Sardine TAC and Initial Anchovy TAC and Sardine TAB for 2006, using Re-Revised OMP-04

S.J. Johnston and D.S. Butterworth

MARAM
Department of Mathematics and Applied Mathematics
University of Cape Town
Rondebosch, 7701

Following the recent 2005 spawner biomass survey, the initial 2006 TACs for the South African sardine and initial sardine TAB are to be set. The following data have been used:

4. Anchovy normal season TAC for 2005: 215 000 tonnes\textsuperscript{1}.

Using the above data, the initial 2006 TACs and TAB are calculated by the Re-revised OMP-04 (Cunningham and Butterworth 2005a) to be:

- Directed sardine TAC: \textbf{204 000 tonnes} (eqn (A.1, A.2))
- Initial normal season anchovy TAC: \textbf{212 251 tonnes} (eqn (A.3, A.4))
- Initial normal season sardine TAB: \textbf{32 711 tonnes} (eqn (A.6))

Comments

The Directed sardine TAC for 2006 shows a 47% decrease from the 2005 value. The reason for the large decrease in sardine TAC is the substantial drop in the spawner biomass estimate from the November survey compared to 2004 (see Table 1 and Figure 1). An appreciable decrease was anticipated following poor results from sardine recruit surveys in both May 2004 and May 2005. Cunningham and Butterworth (2005b) in August this year predicted a (reduced) November 2005 biomass survey estimate of 1.76 million tonnes, with an associated TAC of 267 thousand tonnes, using an assessment model that put high weight on fitting these recruit survey results. Their estimate did not, however, include evaluation of the range about this estimate associated with imprecision of the assessment and sampling error for the November 2005 survey biomass estimate.

\textsuperscript{1} For 2005, the initial normal season anchovy TAC was 215 000 tonnes (adjusted upwards from 204 750 tonnes to meet preliminary allocation commitments), the final normal season TAC was also 215 000 tonnes, and the final seasons-combined TAC 315 648 tonnes. Note, however, that the first two figures corresponded to the Revised OMP, and the last to the Re-Revised OMP, where these revisions were in response to court judgements.
Acknowledgements
MCM are thanked for providing the input data for Re-revised OMP-04.

References

Table 1: November survey spawner biomass estimates for sardine and anchovy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sardine</th>
<th>Anchovy</th>
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<tbody>
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<td>1984</td>
<td>42.10099</td>
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<td>71.04541</td>
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<td>962.2887</td>
<td>3062.710</td>
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</table>

Figure 1: Plot of the time series of November survey sardine and anchovy spawner biomass estimates.
Appendix: Summary of Initial TAC and TAB Equations of Re-revised OMP-04 and their Application for 2006

(1) Directed Sardine TAC
In an initial calculation, the directed sardine TAC is set in proportion to the 2005 November spawner biomass index of abundance:

\[ TAC_s^y = \beta B_{y-1, Nov}^s \quad \text{(A.1)} \]

thus \[ TAC_{2006}^s = 0.14657 \times 962 = 141 \text{ thousand tonnes} \]

However, the TAC is also subject to the constraints of a minimum and a maximum value and a maximum drop to the ‘two-tier’ threshold:

\[ \max \{ (1 - c_{s, mxdn}^S) TAC_{y-1}^S, c_{s, mxtac}^S \} \leq TAC_y^S \leq c_{s, mxac}^S \quad TAC_y^S \leq c_{s, tier}^S \quad TAC_{y-1}^S > c_{s, tier}^S \quad \text{(A.2)} \]

where \( c_{s, tier}^S = 240 \text{ thousand tonnes} \).

Since \( TAC_{y-1}^S = 382 \text{ thousand tonnes for 2004 which is greater than } c_{s, tier}^S \),

\[ TAC_{2006}^S = (1 - c_{s, mxdn}^S) c_{s, tier}^S = 0.85 \times 240 = 204 \text{ thousand tonnes.} \]

\( \beta = 0.14657 \) - a control parameter reflecting the proportion of the previous year’s November spawner biomass index of abundance that is used to make the initial calculation for the directed sardine TAC.

\( B_{y, Nov}^S \) - the observed estimate of sardine abundance (in thousands of tonnes) from the hydroacoustic spawner biomass survey in November of year \( y \).

\( c_{s, mxdn}^S = 0.15 \) - the maximum proportional amount by which the directed sardine TAC can be reduced from one year to the next if the TAC is below \( c_{s, tier}^S \) (which is set at 240 thousand tonnes for sardine).

\( c_{s, mxac}^S = 90000 \text{t} \) - the minimum directed TAC that may be set for sardine.

