Issues Surrounding the Development of a Revised OMP for the SA Pelagic Fishery for Sardine and Anchovy

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Introduction

The current Operational Management Procedure (OMP) for South African sardine and anchovy, OMP-04, is based on assessments using data up to November 2003 (Cunningham and Butterworth 2004a,b). This OMP will need to be updated in the near future to take account, in particular, of:

i) *Updated series of observed spawner biomass and recruitment, following correction for the saturation effect (capping), new target strength expressions and signal attenuation in dense sardine schools (Coetzee et al. 2006).* The previous assessments did include an updated series, but this was not based on an entirely satisfactory calibration analysis. The assessment also needs to be updated to take further survey results since 2003 into account. In particular, recent surveys suggest that the peak in sardine abundance is now past, and this will impact a re-assessment of the stock-recruitment relationship to which resource projections are particularly sensitive.

ii) *Updated ageing information.* In the absence of information, the previous assessment assumed average sardine age-length-keys (from 1997-1999) for recent years. However, the recent high abundance of the resource may be coupled with slower growth rates (van der Lingen 2004), as well as with changes in age at maturity, so that it is particularly important to update the assessment with more recent age-length-keys and/or improved approaches to incorporating available catch-at-length distribution data.

There are, however, perhaps other issues that need to be considered as well in a revision of OMP-04. We introduce two below, and recommend the Pelagic Working Group give consideration to whether there are any others.

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Taking Explicit Account of Predator Needs

The selection of OMP-04 involved the development of a trade-off curve between directed sardine and anchovy catch. This curve represented the possible OMP choices (given different control parameters), subject to the following risk criteria being met: $risk_S < 0.1$ and $risk_A < 0.3$, where:

$risk_S$ - the probability that adult sardine biomass falls below the average adult sardine biomass between November 1991 and November 1994 at least once during the 20-year projection period;

$risk_A$ - the probability that adult anchovy biomass falls below 10% of the average adult anchovy biomass between November 1984 and November 1999 at least once during this projection period.

Adoption of these risk definitions corresponds to some *implicit* allowance for predator needs (as the harvests do not reduce the populations to zero). Figs 1 and 2 compare sardine and anchovy biomass distributions anticipated under no exploitation to those with harvesting under OMP-04. In some way predator needs have to be quantitatively related to these distributions. Clearly **any** harvesting results in distributions shifted to the left, and hence must depart somewhat from what would be ideal from a predator perspective – the question is how **large** a shift is acceptable.

Crawford *et al.* (2006) suggest an *explicit* maintenance of a combined sardine-anchovy biomass of 2 million tonnes to support penguin populations. Figure 3 compares distributions of this combined abundance in the absence of any harvest and under OMP-04, and Table 1 gives the probabilities of this biomass falling below this tonnage. Certainly it seems that the minimum 2 million tonnes sought by Crawford *et al.* (2006) is achieved in the absence of any catch; but even with harvesting under OMP-04, the probability of the combined biomass dropping below this level is only 7%, and the median combined abundance is well above it. Hence, accepting for the purposes of argument the underlying objective proposed by Crawford *et al*. (2006), the question arises of whether this is already effectively more than achieved under OMP-04? What this does make clear is that proposals of this nature have to be caste in a probabilistic framework, with the associated analysis necessarily linked to OMP testing. Plaganyi and Butterworth (2006) includes more specific suggestions of how to proceed towards this end.

Stock Structure

The development of previous OMPs for the sardine-anchovy fisheries have always assumed a single reproductive stock for each of the two species. However, the eastward shift in particularly sardine over recent years has brought with it comments about the possibility of (at least) an “eastern” as well as a “western” sardine population. If stock structure of that nature is considered reasonably plausible, the PWG needs to begin the process of specifying the details of such structure to allow for the development of corresponding operating models for use in the OMP testing process.

References

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Table 1. Sardine. Median (with 90% probability interval in brackets) biomass at the end of the projection period (in thousand tonnes) and biomass as a proportion of carrying capacity for sardine, anchovy and combined sardine and anchovy.

	OMP-04	No Catch
	Sardine	
$B_s(2023)/K_s$	0.71 [0.26; 1.24]	0.94 [0.58; 1.5]
$B_s(2023)$	2903.8 [1007.6; 9845.8]	4011.6 [2044.7; 11342.0]
Prob $B_s(2023) < 1000000$ t	0.05	0.00
	Anchovy	
$B_a(2023)/K_a$	0.45 [0.04; 2.08]	0.75 [0.23; 2.54]
$B_a(2023)$	1026.5 [122.8; 5236.4]	1759.1 [573.4; 6632.9]
Prob $B_a(2023) < 1000000$ t	0.49	0.18
	Combined Sardine and Anchovy	
$B_s(2023)+B_a(2023)$	4654.8 [1808.0; 12834.5]	6766.0 [3274.8; 14838.0]
Prob $B_s(2023)+B_a(2023) < 2000000$ t	0.07	0.00

