Advancing the consolidation of primatology in Bolivia

FINAL REPORT TO THE PRIMATE SOCIETY OF GREAT BRITAIN

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Executive Summary

Thanks to the financial support of the Primate Society of Great Britain (PSGB), the Bolivian Primatology Network (RedBolPrim) has been able to conduct various activities aimed at establishing primatology in Bolivia. A symposium was organised at the '10th Bolivian Congress of Mammalogy', a major event at which recent advances in Bolivian primate research and conservation were presented. A roundtable meeting was also organised to gather important criteria for future RedBolPrim activities, which will improve the quality of primate research and conservation efforts in Bolivia.

Two workshops were held to develop the Action Plan for Bolivian Primates, with the participation of key stakeholders involved in the conservation of Bolivian biodiversity. Important criteria were collected at both meetings, which will improve the quality of the action plan by incorporating realistic and feasible approaches to guide the proposed activities in favour of conserving Bolivian primate species.

The initial stage of long-term molecular research on Bolivian species has begun, with the aim of increasing knowledge of species identity and phylogenetic relationships. An exhaustive search for primate specimens was conducted, and genetic material was obtained from night monkey (Aotus) and howler monkey (*Alouatta*) samples. Mitochondrial DNA sequencing was intended, but limitations were found in the previous stage of DNA amplification by PCR. Further work is planned to address this issue, and an interinstitutional working group has been established to ensure the successful completion of this research project.

By organising various activities, RedBolPrim has raised its profile within the Bolivian scientific and conservation community. All the work conducted has served not only to achieve important goals, but also to establish interinstitutional links that will be crucial for future work aimed at consolidating primatology in Bolivia.

Progress Assessment

Objective 1. To organize a symposium focused on the current state of primatology in Bolivia, within the 10th Bolivian Congress of Mammalogy in July 2025.

The symposium, 'Advances, Challenges and Prospects for Primatology in Bolivia', was held as part of the 10th Bolivian Congress of Mammalogy, which took place from 29 July to 1 August 2025. Like a similar meeting carried out in 2018, this event aimed to showcase the latest primate research and conservation initiatives in Bolivia. It was also the first event of this kind organised by RedBolPrim, who used their social media channels to encourage primatologists and conservationists to share their work. As the mammalogy congress was also part of the First Zoology Meeting in Bolivia, it was a unique opportunity for speakers to present their work to a broad audience, including not only mammalogists, but also entomologists, ichthyologists and a large number of university students.

There was a very good response to the call for presentations, and the primatology symposium therefore included 17 talks covering topics such as research, communication and conservation (Table 1, Figure 1). This made it the largest symposium of the entire Zoology Meeting, with two sessions scheduled for the morning and afternoon of 30 July. Additionally, it highlighted the work of numerous Bolivian researchers and conservationists working with wild and captive primates, and featured contributions from researchers in other countries (Table 1). Furthermore, an average of 25 people attended each talk, which is a remarkable success given that the Zoology Meeting consisted of more than four simultaneous exhibitions in different rooms each day.

Table 1. Authors and titles of the talks that made up the Primate Symposium.

Nro.	Authors	Title
1	Robert B. Wallace, Zulia Porcel, Nohelia Mercado, Heidy López-Strauss, Oriana Prado, Ariana Terán, Damián Rumiz, Luis Acosta, Jesus Martinez	Advances in the distributional knowledge of Bolivian primates
2	Leila M. Porter, Meghan Hanson, Brianna N. Abba, Lucero Hernani-Lineros, Wendy M. Erb & Paul A. Garber	Interannual variation in the diet of *Leontocebus weddelli* over 26 years of research at the Tahuamanu Field Biological Station.
3	Eddy Martínez, Pamela Duran, Laurie Spencer & Leila Porter	Identification of intestinal parasites in *Leontocebus weddelli* from three protected areas in the Bolivian Amazon, Department of Pando.
4	Eddy Martínez, Pamela Duran, Laurie Spencer & Leila Porter	Natural Trypanosomatid Infection in Spotted-Mantled Marmosets (Leontocebus weddelli) in the Bolivian Amazon
5	Erika Alandia R., José Luis Suárez, Rodolfo Nallar & Jesús Martínez	Human herpesvirus in a nocturnal monkey kept as a pet in Beni, Bolivia: implications for primate health and conservation in Bolivia.
6	Laurie Spencer, Eddy Martínez, Pamela Duran & Leila Porter	Molecular characterisation of the intestinal microbiota in spotted-mantled marmosets (*Leontocebus weddelli*) in the Bolivian Amazon.
7	Erika Alandia Robles, Tania Baltazar Lugones, Daniel Quispe Córdoba, Andrés Jiménez Gómez & Hugo Aranibar Rojas	A review of yellow fever epizootics in Bolivia, including areas of occurrence, affected primate species and their impact on public health and conservation.
8	Julia Barreta Pinto, Jesús Martinez, Yahaira Bernal, Rolando Sánchez & Robert Wallace	Population genetics of primates and implications for conservation
9	Daniela Morales Moreno, Mariana Da Silva, Fabiola Suárez, Glenda Ayala & Robert Wallace	Overview of illegal primate trafficking in Bolivia: what do we know about the last decade?
10	Martínez Díaz Miguel Ángel & Ossio Peña Norah Virginia	Preliminary analysis of a primate community in the Passiflora Nature Reserve, San Buenaventura, La Paz, Bolivia.
11	Mario Fidel Fernández Anagua, Norah Virginia Ossio Peña & Adriana Fernández Ruiz	Challenges and prospects in the management of captive primates originating from illegal trafficking: the fundamental role of environmental education at the La Senda Verde Custody Centre in Coroico, Bolivia.

