

Bird and mammal fauna assemblages in well-preserved natural grasslands of Uruguay with different livestock management

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Introduction

Ecosystem change by human activities is a central topic in environmental discussions and temperate grasslands are among the most altered ecosystems on the planet (Millennium Ecosystem Assessment 2005). The Rio de la Plata grasslands are the largest expanse of grasslands on the South American continent and they are no exception to this trend (Miñarro *et al.* 2008). More than 300 species from 39 botanical families have been listed. Perennial summer grasses dominate, with sedges next in importance. There are numerous legumes, but at very low frequencies (Suttie *et al.* 2005). Transformation of this ecosystem began with the introduction of domestic cattle in the sixteenth century but nowadays the intensification of agriculture is the largest threat to this ecosystem. Extensive livestock production seems to be compromise solution between conservation and production. It has been suggested that 68% of the Rio de la Plata grasslands had already been modified by 2010 (Alianza del Pastizal 2010). Uruguay is the only country to lie completely within this grassland zone and almost the entire country is covered by this habitat type. The main human activity in Uruguayan grasslands is, by far, extensive cattle ranching and 71% of this land use occurs on natural grassland (Bilenca and Miñarro 2004). However, transformation of these grasslands is considerable: 7.7% of it was lost between 1990 and 2000 mainly due to the tripling of eucalyptus and pine plantations and a 62-fold increase in soy plantations (Paruelo *et al.* 2006). The change from natural ecosystems to agro-ecosystems brings several consequences at different hierarchical levels, through population dynamics and community structure, to energy and matter flow at an ecosystem scale. The conservation of this habitat type should be a priority because of its high threat situation, the ecosystem services it provides, its potential for sustainable use, its threatened species, and as an emblem of a biogeographical region. Despite this, only 0.21% of Uruguayan grassland is under protection (Bilenca and Miñarro 2004).

One of the many places in the country where native pastures still persist is the Arerungá stream basin in the Department of Salto. Little intensive agriculture takes place in the area, and human land use is almost entirely extensive ovine and bovine ranching (PPR 2008). These grasslands have an important conservation value because they

maintain a rich biodiversity resembling pre-Columbian conditions (Azpiroz and Blake 2009). Sturm (2001) showed grass species composition in the Arerungá area differed between sites where sheep were present and sheep-free ones. Overall, plant diversity, aboveground productivity and forage quality were higher in sheep-free pastures. Azpiroz and Blake (2009) who studied bird assemblages in cropland and natural grasslands grazed by sheep and cattle, found communities differed among sites with higher bird diversity where sheep were present. Thus, the presence of sheep appears to affect vertebrate faunal assemblages.

The aim of this study is to assess the composition of mammalian and avian communities in sites under two different cattle management plans: one where sheep are present along bovine cattle and another where pastures are grazed solely by bovines.

Methods

The study area was located in the estancia “Los Venados” in the Arerungá region of Salto Department, Uruguay. Two sites of roughly 450 ha were surveyed twice seasonally during a 3 year period, through two 3 km transects each, one along the diagonal of the corral enclosing each site and another following the fence line. Site 1 (S1) was grazed bovine steers and Site 2 (S2) was under bovine and ovine cattle grazing. All bird species and medium-size to large mammals seen along transects were recorded. Diversity and similarity indices as well as rarefaction analysis were calculated using PAST 2 V.2.17c. Diversity estimators using EstimateS 9 V. 9.0, and SIMPER analysis through PRIMER 5 V. 5.2.

Results

In the case of mammals, the study found 5412 individuals belonging to 8 species, 4944 individuals from 7 species in S1 and 468 from 6 species in S2. Two species, *Ozotoceros bezoarticus* (Pampas deer) and *Dasyurus hybridus* (Southern long-nosed armadillo), are considered Near Threatened by IUCN. Rarefaction analysis showed only 4.16 species of mammal for S1 when the largest sample (S1) was lowered to 468 individuals. Estimated diversity reached a mean of 9.87 species for the whole study area, suggesting 81% of mammal species were recorded during sampling. Shannon diversity index was 0.1287 for S1 and 0.4884 in S2.

ANOSIM showed a large significant difference between sites ($R=0.88$, $P=0.0001$). *O. bezoarticus* was the most typifying species in both sites, accounting for more than 94% of the identity in each case. *O. bezoarticus* was also the species which discriminated among sites, 97% of the difference explained by the difference in abundance of this species.

For the birds study, 8315 individuals were recorded belonged to 83 taxa. One genus – *Anthus* (pipits) – could not be identified to the species level and might have been composed by up to 5 different species. 4254 individuals were found in S1 belonging to 65 taxa, and 4061 of 64 taxa in S2. Two species are considered Near Threatened, *Rhea americana* (rhea) and *Tryngites subruficollis* (buff-breasted sandpiper) and two Vulnerable, *Anthus nattereri* and *Sturnella defilippii* (Pampas meadowlark) by the IUCN. 64 species resulted for both sites when rarefaction analysis equaled sampled number of individuals. Estimates for total species richness in the study area had a mean of 101.15 species, meaning around 82% of the total species were sampled. Shannon diversity index was 2.628 for S1 and 2.604 for S2. Similarity between sites was significant (ANOSIM analysis $R=0.07$, $P=0.001$), although differences are not large. *Anthus* appears as the typifying taxon for both sites, contributing in at least 44% of the identity of each. 50 % of the dissimilarity between sites was explained by 4 taxa: *Anthus* sp., *Sicalis luteola* (grassland yellow finch), *Rhea americana* and *Vanellus chilensis* (southern lapwing), each contributing from 19.6% to 8.8% of the difference.

Conclusion

There is evidence to support that both mammal and bird assemblages differ between sites. Among mammals, Pampas deer was by far the most abundant species. However, abundance differed greatly from S1 to S2, being on average 10 times higher in S1, even though the species was present in all samples from both sites. It was both the typifying species of both sites and its abundance discriminated the areas. Sturm (2001) demonstrated that Pampas deer reach higher densities in sheep-free pastures, possibly due to competition for grass. Our results agree with these in that Pampas deer densities show a high correlation with differential grazing management. Among birds, assemblages differed significantly but in a much lower degree. Contrary to Azpiroz and Blake (2009), who found areas under the same management as S2 to be more

diverse, our results show diversity and species richness to be similar in both sites. Pipits appear as the most typifying group in both sites; unfortunately we were not able to distinguish between pipit species in the field. As suggested by Azpiroz and Blake (2009) pipit species seem to be affected most by livestock management. Differences among sites were also due mainly to pipit abundances, along with 3 other species. Overall, current land use seems to be sustainable with a rich diversity of grassland vertebrates, supporting conservation priority species. Even though we did not find large differences (except for Pampas deer) among communities, we cannot conclude that individual species are not affected by differential land management.

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