Baseline for the Conservation of a 40-year restored Andean Forest: focal groups of flora and fauna in Farallones de Cali National Natural Park, Colombia.

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Executive summary: The Pance river basin is an ecologically important region with high conservation potential in the southern Colombian Andes, affected by anthropogenic pressures for decades. For over 40 years, the Farallones Foundation has carried out ecological restoration processes to counteract these pressures. However, to date, there has not been a unified baseline study of the flora and fauna species present, necessary information for the conservation of this area. Therefore, we will identify the diversity of seven biological groups known to include keystone, endemic, threatened, and bioindicator species that will provide an account of the current status of this critical site.

Due to the timing of project approval and subsequent logistical considerations related to grant disbursement, the project's commencement was shifted by three months. Fieldwork officially commenced in July 2023, rather than the initially planned April 2023 start date. This delay was duly communicated to and approved by the funding foundation. The grant funds were received on 15 August 2023 and were quickly used to pay for essential equipment used since the first expedition, such as Bushnell tracking cameras, Motorola radios and camping stoves. Since the project's inception, our activities have adhered to the key activities and timescale outlined in our proposal, ensuring alignment with the project's overarching objectives. Below, we provide a breakdown of the activities completed to date and the planned schedule for the remaining activities before our project deadline in August 2024.

1. Sampling Biological Groups of Interest

We successfully conducted four biological expeditions encompassing both rainy (R) and dry (D) seasons (Expedition 1 (22.VII.2023 - 29.VII.2023; D), Expedition 2 (29.XI.2023 - 05.XII.2023; R), Expedition 3 (09.II.2024 - 16.II.2024; D), Expedition 4 (30.III.2024 - 06.IV.2024; R)) in a collaboration between Farallones Foundation, the Pontificia Universidad Javeriana-Cali, Colombian National Parks, and the Administrative Department of Environmental Management (DAGMA). This biodiversity data collection involved five working groups for these seven biological groups, each focusing on a specific component of the reserve's biodiversity.

1.1. Methods

Amphibians and Reptiles: We employed free search methods without restrictions and visual encounter surveys (VES)(Angulo et al., 2006; Veith et al., 2004). Over a total of 28 sampling days, we walked 152 transects, covering all reserve areas. When registering a new species, we photographed, captured, and transported the individual(s) to a processing area. We identified the individuals to the lowest possible taxonomic level using the Amphibians Species of the World database (Frost, 2022).

Birds: We utilized the methods of free transects, stationary observation points, acoustic recordings, and mist nets (used solely for audiovisual records). We conducted a total of 100 free transects/stationary observation points (25 per expedition). We installed mist nets on three of these four expeditions and exerted complementary registers relying on binoculars, sound recorders and telephotography. We identified the individuals using Ayerbe-Quiñones (2022) and McMullan (2023), following the taxonomic criteria of Catalogue of Life (2023).

Mammals: We employed mist nets (double and single), Tomahawk and Sherman traps, camera traps, and mammal traces (Fig. 1). We installed ten camera traps and 15 traps in each expedition, and we used 8-10 mist nets in expeditions 1-3. Bioacoustic equipment was installed in the last expedition but software licensing costs prevented analysis. These methods were chosen to capture mammals with diverse habits and activity periods.

Diurnal Butterflies: We used three methods: Van Someren-Rydon traps, linear transect capture and recording, and free-range transect capture and recording (Fig. 2). We employed Van Someren-Rydon traps (a total of 63 installations), and free-range surveys in each zone of the reserve. We collected unidentified individuals for further identification in the laboratory. For identification we used inaturalist.org, ecoregistros.org, butterflycatalogs.com, Constantino et al. (2002), Vélez & Salazar, (1991), butterfliesofamerica.com, and (Ramírez-Restrepo et al., 2007). We followed the taxonomic criterion of the GBIF occurrence list for Colombia (GBIF, 2023).

