



ANNUAL MEETING

We Are Stronger Together: Building Community to Face Barriers for Latin American and Underrepresented Ecologists

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Introduction

Diverse groups can provide creative solutions to research problems, as people from different backgrounds and points of view offer valuable input that would otherwise be lost in homogenous groups (Hong and Page 2004, Phillips et al. 2014, Gardiner 2020). Yet, Latin American and other diverse and

underrepresented ecologists must deal with challenges that others do not (Nuñez et al. 2021, Arenas-Castro et al. 2024). Some of these challenges include, but are not limited to, language barriers (e.g., Ramírez-Castañeda 2020, Amano et al. 2023, Cao et al. 2024), barriers for female-identifying ecologists (see also Martínez-Blancas et al. 2022), fear of safety and accessibility in the field and the outdoors (see also Ramírez-Castañeda et al. 2022), and access to coding and other computational and institutional resources. Motivated to discuss these issues and propose practical solutions, we organized a symposium for the Ecological Society of America (ESA) Annual Meeting in 2023 titled “We are stronger together: Building community to face barriers for Latin American and underrepresented ecologists.” We broadly asked the panelists to discuss and reflect on the following: How can we support ecologists outside of North America to showcase their research, network, collaborate, and tackle the issues and inequalities they face?

The talks presented novel results or shared experiences from different organizations already engaged in building communities of diverse ecologists and underrepresented communities through tackling language barriers, women-related issues, culturally relevant teaching, outdoor activities, and citizen science in Latin America and the Caribbean. The talks contributed to the annual meeting’s motto of “Ecology for all” by adding a new perspective to the discussion surrounding barriers faced by ecologists outside North America and proposing solutions derived from the experiences of our speakers and the groups they represent, as well as others emerging from discussion during the symposium.

Three of the symposium participants agreed to share their perspectives and findings following the symposium: E. D’Bastiani (*Mulheres na Ecologia*), S. Moreno (*Latino Outdoors*), and L. Santiago-Rosario (*Club Eco-Evo Latinoamérica*).

Gender inequalities: Barriers faced by Brazilian ecologists (Speaker Elvira D’Bastiani)

Higher education scenario in Brazil has undergone a notable change, with a growing presence of women in master’s and doctoral programs in the last decade (GEOCAPES 2023). However, this progress has not occurred without the persistence of gender bias in the academic realm, particularly in ecology. Despite the increasing number of women entering academia, their representation gradually diminishes as they advance in the professional hierarchy (*Nature* Editorial 2021, Ferreira et al. 2022), resulting in a lack of leadership opportunities, access to funding, and acknowledgment compared to their male counterparts. This gender imbalance is further exacerbated for mothers, Black women, and other historically marginalized groups (Zandonà 2022).

In her talk, she presented the outreach initiatives in the project “Women in Ecology,” developed in Brazil since 2020. Her experiences and challenges during her educational journey motivate her to assist others in overcoming obstacles, foster discussions, and propose strategies to enhance female representation in ecology. To accomplish this, the project involves communication and scientific outreach activities. Some of these include

1. **Biographies:** Offering visibility to women ecologists, quantifying and encouraging women’s presence in academic careers. Weekly, we post a brief biography of an ecologist and her journey in science in our social media outlets.

2. **Ecology for Children:** Disseminating ecological materials and activities for young audiences to stimulate and educate children early on about the importance of nature and the development of critical thinking.
3. **EcoNews:** We disseminate research conducted by women through releases and highlight their studies. This includes an “I’m a scientist, and this is my research” board where we create news articles based on theses, dissertations, and papers published and submitted by Brazilian female ecologists. These releases are published on the project’s website and shared with other media outlets.
4. **DEI (Diversity, Equity, and Inclusion):** Promoting issues related to Diversity, Equity, and Inclusion and fostering debate, emphasizing the importance of representation in all areas of ecology.

