THE SOUNDS OF THE CITY

Angélica Hernández-Palma
Bibiana Gómez-Valencia
Yenifer Herrera-Varón
Juan Sebastián Ulloa
Alexander von Humboldt Biological Resources Research Institute, Colombia.

An opportunity for urban biodiversity monitoring

COMMITMENTS
2 5 8

Quote as: Hernández-Palma, A., Gómez-Valencia, B., Herrera-Varón, Y., Ulloa, J.S. The Sounds of the City. P. 186-189. In: Mejia, M.A., Amaya-Espinel, J.D. (eds.). *BiodiverCities by 2030: Transforming Cities with Biodiversity*. Bogotá. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. 2022. 288 pages.

48 MUNICIPALITIES, COLOMBIA

Pop. **22,638,661**

36,799 km²

KEY CONCEPTS

- CITIZEN SCIENCE
- SOUNDSCAPES
- PARTICIPATORY AUDITORY MONITORING OF BIODIVERSITY
- eBIRD
- iNATURALIST

The confinement caused by the COVID-19 pandemic was the ideal scenario to implement an unprecedented strategy that assessed the impact that urbanization and human activities have on the soundscape of cities.

The spread of COVID-19 during the first months of 2020 forced more than half of the world's population to remain isolated in their homes for months. This pre-emptive isolation significantly reduced human activities, mainly related to mobility and vehicular traffic. As a result, significant decreases in air and noise pollution, as well as an increase in the frequency of wildlife sightings became evident in cities around the world (Bates et al., 2021). Thus, this unique scenario created the ideal conditions for the Alexander von Humboldt Biological Resources Research Institute to lead the initiative "How does my city sound? Soundscapes from your window" on a national scale.

The purpose of the initiative was to collect sound data in order to monitor the **soundscapes** of Colombia's urban areas. To this end, teams of citizen scientists came together to listen carefully to the fauna and sounds of their cities during the isolation period. This strategy for **participatory auditory monitoring of biodiversity** was implemented nationwide and was an opportunity to generate and promote connections between city dwellers and the sounds of their environment. Thus, civil society found a space to contribute valuable data to a **citizen science** initiative, using everyday resources such as their smartphones, from their windows. Among the most significant values highlighted by the participants were "contributing to science," "appreciating urban nature," "citizen science," and "providing data," among others (Ulloa et al., 2020). This highlights the importance of implementing participatory practices of data collection for the planning and management of cities.

URBANIZATION EFFECTS

Through the analysis of the recordings provided by the participants, it was clear that the level of urbanization in the different cities of the country had an effect on their soundscapes. In the first place, it was apparent that in the most urbanized city (Bogotá), the diversity of animal sounds was much lower than in cities with lower levels of urbanization. In Bogotá, the sounds recorded were only from birds, while insects, amphibians, and mammals were recorded in the other cities. The same applies to anthropogenic sounds, which were more predominant in Bogotá than in other cities, with the most significant proportion of sounds coming from motorized transport (traffic).

