

# Recommendation of a TAE for the directed midwater trawl horse mackerel fishery for 2021

S.J. Johnston and D.S. Butterworth

MARAM  
University of Cape Town  
Rondebosch 7701

## Summary

The recently updated BC assessment model for horse mackerel is used to estimate the associated Desert Diamond (DD) equivalent seadays required to take the proposed 2021 TAC of 27 670 mt. It is recommended that the TAE of 460 DD equivalent seadays for 2021 remains unchanged from that for 2020.

## Background and analyses

The recently updated 2020 BC assessment model for the horse mackerel fishery is used to estimate distributions for the Desert Diamond (DD) equivalent seadays required to take the proposed 2021 TAC recommendation of 27 670t.

As in previous years, using Desert Diamond catch and effort data, a regression between DD catch and DD effort multiplied by exploitable biomass is effected. This relationship is presumed to apply to the midwater fleet as a whole, when calculating the amount of total effort (DD and DR) expected under a future given constant catch. A log-linear regression through the origin of the form

$$C_y = k. (q * B_{exp,y}^{mid} * Seadays_y) e^{\varepsilon_y}$$

where  $\varepsilon_y \sim N(0, \sigma^2)$

is fitted [excludes 2015, as previously decided by the DWG as there were no observers that year].

Thus for any catch to be made the fishery, one can invert this to predict the distribution of number of DD equivalent seadays required to take that catch.

Note: DD equivalent seadays refers to the combined DD and DR effort in DD equivalent seaday units that will relate to the TAE to make the combined DD and DR directed HM catches.

The data for this regression are reported in Table 1 and Figure 1, with the resultant regression plot in Figure 2. The estimated  $k=79.163$  and  $\sigma = 0.287$ .

Assuming a future midwater CC = 27 670 mt (with no seadays restrictions), the BC model predicts the total DD equivalent seadays required to make the catch each year. Table 2 reports the median with 5<sup>th</sup>, 80<sup>th</sup>, 90 and 95<sup>th</sup> percentiles of these DD equivalent seaday distributions.

Figure 3 plots the median, 5<sup>th</sup>, 80<sup>th</sup>, 90 and 95<sup>th</sup> %ile estimates of DD equivalent seadays required to make a catch of 27 670 mt.

Figure 4 are histogram plots of the DD equivalent seadays required to make a CC of 27 670 mt for each future year. Note category 450 refers to 450-499 seadays etc. Also note that the percentile corresponding to 460 seadays for 2020 is the 87%ile, and for 2021 is the 79%ile.

**Recommendation**

The previous recommendation of a TAE for the directed midwater trawl fishery for horse mackerel was based on the rationale that the low CPUE experienced by this fishery some four-five years ago might reflect an appreciable drop in resource abundance, rather than a temporary decrease in catchability. Although a TAC was recommended for the fishery (appropriate under the latter hypothesis), this TAE ensured that catches would not be excessive if there had actually been an appreciable drop in abundance. Subsequent data forthcoming from the fishery have been shown to be inconsistent with this assumption of a drop in abundance, so that this rationale effectively falls away.

However, the expanded area now fished by the DD, together with the recent commencement of use of an excluder device on the vessel, raise questions about the DD CPUE as a comparable index of abundance over time which merit further investigation. For these and other reasons, to be precautionary at least for the present, it is suggested that a TAE be maintained, but that this be set at a level for which there is a relatively low probability that this restriction would come into play in practice.

Given that for the existing TAE of 460 DD equivalent seadays, there is a probability of only about 20% of this restriction being reached under a 27 670 mt TAC for 2021, it is **recommended** that this restriction remain unchanged for 2021.

Table 1: Desert Diamond data required for regression.

	DD SeaDays	BC model estimated CPUE (q*Bexp)	Seadays*q*B	DD Catch mt
2004	343	0.695	238	21 953
2005	288	0.661	190	21 822
2006	259	0.663	172	17 214
2007	300	0.710	213	23 259
2008	271	0.779	211	19 744
2009	282	1.012	285	23 997
2010	283	1.217	344	24 248
2011	233	1.216	283	23 795
2012	284	1.083	307	17 452
2013	274	1.019	279	21 402
2014	170	0.272	46	5 811
2016	189	0.734	139	8 855
2017	329	1.060	349	16 111
2018	280	1.065	298	19 795
2019	252	1.012	255	13 328

Table 2: BC model predicted DD equivalent seadays required for a constant future catch of 27 670t.

