

Effects of land use and climate change on biodiversity based on the example of lemurs in Madagascar's humid forest

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Introduction

Since 1500, there have been 993 known extinctions and currently, over 44,000 species are threatened with extinction. The rate of species loss has increased significantly since 1900. Biodiversity, the variety of animal and plant species, is in crisis. One of the earth's biodiversity hotspots is the humid forest of Madagascar. It is home to a huge number of species, most of which are endemic, such as the lemurs. 95% of their 112 species are threatened with extinction (Fig. 1), making them one of the most endangered mammal groups in the world. This threatens the entire ecosystem in which they live because of their keystone functions, such as seed dispersal. Many species are sensitive to anthropogenic impacts on their habitats. We are therefore investigating how climate and land use changes are affecting Madagascar's humid forest. Land use change has been identified as the greatest threat to biodiversity, while ongoing climate change raises many questions about its impact on biodiversity.

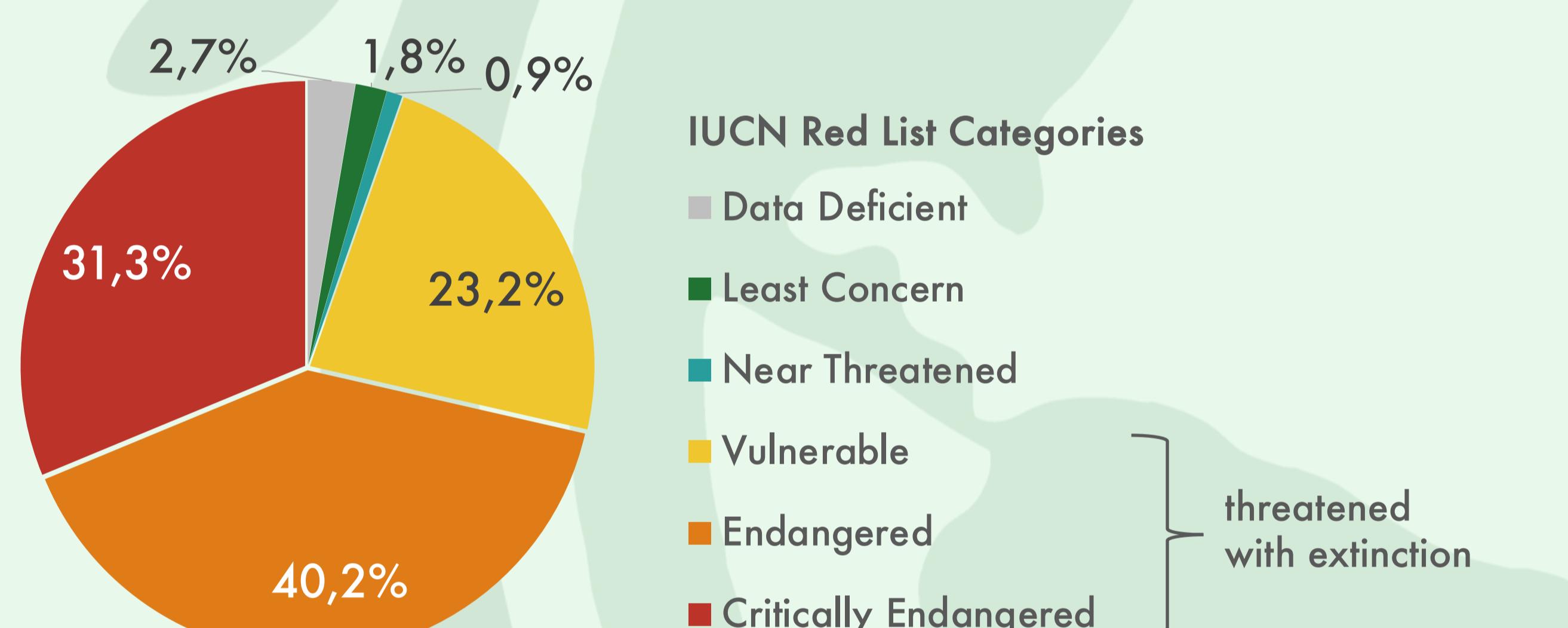


Fig 1: The IUCN Red List categories indicate the percentage of endangerment for all 112 lemur species (IUCN 2024).

Results

Madagascar's humid forest is highly impacted by deforestation. More than 50% has disappeared since 1953 (Fig. 2). The main cause of this process are slash-and-burn practices to clear land for agriculture. Deforestation leads to habitat fragmentation and degradation, which negatively influences lemurs. For example, genetic exchange between populations decreases, as many species avoid the matrix between fragments. Proximity to human settlements leads to disturbances, which can cause sensitive species to leave their habitats.

