People and Birds in the Democratic Republic of the Congo's Peatland Forests

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Introduction

GLOBAL IMPORTANCE OF THE PEATLANDS

- The central Congo Basin peatlands are the world's largest tropical peatland complex, covering 16.8 million hectares, 11.3 million hectares of which lie in the Democratic Republic of the Congo (DRC).[1]
- These peatlands store 29 billion tonnes of carbon, equivalent to three years of global emissions from fossil fuels – 19.6 billion tonnes lie in DRC.[2]
- Indigenous peoples and local communities are effective custodians of the forest and major contributors to conservation.[3,4,5]
- Seven percent of DRC's peatlands are found in protected areas.[6] Expulsions and land-grabbing from Indigenous people and local communities have been reported in some national parks.[7,8]
- The region is rich in wildlife with populations of forest elephants, lowland gorillas, bonobos, chimpanzees and African dwarf crocodiles, although its biodiversity is poorly understood beyond charismatic megafauna.[9]

THREATS

- DRC's government has announced the auction of 27 oil blocks of which three include an estimated 1 million hectares of peatland, estimated to store 1.67 billion tonnes of carbon.[10]
- Oil exploration would lead to deforestation and peatland drainage, and degraded peatland forests are at greater risk of fire, agricultural conversion and charcoal production. The development of roads would also increase forest accessibility for illegal hunters and loggers.

Objectives

We aimed to provide insights into how people use and interact with the peatland forest, as well as the diversity and composition of bird species and their responses to local patterns of forest loss. The project also studied conservation options and made recommendations for protecting the peatlands.

Methodology

Research was undertaken in Equateur, DRC, approximately 50-60 km southeast of Mbandaka at a site located on the Ruki River, a tributary of the Congo River (Figure 1). The study site had a population of approximately one thousand people, the majority of whom were Mongo, of Bantu origin. They split their time between their village and the fishing camp, which was on the banks of the River Sako. The minority Indigenous people were Balumbe and lived in the camp, returning sometimes to their ancestral land near the river port Djonori.

Qualitative methods included focus group discussions, guided forest walks, interviews and participatory activities, to understand where, when and by whom different livelihood activities were conducted. Forest conservation options were researched through key informant interviews conducted online with six non-governmental organisations (NGOs).

Bird point count censuses were undertaken across plots in three different habitats: undisturbed, hardwood-dominated forest; locally logged forest; and intermittently burned peatland. During each 10-minute census, species were identified by visual observation and call. We also conducted a rapid survey of tree species and estimated vegetation cover at each site. The alpha diversity (Chao 1 and Simpson’s Diversity Index) of birds in each habitat was calculated to quantify the impact of disturbance on species richness and species were sorted into diet and habitat preference guilds to compare the composition of species across habitats.

