

Final Evaluation Report

Your Details	
Full Name	Hugo Ignacio Coitiño Banquero
Project Title	Monitoring of mitigation measures implemented in Uruguay to reduce the impacts of the roads on the population of medium and large mammals
Application ID	32885-B
Date of this Report	

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
Monitoring the wildlife crossing signals and evaluate their effectiveness reducing roadkill.				The distance between signals should be shorter, or speed bumps should be placed to slow down traffic.
Generate information about the use of road bridges by animals as wildlife crossings.				Generate alternatives to improve these wildlife crossings to make them more accessible for animals to use.
Consolidate the monitoring network of roadkill at a national level. As well as the connection with both society and governmental institutions such as the Ministry of Transportation and Public Works and the Ministry of Environment.				The project was carried on through the COVID-19 sanitary emergency, which generated problems in the realisation of workshops in educational centres as well as in governmental entities and the general public. Because of this, instances of dialogue were generated virtually. Simultaneously, several videos were created for social media to promote the project and its importance for the conservation and preservation of Uruguay's biodiversity.

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

a). Monitoring of wildlife crossing signs: data obtained during the monthly surveys in 2021 was added to the data provided through citizen science. The total register of vertebrate species run over was 22 with 18 mammals, with foxes and skunks the two most affected species (Table 1).

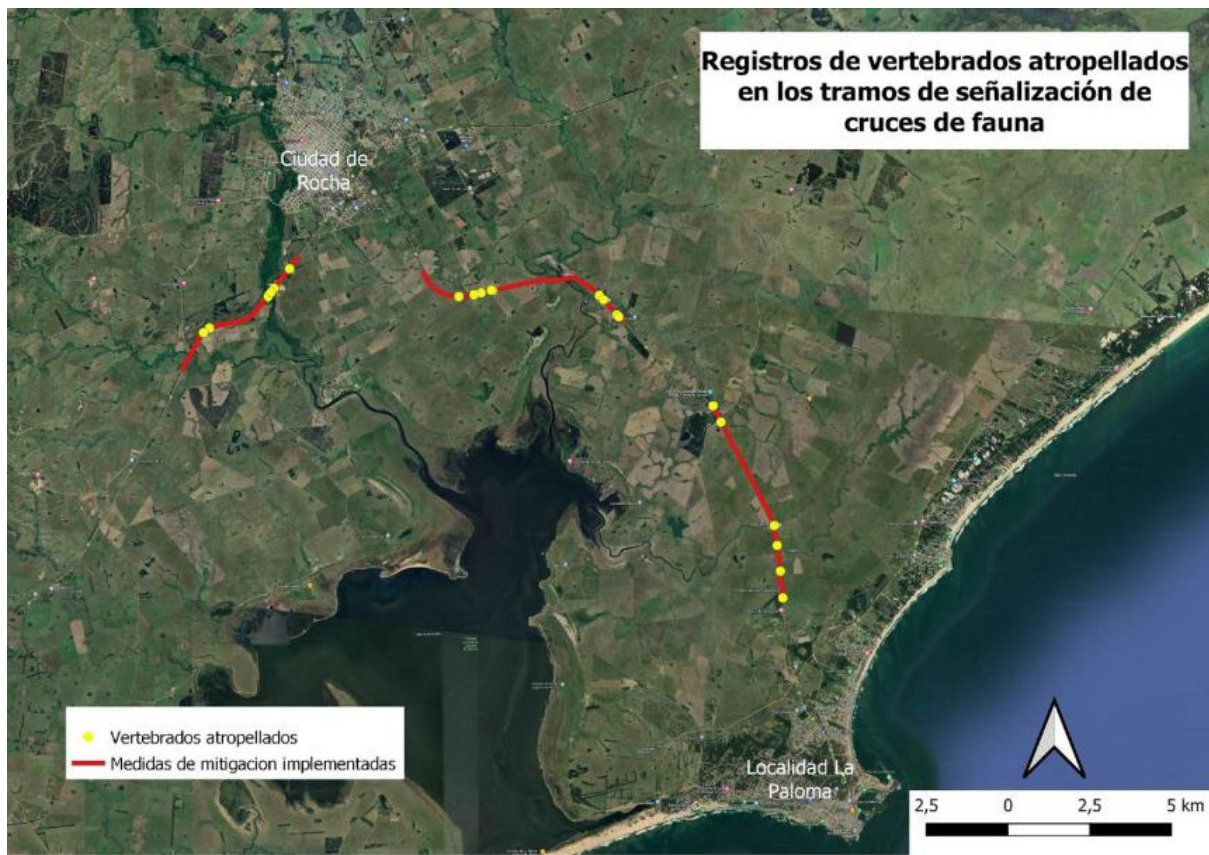


Figure 1- Spatialization of the roadkill records obtained during the project. Segments to apply mitigation measures (red). Road killed vertebrates (yellow).

