

FINAL REPORT

TCD Practicum (LAS 6905)

Fall 2024

Hunting Dimensions in Protected Areas in the Dry Chaco of Paraguay

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Hunting Dimensions in Protected Areas in the Dry Chaco of Paraguay

Introduction

Protected areas are cornerstones of biodiversity conservation. Yet, growing evidence shows widespread species declines within protected areas linked to weak actions to tackle human pressure. Pressures outside protected areas, such as habitat loss, coupled with poor management, can facilitate hunting inside protected areas, reducing their conservation effectiveness. In developing countries, 60% of protected areas have recognized hunting as their largest conservation challenge. Throughout Latin America, protected areas have limited ability to respond to this challenge, beginning with inadequate baselines for evaluating and curbing hunting. Despite the urgency of reducing hunting in protected areas, adequate evaluations of hunting impacts are scarce because wildlife data and accurate hunting data are rarely collected simultaneously and at a scale required for effective management decisions. In addition, local stakeholders' perceptions of hunting are rarely considered and used as a tool to move forward in designing effective conservation actions.

My research addressed these challenges in the Dry Chaco, the largest subtropical forest in the world. The Dry Chaco harbors high mammalian richness (>150 species) and endemism (e.g., the Chacoan peccary, *Catagonus wagneri*), and is one of the last strongholds for jaguars (*Panthera onca*). I conducted the first assessment of the spatial extent, intensity, and underlying drivers of hunting and its effect on mammals within protected areas in the Dry Chaco of Paraguay, my home country. By integrating various methods including infrared camera trapping, acoustic monitoring, and semi-structured interviews with local stakeholder, my research fills three key gaps: a) the absence of accurate estimates of the spatial extent and intensity of hunting within protected areas, b) the lack of assessments of the impacts of hunting on vulnerable taxa at the scale required for effective conservation interventions, and c) the lack of information on local peoples' perceptions on the drivers and motivations of hunting. No similar work has been conducted in Paraguay to date.

In the past three years of conducting my research, I have collaborated with decision makers in Paraguay, such as the Ministry of Environment, and key organizations supporting conservation actions in the region, such as the Wildlife Conservation Society - Paraguay. These collaborations allow my results to be incorporated in upcoming decision-making documents that directly shape national-level conservation planning. In addition, I have collaborated with other local organizations, including the Paraguayan Association of Mammalogists (APM), to provide training opportunities to young conservation leaders in Paraguay, where capacity building opportunities are lacking.

I chose to conduct a TCD practicum as an opportunity to continue my commitment to contribute with scientific information that informs conservation actions in the Dry Chaco of Paraguay and to provide opportunities for capacity building for young conservation leaders. To accomplish this, I conducted meetings with institutions that have been collaborating with to share and discuss my preliminary results, and for capacity building, I designed two workshops on topics of interest according to surveys conducted to students in the past years.

Objectives achieved

- a) **Trained local young-conservation leaders** on fieldwork techniques such as camera trapping and scientific writing with support from the Paraguayan Association of Mammalogists.
- b) **Shared preliminary results** obtained from previous field seasons with local partner, Wildlife Conservation Society – Paraguay, and the Ministry of Environment to discuss future long-term research and conservation planning
- c) **Validated data obtained from social surveys** conducted during summer 2023, on drivers and motivations of wildlife hunting in the Dry Chaco of Paraguay.

Practicum activities and outcomes

1. Presented preliminary results to local partners and decision makers via in-person meetings

I held meetings with various stakeholders, including staff from the Division of Protected Areas and the Division of Wildlife (Fauna) of the Ministry of Environment and local partner Wildlife Conservation Society-Paraguay (see Table 1). I presented preliminary results of my dissertation and discussed the next steps for applying these findings. During these discussions, I explored how my research could contribute to improving protected area management and species conservation plans.