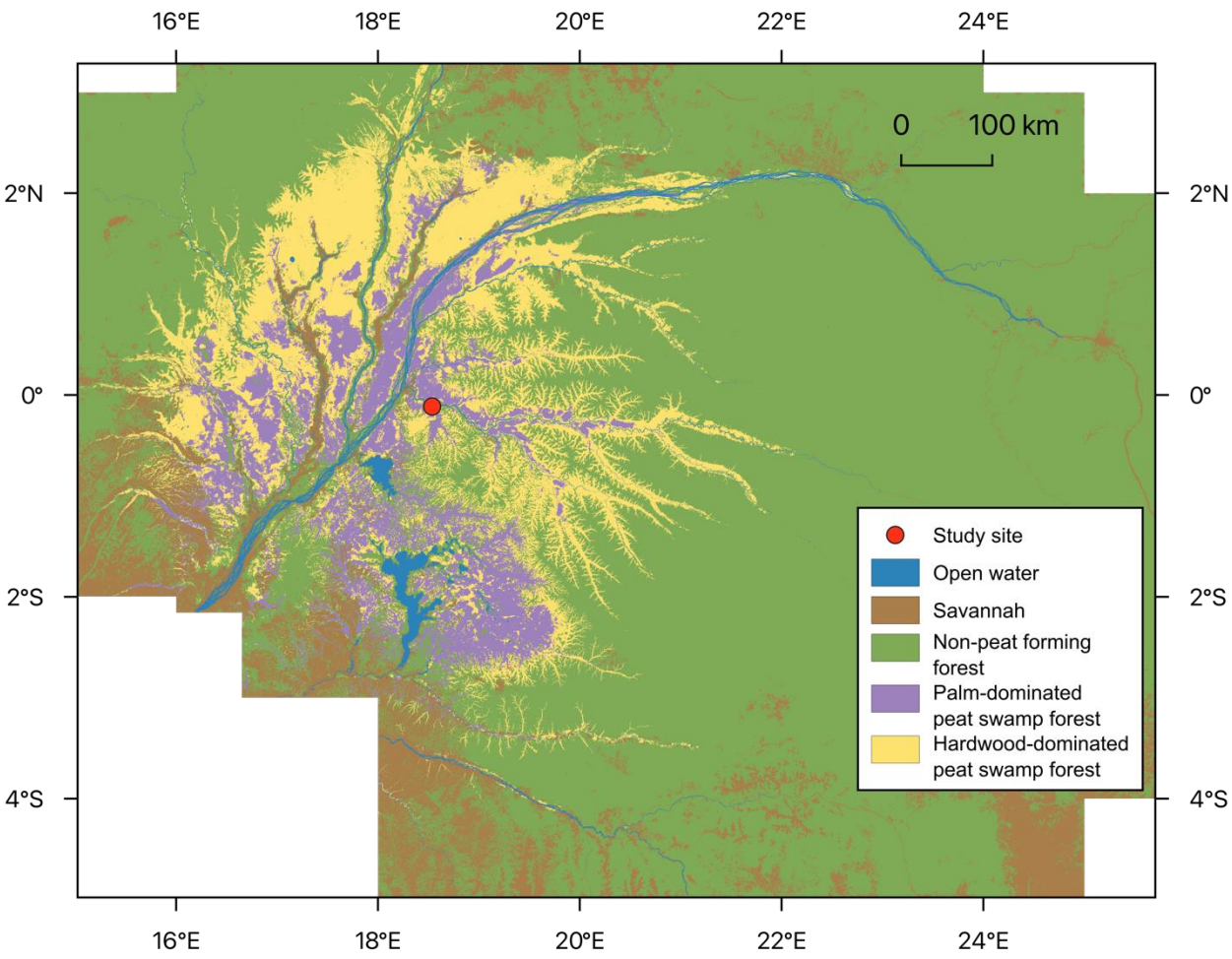

Figure 1. Location of study site on a map of the central Congo Basin peatlands, adapted from Crezee et al. (2022).

Findings

PEOPLE'S USE OF THE PEATLAND FOREST

- People have extensive knowledge of tree species and their properties. They collect wood and vines for construction; they use bark, leaves and roots in traditional medicine, they gather fruit and other food such as honey in the forest, and they generate income from the sale of timber.
- The peat swamp forest holds cultural, spiritual and livelihoods value for the local Mongo and Balumbe populations.
- Fishing is the main livelihood activity, and the swamp forest is where fish reportedly lay their eggs, making it a vital ecosystem for fishing. Different techniques are used in different locations, depending on the season. Many people said that the abundance of fish had reduced in recent years.

- We observed *Xylopia sp.* (Mosange) and *Symphonia globulifera* (Molaka) growing in the peat forest, used by villagers to construct houses, with *S. globulifera* preferred for rafters.
- Peatland plants used in traditional medicine include the bark of *Symphonia sp.* (Bolaka) for back ache and *Daniellia pynaertii* (Molengu) as an aphrodisiac (Figure 2); and the leaves of *Alchornea cordifolia* (Mbonze Mbonze) to stop diarrhoea. *Pentaclethra macrophylla* (Boala) grows in peat swamp forest and in *terra firme* forest, and its bark is used for back ache, stomach ache, toothache and as an aphrodisiac.
- The forest also has spiritual value, as the home of the spirits of the ancestors, called *bilima*. The potential of the forest is unlocked to make traditional medicines effective by the client paying the practitioner a forest access fee (some cash and some items such as clothing, a machete, and/or alcohol). Without the forest access fee, the power of the forest is not activated.
- Birds were occasionally hunted – for example by using a plant-based glue as a trap - and were eaten if caught opportunistically, for example in a fishing net.

