PROJECT UPDATE 1ˢᵗ Booster Grant

Title of Application

Wetland Conservation and the Impact of Invasive Alien Mammals in Northwest Patagonia

Name of leader

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Background

Wetlands are high productivity biodiversity "hot spots", and play an important economic, social and cultural role in the provision of ecosystem services for humans (e.g. fresh water) and their productive activities (e.g. source of quality pastures for livestock). However, wetlands are being lost or degraded very rapidly worldwide, threatened by changes in land use, overexploitation, and the impact of invasive alien species, which cause their loss and degradation. In the northwest of Argentine Patagonia, invasive exotic species threaten the conservation of wetlands (called "mallines" in this region). The individual and combined impacts invasive alien mammals (including wild boar -*Sus scrofa*-, red deer -*Cervus elaphus*- and fallow deer -*Dama dama*-) on wetlands in the Patagonian steppe, threaten native plant communities, soil properties, arthropod communities, and ground-nesting birds. Using an experimental design with multiple differential exclousures we study the role and impact of multiple invasive species in the conservation of wetlands in a scenario of sustainable productive management with low-impact and conservation goals.

Achieved goals and activities

I. Sites selection

A survey of potential sites for this project was carried out at Estancia Fortín Chacabuco (study site), to select six wetlands ("mallines"), with the presence of red deer, fallow deer, wild boar and livestock (cattle and sheep). The approximate location of each site is detailed below: I. Repunte Bajo: 41° 0' 45.9066"S - 71° 10' 49.029"O; II. Repunte Alto: 41° 00' 20.6"S - 71° 11' 13.1"O; III. Potrero: 41° 00' 29"S - 71° 10' 04.57"O; IV. Side: 41° 0'22.70"S - 71° 9'35.02"O; V. Tortuga: 40° 59' 23.4"S - 71° 09' 30.2"O; VI. Lagunita: 40°59'9.80"S - 71° 8'58.90"O (see attached map). The dominant vegetation in these environments are grasses, *Pappostipa speciosa* in the lower sectors and *Festuca pallescens* in the highest areas, with scattered bushes of *Senecio bracteolatus* and *Mulinum spinosum*, while in the most humid and flooded areas species such as *Juncus balticus* predominate, *Poa pratensis* and *F. pallescens* associated with bushes of *Ochetophila trinervis*, *Discaria chacaye*, *Berberis microphylla* and *Maytenus boaria*.

II. Habitat use and abundance monitoring

Preliminary wildlife monitoring was carried out using a camera trap in each mall during the summer of 2024. The cameras were installed at a height of 50 cm from the ground, fixed on a wooden post, operating 24 hours a day and recording 10-second videos and three photos with 5 minute intervals. Important information was collected about the presence and use of habitats of the species under study, and native species with which they coexist (see attached photos).

III. Impact of introduced ungulates

To quantify the negative impacts of introduced deers and wild boar in relation to the reduction of biomass, composition and richness of vegetation in wetlands, but also individualizing its effects, the exclusion experiment was set up. This experiment consists of four treatments (see attached photos): T1) Wild boar exclusion treatment (WBX): the height of the mesh is 0.8 m high, allowing the entry of deers that can easily jump that height, but not wild boar; T2) Deer exclusion treatment (DEX): the height of the mesh is 1 m high, and three strands of galvanized wire are used to raise the height of the exclosure to 1.50 m, preventing the entry of deers. In this treatment, two spaces of 60 cm x 60 cm

were opened in the mesh that allow the entry of wild boar; T3) Deer and wild boar exclusion treatment (DWE): the mesh has a height of 1 m (without "doors" for wild boar) and three strands of galvanized wire are used to raise the height of the closure to 1.50 m. In this way, the entry of deer and wild boar is prevented; T4) Control treatment (CTR): the center and perimeter were marked (same size that T1, T2 and T3) on the ground with eight stakes to delimit the treatment. One replica of each treatment was built in each wetland (N=24). Each exclusion is 5 meters diameter (~16m^2), and was constructed with galvanized steel mesh (section 15 cm x 5 cm), high-strength galvanized field wire, and four waterproofed wooden posts. Finally, small spaces of 20 cm x 20 cm were opened for treatments 1, 2, and 3 to allow the entry of small herbivores (e.g. European hare -*Lepus europaeus*-).

In each exclusion, the following parameters were measured: 1) maximum height of vegetation, 2) richness and cover of plant species (native and exotic), 3) cover of bare soil, 4) plant biomass, and 5) soil hardness. Soil hardness was measured using a penetometer at three random points within each enclosure to obtain an average hardness. The plant biomass was obtained by cutting the aerial vegetation in a plot of 50 cm x 50 cm, which will be dried in an oven for 48 hours at 60°C to obtain dry weight. On the other hand, three soil samples were collected at random points within each treatment using a hollow metal tube and extracting a 10 cm x 2 cm soil core. The samples were collected in the same bag and homogenized. These samples will be analyzed in the laboratories of the Universidad Nacional del Comahue, CRUB (Bariloche, Argentina) to determine: carbon, nitrogen, and phosphorus content, as well as the microbial enzymatic activity.

IV. Estimation of the area hunted by wild boar using UAVs

Exploratory flights were carried out to calibrate the technique and handling of the UAV equipment (DJI mini SE Drone) on site (see attached photos). However, because the assembly of the main experiment with exclusions took more time and effort than expected, the objective of collecting information from wetlands to calculate the surface area cultivated during this period could not be reach. The fall-winter weather, particularly the wind, also made the tasks of advancing with this proposed methodology

difficult. It is expected to resume monitoring during the spring-summer in the following period.

Human resources and collaborative activities: During the initial work of this project, workers from the Fortín Chacabuco Ranch and researchers from CONICET and the Universidad Nacional del Comahue participated. There was also the collaboration of CONICET PhD students (BSc. Victoria Arroyo and BSc. Lucía Retta) with the aim of training students in different sampling techniques. of vegetation, soil and traces of introduced ungulates. There was also the participation of a student from Northern Arizona University (United States), to work on the data collection of the project. We are currently looking for a student to complete their PhD within the framework of this project.

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