Final Evaluation Report

Your Details	
Full Name	Lucía Belén Zamora Nasca
Project Title	Assessing domestic dogs' role in protected areas: interaction with wildlife and society perception
Application ID	28982-1
Date of this Report	July 2022

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Assess the state of the problem of dog-wildlife interaction in urban and rural areas near protected areas.				I almost completely achieved these objectives, however not on the scales that were originally planned. The activity was planned by means of an online survey as well as personal interviews. Due to sanitary restrictions because of the COVID-19 pandemic, I had to reduce the number and sites for the face-to-face interviews to closer locations, leaving mostly rural areas underrepresented. However, the online survey was well attended (1028 respondents) and could supplement the scarcity of information from more distant and isolated areas. We are currently conducting another project to cover the topic in rural areas.
Determine the social perception about protected areas, the presence of dogs in protected areas, and dog–wildlife interactions by all the stakeholders involved.				
Record dog-wildlife interaction.				Globally, most studies assumed dog-wildlife interaction, but it was not directly quantified and in Argentina there was no study that addresses the issue. Here, from respondents' testimonies, we obtained reports of at least 726 events of dogs attacking wildlife. This number is conservative, as it comes from asking people about at least one event they have ever seen. These events involved at least 80 different species present in the country.

Estimate dogs' presence and abundance in protected areas near human settlements.				This sampling had to be done intermittently as sanitary restrictions were relaxed or reverted depending on the severity of the COVID-19 pandemic. So, the sampling was conducted between March and May 2021 and between December 2021 and May 2022. However, it was planned to cover a sampling area of 3000 ha with the camera traps and finally we were able to cover a greater area of 4500 ha in these periods (Fig. 4).
Assess the main drivers that increase the negative impact of dogs on wildlife in the sampled areas.				At the national level we developed two maps of the potential threat to wildlife due to presence of dogs, one for the area of residence of the respondents, and another for the protected areas that people visit (Fig. 3). We also elaborated an online interactive map for the national protected areas visited. To study the drivers at the local level (Nahuel Huapi National Park), we are analysing the relationship between the environmental variables recorded at camera traps sites and the occurrence of dogs in these areas.
Develop an awareness campaign				This objective was not originally proposed, however during the mandatory lockdown due to COVID-19, we contacted a group of audio-visual producers who were interested in collaborating with the project. From this, an informative video and posters to complement the information in the video were produced and actively disseminated through internet and workshops.

2. Describe the three most important outcomes of your project.

a). State of the problem of dog-wildlife interaction at a general level in Argentina

Dogs were reported as a possible threat to wildlife in every ecoregion of the country. Of the total of respondents (1020), 68.4% (688) had witnessed a dog persecuting wildlife at least once. At least 80 different species have been chased or preyed on by dogs, 6.5% of these species are categorised as Endangered or Vulnerable in national and global Red Lists (Figure 1 and 2. Detailed information on the locations of the events reported, the taxonomic classification of the species involved and

categories per ecoregion can be accessed via the following link: https://adivirgilio.shinyapps.io/dogs_attack_to_wildlife/, Zamora-Nasca et al 2021).

In terms of the number of dogs per person, more than half of the respondents (59%) had at least one dog. Of these, 25% have one dog, 24% have two, 18% have three, 10% have four, and 22% five or more. On average, respondents have 2.05 dogs (ranging from 1 to 16). Most of the respondents reported that in the area where they reside, they observe free-roaming dogs at high frequency (median of nine on a frequency scale of 0 to 10) (Zamora-Nasca and Lambertucci in press).

b). State of the problem in the protected areas of Argentina

From the total of respondents who visited protected areas (876), 64% (561) have seen free-roaming dogs in the protected areas visited, 21.6% (189) reported that they did not see dogs roaming and 14.4% (126) reported they did not know if dogs roam in the protected areas they visited. The respondents visited 186 different Argentinian protected areas and they sighted dogs in 78.5% (146) of them (Figure 3. An interactive map detailing information on the responses about sightings of dogs and cases of chase or predation on wildlife in the PA visited can be found in: https://lbzn.shinyapps.io/MapPA/, Zamora-Nasca and Lambertucci manuscript in press).