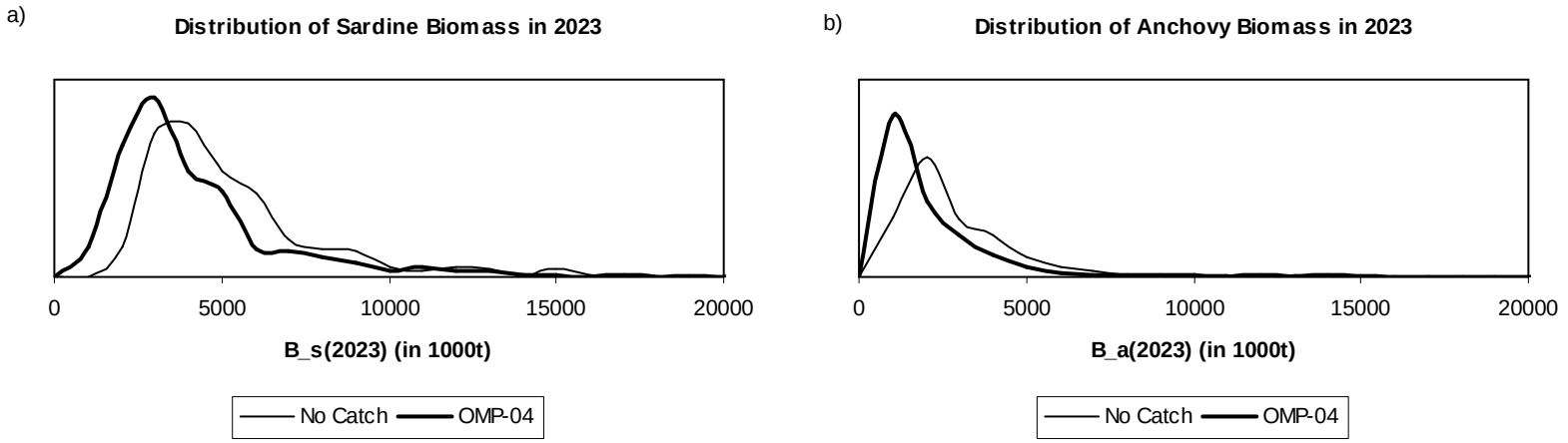

Figure 1. The distribution of a) sardine and b) anchovy biomass at the end of the projection period, under OMP-04 and under a no-catch scenario.

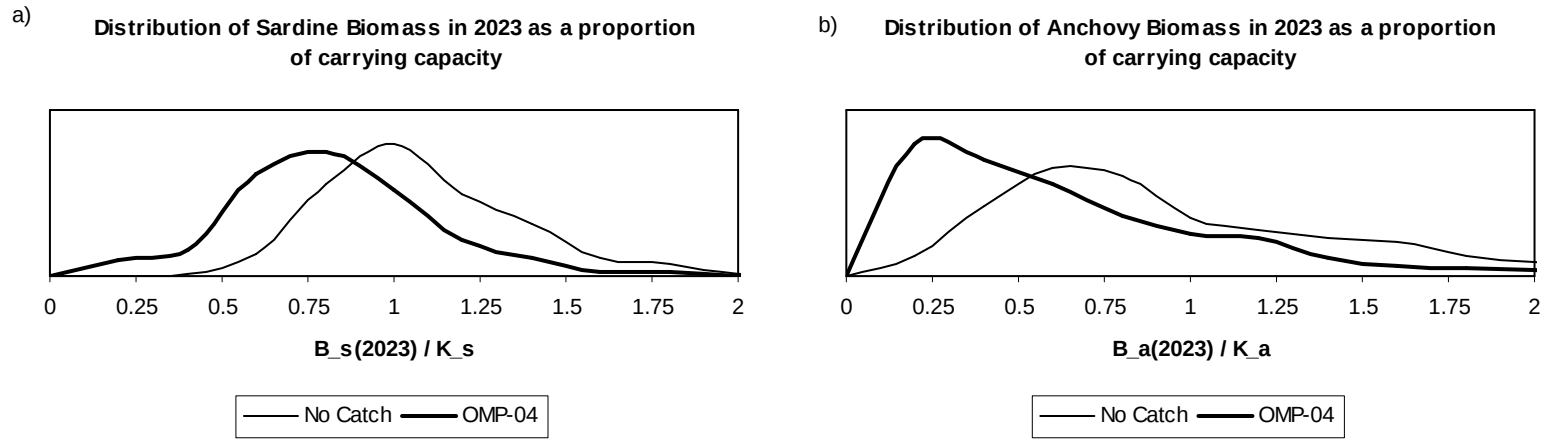

Figure 2. The distribution of a) sardine and b) anchovy biomass at the end of the projection period as a proportion of estimated carrying capacity, under OMP-04 and under a no-catch scenario.

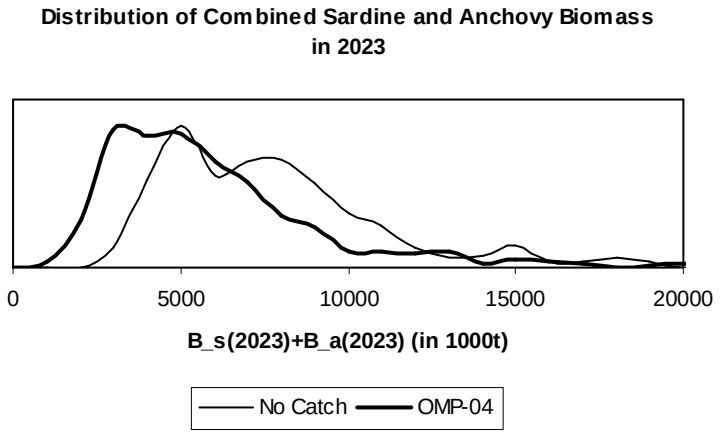

Figure 3. The distribution of combined sardine and anchovy biomass at the end of the projection period, under OMP-04 and under a no-catch scenario.