Table 1: Details of meetings held during TCD practicum

Name	Title/Organization	Contact Information	Meeting/workshop date/s
Ramon Chilavert	Co-director – Division of Protected Areas, Ministry of Environment and Sustainable Development (MADES), Paraguay	rchilatorres@hotmail.com Madame Lynch 3500 casi Primer Presidente, Asuncion-Paraguay.	December 17, 2024 MADES office
Alejandra Corvalan	Staff, technician - Division of Biodiversity Conservation, Ministry of Environment and Sustainable Development (MADES), Paraguay	asp.pyverde@gmail.com Madame Lynch 3500 casi Primer Presidente, Asuncion-Paraguay.	December 17, 2024 MADES office
Dario Mandelburguer	Director – Division of Biodiversity Conservation, Ministry of Environment and Sustainable Development (MADES), Paraguay	dariomandel@gmail.com Madame Lynch 3500 casi Primer Presidente, Asuncion-Paraguay.	December 17 and 18, 2024 MADES office
Gisella Escobar	Staff, technician – Division of Protected Areas, Ministry of Environment and Sustainable Development (MADES), Paraguay	yuyiescobar@hotmail.com Madame Lynch 3500 casi Primer Presidente, Asuncion-Paraguay.	December 17, 2024 MADES office

Frederick Bauer	Scientific Director, Wildlife Conservation Society - Paraguay	fbauer@wcs.org Pitiantuta 664, casi Republica de Siria, Asuncion - Paraguay	November 18 and 19, 2024 WCS- Paraguay office
Maria Belen Ortiz	Program Assistant Officer, Wildlife Conservation Society - Paraguay	wicsparaguay@wcs.org Pitiantuta 664 casi Republica de Siria, Asuncion - Paraguay	November 18, 2024 WCS- Paraguay office
Laura Villalba	Jaguar Program Coordinator, Wildlife Conservation Society - Paraguay	lvillalba@wcs.org Pitiantuta 664 casi Republica de Siria, Asuncion - Paraguay	November 18, 2024 WCS- Paraguay office
Jorge Pinazzo	Conservation Coordinator in Protected Areas, Wildlife Conservation Society - Paraguay	wicsparaguay@wcs.org Pitiantuta 664 casi Republica de Siria, Asuncion - Paraguay	November 18, 2024 WCS- Paraguay office

2. Conducted training workshops for young conservation leaders on camera trapping and scientific writing

I conducted two workshops for young conservation leaders, at the National University of Asuncion (see Table 2). These workshops were co-organized by the Biology Students Association and supported by the Paraguayan Association of Mammalogists. I conducted a survey before and after each workshop exploring participant's knowledge to assess the impact of the training sessions.

2.1. Impact of the workshop participants

Scientific writing and Conservation Planning workshop

Overall, participants reported an increase in knowledge in all topics covered in the workshop. Most participants expressed that they had little to no experience drafting or preparing a conservation project or scientific paper/document. However, after the workshop, they reported feeling more confident in their ability to do so. Many participants were also unfamiliar with the Conservation Standards as a tool for conservation planning and project management. By the end of the workshop, they recognized the importance of using this framework for project conceptualization, particularly in identifying conservation targets, threats, and contributing factors to threats.

The workshop incorporated group activities where participants collaboratively identified conservation targets, analyzed associated threats and contributing factors, and presented project ideas to address these conservation challenges. This hands-on approach helped solidify their understanding of the Conservation Standards and encouraged creative problem-solving.

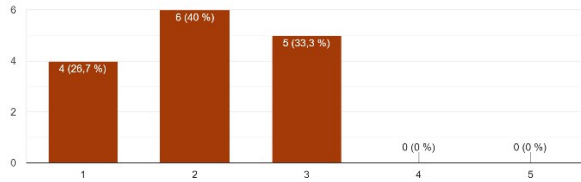
Additionally, the workshop introduced key aspects of grant writing and scientific writing. Participants reported an increase in knowledge on topics such as sentence structure, word choice, citation management, visualizing project schemes, and budget development. Many students emphasized that the workshop served as a valuable first introduction to scientific writing and the conceptualization of conservation projects.