Orchids and Araceae: For orchid survey, we used a preferential method (Wolf et al., 2009) with photo documentation and data collection on life form, phenology, and abundance (Fig. 3). We relied on regional inventories (Galindo Tarazona et al., 2020; Reina-Rodríguez et al., 2011) for identification. For Araceae surveys, we followed standardized transects (Acebey & Krömer, 2008) with *in situ* photography and collection for identification (compared to Reina-Rodríguez et al., 2011). We later used free sampling to target flowering/fruiting stages for morphotype identification and we established a total of ten monitoring plots (2/zone across 5 zones).

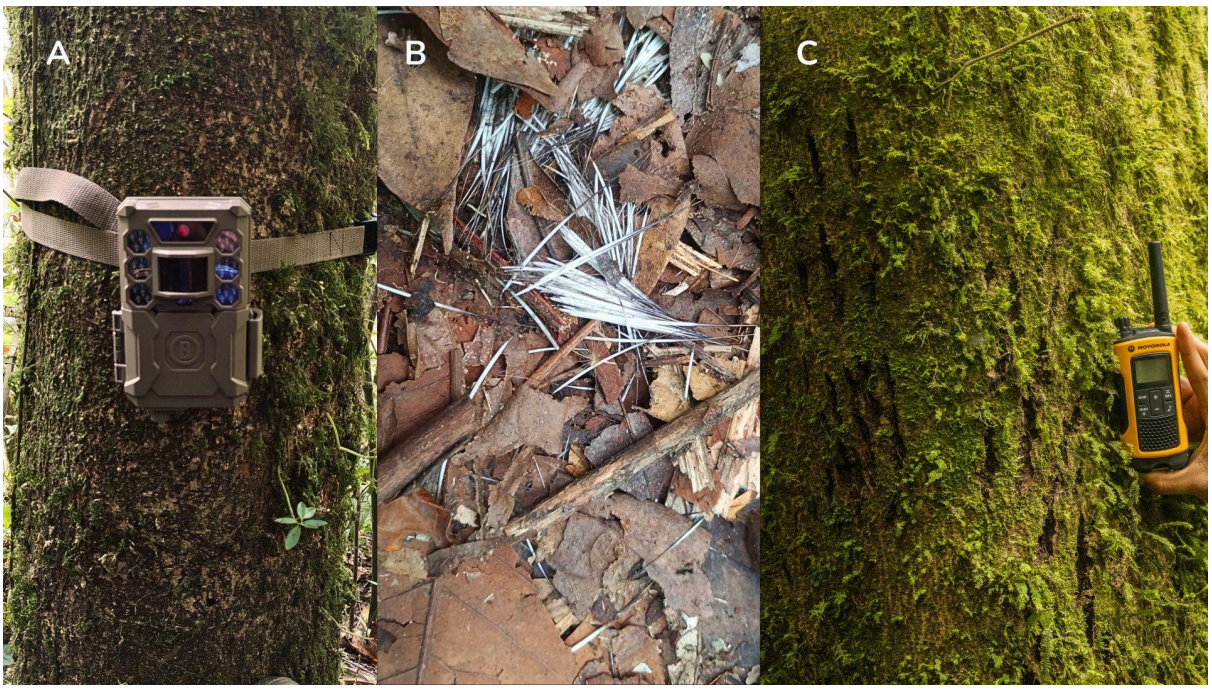

Figure 1. Terrestrial mammal sampling methods. (A) Setting up a camera trap at knee height. (B) Tracks of *Coendou rufescens* (Guianan dwarf porcupine) found on the "Cuchilla" trail, indicating animal activity. (C) Recording a track on tree bark in the "Navajas" zone; a Motorola T400MC radio is used for scale. Photos: Angelín Loaiza (A and B), Carlos Mauricio Ramírez (C).

FIgure 2. Diurnal butterflies sampling methods: (A) Free-range transect. (B & C) Individual handling. (D) Van Someren-Rydon trap assembly. Photos: Carlos Mauricio Ramírez.

Figure 3. Orchid field characterization. Photo: Juan Andrés Medina.