12	Diego E. Maldonado Velarde, Luis Beltrán, Ana L. Cornejo, Fortunato Choque-Bautista & Álvaro A. Quispe	Quantifying the value of ex situ primate management: The case of the Vesty Pakos Municipal Biopark.
13	Carolina N. Martínez Guarachi, Jesús Martínez, Claudia Fabiola Cortez Fernández & Paola Velásquez-Noriega	Application of environmental enrichment in the management of captive primates (Sapajus sp.) at the Vesty Pakos Municipal Biopark.
14	Guido M. Ayala, María Viscarra & Robert Wallace	Twenty-two years of primate monitoring in Madidi National Park: assessing population trends and their importance for conservation.
15	Jesús Martínez, Robert Wallace & Óscar Loayza	Bolivia's endemic primates as ambassadors for regional conservation
16	Jesús Martínez, Zulia Porcel, Pamela Carvajal, Cecilia Flores-Turdera, Cynthya Jurado, Heidy Lopez-Strauss, Lesly Lopez, Marco Campera & Robert Wallace	Dissemination as a tool for local appropriation of natural values: the case of the endemic lucachis of Beni.
17	Jesús Martínez, Erika Alandia, Grace Ledezma & Lucero Hernani-Lineros	Laying the foundations for consolidating primatology in Bolivia.

Figure 1. Some of the talks given at the Primatology Symposium.

Objective 2. To organize a round table to outline the highest priority actions to be carried out for the conservation of primates in Bolivia, within the 10th Bolivian Congress of Mammalogy in July 2025.

The roundtable on Bolivian primatology took place on 31 July, with 27 people in attendance, including RedBolPrim members and non-members (see Appendix A for the list of participants). The meeting began with a presentation given by me on the history, mission, and activities of RedBolPrim, including a brief summary of the talks presented during the primatology symposium. This provided the audience with an adequate context about the primatology work in Bolivia as well as on RedBolPrim.

We then adopted a focus group approach, dividing the audience into three groups of around nine people each (see Figure 2), and conducted a SWOT analysis (strengths, weaknesses, opportunities, and threats) based on the following three questions:

- What are the main current and future challenges and threats for primate populations in Bolivia?
- What advances have been achieved so far in the field of primatology in Bolivia, in terms of both research and conservation?
- What strengths exist to promote the research and conservation of primates in Bolivia?

As the participants came from different disciplines (biology, veterinary science, medicine, communication and anthropology), there was an opportunity to gain insight from a variety of perspectives. Each group summarised their answers to the above questions and presented them to the entire audience for discussion.

The groups provided remarkably similar answers, particularly with regard to the threats facing primate species and the need for further research into their natural history to inform conservation actions. Another important point was the general recognition of RedBolPrim's leading role, which needs to be strengthened for future work on Bolivian primates. There was also a consensus that an Action Plan for primates was needed to provide a strategic framework for future efforts and ensure the achievement of various goals in favour of primate species in Bolivia. Table 2 summarises the results of the SWOT analysis.

Table 2. Priority aspects on the primatology in Bolivia identified by the work groups from the SWOT analysis.

	Threats	**Weaknesses**	**Strengths**	**Opportunities**
Group 1	• Wildlife trafficking. • Diseases (zoonoses). • Habitat reduction due to deforestation. • Wildlife hunting.	• Primatological community not yet fully established in Bolivia. • Lack of financial resources. • Difficulties in establishing long-term research projects.	• Interest from students and early-career researchers • Disease research that was initiated.	• Promote more ecological and genetic studies. • Influence the development of laws to regulate forest burning. • Ensure RedBolPrim has direct links with the Environmental Police Agency (POFOMA). • Promote funding for studies. • Complete the Action Plan. • Influence the development of disease surveillance and management protocols for primate species.
Group 2	• Deforestation and habitat loss. • Forest fires. • Poaching and wildlife trafficking.	• Lack of funding. • Social instability hindering long-term projects. • Lack of awareness of the importance of primates at an academic and societal level.	• Volunteers and experts at RedBolPrim. • Connection of some researchers and conservationists with people to promote interest in primates. • Research conducted by Bolivians.	• Development of an effective financial sustainability system. • Social networks that can be used as effective tools against misinformation.
Group 3	• Burning and deforestation. • Illegal trafficking and domestication. • Diseases (e.g. yellow fever). • Conflicts between humans and primates. • Lack of public policies.	• There are no primatologists on the teaching staff at universities. • There is a lack of biological stations. • There is a lack of continuous funding.	• Specialised professionals, creating foundations for the study of primates in situ and ex situ. • Dissemination to encourage students to work with primates. • Dissemination and communication to raise public awareness about primates.	• Primates Action Plan. • Make primatology a multidisciplinary subject. • Greater environmental awareness and education. • Increase the number of professionals dedicated to primatology. • Involve civil society, including artisans, communicators, educators and productive associations. • Conduct post-fire research in burned areas. • Promote the development of regulations in favour of primates. • Continue with awareness-raising activities.

