

**RECOGNITION OF NATIVE
MAMMALS AND
ENVIRONMENTAL
EDUCATION AMONG BASIC
EDUCATION STUDENTS IN
MARANHÃO,
NORTHEASTERN BRAZIL**

**RECONHECIMENTO DE MAMÍFEROS NATIVOS E EDUCAÇÃO AMBIENTAL
COM ESTUDANTES DA EDUCAÇÃO BÁSICA NO MARANHÃO, NORDESTE
DO BRASIL**

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ABSTRACT

The Fauna in Schools Project aimed to assess the recognition of wild mammals among basic education students and to develop environmental education activities focused on regional fauna in Coelho Neto, Maranhão, and adjacent areas, northeastern Brazil. The project was conducted in two stages. In the first stage, 645 students from public schools participated in semi-structured interviews and a recognition activity involving images of 24 wild mammal species, including 12 native and 12 exotic species. In the second stage, 833 students participated in environmental education activities focused on regional fauna. The most widely recognized species were predominantly exotic, whereas native species such as *Galea spixii* and *Puma concolor* showed low recognition rates. The diagnostic assessment informed the planning of educational activities addressing the recognition, ecological importance, and conservation of regional fauna, combining scientific content, contextualization, and playful strategies. The results highlight the importance of incorporating local biodiversity into educational content and pedagogical practices and underscore the relevance of linking university extension with basic education to connect scientific knowledge, territory, and regional biodiversity. Although the study does not allow inferences about lasting changes in knowledge, attitudes, or conservation-related behaviors, the experience provides a basis for developing contextualized educational activities and aligns with Sustainable Development Goals 4 and 15, related to quality education and the conservation of terrestrial biodiversity.

Keywords: Extinction of Experience; Critical Environmental Education; Regional Fauna; Biodiversity Conservation; University Extension.

RESUMO

O Projeto Fauna nas Escolas teve como objetivo diagnosticar o reconhecimento de mamíferos silvestres entre estudantes da educação básica e desenvolver ações de educação ambiental voltadas à fauna regional em Coelho Neto-MA e áreas adjacentes, Nordeste do Brasil. O projeto foi desenvolvido em duas etapas. Na primeira, 645 estudantes de instituições públicas participaram de entrevistas semiestruturadas e de uma atividade de reconhecimento de 24 imagens de mamíferos silvestres, sendo 12 espécies nativas e 12 exóticas. Na segunda, 833 estudantes participaram de ações de educação ambiental centradas na fauna regional. As espécies mais reconhecidas foram majoritariamente exóticas, enquanto espécies nativas como *Galea spixii* e *Puma concolor* apresentaram baixos percentuais de reconhecimento. O diagnóstico subsidiou o planejamento de ações educativas voltadas ao reconhecimento, à importância ecológica e à conservação da fauna regional, articulando conteúdos científicos, contextualização e estratégias lúdicas. Os resultados reforçam a importância de incorporar a biodiversidade local aos conteúdos e às práticas pedagógicas e evidenciam a relevância da articulação entre extensão universitária e educação básica para aproximar conhecimento científico, território e biodiversidade regional. Embora o estudo não permita inferir mudanças duradouras no conhecimento, nas atitudes ou nos comportamentos relacionados à conservação, a experiência oferece subsídios para o desenvolvimento de ações educativas contextualizadas e se alinha aos Objetivos de Desenvolvimento Sustentável 4 e 15, relacionados à educação de qualidade e à conservação da biodiversidade terrestre.

Palavras-chave: Extinção da experiência; Educação ambiental crítica; Fauna regional; Conservação da biodiversidade; Extensão universitária.

1. INTRODUCTION

Local patterns of perception, use, and learning about wildlife have changed across different contexts in association with socioeconomic transformations and increasing human disconnection from nature (Pilgrim et al., 2008; Miller, 2005; Soga et al., 2020). One consequence is the decline in direct experiences with nature, or the 'extinction of experience' (Pyle, 2011), which may contribute to the loss of knowledge about regional wildlife, the devaluation of nature, and increasing biophobia (Miller, 2005; Soga et al., 2020).