Table 1- Registered run over species within the area of wildlife crossing signals.

Grupo	Especie	Scientific name	Number
Birds	Pava de monte	<i>Penelope obscura</i>	2
Birds	Rapáz	<i>Rapaz sp.</i>	1
Birds	Gallineta grande	<i>Aramides ypecaha</i>	1
Mammals	Zorrillo	<i>Conepatus chinga</i>	8
Mammals	Zorro sp	<i>Zorro sp.</i>	3
Mammals	Zorro de monte	<i>Cerdocyon thous</i>	1
Mammals	Unidentified	Unidentified	3
Mammals	Comadreja mora	<i>Dedilphis albiventris</i>	1
Mammals	Liebre	<i>Lepus europaeus</i>	1
Mammals	Zorro gris	<i>Lycalopex gymnocercus</i>	1
TOTAL			22

Of the three sections that present mitigation measures, section two is the one that presented the highest number of roadkill (9 records) (Figure 1).

Comparing the results obtained in 2021 with those in previous years, we observed a decrease in the number of roadkill, and the richness of species was different, since species such as the bobcat (*Leopardus geoffroyi*) and tatú (*Dasypus novemcinctus*) were not recorded. Despite the decrease in the number of roadkill incidents, it is

important to continue the progress, improving mitigation measures, such as the installation of speed sensors.

b). Bridge monitoring: A total of four bridges located in the wildlife crossing signalling zone and nearby areas. (Figure 2).

Medium and large mammal species were registered in the four bridges using them as wildlife crossings (Table 3).

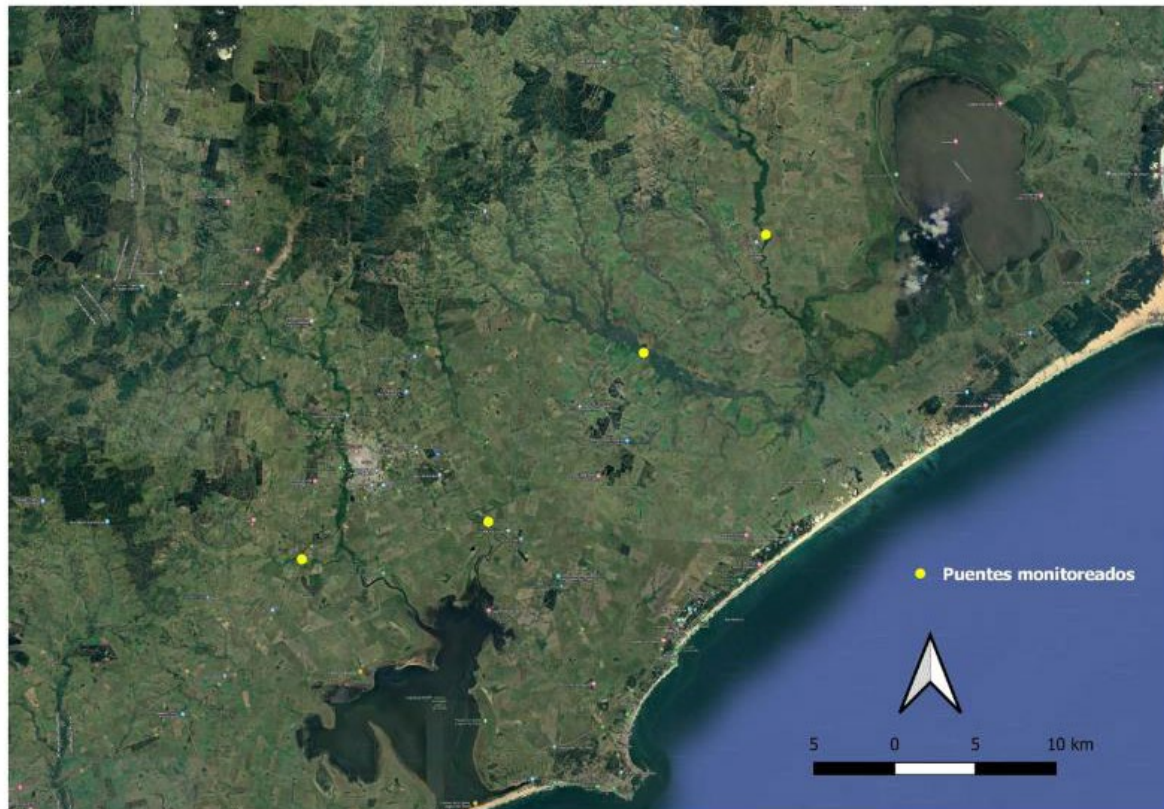


Figure 2- Monitored bridges throughout the project.

