

Land-use change is associated with a significant loss of freshwater fish species and functional richness in Sabah, Malaysia

ABSTRACT

Global biodiversity is being lost due to extensive anthropogenic land cover change. In Southeast Asia, biodiversity-rich forests are being extensively logged and converted to oil-palm monocultures. The impacts of this land-use change on freshwater ecosystems, and particularly on freshwater biodiversity, remain largely understudied and poorly understood. We assessed the differences between fish communities in headwater stream catchments across an established land-use gradient in Sabah, Malaysia (protected forest areas, twice-logged forest, salvage-logged forest, oil-palm plantations with riparian reserves, and oil-palm plantations without riparian reserves). Stream fishes were sampled using an electrofisher, a cast net and a tray net in 100 m long transects in 23 streams in 2017. Local species richness and functional richness were both significantly reduced with any land-use change from protected forest areas, but further increases in land-use intensity had no subsequent impacts on fish biomass, functional evenness, and functional divergence. Any form of logging or landuse change had a clear and negative impact on fish communities, but the magnitude of that effect was not influenced by logging severity or time since logging on any fish community metric, suggesting that just two rounds of selective impact (i.e., logging) appeared sufficient to cause negative effects on freshwater ecosystems. It is therefore essential to continue protecting primary forested areas to maintain freshwater diversity, as well as to explore strategies to protect freshwater ecosystems during logging, deforestation, and conversion to plantation monocultures that are expected to continue across Southeast Asia.