In the survey we asked people if they knew if dogs are allowed in the protected areas they visit. On the other hand, we made a revision on the internet of the official protected areas web pages, social networks and written ordinances to find out if dogs are allowed or not in these protected areas. Then, we analysed the relation between people responses and actual ordinances. We observed that in many cases this information is not accessible to the general public and in some cases, when it is available, it is not clear. When we analysed the relationship between this accessibility and what the respondents answered, we saw that there is a strong relationship between the protected areas that do not mention anything about the regulation of dogs in the area and the people who answered that in those areas "they do not know if it is possible to enter with dogs" and that "it is possible to enter with dogs". In other words, the lack of clear and accessible information to the general public generates confusion among visitors about the regulations (Zamora-Nasca and Lambertucci manuscript in revision).

c). Social perception about protected areas, the presence of dogs in protected areas, and dog–wildlife interactions.

Based on several different questions, we estimated the degree of awareness of the problem of dog interaction with wildlife, the degree of appreciation of the respondents for the protected areas and for the wildlife that inhabits in protected areas. Then, we evaluated how these aspects were related to the degree of agreement with several measures for dog entry into the protected areas and with the degree of concern they expressed in front of several hypothetical dog aggression events proposed. We observed that the greater the awareness about the problem and the greater the degree of appreciation for protected areas and wildlife, the less they agreed with allowing dog access in protected areas. In turn, the greater the awareness of the problem and the greater the degree of appreciation for protected areas and wildlife, the greater the concern about

situations of dog attacks on people and wildlife. In particular, the frequency of sightings of dog attacks on wildlife was the determining factor of the awareness of the problem. In turn, the variable that most influenced their appreciation for protected areas and wildlife was the frequency with which they visit protected areas (Zamora-Nasca and Lambertucci manuscript in press).

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The main difficulty I encountered was the mandatory lockdown and social distancing due to the COVID-19 pandemic. This started a few months after receiving the grant and much of the planned work involved personal interviews. However, the online survey had high participation (1028 respondents) and based on these results, we produced the first paper and developed an awareness campaign with a team of audio-visual producers during this period. As a result of this unplanned situation and the increase in the use of virtual media, the possibility arose to develop this activity and involve people that otherwise would not have been possible. This campaign was carried out through remote work with specialists from Ecuador, Chile, Spain and Argentina. The material produced was widely disseminated throughout Argentina and had good repercussions. The video was shared on numerous social networks and in newspaper articles (at least 4300 visualisations).

The social isolation measures in the country and in particular in the research institute where I work (CONICET) took almost 2 years, but thanks to the extension provided I was able to achieve all the proposed objectives.

4. Describe the involvement of local communities and how they have benefitted from the project.

During the development of the project, we contacted different organisations and institutions that work in topics related to dogs. First of all, we contacted the municipal zoonosis agency. We also contacted with residents of the Program of Veterinary Public Health of URESA Andina (Regional Unit of Epidemiology and Environmental Health Andean Zone) and collaborated with them in vaccination and deworming campaigns in the rural areas where we were able to conduct interviews. We also contacted animal protection organisations. These organisations work on a voluntary basis in different neighbourhoods with trap-neuter-release programmes. Based on meetings and key information provided by them, we chose strategic sites for the interviews and fieldwork. On the other hand, we work together with the Administration of National Parks to carry out the camera trap sampling in the limits of the Nahuel Huapi National Park with the city (Bariloche). Also, we start to work with professors and students of the Comahue National University in an extension project about dogs. With them, we coordinated activities to raise awareness and disseminate information about the problem of free-roaming dogs. Finally, in rural areas and on the edges of national parks there are aboriginal communities, Mapuches. We worked in particular with three of them where we carried out the camera traps sampling.