Students may have difficulty recognizing wildlife from their own surroundings, particularly when they have limited contact with natural environments (Bizerril, 2004). This pattern may be related both to fewer opportunities to interact with local wildlife and to repeated exposure to species from other regions through information and entertainment media (Ballouard; Brischoux; Bonnet, 2011). For example, a study of Brazilian university students found that exotic mammals were more readily recognized, whereas recognition of native mammals was associated with rural life experiences such as farming, fishing, and hunting (Silva et al., 2022).

Educational strategies that expand opportunities for contact with nature and place local biodiversity in context may foster knowledge and appreciation of regional wildlife (Colléony et al., 2017; Sampaio et al., 2018; Santos et al., 2026; Silva et al., 2022; Soga et al., 2020; Souto et al., 2018, 2026; Zhang et al., 2014). In schools, this approach can integrate environmental education, science teaching, and playful learning activities, encouraging student participation and the development of meaningful understandings of biodiversity and

conservation (Ferreira et al., 2022; Puglia; Nishida, 2023; Silva; Soares; Salomão, 2022).

Recognizing the potential of schools to connect students with local biodiversity, the Fauna in Schools Project was developed as a university outreach initiative to raise awareness of the importance of regional wildlife among basic education students in the state of Maranhão. Specifically, the project assessed students' knowledge of wild mammals and conducted environmental education activities aimed at promoting appreciation of regional wildlife.

2. MATERIAL AND METHODS

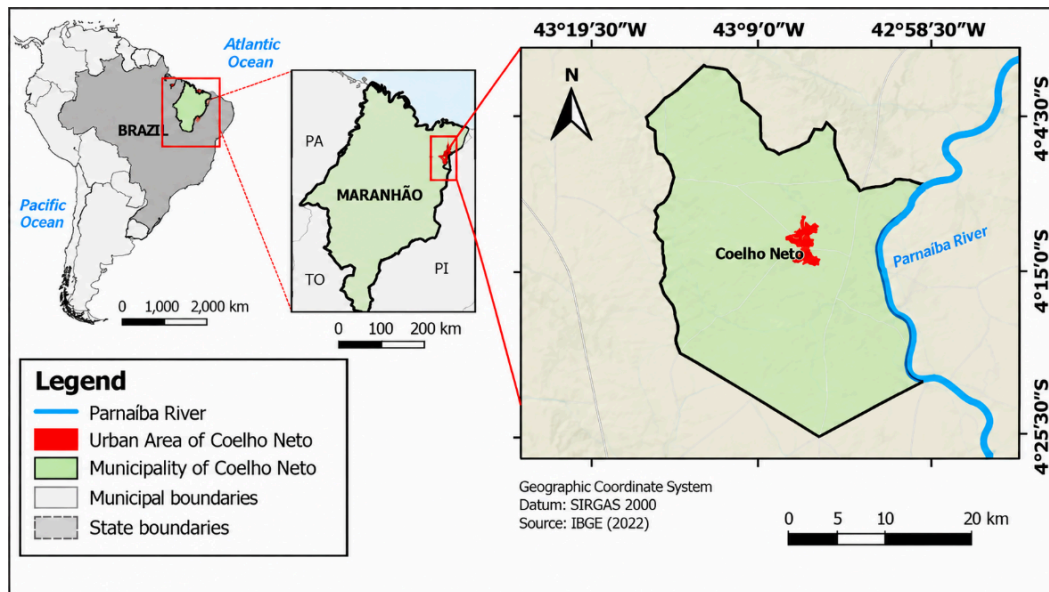
2.1. Study Context And Area

This study was part of the university outreach project 'Fauna in Schools: promoting knowledge of wild mammals among basic education students in Maranhão, northeastern Brazil,' conducted between 2023 and 2026 under the Office of Outreach and Student Affairs of UEMA (PROEXAE/UEMA). The project engaged undergraduate students enrolled in the Biological Sciences teacher education program at UEMA's Coelho Neto campus, including scholarship recipients and volunteers, in teaching, research, and outreach activities aligned with its objectives.

