

Output from the South African Hake OMP-2018 for the 2021 TAC recommendation

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Summary

The TAC output from the South African hake OMP-2018 for 2021 is **139 109 t**, a decrease of 5% from the 2020 TAC. This decrease is mainly a result of reduced commercial catch rates on the west coast in recent years, as well as the low survey abundance estimate from the most recent 2019 south coast survey. The absence of south coast surveys for three of the last four years is a cause for concern. The proportion of *M. capensis* in the south coast offshore catch remains above OMP projection envelopes; this is a matter which merits further evaluation, for which some suggestions are made.

1. OMP-2018 formulae application

The formula for computing the TAC recommendation under OMP-2018 is as follows:

$$TAC_{y+1} = C_{y+1}^{para} + C_{y+1}^{cap} \quad (1)$$

with

$$C_{y+1}^{spp} = b^{spp}(J_y^{spp} - J_0^{spp}) \quad (2)$$

where

TAC_y is the total TAC recommended for year y ,

C_y^{spp} is the intended species-disaggregated TAC for species spp year y ,

J_0^{spp} and b^{spp} are tuning parameters (see Table 1), and

J_y^{spp} is a measure of the immediate past level in the abundance indices for species spp that is available to use for calculations for year y .

J_y^{spp} for the abundance indices is computed as follows:

$$J_y^{para} = \frac{1.0J_y^{WC_CPUE,para} + 0.75J_y^{SC_CPUE,para} + 0.5J_y^{WC_surv,para} + 0.25J_y^{SC_surv,para}}{2.5} \quad (3)$$

$$J_y^{cap} = \frac{1.0J_y^{WC_CPUE,cap} + 0.75J_y^{SC_CPUE,cap} + 0.5J_y^{WC_surv,cap} + 1.0J_y^{SC_surv,cap}}{3.25} \quad (4)$$

with

$$J_y^{WC/SC_CPUE,spp} = \sum_{y'=y-3}^{y-1} I_y^{WC/SC_CPUE,spp} / \sum_{y'=2010}^{2012} I_y^{WC/SC_CPUE,spp} \quad (5)$$

$$J_y^{WC/SC_surv,spp} = \sum_{y'=y-2} I_y^{WC/SC_surv,spp} / \sum_{y'=2011}^{2013} I_y^{WC/SC_surv,spp} \quad (6)$$

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Hence the weighting of the different indices (denoted by I) is taken to be the same as for OMP-2014, and the normalization is such that a value of $J=1$ reflects resource abundance about the same as in 2011/2012.

Table 2 reports the GLM-standardised CPUE series (J. Glazer *pers. comm.*) and survey biomass abundance estimates (T. Fairweather *pers. comm.*), with the J_{2020}^I and J_{2020} values (from equations 3 to 6). The 2013 to 2016 survey biomass estimates are from industry vessels (with the exception of the 2016 spring survey, which was conducted by the *Africana*) and are taken to have the same q as the *Africana* New Gear. The 2017 to 2020, surveys have been conducted by the *Africana* using the New Gear.

The J_{2020}^{spp} values are then computed as:

$$J_{2020}^{para} = \frac{1.0(0.950) + 0.75(1.128) + 0.5(0.791) + 0.25(1.576)}{2.5} = 1.034$$

$$J_{2020}^{cap} = \frac{1.0(0.969) + 0.75(1.377) + 0.5(1.267) + 1.0(1.253)}{3.25} = 1.196$$

and the catch by species is then:

$$C_{2021}^{para} = 88.02(1.034 - 0.132) = 79.430$$

$$C_{2021}^{cap} = 35(1.196 - 0.240) = 33.472$$

so that the TAC recommendation before applying the constraints on maximum allowable annual change, would be 112.902 thousand tons.

1.1 Maximum allowable annual change

The maximum allowable annual increase in TAC is 10%, and the maximum allowable annual decrease in TAC is 5% unless the *M. paradoxus* average biomass index falls too low, in which case the maximum allowable annual decrease becomes:

$$MaxDecr_y = \begin{cases} 5\% & \text{if } J_y \geq J^{thresh1} \\ \text{linear between } x\% \text{ and } 5\% & \text{if } J^{thresh2} \leq J_y < J^{thresh1} \\ x\% & \text{if } J_y < J^{thresh2} \end{cases} \quad (7)$$

x , $J^{thresh1}$ and $J^{thresh2}$ are tuning parameters (see Table 1).