The problem of free-roaming dogs and their impact on wildlife has many aspects, from the problem of the non-responsible ownership, the lack of resources of certain sectors to take care of their pets, the economic losses due to dog attacks on production animals (especially significant in small producers, rural and aboriginal communities), to the lack of people's awareness about the problem. Thus, each sector with which we have interacted needs to work together with the other. Scientific research is necessary for the management plans of free-roaming dog populations by municipalities, and the knowledge of practices for population control is also necessary for rural communities. That they are aware of dog impact on wildlife is important to they become involved in the conservation of natural areas. From these contacts with these institutions, we were able to know the particular reality of each one and setting the basis to look for working in a coordinated manner.

5. Are there any plans to continue this work?

Yes, with people who joined the project in the last year we are planning three related projects with the following general objectives:

- To extend the camera trap sampling area (in Arrayanes National Park and other areas of the Nahuel Huapi National Park) to estimate the presence and abundance of domestic dogs.
- To study the movement and space use of free-roaming dogs through telemetry and accelerometer techniques and to complement this information with that obtained by the camera trap sampling.
- To carry out an evidence-based conservation project on trekking trails in Nahuel Huapi National Park. We look for evaluate the influence of dogs and people on the presence of wildlife. The study will be carried out in two instances, before and after to establish different types of signage and messages on the trails about the impact of dogs on wildlife to assess people's response to these different types of signage. Globally, there are few conservation actions studies referred to dog management in protected areas and unfortunately, there is no conservation action project reported for protected areas in our country. I believe that in this national park, which has an intensive use, both by tourist and local people, it is urgent to develop studies to evaluate the effectiveness of different measures to prevent the impact of dogs on wildlife.

6. How do you plan to share the results of your work with others?

During the strict lockdown we elaborated an audio-visual campaign through teleworking. In addition to the diffusion that already had the material through social networks and news media, I plan to disseminate it to the respondents of the online survey (1028), since they provided us their email address.

In turn, from the presentations and seminars we gave during this period, people from different disciplines joined the project. Now, we are forming an interdisciplinary group composed by two biologists, an anthropologist, a specialist in communication and a psychologist and dog trainer who works in animal behaviour. With this team

we are planning a series of workshops where we will disseminate the results found so far and actively work on awareness campaigns.

Finally, four scientific papers have emerged from this project, one already published, one in press, one under review and one in preparation (Please, see references below).

7. Looking ahead, what do you feel are the important next steps?

One of the results we obtained is that people who have witnessed dog attacks on wildlife are more aware of the problem and are more willing to comply with dog management measures. Based on this, I believe it is important to quantify the problem in detail in the field, estimate the magnitude of the impact and work actively with society transmitting this information. One of the main causes of this problem is the lack of knowledge of society about it. Working actively with different social actors in the decision-making process about regulations and in the dissemination of the problem is key.

On the other hand, there is no evidence-based conservation work on the subject in the country, so we are planning to develop one, as mentioned in the future work section. I believe that this information is urgently needed to address public policies and more realistic dog management measures with greater compliance by society.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Rufford's support and its logo were presented in the audio-visual campaign (please, see links in references below). This material was disseminated on the social networks of the group and the research institute, as well as through local and national news media. The video has at least 4300 visualisations, these are the ones that could be counted through the platforms where we uploaded it, but also it had greater diffusion through other networks.

Also, I used The Rufford Foundation logo and I thanked Rufford for all their support when I presented results in different seminars and workshops to the community, as described below:

- Talk on the impact of free-roaming dogs on wildlife in the postgraduate course: "Applied Ecology" of the PhD in Biology at the National University of Comahue. Year 2021.
- Talk on the impact of free-roaming dogs on wildlife in the postgraduate course: "Bases and tools in conservation biology" of the PhD in Biology at the National University of Comahue. Years 2021 and 2022.
- Talk on impacts of free-roaming dog populations on wildlife in the framework of the workshop: "Workshop on strategies for the study and estimation of dog populations" at the veterinary career of the National University of Rio Negro. March 31, 2022

- Workshop-debate on impacts of free-roaming dog populations on wildlife within the framework of the activities for the "Environment Week" organised by the "Mesa Bariloche Sustentable" (Municipality of San Carlos de Bariloche, Manos Verdes Foundation, Circuito Verde Foundation, Tierra Activa Foundation, Bariloche Limpia Foundation, Nahuel Huapi National Park, National Parks Administration, Inibioma-Conicet/National University of Comahue). 9 June 2022.
- Talk on the impact of free-roaming dogs on wildlife in "Frey" mountain refuge. Year 2022
- Talk on the impact of free-roaming dogs on wildlife to students of the discipline "Nature interpretation" of the Physical Education career from the National University of Comahue. Year 2022.