The Fauna in Schools Project was conducted in the municipality of Coelho Neto (4°15'35.00"S; 43°1'5.60"W) and surrounding areas in eastern Maranhão, northeastern Brazil (Figure 1). The region is influenced by the Parnaíba River basin and includes native vegetation in Cerrado, babaçu palm forests, and associated ecotones, while also undergoing transformations linked to urbanization and expansion of the agricultural frontier (Lima et al.,

2016; SEMA, 2023). The activities targeted basic education students at public educational institutions.

Figure 1. Location of the region where the Fauna in Schools Project was carried out



Source: Authors (2026).

2.2. Procedures

Initially, semistructured interviews (Bernard, 2006) were conducted to assess students' knowledge of wild mammals. The questionnaire included 24 animal images: 12 wild mammal species commonly found in eastern Maranhão and 12 exotic mammals frequently featured in educational materials or the media. For each image, students indicated whether they recognized the species and provided its name. Recognition was considered correct when a student provided a common name used locally or widely circulated in the media. The data collection protocol was approved by the Research Ethics Committee of the Federal University of Piauí (CAAE No. 62606516.0.0000.5214).

After the assessment, the team returned to participating schools to present the findings and conduct environmental education activities focused on regional wildlife. These activities were grounded in critical environmental education principles, emphasizing dialogic knowledge construction, connections between content and students' everyday lives, and reflection on socioenvironmental issues (Grün, 2006; Logarezzi, 2010). Lectures, short lessons, workshops, and educational games addressed local wildlife recognition, ecological importance, conservation, and ecosystem services. The activities sought to encourage student participation and strengthen connections with regional biodiversity by integrating scientific content, playful elements, and knowledge related to the local context.

3. RESULTS AND DISCUSSION

3.1. Recognition Of Wild Mammals

During the first stage, 645 students from 11 educational institutions were interviewed (Table 1). The most frequently recognized species were predominantly exotic, except for *Bradypus variegatus* (sloth) and *Hydrochoerus hydrochaeris* (capybara). By contrast, the least recognized species were native to the region. *Galea spixii* (Spix's yellow-toothed cavy) and *Puma concolor* (cougar/Puma) were identified by only 11% and 16% of respondents, respectively (Figure 2).