Figure 2. Plants used for traditional medicine observed growing in peat swamp forest. A) *Danielia pinaertii*; B) *Symphonia globulifera*; C) *Pentacleta macrophile*; D) Traditional medicine practitioner collecting *Danielia pinaertii* bark to make infusions for treatments.

Case Study

Access to forest resources depends on who you are and what you want to use the forest for. It is controlled by the *ayant droit*, or right holder, who is the direct descendant of the village's founding ancestor. The villagers, who are Mongo and of Bantu origin, have unlimited access to forest resources, while the Balumbe, who are Indigenous, must provide free labour to the village in exchange for access to the forest. This is one aspect of the social and economic discrimination the Balumbe face.

The landscape is a mosaic of forest types (dry or *terra firme*, seasonally inundated and hardwood-dominated or palm-dominated peat swamp forest) as well as rivers, ponds and savanna. Forest use depends on the season, forest type and user. For example, in peat swamp forest, young men conduct logging, men and women practise different fishing techniques, children gather fruit, and Indigenous people collect honey and make roof thatch, known as *chaumes*.

The Balumbe are known for their skill in making *chaumes* from palm fronds of the *Raphia laurentii* tree. A large area of peat swamp forest north of the village is palm-dominated and this was known as the *Jardin des Chaumes*, or garden of palms (Figure 3). The Balumbe sell the *chaumes* to Mongo villagers who control market access and sell the *chaumes* on for double the price. A Balumbe woman said, "They double the price … because for the Mongo, it is their forest."

The peat swamp forest is known as *Entoku or* "deep, sinking mud" and is not visited much unless it is flooded. Fishing is the main livelihood activity and in the rainy season the peat forest can be navigated in a pirogue for fishing and for collecting wood for construction.

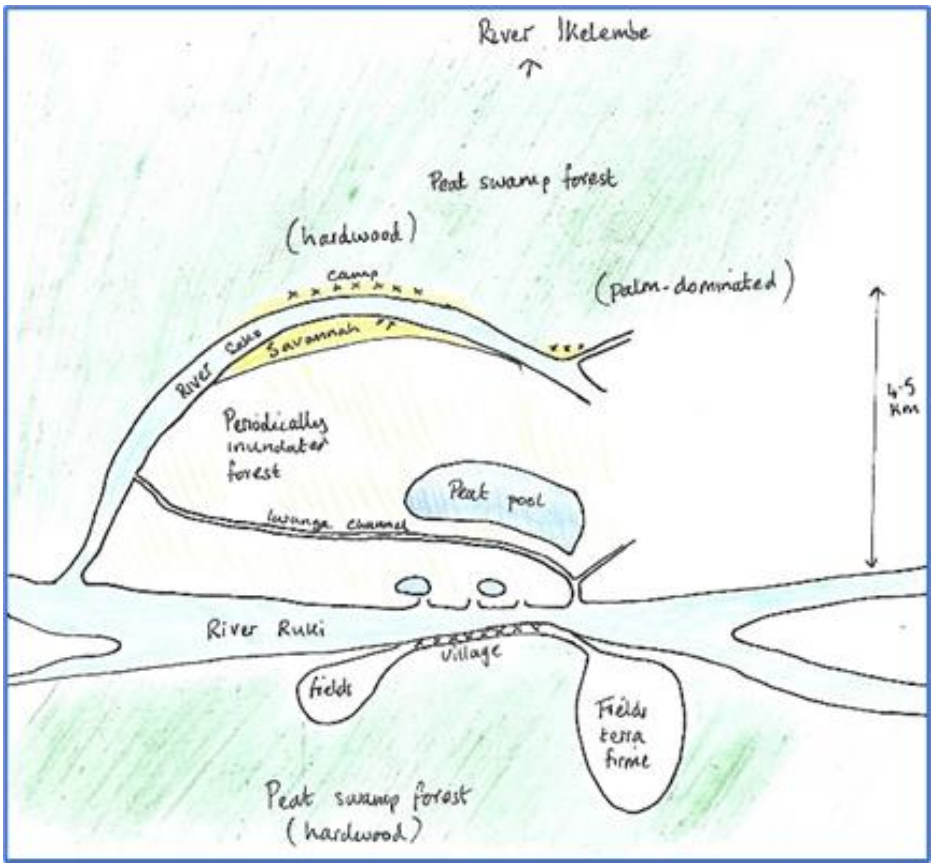

Figure 3. Sketched map of the study site, based on interviews and focus groups, showing different forest types, each supporting different forest uses.

