in less than 10%. Poorly managed or drying bofedales are transforming and dominated by less palatable species such as *Aciachne pulvinata*, indicating processes of degradation.

## CONCLUSION

Bofedales are ecosystems of great importance to local communities, including the regulation of water, support of biodiversity, and pastoral production. Bofedales are in need of participatory conservation management, as they are currently threatened by mining, over-grazing, climate change, and other human activities.

## ACKNOWLEDGEMENTS

Special thanks is extended to the parkguards of ANMI for their participation and contribution to the workshops, and thanks also to SERNAP for the invitation to work in the region.

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