An initial reality check on estimates related to black-browed albatross kills in the South African trawl fishery

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Introduction

The SASSI Kingklip assessment makes certain key statements about the kills of black-browed albatross (the avian species most at risk of those they consider) in the SA trawl fishery:

an annual kill of 5000 in 2006 (all birds 18000)
a subsequent reduction to 2200 through the introduction of tori lines (all birds 8000) (assuming proportional reduction)
a necessary bycatch reduction to less than 2% of current levels needed for the population to recover.

The document conducts an initial reality check on these assertions. To do so it makes use of results in Thomson *et al.* (2009). Since this document is not immediately available to DWG participants, certain key extracts are attached hereto, specifically

i. the paper's abstract;
ii. the best fit obtained for a black-browed albatross population model to the albatross data from South Georgia; and
iii. the associated estimates of albatross mortalities caused by various fishing fleets.

The 2006 kill estimate

The estimate of this kill, from Watkins *et al.* (2008) is 5000 with a 95% confidence interval estimate of [2500,8500]. Yet the graph attached from Thomson *et al.* (2009) suggest a kill at that time of about 4000 by all trawl fleets (SA, Namibia, Argentina, Uruguay, New Zealand and Australia). Assuming roughly equal effort in SA and Namibian trawl fisheries, and that they dominate all other such fisheries, the implied black-browed albatross kill by the SA trawl fleet in 2006 is 2000, which is below the lower CI for the Watkins *et al.* (2008) estimate.

Possible reasons for this are that the Watkins *et al.* (2008) failed to standardize their overall 18000 bird kill estimate for the effects of wind strength and direction. Rob Leslie (pers. comm.) has suggested that the sampling was unrepresentative, with an unduly high proportion of these variables at values that would predict high levels of bird kills. Further the bootstrap variance estimation is based on units of 10 minutes of observation treated as independent without any adjustment for probable autocorrelation. This could result in inappropriately narrow confidence intervals.

The subsequent reduced estimate

Only a preliminary 8000 figure overall (approximately 2200 black-browed albatross) is provided by SASSI, which reflects that tori lines achieved a kill reduction of some 55%. But other estimates are available for the tori line effectiveness, eg. Reid and Edwards (2005) estimate a 90% effect for trawl fisheries in the Falkland islands, whereas reports from Namibia (Paterson quoted in Albatross Task Force: Annual Report 2009) reports 186 bird interactions reduced to zero with the introduction of tori lines.

Given the preliminary nature of the direct estimate, it would seem best (if at all) to update a prior based on data from other fisheries for the kill reduction achieved by tori line introduction, in a Bayesian process. The information above suggests a median for the prior for kill reduction of over 90%. Use of such a value would greatly reduce the 8000 overall figure (2200 black-browed albatross) used for the SASSI kingklip assessment.

Reduction necessary for recovery

A population model is needed if projections are to be made. The Thomson *et al.* (2009) model (attached) estimates zero density dependence. As such, even if kills cease, the population would not recover. A model without a realistic estimate of or input for the extent of density dependence cannot be used reliably for population projection. The abstract attached indicates that the authors are consequently not yet satisfied with their model. Alternative model assumptions and/or approaches are needed, e.g. the use of a Bayesian approach with a prior for the extent of density dependence based on other similar species.

Conclusion:

Taken together, these initial considerations suggest that the current kill of black-browed albatrosses in the SA hake trawl fishery could be up to about an order of magnitude less than indicated in the SASSI assessment. Furthermore there seems as yet no reliable analysis available upon which to draw conclusions (as in the SASSI assessment) concerning the kill reduction level necessary to secure the recovery of the black-browed albatross.

References:

Reid, T and Edwards, M (2005) Consequences of the introduction of tori lines in relation to seabird mortality in the Falklands islands trawl fishery. Falklands Conservation Project.

Thomson, R.B., Phillips, R.A. and Tuck, G.N. (2009) Modelling the impact of fishery bycatch on black-browed albatrosses of South Georgia. Document presented to the ICCAT Sub-Committee on Ecosystems. Recife, Brazil. June 2009. SCRS/2009/077.