The above information has been forwarded to the RedBolPrim group working on the development of the Action Plan for the Conservation of Primates in Bolivia, with the aim of using the gathered criteria as a technical and academic approach on the perception and priorities for the conservation of Bolivian primates. This information is also invaluable for planning future RedBolPrim activities to help achieve distinct goals in the coming years.

On the other hand, the symposium and roundtable meetings have encouraged the attendance of people who are not part of RedBolPrim. The symposium talks and the criteria presented by the working groups at the round table were very well received by this audience, and more than ten people expressed their interest in joining RedBolPrim. Most of these people were undergraduate students, representing the next generation of Bolivian researchers and conservationists (Figure 2).

Figure 2. Images from the Round Table. From top to bottom, meeting attendees, group discussions and new members registering with RedBolPrim.

Objective 3. To support the attendance of representatives of indigenous territories to strategic workshops for the development of the Bolivian Primate Action Plan.

RedBolPrim has promoted the development of the Action Plan for the Conservation of Primates in Bolivia in a joint process with the National Museum of Natural History of Bolivia (MNHN). The MNHN is a certified research unit within the remit of the General Directorate for Biodiversity and Protected Areas and the Ministry of the Environment, and is authorised to develop strategic planning instruments, such as action plans, in accordance with approved procedures. For this reason, the MNHN is officially leading the process to develop the action plan for Bolivian primates.

The first task was to organise two workshops with different key stakeholders in two locations to facilitate participants' travel logistics. The goal was to conduct a situational assessment of primate conservation in Bolivia and propose measures to address the threats they face, which would later be prioritised as actions. Although these meetings were crucial for developing the action plan, the environmental authority had no financial resources of its own to hold them, so funding had to be sought from other sources. This caused a delay to the originally planned work schedule, exacerbated by the end of the national government's term, which reduced the environmental authority's availability to supervise this task.

RedBolPrim succeeded in securing financial support from the Primatological Society of Great Britain (PSGB) to cover transport costs to ensure the participation of key local stakeholders, including representatives of indigenous territories, as well as individuals from other sectors who have limited funding. Encouraged by this achievement, the MNHN looked for funding options and obtained significant financial support to carry out the required workshops for the action plan in the cities of Cobija and Trinidad (in the northern and central regions of Bolivia, respectively). Consequently, the budget allocated to the PSGB for the action plan only covered the costs associated with the lunch provided at the workshop in Trinidad and the maintenance of the room where the workshop took place. The rest of the expenses linked to the two workshops were covered by funds obtained by the MNHN.

The two workshops were successfully carried out in Cobija (15 July 2025) with 37 participants, and in Trinidad (17 July 2025) with 38 attendees (Figure 3). A variety of key Bolivian biodiversity stakeholders were present at both meetings, including representatives of environmental authorities, national and subnational protected areas, scientific research units, wildlife custody centres, non-governmental organisations, and indigenous community and territory representatives (see Appendix B for the list of participants).

Working in focal groups, participants provided different perspectives on the conservation of Bolivian primate species, together with a rich and varied set of proposals for actions to

be taken to promote the conservation of these species and their habitats. The information obtained during the workshops was revised, organised and forwarded to the team responsible for developing the action proposals for the action plan.

In mid-November 2025, RedBolPrim submitted the first consolidated version of the action plan document to the MNHN. This included a matrix of proposed actions based on contributions from the two workshops, as well as from the roundtable mentioned in the previous section (receipt letter in Appendix C).

Figure 3. Images from workshops held in Cobija (left) and Trinidad (right) to develop the Action Plan for the Conservation of Primates in Bolivia.

Objective 4 (New). To promote the first stage of a long-term molecular research project on primates in Bolivia.

Notable progress has been made in primatological research in Bolivia, but important knowledge gaps remain, such as the lack of molecular information on Bolivian primates, which limits our understanding of their taxonomic identity and phylogenetic relationships. RedBolPrim is working to promote research into the molecular taxonomy of Bolivian primates through mitochondrial DNA sequencing. The first stage of this initiative involves specimens from Bolivian scientific collections as a source of tissue samples. This research project has been organised in collaboration with the National Museum of Natural History of Bolivia (MNHN), as this certified research unit is authorised to manage the use of genetic material. The initiative also considers analysing genetic

material in national laboratories to increase local capabilities and expertise, while reducing paperwork and export costs when analysis is carried out outside the country.

With support from WCS, RedBolPrim began this research project in May 2025, prompting an exhaustive search for primate specimens in various natural history museums in Bolivia. This led to the formation of an interinstitutional working group and the conduct of a preliminary pilot study, the results of which are still being evaluated. Based on this initial experience, it was deemed appropriate to analyse more samples, and the focus was turned to owl and howler monkeys (*Aotus* and *Alouatta*), for which several specimens had been collected in different ecoregions, which might have promoted some genetic differentiation.

The reduction in the development costs of the action plan, as described in the previous section, meant that PSGB funding could be allocated to this molecular research initiative, as confirmed through the respective consultations. PSGB funding was then used to cover the sequencing analysis costs for 22 samples: 11 *Alouatta* and 11 *Aotus*. These samples were part of a larger group of 38 samples analysed by the Molecular Biology and Clinical Analysis Laboratory (BIOMOLAB), with analysis costs covered by various sources. The following information corresponds to the analysis of the full group of samples, in order to provide a general overview of the work conducted.

