Final Anchovy TAC and Sardine TAB for 2012, Using OMP-08

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Following the recent 2012 recruit survey, the revised and final 2012 South African anchovy TAC and sardine TAB are to be recommended. The following data have been used:

1) November 2011 survey sardine 1+ biomass: 1 037 060 t.
2) November 2011 survey anchovy 1+ biomass: 754 124 t.
3) May 2012 survey anchovy recruitment, adjusted for delayed start: 203.160 billion.
4) Time after 1 May that the survey commenced: 1.50 (survey commenced on 16th June)
5) Anchovy recruit catch from 1st November to 15th June, using monthly cut-off lengths from Cunningham *et al*. 2007: 32.050 billion
6) Anchovy adult catch from 1st November to 15th June, using monthly cut-off lengths from Cunningham *et al*. 2007: 3.413 billion
7) Juvenile sardine : anchovy ratio (by mass) observed in the May recruitment survey: 0.0933
8) Juvenile sardine : anchovy ratio (by mass) observed in the May commercial catches: 0.0458
9) Directed sardine TAC for 2011: 90 000 t.
10) Directed anchovy normal season TAC for 2011: 270 291 t[1].

Using the above data, the final 2012 TAC and TAB recommendations are calculated by OMP-08 to be:

Directed sardine TAC:	100 595t
Initial normal season anchovy TAC:	202 718t
Revised normal season anchovy TAC:	352 718t
Additional season anchovy TAC:	120 000t
Total anchovy TAC:	472 718t
Initial normal season sardine TAB:	25 446.6t
Revised normal season sardine TAB:	35 879.1t
Additional season sardine TAB:	2 000.0t
Total sardine TAB:	37 879.1t

The equations used to calculate these TAC/Bs are given in the Appendix.

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[1] The total anchovy TAC for 2011 was 390 291t, comprising of 270 291t for the normal season and 120 000t for the additional season.

Comments on the TACs

As no Exceptional Circumstances were declared for sardine in December 2011, there is no update to the directed sardine TAC.

The normal season and additional season anchovy TACs were constrained by the maximum increase/allocation of 150 000t and 120 000t, respectively. Exceptional Circumstances do not apply.

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References

Cunningham, C.L., van der Westhuizen, J.J., Durholtz D. and Coetzee, J. 2007. A Record of the Generation of Data Used in the Sardine and Anchovy Assessments. Unpublished MCM Document MCM/2007/SEPT/SWG-PEL/03. 28pp.

de Moor, C.L. and D.S. Butterworth. 2008. OMP-08. MCM document, MCM/2008/SWG-PEL/23. 15pp.

Appendix: Summary of revised and final anchovy TAC and sardine TAB equations of OMP-08 (from de Moor and Butterworth 2008).

Revised TAC / TAB

The revised anchovy TAC is initially calculated as:

$$TAC_{2012}^{2,A} = \alpha_{ns}\ q\left(p\frac{N_{2011,rec0}^{A}}{\overline{N}_{rec0}^{A}} + (1-p)\frac{B_{2011,N}^{obs,A}}{\overline{B}_{Nov}^{A}} \right)$$

This results in $TAC_{2012}^{2,A} = 401163\text{t}$. As the normal season anchovy TAC in 2011 was below the 2-tier threshold of 330 000t, this TAC is subject to the following constraints:

$$\max\left\{\left(1-c_{mxdn}^{A}\right)TAC_{2011}^{2,A}\ ;TAC_{2012}^{1,A};c_{mntac}^{A}\right\} \le\ TAC_{2012}^{2,A}\ \le\ \min\left\{c_{mxtac}^{A};TAC_{2012}^{1,A}+c_{mxinc}^{ns,A}\right\}$$

which results in $TAC_{2012}^{2,A} = 352\,718\text{t}$. The anchovy biomass projected for November 2012 is above the Exceptional Circumstances threshold and thus no Exceptional Circumstances provisions were invoked. In the above equations we have:

$B_{2011,Nov}^{A}$ - the estimate of anchovy abundance (in thousands of tons) from the hydroacoustic spawner biomass survey in November 2011.

$\overline{B}_{Nov}^{A}$ - the historic average index of anchovy abundance from the spawner biomass surveys from November 1984 to November 1999, of 1 380.28 thousand tons.

$N_{2011,rec0}^{A} = (N_{2012,r}^{obs,A}e^{0.5(6+t_{2012}^{A})0.9/12} + C_{2012,0bs}^{A})\ e^{[0.5(6+t_{2012}^{A})]0.9/12}$

- the simulated estimate of anchovy recruitment from the recruitment survey in 2012, $N_{2012,r}^{obs,A}$, back-calculated to 1 November 2011 by taking natural and fishing mortality into account.

