

An initial investigation into the increase in the fishing mortality species ratio ($F_{paradoxus}/F_{capensis}$) in recent hake assessments

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Introduction

Recent hake assessments (Rademeyer and Butterworth 2016) have estimated the ratio of the fishing mortality on *M. paradoxus* to that on *M. capensis* (F_{para}/F_{cap}) for all fleets combined to be substantially higher than that estimated in previous assessments (Rademeyer and Butterworth 2014) (Figure 1). The performance of the current OMP has been tested based on projections that assumed that F_{para}/F_{cap} would stay constant. It is therefore important to try to understand the reasons for this increase.

Updated longline catches

The 2013-2016 longline catches used in the May 2016 paper had been split by species assuming the 2012 ratio. The 2011-2016 species split longline catches have now been updated by applying the survey species ratio by depth (Somhlaba, pers. com.). The catches assumed and overall species ratios are given in Table 1 and Figure 2.

Results for a run using the new longline catches are given in Table 2. The run using the new longline catches has little effect on the total negative log-likelihood or on the spawning biomass trajectories (Figure 3). There is some decrease of the longline F_{para}/F_{cap} ratio (Figure 4) with the new longline catches. What is more obvious in Figure 4 however is that the increase in the F_{para}/F_{cap} ratio comes now primarily from the south coast offshore trawl fleet. The increase in the south coast offshore trawl F_{para}/F_{cap} ratio comes directly from an increase in the *paradoxus/capensis* catch ratio for that fleet, which in turn is a consequence of considerable reductions over recent years in the *M. capensis* catch by that fleet (Table 3).

References

Rademeyer RA and Butterworth DS. 2014. Results leading to a Proposal for a Reference Set of Operating Models for Testing the 2014 OMP Revision for the South African hake resource. FISHERIES/2014/MAR/SWG-DEM/14.

Rademeyer RA and Butterworth DS. 2014. An initial update of the Reference Case Assessment and related projections for the South African hake resource. FISHERIES/2016/MAY/SWG-DEM/11.

Table 1: Old (May 2016) and updated species split longline catches (in thousand tons) and species ratio.

	<i>M. paradoxus</i>				<i>M. capensis</i>				C_{para}/C_{cap}			
	WC		SC		WC		SC		WC		SC	
	old	new	old	new	old	new	old	new	old	new	old	new
2011	3.261	2.522	0.905	0.140	2.705	3.521	2.009	3.047	1.206	0.716	0.450	0.046
2012	3.572	4.358	2.963	0.306	0.829	2.570	1.840	1.737	4.309	1.696	1.610	0.176
2013	6.362	6.056	0.911	0.060	1.477	2.606	0.566	1.308	4.309	2.324	1.610	0.046
2014	7.004	6.879	0.356	0.008	1.626	2.123	0.221	0.315	4.309	3.241	1.610	0.025
2015	2.105	5.223	0.078	0.021	0.489	2.935	0.048	0.064	4.308	1.780	1.609	0.321
2016	2.366	5.632	0.087	0.022	0.549	3.165	0.054	0.069	4.309	1.780	1.611	0.321

Table 2: Estimates of management quantities for the May 2016 assessment model run and the run using the new longline catches.

	May 2016 (Rademeyer and Butterworth 2016)	New longline catches	
-lnL total	-223.0	-223.4	
<i>M. paradoxus</i>	B^{sp}_{MSY}	169	162
	B^{sp}_{2014}	179	173
	B^{sp}_{2014}/K^{sp}	0.19	0.19
	$B^{sp}_{2014}/B^{sp}_{MSY}$	1.06	1.07
	B^{sp}_{2015}	168	161
	B^{sp}_{2015}/K^{sp}	0.17	0.18
	$B^{sp}_{2015}/B^{sp}_{MSY}$	1.00	1.00
	B^{sp}_{2016}	157	147
	B^{sp}_{2016}/K^{sp}	0.16	0.16
	$B^{sp}_{2016}/B^{sp}_{MSY}$	0.93	0.91
	<i>MSY</i>	116.1	115.1
<i>M. capensis</i>	B^{sp}_{MSY}	67	65
	B^{sp}_{2014}	158	154
	B^{sp}_{2014}/K^{sp}	0.72	0.70
	$B^{sp}_{2014}/B^{sp}_{MSY}$	2.36	2.36
	B^{sp}_{2015}	163	158
	B^{sp}_{2015}/K^{sp}	0.74	0.72
	$B^{sp}_{2015}/B^{sp}_{MSY}$	2.42	2.42
	B^{sp}_{2016}	163	157
	B^{sp}_{2016}/K^{sp}	0.74	0.72
	$B^{sp}_{2016}/B^{sp}_{MSY}$	2.43	2.41
	<i>MSY</i>	62	63

Table 3: Species split offshore trawl catches (in thousand tons) and their species ratio.