First, the DNA was extracted using a Qiagen DNeasy kit and then quantified through UV spectrophotometry using a NanoDrop ND-1000 instrument, which also provided information on the concentration and quality of the DNA. Successful DNA extraction was obtained from 37 of the 38 samples in this procedure, as detailed in Table 3.

The next task was to amplify the extracted DNA by PCR. The process focused on the Cytochrome B (CytB) and Cytochrome Oxidase 1 (COX1) regions using two primers (mtD-26_F and mtD-28_R) with the Phusion High-Fidelity PCR Master Mix Kit (M0530L, New England Biolabs, Inc.). Despite following standard procedures, no amplified DNA was obtained for the CytB region. To verify this, BIOMOLAB sent a subset of samples to the Eurofins Genomics Tokyo laboratory in Japan, but the same result was obtained. Another PCR attempt was conducted on the COX1 region using primers HCO2198 and LCO1490, but again, no amplified DNA was obtained. This final attempt revealed the presence of a PCR inhibitor in the samples. Further details of the analysis procedure and results can be found in the laboratory report included in Appendix D.

Table 3. Results of the DNA extraction of the 38 samples of Bolivian primates.

ID	Species	Sample Museum code	Sample type	DNA concentration (ng/ul)
1	*Aotus azarae*	2730	Ethmoid tissue	28.1
2	*Aotus azarae*	B Paragua	Skin tissue	25.7
3	*Aotus azarae*	CBF 9304	Muscle tissue and liver	2.5
4	*Aotus trivirgatus*	CBF 3988	Ethmoid tissue	1.4
5	*Aotus nigriceps*	CBF 5441	Skin tissue	80.6
6	*Aotus azarae*	4612	Ethmoid tissue	2.0
7	*Aotus azarae*	CBF 327	Ethmoid tissue	2.1
8	*Aotus azarae*	2991	Muscle tissue	0.0
9	*Aotus azarae*	2988	Ethmoid tissue	0.8
10	*Aotus sp.*	CBF 3989	Ethmoid tissue	3.9
11	*Aotus azarae*	1169	Ethmoid tissue	10.7
12	*Aotus azarae*	2097	Ethmoid tissue	2.2
13	*Aotus azarae*	1109	Ethmoid tissue	29.3
14	*Aotus azarae*	2990	Ethmoid tissue	1.5
15	*Aotus azarae*	1378	Muscle tissue	39.9
16	*Aotus azarae*	CBF 331	Ethmoid tissue	19.7
1	*Alouatta sara*	2955	Ethmoid tissue	5.3
2	*Alouatta sp.*	CBF 8121	Muscle and ethmoid tissue	5.1
3	*Alouatta sara*	4636	Ethmoid tissue	21.4
4	*Alouatta caraya*	2101	Ethmoid tissue	12.3
5	*Alouatta seniculus sara*	CBF 1525	Ethmoid tissue	3.9
6	*Alouatta seniculus sara*	CBF 376	Ethmoid tissue	12.6
7	*Alouatta sara*	4644	Ethmoid tissue	1.5
8	*Alouatta guariba*	CBF 6714	Muscle and ethmoid tissue	4.9
9	*Alouatta sara*	2970	Muscle tissue	1.8
10	*Alouatta caraya*	CBF 3978	Ethmoid tissue	2.4
11	*Alouatta caraya*	57	Muscle and skin tissue	2.3
12	*Alouatta caraya*	59	Muscle tissue	1.0
13	*Alouatta cf. caraya*	CBF 8883	Muscle and ethmoid tissue	39.7
14	*Alouatta sp.*	CBF 9176	Ethmoid tissue	1.5
15	*Alouatta sara*	2956	Ethmoid tissue	1.6
16	*Alouatta sara*	San Miguelito	Skin in alcohol	2.8
17	*Alouatta sara*	55	Ethmoid tissue	2.2
18	*Alouatta seniculus sara*	CBF 377	Ethmoid tissue	1.5
19	*Alouatta cf. caraya*	CBF 8882	Muscle tissue	2.7
20	*Alouatta sara*	3215	Ethmoid tissue	3.1
21	*Alouatta cf. caraya*	CBF 9166	Muscle tissue	2.6
22	*Alouatta seniculus*	MHNC-M 93	Skin tissue	1.7

These results prevented the planned DNA sequencing analysis from being carried out, but there is a chance of obtaining adequate genetic material for this analysis by using specific PCR protocols according to the substances to which the primate specimens were exposed. In this regard, it is important to note that approximately 70% of the samples are from specimens collected between 1980 and 2000, a period during which chloroform was commonly used to preserve specimens in the field for several days or weeks prior to their arrival at scientific collections. Additionally, borax salts were used to fumigate scientific collections and prevent the proliferation of insects (dermestids), which represents another potential PCR inhibitor.

The parties involved in the project (MNHN, RedBolPrim and BIOMOLAB) are committed to continuing with the research into the molecular biology of Bolivian primates. The MNHN is gathering information on the current management of scientific collections, which will be used to adjust the PCR process to obtain the required genetic material for sequencing analysis. BIOMOLAB has also expressed its willingness to cooperate by offering to conduct the sequencing analysis of 12 samples free of charge once the necessary genetic material is available. In addition to the commitment expressed formally by BIOMOLAB in their technical report (see Appendix D), the MNHN has provided a letter of support for this research project (see Appendix E). The work will therefore continue in order to resolve the identified issues, and the support provided by PSGB will be recognised in any publication resulting from this research project.