During the three years of working on this project, Elvira noticed some gaps, one of which was gender bias in Brazil’s ecology field. Thus, in 2021, the project team assessed the current gender composition among professors (assistant and associate) and students in postgraduate programs in ecology and conservation associated with the Brazilian Association of Ecological and Conservation Science (ABECO). Data were collected from 54 programs, of which 52 provided information on professors teaching at graduate level, 31 on adjunct professors, and 23 on doctoral candidates, and 27 on master’s students.

We found that the number of males is 65.07% greater than that of female professors ($lm: \beta_1 = -6.057$, $SE = 0.721$, $df = 102$, $t = -8.39$, $P < 0.001$). However, there was no significant difference in the gender of collaborators ($lm: \beta_1 = -6.774$, $SE = 0.367$, $df = 60$, $t = -1.842$, $P = 0.070$). Regarding students, women were a majority at the master’s level ($lm: \beta_1 = 4.148$, $SE = 1.533$, $df = 54$, $t = 2.706$, $P = 0.009$). At the same time, there was no significant difference between genders at the doctoral level ($lm: \beta_1 = 3.261$, $SE = 2.631$, $df = 44$, $t = 1.239$, $P = 0.222$). This means that women are actively engaged in academia, but some factors limit their presence in higher positions. As a result, we are currently conducting a nationwide survey in Brazil collecting personal information, such as housing, career, education level, income, former advisors, productivity, work environment, maternity, sexual and other harassment, and satisfaction with the academic career. The goal is to understand the barriers women are facing to understand why they are not reaching higher positions in ecology in Brazil.

During her talk, Elvira shared preliminary results from this ongoing survey. The first barrier identified is that most male ecologists in Brazil are not involved in initiatives to increase women’s representation. Respondents also highlighted the perception that men are more easily hired or promoted and that ecology departments are predominantly composed of men. Most female ecologists work in public universities, are responsible for household activities, and reported they face limitations or even hear gender-related jokes, as well as sexual harassment, many cases of which went unreported. Other barriers include a lack of financial support and resources for their jobs and inadequate salaries. Notably, most female ecologists reported they do not have children, and this choice was related to their careers (see also Machado et al. 2019).

Social and cultural burdens placed on women often make many female ecologists abandon their academic careers or face reduced chances in competitive selection processes. This outcome is likely connected to structural issues, but effective strategies are urgently needed to change this scenario. The data collected will allow our team to understand the primary barriers women encounter and guide strategies/

policies aimed at graduate programs in Brazil. However, it is equally important that those in leadership positions take proactive measures to change this scenario (Ross et al. 2022). In addition to leadership efforts, organizations, universities, and institutions working in ecology must actively promote policies and practices that foster inclusivity and equal opportunities in Brazil. This could involve implementing mentorship programs, offering flexible work arrangements, and establishing clear pathways for career advancement for women and other marginalized groups.

In conclusion, increasing women's representation in ecology is a multifaceted challenge that requires a comprehensive understanding of the barriers they face, the formulation of effective strategies, and the active involvement of individuals at all levels of the Brazilian ecological community. By working together, we can create a more inclusive and diverse field that benefits from women's unique perspectives and talents in ecology.

We are here: Why representation in the outdoors matters (Speaker Sebastian Moreno)

Sebastian explored the importance of promoting inclusive and diverse outdoor engagement in his talk and the barriers historically marginalized communities face. He began by sharing his journey, growing up in a city with limited outdoor exposure due to safety concerns. This perpetuated the idea that nature was not accessible and/or safe. His inspiration for addressing this issue was drawn from his experiences and passion for nature.

There is a lack of racial and ethnic diversity in the outdoor and conservation community in the United States. Over 70% of outdoor recreationists are Caucasian, and about 13% are Hispanic. Addressing this imbalance is urgent, as a failure to diversify outdoor participation could lead to significant revenue loss for outdoor businesses and threaten the conservation of public lands (2022 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation).