Participants also expressed a desire for a more extended and intensive workshop that includes writing practice to further develop their skills in these areas.

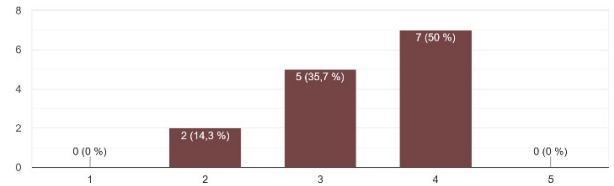
Responses before the workshop **Responses after the workshop**

How prepared do you feel to plan/draft a conservation project for species or ecosystems?

Actualmente, ¿Qué tan preparado/a te sientes para planificar/idear un proyecto de conservación para especies y/o ecosistemas? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

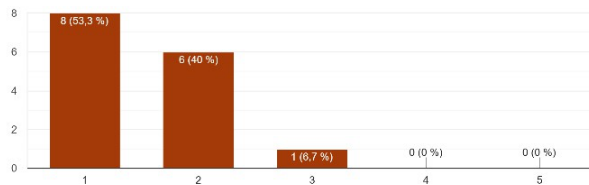


Actualmente, ¿Qué tan preparado/a te sientes para planificar/idear un proyecto de conservación para especies y/o ecosistemas? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
14 respuestas

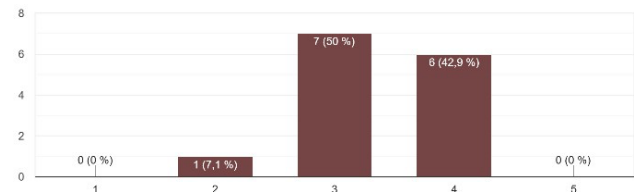


How familiar are you with the Conservation Standards (Open Standards for the Practice of Conservation)?

Actualmente, ¿Qué tan familiarizado/a estás con respecto a los Estándares Abiertos para la Práctica de la Conservación? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

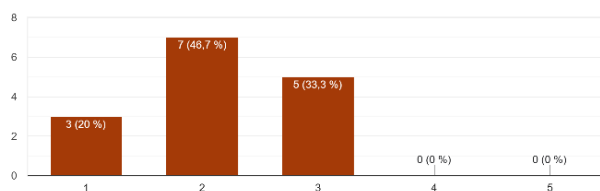


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14 respuestas

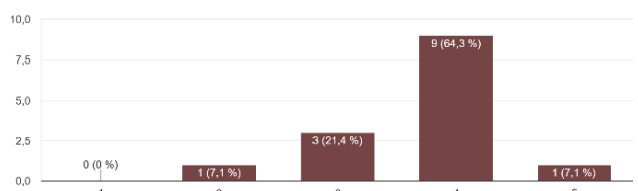


How familiar are you with respect to conservation targets? (what they are and how to select them).

Actualmente, ¿Qué tan familiarizado/a estás con respecto a los objetos de conservación? (que son y como se seleccionan) 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

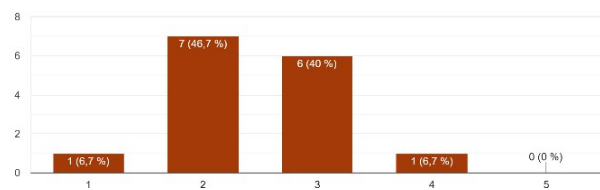


Actualmente, ¿Qué tan familiarizado/a estás con respecto a los objetos de conservación? (que son y como se seleccionan) 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
14 respuestas

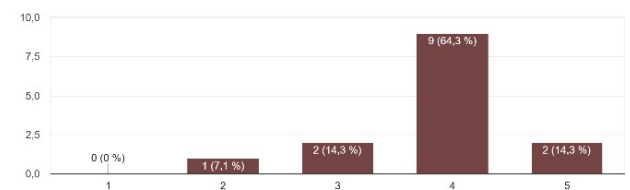


How familiar are you with respect to identification of threats to species or ecosystems?

