Modelling dog attacks on Little Penguin populations

In Tasmania, Little Penguins (*Eudyptula minor*) are subject to domestic dog attacks adding pressure to colonies already impacted by habitat loss due to coastal development. There is a need to better understand what impact these mortalities may have on colonies, particularly the fragmented, smaller colonies.

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Background

Dog attacks on Little Penguins have been recorded in Tasmania since at least the 1980s with up to 80 birds killed in a single attack. In 2019 alone, there were at least five attacks with 10 or more penguins killed each time.

Approach

- We used a Little Penguin population model to simulation-test how dog attacks of various frequency and intensity influence the sustainability of colony populations. We considered three different colony sizes:
  - small (100 individuals)
  - medium (300 individuals)
  - large (500 individuals)
- Frequency and intensity of dog attacks were informed by mortality data from confirmed or likely dog attacks reported in Tasmania since 1980.
- Combinations of attack intensity and attack frequency were applied to each colony size in the simulation.
- We calculated risk of colony collapse (defined as <10 birds) after 20yrs and the median time to colony collapse.

Key findings

- Collated data on actual attacks indicated 60 mortality events were likely attributed to dogs since 1980 with an average attack intensity of 15 penguins killed and the largest being 80 penguins killed.
- Simulation found that medium and large colonies were only at risk of collapse if attack frequency was large (> 20 attacks per 50yrs) *and* attack intensity was high (30 or more birds killed per attack).

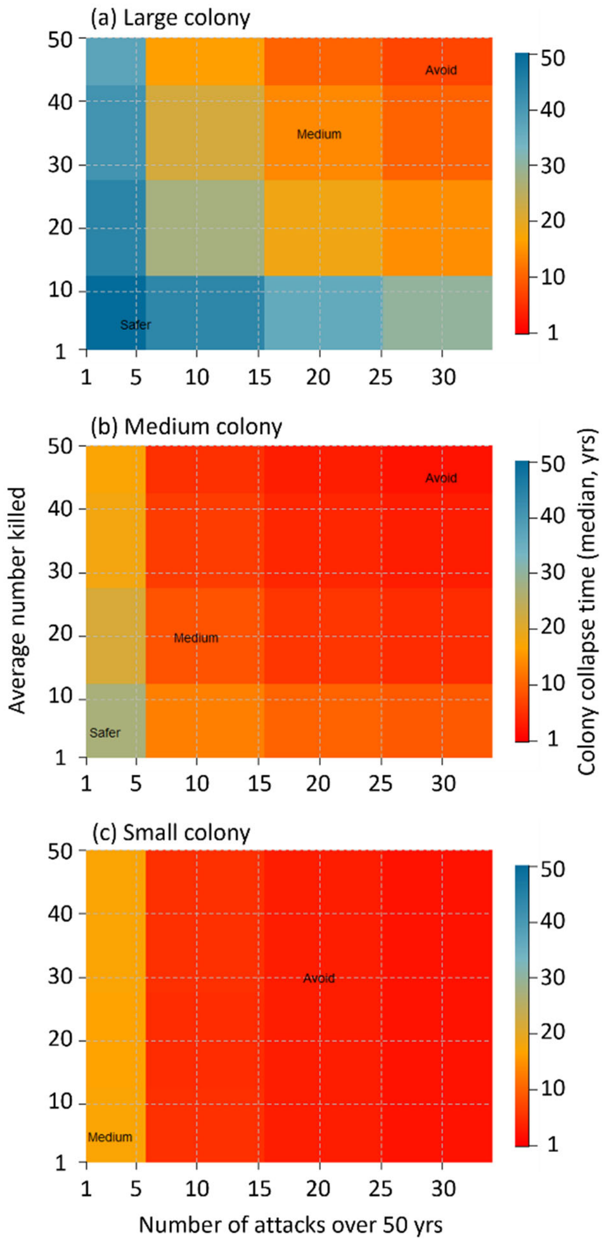

Figure 1: Median colony collapse time (years) for (a) large (500 birds), (b) medium (300 birds) and (c) small (100 birds) colonies based on attack intensity (average number penguins killed per attack) and number of attacks over a 50-year period. Colony collapse defined as <10 birds.

- Small colonies were at risk if attack frequency was greater than 5-10 attacks per 50 yrs and 15 or more birds were killed per attack.
- If attacks were frequent (e.g. more than 20 per 50 yrs), even attacks of small intensity (5 birds killed per attack) could put small colonies at risk of collapse in 10 years.

  Our findings were robust to minor changes in key parameters and to predation across all age classes (including juvenile penguins).

Caveats

1. We modelled generic "small", "medium" and "large" penguin colonies and not any specific colony in Tasmania. However, sizes of our generic colonies were chosen to span the abundance range of many Tasmanian colonies.
2. In the absence of data from Tasmanian colonies, the model was parameterised using data from Phillip Island. Nevertheless, this initial model is informative and highlights the need for additional data from Tasmanian colonies.
3. The model assumes constant survival over time for each age class and uses estimates of average annual fecundity.

Conclusion

Outputs from our model suggest that dog attacks pose a serious risk to the viability of small-to-medium sized penguin colonies in Tasmania if mortality events are large. In particular, small penguin colonies are vulnerable if dog attacks continue, with number of attacks being more influential than attack size. Importantly, our work highlighted (1) the need to reduce fatal interactions with dogs and other introduced predators, and (2) the need for continued efforts to collect more data, such as monitoring surveys, that are both consistent and aligned between the different community groups/NGOs.

Although we have focused on the impacts of dog attacks on Little Penguins, there are numerous significant threats to our native fauna. Our modelling framework is generic and can consider other species and other types of external -mortality events including oil-spills, marine heat waves, and other predators.

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