Outputs

The primatology symposium was the largest event of its kind at the Zoology Meeting, with a significant number of presentations and attendees, while the roundtable promoted the inclusion of 14 new members in RedBolPrim. This is a significant achievement in sparking interest in primatology among the next generation of Bolivian researchers and conservationists. Both meetings were posted on the RedBolPrim Facebook page, which has a wide national and international reach (https://n9.cl/arcm7, https://n9.cl/bwigrt, https://n9.cl/n5c5e), thereby raising the group's profile within the Bolivian research and conservation community. In addition, the roundtable served to identify the expectations of RedBolPrim members, as well as other researchers and conservationists, highlighting the tasks that this group should prioritise in future activities.

Through its proactive fundraising efforts, RedBolPrim has played a leading role in inspiring the work of the Bolivian environmental authority in developing the action plan for Bolivian primates. Inspired by this, the National Museum of Natural History of Bolivia (MNHN) has initiated the development of action plans for snakes and turtles in Bolivia, applying the same multi-species approach employed for primates. This demonstrates the impact of the RedBolPrim initiative in promoting broader efforts to conserve Bolivian wildlife. Although there was a delay in relation to the original schedule, this was offset by achieving greater results. Presenting the consolidated action plan document to the

MNHN marks the end of the most critical phase in developing this strategic planning tool. Throughout this process, RedBolPrim has demonstrated its organisational capabilities and its members' commitment to effective contribution.

Almost all of the samples (37 out of 38) have provided DNA extracts, which are ready to be used in the next stages of the molecular research project. This experience has strengthened the relationships between the parties involved, as demonstrated by MNHN's willingness to assist in obtaining information on Bolivian scientific collection management in order to adjust the PCR protocols, and BIOMOLAB's commitment to conducting the sequencing analysis of a significant number of samples free of charge. Thus, a working group specialising in molecular research on Bolivian primates is being established, which will be crucial for concluding the current research initiative and promoting further research on this topic in Bolivia.

Additionally, RedBolPrim produced some outreach items as part of organising the symposium and roundtable meetings held at the First Zoology Meeting in Bolivia, as well as the workshops for the action plan for Bolivian primates. These items include banners, T-shirts, tote bags, key rings and stickers featuring drawings of Bolivian primate species created by RedBolPrim members. Although PSGB funds were not used for this activity, the items included the PSGB logo in recognition of their valuable support of all the activities conducted (Figures 4 and 5). These materials helped to raise the profile of RedBolPrim at all the meetings and will be useful for their future outreach activities.

Figure 4. Designs of the different outreach items. a: banners, b: T-shirt, c: tote bag, d: key ring, and e: sticker.

Figure 5. Outreach items produced. a: banner, b: T-shirt, c: tote bag, d: key rings, and e: stickers.

Next steps

Through the symposium and roundtable, RedBolPrim has gained greater recognition within the Bolivian community of researchers and conservationists. All the information shared at these meetings is a valuable resource of guidelines for RedBolPrim's future work and will help them to continue promoting the development of primatology in Bolivia.

The work of RedBolPrim specialists in developing the action plan for Bolivian primates has provided crucial technical input for this strategic planning tool, representing a key reference on the work of this group for Bolivian biodiversity. RedBolPrim will continue to support the development and approval of the action plan by the environmental authority, which is expected by mid-2026. The group can use this advance knowledge of priority actions to organise activities that will contribute to their implementation.

The molecular research project on Bolivian primates will continue, starting with an assessment of different PCR protocols to address the issue of DNA amplification, taking into account the preservation agents used on the primate specimens from which the tissues were obtained. The aim is to amplify the DNA of as many samples as possible for use in further DNA sequencing analysis, and to publish the research results in order to encourage further research into the molecular biology of Bolivian primate species and help to fill the existing knowledge gap.

Financial Narrative

The funds received from PSGB were crucial in completing the planned tasks and also covered the expenses for additional activities. Of the approved budget of £1,200, a total of USD 1,534.83 was received, taking into account the international transfer fee. The total expenses incurred for activities carried out using these funds amounted to USD 1,548.13. The remaining USD 13.30 was covered by another source of financing. More information can be found in Table 4.

Table 4. Costs covered by PSGB funds.

Description	USD
Lunch for Trinidad attendees of the action plan workshop.	262.21
Washing of room tablecloths (Trinidad workshop for action plan).	21.55
DNA sequencing analysis of 22 primate tissue samples.	1264.37
Total	1548.13

Conclusion

The symposium and roundtable meetings provided an excellent opportunity for primatology researchers to share their experiences with the Bolivian community of researchers and conservationists. Important criteria were obtained from both events to inform future activities aimed at increasing research and conservation efforts for Bolivian primates.

The quality of the information used to develop the action plan for Bolivian primates has increased as a result of the two workshops conducted. Criteria obtained from key biodiversity conservation stakeholders provided a more realistic framework of threats to primate species and the efforts required to address them and promote primate conservation.

The launch of molecular research activities on Bolivian primates is an important step in generating the first body of knowledge in this area. Although the results were not as expected, a robust interinstitutional working group has been formed which is fully committed to completing this project.

RedBolPrim's coordination of various activities has strengthened its position within the Bolivian biodiversity research and conservation community. This will be crucial for the group to fulfil its mission of promoting primatology development in Bolivia.