Climate change is contributing to the degradation of Madagascar's humid forest, in addition to land-use change. Less severe climate



scenarios such as SSP2 4.5 indicate that significant portions of the island's forest could disappear due to climate change alone. In addition to increased droughts and changing rainfall patterns, cyclones are becoming more frequent and intense. This is causing the habitats of all lemur species to decrease by approximately 67%, with some species losing up to 75% of their habitat by 2070.

Discussion

The preservation of Madagascar's humid forest, with its high biodiversity, is crucial for both, the ecosystem services they provide and the livelihoods of local communities. The extinction of lemurs could have cascading effects, leading to the loss of additional species and negatively impacting the structure and integrity of the remaining forest. Despite the establishment of many protected areas and a deforestation ban, nature conservation has not been able to halt deforestation and degradation. Viable solutions must include poverty reduction measures, such as implementing more efficient and sustainable farming methods, improving rural infrastructure, and promoting ecotourism. Additionally, reforestation is a potential option for disused farmland.

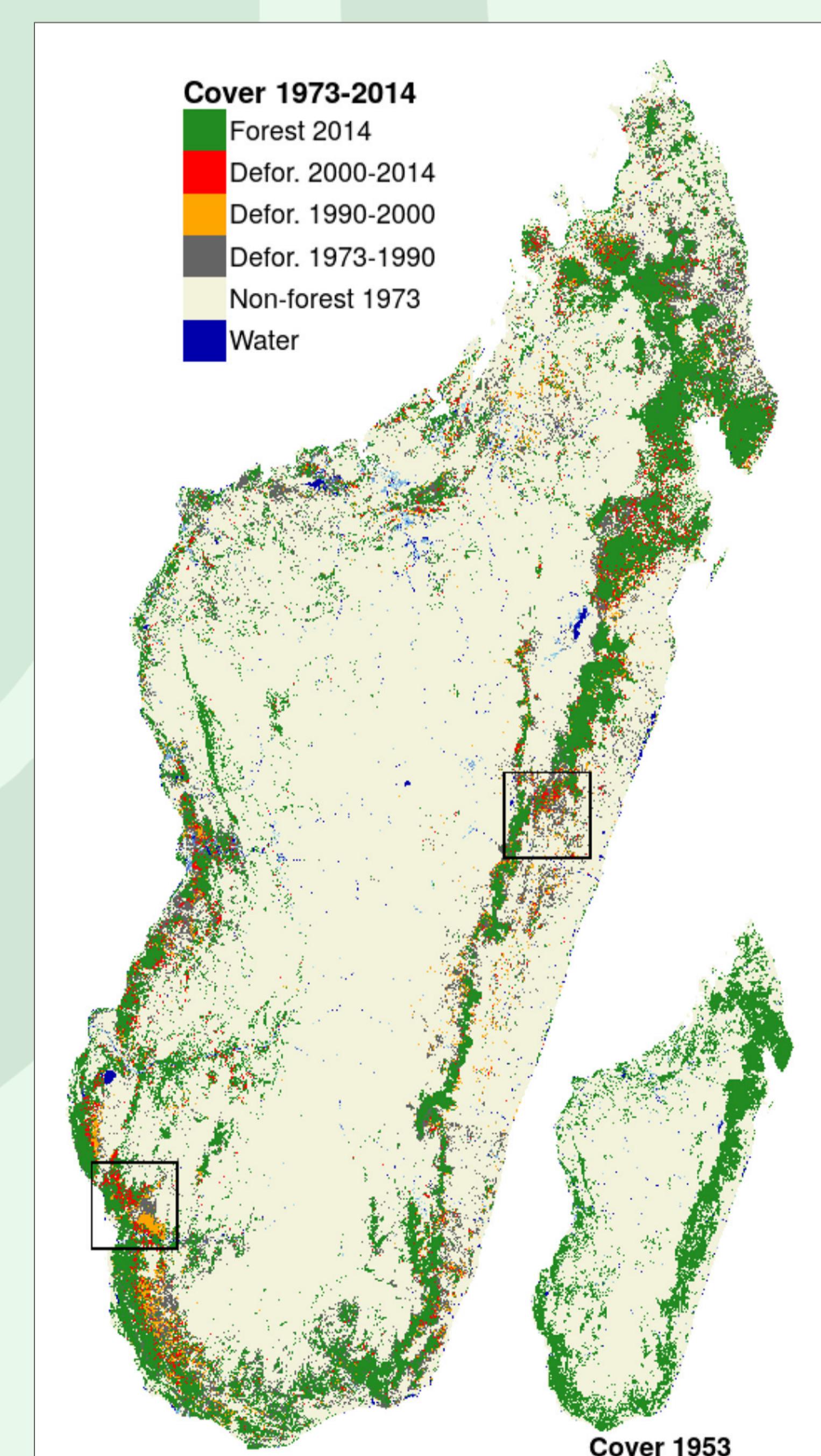


Fig 2: Deforestation in Madagascar (Vicelldent et al. 2017).



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Literature

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