

## Responses to Matters Raised in Document MARAM/IWS/DEC14/Peng/A4

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### Abstract

The effect of fishing on Robben Island penguins inferred from the Weller *et al.* (2014) model could range from negligible to enormous dependent entirely on what values are assigned to its parameters. Virtually no defensible justification for the values of key penguin reproduction and survival parameters, previously indicated as having been informed by “Expert opinion”, has been provided. Until such justification might be furnished satisfactorily, the approach would seem to be insufficiently developed to provide any reliable input for tactical scientific recommendations on penguin management.

### Background

MARAM/IWS/DEC14/Peng/A1 states that: “Weller *et al.* (2014) developed a systems dynamic (process-based) model of the pressures acting on African Penguin demographics, and parameterised this for Robben Island. This model is strategic and not intended for prediction purposes. The model showed a weak benefit to the penguin colony of short-term (three-year) closure to purse-seining around Robben Island, which would be strengthened with longer and more continuous periods of closure. .... The model was parameterised based on the best available biological estimates for the locality”. Weller *et al.* (2014) themselves state that the Robben Island population “was found to be strongly driven by food availability”, and that the impact of the closures of areas around the colony to fishing was “easily masked by food-driven variability in population growth”.

Despite the statement by the authors of Peng/A1 that this model is “not intended for prediction purposes”, its conclusions are framed in predictive terms related to the magnitude and variation of the impact of food availability, as influenced by fishery catches, on the Robben Island penguin population trends. Even though these predictions are not numeric, they are phrased in a manner that implies an ability to estimate relative quantitative effects in some way.

Clearly such estimability requires an ability to quantify, even if coarsely, the relationships between penguin reproduction and survival factors/rates and food availability, and between food availability and fishery catches. This in turn requires functional forms for these relationships, and values (or value ranges) assigned to their parameters. MARAM/IWS/DEC14/Peng/B7 noted that the basis given for the choices for many of these values in Weller *et al.* (2014) was “Expert opinion” alone. It requested that the basis in data/information for these opinions be spelt out to provide a basis to evaluate the appropriateness of the associated parameter values selected, and specifically listed certain parameters relating to reproductive success and survival, noting that the effect of fishing inferred from the model could range from negligible to enormous dependent entirely on what the values assigned to these parameters were.

### Responses to information provided

#### Egg and chick survival

Questions have been raised about the parameters associated with these factors earlier, as reflected in MARAM/IWS/DEC14/Peng/B7, where reference was made to the unsatisfactory nature of information provided previously that the relationships had been parametrised under the assumption that local catch provided an index of local prey availability (local biomass). Attention has already been drawn to the problematic nature of this assumption in MARAM/IWS/DEC14/Peng/B4, Peng/B9 and Peng/B10.

Peng/B7 reports an earlier associated request made following information received that (such) parameters “were chosen such that they mapped the range of observed survival rates for each age class to the range of observed variation in food biomass”. The request was for tables and plots of these values and associated biomasses, their sources, and further for one or more bi-plots as minimally some relationship needed to be evidenced to augment a statement of “range mapping” alone.

Unfortunately MARAM/IWS/DEC14/Peng/A4 does not provide a response to this request, nor any further clarification on these parameters.

### Shark and terrestrial predation

MARAM/IWS/DEC14/Peng/A4 does provide some response on these parameter value choices, but it is very difficult to evaluate. Why these particular values? Why not ones much larger or much smaller? Perhaps expert opinion could inform on these values relative to each other, but addressing the core issue here requires values that indicate the extent of such predation in absolute terms.

This response does not seem to provide a basis to allow evaluation of the appropriateness of the choices made.

### Increase in marine predators across 2003

MARAM/IWS/DEC14/Peng/A4 argues only that such an increase is plausible (and indeed it is), but what matters is the extent of the increase. Peng/B7 reports an earlier request for evidence for the extent assumed by Weller *et al.* (2014). Peng/A4 is silent on that matter.

## **Conclusions**

Although further questions similar to those above could be asked, that would not seem the immediate priority. There appears to be a very fundamental problem with this approach as currently applied, which is an (apparent) inability to explain/justify the values chosen for key parameters. Since key outputs and hence key inferences drawn depend on these choices, how can one distinguish reliable from arbitrary choices, and hence determine whether or not the conclusions from this work have any sound basis?

This is not to say that there is no basis for informed opinion to facilitate the development of scientific fisheries advice – data-poor assessment methods rely on that - but they are recognised as weak and as a last resort. The data situation in this case, while not ideal, is certainly closer to data-rich than to data-poor in a fisheries context, and the data that are available should be used to inform the parameter value choices for such a model in a clear, defensible and replicable process.

Until that might be achieved, this approach would not seem to be sufficiently developed to provide any reliable input to tactical scientific recommendations for management of penguins or the species on which they prey.

## **Reference**

Weller, F., Cecchini, L.-A., Shannon, L. J., Sherley, R. B., Crawford, R. J. M., Altwegg, R., Scott, L., Stewart, T., and Jarre, A. 2014. A system dynamics approach to modelling multiple drivers of the African penguin population on Robben Island, South Africa. *Ecological Modelling*, 277: 38–56.