# Living in a noisy world: understanding the impacts of anthropogenic noise disturbance on pygmy marmoset behaviour in the Peruvian amazon

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## Declaration of Authorship

I, Larissa Barker, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signature:

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Date: 03/06/2022

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**Abstract**

The ecotourism sector is growing rapidly and is already a significant portion of the global tourism market. With an increase in ecotourism comes an increase in the variety and the amount of anthropogenic noise a landscape is exposed to. The primary aim of this thesis is to understand the effect of anthropogenic noise disturbance on eastern pygmy marmoset (*Cebuella niveiventris*) behaviour in the Área de Conservación Regional Comunal Tamshiyacu Tahuayo (ACRCTT), Peru and to investigate the distracted prey hypothesis, this thesis is the first example of examining changes in primate vocalisations along a gradient of anthropogenic noise exposure.

In order to quantify these behavioural changes, I first catalogued the change in anthropogenic noise levels across the landscape, by comparing the levels of anthropogenic disturbance inside the ACRCTT to that outside its boundaries including the nearby community and ecotourism lodge. I compared a manually catalogued acoustic analysis method with the Normalised Difference Soundscape index from the 'soundecology' R package and found that for a finer scale of anthropogenic noise differences the human conducted analysis was more accurate and appropriate for this setting. Due to its superiority for the needs of this study the manually catalogued acoustic analysis results were used to understand how the calls of the pygmy marmosets differed with anthropogenic noise levels. I found key differences in the spectral and temporal characteristics for three of four call types on a gradient of exposure to anthropogenic noise. I conclude that anthropogenic noise should now be included as one of the many pressures that are causing modifications and shifts in primate vocalisations.

Anthropogenic noise not only impacts communication but it has also been found to impact fitness due to an increased predation risk with the noise serving as a distracting stimulus. To explore how anthropogenic noise drives other behavioural changes, specifically in antipredator responses, a playback experiment was conducted. First a riverine diurnal raptor species survey was conducted in order to identify which of the pygmy marmosets' predators were found in the area and their calls used as a playback condition. I explored these potential behavioural changes under the lens of the distracted prey hypothesis, which postulates that animals can become distracted by any stimulus which it is able to perceive and this distraction leaves them more vulnerable to other potential threats. With the aim of investigating this hypothesis, I used

Automated Behavioural Response systems (ABRs) to conduct two playback experiments. The first playback gathered the preliminary baseline behavioural reactions to different raptor calls and anthropogenic noises. The second featured predator calls that were spliced into different anthropogenic noises to see if the marmosets were still able to detect the predator calls or if they had become distracted by the abiotic noise. This experiment was the first to employ the use of ABRs on a primate species in conjunction with a targeted behavioural hypothesis. This initial study demonstrates that ABRs are an incredibly useful tool in behavioural experiments and recommendations are made for its use in future studies.

This thesis aims to illustrate the behavioural changes caused by anthropogenic noise disturbance with the intention of demonstrating the far-reaching impacts of this form of pollution and to understand how primates are adapting to the presence of anthropogenic noise if at all. Through this research I was able to establish that these behavioural shifts are occurring even on a small-scale gradient of exposure. This thesis serves as one of the first steps in quantifying these effects and in this mitigation methods can be explored and developed.

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