Progress Report October 2025. Project:

The impact of different types of artificial lights on nocturnal pollination by hawkmoths in Argentina: insights for urban planning and biodiversity conservation

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Performed activities. Progress of Key Outcome 2 - Citizen science and outreach project.

In April we created a citizen science and conservation project called **Protejamos la Noche** (Let's Protect the Night), to involve the community in recording the different types of lamps used in public lighting in the province of Córdoba, Argentina. The project relies on volunteers actively participating in data collection by using a diffraction tool attached to their mobile phone cameras to capture the emission spectrum of street lamps. These records are then uploaded to the free Epicollect5 app. The photographs collected will later be calibrated and classified according to the lighting technology of the lamps (LED, high-pressure sodium or mercury vapour). This allows us to map the different lamp types that are being implemented in the Córdoba province. Citizen participation also seeks to raise awareness of light pollution, highlight the ecological importance of nocturnal pollination, and encourage the responsible use of artificial light at night.

To identify street lamps according to the lighting technology, we developed a diffraction tool that consists of a plastic transparent disc cut from a DVD. This enables light diffraction and the visualization of emission spectra. The disc is fitted with double-sided adhesive tape to make it easy to attach to mobile phone cameras. Each diffraction tool comes with a card containing clear instructions on how to take photos correctly and upload them to the app, as well as a sticker featuring the project logo. All these items are packaged together in an envelope called the **Diffraction Kit** (Fig. 1). We also created the Protect the Night project on the *Epicollect5* app, which allows participants to upload their records. Each record includes basic information such as the date, time, and geographic coordinates of the sampled lamp. Georeferencing this data will also enable us to assess the spatial distribution of the different types of light identified, as well as estimate the extent of light pollution in the region.

Before delivering the diffraction kits, we conducted a nighttime field sampling using the diffraction tool to verify its functionality in recording light spectra. We also used a spectroscope to record the emission spectra of various types of public lighting used in the region and calibrate them. This was to enable us to later calibrate the spectral data recorded by participants, based on the distinctive characteristics of the spectra associated with each type of lamp (Fig. 2).

Figure 1. Components of the Diffraction Kit: (a) a diffraction tool, (b) an instruction card, and (c) a sticker with the project logo, all packaged together in a small envelope.