	<i>M. paradoxus</i>		<i>M. capensis</i>		C_{para}/C_{cap}	
	WC	SC	WC	SC	WC	SC
1995	102.877	5.396	18.020	1.755	5.709	3.075
1996	110.460	11.080	18.715	2.209	5.902	5.016
1997	103.035	13.651	14.119	2.185	7.297	6.247
1998	113.083	11.703	14.570	2.450	7.761	4.777
1999	89.147	13.435	14.614	1.912	6.100	7.028
2000	97.417	9.920	20.285	3.610	4.802	2.748
2001	101.990	11.016	15.606	5.141	6.535	2.143
2002	91.720	15.445	13.211	3.140	6.943	4.919
2003	95.143	21.107	10.233	3.926	9.298	5.376
2004	86.916	30.746	11.315	4.024	7.681	7.641
2005	87.540	25.051	7.727	4.195	11.329	5.972
2006	83.840	22.133	9.657	2.494	8.682	8.874
2007	96.332	15.825	12.537	1.420	7.684	11.148
2008	88.290	14.940	11.085	2.567	7.965	5.821
2009	69.716	13.269	10.783	2.431	6.465	5.458
2010	70.156	17.863	9.738	1.649	7.204	10.830
2011	76.744	20.447	15.505	1.543	4.950	13.255
2012	82.362	19.356	11.970	1.776	6.881	10.897
2013	75.403	32.693	7.699	0.642	9.793	50.947
2014	76.240	46.146	7.381	0.597	10.329	77.245
2015	80.569	34.175	10.251	0.477	7.860	71.675
2016	86.876	36.850	11.053	0.514	7.860	71.675

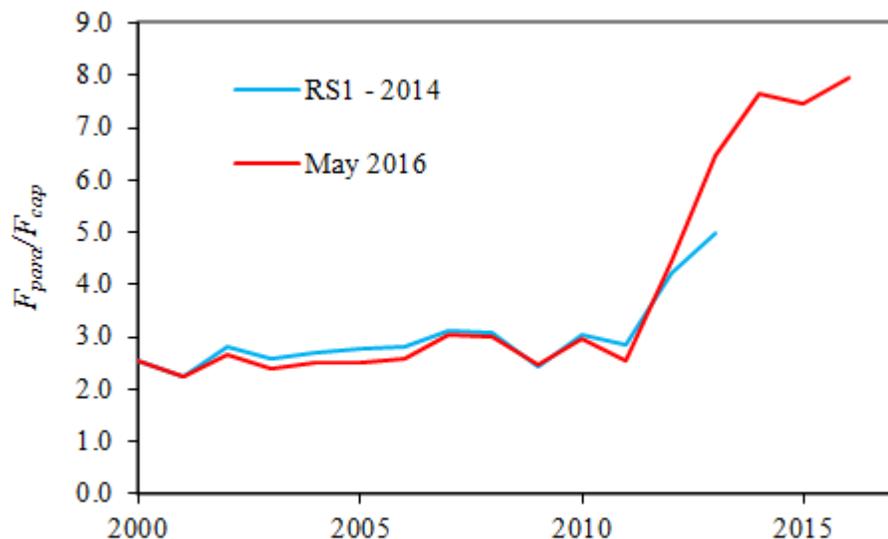


Figure 1: Fishing mortality species ratio over all fleets combined for RS1-2014 (Rademeyer and Butterworth 2014) and the May 2016 update (Rademeyer and Butterworth 2016).