Here, the *M. paradoxus* average biomass index (1.034) is above $J^{thresh1}$ (0.75), so that the maximum allowable decrease of 5% would apply: the TAC recommendation after applying the constraint is hence 139 109t (reduced by 5% from a 2020 TAC of 146.431 thousand tons).

1.2 Upper cap and fixed TAC

Two further rules are included in OMP-2018:

- i. An upper cap on the TAC is imposed, so that the TAC cannot exceed 160 000t.
- ii. The TAC for 2019 and 2020 is fixed at 146 431t.

Neither impact the TAC recommendation for 2021.

Hence the final TAC recommendation for 2021 is 139 109t.

2. Additional points for discussion

The recent data are compared to the projections under OMP-2018 for the Reference Set of Operating Models (RS) in Figure 1 (commercial CPUE), Figure 2 (survey indices) and Figure 3 (proportion of *M. capensis* in the offshore trawl catch). The most recent data points for CPUE and survey indices all lie within the probability envelope bounds projected; consequently, they indicate no need for Exceptional Circumstances to be triggered. The west coast CPUE indices are, however, close to the lower bounds of these probability envelopes and the *M. paradoxus* west coast CPUE in particular has shown a decreasing trend over the last three years. The south coast CPUE indices on the other hand have been close to or above the median trajectory projected under OMP-2018. The west coast survey indices indicate little change for *M. paradoxus* from 2019, and a marked improvement for *M. capensis*. No autumn survey was conducted for the south coast in 2020.

The absence of a south coast autumn survey for three of the last four years is a cause for concern. The occasional absence of a survey was envisaged in the specification and adoption of the OMP, but in the current situation results for 2019 only instead of all three of the 2018, 2019 and 2020 survey outcomes are contributing to the OMP input from surveys on the south coast. This renders the 2019 survey results unduly influential in the TAC recommendation computation. Hopefully, this situation will be improved shortly with this survey taking place again in 2021.

The recent proportions of *M. capensis* in the offshore trawl fishery catch (Figure 3) have been slightly higher than the median for the west coast (but within the bounds of the projection envelopes). However, for the south coast, the 2019 proportion is again outside the probability envelopes as in 2018.

This difference would not seem sufficient to trigger the OMP's Exceptional Circumstances provisions immediately, given also that data capture for 2019 is not yet complete so that this result could change. However, the matter does likely warrant further examination in the light of possible implications for the 2022 TAC recommendation a year hence. Consequently, it is suggested that once current data capturing processes have been completed (likely around the end of this year), the Reference Case assessment be routinely updated (providing an updated RC OM), and that the current OMP be run for this to check that performance remains acceptable. Furthermore, south coast trawl catch distributions should be checked as to whether they reflect a net inshore movement, which could be contributing towards this higher proportion.

Table 1: Tuning parameters for OMP-2018

	<i>M. paradoxus</i>	<i>M. capensis</i>
J_0	0.132	0.240
b	88.02	35.00
$j_{thresh1,para}$	0.75	
$j_{thresh2,para}$	0.65	
$j_{thresh,cap}$		0.60
x	25	

Table 2: GLM standardised CPUE series and west coast summer and south coast autumn survey abundance estimates. Note that the abundance estimates in bold incorporate the calibration factors agreed for OMP application as they are for surveys in which the Old Gear was used on the *Africana* ($q^{old}/q^{new}=0.883$ for *M. paradoxus* and 0.652 for *M. capensis*). However, note also that these abundance estimates are not actually used in any of the calculations for the 2021 TAC recommendation.