Actualmente, ¿Qué tan familiarizado/a estás con respecto a identificación de amenazas hacia especies o ecosistemas? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

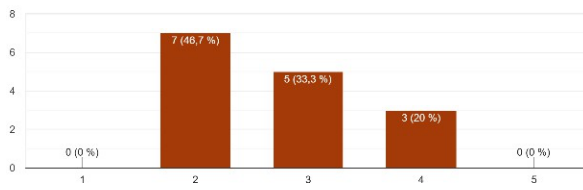


Actualmente, ¿Qué tan familiarizado/a estás con respecto a identificación de amenazas hacia especies o ecosistemas? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
14 respuestas

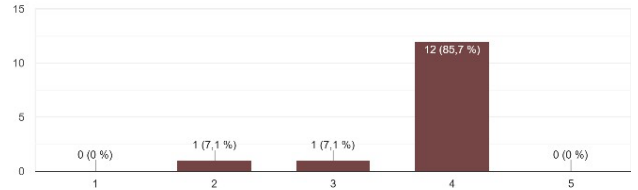


How familiar are you with respect to contributing factors of threats to species or ecosystems?

Actualmente, ¿Qué tan familiarizado/a estás con respecto a identificación de factores que contribuyen a las amenazas para una especie o e...? 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

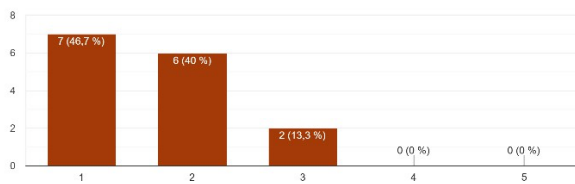


Actualmente, ¿Qué tan familiarizado/a estás con respecto a identificación de factores que contribuyen a las amenazas para una especie o e...? 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
14 respuestas

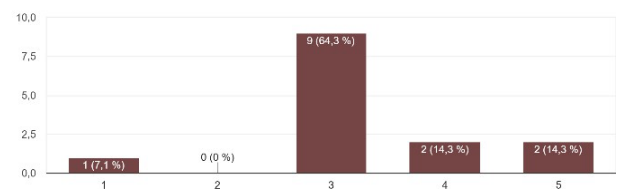


How prepared do you feel to draft and write a research/conservation grant?

Actualmente, ¿Qué tan preparado/a te sientes para idear y escribir un borrador de propuesta de financiamiento para investigación? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

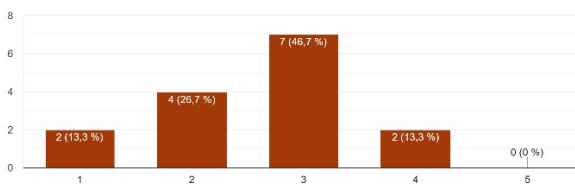


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14 respuestas

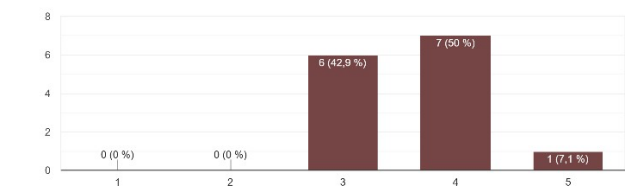


How familiar are you with scientific writing? (in terms of selection of key words, wording, framework elaboration, schemes, etc.)