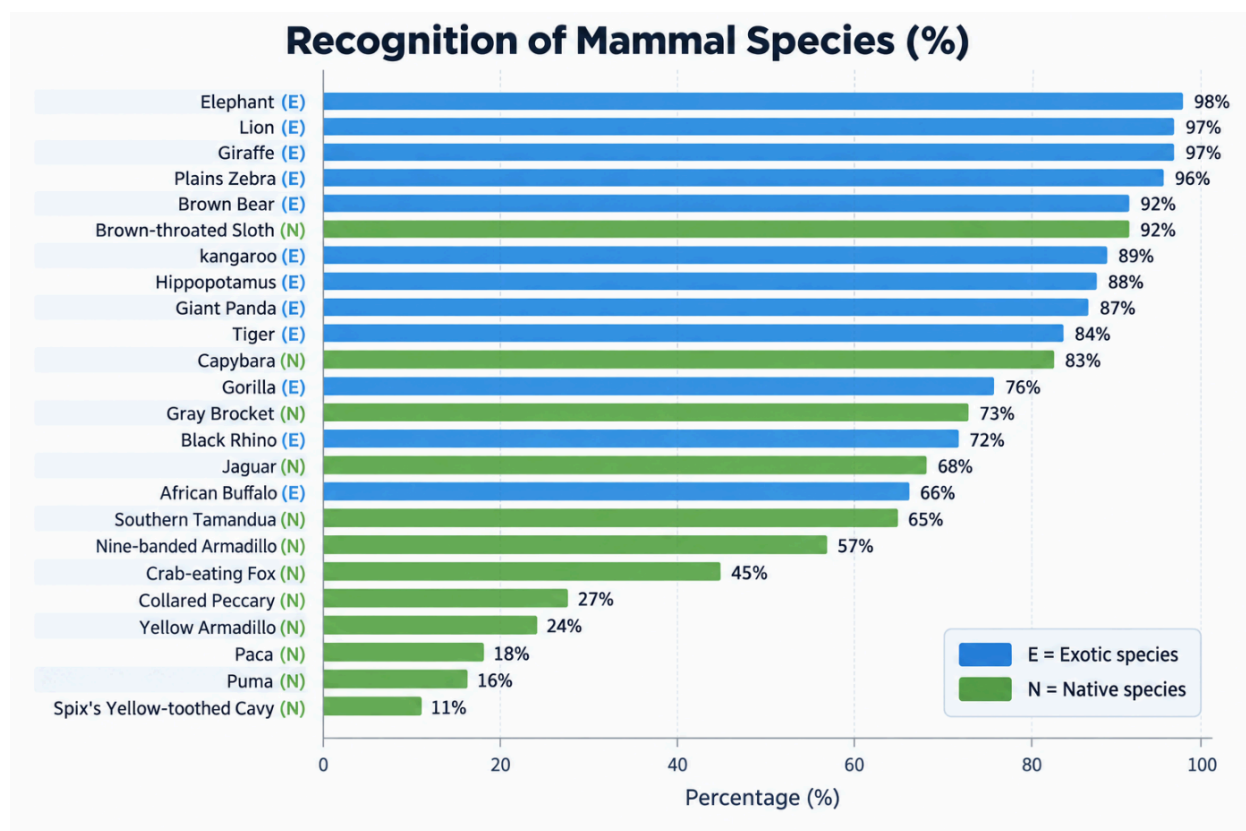
Table 1. Educational institutions participating in the mammal recognition assessment in Coelho Neto, Maranhão, and surrounding areas

Educational institution	Number interviewed	Percentage (%)
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Centro Educa Mais Carlos Duque Bacelar	60	9.3
Centro de Ensino Justino Silva Bastos	102	15.8
Centro de Ensino Paulo Ramos	66	10.2
Centro de Ensino Professor Antônio Nonato Sampaio	40	6.2
Centro de Ensino Professor Luís Viana	26	4.0
Escola Miguel do Arte Castelo Branco	34	5.3
Escola Municipal Felipe de Oliveira	35	5.4
Instituto Estadual de Educação, Ciência e Tecnologia do Maranhão	117	18.1
Instituto Federal de Educação, Ciência e Tecnologia do Maranhão	67	10.4
Unidade Escolar Cléber Sampaio	68	10.5
Unidade Escolar Doutor Moacyr Bacelar Nunes	30	4.7
Total	645	100

Source: Authors (2026).

Figure 2. Percentage of correct recognition of mammal species by basic education students in Coelho Neto, Maranhão, and surrounding areas



Note: N = regional fauna species; E = exotic fauna species. Source: Authors (2025).

Greater familiarity with exotic species is consistent with findings from other educational settings, in which animals widely featured in media and school materials tend to occupy a prominent place in students' memories (Ballouard; Brischoux; Bonnet, 2011; Campos et al., 2012; Campos; Nates; Lindemann-Matthies, 2013). Among Brazilian university students, Silva et al. (2022) observed a similar pattern: all exotic mammals assessed were among the best recognized species, whereas native species such as *Galea spixii* and *Pecari tajacu* had lower identification rates. This pattern suggests that students' familiarity with wildlife depends not only on whether species occur locally, but also on opportunities for exposure to and contact with different animals.

This contrast may be interpreted through the concept of extinction of experience, whereby reduced everyday interactions with nature can limit opportunities for contact with and learning about local biodiversity (Miller, 2005; Pyle, 2011; Soga et al., 2020). Research

indicates that experiences in natural environments may be associated with greater knowledge of local wildlife (Sampaio et al., 2018; Silva et al., 2022; Zhang et al., 2014). For example, Silva et al. (2022) found that rural experiences, particularly farming and fishing, were associated with the ability to recognize native mammals. Although these relationships were not assessed in the present study, the observed pattern reinforces the relevance of expanding opportunities for contact with and contextualized learning about regional wildlife in schools.

