

Exploitation rates corresponding to 2021 sardine TACs and TABs

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Exploitation rates corresponding to the initial 2021 sardine TACs and TABs were estimated, with the January 2021 allocations corresponding to an exploitation rate of about 6% on the west component, if all catches ≤ 14 cm were ignored. An increase of 1000t in the >14 cm sardine TAB increased this exploitation rate by 128% to about 14%.

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Introduction

Exploitation rates corresponding to the 2021 sardine TACs and TABs were calculated to assist with 2021 management recommendations given the declaration of Exceptional Circumstances for sardine and before a sardine assessment updated with 2020 data becomes available.

Data and Methods

Exploitation rates were calculated as the annual catch taken as a proportion of the available sardine biomass. Historically the model predicted sardine biomass has been used (de Moor 2020a). However, in the absence of an updated assessment, the sardine biomass in November 2020 was taken to be that observed during the November 2020 survey (Coetzee *et al.* 2020), corrected for the acoustic survey bias which was estimated at 0.77 at the joint posterior mode (de Moor 2020a), with a posterior median and 95% probability interval (PI) of 0.74 [0.63,0.88] (de Moor 2020b).

The annual catch was taken from November of one year through to October of the next, to correspond with the estimated biomass from the November survey and the sardine assessment (de Moor 2020a). These calculations assume the sardine TACs and TABs would be taken before November 2021. In addition, 333.1t of >14 cm sardine and 26.68t of ≤ 14 cm sardine was landed west of Cape Agulhas and 2914.6t of >14 cm sardine was landed east of Cape Agulhas in November and December 2020 (D. Merkle pers comm.).

Results and Discussion

The available sardine west component biomass in November 2021 was estimated at 13 979t with a 95% PI of [12 637t, 16 792t] (Table 1).

Considering the catch to consist of >14 cm sardine only, the 2021 exploitation rate on the west component was estimated to be 0.060 (ranging from 0.048 to 0.068) for a >14 cm sardine TAB with round herring and anchovy of 500t, which was the TAB awarded in January 2021 (Table 1). Assuming all the >14 cm directed sardine TAC would be taken east of Cape Agulhas, the 2021 exploitation rate on the south component was estimated to be 0.033 (ranging from 0.027 to 0.037). These exploitation rates are lower than the historical averages and close to the exploitation rate on the south component in the most recent 5 years (Figure 1, Table 2).

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If the >14cm sardine TAB with round herring and anchovy was increased to 1500t, together with an additional 66t of >14cm sardine TAC taken as 'directed' catch west of Cape Agulhas in early 2021 (J. de Goede pers comm.), the exploitation rate on the west component was estimated to increase to 0.136 (ranging from 0.110 to 0.154). This is an increase of 128%, or in additive terms, an increase of 0.076 (ranging from 0.062 to 0.087) (Table 1, Figure 2).

Considering the catch to consist of all catches and bycatches, the 2021 exploitation rate on the west component was estimated to be 0.956 (ranging from 0.775 to 1.086) for a >14cm sardine TAB with round herring and anchovy of 500t, which was the TAB awarded in January 2021 (Table 1, Figures 1 and 2). This would increase by 8%, or in additive terms, an increase of 0.072 (ranging from 0.062 to 0.087) if the >14cm sardine TAB with round herring and anchovy was increased to 1500t, together with an additional 66t of >14cm sardine TAC taken as 'directed' catch west of Cape Agulhas. Some, not all, of these total landings would be taken from the recruits which become available to the fishery during the course of the year.

References

- Coetzee JC, Shabangu FW, Geja Y, Merkle D, Maliza L, Ntiyantiya D, Bali A, Peterson J, Jarvis G, Mxunyelwa N, Mahlali O, Mhlongo J, Mabali A, Fono A, Chauke V, April W, Johnson M, Williams M, Engel H and Rademan J. 2020. Results of the 2020 pelagic biomass survey. DEFF Branch Fisheries Document FISHERIES/2020/DEC/SWG-PEL/130.
- de Moor CL. 2020. Baseline assessment of the South African sardine resource using data from 1984-2019. DEFF Branch Fisheries Document FISHERIES/2020/APR/SWG-PEL/30.
- de Moor CL. 2020. South African sardine assessment posterior distributions and sensitivity tests. DEFF Branch Fisheries Document FISHERIES/2020/DEC/SWG-PEL/138.