A survey (Floyd et al. 2016) revealed urban residents' perception of urban wildlife refuges and the barriers diverse urban residents face in accessing natural areas. Results from the study identified several common obstacles that people, specifically those historically excluded from participating in these spaces, encounter. These obstacles include a need for more connection to nature, from limited exposure and familiarity with natural environments. Additionally, negative associations with outdoor spaces, often due to past experiences or perceived dangers, further deter engagement. Cultural confidence issues, where individuals feel out of place or unwelcome in these settings, exacerbate the problem.

Moreover, the study highlighted the need for more school time and resources dedicated to nature education, which limits opportunities for young people to develop an appreciation for the outdoors. The sometimes unintentional, unwelcoming atmosphere, often associated with refuge facilities, has been perceived as intimidating or exclusive. These findings underscore the need for more inclusive and accessible programs that actively work to engage diverse communities and foster a welcoming environment in urban wildlife refuges (Floyd et al. 2016). By addressing these barriers, we can create more equitable opportunities for all urban residents to connect with nature and benefit from its physical and mental health advantages.

Sebastian then discussed how systemic biases, such as structural racism and classism, contribute to these barriers. These biases typically manifest in urban planning and policy decisions that disproportionately affect marginalized communities, leading to high impervious surface cover and exacerbating stormwater runoff and flooding issues. Heat islands, resulting from concrete concentration and lack of tree cover, disproportionately raise temperatures in these areas, leading to increased health risks during heat waves. Additionally, the lack of greenspaces deprives residents of the numerous benefits of natural areas, including recreational opportunities, mental health benefits, and improved air quality. Environmental pollutants, often more prevalent in economically disadvantaged neighborhoods, pose serious health risks and contribute to chronic conditions. These inequities impact human health and alter ecological and evolutionary processes by disrupting habitats and species distributions (Schell et al. 2020).

Addressing these issues requires a commitment to environmental and social justice. It is essential to create policies and initiatives that ensure equitable access to environmental services, such as clean air, water, and green spaces, while protecting environmental disservices, like pollution and extreme weather effects. By integrating environmental and social justice efforts, we can work toward urban environments that promote health, well-being, and resilience for all residents, regardless of their socioeconomic status or racial background. This holistic approach is crucial for fostering sustainable and inclusive urban communities.

Despite these challenges, organizations like Latino Outdoors aim to create spaces for historically marginalized groups to enjoy the outdoors. Latino Outdoors, founded by José González, has grown into a national community with a mission to inspire, connect, and engage Latine communities in outdoor activities, embracing culture and family as integral parts of the outdoor narrative. The organization operates under a framework that connects people, their surroundings, processes, and policies to build communities, foster a sense of place, empower outdoor enthusiasts, and influence policies impacting the outdoors.

The talk emphasized that by providing Latine communities with increased opportunities to access outdoor activities and spaces and by ensuring better representation in these areas, we can shift the demographics of the conservation constituency to better reflect the country's diversity better. In conclusion, diversity leads to justice, sustainability, and a thriving world, making it imperative to address disparities in outdoor participation and engage all communities in nature conservation.

Latin American scientist perspectives: The complexities of conducting ecological and evolutionary research in the region (Speaker Luis Y. Santiago-Rosario)

Latin America and the Caribbean (hereon Latin America) is an extensive region encompassing 31 countries and territories where Spanish and Portuguese are mainly spoken (together representing 90% of the population). Around 10% of the population speak other indigenous (e.g., Aymara, Quechua, Nahuatl, etc.) and non-indigenous languages (e.g., Dutch, English, French, etc.; source: <https://worldpopulationreview.com/>). The region boasts of an incredible and extensive biodiversity, species richness, biogeographical regions, and natural history, which sustained the development of indigenous societies (Raven et al. 2020), and served as inspiration for scientific research in ecology and evolutionary biology. Given its notable biodiversity, the region has contributed to the advancement

of ecology and evolutionary biology: the theory of natural selection by Charles Darwin in the Galapagos Islands (Darwin 1859), the foundation of biogeography by Alexander von Humboldt in the Chimborazo Mountain (see Wulf 2015), among others. Despite the region's valuable contribution to those fields, research done in Latin America comes with many barriers and limitations, especially when performed by Latin American scientists (Meneghini et al. 2008, Gomez et al. 2022). Since colonial times, structural and cultural factors have influenced the development of science in the region, with its economic background hampering research productivity (Amano et al. 2016, Ciocca and Delgado 2017, Valenzuela-Toro and Viglino 2021, Ocampo-Ariza et al. 2023). Consequently, the limitations and challenges that scientists in the ecology and evolutionary biology fields face in Latin America stem from problematic inequities.