Limited familiarity with native wildlife also highlights an educational opportunity. When biodiversity teaching relies predominantly on species unfamiliar to students' surroundings, opportunities to connect scientific content with local places and experiences are reduced. Incorporating regional wildlife into educational practices may therefore broaden opportunities to recognize and learn about native species while fostering meaningful understandings of biodiversity, conservation, and a sense of place. Contextualized educational experiences can thus help connect students with regional wildlife and make biodiversity education more meaningful.

3.2. Environmental Education, Playful Learning, And University Outreach

The second stage involved 833 basic education students from nine institutions and included lectures, short lessons, workshops, educational games, quizzes, and model building (Table 2). Activities centered on regional wildlife and addressed species recognition, ecological importance, threats, and conservation.

Table 2. Environmental education activities conducted at educational institutions in Coelho Neto, Maranhão, and surrounding areas

Educational institution	Environmental education activities	Participants
Centro de Ensino Justino Silva Bastos	Lectures on the importance and conservation of wildlife; games “Fauna Fun,” “What Animal Is This?,” “Wildlife Trail,” and “Mini-Test Quiz.”	176
Centro de Ensino Professor Antônio Nonato Sampaio	Short lesson; workshop on Cerrado mammals; games “Guess the Animal” and “Extinction Link.”	70
Centro Educa Mais Professor Luís Viana	Lecture on native species; games “What Animal Am I?,” memory game, and “Which Animal Am I?”	138
Instituto Estadual de Educação, Ciência e Tecnologia do Maranhão	Game “Footprint Trail: Following Wildlife Tracks.”	40
Instituto Federal de Educação, Ciência e Tecnologia do Maranhão	Game “Treasure Hunt: Which Animal Am I?”	33
Unidade Escolar Dr. Moacyr Bacelar Nunes	Lecture on Cerrado wildlife; memory game and three-clue game.	56
Escola Municipal Francisco Cléber Sampaio dos Santos	Short lesson; lecture; wildlife trail; quiz; “Animal Expert” card game; animal-themed interactive activity; model building.	184
UMI – Unidade Mais Integral Dr. Benedito	Lecture and quiz.	37

Duarte		
Centro Educa Mais Carlos Magno Duque Bacelar	Games “Wildlife Board Game,” “Wildlife Bingo,” and “Which Animal Are You?”	99

Source: Authors (2026).

The range of strategies adopted is consistent with an approach to environmental education that moves beyond exclusively lecture-based content delivery to incorporate participation, dialogue, and contextualization (Grün, 2006; Logarezzi, 2010). In the Fauna in Schools Project, games such as 'Footprint Trail,' 'What Animal Is This?,' 'Treasure Hunt,' and 'Wildlife Bingo' transformed animal characteristics, tracks, and identities into elements of pedagogical interaction. Studies from northeastern Brazil have shown that games featuring Caatinga birds and mammals can be well suited to their target audiences, engaging, and useful for teaching concepts related to local wildlife (Ferreira et al., 2022).

Playful learning, however, should not be viewed merely as entertainment. When connected to students' prior knowledge, age-appropriate language, and concrete conservation issues, it can expand opportunities for participation and learning. In an initiative involving elementary school students, biodiversity activities combining games, comics, and interaction with zoological collections connected scientific knowledge with children's experiences and addressed conservation issues (Silva; Soares; Salomão, 2022). Similarly, environmental education initiatives addressing wildlife have emphasized dynamic, participatory, and contextualized activities grounded in interactivity and playful learning (Puglia; Nishida, 2023).

Another important aspect is the project's university outreach component. Returning to schools after the initial assessment enabled knowledge produced in the first stage to be transformed into educational activities for the very communities involved. This exchange between university and school resembles traveling science communication initiatives that emphasize outreach as a means of democratizing knowledge and connecting with audiences who may not ordinarily access university spaces (Corte et al., 2021). Moreover, research on outreach projects indicates that community-based activities can connect theory and practice while expanding outreach participants' own methodological repertoires (Sousa; Santos, 2025).