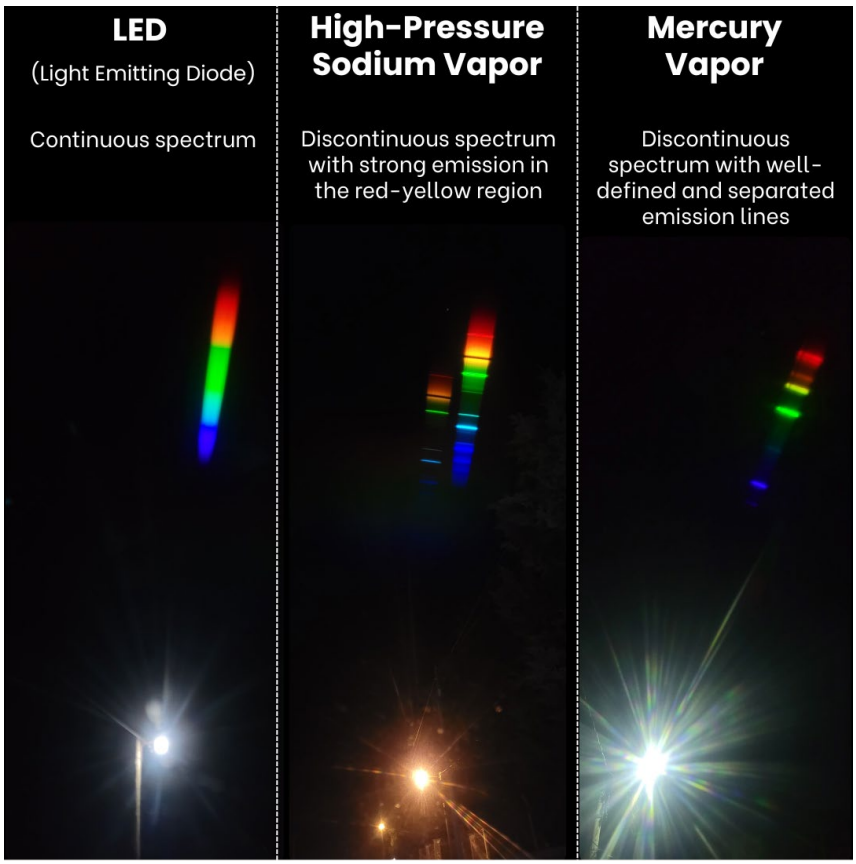

Figure. 2. Spectra of the three main types of light used in the province of Córdoba (LED, high-pressure sodium vapour, and mercury vapour), captured by participants using the diffraction tool.

To maximize participation and reach as many people as possible, we created social media accounts (Instagram, Twitter) and a website dedicated to the project. Here, we share information about the focus of the project, our objectives, and how to get involved in the data collection. We circulated a Google form through these platforms enabling interested individuals to provide their contact information and allowing us to reach out to them and send them the diffraction kit. In addition, we designated interested and volunteer participants as local delegates, providing them with several kits to distribute within their communities. This also helped us reach different towns and localities from the interior of the province.

We also created a project on iNaturalist, a digital platform for recording and identifying species observations, with the aim of compiling records of hawkmoths submitted by the community in the province of Córdoba (Argentina). This will help document the diversity of this insect group in the region.

In addition to digital outreach, we gave talks at secondary schools and biology courses at the **National University of Córdoba**, as well as seminars at various institutions. Furthermore, we gave different media interviews to encourage participation in the project and invite the general public to attend the upcoming workshop. You can find details of all our outreach activities on our website.

In August 2025, we held a **hybrid workshop** on the project, its objectives, and how to participate (Fig. 3). The event was conducted simultaneously in two modalities: in-person participants attended a classroom provided by the National University of Córdoba, while virtual participants joined via a Google Meet link and could follow the workshop live through a camera installed in the classroom. The workshop consisted of two sessions: one theoretical and one practical. It began with a 30-minute theoretical presentation introducing background information on light pollution and its effects on nocturnal pollination mediated by hawkmoths. A 15-minute coffee break was scheduled between the theoretical and practical sections. After the break, the practical session began. Participants received a diffraction kit, and the classroom lights were turned off, leaving only a single light source on. Using the diffraction tool alongside their mobile phone cameras, participants identified the type of light based on the observed spectrum. At the end of the activity, the characteristics of the emission spectra of the lamps used in the province were explained. Participants then uploaded their photographs to the application together. The workshop concluded with a brief discussion on the responsible use of artificial light at night. Each participant, whether attending in person or virtually, received a certificate of participation. The workshop was a great success, with 23 participants attending in person and 44 joining virtually.