	DD equivalent seadays 2020	DD equivalent seadays 2021
Median	335	363
5 <sup>th</sup> %ile	204	227
80 <sup>th</sup> %ile	432	462
90 <sup>th</sup> %ile	486	528
95 <sup>th</sup> %ile	540	583

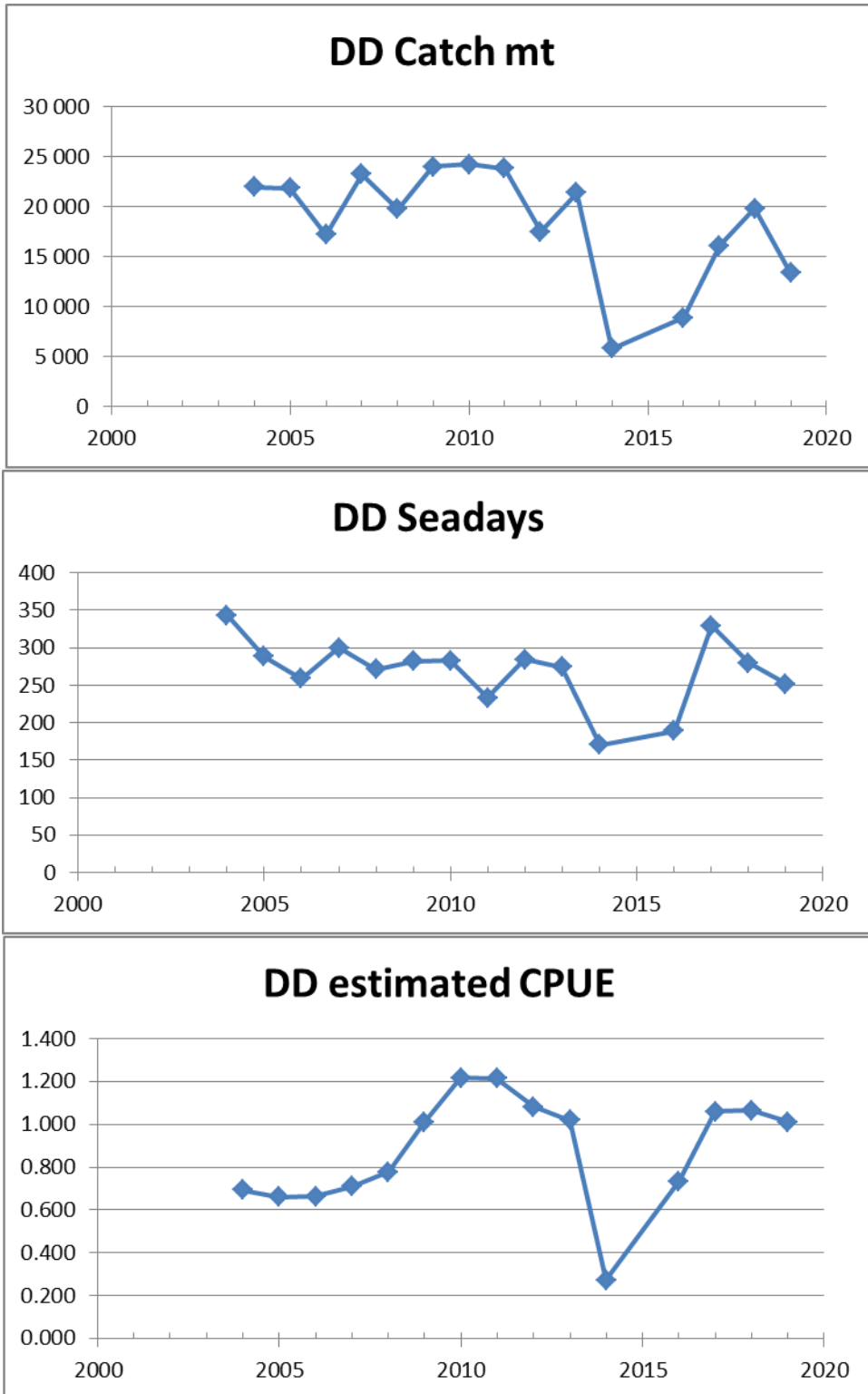


Figure 1: Plots of DD catch (mt), effort (seadays) and the BC model estimated CPUE.