Arroyo Chafalote's bridge showed the highest richness of species, followed by Arroyo Las Conchas's bridge (Table 3 and Figure 3).

Arroyo Chafalote's bridge is 90 m long and has a dry strip of approximately 50 m that floods during heavy rains (Table 2). This strip allows wildlife to cross under the bridge while maintaining ecological connectivity and preventing animals from being run over. However, something to highlight is that the bridge is very close to the town of 19 de Abril, which has a population of approximately 205 inhabitants (according to the last census conducted in 2011 by the National Institute of Statistics). The inhabitants of this town use the dry strip and its surroundings for different recreational activities, which could be affecting the crossing behaviour of medium and large mammal species.

Table 2- List of monitored bridges. Dry strip: area under the bridge where the watercourse don't flow, allowing wildlife to cross through there.

Bridge	Bridge length (m)	Length of dry stripe (m)
Stream Sauce de Rocha	70	25
Stream Don Carlos	50	30
Stream Chafalote	90	50
Stream Las Conchas	20	4

Table 3- List of species registered on monitored bridges.

Name of the stream	Common name	Scientific name
Sauce de Rocha	Guazubirá	<i>Mazama gouazoubira</i>
	Margay	<i>Leopardus wiedii</i>
	Murciélagos	Bats
	Tatú	<i>Dasypus novemcinctus</i>
	Zorro de monte	<i>Cerdocyon thous</i>
Don Carlos	Carpincho	<i>Hydrochoerus hydrochaeris</i>
	Gato montés	<i>Leopardus geoffroyi</i>
	Guazubirá	<i>Mazama gouazoubira</i>
	Lobito de río	<i>Lontra longicaudis</i>
	Mano pelada	<i>Procyon cancrivorus</i>
	Tatú	<i>Dasypus novemcinctus</i>
	Zorro de monte	<i>Cerdocyon thous</i>
Zorro gris	<i>Lycalopex gymnocercus</i>	
Chaffalotte	Carpincho	
	Gato montés	<i>Leopardus geoffroyi</i>
	Margay	<i>Leopardus wiedii</i>
	Lobito de río	<i>Lontra longicaudis</i>
	Mano pelada	<i>Procyon cancrivorus</i>
	Guazubirá	<i>Mazama gouazoubira</i>
	Murciélagos	Bats
	Tatú	<i>Dasypus novemcinctus</i>
	Zorrillo	<i>Conepatus chinga</i>
	Zorro de monte	<i>Cerdocyon thous</i>
	Zorro gris	<i>Lycalopex gymnocercus</i>
Las Conchas	Apereá	<i>Cavia aperea</i>
	Gato doméstico	<i>Felis catus</i>
	Gato montés	<i>Leopardus geoffroyi</i>
	Lobito de río	<i>Lontra longicaudis</i>
	Mano pelada	<i>Procyon cancrivorus</i>
	Guazubirá	<i>Mazama gouazoubira</i>
	Tatú	<i>Dasypus novemcinctus</i>
	Zorro de monte	<i>Cerdocyon thous</i>
	Zorro gris	<i>Lycalopex gymnocercus</i>

