

**SOME INITIAL THOUGHTS ON EVALUATION OF THE POWER OF AN  
EXPERIMENT TO DETECT THE EFFECT ON PENGUIN REPRODUCTIVE  
SUCCESS OF CLOSURE OF AREAS AROUND BREEDING COLONIES TO  
PELAGIC FISHING**

D S Butterworth

Substantial declines in counts of African penguins at breeding colonies over a very recent period (see ASWS/JUL07/PENG/DAT/1), together with poor recruitment of sardine and anchovy over most of those years, have led to the conclusion that poor food availability is a likely cause of these declines. This in turn has led to the suggestion that closure to pelagic fishing of areas around penguin breeding colonies could enhance the birds' reproductive success to assist arrest and reverse these recent trends.

Arising from this have been the proposals that such an exercise be conducted as an experiment, and further that the likely power of such an experiment to detect the effect hypothesised should first be evaluated. Finalisation of the details of an approach for such an evaluation must first await the completion of compilation of available time series of indices of penguin reproductive success whose collection will be continued in the future. In the meantime, however, the Workshop provides an opportunity to share some thoughts on possible approaches to such an evaluation, in the context that relatively limited time and person-power resources will be available for this exercise that needs to be completed before the end of 2007. The following points would seem pertinent to such a discussion:

- The resource limitations mentioned mean that it would not be viable to attempt an approach as relatively complex as that of ASWS/JUL07/PENG/ASS/3 for Steller sea lions, in particular to embed the testing within a detailed population model fitted to available data (*inter alia* the model of ASWS/JUL07/PENG/ASS/2 is unlikely for similar reasons to reach sufficiently quickly a stage of development where it could be used for such a purpose).
- There are likely only about 5-6 colonies from which sufficient data have been collected in the past that they could form part of such an experiment.
- One potential index that could be used to monitor the reproductive success at a colony is chicks fledged per breeding pair. However, Table 3 of ASWS/JUL07/PENG/DAT/1 indicates that over the period that this index is available for the relatively close Robben and Dassen Island colonies, trends were not particularly similar ( $r^2 \sim 0.5$ ). This in turn suggests poor discriminatory power from an experiment, unless the variance of the associated process error can be reduced in some way.
- The standardisation of indices towards this end of process error reduction by taking account of co-variates (such as cat predation, pelagic fish abundance, pelagic catches around the colony), as well perhaps of time series effects (as a surrogate for a full penguin population dynamics model), seems a potential way forward. However, ability to estimate the associated parameters may be compromised by the limited length of the data series available.