How forest fragmentation is impacting on amphibian and reptile species

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Experts call for new conservation guidelines after research shows 90% of tropical amphibian and reptile species are affected by the 'edge effect' and forest islands less than 500m in diameter are putting many at risk.

Breaking up the rainforest into small 'forest islands' means more species are being forced to live on the forest edge, prompting a decline in species sensitive to changes in light, moisture and temperature.

Studying over 100 species of reptiles and amphibians living in nine fragmented forest landscapes in Central and South America, scientists found that over 90 % of all species were affected by the forest edge effect. While a small number of these actually increased in abundance (those already adapted to living at the forest boundary), the majority of species declined and the negative impact on them extended far into the forest interior.

Sampling in areas where the forests had been divided to make way for farming or roads, the research team led by Newcastle University, UK, showed the average 'edge effect' extended more than 250m into the forest. This means a forest island with a diameter of less than 500m would contain no viable 'core' area for many forest species.

Publishing their findings today in the academic journal *Biological Conservation*, the research team – involving experts from Imperial College, the University of East Anglia and Colombia University - are calling for a new approach to forest conservation and management.

Dr Marion Pfeifer, one of the lead authors and a lecturer in Ecology, Conservation and Management at Newcastle University, explains:

"The rapid decline in the world's rainforests is having a devastating effect on species numbers and diversity but until now there has been little information about the additional impact of forest fragmentation.

"In our study, we found the majority of amphibian and reptile species were negatively impacted the closer we got to the forest edge and in some cases, species disappeared altogether."

"The findings have strong implications for conservation in fragmented tropical landscapes and suggest large forest patches will need to be conserved to protect forest-dependent species and avoid loss of biodiversity."

Combined impact of deforestation and fragmentation

Forest fragmentation acts on top of forest loss, as habitats are broken up into increasingly smaller, isolated patches. This in turn reduces the core area of favourable habitat for forest species.

In the Brazilian Atlantic forest, for example, more than 80% of the fragments are less than 50 hectares and half of the remaining forest is closer than 100m from an edge, much smaller than the minimum 250m needed to preserve species diversity.

"These 'edge zones' differ structurally and functionally from the original forest," explains Dr Pfeifer.

"Edges are typically characterised by more open canopies, leading to reduced moisture, increased light, wind and maximum daily temperatures. This compares to the core where the dense canopies can

filter up to 95% of the solar radiation and the environment is more constant.

"Some species, such as many amphibians and reptiles, are more sensitive than others to changes in the microclimate so this edge zone effect will significantly impact their ability to survive."

"Also, while many species may decline, some others may actually benefit, particularly those species that are less sensitive to temperature, light and moisture variability."

Amphibians under threat

Amphibians are the world's most threatened group on the IUCN Red List of threatened species, the world's most comprehensive information source on the global conservation status of animal, fungi and plant species.

Assessing the abundance of 104 species of amphibians and reptiles in nine fragmented forest regions in the Neotropics, the team found that only two amphibians and eight reptiles were not sensitive to the edge effect.

Now the team are looking at the impact of the 'edge effect' caused by fragmentation on other species, from insects to birds and mammals, and how this information might be used to inform future conservation and management strategies in fragmented forested landscapes. For this, the team will make use of an extensive dataset compiled within the Global Biofrag project, led by Dr Pfeifer (biofrag.wordpress.com/).

"Road expansion is a key priority for communities in this part of the world so this research will be vital in helping to inform future management plans," says Dr Pfeifer.

"Amphibians and reptiles are useful indicator species to assess the overall health of the forest ecosystem and the next step will be to work with local communities to see how we can best protect biodiversity under conflicting land use demands."

More information: Laure Schneider-Maunoury et al. Abundance signals of amphibians and reptiles indicate strong edge effects in Neotropical fragmented forest landscapes, *Biological Conservation* (2016). DOI: 10.1016/j.biocon.2016.06.011

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