Young men log trees growing in the peat forest to sell in Kinshasa for construction. The most logged species is *Danielia pinaertii* (Molenge). All but one interviewee said that logging has no impact on the forest, “The trees will never end, they will never run out.” One person said *D. pinaertii* is becoming rare. Other species felled for logs include *Uapaca sp.* (Mosenge), *Manilkara obovate* (Konya) and *Entadophragma palustre* (Bosala/ Ifake). Known as redwoods, these do not float, unlike *D. pinaertii*, and are harder to transport out of the forest. *D. pinaertii* is made into rafts to float downriver to Kinshasa. The villagers started logging in the early 2000s. In 2021, an estimated 500-700 trees were floated downstream from this camp.

No-one in the village expressed the opinion that the forest needed to be protected. “The forest is something that comes from God, it will never end,” the *ayant droit* said. There was a widely held belief that the wealth of the forest is never-ending.

BIRD DIVERSITY AND COMMUNITY COMPOSITION

- Birds are reliable indicators of environmental disturbance and their absence from or presence in landscapes can provide important insights into the health of ecosystems.
- Birds contribute to the maintenance of ecosystems by providing a variety of services. For instance, frugivores disperse seeds, insectivores control pest densities and nectarivores are important pollinators.[11,12]
- We recorded 244 birds representing 36 species and 25 genera during the censuses, and a further c.15 species beyond the surveys. In total, therefore, we observed at least 50 species (e.g. Figure 4).
- We did not find any threatened or endemic species, although given the localised geographical scope and limited timeframe of our censuses, threatened species may be present elsewhere in the region.
- Every species was already known to exist in the wider (non-peat forming) Congo Basin.
- The alpha diversity (species richness) of birds was highest in the undisturbed forest and lowest in the burned habitat, which was the most fragmented and open of the three studied locations (Figure 5A).

Figure 4. Great blue turaco (*Corythaeola cristata*) observed in a locally disturbed area of peat swamp forest.