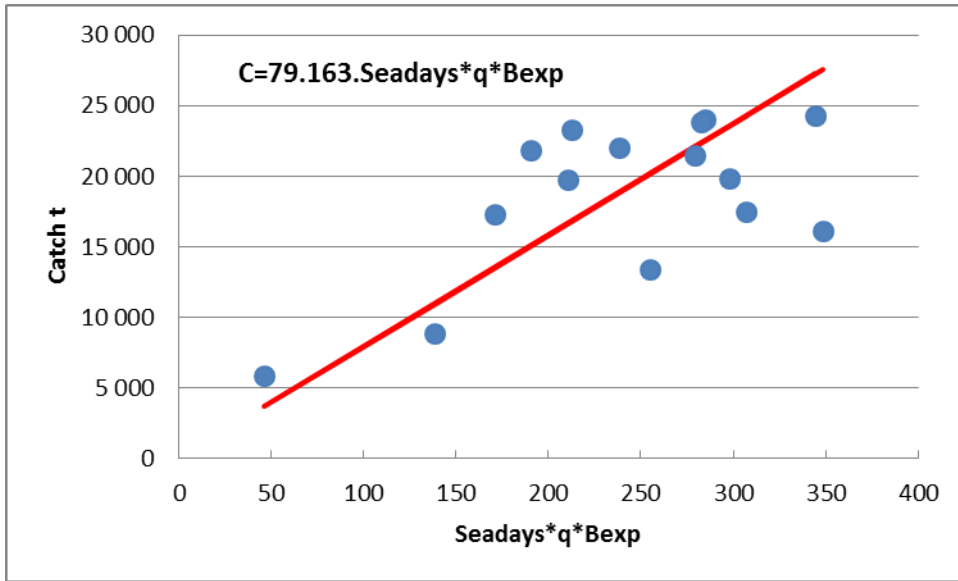


Figure 2: Regression of DD catch against DD seadays\*q\*Bexp.

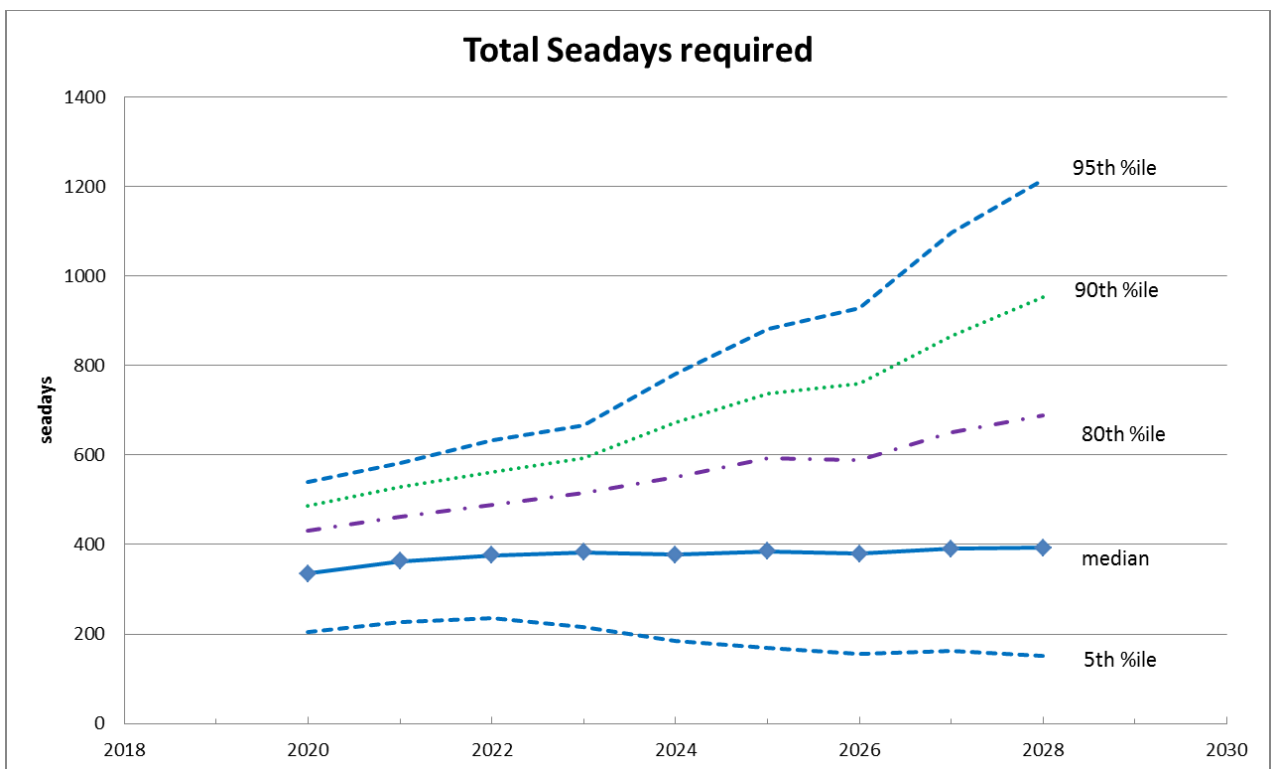


Figure 3: Median, 5<sup>th</sup> percentile and 95<sup>th</sup> %ile estimates of total seadays required to make catch of 27 670 MT.

