

# Deforestation in the tropics causes declines in freshwater fish species

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(Left) Photo showing that drought conditions had reduced the water flow in one of the freshwater stream study sites located in Sabah. (Right) Researchers performing fieldwork to obtain fish specimens for their study. Credit: Tan Heok Hui

NUS ecologists have found that *Nematabramis everetti*, a common freshwater fish species that is resilient to climate change-associated drought conditions, is nevertheless unable to escape the effects of deforestation, with significantly reduced numbers in streams that run through the logged areas on the island of Borneo.

Southeast Asia has among the highest levels of deforestation as forested areas are converted for agricultural purposes such as palm oil production. Destruction of pristine rainforest affects not only the terrestrial flora and fauna, but also the [freshwater fish](#) and other aquatic organisms living in the rivers and streams running through the area. These effects were exacerbated in 2016 by a severe El Niño weather pattern that brought [drought](#) to the region. Changes in land use and extreme climatic events are thought to have synergistic impacts on the local aquatic biodiversity. However, there are limited studies on this issue in the tropics.

Research studies by Prof Darren Yeo and his research fellow, Dr. Clare Wilkinson from the Department of Biological Sciences, NUS, found that *Nematabramis everetti*, a local common species from the carp family found in the streams of Sabah, Malaysia, is resilient to drought conditions in its environment. However, this silver-coloured [tropical fish](#) that can grow up to about 10 cm in length has reduced numbers in forested areas that had undergone logging activities.

The other research team members include Dr. Tan Heok Hui from the Lee Kong Chian Natural History Museum, NUS, and Prof Rob Ewers from Imperial College London. In a separate study, the research team also found that the variety of freshwater fish species was reduced in areas that had been subjected to logging or converted to oil palm plantations when compared to protected forested areas.



*Nematabramis everetti*, a common and economically important freshwater fish species found in the forest streams of southeastern Sabah in this study. Credit: Tan Heok Hui

A severe drought in 2016 reduced 16 streams located in the southeastern part of Sabah in Borneo into a series of disconnected pools of water. This provided an opportunity to study the ecological impact on the local fish population. These streams run through different land uses comprising primary forest, forest subjected to logging, and oil palm plantations. Under normal conditions, the streams had a water depth of up to 1.2 meters and ranged from about three to ten meters wide. The research team collected data on the abundance and biomass of *Nematabramis everetti* before, during and after the drought over four years.

Dr. Wilkinson said, "Although water temperature rose, oxygen levels dropped, and the fish were restricted to a smaller area, *Nematabramis everetti* was surprisingly resilient to these [drought conditions](#). However, its population was still significantly reduced in streams that run through regions which are subjected to logging activities."

Prof Yeo said, "It is ecologically important to continue monitoring this abundant [fish](#) species, which provides an important ecosystem service to local human communities, and how it is affected by future [climate change](#) and land-use change, such as logging, deforestation and conversion to plantation monocultures across Southeast Asia."

The research team believes that these results are fundamental to developing mitigation strategies for dealing with future environmental changes.

**More information:** Clare L Wilkinson et al. Resilience of tropical, freshwater fish (*Nematabramis everetti*) populations to severe drought over a land-use gradient in Borneo, *Environmental Research Letters* (2019). [DOI: 10.1088/1748-9326/ab0128](https://doi.org/10.1088/1748-9326/ab0128)

Clare L. Wilkinson et al. Land-use change is associated with a significant loss of freshwater fish species and functional richness in Sabah, Malaysia, *Biological Conservation* (2018). [DOI: 10.1016/j.biocon.2018.04.004](https://doi.org/10.1016/j.biocon.2018.04.004)

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