Submission on: 2007-08 SQU6T OPERATIONAL PLAN: INITIAL POSITION PAPER

I am an Associate Professor in the Department of Marine Science at Otago University, were I teach Marine Conservation Biology, Conservation Biology of Marine Mammals, and Marine Ecology. I have been a practicing marine ecologist for 23 years, and have published more than 80 scientific papers, chapters in books and books. I have supervised several research projects on New Zealand sea lions. I wish to make the following comments.

1. The use of SLEDs has effectively prevented any reliable quantification of how many sea lions are killed in the squid trawl fishery. Because bycatch is now essentially hidden, there is no incentive for skippers to take other measures to reduce bycatch.

2. Estimating sea lion catches from the number of trawl tows is an indirect and extremely approximate process which has potential for serious bias. Two clear examples of such bias are: (a) The year in which there was 100% observer coverage produced a quantified strike rate of over 11.5%, yet 5.3% is the assumed strike rate used in the calculations, (b) Tow length in this fishery is nearly double what it was when strike rate was estimated, yet there has been no adequate correction. This is irrational and unacceptable.

3. The Breen-Kim model has been criticised by several skilled modellers. In my opinion, the most important criticisms of it are:
   - At its core is a logistic model. To validly use such a model, one must have a set of catch and abundance data over a wide range of popltaion sizes – otherwise the model can provide no information on any density dependent parameter. Yet the model has abundance data only from a short period over which population sizes has remained similar. Hence those data give no infromation about where this population might be on the logistic growth curve. Fundamentally, that is why this model is uninformative about *K,* and the posterior distribution for this parameter (and of the other density dependent parameters) is essentially driven by its prior. This problem is extremely important, because how one might manage this population depends closely on where current populations are with respect to *K*.

   - The model considers only the population on the Auckland islands shelf.

   - The model deals with environmental variability in a way that underestimates variability and risk. If you generate random survival rates using the formula in the BK model, the standard deviation of those survival rates is much smaller than that arrived at using other well-described approaches. This results in lower variability and therefore an underestimate of risk (e.g. risk of population decline, risk of extinction, failure to establish new breeding colonies, etc.). This parameterisation results in population growth rates similar to a deterministic model, in particular for high survival rates with a high standard deviation.

   - The model used to estimate FRMLs is a Bayesian model which attempts to estimate all the parameters simultaneously, then uses those estimates to provide population projections. In the parameter estimation, the only "test" of validity is whether the multiple input data sets are consistent with one another. This is a weak test by any standards, because a relatively precise but biased dataset has the potential to compromise resulting estimates for all the other parameters.

- There is no attempt to estimate model uncertainty. In robust population modelling, it is common to assess model uncertainty (the ability to test whether the model is right) via comparison of several competing models. Not doing this is assumes that the model cannot be wrong. That this type of model is trustworthy is an act of faith. This is especially illogical considering that some of its results are unrealistic and considering that the model has a long list of acknowledged problems.

- Since the model is uninformative about *K*, the estimates of the proportion of runs that reach 90% of *K* (Crit 20, Crit 100, and Nmat/K in table 1) are meaningless in any quantitative sense.

- Many of the model outputs are difficult to believe. For example, the most extreme of the possible "sustainable" bycatch estimates is 513. This is about a quarter of the current pup production at the Auckland islands. It is especially difficult to believe given the demonstrated decline in current pup production.

4. There is an assumption that a more complex model is necessarily a better one. In this case the reverse is true. The PBR approach is much simpler, transparent, considerably more robust to bias and uncertainty in input data, and has been designed with clear management goals in mind

5. The statement that the AWEG has accepted the Breen-Kim model as the best available model (point 28) is open to challenge. The model has been heavily critised on many occasions, and my understanding is that Dr Breen is currently working on various of its deficiencies. I understand also that the PBR model has been argued to be superior by several AWEG members.

6. It is misleading to state that FRMLs range up to 513, because that implies that under some senarios, 513 would be a sustainable annual bycatch. This is not true. Under the least conservative model, 513 is the maximum ONE SEASON take. In other words, you could only take if for one season. Under the same senario, the average take would have to be less than 100.

7. If the species is to (eventually) recovery to non-threatened status, it must found new breeding populations. No-one knows precisely how that process will occur, but it is clear that letting the subantarctic population expand as fast as possible, so they saturate that environment, is likely to acccelerate the recolonisation process.

8. Recent studies of foraging ecology demonstrate that female NZSLs are operating very close to their physiological limits, routinely diving beyond their aerobic capacity. This suggests that the foraging environment is marginal, and this might help explain why reproductive rate among breeders is relatively low (for a sealion), and why there is a very high proportion of non-breeders (about 20% of females never breed). These data suggest that a VERY precautionary management regime would be appropriate (ie much more cautious than we have now).

9. Additionally, recent mass-mortality events underscore the need for conservative management. The fact that a convincing cause has not been established (the bacterial agents identified are very likely to be secondary – what was the primary cause?) argues for additional uncertainty.

10. There is no rational basis for change in the discount rate, because there is no convincing evidence that survivability of ejection has improved. Such evidence can only be provided by having a cover over the "ejection hatch".

11. The validity of the process of approving SLEDs (IPP point 91) is strongly undermined by the observation that 2 vessels which caught 8 sealions had malfunctioning SLEDs (see IPP point 75).

12. Given that the bycatch of marine mammals in fisheries is inherently undesirable, it is axiomatic that marine mammal bycatch should decrease over time. This is particularly so in the context of declining estimates for pup production. Yet this has not happened. The allowable catch of New Zealand sealions has been greater over the last three years than ever before. This is in stark contrast with our legislative goals, and contary to what the World expects from us. It is indefensible.

I recommend that:

- The minister implements a higher strike rate consistent with the data, and with the much higher rate observed with 100% observer coverage.
- No change is made to the discount factor, on the basis that there is no convincing evidence to support change
- To minimise impact on sealions, and more adequately reflect uncertainites and the fact that this population is declining, the minister should implement a conservative option consistent with the PBR. This means implementing rule 310, resulting in an FRML of 53 sealions.
- Additionally, the minister should take concrete steps to encourage the use of more selective fishing methods. That jigging is used successfully at the Falkland Islands indicates that it could be used at the Auckland Islands.

I am grateful for the opportunity to comment.

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