

ON THE POTENTIAL IMPACT OF ANY CATCH CORRELATION WITH BIOMASS ON ESTIMATES OF THE EFFECT OF FISHING PARAMETER λ

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In MARAM/IWS/DEC14/Peng/WP3, various arguments were presented to the effect that it is not necessary for the any bias adjustment to be made to estimates of the fishing effects parameters λ to account for measurement error in the biomass term in the associated GLM estimation process, contrary to the submission by Bergh in MARAM/IWS/DEC14/Peng/A10.

In these circumstances, the $r_{B,MB}$ term in the bias adjustment formula for the λ (proportional to the standardised regression weight parameter $\beta_{C,P}$ used by Bergh – see towards the end of his pg 12) becomes 1, so that λ adjusted for the remaining bias is given by:

$$\lambda_{bias\ adj} = \lambda_{orig} (1 - r_{B,C}^2)$$

Document MARAM/IWS/DEC14/Peng/B9 reports five values for this squared correlation coefficient ($r_{B,C}^2$) for anchovy catches with recruitment biomass estimates for the resource as a whole and for catches with 10 and 20 nm of Dassen and of Robben Islands. These are 0.043; 0.203; 0.169; 0.021; and 0.036.

The Tables following show estimates of λ for Dassen and Robben Islands corrected for bias in this way for the lowest, median and highest of these values of $r_{B,C}^2$. They also show the values of the standardised regression weights corresponding to the λ are also shown.

It is clear that the extent of these bias adjustments to the original λ values is relatively small (and does not change the sign of the λ).

Table 1: Results for the bias adjustments to the fishing effects parameter λ for Dassen and Robben Island **fixed year effects** for the different values of the r^2 for the relation between the catch and the biomass. The standardised regression weight (*sensu* MARAM/IWS/DEC14/Peng/A10) value equivalent to λ is also shown. Note that owing to time constraints results are shown for 10nm catches only.

Penguin response	Fish and Area		λ (Dassen)				λ (Robben)				Standardised regression weight	
			Original (biased)	Bias adjusted			Original (biased)	Bias adjusted			Dassen	Robben
				$r^2=0.021$	$r^2=0.043$	$r^2=0.203$		$r^2=0.021$	$r^2=0.043$	$r^2=0.203$		
Chick condition Robben $N \in [393,947]$	S	10	0.10	0.10	0.09	0.07	-0.11	-0.11	-0.11	-0.08	0.07	-0.08
	A	10	-0.67	-0.66	-0.63	-0.50	0.34	0.33	0.32	0.25	-0.44	0.23
	T	10	-0.80	-0.79	-0.75	-0.60	0.44	0.43	0.41	0.32	-0.50	0.29
Active nest proportion Robben $N \in [393,947]$	S	10	0.96	0.94	0.90	0.72	0.71	0.69	0.66	0.53	1.02	1.19
	A	10	0.15	0.15	0.14	0.11	1.02	1.00	0.96	0.77	0.08	0.68
	T	10	0.26	0.26	0.24	0.19	1.05	1.03	0.99	0.79	0.13	0.69
Foraging path length	S	10	-0.24	-0.24	-0.23	-0.18	-0.33	-0.32	-0.31	-0.25	-0.32	-0.38
	A	10	-0.07	-0.07	-0.07	-0.05	0.14	0.14	0.13	0.11	-0.04	0.10
	T	10	0.02	0.02	0.02	0.02	0.08	0.08	0.07	0.06	0.01	0.05
Foraging path duration	S	10	0.31	0.30	0.29	0.23	0.36	0.35	0.34	0.27	0.40	0.41
	A	10	0.07	0.07	0.06	0.05	0.27	0.26	0.25	0.20	0.04	0.18
	T	10	0.24	0.23	0.22	0.18	0.20	0.20	0.19	0.15	0.13	0.14

Table 2: Results for the bias adjustments to the fishing effects parameter λ for Dassen and Robben Island effects given by **spawner biomass** for the different values of the r^2 for the relation between the catch and the biomass. The standardised regression weight (*sensu* MARAM/IWS/DEC14/Peng/A10) value equivalent to λ is also shown. Note that owing to time constraints results are shown for 10nm catches only.