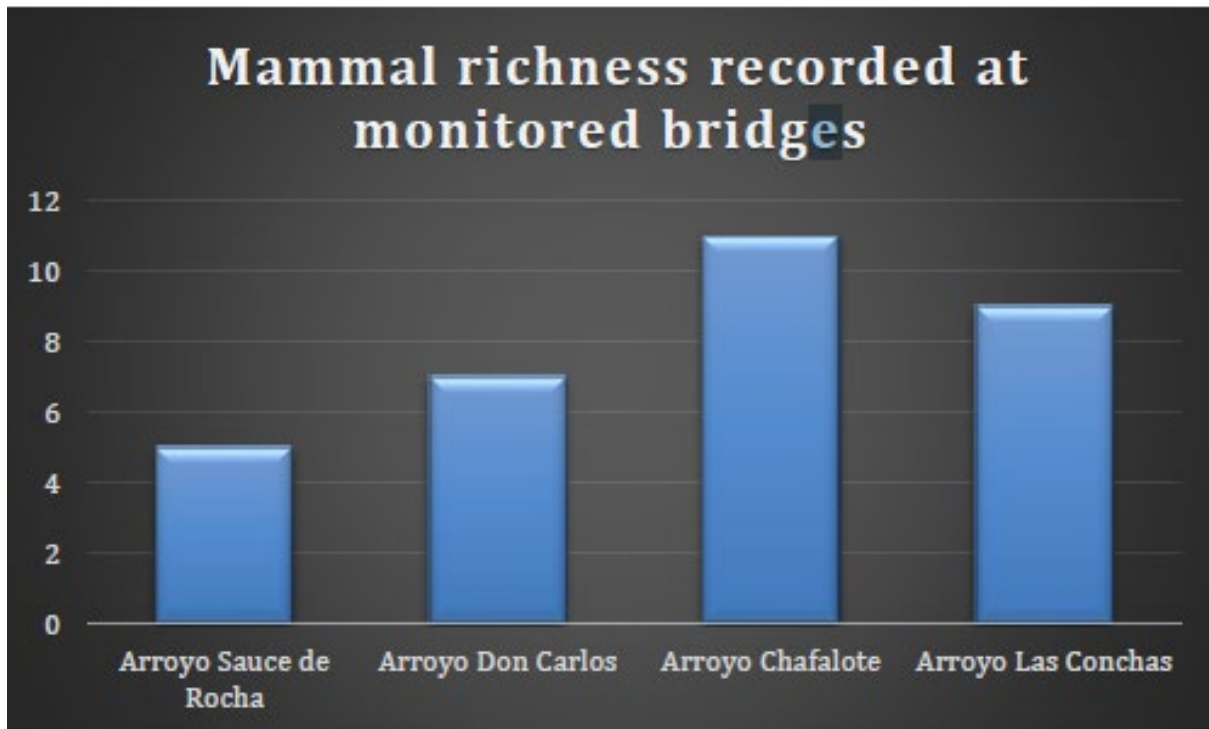


Figure 3- Richness of mammal species recorded at each bridge monitored throughout the project.

On the other hand, Arroyo Las Conchas's bridge is 20 m long (Table 2) and it has a cement dry strip of 4 m. This bridge is located on the border of Laguna de Rocha's Protected Area, which could be crucial in terms of ecological connectivity. In relation to the number of records obtained for each species on each bridge, variations were observed depending on the bridge (Figure 4). Despite this, there were two species that used, with different frequency, the four bridges as wildlife crossings: *Mazama gouazoubira* and *Dasypus novemcinctus* (Table 3). Margay, which is a nationally and internationally threatened species, was only recorded using bridges as wildlife crossings in two of the bridges (Chafalote and Sauce de Rocha) and the frequency of use was very low compared to the other species. However, in the monitoring within the native forest, a greater number of records of this species were obtained. This could indicate a barrier effect, since the number of records inside the forest was significantly higher than those obtained under the bridges. We believe that further studies on the problem, including more bridges, are necessary to confirm this.

Arroyo Las Concha's bridge was the only one that recorded an invasive exotic species, the domestic cat. Throughout the project, many records of this species crossing under this bridge were obtained. This is a warning, since, as mentioned above, the bridge is located on the boundary of a protected area, and so it is a fact that this species is moving within the area.

Comparing the records of roadkill obtained from 2015 to date, with those obtained from bridge monitoring, we observed that there are species that use the bridges and have not been recorded run over, such as capybara. Other species have been

recorded as run over in the area, but in low abundance, such as margay and guazubirá, and other species with a high abundance of roadkill, such as the skunk, bush fox, grey fox, mano pelada and tatú.

Finally, important results were obtained in relation to the hours of greatest mammal crossing activity under the bridges. Between 19 pm to 6 am (night-time) we recorded more activity (Figures 5). These data provide us with basic information to advance in new signalling measures, such as intelligent signalling, in which the driver is told when mammals are most active so that they have to slow down.

Table 4- List of registered species in the four monitored bridges and the daily activity pattern for each species.

Stream	Specie	at morning (6 a 12hs)	at afternoon (12 a 19hs)	at night (19 a 6hs)	Total
Don Carlos	Guazubirá	12	4	5	21
	Carpincho	5	6	41	52
	Gato montés	0	1	0	1
	Lobito de río	0	1	0	1
	Tatú	0	0	15	15
	Zorro de monte	3	4	5	12
	Zorro gris	0	1	0	1
	TOTAL	20	17	66	103
Sauce de Rocha	Guazubirá	22	9	54	85
	Margay	0	0	3	3
	Murciélagos	0	0	5	5
	Tatú	1	6	59	66
	Zorro de monte	1	3	21	25
	TOTAL	24	18	142	184
Arroyo Chaffalotte	Carpincho	2	0	2	4
	Gato montés	3	1	0	4
	Margay	1	0	5	6
	Lobito de río	1	2	1	4
	Mano pelada	0	1	6	7
	Guazubirá	9	13	13	35
	Murciélagos	0	0	2	2
	Tatú	5	6	80	91
	Zorrillo	0	0	2	2
	Zorro de monte	3	1	24	28
	Zorro gris	1	0	1	5
	TOTAL	25	24	139	188
Arroyo Las Conchas	Apereá	5	4	1	10
	Gato doméstico	5	8	57	70
	Gato montés	0	1	0	1
	Lobito de río	9	6	4	19
	Mano pelada	0	0	6	6
	Guazubirá	0	0	1	1
	Tatú	0	4	37	41