Luis Santiago-Rosario (Puerto Rico) presented the work performed by the committee members of the Club Eco-Evo Latinoamérica, composed of Ana L. Salgado (Ecuador), Winer Daniel Reyes Corral (Ecuador), Ixchel González-Ramírez (Mexico), Diego Paredes-Burneo (Peru), and Ana Paula A. Assis (Brazil) alongside the executive director of the Association for Tropical Biology and Conservation (ATBC), Lúcia G. Lohmann (Brazil). He focused on presenting Latin American scientists' limitations in the region. The talk presented the survey results about researchers' perspectives and limitations in ecology and evolutionary biology across this geopolitically and biologically diverse region. The survey was shared via social media, reaching 211 regional scientists.

Scientists from diverse backgrounds and academic experiences identified a lack of funding (95% of the respondents), a lack of adequate infrastructure (68% of the respondents), and local political instability (67%) as the most important limitations for pursuing research in the region. The survey also showed that 71% of graduate students performed their graduate studies outside their country of origin, especially in the Global North, underscoring the migration trend with higher specialization. One big limitation for undergraduate students was funding: most of them funded their research out-of-pocket. In a broader sense, local government funding increases toward more stable positions, such as professorships, yet there is variation across the countries in the region. Most respondents (99.5%) think these limitations are cumulative and have huge implications on how and who can be a scientist in Latin America. This aspect has been documented in recent news outlets (i.e., *El Hilo* podcast #180 <https://elhilo.audio/podcast/salud-vacunas-latinoamerica/>), especially important during and after the COVID-19 pandemic.

Based on these perceived issues, they presented some actionable solutions:

- **Increase in training and mentoring opportunities.** These opportunities will improve the skills of scientists in the region, through workshops and opening networking connections with scientists from the Global North and among scientists in the region.
- **Novel funding opportunities.** By generating new public-private partnerships for research and development and cross-country alliances to increase funding opportunities at all career levels, from undergraduate students to established researchers.
- **More equitable and inclusive research partnerships.** Long-lasting partnerships between scientists from the Global North and Latin America should ensure equal responsibilities in planning, execution, and reporting, including co-authorship in publications. Additionally, efforts must be

made to involve local communities, thereby preventing parachute or helicopter science and other unethical practices pervasive in the region.

- **Enhancing research citation and visibility.** The predominance of scientific literature in English often conceals work published in other languages, leading to fewer citations for these studies (Gomez et al. 2022, Liu et al. 2023). Citing research by regional scientists increases their visibility and helps them establish a strong publication record, which is crucial for securing employment and funding (Nakamura et al. 2023). By recognizing and citing their contributions, we can support more scientists accessing greater opportunities within their regions.
- **Improved tools to address academic challenges.** There are multiple ways current tools can be used to bridge gaps in languages (e.g., DeepL, ChatGPT, among others) and by universities and research institutions of the Global North to engage equitably with early-career scientists from Latin America (see Khelifa et al. 2022, Steigerwald et al. 2022).

The survey highlighted the necessity of acknowledging and discussing these limitations to devise intentional solutions. Establishing spaces for collaboration, academic career guidance, skill development, and other activities among Latin American scientists is crucial for addressing visibility gaps and limitations, particularly compared to scientists from the Global North. A platform like Club Eco-Evo Latinoamérica (<https://ecoevolat.github.io>), where researchers can interact, share opportunities, and exchange knowledge regionally and globally, is essential. It enhances participation, visibility, and knowledge dissemination while fostering long-lasting collaborations, conservation efforts, and the development of sociopolitical policies to address the challenges faced by the Latin American scientific community.

