

Final Anchovy TAC and small pelagic TABs for 2018

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The hydro-acoustic survey of small pelagic recruitment typically forms a key input into the Operational Management Procedure Harvest Control Rule formula for the mid-year adjustment of South African sardine and anchovy Total Allowable Catches (TACs) and Total Allowable Bycatches (TABs). Given the absence of a recruit survey during 2018, the following assumptions are made in order to finalise the anchovy TAC for 2018:

- The start date for the survey is assumed to be 15th May 2018 (de Moor 2017).
- The recruit cut-off-length estimated for the recruit survey is used to inform the monthly recruit cut-off length for separating juvenile catches from adult catches from April onwards (de Moor and Butterworth 2014). For 2018 the recruit cut-off-length is assumed to be 9.5cm in April and 10cm in May.
- The lowest survey estimate of anchovy recruitment over the past decade is used as a conservative estimate of anchovy recruitment for 2018. This is 104.166305 billion recruits observed in 2011 (DAFF 2017).

These assumptions, together with previously available data give the following inputs to the interim OMP-18¹ HCR formula.

- 1) November 2017 survey estimate of anchovy biomass: 1 568 398 tonnes.
- 2) May 2018 survey estimate of anchovy recruitment: 104.166305 billion.
- 3) Time after 1 May that the survey commenced: 0.5 months
- 4) Anchovy recruit catch from 1st November to 14th May, using monthly cut-off lengths from de Moor *et al.* 2012 and assuming recruit cut-off lengths of 9.5cm for April and 10cm for June: 13.115 billion
- 5) Anchovy adult catch from 1st November to 14th May, using monthly cut-off lengths from de Moor *et al.* 2012 and assuming cut-off lengths of 9.5cm for April and 10cm for June: 1.402 billion
- 6) Directed anchovy TAC for 2017: 450 000 tonnes.

This gives the following final anchovy TAC for 2018 as:

Final anchovy TAC:

295 911 tonnes

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¹ The HCR formula for Interim OMP-18 is similar to that of OMP-14, with some changes to constraints (see Appendix)

The equations used to calculate this TAC are given in the Appendix.

Given the absence of a recruit survey in 2018, no adjustment to the ≤ 14 cm sardine TAB with anchovy is made, and the following TABs remain unchanged from that awarded at the start of the year:

Final ≤ 14 cm sardine TAB with directed anchovy fishing:	25 129 tonnes
> 14 cm sardine TAB with directed round herring and anchovy fishing:	7 000 tonnes
≤ 14 cm sardine TAB with directed round herring fishing:	1 000 tonnes
Anchovy TAB for sardine only right holders:	500 tonnes

No adjustment to the 2018 directed > 14 cm sardine TAC nor the associated ≤ 14 cm sardine TAB with directed > 14 cm sardine fishing is provided at this time.

Comments on the TACs

The final anchovy TAC was not subject to any constraints.

Acknowledgements

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References

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Appendix: Summary of final anchovy TAC equations of Interim OMP-18.

The revised anchovy TAC is initially calculated as:

$$TAC_{2018}^A = \alpha q \left(p \frac{N_{2017,0}^A}{\bar{N}_0^A} + (1 - p) \frac{B_{2017}^{obs,A}}{\bar{B}_{Nov}^A} \right)$$

This results in $TAC_{2018}^A = 295\,911t$. As the anchovy TAC in 2017 was above the 2-tier threshold of 330 000t, this TAC is subject to the following constraints:

$$\max\{TAC_{2018,init}^A; (1 - c_{mxdn}^A)c_{tier}^A; c_{mntac}^A\} \leq TAC_{y2017}^A \leq c_{mxtac}^A$$

which results in $TAC_{2018}^A = 295\,911$. The anchovy biomass projected for November 2018 is above the Critical Biomass threshold and thus the Critical Biomass metarule is not used. In the above equations we have the following:

$B_{2017}^{obs,A}$ - the estimate of anchovy abundance (in thousands of tons) from the hydroacoustic survey in November 2017.

\bar{B}_{Nov}^A - the historical average index of anchovy abundance from the surveys from November 1984 to November 1999, of 1 380.28 thousand tons.

$$N_{2017,0}^A = (N_{2018}^{obs,A} e^{t_{2017} \times 1.2/12} + C_{2018,obs}^A) e^{6 \times 1.2/12} = 223.432$$

- the estimate of anchovy recruitment from the recruitment survey in 2018, $N_{2018}^{obs,A}$, back-calculated to 1 November 2017 by taking natural and fishing mortality into account.

$\bar{N}_0^A = 221.814$ - the average 1985 to 1999 observed anchovy recruitment (in billions) in May, back-calculated to November of the previous year.

$\alpha = 0.943$ - 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 $\alpha = 1$.

$c_{mxdn}^A = 0.25$ - the maximum proportional amount by which the directed anchovy TAC can be reduced from one year to the next.

$c_{mxtac}^A = 350$ - the maximum directed TAC that may be set for anchovy (in thousands tons).

$c_{tier}^A = 330$ - 2-tier threshold for directed anchovy TAC

$C_{2018,obs}^A = 13.115$ - the observed juvenile anchovy landed by number (in billions) from the 1st of November 2017 to the day before the recruit survey commenced in 2018.

$t_{2018} = 0.5$ - the timing of the anchovy recruit survey in 2018 (number of months) relative to the 1st of May.