Actualmente, ¿Qué tan familiarizado estás con respecto a la redacción científica? Por ejemplo: elección de palabras clave, elaboración de marco...= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas

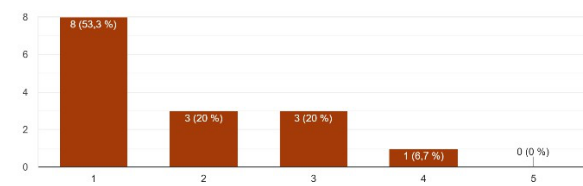


Actualmente, ¿Qué tan familiarizado estás con respecto a la redacción científica? Por ejemplo: elección de palabras clave, elaboración de marco...= Un poco 3= Algo 4= Mucho 5= Extremadamente
14 respuestas

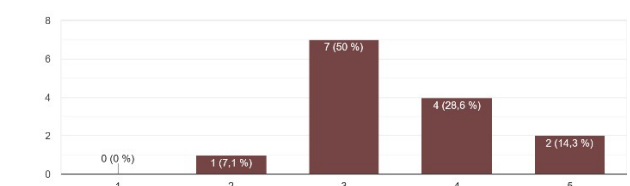


How familiar are you with budget elaboration for a research/conservation project?

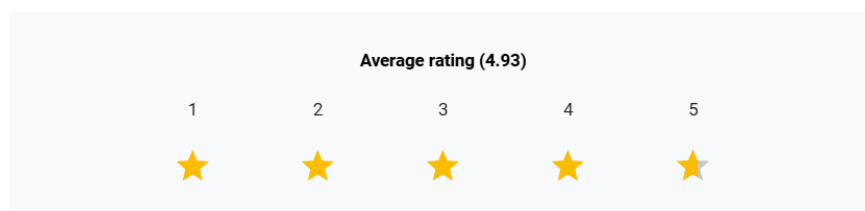
Actualmente, ¿Qué tan familiarizado estás con respecto a la elaboración de un presupuesto para un proyecto de investigación? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
15 respuestas



Actualmente, ¿Qué tan familiarizado estás con respecto a la elaboración de un presupuesto para un proyecto de investigación? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
14 respuestas



How would you rate this workshop?



Camera trap workshop

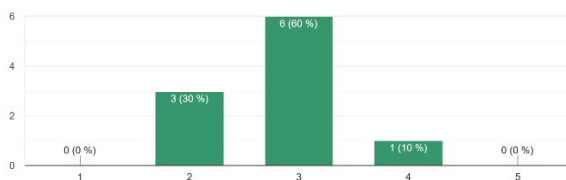
Overall, participants reported an increase in knowledge in all topics covered in the workshop. The majority of participants had some prior knowledge of camera trapping and reported a significant increase in their understanding after the workshop. They particularly emphasized gaining a clearer grasp of the types of research questions that can be addressed using camera traps and the appropriate designs for each question. The workshop also provided an introduction to key concepts such as presence/absence, species diversity, abundance, activity patterns, and density estimation, along with the data collection requirements for these analyses.

Additionally, the workshop included an overview of field applications, especially those tailored for remote areas with limited or no internet access. Participants found tools like Epicollect for data collection and Avenza Maps for offline navigation highly beneficial. Several expressed that these tools inspired them to explore geoprocessing methods further. The workshop also facilitated discussions around various research papers that employed camera trapping, which participants found insightful and enriching. For many students, this was their first hands-on experience configuring, installing, and retrieving camera traps, an activity they found particularly valuable and practical for their future work.

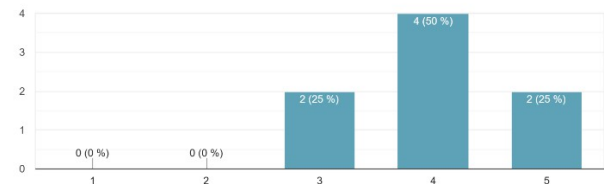
Responses before the workshop Responses after the workshop

How much do you know about camera trapping as a tool for biodiversity research?