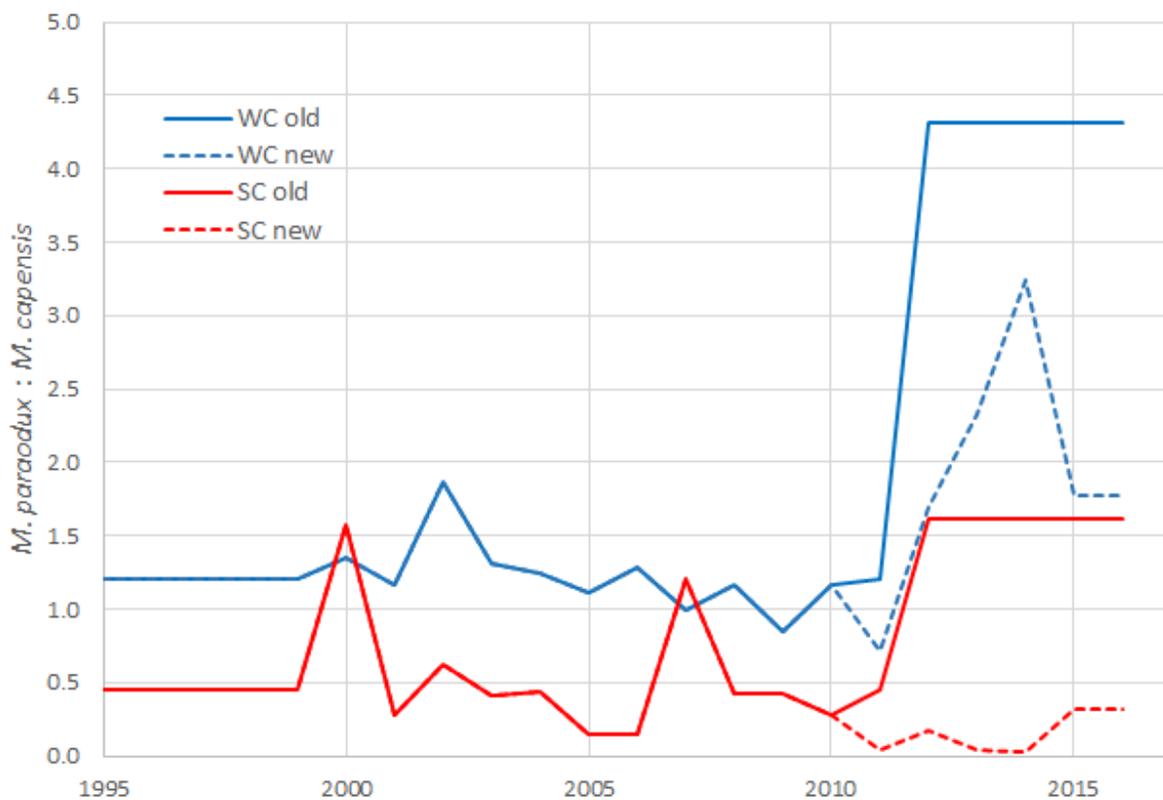


Figure 2: “Old” (May 2016) and “New” (Somhlaba, pers. com.) *M. paradoxus*: *M. capensis* ratios in the west coast and south coast longline catches.

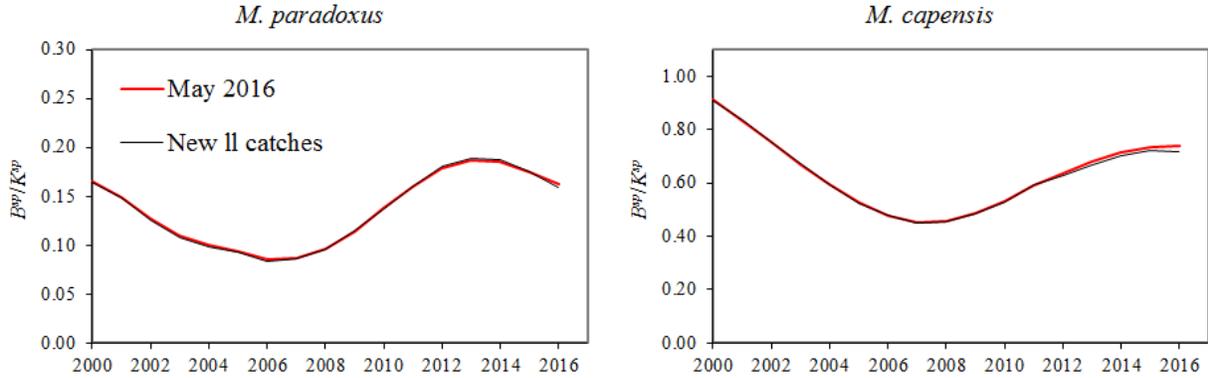


Figure 3: Spawning biomass trajectories relative to pre-exploitation level for the May 2016 assessment run and the run with new longline catches.

