The Potential Consequences of Dumping Juvenile Anchovy and Sardine

C.L. de Moor* and D.S. Butterworth*

Correspondence email: carryn.demoor@uct.ac.za

The potential consequences of dumping or slipping juvenile anchovy and sardine were investigated using the OMP-08 simulation testing framework. In this analysis, the following assumptions have been made:

1) Every year the tonnage of normal season juvenile anchovy which die is 8, 10 or 15% larger than that which is caught. This is based on the level of reports of dumping between 25-28th April 2010, when an estimated 300t of anchovy was dumped and/or slipped in two days. This was doubled to assume about 600t was dumped in the four day period, which equated to about 8% of the landed catch.

2) There is no change to the additional season juvenile anchovy catch, nor to the anchovy 1-year-old catch.

3) The tonnage of normal season juvenile sardine which die is equal to the sum of the bycatch landed and an additional tonnage with is calculated as *ratio*additional anchovy catch dumped*. The *ratio* is the ratio of juvenile sardine to anchovy in the catch and is assumed to be either 0.1, 0.4 or 0.7. The *additional anchovy catch dumped* is *x**tonnage of anchovy landed, where *x* is either 0.08, 0.1 or 0.15 corresponding to the choice in 1) above.

4) There is no change to the additional season juvenile sardine bycatch, nor to the sardine directed 1+-year-old catch.

5) There is no change to the model predicted juvenile sardine and anchovy catch prior to the survey.

Results and Discussion

Table 1 summarises the effect of the alternative assumptions of juvenile anchovy and sardine dumping on the populations and on the projected catch. A moderate dumping assumption of 8% of the normal season anchovy catch, together with a bycatch ratio of 0.4 results in an increase in the risk to the sardine resource from 0.178 to 0.259 and an increase to the risk to the anchovy resource from 0.097 to 0.127.

Recall that risk for OMP-04 and OMP-08 was defined as:

$risk_S$ - the probability that adult sardine biomass falls below the average adult sardine biomass over November 1991 and November 1994 at least once during the projection period of 20 years.

$risk_A$ - 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 the projection period of 20 years.

* MARAM (Marine Resource Assessment and Management Group), Department of Mathematics and Applied Mathematics, University of Cape Town, Rondebosch, 7701, South Africa.

If the risk levels of $risk_S < 0.18$ and $risk_A < 0.10$ were maintained, then the average directed sardine catch would decrease from 190 to 128 000t and the average anchovy catch would decrease from 381 to 239 000t. Note that in this scenario, the risk to the sardine resource, which is influenced by the increased juvenile sardine mortality due to dumping, is the primary constraint.

In the scenario of 10% of the normal season anchovy being dumped with a high bycatch ratio, the risk to the sardine resource more than doubles, while the risk to the anchovy resource increases by 50%. The average sardine and anchovy resource biomasses after 20 years fall in comparison to carrying capacity, the risk threshold biomass and the resource biomasses at the beginning of the projection period. In addition the projected average directed sardine catch decreases by 19%. For this scenario it is not possible to satisfy the risk levels of $risk_S < 0.18$ and $risk_A < 0.10$, even for control parameters $\beta = 0$ and $\alpha_{ns} = 0$.

Table 1. Key summary statistics for the trade-off point for OMP-08 (first column) and comparative values under alternative assumptions of juvenile anchovy and sardine dumping.

% of anchovy normal season catch that is dumped	0%	8%	8%	8%	10%	10%	10%	15%	15%
Assumed bycatch % with the above dumped anchovy	0%	0%	10%	40%	10%	40%	70%	10%	40%
$risk_S$	0.178	0.178	0.194	0.259	0.199	0.288	0.392	0.211	0.355
$\overline{C}^S$ (2008-2027)	190	190	187	175	186	170	153	183	159
AAV^S (2008-2027)	0.24	0.24	0.24	0.25	0.24	0.25	0.26	0.24	0.25
$\overline{B^S_{2027}/K^S_{non-peak}}$	0.68	0.69	0.67	0.62	0.67	0.60	0.52	0.66	0.55
$\overline{B^S_{2027}/Risk^S}$	10.45	10.47	10.20	9.36	10.14	9.09	7.97	9.99	8.35
$\overline{B^S_{2027}/B^S_{2007}}$	5.66	5.67	5.56	5.21	5.54	5.09	4.59	5.48	4.77
$\overline{B^S_{\min}/K^S_{non-peak}}$	0.26	0.26	0.26	0.23	0.25	0.22	0.19	0.25	0.20
$\overline{B^S_{\min}/Risk^S}$	1.78	1.78	1.73	1.57	1.72	1.52	1.31	1.69	1.38
$risk_A$	0.097	0.122	0.123	0.127	0.128	0.136	0.143	0.139	0.146
$\overline{C}^A$ (2008-2027)	381	376	376	377	375	376	376	372	373
AAV^A (2008-2027)	0.30	0.31	0.31	0.31	0.31	0.31	0.30	0.31	0.31
$\overline{B^A_{2027}/K^A}$	0.61	0.59	0.59	0.58	0.58	0.57	0.57	0.56	0.56
$\overline{B^A_{2027}/Risk^A}$	1.81	1.75	1.74	1.73	1.72	1.71	1.69	1.68	1.65
$\overline{B^A_{2027}/B^A_{2007}}$	0.84	0.82	0.82	0.81	0.81	0.81	0.80	0.81	0.79
$\overline{B^A_{\min}/K^A}$	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12
$\overline{B^A_{\min}/Risk^A}$	0.39	0.37	0.37	0.36	0.36	0.35	0.35	0.35	0.34