



LETTER TO THE EDITOR

## Empowering Indigenous students to engage in Amazon conservation

SERGIO SANTORELLI JUNIOR, JOSÉ AUGUSTO PIRAHÃ KAA'AOI, RAFAEL DE FRAGA, LIS F. STEGMANN, DANIELA BÔLLA, IGOR YURI FERNANDES, JANSEN ZUANON & WILLIAM E. MAGNUSSON

Indigenous peoples and their interactions with the natural world are crucial for Amazonian biodiversity and sustainable socioeconomic systems (Athayde et al. 2021). Developing policies for raising awareness about indigenous Amazonian languages, including concrete actions for integrating linguistic conservation, guarantee environmental justice and sustainable development in the Amazon (van der Voort et al. 2021). Engaging indigenous youth is a promising strategy, as many are willing to participate in conservation efforts (Franzolin et al. 2020), and therefore it is important to include topics about conservation, biodiversity and science in indigenous-school agendas.

In Brazil, 98% of the indigenous lands are in the northern region, known for its significant ethnic and linguistic diversity (Crisostomo et al. 2015). Young students in this area display a keen interest in local biodiversity (Franzolin et al. 2020). However, Biology textbooks poorly cover Amazonian biodiversity, often with superficial content and technical-scientific terms hindering early student learning (Leal et al. 2019). Additionally, most educational material is in Portuguese, leading to limited efforts in preserving indigenous-language diversity for future generations. To address this, we prepared three illustrated wildlife guides in Tupi-Kagwahiva, a shared language among ethnic groups in southwestern Amazonia (Fig. 1).

Publishing books in indigenous languages is a significant achievement for the democratization of science and the empowering threatened peoples and cultures by urbanization and land-use changes. However, ensuring quality entails overcoming various challenges. Finding a bilingual indigenous translator proved challenging, and even those fluent in both languages depend on their leaders' approval to take on translation tasks. Moreover, numerous Portuguese lacked equivalents in Tupi-Kagwahiva, necessitating adjustments to the original text. Careful modification was crucial to avoid losing important information. Also, the payment for translating Portuguese into indigenous language was complicated due to the lack of appropriate regulation by research-funding agencies.

In the first book, "*Kurua Humaitá Kavyra Porá*", the students will learn about the enormous variety of shapes, colors, and habits of the local frogs (Lima et al. 2023). In the second book, "*Moia Humaitá Kavyra Porá*", an introduction is made to the poisonous snakes and their main



**Figure 1.** Wildlife guides focusing on frogs, venomous snakes and stream fish were translated into Tupi-Kagwahiva, a common language to various ethnic groups in southwestern Amazonia.

characteristics that can help identify potentially dangerous species (Fraga et al. 2023). The third book, “*Pira Yae Rekwarupiva’ea*”, presents the main fish groups found in the network of small forest streams (*igarapés*) and offers insights into regional fish diversity and curiosities about stream-fish behavior (Stegmann et al. 2023).

At the end of this initiative, we expect to fill an education gap and provide high-quality indigenous language educational material. This will contribute to building more respectful and integrated relationships between scientific and traditional knowledge. Young indigenous people are fundamental actors to ensure biocultural diversity protection, which can only be achieved if the multilingual characteristic of the Amazon is not considered an obstacle, but rather a rich legacy and

an opportunity. With this initiative we show that, however complex the transliteration of technical-scientific knowledge into the indigenous language may be, this is an essential initial step for other initiatives and enables a reframing of the way education in indigenous schools has been configured and applied.