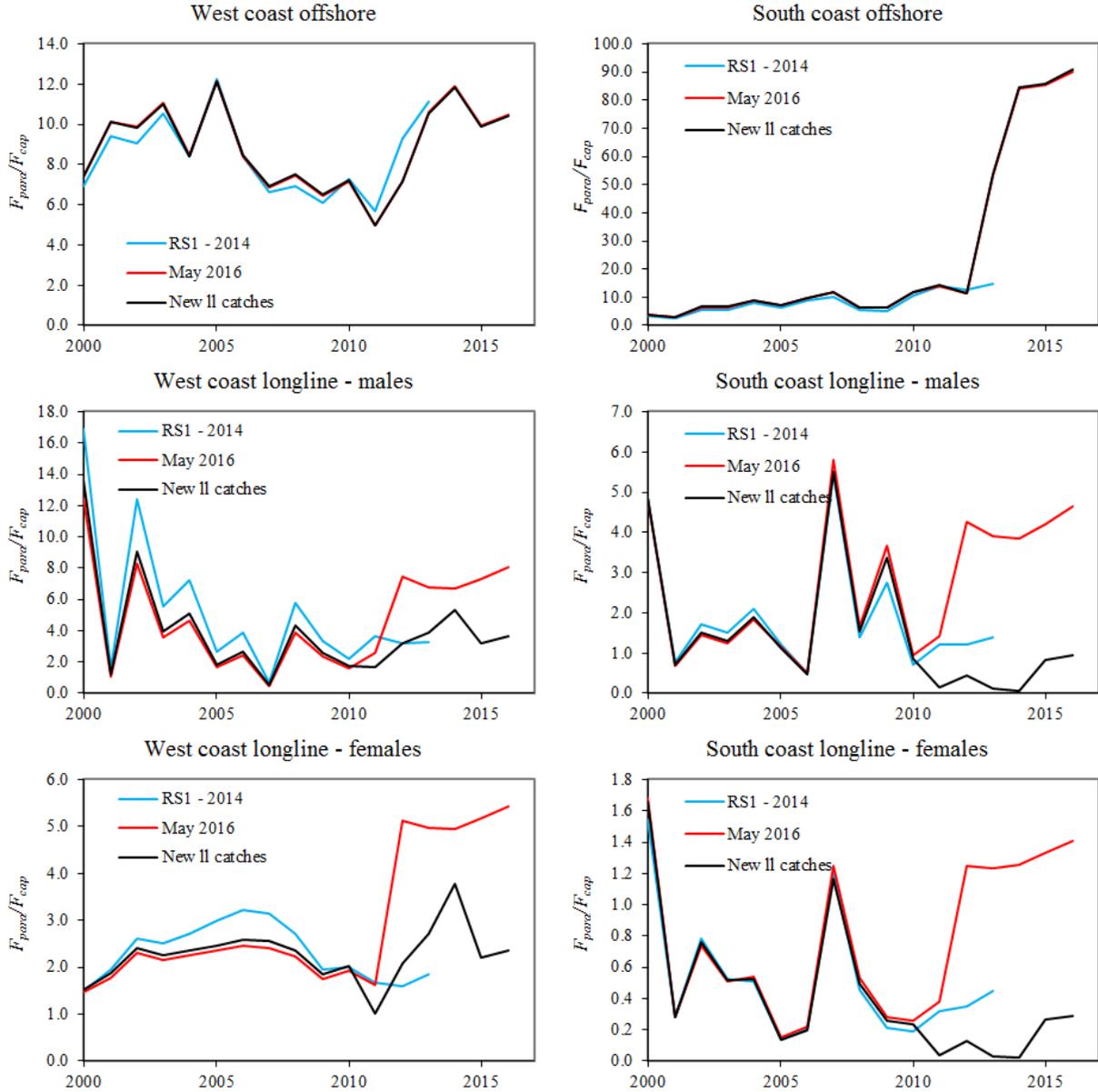


Figure 4: F_{para}/F_{cap} ratio for each fleet separately for the RS1-2014 (Rademeyer and Butterworth 2014), the May 2016 update (Rademeyer and Butterworth 2016) and the run with new longline catches.