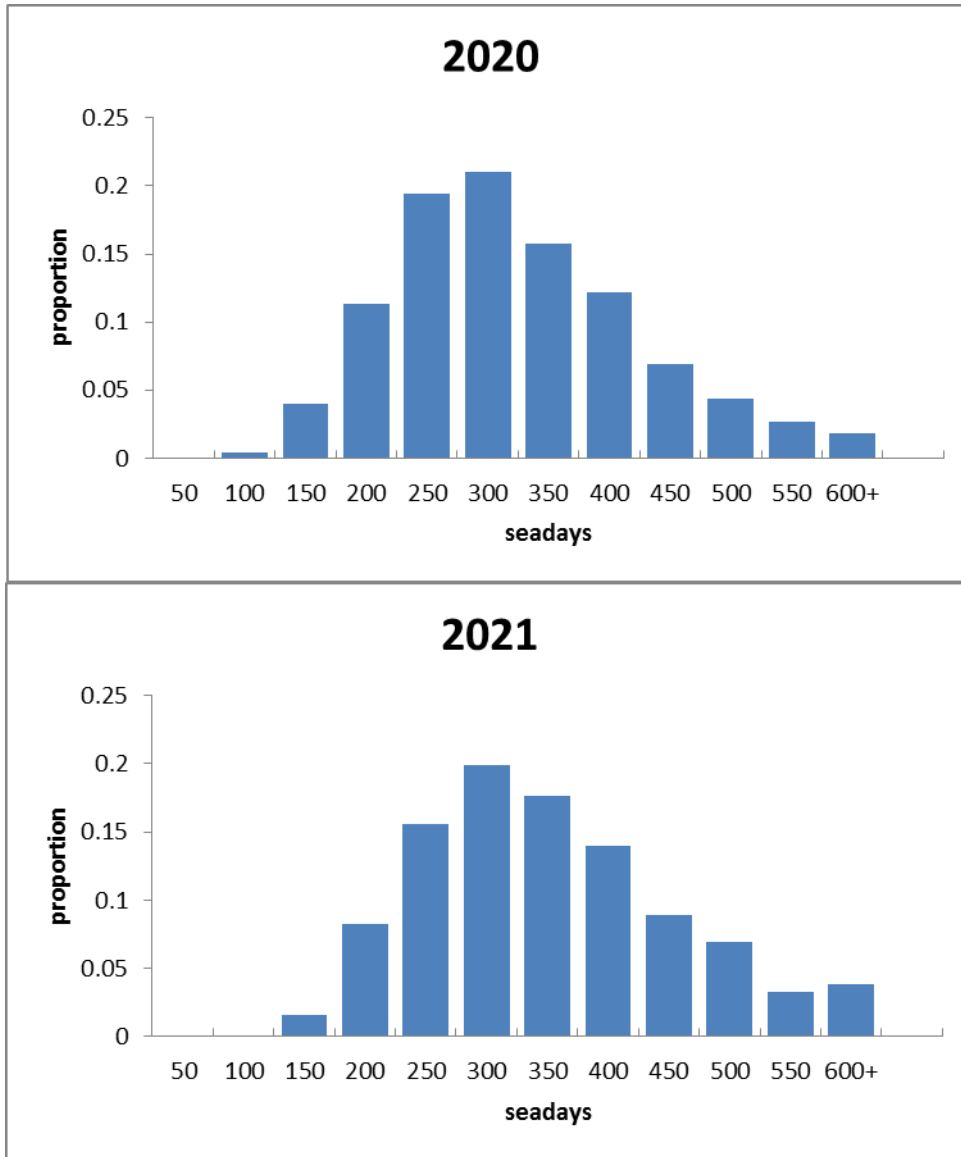


Figure 4: Histogram of DD equivalent seadays required to make the CC of 27 670 for each year. Note category 450 refers to 450-499 seadays etc.