1.2. Preliminary Results

Amphibians: We recorded a total of 509 amphibian individuals during our four biological expeditions, representing 10 identified species. The majority of these species belong to the family Strabomantidae, and one species from the family Centrolenidae.

Reptiles: We recorded a total of 49 reptiles, from 4 families, 7 genera and 11 species. Most of these species belong to the family Dactyloidae, with one species classified as vulnerable.

Birds: We recorded a total of 2,203 bird individuals, encompassing 16 orders, 42 families, 166 genera, and 215 species (Fig. 4).

Mammals: We recorded a total of 50 mammal species, including 23 bat species and 27 terrestrial mammal species. Seven of these 50 species are classified as threatened by the IUCN.

Diurnal butterflies: Utilizing the proposed sampling methods, we identified 153 butterfly species. We recorded three additional species during casual encounters between transects and revisions, giving a current total of 156 identified species, with some individuals still undergoing laboratory identification.

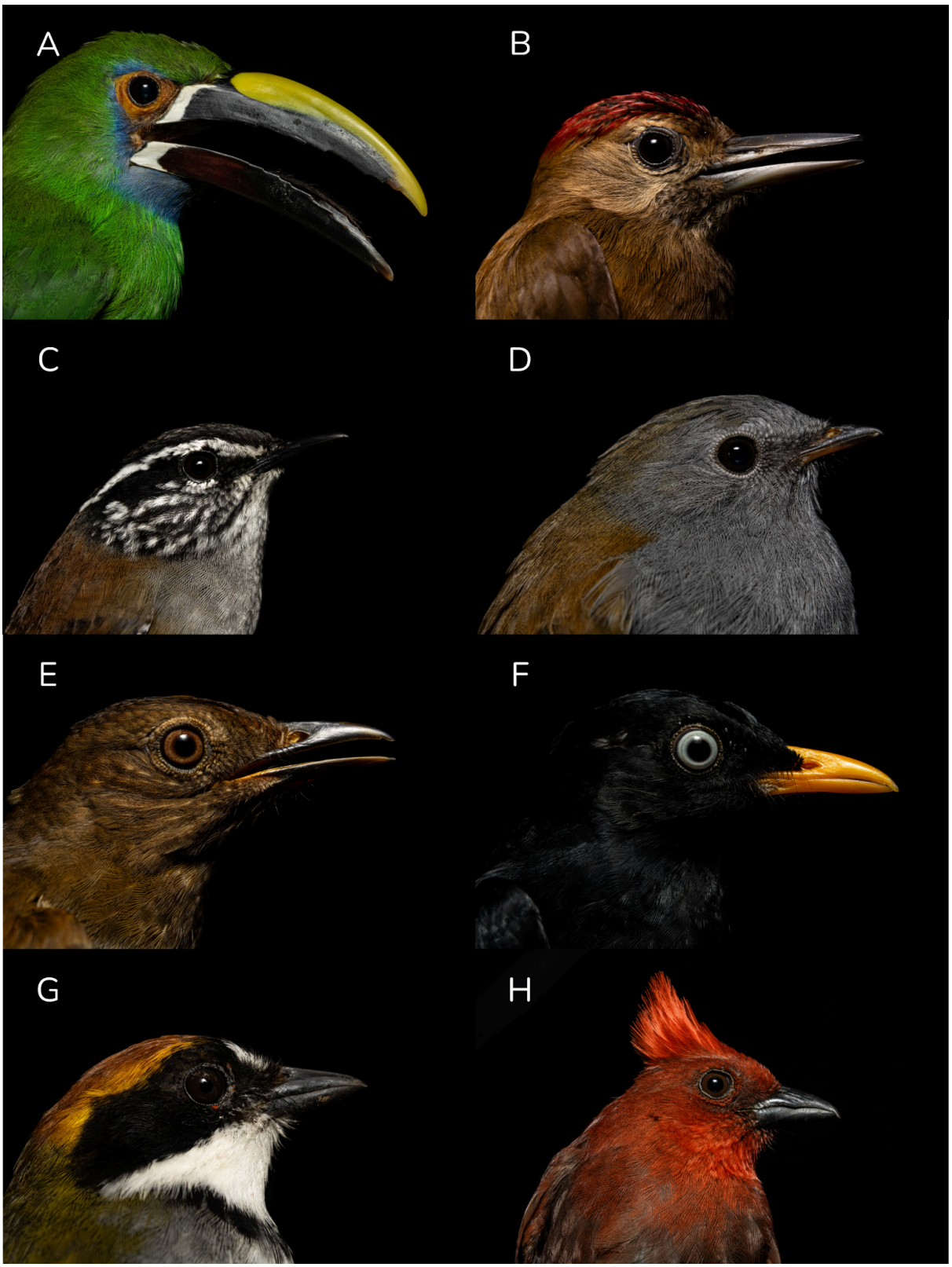

Figure 4. A selection of bird species captured during the expeditions of the project. (A) *Aulacorhynchus albivitta* (Ramphastidae). (B) Male *Dryobates fumigatus* (Picidae). (C) *Henicorhina leucophrys* (Troglodytidae). (D) *Myadestes ralloides* (Turdidae). (E) Juvenile *Turdus serranus* (Turdidae). (F) *T. leucops* (Turdidae). (G) *Arremon brunneinucha* (Passerellidae). (H) Male *Habia cristata* (Cardinalidae). Photos: Juan A. Medina-Gallo.

2. Informative and educational infographics.

We are in the final stage of the design of a series of infographics to communicate our key findings and provide general information about the groups of interest. These infographics will present information on the natural history, ecology, distribution, habitat, conservation status, and/or population protection recommendations of the species in a user-friendly format with clear language. To enhance the simplicity and appeal of the information for a general audience, we will use "conservation flagship species" to represent each of the seven biological groups. These flagship species will serve as symbols to raise awareness and foster a sense of ownership of the region's biodiversity among the public. All photographs used in the project materials are either authored by project members or are freely available for use.

Educational cubes: We are developing two educational cubes, primarily for children, with 50x70 cm faces (Fig. 5). Each face will feature photographs and information about a specific conservation flagship species. Each cube will also include a QR code that directs interested viewers to a digital booklet. The design process is being finalized for the transition to the printing phase.