All of the above activities represent initial stages or important processes intended to improve primate research and conservation in Bolivia. I would like to express my sincere gratitude to PSGB for their invaluable support in conducting these activities, and I look forward to continuing to work together in favour of primate conservation.

C. Letter confirming receipt of the first consolidated document of the Bolivian Primates Action Plan by the Bolivian National Museum of Natural History.

MNHN
Museo Nacional
de Historia Natural

La Paz, 19 de noviembre del 2025
MNHN/N°409/2025

Señores:
RED BOLIVIANA DE PRIMATOLOGÍA (RedBolPrim)

Presente. –

REF.: ACUSE DE RECIBO DE LA MATRIZ Y BORRADOR DEL PLAN DE ACCIÓN DE PRIMATES DE BOLIVIA

De mi consideración:

Por medio de la presente, el Museo Nacional de Historia Natural (MNHN) extiende un cordial saludo y acusa recibo de la matriz y del borrador del Plan de Acción de Primates de Bolivia, documentos remitidos en el marco de la propuesta para la elaboración del mencionado Plan.

Al respecto, se comunica que ambos insumos se encuentran en proceso de revisión por parte de las áreas técnicas correspondientes del MNHN. Una vez concluido este análisis, y de existir observaciones, los documentos serán remitidos a RedBolPrim para la incorporación de los ajustes o precisiones pertinentes. Posteriormente, y tras la consolidación final del contenido, el Plan será derivado a la Autoridad Ambiental Competente Nacional (AACN) para su consideración.

Agradecemos el cumplimiento oportuno de los plazos establecidos y la colaboración continua en este proceso técnico, el cual es de gran importancia para la conservación de los primates en el país.

Sin otro particular, hago propicia la oportunidad para saludar a ustedes con mi más alta consideración.

c.c.: Arch. Corr.
HAR/ltv

N. Hugo Aranibar Rojas
DIRECTOR GENERAL EJECUTIVO a.i.
Museo Nacional de Historia Natural

Vo.Bo
L.L.V.

"2025 BICENTENARIO DE BOLIVIA"

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D. Technical report of the molecular analysis of primate samples.

BIOMOLAB
LABORATORIO DE BIOLOGIA MOLECULAR Y ANALISIS CLINICOS

RESULTS OF THE ANALYSIS

Genetic DNA Analysis of *Aotus sp.* and *Alouatta sp.* Tissues

Requesting Institution: Jesus Martinez – Red Boliviana de Primatología (RedBolPrim).
Department: La Paz **Country:** Bolivia
Results Delivery Date: January 12th, 2025

Part A. DNA Extraction Analysis of *Aotus sp. and Alouatta sp.* Tissues

Methodology

Genomic DNA was extracted using the Qiagen DNeasy extraction kit. The biological material was provided by WCS staff. The samples were stored at -80 °C until the extraction process began. The resulting genetic material was quantified by UV spectrophotometry using a NanoDrop ND-1000 instrument to evaluate its concentration and quality at the following wavelengths in the ultraviolet spectrum: A230, A260, and A280.

Results

DNA was successfully extracted from most of the tissues. Only one sample (CBF2991) was found to have no genetic material detectable. We could extract genetic material from all the other samples, although in some cases small quantities (less than 5ng/ul) (Table 1).

Table 1. DNA concentration extracted from animal samples

#	Species	Sample museum codes	DNA concentration (ng/ul)
1	*Aotus azarae*	2730	28.1
2	*Aotus azarae*	B Paragua	25.7
3	*Aotus azarae*	CBF 9304	2.5
4	*Aotus trivirgatus*	CBF 3988	1.4
5	*Aotus nigriceps*	CBF 5441	80.6
6	*Aotus azarae*	4612	2
7	*Aotus azarae*	CBF 327	2.1
8	*Aotus azarae*	2991	0
9	*Aotus azarae*	2988	0.8
10	*Aotus sp.*	CBF 3989	3.9
11	*Aotus azarae*	1169	10.7
12	*Aotus azarae*	2097	2.2
13	*Aotus azarae*	1109	29.3
14	*Aotus azarae*	2990	1.5
15	*Aotus azarae*	1378	39.9

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16	*Aotus azarae*	CBF 331	19.7
1	*Alouatta sara*	2955	5.3
2	*Alouatta sp.*	CBF 8121	5.1
3	*Alouatta sara*	4636	21.4
4	*Alouatta caraya*	2101	12.3
5	*Alouatta seniculus sara*	CBF 1525	3.9
6	*Alouatta seniculus sara*	CBF 376	12.6
7	*Alouatta sara*	4644	1.5
8	*Alouatta guariba*	CBF 6714	4.9
9	*Alouatta sara*	2970	1.8
10	*Alouatta caraya*	CBF 3978	2.4
11	*Alouatta caraya*	57	2.3
12	*Alouatta caraya*	59	1
13	*Alouatta cf. caraya*	CBF 8883	39.7
14	*Alouatta sp.*	CBF 9176	1.5
15	*Alouatta sara*	2956	1.6
16	*Alouatta sara*	San Miguelito	2.8
17	*Alouatta sara*	55	2.2
18	*Alouatta seniculus sara*	CBF 377	1.5
19	*Alouatta cf. caraya*	CBF 8882	2.66
20	*Alouatta sara*	3215	3.1
21	*Alouatta cf. caraya*	CBF 9166	2.6
22	*Alouatta seniculus*	MHNC-M 93	1.7

Part B. PCR of the Cytochrome B (CytB) or the Cytochrome Oxidase 1 (COX1) region for analysis of *Aotus sp. and Alouatta sp.* Barcoding.

