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Impacts of Human Disturbance Stimuli on the Behaviour and Breeding Biology of Subantarctic Yellow-eyed Penguins (*Megadyptes antipodes*)

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Abstract

Eco-tourism is increasing in popularity worldwide, particularly in previously isolated areas such as Antarctica and the subantarctic. This may be increasing the levels of human disturbance stimuli (human-related presence, objects or sounds), which can have impacts on wildlife at an individual level (behaviourally and physiologically) and at a population level. Human disturbance (the response of an animal to a disturbance stimulus) has been studied in most penguin species, showing both inter- and intra-specific differences in responses to disturbance stimuli at similar distances. The Yellow-eyed Penguin (*Megadyptes antipodes*) is negatively impacted by human disturbance stimuli, but very little research of any kind has been conducted on the subantarctic population. This is despite some areas within the subantarctic being regularly exposed to tourism, and the subantarctic population making up an estimated 60% of the entire species. I used an experimental approach to investigate the behavioural impacts of human disturbance stimuli on subantarctic Yellow-eyed Penguins, on Enderby Island. Human presence significantly changed their behaviour, resulting in an increased time spent vigilant and a decrease in the frequency of maintenance behaviours. By modelling the probability of disturbance at varying distances from the penguin to the human, I showed the current minimum approach distance of 5 m (with a 99% chance of disturbance) was not effective. I also quantified the breeding biology of subantarctic Yellow-eyed Penguins, and investigated the impact of human disturbance stimuli on their breeding success. There was no difference in nesting success (expressed as number of eggs, chicks and fledglings surviving per pair) between the disturbed and undisturbed site and no significant difference in the average weight and body size of fledglings at the disturbed site compared to fledglings at the undisturbed site. My results indicate that at current levels human disturbance stimuli has a behavioural impact on subantarctic Yellow-eyed Penguins, but a population-level impact was not detectable. This may be due to the low level of tourism and high degree of tourism management in the New Zealand

subantarctic, and the resulting low number of interactions between penguins and humans. Enderby Island tourism may therefore be an example of sustainable eco-tourism and successful management, although more research including multi-year studies would be needed to confirm this.

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