Actualmente, ¿que tanto conocés con respecto al fototrampeo como herramienta para estudios de biodiversidad? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
10 respuestas

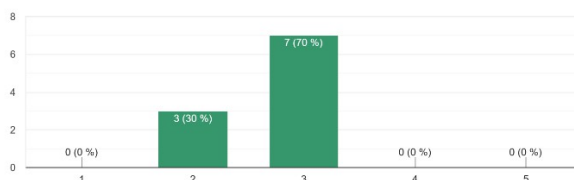


Actualmente, ¿que tanto conocés con respecto al fototrampeo como herramienta para estudios de biodiversidad? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
8 respuestas

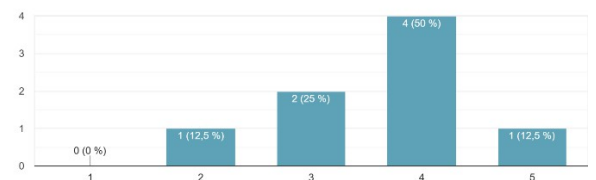


How familiar are you with concepts related to presence/absence, species diversity, abundance, activity patterns and/or density?

Actualmente, ¿que tan familiarizado/a estas con conceptos relacionados a presencia/ausencia, diversidad de especies, abundancia, patrones de ...? 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
10 respuestas

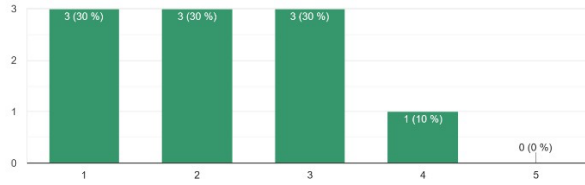


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8 respuestas

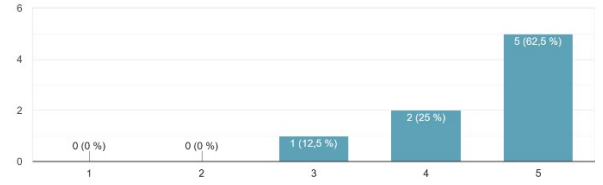


Have you read/analyzed scientific articles that use camera trapping as a tool/method? Has it been useful to read/analyzed scientific articles during the workshop?

Actualmente, ¿has leído/estudiado/analizado/criticado artículos científicos que utilizan fototrampeo en su metodología? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
10 respuestas

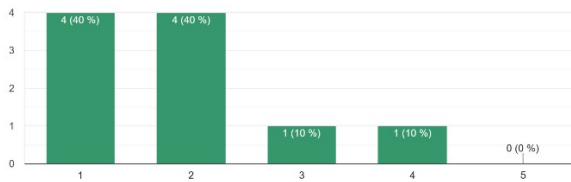


¿Te ha resultado útil el haber analizado/criticado artículos científicos que utilizan fototrampeo en su metodología? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
8 respuestas

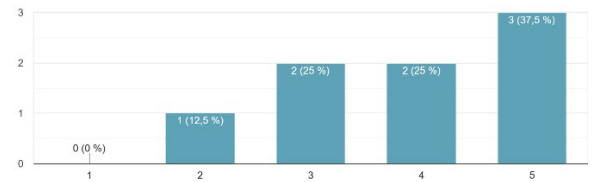


How familiar are you with apps that might be useful when collecting field data?

Actualmente, ¿que tan familiarizado/a estás con respecto a aplicaciones ("apps") que puedan ser de utilidad para la colecta de datos en campo? 1... 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
10 respuestas

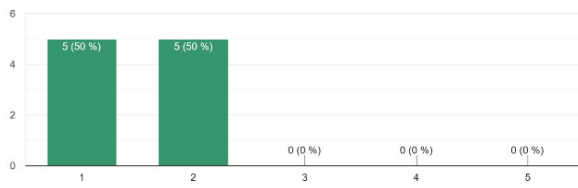


Actualmente, ¿que tan familiarizado/a estás con respecto a aplicaciones ("apps") que puedan ser de utilidad para la colecta de datos en campo? 1... 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
8 respuestas

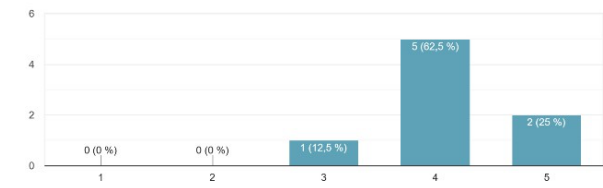


How familiar are you with installation and retrieval forms for camera traps?