Moreover, I acknowledged the funding from The Rufford Foundation in each manuscript that I have submitted to peer-reviewed international journals (three) and will do the same in the last manuscript that we are actually working on.

9. Provide a full list of all the members of your team and their role in the project.

The team of this project is integrated by **Lucía Zamora, Sergio Lambertucci, Agustina DiVirgilio** and **Pablo Plaza.**

Lucía Zamora was the leader of the team.

Lucía Zamora and **Sergio Lambertucci** conceived the ideas in this project.

Lucía Zamora designed the surveys and the experimental fieldwork, with the help of **Sergio Lambertucci, Agustina DiVirgilio** and **Pablo Plaza.**

Lucía Zamora carried out the fieldwork and collected the data with the help of a field assistant.

Lucía Zamora analysed the data and led the writing of all four manuscripts. **Sergio Lambertucci, Agustina DiVirgilio** and **Pablo Plaza** revised the manuscripts and made comments to improve them.
Lucía Zamora developed the awareness campaign, in collaboration with the team of visual animators. **Sergio Lambertucci** made comments to improve it.

Lucía Zamora was responsible for sharing the results in the local community, the scientific community, social medias, and news media (radio and newspapers).

10. Any other comments?

We would like to thank The Rufford Foundation for the grant received. Argentina has been going through a deep economic crisis for several years and the scientific sector has been deeply affected. Without this funding, it would be practically impossible to carry out this type of project and maintain the level of scientific productivity and quality. I hope to apply again for a Rufford Grant soon.

On the other hand, I am deeply grateful for the understanding, flexibility and extra time given due to the complications generated by the COVID-19 pandemic. Without this understanding it would have been more difficult to achieve all the objectives proposed.

References of scientific manuscripts written based on the results obtained from this project and links to the awareness campaign:

Zamora-Nasca, L.B., di Virgilio, A., Lambertucci, S.A., 2021. "Online survey suggests that dog attacks on wildlife affect many species and every ecoregion of Argentina". Biological Conservation 256. https://doi.org/10.1016/j.biocon.2021.109041

Zamora-Nasca, L.B., Lambertucci, S.A. 2022. "Domestic dog-wildlife interactions and support for pet regulations in protected areas". In press.

Zamora-Nasca, L.B., Lambertucci, S.A. 2022. "Lack of accessibility and clarity in regulations about dog entry in protected areas influence people's awareness" In revision.

Zamora-Nasca, L.B., Lambertucci, S.A. Manuscript of the data obtained from the camera trap survey. In preparation.

Link to video of awareness campaign in vimeo with subtitles: https://vimeo.com/650812429/ea922c94ab

Link to video of awareness campaign in YouTube: https://youtube.com/watch?v=kuKHG999304&feature=share

Link to posters of awareness campaign: https://drive.google.com/drive/u/1/folders/1Jmkv2UKIJ-5pCPBxhARvGVxXOW2zPrJe

