

On Whether to Alternate Between Pairs of Islands in the Penguin Feasibility Study

Doug S Butterworth

MARAM (Marine Resource Assessment and Management Group)
Department of Mathematics and Applied Mathematics
University of Cape Town
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The objective of the penguin feasibility study is “to assist the design of an experiment which could have the potential to achieve adequate power within a realistic time period to confirm the effects of closure on African penguins”.

Methodology whereby such power to detect the impact of fishing on penguin reproductive success based on time series of observations of penguin demographic parameters at two nearby island colonies is set out in Brandao and Butterworth (2007). Extensions in Robinson and Butterworth (2010) show how this methodology could be extended to take account of estimates of fish abundance, such as might in future be provided by time series of acoustic surveys of pelagic fish in the near vicinity of penguin island colonies. The key purpose of the feasibility study is to provide estimates of the process error variance (sometimes termed “additional variance”) in the relationships between reproductive success and the extent of fishing near an island, upon which such power is strongly dependent (this variance has a standard deviation denoted by σ_e in Brandao and Butterworth (2007), and pertains to the ε error term in, for example, equation A1 of that document).

Estimation of the effect of fishing on penguin demographic parameters is confounded by other factors that influence their values each year, so that it is important that over time contrast is maximized to provide more precise estimation of σ_e . Thus, for example, if one island is closed every year, it is scarcely possible to distinguish an inter-island difference from the effects of fishing in the data collected on demographic parameters. Contrast is best achieved through a process of alternate opening and closing of each of a pair of nearby islands, where closure of one to fishing co-incides with opening of the other. In the long run, this would produce equivalent power in about a quarter of the time required for an alternative approach which closed one of the pair throughout the experiment while alternating opening and closing of the other.

With already two years of the feasibility study with the same island of each pair closed, it is thus important that if the study continues, the alternation approach suggested commence immediately. Furthermore, if the feasibility study leads to a longer term experiment, such alternation in the feasibility study will advance the time within which the overall exercise can be anticipated to provide the results required.

REFERENCES

- Brandão A, Butterworth DS. 2007. An initial analysis of the power of monitoring certain Indices to determine the effect of fishing on penguin reproductive success from an experiment where pelagic fishing is prohibited in the neighbourhood of Robben Island, but continues around Dassen Island. Document MCM EAFWG/OCT2007/STG/04.
- Robinson W and Butterworth DS. 2010. GLMs relating penguin demographics to pelagic catches close to islands and to pelagic abundance. Document MCM/2010/SWG-PEL/Island Closure Task Team/19.