\( c_{s, mxac}^S = 500000 \text{t} \) - the maximum directed TAC that may be set for sardine.
(2) Initial Directed Anchovy TAC

The initial directed anchovy initial TAC is based on how the 2005 November spawner biomass survey estimate of abundance related to the historic (pre-2005) average.

\[
TAC_{1,y}^{A} = \alpha_{ns} \delta q \left( p + (1 - p) \frac{B_{y,Nov}^{A}}{B_{Nov}^{A}} \right) \tag{A.3}
\]

Application of this formula results in:

\[
TAC_{2006}^{1,A} = 0.73752 \times 0.85 \times 300 \times [0.7 + 0.3 \times \left( \frac{3063}{2144} \right)]
= 212,251 \text{ thousand tonnes.}
\]

This anchovy TAC is subject to similar constraints as apply for sardine:

\[
\max \left\{ (1 - c_{\text{mxtac}}^{A,y}) TAC_{y-1}^{2,A} \leq TAC_{y}^{1,A} \leq c_{\text{mxtac}}^{A} TAC_{y-1}^{2,A} \right\} \leq TAC_{y}^{1,A} \leq c_{\text{tier}}^{A} TAC_{y-1}^{2,A} \quad TAC_{y}^{2,A} > c_{\text{tier}}^{A}
\tag{A.4}
\]

where \( c_{\text{tier}}^{A} = 330 \) thousand tonnes.

Since \( TAC_{y-1}^{2,A} = 215 \) thousand tonnes for 2005, which is smaller than \( c_{\text{tier}}^{A} \), and

\[
(1 - c_{\text{mxtac}}^{A,y}) TAC_{y-1}^{2,A} = 0.75 \times 215 \times 000 = 161,250 ,
\]

the anchovy TAC for 2006 remains

\[
212,251 \text{ tonnes.}
\]

In the above equations we have:

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

- \( \overline{B}_{Nov}^{A} \) - the historic average index of anchovy abundance from the spawner biomass surveys from November 1984 to November 2004, of 2143.75 thousand tonnes.

- \( \alpha_{ns} = 0.73752 \) - a control parameter which scales the anchovy TAC to meet target risk levels for sardine and anchovy.

- \( \delta = 0.85 \) - a ‘scale-down’ factor used to lower the initial anchovy TAC to provide a buffer against possible poor recruitment.

- \( p = 0.7 \) - the weight given to the recruit survey component compared to the spawner biomass survey component in setting the anchovy TAC in the midyear revision.

- \( q = 300 \) - reflects the average annual TAC expected under OMP99 under average conditions if \( \alpha_{ns} = 1 \).
\[ c^{A}_{\text{msdn}} = 0.25 \] - 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).

\[ c^{A}_{\text{mntac}} = 150\,000t \] - the minimum directed TAC that may be set for anchovy.

\[ c^{A}_{\text{mxtac}} = 600\,000t \] - the maximum directed TAC that may be set for anchovy.

Note that for the mid-year revision, the normal season TAC will be given by:

\[
\text{Revised anchovy TAC: } \quad TAC_{y}^{2,A} = \alpha_{\text{ns}} q \left( p \frac{N_{y-1,\text{rec}0}^{A}}{N_{y-1,\text{rec}0}^{A}} + (1-p) \frac{B_{y-1,\text{Nov}}^{A}}{B_{\text{Nov}}^{A}} \right) 
\] (A.5)

where

\[ N_{y-1,\text{rec}0}^{A} \] - the simulated estimate of anchovy recruitment from the recruitment survey in year \( y \), back-calculated to 1 November \( y - 1 \) by taking natural and fishing mortality into account, and

\[ \overline{N}_{y-1,\text{rec}0}^{A} \] - the average simulated estimate of anchovy recruitment at the beginning of November from 1984 to \( y - 2 \).

and subject to other constraints detailed in SWG/DEC2005/PEL/05.

(3) Initial sardine TAB

The initial sardine TAB is calculated using:

\[
\text{TAB}_{y}^{1,S} = \gamma_{y} TAC_{y}^{1,A} + TAB_{\text{rh}}^{S} 
\] (A.6)

where:

\[ \gamma_{y} = 0.1 + \frac{0.1}{1 + \exp \left( -\frac{1}{0.1} \times \frac{0.00025 \left( B_{y-1,\text{Nov}}^{S} - 2000 \right)}{\alpha} \right)} = 0.107 \]

thus, given \( B_{2005,\text{Nov}}^{S} = 962 \) thousand tonnes:

\[
\text{TAB}_{2006}^{1,S} = 0.107 \times 212\,251 + 10\,000 = 32\,711 \text{ tonnes}.
\]

In the above equations we have:

\[ TAB_{\text{rh}}^{S} = 10\,000t \] - the fixed tonnage of adult sardine bycatch set aside for the round herring fishery each year.

\[ \gamma_{y} \] - a conservative allowance for the ratio of juvenile sardine to juvenile anchovy in subsequent catches.
(4) Exceptional circumstances
Since the observed November 2005 survey sardine spawner biomass estimate is above 250 000t, no sardine exceptional circumstances are invoked. Similarly, since the November 2005 survey anchovy spawner biomass estimate is above 400 000t, no anchovy exceptional circumstances are invoked.