Figures

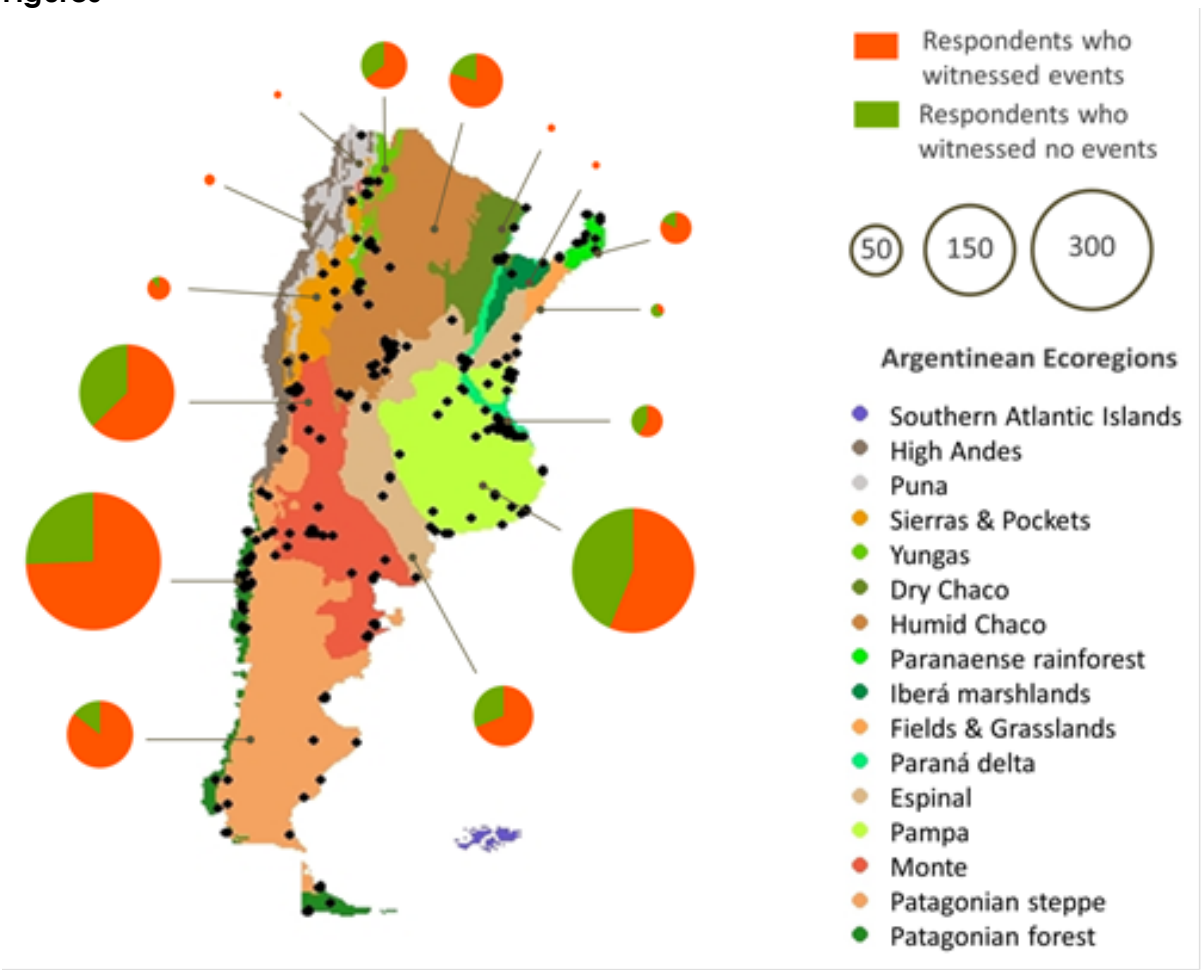

Figure 1. Map of Argentina including the locations, by ecoregion, from which we obtained responses reporting dogs chasing or preying on wildlife, and the total number of respondents from each ecoregion. Respondents who witnessed persecution events (red in pie chart) are distinguished from those who witnessed no events (green). Detailed information on the locations of the events reported, the taxonomic classification of the species involved and categories per ecoregion can be accessed via the following link: https://adivirgilio.shinyapps.io/dogs_attack_to_wildlife/