Zorro de monte	0	0	4	4
Zorro gris	1	0	3	4
	20	23	113	156

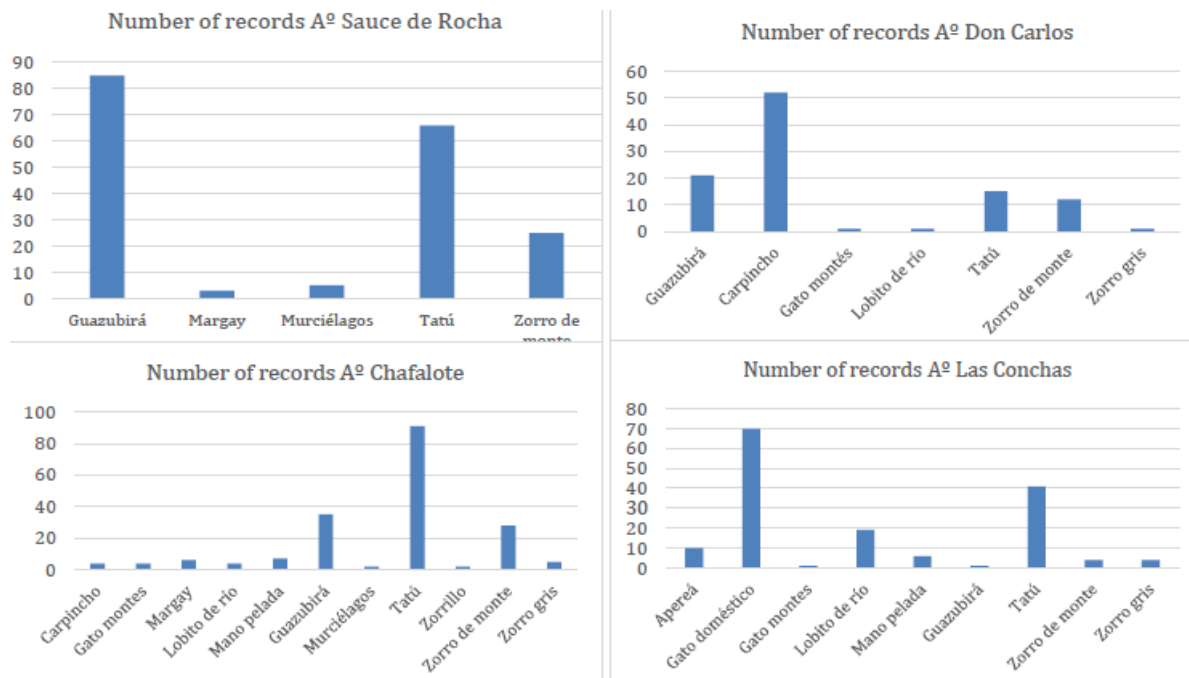


Figure 4 - Graphics with the number of registers for each mammal species recorded in four bridges.