Digital booklet: This aims to complement the educational cubes and provide a deeper dive into the featured species. This booklet contains digital illustrations, descriptions, and ecological insights about the flagship species and their importance to the ecosystem. The content is presented in a simple and engaging manner, making it accessible to children and a wide range of audiences.

Informative Banners: To complement our outreach efforts and provide a visual overview of the reserve's biodiversity, we have developed a series of informative banners (Fig. 6). Each banner features high-quality photographs and detailed information about one of the biological groups sampled in the Bachué Natural Reserve. Additionally, the banners highlight some of the most important representatives of each group recorded in the area. With dimensions of 1x2 m, these banners will serve as eye-catching educational tools in various locations within the reserve and surrounding communities.

Figure 5. Design of some of the faces of the educational cubes with photographs and relevant information on the selected flagship species for each biological group.

Figure 6. Design of the informative banner for the mammal group in the framework of the project.

3. Workshop for the community

We will lead a workshop at a key school of the Pance community during the first week of July 2024 (exact date to be determined collaboratively with teachers, the Farallones Foundation, and the Pontificia Universidad Javeriana-Cali). This workshop will directly involve children aged 5-15 through a series of educational talks on the Upper Pance Basin's biodiversity, in which we will showcase the results of the conducted expeditions. The talks, adapted for the target age group, will utilize the previously mentioned educational/informative materials. Our main objective is to engage children in the protection of their local environment. Through interactive learning, we will help participants identify various species and understand the challenges these species face. This approach aims to foster a lasting connection with their natural environment from an early age.

4. Manuscript Writing and Submission

The project team is currently finalizing three manuscripts for their submission to target journals by the end of July 2024. These manuscripts include comprehensive findings on the bird, mammal, and butterfly inventories conducted in the study area. Additionally, they report new species records for amphibians and reptiles in Farallones de Cali National Natural Park.

5. References

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