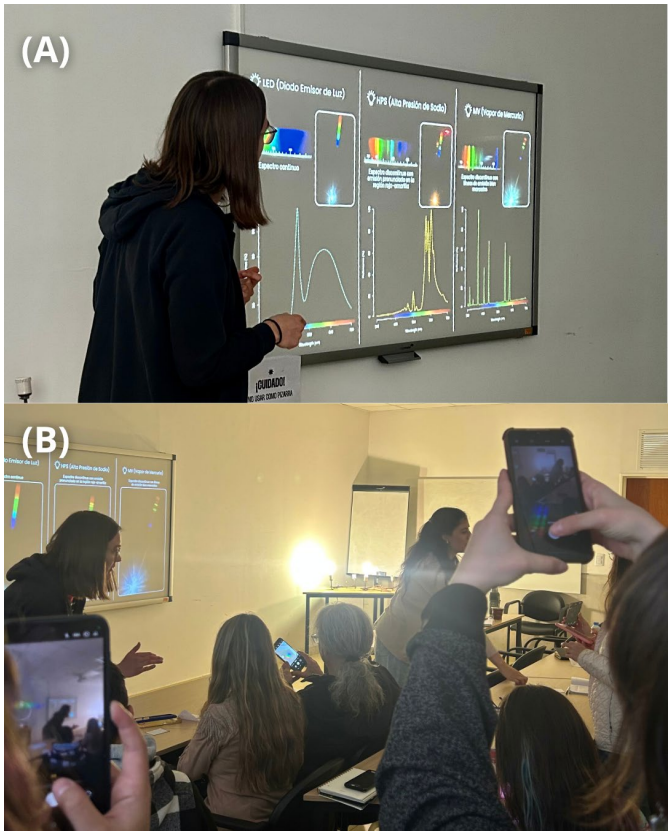

Fig. 3. Hybrid workshop of Protect the Night: (A) Theoretical session and presentation of background information; (B) Practical session, using the diffraction tool to record emission spectra.

Until now we have obtained 220 records submitted to the Epicollect5 app across the region (Fig. 4). Over the next few months, we will process the photographs uploaded to the Epicollect app in order to determine the field sampling sites for Key Outcome 1. These samplings are planned for the upcoming warm season of 2025–2026 (from October to March). The sampling will involve visiting sites across the province of Córdoba where the three main types of lamps are present. At these sites, we will evaluate the success of nocturnal pollination mediated by hawkmoths by measuring parameters related to the reproductive success of the plants.

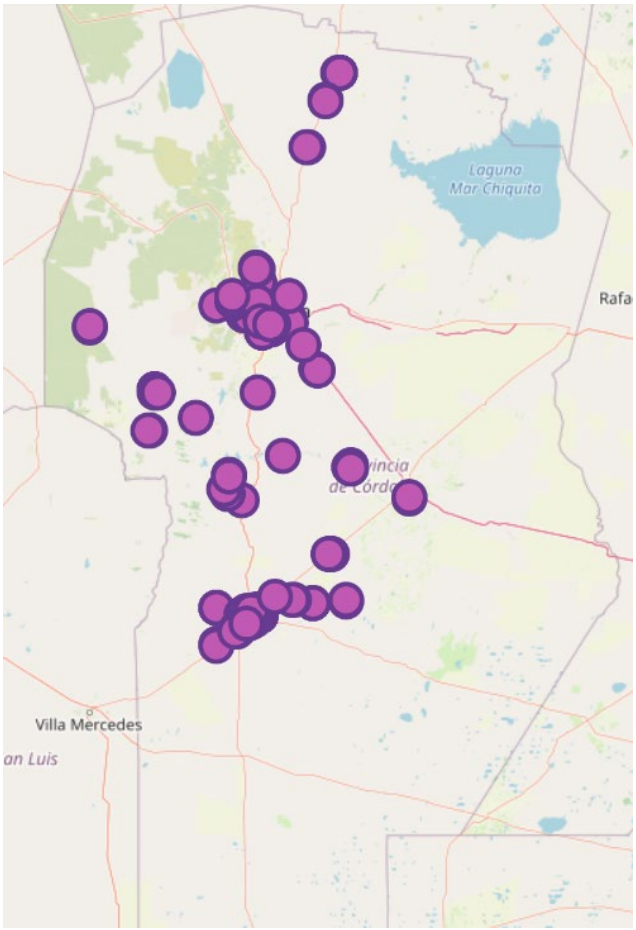

Fig. 4. Records obtained through the citizen science project in Córdoba province, Argentina.

Status of Project Objectives

Key Outcome	Degree of progress	Pending activities
(1) Influence of different lighting technologies on the success of nocturnal pollination mediated by hawkmoths in the province of Córdoba, Argentina.	10%	Define sampling sites and carry out field sampling to evaluate the success of nocturnal pollination under different lighting technologies.
(2) Citizen science and outreach project	90%	Image processing to determine the light types of the province
(3) Map of vulnerability of nocturnal pollination based on lighting technologies implemented in the province of Córdoba, Argentina	0%	Using the information obtained from Key Outcome 1, we will predict the vulnerability of nocturnal pollination, taking into account the types of lamp across the province of Córdoba.