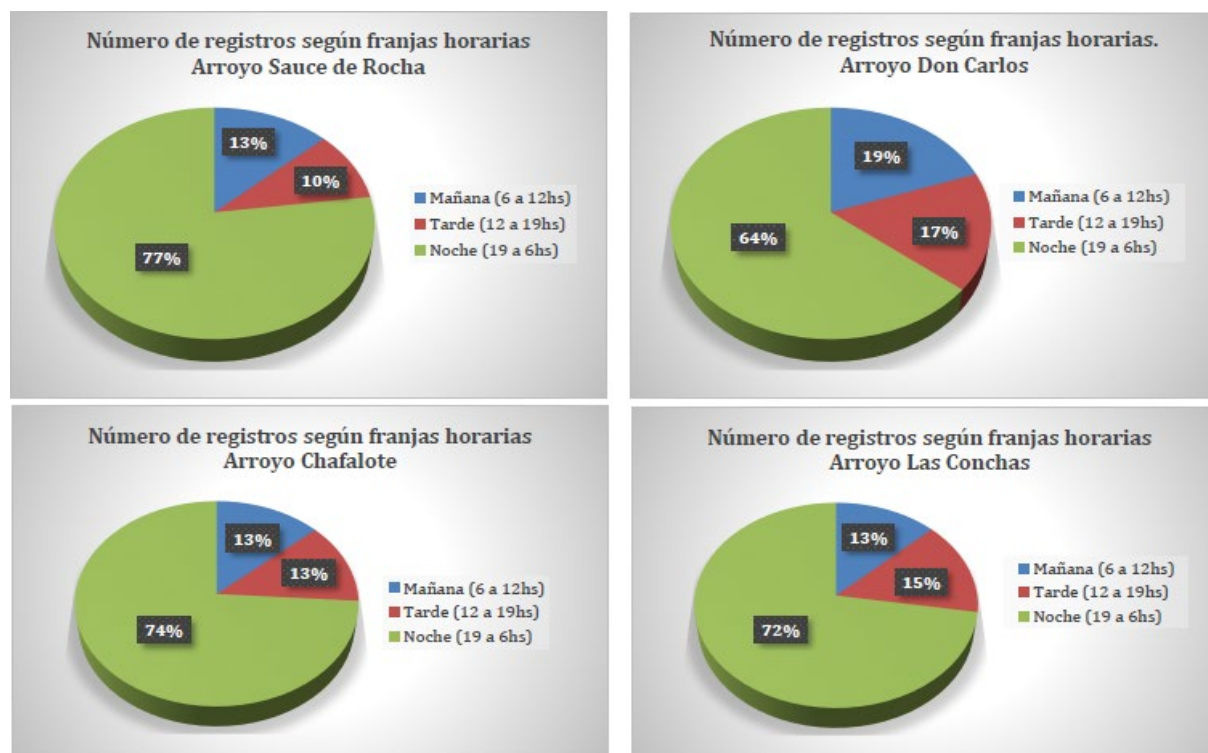


Figure 5 - Graphics showing different time-range registers for mammals in 4 bridges. Day (blue) Afternoon (red) Night (green)

c). Promotion and education: COVID 19, emergency made it difficult for us to implement presential workshops. In rural educational centres (near the study zone), the situation was more complicated since it was not possible to offer virtual workshops because the facilities don't have the necessary conditions (televisions, good internet connection, among others). To execute educational activities, we developed audio-visual and printed materials. We used social media of the NGO ECOBIO Uruguay (YouTube, Instagram and Facebook) as the platform to deliver our educational audio-visual materials. Within the audio-visual materials we created special publications that aimed to generate interaction with society, such as multiple-choice questions where people can identify species or some trace of them. Regarding workshops that aimed at the general public, virtual and presential workshops were held in which a large number of people participated. There were also press releases in newspapers and radio interviews in which the project was publicised and the importance of the subject was communicated.





Vida Actual

NATURALEZA

Pise el freno: se aproxima a un cruce de fauna

Las carreteras modifican la distribución de medianos y grandes mamíferos en Uruguay; entre las especies atropelladas hay varias de conservación prioritaria

MARÍA DE LOS ÁNGELES ORFILA
Jueves, 14 Enero 2021 04:00

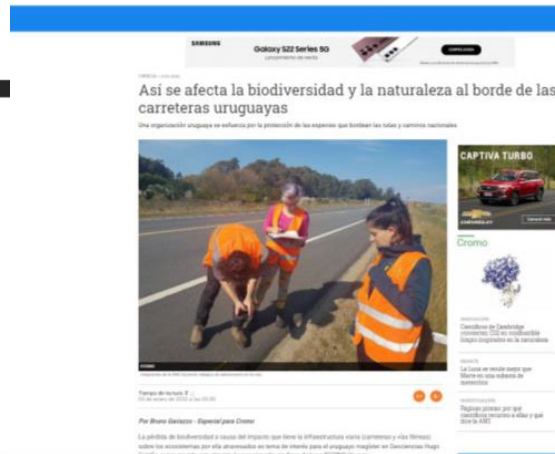
Compartir esta noticia



Señal de cruce de fauna en Rocha. Foto: Hugo Coitiño



Hugo Coitiño ve las carreteras de otra manera. Mientras que unos las ven como la forma de transitar por el país y acceder a las ciudades o pueblos; él, desde su visión como estudiante de doctorado de Pedeciba Geociencias, le



Posters used for virtual and presental presentations.




Divulgation and education materials in social media.

This year we will continue with workshops for society and will resume environmental education activities in educational centres. We also continue to coordinate interviews on local television and radio.


At an international level, the project was publicised in different ways:

- Through the IUCN Latin American and Caribbean Transport Working Group (LACTWG) where it was published in their social media and newsletter.
- Argentinian Conference on Virtual Mastozoology, where we participated with a virtual poster.
- II Virtual Symposium and VII International Symposium on Impacts of Human Infrastructure on Wildlife in Latin America, held virtually in El Salvador.