Actualmente, ¿que tan familiarizado/a estás con planillas de instalación, revisión y retiro de cámaras trampa? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
10 respuestas

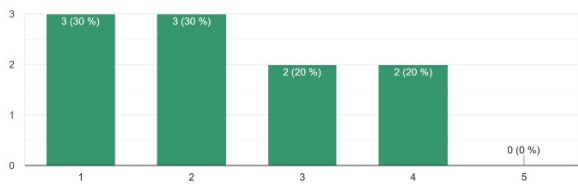


Actualmente, ¿que tan familiarizado/a estás con planillas de instalación, revisión y retiro de cámaras trampa? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
8 respuestas

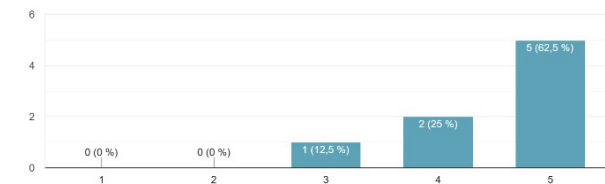


Do you have experience or did you have the opportunity to install, revise and/or retrieve camera traps?

Actualmente, ¿has tenido experiencias u oportunidades que te hayan permitido instalar, revisar y/o retirar cámaras trampa? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
10 respuestas



¿Te resulta útil tener la experiencia de instalar y retirar las cámaras trampa? 1= Nada 2= Un poco 3= Algo 4= Mucho 5= Extremadamente
8 respuestas



How would you rate this workshop?

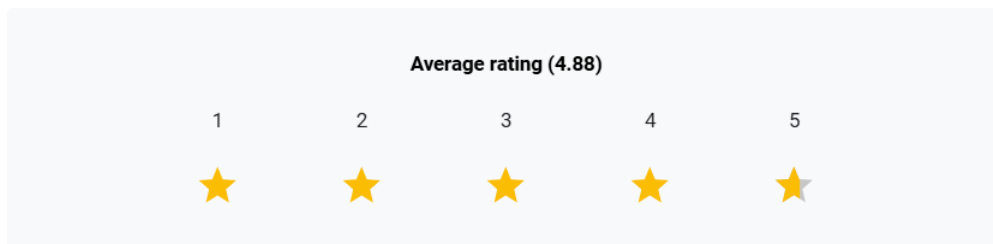


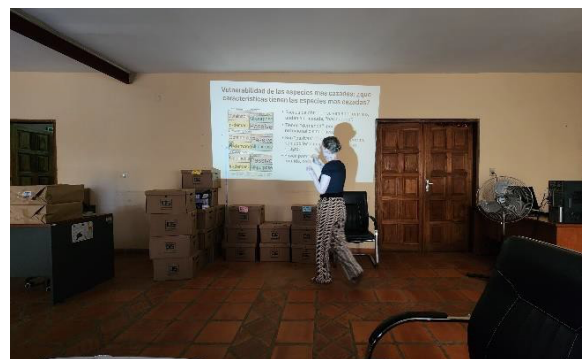
Table 2: Details of workshops conducted.