Watkins, B.P., Petersen, S.L. and Ryan, P.G.(2008) Interaction between seabirds and deep-water hake trwl gear: an assessment of impacts in South African waters. Animal conservation 11. 247-254

Modelling the impact of fishery bycatch on black-browed albatrosses of South Georgia

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1 Abstract

We applied a seabird assessment model to data for black-browed albatross breeding on South Georgia. The model estimated that trawl fisheries, followed by Uruguayan and Brazilian pelagic longline fisheries, are most responsible for historical incidental bycatches of these birds. The model favours a surprisingly low adult natural mortality rate of 0.04 y^{-1} and does not favour density dependence in either productivity or juvenile natural mortality rates. Because if the lack of density dependence, the model cannot simulate future population recovery scenarios, even given zero future bycatch. Projections of the model show that elimination of bycatch through the introduction of effective mitigation, or complete fishery closure in two 5×5 degree spatial blocks off southern Uruguay in spring or in winter would be equivalent to large reductions in overall effort, even if all effort is displaced to adjacent waters so that no overall reduction in effort occurs. The model indicates that most black-browed albatross bycatch occurs off southern Africa, Uruguay, southern Brazil and, to a lesser degree, south-eastern Australia. Greater mitigation in these regions would be advantageous to the black-browed albatross population. Future mitigation of bycatch in the pelagic longline fisheries of Uruguay and Brazil leads to greater future black-browed albatross population sizes than does mitigation of the trawl fisheries. Further investigation is needed into the nature of density dependence in black-browed albatross.

