

# **Amazonian streams found teeming with fish species are lacking protection**

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Credit: Cecília Gontijo Leal

Hundreds of thousands of Amazonian streams are teeming with highly diverse populations of fish species, a new study reveals.

Scientists have found that small streams, in areas of the eastern Brazilian Amazon that are a mixture of [forest](#) and farmland, contain fauna new to science, as well as very rare species.

The team from Lancaster University and the Sustainable Amazon Network (an initiative bringing together more than 30 institutions) looked at 83 small streams approximately three metres wide. In a single 150m stretch of stream scientists found more species than found in the whole of countries such as Norway or Denmark.

In addition, they found that even in the same river basin, streams that are a few dozen miles from each other can have different sets of species. This means that keeping a few streams within protected areas is not enough to safeguard such biodiversity.

However, the research, published in the *Journal of Applied Ecology*, has led to concerns from the authors that the streams, and their [fish](#) populations, are not sufficiently protected by current environmental laws.

Dr. Cecília Gontijo Leal, lead author of the study and researcher at the Emílio Goeldi Museum in Brazil, said: "Our study demonstrates that private properties, such as farms, are of great importance in ensuring conservation in the Amazon. Protected areas alone will not suffice to guarantee the conservation of stream fish. It is fundamental to enforce conservation measures aimed at small streams beyond parks and other



public reserves."

The most important environmental legislation in private properties, the Brazilian Forest Code, focusses in protecting the vegetation in the riparian zones alongside watercourses. But the new study demonstrates that factors occuring beyond the riparian zones, and which are not addressed by Brazilian environmental legislation, also threaten the fish fauna.



Credit: Cecília Gontijo Leal

"The conservation of small Amazonian streams depends on the overall health of the catchments of which they are part," said Professor Jos Barlow of Lancaster University and study co-author. "The fish are not only affected by deforestation in the forest margins. Forests furthest from the margins are also important, as well as other developments not mentioned in the legislation, such as unpaved roads and agriculture intensification," he added.

The results have important implications for the implementation of the Forest Code in the Brazilian Amazon. The law allows a deforested area in a given property to be compensated anywhere in the biome. But the study underscores the importance of compliance efforts to take place locally, either by focusing on rehabilitation in landscapes that are heavily deforested or by undertaking off-farm compensation within the same [river basin](#). The authors also point out that the focus of the Forest Code on riparian forest patches should not undermine the need to maintain and restore native vegetation in areas further away from the streams.

"Our results highlight the complexity of the conservation of a group that represents an important part of the world's biodiversity, since almost 10 per cent of the planet's vertebrates are freshwater Amazonian fish," added Dr Paulo Pompeu, Professor at the Federal University of Lavras in Brazil and another co-author of the study.

These hundreds of thousands of small streams comprehensively occupy the Amazonian landscapes and represent up to 90 per cent of the of the total water-course length in some sub-basins.

**More information:** Cecília G. Leal et al. Is environmental legislation conserving tropical stream faunas? A large-scale assessment of local, riparian and catchment-scale influences on Amazonian fish, *Journal of Applied Ecology* (2017). [DOI: 10.1111/1365-2664.13028](https://doi.org/10.1111/1365-2664.13028)

Provided by Lancaster University

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