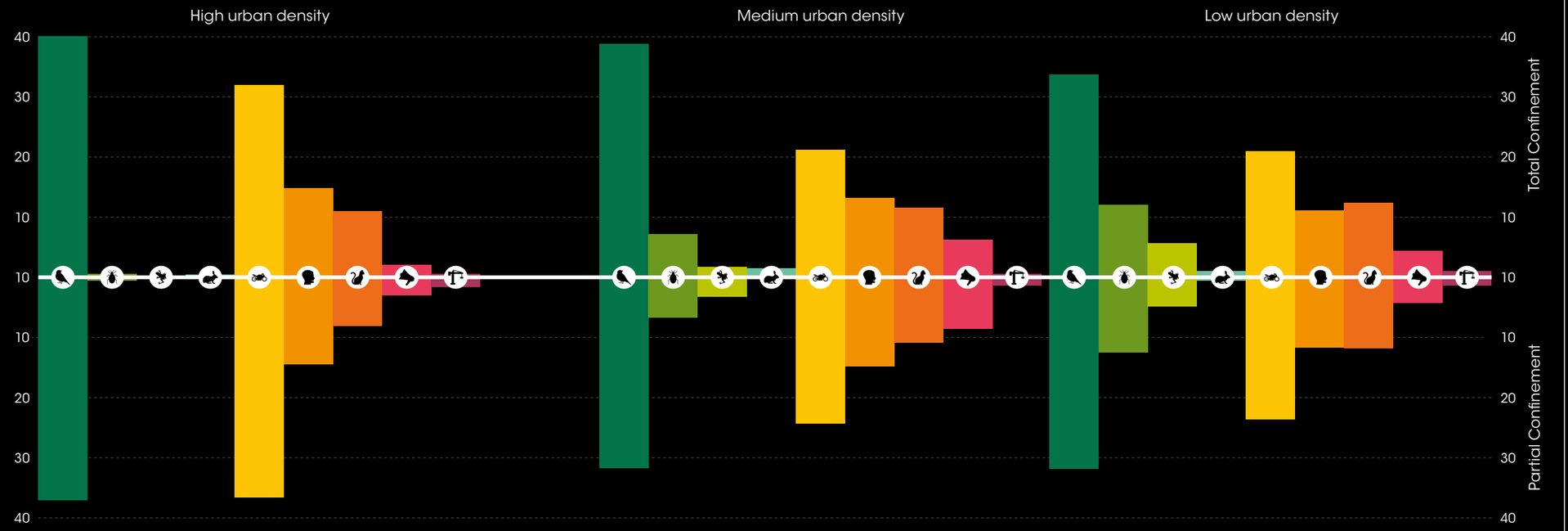
MOBILE SCIENCE

To encourage broad citizen participation in this initiative, a standardized smartphone-based data collection protocol was developed. Acoustic sampling was conducted during two confinement periods by COVID-19: total confinement (TC: April) and partial confinement (PC: May-June). TC refers to when mobility restrictions were tightest (average mobility reduction of -72.1 %). PC represents the later period when more substantial restrictions were lifted and mobility increased by 12.5 % compared to TC (Google, 2020).

Participants collected 90-second sound recordings from their windows during the morning (5-7 a.m.) and afternoon (5-7 p.m.), times that coincide with wildlife activity peaks. For each sound recording, participants also completed a short survey in which they had to determine the presence of 12 soundscape components associated with: wildlife sounds (insects, amphibians, birds, and mammals), anthropogenic sounds (motorized transport, construction, loudspeakers, human voices, and domestic animals), and abiotic sounds (rain, wind, and thunder) (Ulloa et al., 2021).

SOUND FINDINGS

A total of 202 citizen scientists joined the initiative, through whom 5,717 sound recordings were collected from 48 municipalities in Colombia[1]. Based on the data, it was estimated that between the TC and the PC, there was an overall increase of 2.15 dB in sound pressure levels, equivalent to an increase of 128%. As expected, these changes in sound pressure levels and in the acoustic profile of the environment were proportional to the level of urbanization of the cities. For example, the capital city (Bogotá), with higher urbanization intensity, showed a more significant change than that recorded in the country's smaller and less urbanized cities. Similarly, it was found that the variations detected in the acoustic profile were less than in the forested areas areas of the cities, which indicates the importance that vegetation can have in buffering the impacts of urban noise pollution.



The results also showed the effect of human activities on the soundscapes of Colombian cities. Anthropogenic sounds were present in a smaller proportion during total confinement, and wildlife sounds were more present. The opposite occurred when the isolation measures were relaxed (partial confinement) and more people went out into the streets, increasing the sounds coming from human activities and decreasing the perception of animals.

On the other hand, the changes recorded between the two periods in both sound pressure and the acoustic profile of the environment were not proportional to those perceived by citizens nor to the level of urbanization itself. This gap may be associated with the masking effect that anthropogenic noise generates over the rest of the soundscape or with the very disconnection between urban citizens and nature in large cities, making it difficult for them to recognize sounds associated with other components of biodiversity.

WITHIN EVERYONE'S REACH

In addition to being a unique opportunity for citizen participation, the initiative was also distinguished by its open nature. The data collection protocols, the information registration forms, the data analysis codes, and even the data collected are openly and freely available in the Institutional Data and Information Infrastructure (I2D) of the Humboldt Institute (Alexander von Humboldt Institute, 2020).

Thus, while it is clear that urban biodiversity monitoring is a task that requires financial resources, time, and trained personnel, the experience of this initiative exposes participatory and open data research as a viable option. The information gathered through these mechanisms ultimately represents a valuable input to inform decision-making regarding the management of natural resources in urban environments while strengthening the connection between nature and urban dwellers.

KEY LESSONS

- Citizen science initiatives in urban areas allow the development of cognitive skills in the public. In this particular case, it allowed citizens to get involved in the development of a research project, share their experiences and acquired knowledge, and strengthen their relationship with and awareness of nature.
- The fact that the monitoring strategy proposed in this case is entirely open facilitates transparent and permanent access to information by any citizen. This strategy can also be adapted to different contexts, making open monitoring and management of information on soundscapes in urban environments with citizen participation in any city in the world possible.
- Biodiversity monitoring is vital to quantify the changes generated by different actions or implementations developed in urban environments. The monitoring strategy proposed in this case study can quantify changes in soundscapes, helping to manage or reduce the sources of sound pressure that affect our well-being and that of the fauna living in green areas of cities.
- The monitoring strategy proposed in this case study can be easily adapted to different urban planning instruments. For example, indicators can be created from sound data to follow up on various interventions in cities. In this case, the strategy was used to quantify the effects of urbanization independent of human activity. However, its use can be explored in different contexts to assess the status of human pressures and wildlife species in urban areas, contributing to methodologies such as the IUCN Urban Natural Index (2022), specifically providing a participatory method.
- The results obtained through this initiative showed the importance of green spaces within cities, both for human well-being and the wildlife inhabiting them. For this reason, a monitoring initiative such as the one described above can be useful for planning cities in a more comprehensive manner. This is key to protecting and expanding green spaces in cities and preserving the many benefits they provide to people, such as carbon capture and storage and noise and temperature reduction.
- Technology is a fundamental ally in developing this kind of monitoring strategies. Digital platforms such as **eBird** and **iNaturalist** enable participatory biodiversity monitoring and inventory projects globally in urban and rural environments.