The number of participants and variety of activities demonstrate the reach of the initiative, but do not, on their own, provide evidence of lasting changes in environmental knowledge, attitudes, or behavior. Assessing these outcomes requires specific instruments, such as pre- and post-intervention measures and follow-up over time. Such caution is particularly relevant for one-off environmental education activities, in which immediate interest does not necessarily indicate the long-term consolidation of learning and values.

In this context, the main contribution of the second stage was to create educational experiences situated in regional wildlife and to report the findings back to schools. By connecting local species, threats, ecological functions, and playful teaching strategies, the project linked the initial assessment to regional biodiversity education. This connection among scientific knowledge, place, and student participation also aligns with SDGs 4 and 15 by linking quality, contextualized education with awareness of terrestrial biodiversity conservation.

3.3. Assessment And Planning Of Environmental Education Activities

Projects combining knowledge assessment with educational interventions can identify which species students recognize and which remain unfamiliar, providing a basis for designing contextualized activities. This stage is especially relevant because Brazilian studies have documented selective knowledge of biodiversity, with greater familiarity with certain groups or species and gaps in the recognition of native wildlife. For example, in a sample of 990 urban and rural students from semiarid Brazil, mammals and birds accounted for the greatest richness and diversity of animals mentioned in classes, whereas approximately half the participants lacked a conceptual understanding of nature conservation (Oliveira et al., 2020).

In the present study, the assessment provided an empirical foundation for planning educational activities, preventing the intervention from being designed solely around assumptions about what students ought to know. Identifying the most and least recognized species revealed gaps in familiarity with regional wildlife and helped direct teaching toward native species. This approach is particularly relevant given evidence that biodiversity knowledge can be associated with students' everyday experiences. For example, among Brazilian university students, Silva et al. (2022) found greater recognition of exotic species and an association between native wildlife recognition and rural experiences, family farming, fishing, and hunting.

The distinction between conceptual knowledge and species recognition further underscores the value of assessment. Among

high school and Biological Sciences students, Azeredo et al. (2025) found that understanding concepts related to native and exotic species coexisted with difficulties classifying plants common to the region. Although that study focused on plants, its findings are relevant to wildlife education because they show that knowing general biodiversity concepts does not necessarily mean recognizing the species present locally. Similarly, gaps in regional biodiversity recognition among Biological Sciences students support the need for place-based educational approaches (Macedo; Alves, 2025).

Linking assessment to intervention also allows educational strategies to be tailored to the intended audience. In the Fauna in Schools Project, identified gaps in wild mammal recognition were followed by regional wildlife activities combining scientific content, playful learning, and participation. This approach is consistent with research showing that educational games about Caatinga birds and mammals can support learning and appreciation of local wildlife (Ferreira et al., 2022). Beyond cognition, understanding students' relationships with animals can broaden approaches to wildlife education. In a study of high school students in Teresina, Santos et al. (2026) found an association between aversion to vertebrates and lower overall knowledge, emphasizing the need to consider affective and cultural factors and opportunities to experience nature.

Therefore, assessing knowledge of wildlife should be viewed not merely as measurement but as a tool for guiding pedagogical decisions. By revealing which species remain unfamiliar and which aspects of regional biodiversity are less represented in students' knowledge, such initiatives can inform teaching materials, field activities, teacher training, and outreach actions. In the Fauna in Schools Project, the link between assessment and intervention

enabled the team to respond to identified gaps through educational experiences centered on regional wildlife, connecting knowledge production with needs observed in schools themselves.

3.4. Implications For Biodiversity Conservation

Knowledge of local biodiversity is an important dimension of people's relationship with nature and may contribute to the development of conservation-oriented attitudes. When students know little about species occurring in their own region, part of its biodiversity may remain absent from their cultural and educational reference points, limiting opportunities to recognize and value it. Brazilian studies show that formal education may favor more charismatic groups or exotic examples while native species remain poorly recognized (Oliveira et al., 2020; Silva et al., 2022; Macedo; Alves, 2025). This imbalance is especially important in a megadiverse country where biodiversity conservation also depends on integrating local species into education and the relationships that communities build with their environment.

