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Editorial

Climate Impact on Forest Species: Historical and Future Perspectives in the Western Amazon

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The Amazon Forest is the largest tropical forest in the world and plays a fundamental role in the global hydrological cycle. The loss of forest cover can lead to significant increases in land surface temperature and, consequently, to reductions in precipitation, particularly during the dry season [1]. In addition, the forest strongly influences the regional microclimate by buffering macroclimatic effects, reducing air temperature, and increasing relative humidity. In this context, precipitation becomes a key factor, as the microclimate exhibits a climate-buffering effect approximately 8.6% greater during the rainy season than during the dry season [2]. These climatic variations may stimulate species migration to more favorable environments or, in extreme cases, lead to local extinction. Species that are better adapted to new climatic conditions tend to thrive and become more abundant in the habitats they occupy. However, climate change has accelerated due to anthropogenic activities, altering the Earth's landscape in multiple ways, from degrading water quality for human consumption in rivers and oceans through changes in pH, to reducing air quality as a result of increased concentrations of greenhouse gases (GHGs), such as carbon dioxide (CO_2) and methane (CH_4) [3]. Climate change has also intensified natural climate phenomena such as the El Niño–Southern Oscillation (ENSO), which consists of two opposite phases of the same natural climate pattern occurring in the Pacific Ocean. These phases are characterized by significant differences in sea surface temperature, winds, surface pressure, and precipitation, triggering a wide range of global climate impacts [4]. Variations in these phenomena, combined with the environmental changes to which trees are exposed, directly affect growth quality in terms of height, diameter increment, and crown expansion [5]. Tree trunks are slow-growing structures and are widely used to estimate tree age and to analyze climatological variations that influence tree development [6]. Growth rings are the primary indicators of long-term climatic variability, being particularly well defined in temperate regions where seasonal contrasts are strong [7]. In tropical forests, however, the formation of growth rings in many species is associated with hydrological seasonality, with wood growth occurring during the rainy season (light rings), followed by darker rings formed during the dry season when growth is reduced or ceases [8]. Dendrochronology is the science that studies tree growth rings to determine the exact year of their formation and to analyze temporal and spatial patterns of physical and environmental processes. A related discipline, dendroclimatology, uses tree-ring records to study present climate conditions and to reconstruct past climate variability [9]. In this context, integrating dendroclimatological studies with future scenarios proposed by the Intergovernmental Panel on Climate Change (IPCC), known as the Shared Socioeconomic Pathways (SSPs), is of great importance for understanding the past, present, and future dynamics of forests and their vulnerability under climate change scenarios. The Antimary State Forest represents an emblematic example of a strategic area for studies on climate change and biodiversity, particularly due to its role in atmospheric carbon dioxide sequestration and the conservation of forest species. Located in the Western Brazilian Amazon, this region stands out for having a well-established forest management plan, with species georeferenced and identified at the species level. This infrastructure facilitates high-precision field and laboratory analyses, allowing robust comparisons with studies conducted in other regions. This project is being carried out and funded by the Brazilian National Council for Scientific and Technological Development (CNPq) through a Research Productivity Fellowship (Process No. 306275/2024-4).

References

1. Franco MA, Rizzo LV, Teixeira MJ, Artaxo P, Azevedo T, et al. (2025) How Climate Change and Deforestation Interact in the Transformation of the Amazon Rainforest. Nat Commun 16(1): 7944.
2. Ma Z, Gris D, do Nascimento PJFP, de Castilho CV, Ribeiro SC, et al (2025) The Variability of Microclimate in the Amazon Rainforest. Agric For Meteorol 375: 110866.
3. IPCC (2021) Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press 41 pp.
4. Golden Gate Weather Services – GGWS (2024) El Niño and La Niña years and intensities based on the Oceanic Niño Index (ONI). Available at: https://ggweather.com/enso/oni.htm (accessed 21 January 2024).
5. Kint V, Aertsen W, Campioli M, Vansteenkiste D, Delcloo A, et al. (2012) Radial Growth Change of Temperate Tree Species in Response to Altered Regional Climate and Air Quality During the Period 1901–2008. Climatic Change 115: 343-363.
6. Sette Jr CR, Tomazello M, Lousada JL, Lopes D, Laclau JP (2016) Relationship Between Climate Variables, Trunk Growth Rate and Wood Density of Eucalyptus Grandis Trees. Revista Árvore 40: 337-346.
7. Silva MDS, Funch LS, da Silva LB (2019) The Growth Ring Concept: Seeking A Broader And Unambiguous Approach Covering Tropical Species. Biol Rev 94(3): 1161-1178.
8. Quesada-Román A, Ballesteros-Cánovas JA, George SS, Stoffel M (2022) Tropical and Subtropical Dendrochronology: Approaches, Applications, and Prospects. Ecological Indicators 144 109506.
9. Schweingruber FH (2012). Tree Rings: Basics and Applications of Dendrochronology. Springer Science & Business Media.