

**Pond beats. Conservation of threatened amphibians in  
wetlands of  
Valdivian rainforest remnants of Argentina**

**Objective 1**

**Park Rangers Workshop update**

A brief reference manual on passive acoustic monitoring (PAM) was developed for park rangers. This document includes basic instructions for programming automated digital recorders (ADRs) and data loggers used to register environmental variables. It explains the use of the devices most commonly employed in the field (AudioMoths and Wildlife Acoustics Song Meter recorders), detailing the steps required for their configuration, the software most frequently used for handling audio files in passive acoustic monitoring, and the key considerations before deploying equipment in the field—such as formatting memory cards, verifying estimated battery life, and recommendations for protecting devices from weather exposure.

In addition to ADRs, the manual includes instructions for programming and deploying data loggers such as iButtons (Thermochron), HOBO MX2301A units, and Kestrel Drop D3 devices. These instruments complement automated digital recorders by providing simultaneous information on environmental variables during monitoring periods, which is essential for understanding how environmental conditions influence the reproduction of these organisms—particularly relevant in the context of climate change.

Beyond the creation of the reference document for implementing passive acoustic monitoring, training sessions were conducted for the park rangers who have been supporting and accompanying us in amphibian monitoring efforts in wetland remnants of the Valdivian rainforest. These sessions were carried out as part of the regular activities involved in deploying and maintaining equipment. During them, we explained the use of devices for passive acoustic monitoring of amphibians and carried out field exercises to strengthen practical skills in their operation.

## Objective 2

### Swamp protection

One of the main objectives of the Rufford project was to provide materials to support livestock containment and to deliver talks and workshops for local livestock producers in areas where priority wetlands for this project are located. However, due to coordination difficulties, it was not possible to carry out the in-person activities with local livestock producers.

In order to maintain the core objective (reducing the impact of livestock on wetlands), we evaluated viable alternatives within the project area together with National Parks staff. In agreement with the staff of Nahuel Huapi National Park, it was decided to collaborate in the protection of an ecologically important wetland for amphibians, located in the locality of Espejo Chico, near Lake Ceferino. This wetland had previously been protected with a perimeter fence that, over time, had deteriorated and no longer fulfilled its function. Based on recent records of livestock presence and in coordination with the park rangers, the complete reconstruction of this fence was identified as a priority action.

In addition to supporting the fencing of this wetland in Nahuel Huapi, materials will be provided to Lago Puelo National Park to contribute to livestock management and control in the areas identified as most sensitive.

## Objective 3

### Raise awareness among the local public community

One of the most important science outreach events in the Bariloche community is *INIBIOMA Abierto*, an annual event in which schools of all educational levels visit the INIBIOMA facilities and participate in talks and workshops showcasing the different research lines developed at the institute. This event provided an ideal setting to present our wetland conservation project in remnants of Valdivian rainforest—based on amphibian monitoring—and to introduce teachers and students to the importance of these ecosystems and the threats they face.

Among the talks and workshops we designed for visiting students, we included a PowerPoint presentation to introduce the audience to the world of amphibians, highlighting their biological characteristics and illustrating their vocalizations using recordings collected during our field campaigns. This allowed participants to learn about the amphibian species richness in the surroundings of Bariloche and to recognize species by their calls. Stickers featuring different frog species were also handed out, and an interactive quiz game was developed, awarding points based on the knowledge acquired during the presentations.

In addition, we set up a permanent booth focused on bioacoustics, where we explained passive acoustic monitoring in greater depth and emphasized its importance for wildlife monitoring, particularly for amphibians. At the booth, we showcased equipment (recording devices and data loggers) and played audio recordings of the species we study.

These talks and workshops resulted in an experience filled with learning, surprise, and enjoyment, leaving many students curious and eager to continue exploring the natural world.

## **Virtual library update**

One of the proposed activities has been the installation of QR signage along the trails that cross the monitored wetlands. These QR codes redirect visitors to the project's virtual library, a digital collection created specifically for this purpose. This virtual library consists of short informational micro-videos that include amphibian vocalizations, basic biological information, and audio samples of the monitored soundscapes, as outlined in Objective 3.

We are currently in the process of producing this signage, which requires the National Parks Administration (APN) to review and approve the designs and grant us authorization for installation. We have already created a YouTube channel (<https://www.youtube.com/@LebechInibioma>) where the audiovisual material intended for visitors will be gradually uploaded, once both the content and the signage designs receive the corresponding approval.

The audiovisual material hosted on the channel—micro-videos under one minute featuring vocalizations and biological information—constitutes the project's virtual library or audio library, as originally planned. Each video (accessible through the QR codes) presents the species' vocalization accompanied by basic information on its reproductive biology and activity period, and includes the logos of the institutions involved in the project. The aim is for visitors to Lago Puelo and Nahuel Huapi National Parks to freely access this virtual library. In this way, the videos will offer a more interactive and immersive experience during their walk along the trails that border the wetlands.

## Scientific meeting

The XXV Argentine Herpetology Congress was held from October 1–3, 2025, in the city of San Salvador de Jujuy, in northern Argentina. At this event, numerous researchers and students presented the findings obtained during the development of their projects, and we were no exception. We presented our results on the reproductive acoustic phenology of the three *Batrachyla* species that inhabit two localities in Puerto Blest within Nahuel Huapi National Park: La Turbera and Lake Cántaros. The three species evaluated were *Batrachyla antartandica*, *B. leptopus*, and *B. taeniata*.

We found that *B. antartandica* begins its reproductive period earlier and ends it later compared to the other two species, most likely because it is able to vocalize at lower temperatures than *B. leptopus* and *B. taeniata*. In addition, through a Principal Component Analysis (PCA), we observed that temperature is the variable that most strongly influences the vocalization activity of the three species.