Table 1. The estimated true sardine biomass west of Cape Agulhas based on the November survey estimate of 10 777t and base case model estimated survey bias (MLE and 95% PI). The exploitation rate on west component sardine is given for the catches corresponding to a >14cm sardine TAB with round herring and anchovy fishing of (i) 500t, (ii) 930t and (iii) 1500t, with a >14cm 'directed' sardine catch of 66t west of Cape Agulhas associated with (ii) and (iii). For additional information, the exploitation rate on the west component sardine considering only catches and bycatches taken during 2021 and not during November and December 2020 are given in the right hand columns, but these are not comparable with historical exploitation rates.

True biomass :		13979 [16792,12637]		
>14cm TAB	833.1	0.060 [0.048,0.068]	500	0.036 [0.030,0.040]
	1329.1	0.095 [0.077,0.108]	996	0.071 [0.059,0.079]
	1899.1	0.136 [0.110,0.154]	1566	0.112 [0.093,0.124]
% increase		128%		213%
additive increase		0.076 [0.062,0.087]		0.076 [0.063,0.084]
Total TABs	13359.8	0.956 [0.775,1.086]	6750	0.483 [0.402,0.534]
	13855.8	0.991 [0.804,1.127]	7246	0.518 [0.432,0.573]
	14425.8	1.032 [0.837,1.173]	7816	0.559 [0.465,0.618]
% increase		8%		16%
additive increase		0.076 [0.062,0.087]		0.076 [0.063,0.084]

Table 2. Average historical exploitation rates (see Figure 1).

	West Component	South Component
1985-2020	0.222	0.049
2011-2020	0.273	0.068
2016-2020	0.274	0.030