To enrich the hypervariable regions of the mitochondria, we used the following primers for the CytB region:

mtD-26_F TATGTACTACCATGAGGACAAATATC
mtD-28_R ATTACACCTCCTAATTTATTAGGAAT

The master mix used was Phusion high-fidelity PCR kit M0530L (New England BioLabs Inc.) according to the instructions in the user manual provided by the manufacturer in the following proportions:

Reagents	***Volume µl***
Reaction Buffer HF– (5X)	*2*
dNTPs 10 mM	*0,5*
Primers F (10uM)	*0,5*

Primers R (10uM)	*0,5*
H_2O nuclease-free	*10*
Phusion Polymerase	*0.25*
gDNA sample	*5*
Reaction Total Volume	***20 ul***

PCR was performed according to the following protocol:

Phase	***Temp. (°C)***	***Time***	***No. de Cycles***
Initiation	*98°*	*30 s*	*1*
Denaturation	*98°*	*30 s*	*30*
Annealing	*53°*	*45 s*	
Extension	*72°*	*1 min*	

Part B. Results

No band was observed in the 38 samples analyzed. In addition, a subset of this samples (30 samples) was shipped to Eurofins Genomics Tokyo, Japan to be analyzed parallelly and we had the same results. We used a different pair of primers (HCO2198 and LCO1490 for COX1) to ensure the amplification. However, we only verified that these samples contain an unknown inhibitor that is interfering with normal PCR amplification (Figure 1).

We would like to inform you that we have performed **PCR amplification.** However, in some (or all) samples, the PCR band was not detected or was identified as unsuitable for sequencing. Please refer to the table below for a list of holding samples. Therefore, related sequencing reactions have been put on hold, and successfully amplified samples are now in the process of sequencing.

No band	COX_B1,COX_B10,COX_B11,COX_B12,COX_B13,COX_B14,COX_B15, COX_B2,COX_B3,COX_B4,COX_B5,COX_B6,COX_B7,COX_B8,COX_B9, COX_X1,COX_X10,COX_X11,COX_X12,COX_X13,COX_X14,COX_X15, COX_X16,COX_X2,COX_X3,COX_X4,COX_X5,COX_X6,COX_X7,COX_X8,COX_X9

Figure 1. Results from a lab partner abroad (Eurofins Genomics Tokyo, Japan).

Conclusions

DNA was extracted successfully from 37 out 38 samples. DNA concentration ranged from 0,8ng/ul to 80 ng/ul. Due to the inability to amplify the barcoding regions through PCR we

cannot proceed to perform DNA sequencing and therefore to not provide DNA sequences from these tissues. As potential drivers for the obtained results, we consider that DNA samples might be contaminated with a PCR inhibitor or have been exposed to many chemical and physical process that have degraded DNA in a way that PCR can not be completed successfully, since the target regions might be absent for amplification. Some possible culprits are Borax and Formalin (known PCR inhibitors), used to preserve the tissues from museum samples (Cooper, 1994).

The laboratory is willing to work with the RedBolPrim and the National Museum of Natural History (MNHN) of Bolivia to find a solution to the PCR problem and ensure the continuity of the research project, which aims to provide molecular information on Bolivian primate species. Different specific PCR techniques and inhibitor-removers will be tested in an attempt to complete this process and enable sequencing analyses to be run on as many samples as possible.

The funds received have covered the costs of the DNA extraction process as well as the PCR attempts. However, given that no DNA sequencing has yet been performed, we would like to demonstrate our commitment to continuing this study by analyzing 12 samples at no additional cost. Therefore, the payment already made will cover the costs of the work already completed and sequencing for 12 selected samples once we solve the PCR issues.

References

Cooper, A. (1994). DNA from museum specimens. In Ancient DNA: recovery and analysis of genetic material from paleontological, archaeological, museum, medical, and forensic specimens (pp. 149-165). New York, NY: Springer New York.