Luis also presented ways scientists from the Global North can engage more effectively and equitably across three career stages, undergraduate and graduate students, early-career researchers, and established researchers.

Students should keep in mind the following aspects when performing research in Latin America:

- **Develop local connections.** These take time, but they are essential to generating lasting influence on the community.
- **Learning the local language is crucial.** Do not assume that people will speak English, as this is often not true. Proficiency in Spanish or Portuguese is highly beneficial, though it requires time and effort. If language learning is not feasible, collaborating with local researchers is essential, as they can assist with navigating daily interactions in the host country.
- **Stay on top of local news.** This is for your safety and the safety of those in the communities where you will be performing your work.
- **Respect and acknowledge local rules and regulations.** For instance, if working with specimens requires permits, please ensure you get those before any work is done. Regulations are in place for a reason, and not following them could get you in trouble with local authorities. While working on tribal territories, adhere to their rules and respect their land.
- **Participate in and with the community.** You are not only there to teach the community but also to learn from it. Their natural history knowledge is often more extensive than yours, and it is humbling to experience.

Early-career researchers should take the following into account:

- **Good local connections go a long way.** As previously mentioned, these connections could only increase your research success. Do NOT engage in parachute or helicopter science!
- **Be generous with collaborations and resources.** Many local scientists lack the resources to complete big projects. Collaborating with them can minimize resource gaps and increase regional science proficiency.
- **Teach and learn from local communities.**
- **Cite Latin American articles when relevant.**

Lastly, established researchers should:

- **Incentivize in-person and virtual training opportunities.** Workshops and other training opportunities are great resources for engaging with early-career scientists within the region.
- **Support local undergraduate and graduate students.**
- **Evaluate your research's impact on the communities it impacts.** Data on how much the research has impacted local communities will help us understand our social impact on local communities. These data can also be used to improve broadening participation, which is important for many funding agencies and opportunities.

The presentation highlighted significant challenges encountered by scientists in Latin America within the fields of ecology and evolutionary biology. Since these barriers greatly affect their careers and regional opportunities, recognizing these limitations is a crucial first step. Our suggestions include fostering collaborative platforms among Latin American scientists: establishing local connections, language acquisition, adherence to local regulations, and active community engagement. Encouraging fair partnerships, supporting local scientists, and prioritizing community impact assessments are vital. These results are summarized in a study (Salgado et al., *unpublished manuscript*) currently in review.

We are stronger together blazing a trail for Latin American and underrepresented ecologists

The symposium organized by the ESA Latin America and the Caribbean (LAC) Chapter of ESA aimed to highlight diverse efforts to address challenges faced by ecologists from Latin America and additional underrepresented backgrounds. However, we have only begun to scratch the surface regarding the many efforts by folks in the ecology community to build community and bridge the gaps and barriers faced by ecologists beyond the dominant groups in North America.

The LAC chapter is continuing to build upon this effort in various ways by continuing to work in partnership with diverse groups and was involved with several activities during the 2024 ESA Annual Meeting in Long Beach. For example, the LAC chapter organized two sessions, one of which is a direct follow-up of the 2023 symposium described here, inviting organizations across Latin America who are creating networks and communities for ecologists titled “The Role of Latin American Networks in Supporting Ecologists Throughout Their Careers.” Furthermore, the LAC chapter organized a session focused on the language and accessibility barriers regarding publishing in ecological journals titled “Publishing our ecology across languages and borders.” Lastly, the LAC chapter worked together with other ESA chapters to organize a

symposium on how sections/chapters are creating inclusive spaces for early career scientists and how that has led to better recruitment, retention, and success in ecology. We plan to thoroughly describe the outcomes of all these events soon in a *Bulletin* piece.

While we recognize that these efforts in isolation will not provide all the solutions needed to reduce the barriers and gaps faced by ecologists in Latin America and broadly ecologists from marginalized backgrounds, we aim to continue with the mission of bringing together and highlighting a diversity of efforts across ecological communities and moving forward stronger together.

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