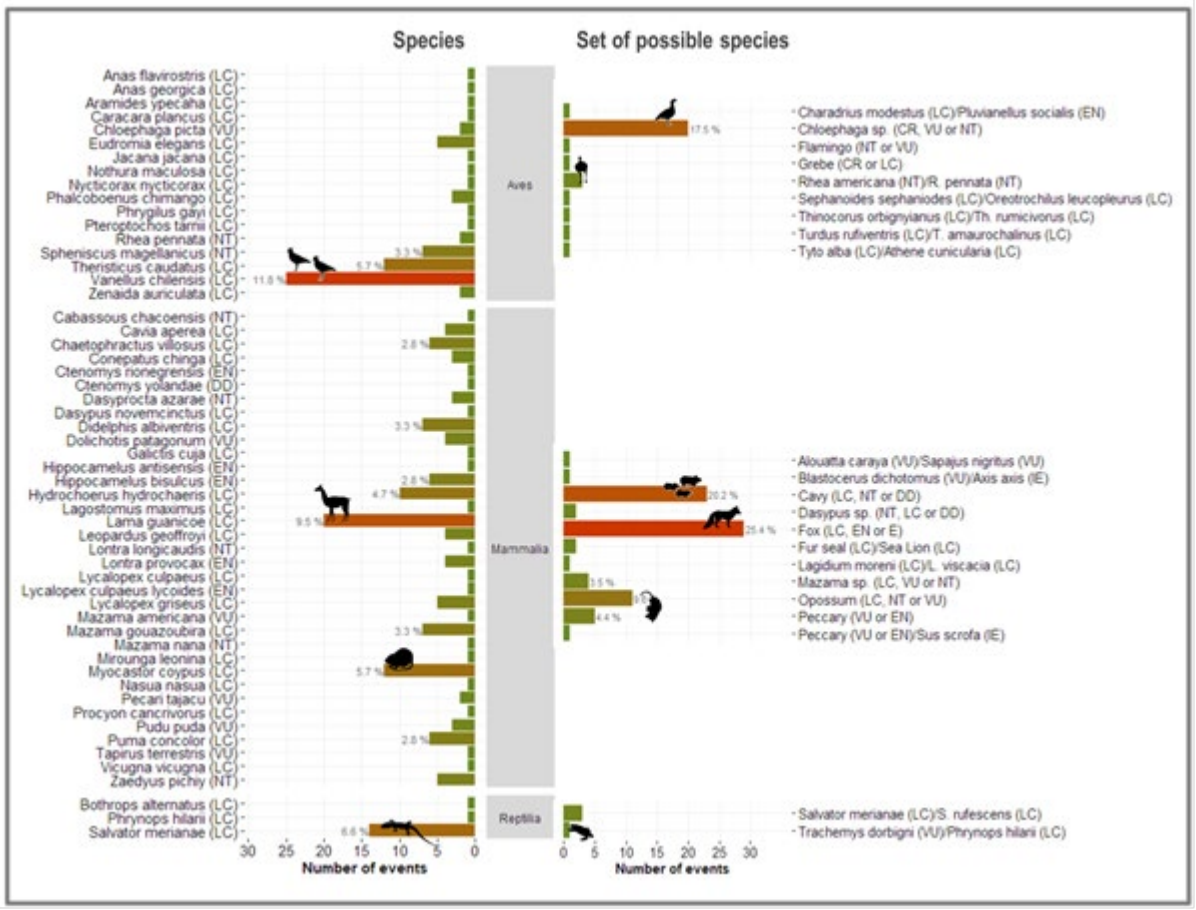

Figure 2. Number of dog chases or predation events on wildlife (and percentages of the total events) that could be identified taxonomically at class and species level. Native and exotic species and sets of possible species (see details in Methods section) are included. The colour gradient of the bars represents the number of events, from the lowest (green) to the highest (red). Detailed information on the locations of the events reported, the taxonomic classification of the species involved and categories per ecoregion can be accessed via the following link: https://adivirgilio.shinyapps.io/dogs_attack_to_wildlife/