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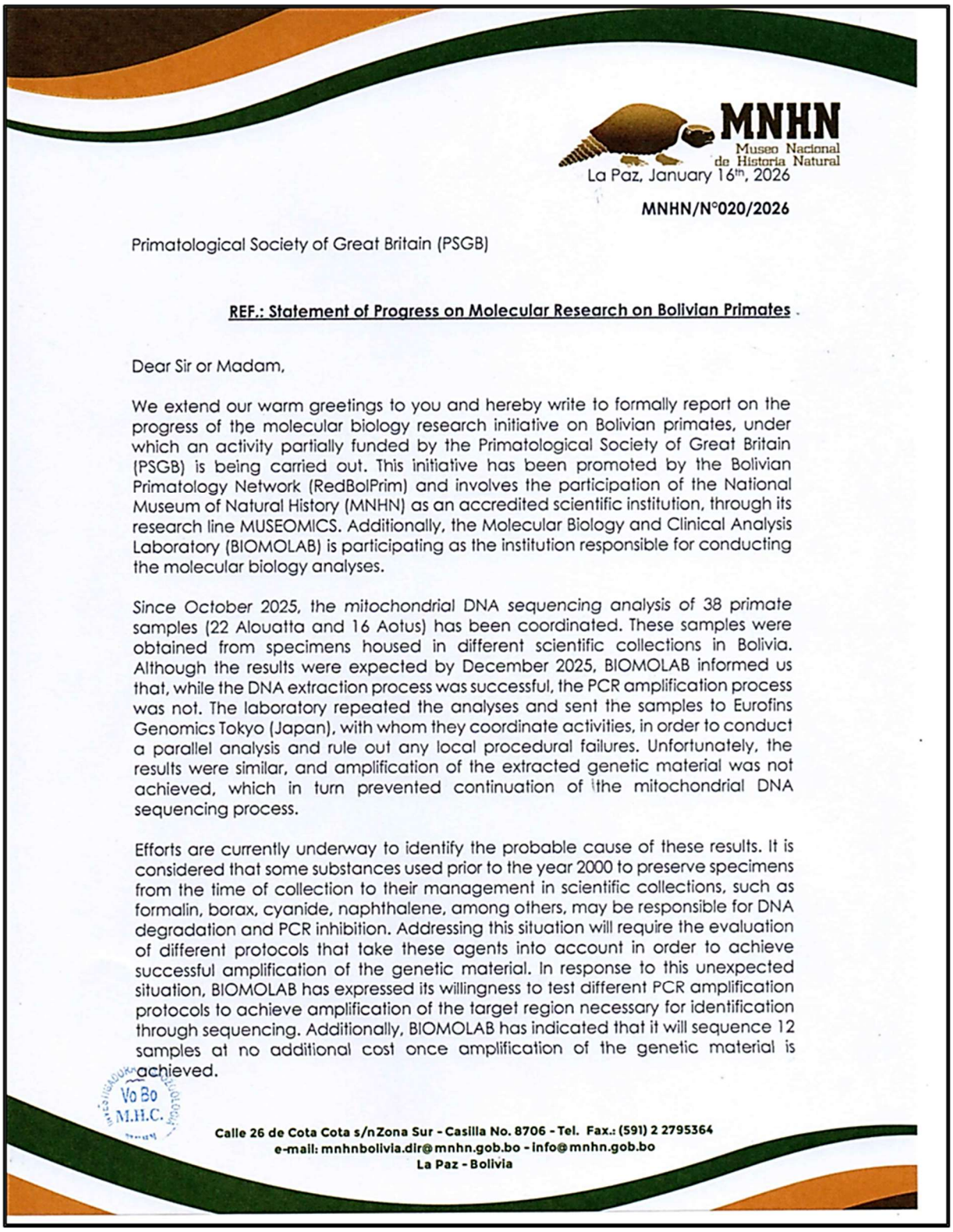
E. Support letter of the National Museum of Natural History of Bolivia (MNHN) on the molecular research project.



MNHN
Museo Nacional de Historia Natural

La Paz, January 16th, 2026

MNHN/N°020/2026

Primatological Society of Great Britain (PSGB)

REF.: Statement of Progress on Molecular Research on Bolivian Primates

Dear Sir or Madam,

We extend our warm greetings to you and hereby write to formally report on the progress of the molecular biology research initiative on Bolivian primates, under which an activity partially funded by the Primatological Society of Great Britain (PSGB) is being carried out. This initiative has been promoted by the Bolivian Primatology Network (RedBolPrim) and involves the participation of the National Museum of Natural History (MNHN) as an accredited scientific institution, through its research line MUSEOMICS. Additionally, the Molecular Biology and Clinical Analysis Laboratory (BIOMOLAB) is participating as the institution responsible for conducting the molecular biology analyses.

Since October 2025, the mitochondrial DNA sequencing analysis of 38 primate samples (22 Alouatta and 16 Aotus) has been coordinated. These samples were obtained from specimens housed in different scientific collections in Bolivia. Although the results were expected by December 2025, BIOMOLAB informed us that, while the DNA extraction process was successful, the PCR amplification process was not. The laboratory repeated the analyses and sent the samples to Eurofins Genomics Tokyo (Japan), with whom they coordinate activities, in order to conduct a parallel analysis and rule out any local procedural failures. Unfortunately, the results were similar, and amplification of the extracted genetic material was not achieved, which in turn prevented continuation of the mitochondrial DNA sequencing process.

Efforts are currently underway to identify the probable cause of these results. It is considered that some substances used prior to the year 2000 to preserve specimens from the time of collection to their management in scientific collections, such as formalin, borax, cyanide, naphthalene, among others, may be responsible for DNA degradation and PCR inhibition. Addressing this situation will require the evaluation of different protocols that take these agents into account in order to achieve successful amplification of the genetic material. In response to this unexpected situation, BIOMOLAB has expressed its willingness to test different PCR amplification protocols to achieve amplification of the target region necessary for identification through sequencing. Additionally, BIOMOLAB has indicated that it will sequence 12 samples at no additional cost once amplification of the genetic material is achieved.

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Based on the above, the MNHN wishes to highlight BIOMOLAB's strong commitment and willingness to prioritize the generation of the information required for this research. Likewise, as a nationally accredited research institution, we will continue to follow up on this research initiative, which will be of great value for the conservation of Bolivian primates. In this context, we acknowledge the important financial support provided by the PSGB and will ensure that this support is recognized in any technical report or publication generated in relation to this research initiative.

We thank your attention and reiterate our kind regards.

Sincerely,

N. Hugo Aranibar Rojas
DIRECTOR GENERAL EJECUTIVO a.i
Museo Nacional de Historia Natural

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