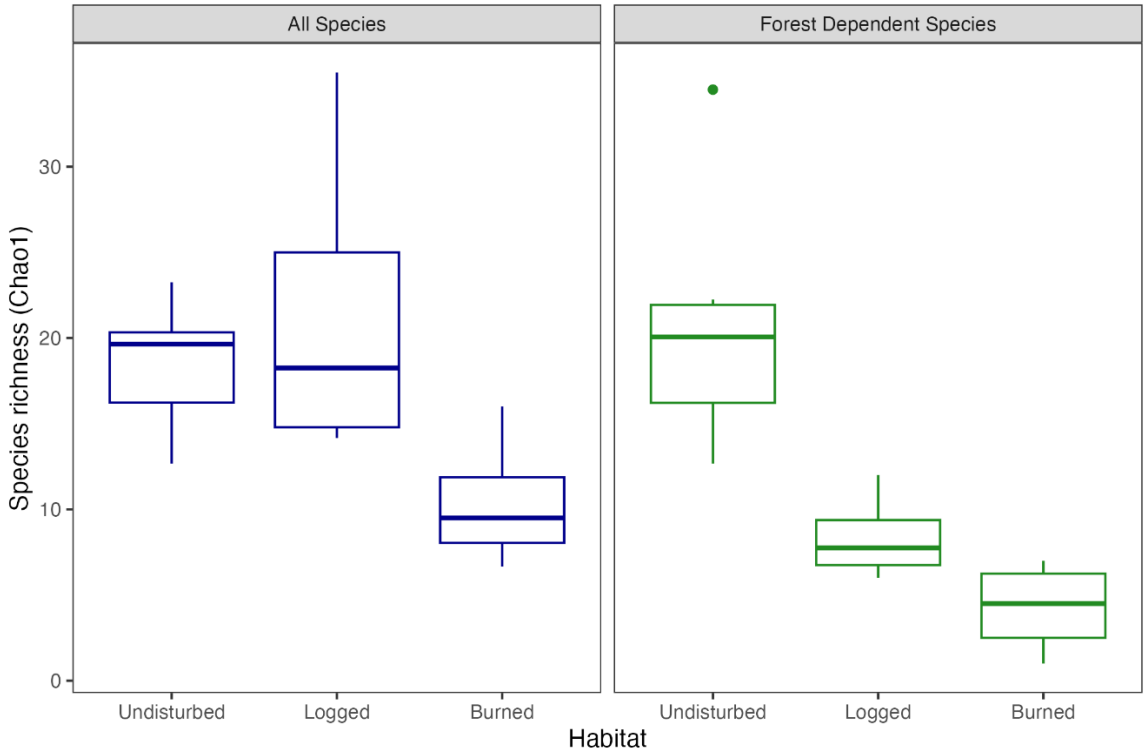

Figure 5. Species richness (Chao1 species diversity estimator) across the three studied habitats, for A) all species, and B) forest-dependent species.

- Interestingly, bird species richness did not decline significantly in the logged habitat, likely due to the presence of remnant forest patches and edge effects, providing suitable refuge for some species.
- We found even greater variation across habitats in the richness of forest-dependent species, particularly between the undisturbed and burned habitats (Figure 5B).
- The community composition of birds differed significantly across habitats.
- Most frugivorous and forest-dependent species associated closely with the undisturbed habitat, whereas granivorous and non-forest-dependent species favoured less forested areas (Figure 6).