Workshop	Date and time	Location	Participants
Scientific writing and conservation planning	November 20 and 21, 2024 From 9:00 to 15:00.	National University of Asuncion, Biology Department (Room A32)	16 participants were from Biology, Geology, Environmental engineering and Veterinary majors.
Camera trapping as a tool for biodiversity research	December 10, 2024 From 9:00 to 15:00.	National University of Asuncion, Biology Department (Room A36)	10 participants were from Biology, Environmental engineering and Veterinary majors

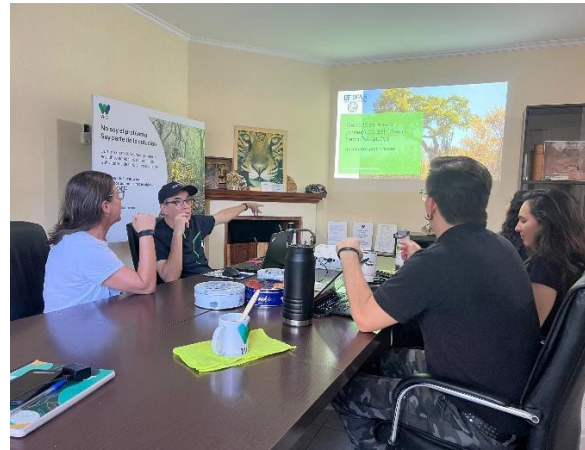
Photo record

Meetings

Meeting at the Division of Protected Areas at the Ministry of Environment



Meeting with Wildlife Conservation Society - Paraguay



Scientific writing and Conservation Planning workshop



Participants – Scientific writing and Conservation planning workshop



Participants presenting group exercise – conservation targets, threats and contributing factors identification.



Participants presenting group exercise – conservation targets, threats and contributing factors identification.

Participants presenting group exercise – conservation targets, threats and contributing factors identification.

Camera trap workshop



Participants – Camera trap workshop



Participants engaging in camera trap set up and configuration during workshop.

3. Final remarks and future steps.

The practicum’s objectives—ranging from engaging decision-makers and local conservation organizations to training young leaders in field techniques—have been met with tangible outcomes. These include enhanced stakeholder collaboration, knowledge-sharing workshops, and the generation of preliminary data that will inform future conservation strategies. As a long-term commitment with local conservation in Paraguay, some key future steps are expected to be addressed following this practicum. These include:

- a) **Stakeholder engagement and data sharing:** Conduct follow-up meetings with stakeholders to present emerging results and refine conservation strategies and develop an accessible platform for data sharing. Specifically, we agreed to present findings to park rangers during a Zoom session in February 2025, as part of a pre-scheduled training session that will gather all rangers from the affected areas. In addition, upon finishing data processing, I agreed to provide a repository of camera trap images which resulted from the field campaigns to the Ministry of Environment and to submit a comprehensive report in Spanish upon the completion of the

dissertation, highlighting all the results obtained.

- b) **Capacity building:** Organize (or co-organize) advanced workshops focused on scientific writing, project conceptualization, and hands-on fieldwork techniques to further empower local conservation leaders. Establish a mentorship program to provide ongoing guidance to workshop participants as they implement their learnings.
- c) **Scientific contributions:** Publish key findings in peer-reviewed journals to contribute to the global understanding of conservation challenges in the Dry Chaco ecoregion. Collaborate.
- d) **Contributions to conservation actions:** Key information related to hunting pressure, specifically about intensity and spatial distribution gathered from my research, will inform the Management Plans of national parks, which is scheduled for renewal in 2027. In addition, my data will also be used as reference for the update of the threat assessment of mammals of Paraguay (e.g., the Red Book of Threatened species) with local stakeholders to incorporate findings into official documents, such as the Management Plans for national parks and the Red Book of Threatened Species in Paraguay.
- e) **Research continuation:** Expand data collection efforts to cover additional protected areas in the Dry Chaco to improve the representativeness and scalability of findings.

Acknowledgments

The activities for this TCD practicum were possible thanks to funding provided by the Research Abroad for Doctoral Students from the International Center at the University of Florida. In addition, I received support from local organizations such as the Paraguayan Association of Mammalogists (APM), the Paraguayan Association of Biology Students (AEBP) and local project partner Wildlife Conservation Society – Paraguay. I am also grateful to my academic advisor, Dr Vanessa Hull for providing logistic support and feedback during my stay in Paraguay.