	<i>M. paradoxus</i>				<i>M. capensis</i>			
	WC CPUE	SC CPUE	Summer survey	Autumn survey	WC CPUE	SC CPUE	Summer survey	Autumn survey
2007	6.189	2.386	407.38	102.20	1.620	2.830	73.23	65.94
2008	6.766	2.464	238.14	33.03	1.997	3.723	52.58	102.17
2009	6.976	2.929	310.76	45.03	2.939	6.397	140.44	111.19
2010	7.783	3.230	653.28	53.16	2.631	5.159	249.08	261.14
2011	7.597	3.793	380.19	21.05	3.104	5.855	89.10	105.42
2012	6.633	3.332	405.87		2.608	3.874	84.75	
2013	6.634	3.712	136.26		2.675	3.874	30.38	
2014	6.703	3.486	269.48	62.93	2.194	2.798	219.76	63.39
2015	8.707	3.299	207.58	111.41	2.713	2.858	65.09	76.06
2016	8.772	3.405	312.88	94.18	2.713	3.807	115.06	83.20
2017	7.935	3.768	319.02		2.789	5.122	69.29	
2018	6.967	4.234			2.827	9.195		
2019	6.011	3.682	243.56	33.18	2.463	6.189	62.56	132.10
2020			243.09				109.98	
J_{2020}^i	0.950	1.128	0.791	1.576	0.969	1.377	1.267	1.253
W^i	1.000	0.750	0.50	0.25	1.000	0.750	0.50	1.00
J_{2020}	1.034				1.196			

* The 2013 to 2016 survey results are from the industry vessels (excepting the 2016 spring survey, which was conducted by the *Africana*), and are taken to have the same q as the *Africana* New Gear.

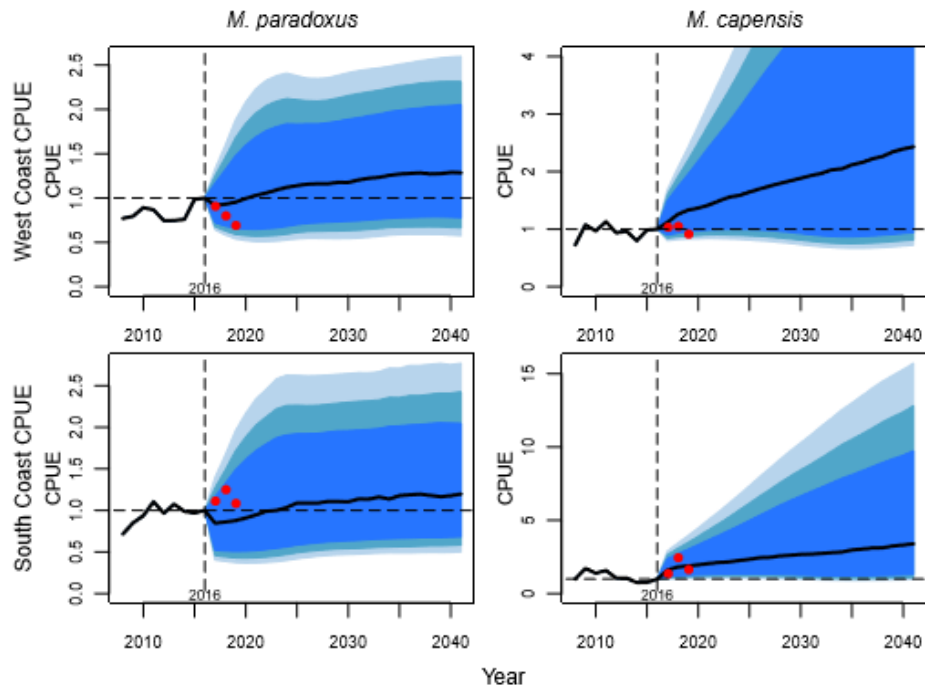


Figure 1: 95, 90, 80% probability envelopes (PEs) and medians for the projected GLM-standardised CPUE for *M. paradoxus* and *M. capensis* for the updated RS under OMP-2018. The red dots show the 2017-2019 CPUE indices, standardised relative to the 2016 value in the updated GLM series. Note that the vertical axis of the *M. capensis* west coast figure has been truncated for greater clarity.