$\overline{N}_{rec0}^{A} = 197.96$ - the average 1985 to 1999 observed anchovy recruitment (in billions) in May, back-calculated to November of the previous year.

$\alpha_{ns} = 0.78$ - a control parameter which scales the anchovy TAC to meet target risk levels for sardine and anchovy.

$p = 0.7$ - the weight given to the recruit survey component compared to the spawner biomass survey component in setting the anchovy TAC.

$q = 300$ - reflects the average annual TAC expected under OMP99 under average conditions if $\alpha_{ns} = 1$.

$c_{mxdn}^{A} = 0.25$ - the maximum proportional amount by which the normal season directed anchovy TAC can be reduced from one year to the next (note that the additional season anchovy TAC is not taken into consideration in this constraint).

$c_{mxtac}^{A} = 600$ - the maximum directed TAC that may be set for anchovy (in thousands tons).

$c^{ns,A}_{mxinc} = 150$ - the maximum amount by which the anchovy TAC is allowed to be increased within the normal season (in thousand tons).

$C^{A}_{2012,0bs} = 32.050$ - the observed juvenile anchovy landed by number (in billions) from the 1st of November 2011 to the day before the recruit survey commences in 2012.

$t^{A}_{2012} = 1.500$ - the timing of the anchovy recruit survey in 2012 (number of months) relative to the 1st of May.

The revised sardine TAB is calculated using:

$$TAB^{2,S}_{2012} = \lambda\, TAC^{1,A}_{2012} + r_{2012}\,(TAC^{2,A}_{2012} - TAC^{1,A}_{2012}) + TAB^{S}_{rh}$$

This gives $TAB^{2,S}_{2012} = 35\,879.1\text{t}$, where $\lambda = \max\{\gamma_{2012}, r_{2012}\} = 0.108$.

In the above equations we have:

$TAB^{S}_{rh} = 3500\text{t}$- the fixed tonnage of adult sardine bycatch set aside for the round herring fishery each year.

$\gamma_{2012} = 0.108$ - a conservative allowance for the ratio of juvenile sardine to juvenile anchovy in subsequent catches.

$r_{2012} = \frac{1}{2}(r_{2012,sur} + r_{2012,com}) = 0.070$

- the ratio of juvenile sardine to anchovy "in the sea" during May 2012, calculated from the recruit survey and the sardine bycatch to anchovy ratio in the commercial catches[2] during May.

<u>Final TAC / TAB (the anchovy additional sub-season from 1st September)</u>

The final anchovy TAC is initially calculated as:

$$TAC^{3,A}_{2012} = \alpha_{ads}\; q\left(p\,\frac{N^{A}_{2011,rec0}}{\overline{N}^{A}_{rec0}} + (1-p)\frac{B^{obs,A}_{2011,N}}{\overline{B}^{A}_{Nov}} \right)$$

This gives $TAC^{3,A}_{2012} = 601\,745\text{t}$. The constraints:

$$\max\left\{TAC^{2,A}_{2012}; c^{A}_{mntac}\right\} \le TAC^{3,A}_{2012} \le \min\left\{c^{A}_{mxtac}; TAC^{2,A}_{2012} + c^{ads,A}_{mxinc}\right\}$$

result in $TAC^{3,A}_{2012} = 472\,718\text{t}$. The anchovy biomass projected for November 2012 is above the Exceptional Circumstances threshold and thus no Exceptional Circumstances provisions were invoked. In the above equations we have:

$\alpha_{ads} = 1.17$ - a control parameter which scales the anchovy TAC to meet target risk levels for sardine and anchovy.

$c^{ads,A}_{mxinc} = 120$ - the maximum amount by which the anchovy TAC is allowed to be increased within the additional sub-season (in thousand tons).

[2] Only commercial catches comprising at least 50% anchovy with sardine bycatch are considered.

The final sardine TAB is calculated as:

$$TAB_{2012}^{3,S} = TAB_{2012}^{2,S} + \min\left\{TAB_{ads}^{S}\ ;\ \gamma_{2012}\ (TAC_{2012}^{3,A} - TAC_{2012}^{2,A})\right\}$$

which gives $TAB_{2012}^{3,S} = 37\,879.1\text{t}$. Here:

$TAB_{ads}^{S} = 2$ - the maximum fixed tonnage of juvenile sardine bycatch set aside for the anchovy additional sub-season each year (in thousand tons).