UNIVERSIDAD NACIONAL

Instituto Internacional en Conservación y Manejo de Vida Silvestre
GIT
Infraestructuras humanas y Biodiversidad



Con la ponencia titulada:
Situación de Ecología de Carreteras en Uruguay.
Presentada en el II Simposio Virtual y VII Simposio Internacional de Impactos de la Infraestructuras humanas sobre la Vida Silvestre en Latinoamérica.
Realizado del 27 y 28 de octubre 2021. Modalidad virtual. El Salvador.

Finally, materials were developed to bring the issue closer to family through games that engage children and adults. The publication includes information about the application to strengthen the National Wildlife Collision Network and to reinforce the importance of mitigation measures implemented.

An educational booklet called "Librito de Ruta" (Road Booklet) was developed. The purpose of this booklet is, teaching children about Uruguay's fauna and the impacts of roads, through games, also to create a link with parents through reading the information about native fauna.



A vinyl sticker was developed to be distributed among drivers to strengthen the National Wildlife collision Network and the signalling mitigation measures implemented.



At a governmental level, we reinforce ties with the Ministry of Transportation and Public Works, which requested reports on road sections to be improved. These reports identified high mortality sites and the mitigation measures to be implemented. These reports are intended to increase the issue at a national level and the implementation of new mitigation measures to be placed on the roads

studied, such as, for example, the construction of walkways under bridges and fencing in these areas.

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

As mentioned in the last objective, due to COVID 19 sanitary emergency it was very difficult to get presential workshops or meetings with society, educational centres and governmental entities. This situation made us reevaluate our strategy to divulgate the project and the importance of biodiversity conservation.

The strategies we implemented were:

Consolidate social media with audio-visual materials, and workshops through virtuality. However, we couldn't develop these instances with certain rural schools as they did not have the adequate equipment to connect.

This forced us to plan the activities for 2022 once the sanitary emergency is over and we return to full face-to-face attendance.

Another problem we faced during the project was the theft of camera traps, which resulted in the loss of information.

Despite this, we were able to generate information on the use of bridges as wildlife crossings. Finally, at the end of 2021, the Ministry of Transportation and Public Works began to modify the bridges, which meant that we had to remove the cameras that were installed. We see this as an opportunity because once construction is completed, we will be able to restart the monitoring and evaluating how the changes made to the bridge and its surrounding affects the wildlife crossing.

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

Due to the sanitary emergency experienced during the project, it was not possible to fully involve people. However, the different activities and materials generated during the project build up a network with society as there was a great exchange through social media.

This interaction significantly increased the number of followers in social media and the people who started using the App. These are crucial indicators, as they show us how, what was generated in relation to education and divulgation had a positive impact.

Finally, at the end of 2021, people from Santa Ana's town (department of Colonia) and Santa Isabel (department of Rocha) approached us through social media concerned about the high number of wildlife being run over in the surrounding of their homes. As a result, we began to work together to analyse the situation and identify the most appropriate mitigation measures for each case. Because of the sanitary emergency, presential workshops with these populations began in 2022.

5. Are there any plans to continue this work?

As a result of this project, new topics to investigate and to continue working with those generated to date have arisen.

Some of these are:

- Reinforce the monitoring of bridges: during 2022 we will continue to work on monitoring bridges on other roads in the country. Structural measures of bridges will be recorded and then differences related to study their use as wildlife crossing. This will allow us to obtain more information about how bridges should be built to allow wildlife crossing. Where local fauna does not use the bridge as wildlife crossing, we will analyse why, and which mitigation measure can be implemented to adapt the bridge as a wildlife crossing.
- Conduct environmental education workshops in educational centres: once the sanitary emergency is over, the educational centres are returning to normal, which will allow us to carry out the planned workshops.
- Continue monitoring two of the bridges of this project. As mentioned above, at the end of 2021 bridges started to be modified. This modification generated notorious changes in the natural surroundings that could affect the behaviour of the fauna that used these structures. Once the bridge modifications are finished, monitoring them again can show us how this modification affects the native fauna behaviour and in the case that the bridge is not used as a wildlife crossing, study how long it takes for the fauna to readapt to the changes made on bridge and use it as a wildlife crossing.
- The monitoring of new bridges will allow us to gather sufficient information to understand which the time is range that mammal present the highest activity. This is essential to advance in the development of intelligent signalling where, based on the application of mathematical algorithms, it will be possible to program signs that indicate the driver the time range of highest wildlife activity.
- Monitoring fauna in the habitats near the bridges will allow us to analyse if there are species that are affected by the roads and do not use the bridges to cross. To this end, we plan to monitor several more bridges and carry out occupancy modelling.
- During 2021, work began on structural and functional connectivity analyses for one of the country's largest watersheds, the Río Negro basin. This basin is a national priority. The analysis of structural and functional connectivity will provide key data to generate an environmental management of the territory aiming at the conservation of biodiversity. At the same time, biological corridors will be identified for various species of mammals that are a priority for conservation. Once these biological corridors have been identified and the most relevant sites for ecological connectivity have been obtained, the road infrastructures that fragment both the biological corridors and the areas

of high connectivity will be monitored. This will allow, to validate the connectivity models and to analyse which is the correct mitigation measure to be implemented in these sites to maintain connectivity and the circulation of mammal species.