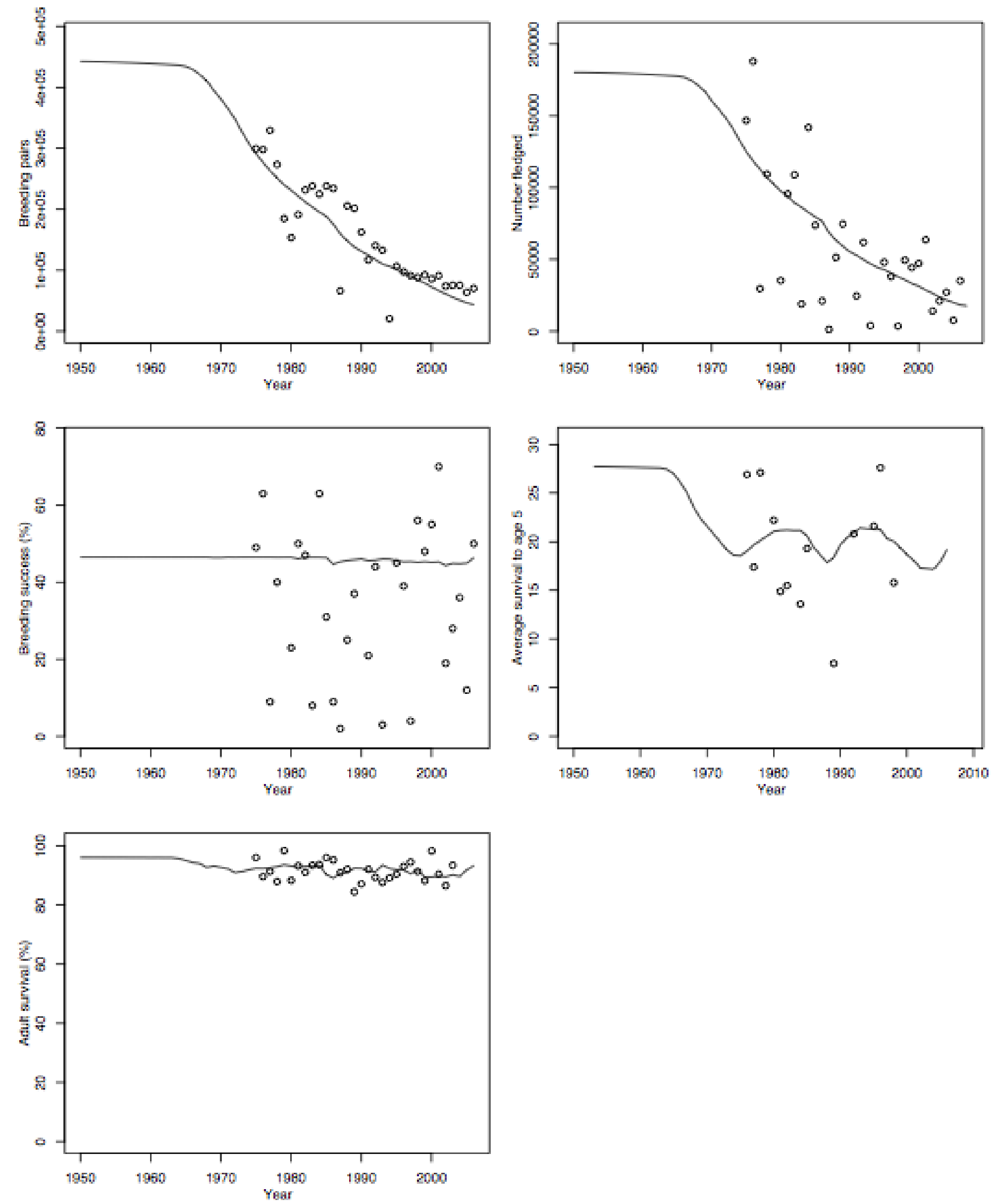
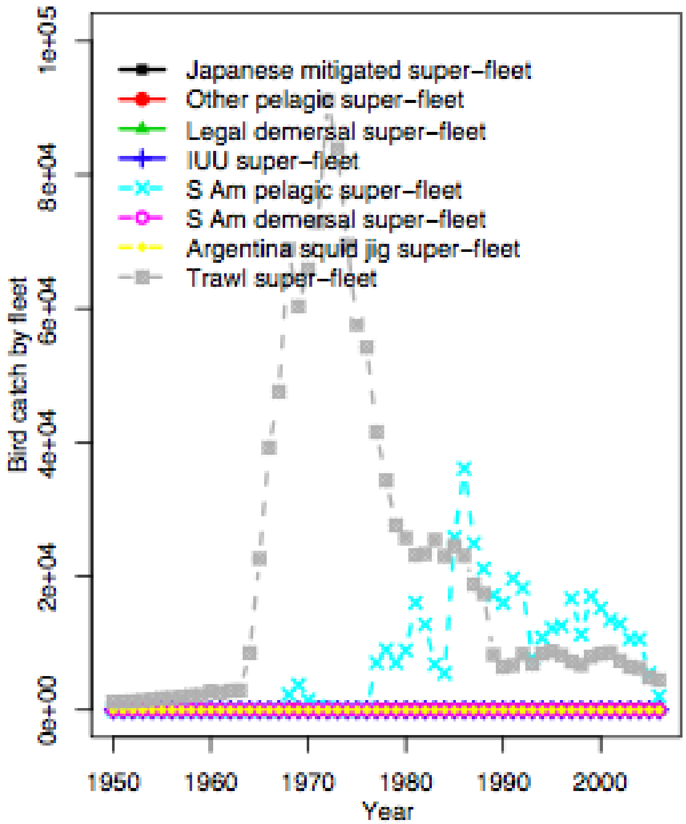


Figure 17: Observed (circles) and model estimated (lines) quantities on which the base case model is conditioned. Results are shown for the base case model, which uses adult natural mortality of $M = 0.04$.


Japanese mitigated super–fleet
Other pelagic super–fleet
Legal demersal super–fleet
IUU super–fleet
S Am pelagic super–fleet
S Am demersal super–fleet
Argentina squid jig super–fleet
Trawl super–fleet
Bird catch by fleet
0e+00
2e+04
4e+04
6e+04
8e+04
1e+05
1950
1960
1970
1980
1990
2000
Year