However, the relationship between knowledge and conservation should not be oversimplified. Recognizing a species does not, in itself, ensure conservation-oriented behavior, because environmental attitudes are also influenced by values, experiences, socioeconomic circumstances, access to nature, and cultural factors. Nevertheless, evidence suggests that knowledge can play a role. In Santiago, Chile, students' knowledge of urban birds was positively associated with participation in conservation activities, while neighborhood ecological complexity was linked to bird knowledge (Muñoz-Pacheco; Cerda; Villaseñor, 2025). These results reinforce the

importance of expanding opportunities to learn about local biodiversity and experience biologically diverse environments.

Accordingly, school-based wildlife activities can move beyond naming species to address their distributions, ecological roles, threats, relationships with human communities, and conservation strategies. In Brazil, Oliveira et al. (2020) found that, although nearly 70% of surveyed students reported having studied wildlife conservation, approximately half lacked a conceptual understanding of nature conservation. Including the topic in the curriculum therefore does not, by itself, ensure that students understand it. Contextualized approaches may promote more meaningful connections among biodiversity, the environment, and human practices (Silva et al., 2022).

Appreciation of regional wildlife may also bring students closer to the biodiversity of their everyday lives. Among Brazilian university students, field experiences and rural activities were associated with recognition of native mammals, leading the authors to recommend more field activities and other opportunities to interact with local biodiversity (Silva et al., 2022). Complementarily, Santos et al. (2026) highlight the importance of affective and sociocultural dimensions in wildlife education, particularly for animals that provoke fear or aversion.

Against this background, the Fauna in Schools Project brought regional wildlife more prominently into the school setting and transformed gaps in knowledge into subjects for learning, dialogue, and participation. Using local species in games and other educational activities helped connect ecological concepts to organisms found in ecosystems familiar to students. Experiences in

public schools in Piauí indicate that games featuring Caatinga birds and mammals can support teaching about local species and conservation of wildlife diversity (Ferreira et al., 2022). Conservation can thus be discussed through species, landscapes, and socioenvironmental issues recognizable to students rather than remaining limited to examples far removed from their reality.

Equitable access to opportunities for learning about biodiversity is another important dimension. Muñoz-Pacheco, Cerda and Villaseñor (2025) showed that socioeconomic differences were related to neighborhood ecological complexity and, indirectly, to opportunities to learn about biodiversity and participate in conservation activities. In this sense, projects implemented in public schools may broaden educational opportunities for students with varying degrees of everyday access to green spaces and wildlife. Schools can therefore serve as spaces for democratizing biodiversity knowledge and, where feasible, facilitating direct experiences with nature.

Although the present study did not assess long-term changes in conservation-related knowledge, attitudes, or behavior, combining assessment, environmental education, and university outreach offers a way to connect regional biodiversity with everyday school life. Continued activities, integrated into participating institutions' educational planning, may expand opportunities to learn about local wildlife and strengthen its role in conservation education, consistent with SDGs 4 and 15.

4. FINAL CONSIDERATIONS

The findings reveal a mismatch in basic education students' recognition of regional wildlife, reinforcing the importance of

incorporating local biodiversity into educational content and practices. In this context, the surrounding region can provide a meaningful reference point for science teaching and environmental education, connecting school subjects with species and environments familiar to students.

Combining assessment and educational intervention proved to be a relevant strategy for identifying knowledge gaps and guiding contextualized activities about regional biodiversity. However, the data does not allow conclusions about lasting changes in conservation-related knowledge, attitudes, or behavior. Future studies could include pre- and post-intervention assessments and longitudinal follow-up to evaluate these dimensions.

The Fauna in Schools Project demonstrates the value of collaboration between universities and basic education institutions in connecting scientific knowledge, local contexts, and regional biodiversity. Sustaining such initiatives as part of school educational planning may increase opportunities to learn about regional wildlife and strengthen its inclusion in conservation education, in line with SDGs 4 and 15.

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