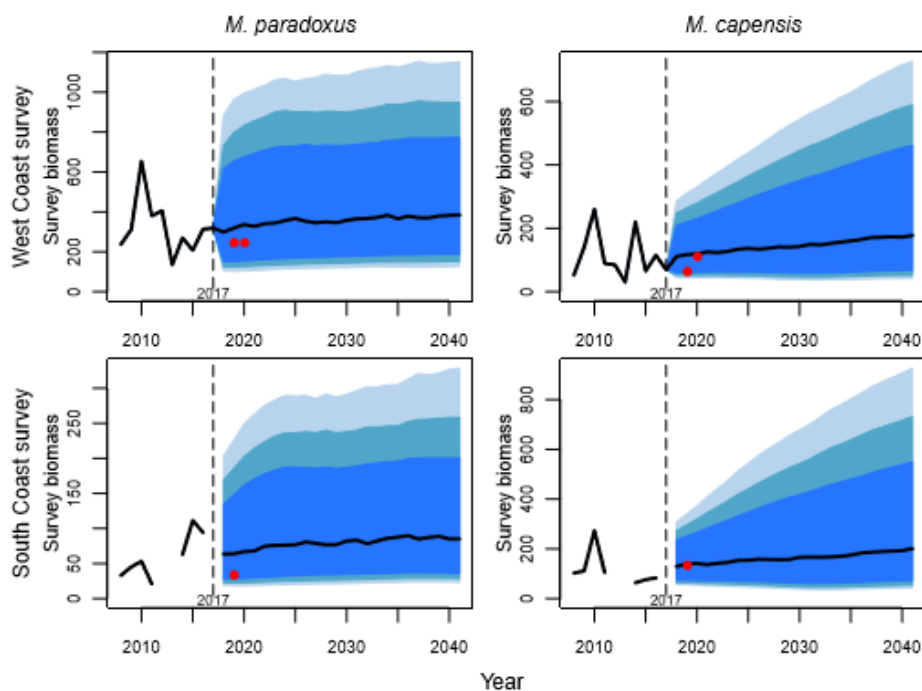


Figure 2: 95, 90, 80% PEs and medians for the survey abundance indices for *M. paradoxus* and *M. capensis* for the updated RS under OMP-2018. Gaps in the median trajectory for the south coast survey reflect years for which surveys did not take place. Estimates from the 2019 surveys are indicated by red dots. Note: future surveys are assumed to be carried out using the New Gear on the *Africana*; if an industry vessel is used instead, the resultant estimates must be multiplied by 1.25 before comparison with the bounds in these plots.

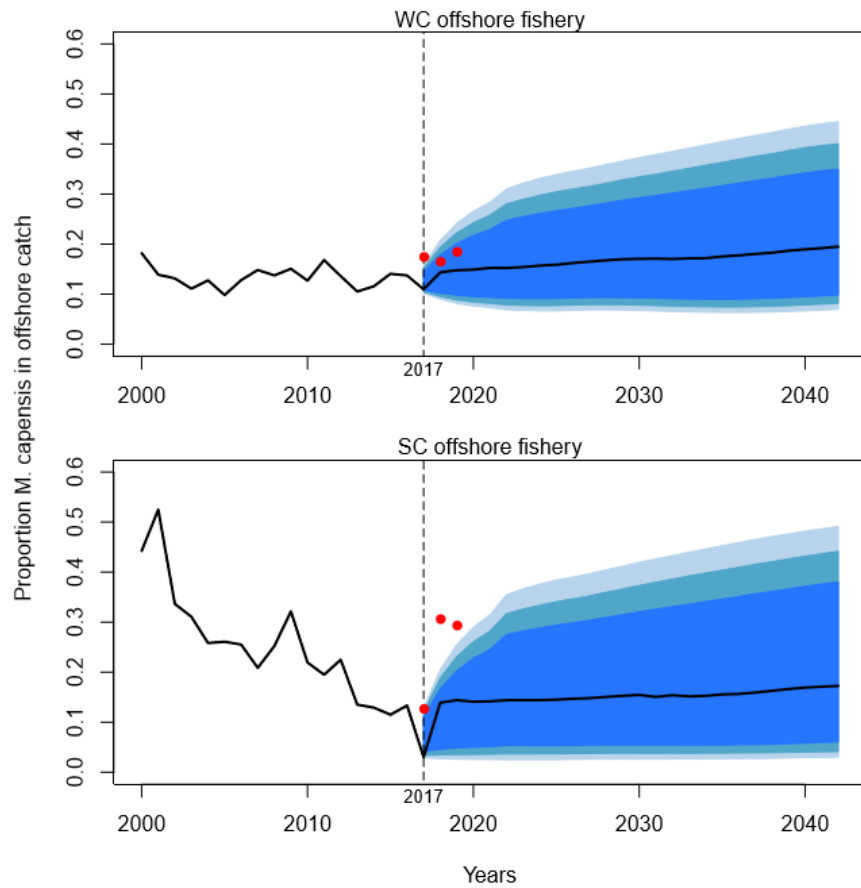


Figure 3: 95, 90, 80% PEs and median for the proportion *M. capensis* in the offshore trawl catch, with the 2017-2019 observed proportions indicated by the red dots.