The formulae used to set the 2021 initial anchovy TAC

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The formulae used by the SWG-PEL to set the initial directed anchovy TAC for 2021 correspond to those used to recommend the initial anchovy TAC under OMP-18 (de Moor 2018) and OMP-18rev (under development; de Moor 2020). However, the parameter values differ. The formulae, together with associated parameter values are detailed in the Appendix. The α value used at this point in time was selected based on initial OMP-18rev results presented by de Moor (2020) for joint sardine-anchovy Candidate Management Procedures based on sardine-anchovy Operating Models. This work was a step towards OMP-18rev. However, OMP-18rev will be an anchovy-only OMP and still needs to be tuned to obtain final control parameters .

References

de Moor CL. 2018. Considering alternative constraints to the anchovy Harvest Control Rule. DAFF: Branch Fisheries Document FISHERIES/2018/APR/SWG-PEL/06.

de Moor CL. 2020. Some initial results in the development of OMP-18rev. DEFF: Branch Fisheries Document FISHERIES/2020/DEC/SWG-PEL/123.

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Appendix A: Harvest Control Rules used to set the 2021 initial anchovy TAC

Initial directed anchovy TAC: $$TAC^A_{y,init} = \alpha\delta q\left(p + (1-p)\frac{B^{obs,A}_{y-1}}{\bar{B}^A_{Nov}}\right) \quad (A.1)$$

subject to: $$\begin{matrix} max\{(1-c^A_{mxdn})TAC^A_{y-1}; c^A_{stbl}\} \le TAC^A_{y,init} \le c^A_{mxtac} & if\ TAC^A_{y-1} \le c^A_{tier} \\ max\{(1-c^A_{mxdn})c^A_{tier}; c^A_{stbl}\} \le TAC^A_{y,init} \le c^A_{mxtac} & if\ TAC^A_{y-1} > c^A_{tier} \end{matrix} \quad (A.2)$$

If $B^A_{crit} \le B^{obs,A}_{y-1} \le B^A_{crit} + \Delta^A$ and the initial directed TAC was constrained by $(1-c^A_{mxdn})TAC^A_{y-1}$ or $(1-c^A_{mxdn})c^A_{tier}$ in equation (A.2):

$$TAC^A_{y,init} = \left(1 - \frac{B^{obs,A}_{y-1} - B^A_{crit}}{\Delta^A}\right)TAC^{A\prime\prime}_y + \left(\frac{B^{obs,A}_{y-1} - B^A_{crit}}{\Delta^A}\right)TAC^{A\prime}_y \quad (A.3)$$

where $TAC^{A\prime\prime}_y$ is the TAC output from equation (A.4) when $B^{obs,A}_{y-1} = B^A_{crit}$, while $TAC^{A\prime}_y$ is the value output from equation (A.2) when $B^{obs,A}_{y-1} = B^A_{crit} + \Delta^A$.

If $B^{obs,A}_{y-1} < B^A_{crit}$, then Critical Biomass metarules apply for the initial anchovy TAC:

Initial directed anchovy TAC: $$TAC^A_{y,init} = \begin{cases} 0 & if\ \frac{B^{obs,A}_{y-1}}{B^A_{crit}} < x^A \\ TAC^{A\_before}_y \left(\frac{\frac{B^{obs,A}_{y-1}}{B^A_{crit}} - x^A}{1-x^A}\right)^2 & if\ x^A < \frac{B^{obs,A}_{y-1}}{B^A_{crit}} < 1 \end{cases} \quad (A.4)$$

where $TAC^{A\_before}_y = \alpha\delta q\left(p + (1-p)\frac{B^{obs,A}_{y-1}}{\bar{B}^A_{Nov}}\right)$, subject to $c^A_{stbl} \le TAC^{A\_before}_y \le c^A_{mxtac}$.

Table A1. Definitions of the control parameters, constraints and data used in the formulae given in this Appendix. All mass-related quantities are given in thousands of tons.

Parameter	Definition	Value
α	Directed anchovy catch control parameter for normal season	0.936
δ	Scale-down factor applied to initial anchovy TAC to provide a buffer against possible poor recruitment	0.85
p	Weighting given to recruitment survey compared to November survey in setting anchovy TAC	0.7
q	Constant reflecting average annual TAC under OMP-99 if $\alpha = 1$	300
$B^{obs,A}_{2020}$	November survey estimate of anchovy total biomass in 2020	1646.846
$\bar{B}^A_{Nov}$	Historical average 1984 to 1999 November survey estimate of anchovy total biomass	1380
c^A_{stbl}	Stable anchovy TAC	120
c^A_{mxtac}	Maximum total anchovy TAC	350
c^A_{tier}	Two-tier threshold for anchovy TAC	330
c^A_{mxdn}	Maximum proportion by which anchovy TAC can be reduced annually	0.25
B^A_{crit}	November survey estimated biomass threshold below which Critical Biomass metarules are invoked for anchovy	600-800[1]
Δ^A	Linear smoothing is introduced below $B^A_{crit} + \Delta^A$ before sardine Critical Biomass metarules are applied (to ensure continuity)	100
x^A	The proportion of B^A_{crit} below which the metarule sets the anchovy TAC to zero	0.25

[1] A value for $600 \le B^A_{crit} \le 800$ has yet to be selected, but given $B^{obs,A}_{2020} = 1646.846$, the initial TAC is independent of this selection.