COMMENTS ON THE SIMPLE PENGUIN MODEL OF SWG/EAF/SEABIRDS/13APR/01

D S Butterworth and É E Plagányi

Straightforward re-arrangement of the equations near the bottom of pg 1 of this document yields:

$$M_t = (S_a / P_t)\, B_t + \tfrac{1}{2}\, S_j\, S_a^2\, C_{t-3}\, B_{t-3} \qquad (1)$$

Substituting values assumed for case a): $P_t = 0.68,\ S_j = 0.51,\ S_a = 0.85$
gives:

$$M_t = 1.25\, B_t + 0.184\, C_{t-3}\, B_{t-3} \qquad (2)$$

Note:

1) In terms of equation (2) $M_t > B_t$ as all terms on the RHS are positive.
Yet this does not hold for the plots shown – some explanation is needed.

2) Given the form of equation (2), with the RHS dominated by B_t, plots of M_t vs B_t will by construction show a good "fit", but this is not the appropriate test of such a model. Technically, the assumptions underlying equation (2) – that the B_t values are exact (without error) – are synonymous with a process error estimator. Thus the quality of the fit of such a model should be judged by a plot of the associated residuals (apparently $M_t - 1.25 B_t - 0.184 C_{t-3}\, B_{t-3}$) against time, though it should be noted that well documented simulation studies have shown that the performance of process error estimators is much inferior to that of the observation error estimators that are conventionally applied for such models.

3) The simple model proposed contains no framework for linking variations in demographic parameter values to pelagic fish abundance, which is fundamental to the planned evaluation of alternative fish harvesting strategies on penguin abundance through the pelagic OMP testing process.