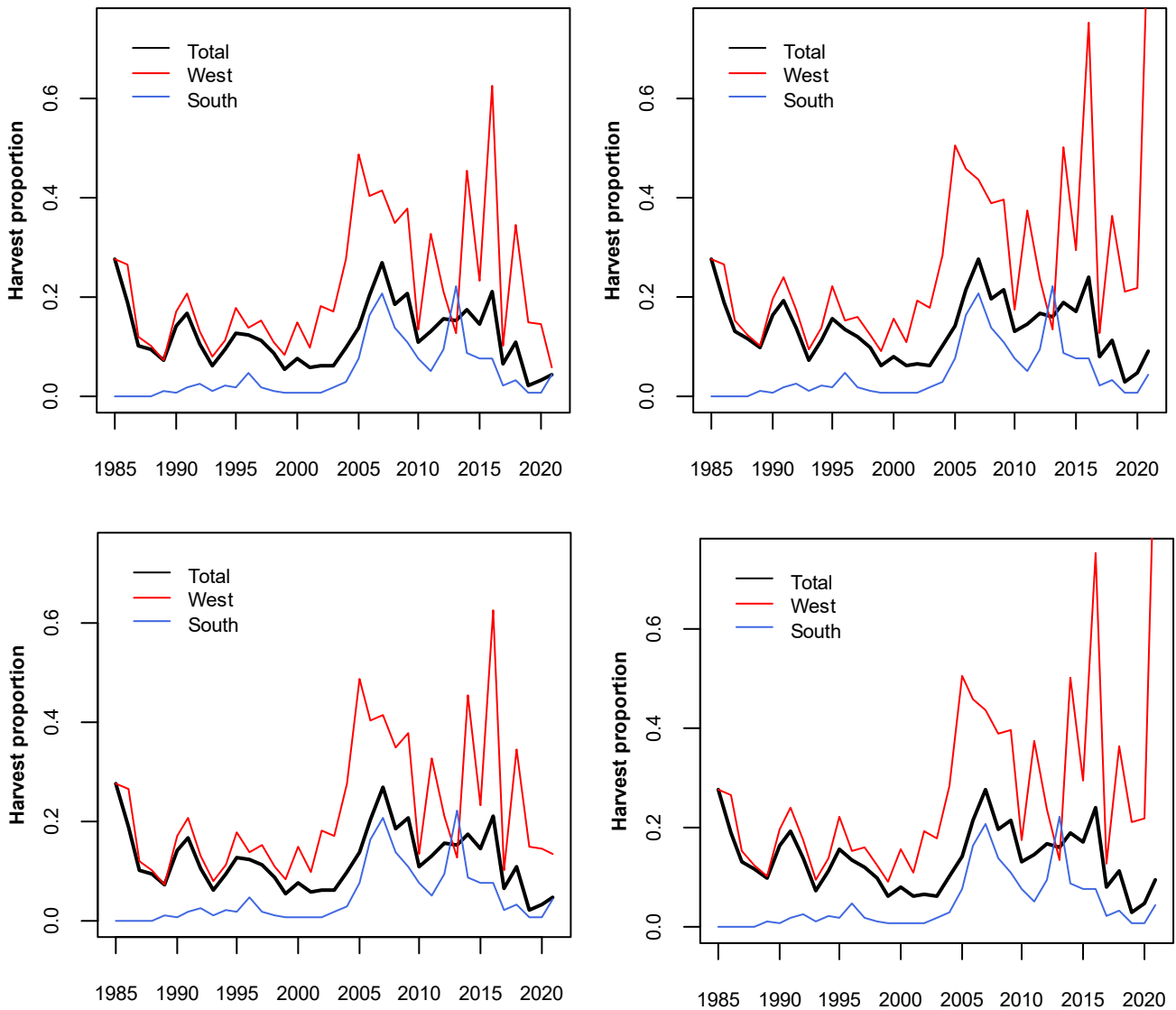


Figure 1. The exploitation rate updated from de Moor (2020a). The left plot excludes small sardine bycatch while the right plot includes these landings. The top plots assume 2021 catches correspond to the TAC/Bs awarded in January 2021, while the lower plots assume 2021 catches correspond to an additional 1000t of >14cm sardine TAB and 66t of ‘directed’ sardine on the west coast.

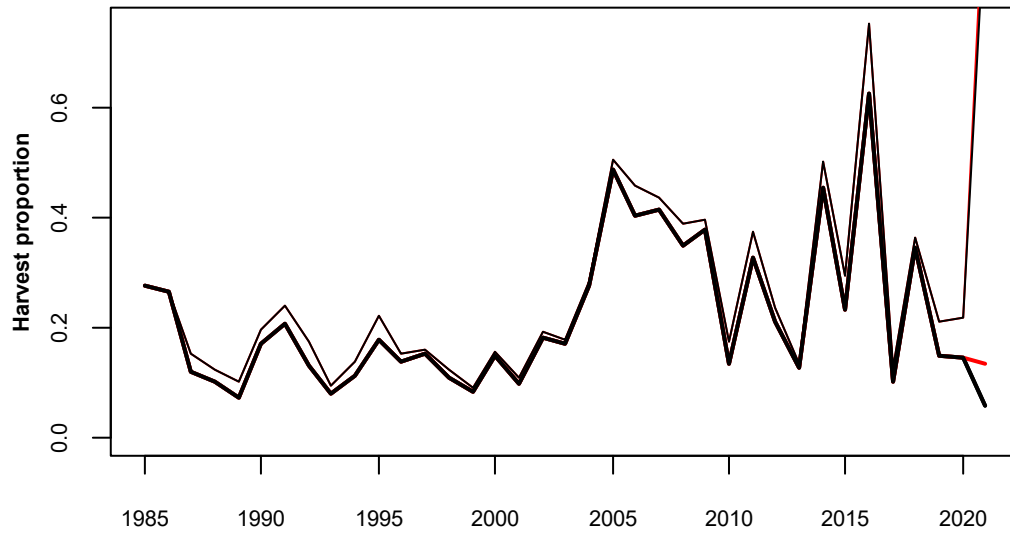


Figure 2. The west component exploitation rate updated from de Moor (2020a). The thick lines exclude small sardine bycatch with anchovy while the thin lines include these landings. The black lines assume 2021 catches correspond to the TAC/Bs awarded in January 2021, while the red lines assume 2021 catches correspond to an additional 1000t of >14cm sardine TAB and 66t of 'directed' sardine on the west coast.