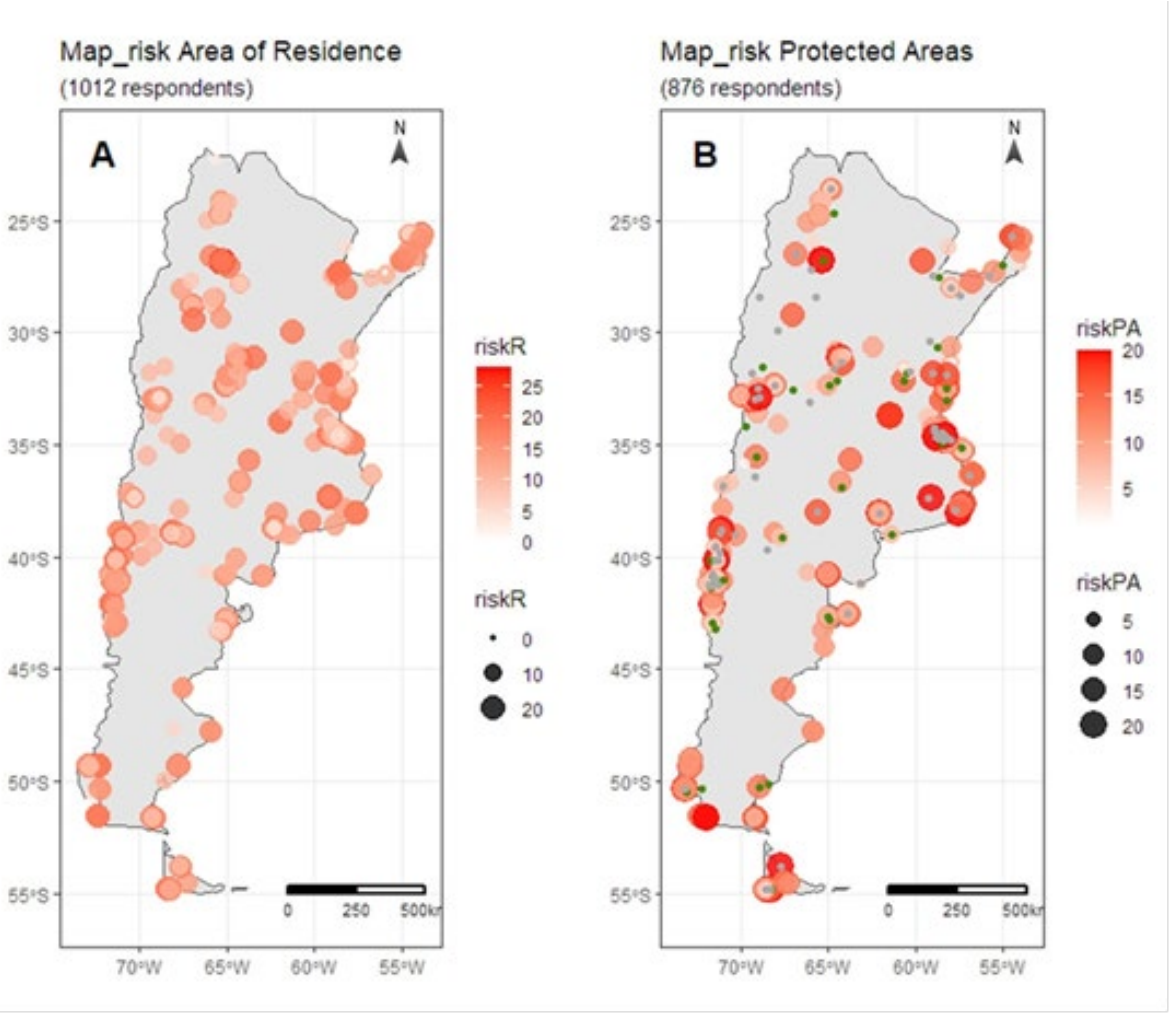

Figure 3. Map of Argentina (the 8th largest county in the world) including the risk index for wildlife conservation exposed to the presence of dogs in: A) respondent's area of residence, and B) protected areas visited by respondents. The dots red intensity and size indicate the level of risk. Green dots, indicate protected areas where some respondents reported not seeing free-roaming dogs. Grey dots, indicate protected areas where some respondents did not know if there are free-roaming dogs. An interactive map detailing information on the responses about sightings of dogs and cases of chase or predation on wildlife in the PA visited can be found in: https://lbzn.shinyapps.io/MapPA/.