## REFERENCES

- ATHAYDE S, SHEPARD G, CARDOSO TM, VAN DER VOORT H, ZENT S, ROSERO-PEÑA MC, ALMEYDA ZAMBRANO A, WAWAEITXAPÔH SURUÍ G & LARREA-ALCAZAR DM. 2021. Chapter 10: Critical interconnections between the cultural and biological diversity of Amazonian peoples and ecosystems. In: Amazon Assessment Report 2021, UN Sustainable Development Solutions Network (SDSN). doi: 10.55161/IOBU4861.
- CRISOSTOMO AC, ALENCAR A, MESQUITA I, CASTRO I, MARTHA S, DOURADO F, MOUTINHO P, CONSTANTINO P & PIONTEKOWSKI V. 2015. Terras Indígenas na Amazônia Brasileira: reservas de carbono e barreiras ao desmatamento, n. 1. Brasília, 16.
- FRAGA R, LIMA A, SANTORELLI S, FERNANDES I, MASSELI G, ANJOS M & MAGNUSSON W. 2023. Moia Humaitá Kavyra Porá - Cobras venenosas e espécies semelhantes na região de Humaitá (Tradução em Tupi-Kagwahiva), n. 1. Manaus, 48 p.
- FRANZOLIN F, GARCIA PS & BIZZO N. 2020. Amazon conservation and students' interests for biodiversity: The need to boost science education in Brazil. *Sci Adv* 6: doi 10.1126/sciadv.abb0110.
- LEAL C, MEIRELLES R & RÔÇAS G. 2019. What do high school students think about genetics? Content concepts based on a content analysis. *Revista Eletrônica Científica Ensino Interdisciplinar* 5: 71-86. doi: 10.21920/recei720195137186.
- LIMA A, FERRÃO M, DAYRELL J, FRAGA R, SANTORELLI S, MAGNUSSON W, ANJOS M & FERREIRA A. 2023. Kurua Humaitá Kavyra Porá - Sapos da Região de Humaitá: Uma introdução à diversidade de sapos para estudantes e ecoturistas (Tradução em Tupi-Kagwahiva), Humaitá, Amazonas, n. 1. Manaus, 56 p.
- STEGMANN L, ZUANON J, SANTORELLI S, MAGNUSSON W, LOURENÇO I, BASTOS D, MENDONÇA F & ANJOS M. 2023. Pirae Yae Rekwarupiva'ea - Guia ilustrado dos peixes de igarapés da BR-319: Uma introdução à biodiversidade (Tradução em Tupi-Kagwahiva), n. 1. Manaus, 56 p.
- VAN DER VOORT H, RODRIGUEZ ALZZA AC, DILLON SWANSON T & CREVELS M. 2021. Chapter 12: Languages of the Amazon: Dimensions of diversity. In: Amazon Assessment Report 2021, UN Sustainable Development Solutions Network (SDSN). doi: 10.55161/WJLU9122.

### How to cite

SANTORELLI JUNIOR S, KAA'AOI JAP, FRAGA R, STEGMANN L, BÔLLA D, FERNANDES IY, ZUANON J & MAGNUSSON WE. 2024. Empowering Indigenous students to engage in Amazon conservation. *An Acad Bras Cienc* 96: e20230827. DOI 10.1590/0001-3765202420230827.

*Manuscript received on July 27, 2023;  
accepted for publication on September 13, 2023*

### SERGIO SANTORELLI JUNIOR<sup>1</sup>

<https://orcid.org/0000-0003-1479-3040>

### JOSÉ AUGUSTO PIRAHÃ KAA'AOI<sup>2</sup>

### RAFAEL DE FRAGA<sup>3</sup>

<http://orcid.org/0000-0002-9900-4276>

### LIS F. STEGMANN<sup>4</sup>

<https://orcid.org/0000-0002-6047-9928>

### DANIELA BÔLLA<sup>5</sup>

<https://orcid.org/0000-0002-0527-5631>

**IGOR YURI FERNANDES<sup>5</sup>**

<https://orcid.org/0000-0002-7930-7851>

**JANSEN ZUANON<sup>6</sup>**

<https://orcid.org/0000-0001-8354-2750>

**WILLIAM E. MAGNUSSON<sup>6</sup>**

<https://orcid.org/0000-0003-1988-3950>

<sup>1</sup>Universidade Federal do Amazonas, Instituto de Educação, Agricultura e Ambiente, Rua 29 de Agosto, 786, Centro, 69800-000 Humaitá, AM, Brazil

<sup>2</sup>Aldeia Maagaguii, Humaitá, Amazonas, Brazil

<sup>3</sup>Universidade Federal do Oeste do Pará, Laboratório de Ecologia e Comportamento Animal, Rua Vera Paz, s/n, Salé, 68040-255 Santarém, PA, Brazil

<sup>4</sup>Embrapa Amazônia Oriental, Tv. Dr. Enéas Pinheiro, s/n, Marco, 66095-903 Belém, PA, Brazil

<sup>5</sup>Instituto Nacional de Pesquisas da Amazônia, Programa de Pós-graduação em Ecologia, Av. André Araújo, 2936, Aleixo, 69060-001 Manaus, AM, Brazil

<sup>6</sup>Instituto Nacional de Pesquisas da Amazônia, Coordenação de Biodiversidade, Av. André Araújo, 2936, Aleixo, 69060-001 Manaus, AM, Brazil

Correspondence to: **Sergio Santorelli Junior**

*E-mail: santorelli.jr@gmail.com*

**Author contributions**

All authors contributed to the intellectual conception, writing and preparation of the letter.

