

A proposal for future penguin island closures

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A proposal for moving forward from the penguin island closure experiment conducted between 2008-2020 is presented, suggesting that Robben and St. Croix Islands can now be closed for an “extended period” from 2021, that the current experiment be continued around Dassen Island in the short-term while further understanding of the current ‘counter-intuitive’ results is obtained and that Bird Island be opened for an “extended period” from 2021.

I provide proposals for the future of closure and/or experimentation with closure to purse-seine fishing within 20km radius areas around each of the four penguin breeding islands that have been part of the experiment conducted between 2008-2020. These proposals are primarily based on the summary of both sets of GLMM analyses available to the SWG-PEL, which were tabled and noted in de Moor (2020). I have kept the proposals here-in relatively short, and hopefully practical, but am willing to discuss further details if necessary.

Robben Island

- As both sets of analyses currently show that the closure of Robben Island to purse-seine fishing benefits penguins, Robben Island should be closed for an “extended period” from 2021.
- Approximately a third of this area has already been closed as part of the MPA recently established in the area.
- I would recommend the “extended period” be 10 years, after which the closure should be reviewed to determine whether the expected benefit for penguins is being achieved (noting that the “benefit” may be a slower decline rather than an increase in numbers).
- Data should continue to be collected during this period and re-analysed once approximately e.g. 8 years more data are available to ensure that results are available before the e.g. 10-year period is up.
- Noting indications made at the last meeting that it may be difficult/costly to continue to collect some of the data, and anticipating a discussion regarding which time series should be continued, chick condition, fledging success and chick survival should be prioritised.

St Croix Island

- As both sets of analyses currently show that the closure of St. Croix Island to purse-seine fishing benefits penguins, St. Croix Island should be closed for an “extended period” from 2021.
- Approximately a quarter of this area has already been closed as part of the MPA recently established in the area.
- I would recommend the “extended period” be 10 years, after which the closure should be reviewed to determine whether the expected benefit for penguins is being achieved (noting that the “benefit” may be a slower decline rather than an increase in numbers).
- Data should continue to be collected during this period and re-analysed once approximately e.g. 8 years more data are available to ensure that results are available before the e.g. 10-year period is up.

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- Noting indications made at the last meeting that it may be difficult/costly to continue to collect some of the data, and anticipating a discussion regarding which time series should be continued, maximum distance, path length and trip duration should be prioritised.
- It would be very useful for the SWG-PEL to gain a better understanding of the link between the foraging data and penguin reproductive success (see also Dassen Island below). Sherley (2020) provided some initial comments to this point, but I have some remaining questions that I'd appreciate the opportunity to explore.
- Should something unexpected arise from this 'better understanding' it may be prudent to bring the review of the "extended closure" forward.

Dassen Island

- Both sets of analyses currently show that the closure of Dassen Island to fishing will benefit penguin chick survival.
- However, the overall benefit to penguins is not clear given some results from Butterworth and Ross-Gillespie which, if taken at face value, suggest the closure of Dassen Island to fishing may be detrimental to chick growth, path length and trip duration.
- The current 3-year closed followed by 3-year open experiment should be continued for the short-term future (hopefully only a year) to allow time for these 'counter-intuitive' results of Butterworth and Ross-Gillespie to be further understood. For example, is there some geographical or biological reason that would explain these results for Dassen, when the analysis of the same type of data for Robben Island indicated that the experiment couldn't produce informative results for those data sets. These results came from sets of data which Sherley did not analyse, with reasons given in Sherley (2020).
- Data should continue to be collected during this short-term extension to the experiment, although re-analysis including an additional year's data is not necessarily required if the 'counter-intuitive' results can be adequately explained and understood based on data already available up to 2018.

Bird Island

- Sherley's results suggests this experiment could not inform on the impact of fishing to penguins on Bird Island.
- Butterworth and Ross-Gillespie's results suggest extending the experiment at this Island may produce more informative results, although there is already a weak indication that closure may decrease trip duration of penguins from Bird Island.
- Approximately half of this area has already been closed as part of the MPA recently established in the area.
- Coetzee and Merkle (2020) indicate that in most years (excluding 2006-2010) very little sardine catch has been taken within 20km of Bird Island and no anchovy has been caught around the island. The lack of contrast (high v low fishing in open v closed years) likely contributes to the ability for this experiment to inform on the impact of near-island fishing to penguins on Bird Island.
- I see three possible ways forward:
 - (i) Design a new experiment (possibly longer periods for which the island is open/closed, noting that the recently established MPA in the area would likely mean analysis of data would be constrained to the new experimental years to maintain consistency, and results will thus only be available a number of years from now).
 - (ii) Opening the area to purse-seine fishing for an "extended period".
 - (iii) Closing the area to purse-seine fishing for an "extended period".
- Given the lack of historical catches around this island (and thus lack of contrast in the data), I would suggest option (ii) or (iii) is preferential to option (i).

- One could argue in favour of (iii) on the basis that the small catches imply that the socio-economic impact of closing a 20km radius area around Bird Island would be relatively small and that the benefit to penguins shown from closing other islands with greater contrasting data *might* imply a benefit would also apply to penguins on Bird Island.
- However, as approximately half of the area has already been closed as part of the recently established MPA, I would propose that the remaining area around Bird Island be open to purse-seine fishing for an “extended period”. One expects future catches within 20km of the island to continue to be of the same order as the recent past. However, should catches exceed that recently observed this decision should be immediately re-evaluated. This would be similar to Exceptional Circumstances potentially being declared for the sardine-anchovy OMP if, for example, the realised spatial distribution of catches, selectivities or small sardine bycatch with anchovy differs markedly from that assumed when the OMP was developed (de Moor 2018).

As a final note, Butterworth (2020) and in a subsequent email circular to the SWG-PEL, indicated that the population model analysis of Robinson *et al.* (2015) could also be used to inform decisions about the island closure experiment around Robben Island, despite a prior email on 12/09/2020 to 6 SWG-PEL members/observers to the contrary. Butterworth (2020) argues that as Robinson *et al.* (2015) found no relationship between penguin reproductive success and anchovy recruitment at Robben Island, this “effectively argues against the case for closure there”. However, Robinson *et al.* (2015) found a relationship between penguin adult mortality at Robben Island and sardine biomass west of Cape Agulhas and Coetzee and Merkle (2020) show that both sardine and anchovy are fished within the 20km radius area of Robben Island.

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