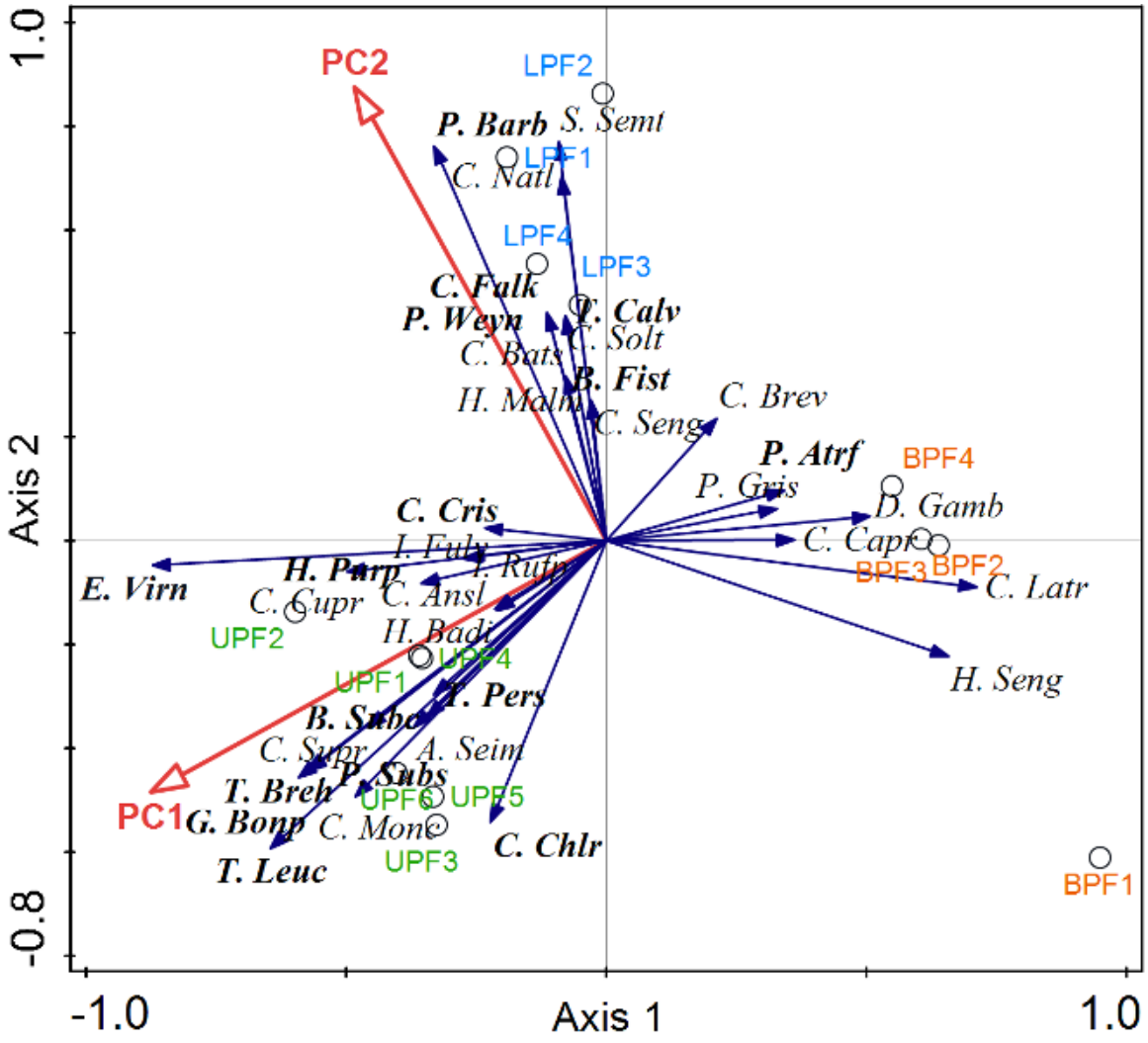

Figure 6. Ordination plot of the constrained redundancy analysis showing associations between bird species and the environmental data, condensed into two principal components, across the three studied habitats: UPF = undisturbed; LPF = logged; BPF = burned. Frugivorous and forest specialist species are emboldened.

Conservation Implications

FOREST USE RIGHTS

- Six interviews were conducted with NGO staff and all interviewees supported community concessions or community reserves as ways to protect the forest.
- Three interviewees suggested that the peatland forest is well-suited to conservation because it is difficult to access and unsuitable for economic activities such as growing manioc, charcoal-making and industrial logging.
- Another observed that community concessions are only possible where there are no existing concessions.
- All interviewees said it is important to develop a community management plan, and to fund community development alongside forest protection.
- One noted there are trade-offs inherent in protecting livelihoods and trees. “It is a challenge, doing both community development and forest protection. We study the options and plan development that does not destroy the forest resources".

BIRD COMMUNITIES

- Our findings, both quantified and observed, suggest that the use of the peatland forest by local communities is not a significant threat to bird populations.
- Although there was a change in the composition and decline in the richness of species in the burned habitat, this area was relatively small and likely did not alter the connectivity of the landscape for bird species.
- While the diversity of forest-dependent and frugivorous species fell outside the undisturbed forest, the limited scale and intensity of community forest use in the logged and burned habitats is unlikely to pose significant risks to these species on a landscape scale.
- Nonetheless, protecting small patches of forest in areas where livelihood activities are conducted may help to protect bird species and the ecosystem services they provide on a local scale.
- Community concessions, with the long-term backing of funders and local NGOs, could safeguard biodiversity further while also supporting community forest use and sustainable livelihood strategies.
- The proposed oil blocks represent a much larger threat to birds, as this would inevitably cause more extensive forest loss and a significant decline in landscape connectivity, with severe impacts on forest-dependent species.

- Further research is required to determine whether endemic and/or threatened species are present within these peatlands, to assess the impact of forest loss on rates of seed dispersal and pollination, and to quantify natural forest regeneration in the region's peatland forests.

Conclusion

Our research provides novel insights into both how people use and interact with DRC's peatland forest, and how the diversity and composition of bird species may vary across this landscape. Forest communities in DRC, whose livelihoods rely on the forest, and the international community, which strives to protect the region's biodiversity and carbon, have a shared interest in conserving these peatland forests. This offers an opportunity to fund projects that provide benefits to the people in exchange for their role in protecting the forest and its wildlife. Financing for conservation of the Congo Basin peatlands should support the equal rights of local communities and Indigenous Peoples, secure their customary tenure and prioritise community-led participatory processes for regulated use of the forest.

Acknowledgements

This research was generously supported by the Royal Geographical Society, through the Shara Dillon and Jeremy Willson Awards, funders via our online "Experiment" scientific research crowdfunding page and a NERC Large Grant to Simon L Lewis, "CongoPeat", NE/R016860/1.

It was made possible by a research team already on site: Shona Jenkins, PhD candidate at the University of Edinburgh, and research assistants, Ovide Emba and Esther Bokungu. We extend our gratitude to Groupe d'Action pour Sauver l'Homme et son Environnement (GASHE) and Greenpeace Africa for logistical support, and to Professor Simon Lewis for his guidance and supervision.

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