Penguin response	Fish and Area		λ (Dassen)				λ (Robben)				Standardised regression weight	
			Original (biased)	Bias adjusted			Original (biased)	Bias adjusted			Dassen	Robben
				$r^2=0.021$	$r^2=0.043$	$r^2=0.203$		$r^2=0.021$	$r^2=0.043$	$r^2=0.203$		
Chick condition Robben $N \in [393,947]$	S	10	-0.07	-0.07	-0.07	-0.05	-0.04	-0.04	-0.03	-0.03	-0.05	-0.02
	A	10	0.01	0.01	0.01	0.01	-0.12	-0.12	-0.11	-0.09	0.01	-0.08
	T	10	0.03	0.03	0.03	0.03	-0.14	-0.14	-0.13	-0.10	0.02	-0.09
Active nest proportion Robben $N \in [393,947]$	S	10	0.29	0.29	0.28	0.22	0.16	0.15	0.15	0.12	0.31	0.26
	A	10	0.04	0.04	0.04	0.03	0.69	0.67	0.65	0.51	0.02	0.46
	T	10	0.31	0.30	0.29	0.23	0.73	0.71	0.68	0.54	0.15	0.48
Foraging path length	S	10	-0.10	-0.10	-0.10	-0.08	-0.12	-0.11	-0.11	-0.09	-0.14	-0.13
	A	10	0.13	0.13	0.12	0.10	0.17	0.17	0.16	0.13	0.07	0.12
	T	10	0.11	0.11	0.11	0.08	0.13	0.13	0.12	0.10	0.06	0.09
Foraging path duration	S	10	0.08	0.08	0.08	0.06	0.07	0.06	0.06	0.05	0.11	0.07
	A	10	0.39	0.38	0.36	0.29	0.12	0.11	0.11	0.09	0.21	0.08
	T	10	0.40	0.39	0.37	0.30	0.15	0.14	0.14	0.11	0.22	0.10

Table 3: Results for the bias adjustments to the fishing effects parameter λ for Dassen and Robben Island effects given by **recruit biomass** for the different values of the r^2 for the relation between the catch and the biomass. The standardised regression weight (*sensu* MARAM/IWS/DEC14/Peng/A10) value equivalent to λ is also shown. Note that owing to time constraints results are shown for 10nm catches only.

Penguin response	Fish and Area	Original (biased)	λ (Dassen)			Original (biased)	λ (Robben)			Standardised regression weight	
			$r^2=0.021$	Bias adjusted			$r^2=0.203$	$r^2=0.021$	Bias adjusted		$r^2=0.203$
Chick condition Robben $N \in [393,947]$	S 10	-0.01	-0.01	-0.01	0.00	0.17	0.17	0.16	0.13	0.00	0.12
	A 10	0.01	0.01	0.01	0.01	-0.13	-0.13	-0.12	-0.10	0.01	-0.09
	T 10	0.00	0.00	0.00	0.00	-0.12	-0.12	-0.11	-0.09	0.00	-0.08
Active nest proportion Robben $N \in [393,947]$	S 10	0.41	0.40	0.38	0.30	0.28	0.27	0.26	0.21	0.43	0.47
	A 10	0.37	0.37	0.35	0.28	0.66	0.65	0.62	0.49	0.20	0.44
	T 10	0.48	0.47	0.45	0.36	0.93	0.91	0.87	0.69	0.23	0.61
Foraging path length	S 10	0.09	0.09	0.08	0.06	0.15	0.15	0.14	0.11	0.11	0.17
	A 10	0.09	0.08	0.08	0.06	0.25	0.25	0.24	0.19	0.05	0.17
	T 10	0.15	0.15	0.14	0.11	0.28	0.28	0.26	0.21	0.08	0.19
Foraging path duration	S 10	0.12	0.12	0.11	0.09	0.12	0.11	0.11	0.09	0.16	0.13
	A 10	0.36	0.36	0.34	0.27	0.16	0.16	0.15	0.12	0.20	0.11
	T 10	0.41	0.40	0.38	0.30	0.19	0.19	0.18	0.14	0.23	0.13