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What's in a name — the battle to save Brazil's biodiversity

Brazil has one of the highest levels of plant biodiversity in the world, but many local habitats are under pressure. Find out how the EUBrazilOpenBio project is using cloud computing to help conservation efforts in the region.



The Amazon rainforest dominates over two thirds of Brazil. Image courtesy NASA, Wikimedia Commons.

Brazil is one of Earth's greatest biodiversity hotspots and is home to more vascular plant species than any other country in the world. Over two thirds of Brazil is dominated by the Amazon rainforest, where one can find over 400 different tree species per hectare in many areas. Despite, deforestation of the Amazon having slowed to a rate of around 4,500 square kilometers per year - [down from a peak of over 27,000 square kilometers in 2004](#) - this biodiversity is under severe pressure. [354 of Brazil's plant species are currently listed as 'endangered' or 'vulnerable'](#) and an additional 50 species are classified as being 'critically endangered'.

Consequently, it is of paramount importance that conservationists working in the region have access to reliable taxonomic information classifying the names of species. Such information is essential for reliable environmental science, for monitoring

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changes in biodiversity and for effectively addressing challenges related to climate change, both locally and on a global scale. However, accessing and using taxonomic information is not always easy, since conservationists and researchers cannot always be sure that the same taxonomic name will appear in different catalogues of biodiversity in the region. Often, different names in different catalogues may in fact refer to the same species, or species listed in one catalogue may be omitted from another entirely.

"One major problem is integrating regional taxonomies that have been created locally for regional floras and faunas with global taxonomies linked to worldwide monographs and species databases" explains [Alex Hardisty, director of informatics projects at Cardiff School of Computer Science and Informatics, Cardiff University, UK.](#)

"The ability to cross-reference between regional and global taxonomic data sets is often masked by complex differences in the taxonomic classification used. A species may, for instance appear to be missing from one catalogue because it is subsumed within another species in the other catalogue".

Solving this problem is where [EUBrazilOpenBio](#) comes in. The project deploys a joint EU-Brazil cloud-computing-based e-infrastructure of open access resources that allows sharing of hardware, software and data on-demand. These resources are being put to use by both European and Brazilian scientists to help conduct a wide range of conservation and research programs. One such

initiative entails use of the [Catalogue of Life Cross-Mapping Tool](#), developed by scientists at Cardiff University, to improve taxonomic information relating to Brazil's plant species.

The tool cross-maps the regional [List of Species of Brazilian Flora](#), containing around 10,000 species organized under 40,000 plant taxa names (including synonyms), against the global [Species2000/ITIS Catalogue of Life](#), indexing about 150,000 plant species. The Catalogue of Life Cross-mapping Tool helps manage differences between catalogues by detecting, analyzing and reporting not only differences between two checklists of species, but also differences in their taxonomic treatment. It then identifies potential resolutions to help researchers resolve these differences.

A virtual herbarium

The EUBrazilOpenBio project is also building on the efforts of the [Brazilian National Institute of Science & Technology](#) to create a [virtual herbarium](#) of flora and fungi. The aim is to generate species distribution (or [ecological niche](#)) models based on specimen data. "Our cooperation with the Brazilian Virtual Herbarium is also part of the drive towards a more complete and integrated view, identifying knowledge gaps in the biogeography of flora and using herbarium data to generate ecological niche models", says [Vanderlei Canhos](#), director of the [Reference Centre on Environmental Information in Brazil](#) and EUBrazilOpenBio's Brazilian coordinator.

Creating the virtual herbarium requires interaction with both the [List of Species of the Brazilian Flora](#), which contained approximately 40,000 plant names in its most recent edition, and the [Species Link network](#), which currently provides almost 5 million species occurrence records from hundreds of institutions.

The idea is to benefit from the 'taxonomic intelligence' of the tool and support a pilot study that analyzes the regional plant catalogue of Brazil against the global index of plants within the Catalogue of Life. This will be used to improve the linkage between the terms in the lists and to enhance both the Catalogue of Life and the Brazilian List of Flora. In turn, this will allow taxonomic and biodiversity specialists to utilize richer data and will hopefully also lead to the exchange of information in both directions (from the regional Brazilian List of Flora to the Catalogue of Life and *vice-versa*), thus helping to fill and close gaps between the different taxonomies. This consolidation is likely to be a significant boon to the conservation efforts of scientists who make use of these catalogues in their research and should help provide a fuller picture of biodiversity levels in Brazil.

The motivation behind EUBrazilOpenBio is twofold, says Rosa Badia, the project's European coordinator. "On one hand it aims to tap into existing different European and Brazilian high quality data sources and tools to provide biodiversity scientists with easy access to an even

greater knowledge base, achieved through the integration and shared use of appropriate computing resources."

However, she adds: "A second key defining characteristic of the EUBrazilOpenBio initiative is its goal to aggregate disparate compute and data technologies into a coherent and integrated research environment for the benefit of the biodiversity community. EUBrazilOpenBio supports the open access movement, promoting the concept of openness for scientific research by leveraging the achievements, components and infrastructures developed in other projects, so that both regions can capitalize on earlier investments and bring to the table experiences on user-centric approaches."

This principle of capitalizing on existing e-infrastructure is absolutely central to EUOpenBio, as the project's Brazilian scientific director, Vinod Rebello, explains: "The infrastructure is using carefully chosen core technologies from other projects. Rather than create a new monolithic infrastructure, we wish to demonstrate an infrastructure model that is capable of harnessing existing disparate resources (infrastructures) to provide a coherent research environment for scientists."

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