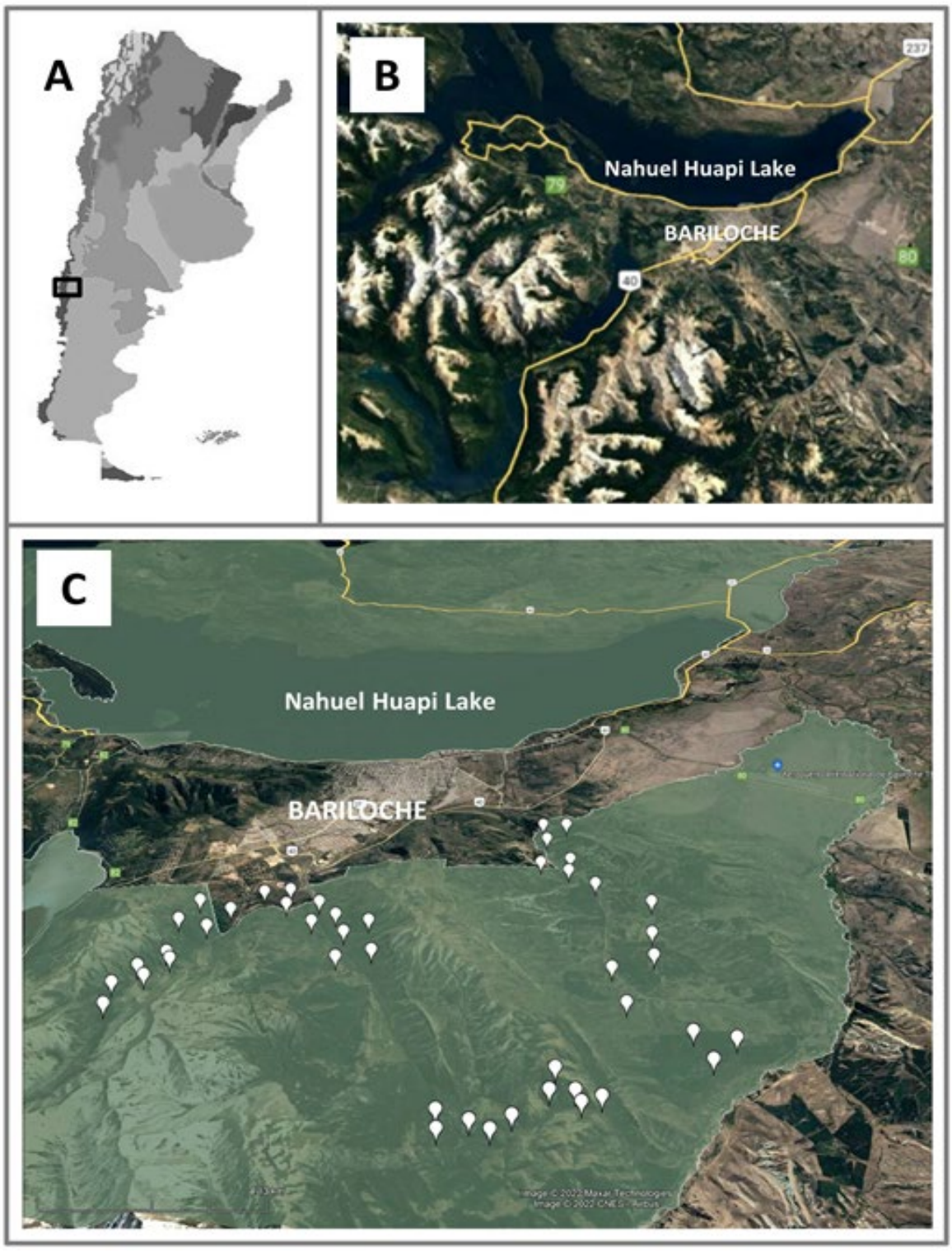

Figure 4. Study area where the camera trap sampling was performed. It is located in North Patagonia of Argentina (A); in Bariloche City (B). The cameras were installed in the Nahuel Huapi National Park (green shaded polygon), in four valleys at difference distance of Bariloche city (C). White marks correspond to each camera station.