- Strengthen the work with the localities of Santa Ana and Santa Isabel on the impacts of road infrastructure in both localities.
- Finally, by the end of 2021 after a meeting with the Road Director of the Ministry of Transportation and Public Works (MTO), a working group will be created to develop a manual on the construction of biodiversity-friendly roads. We believe that this is a fundamental step at the national level since this guide will have the objective of advising construction companies on how to include the different mitigation measures in their projects.

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

The results obtained in this project will be presented in congresses, symposiums, national and international conferences.

We will also continue with the development of audio-visuals for social media, talks for the general public, for government agencies and construction companies.

A manual of good practices will be prepared for road construction companies nationwide, specifying mitigation measures and how they should be implemented.

Educational material such as booklets, brochures, videos, etc. will continue to be developed.

Finally, we will continue to create articles about the issue through different media such as newspapers, television and radio.

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

The Road Ecology and Biodiversity Research Line will continue to be strengthened at the national level through different projects and activities.

We will continue monitoring the bridges, including other highways in the country. This will allow us to progress in the adaptation of bridges as wildlife crossings and how they should be built to fulfil this function.

In those bridges that do not allow wildlife to cross, an access platform should be built to maintain ecological connectivity and allow wildlife to circulate without being run over.

At the same time, progress will be made in the creation of a working group along with the MTO, construction companies, the Ministry of the Environment, the Faculty of Science and ECOBIO Uruguay to prepare manuals of good practices in road infrastructure to mitigate impacts on biodiversity and ecosystems.

We will also continue with education programmes and information to society on the subject and strengthen the National Roadkill Monitoring Network.

We will continue to train professionals on the subject through undergraduate and graduate courses, Bachelor's and master's theses, and by integrating the subject into the Environmental Control Technician program at UTU.

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?

The Rufford Foundation logo was used in all the activities carried out as well as in the printed materials. In the interviews conducted throughout the project, Rufford was also mentioned, highlighting its importance to execute the project.

Also, the logo will be present in the environmental education activities that will be implemented in 2022 and in the national and international congresses in which the results of the project will be presented.

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

Elis Montagne: Participated in the planning and field trips throughout the project. She was in charge of the elaboration of divulgation, communication and educational materials (books and stickers) social media management and website update. Also participated in the data analysis and preparation of the final report.

Juan Domínguez: Participated in the planning and field trips throughout the project. Collaborated in the development of outreach and educational materials. He also participated in data analysis and preparation of the final report.

Cecilia Casco: Participated in the planning and field trips throughout the project. Collaborated in the development of outreach and educational materials. She collaborated in the elaboration of the divulgation, communication and educational materials. Also participated in data analysis and preparation of the final report.

Lorena Coelho: Participated in planning and field trips. Collaborated in the development of outreach and educational materials. She also participated in data analysis and preparation of the final report.

Rocío González: Participated in planning and field trips. Collaborated in the development of outreach and educational materials. She also participated in data analysis and preparation of the final report.

Agustina Serrón: Participated in the planning and field trips at the beginning of the project, collaborated in the elaboration of divulgation and education materials, and participated in the elaboration of the final report.

Micaela Zorzi: She integrated the project at the end and participated in data analysis and preparation of the final report.

10. Any other comments?

This project could not have been carried out without the support of The Rufford Foundation. It is important to note that there has never been a project at the national level to evaluate the potential of bridges as wildlife crossings. Thanks to Rufford's support, we were able to start working on this issue and begin to generate information, which is essential for the implementation of new mitigation measures to reduce the loss of fauna through roadkill and maintain ecological connectivity.

An important preliminary result obtained during the project shows that mammals that use the bridge as fauna crossings were recorded inside the forest. However, there were other species that were recorded within the forest, but not using the bridges, such as the ferret (*Galictis cuja*), the axis deer (*Axis axis*) and the wild boar (*Sus scrofa*).

The information gathered in relation to this subject could be indicating that the species that appear inside the forest but not under the bridges may be due to a barrier effect, i.e., that the road infrastructures are affecting the distribution of these species. To confirm this, more studies are needed and a more in-depth analysis of the occupation patterns.

Finally, we would like to thank The Rufford Foundation for giving us this opportunity to continue our work and advance in mitigating the impacts of roads on our fauna.