

Additional graphs and tables for the Robben Island penguin model

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At the request of the review panel, the model has been adjusted and some further plots have been produced.

1. The objective function values for the various sensitivity tests are listed in Table 1.
2. The log-normal bias correction has been applied (see MARAM IWS/DEC11/P/PENG/WP2) and the projection plots have been updated (Figure 1 to Figure 3).
3. Time series of the survival rates for the full model and for the tag data only are plotted in Figure 4.
4. Plots of the observed and expected numbers of re-sightings by year of tagging are shown in Figure 5 and Figure 6.
5. The various fits and residual plots for $\tilde{\sigma} = 0.05$ are shown in Figure 7 and Figure 8. Compare these to Figure 4 in MARAM IWS/DEC11/P/PENG/P1 where $\tilde{\sigma} = 0.1$.

Table 1: Results of sensitivity tests with a column of total negative log likelihood values added.

Future $B_S = 0.3$	2009	2020	2020/2009	ratio to base case	$-\ln L$
Base case	1694	2180	1.29		5991.78
1. B–M relationship 1	1732	2288	1.32	1.03	6003.84
2. Force tag data fit	2077	3601	1.73	1.35	6053.18
3. $p_j = 0.9$	1682	2509	1.49	1.16	5999.53
4. $a^* = 3$	1714	2116	1.23	0.96	5986.41
5. $a^* = 5$	1678	2278	1.36	1.06	6002.15
6. $\sigma_j = 0.2$	1733	2138	1.23	0.96	6002.50
7. $\tilde{\sigma} = 0.05$	1762	3028	1.72	1.34	5986.75
8. $\tilde{\sigma} = 0.2$	1657	1232	0.74	0.58	6001.41
9. $H_{\max} = 1.5$	1676	2188	1.31	1.02	5995.24
10. $q = 0.8$	1694	2170	1.28	1.00	5992.06
11. $q = 1.0$	1695	2198	1.30	1.01	5991.52

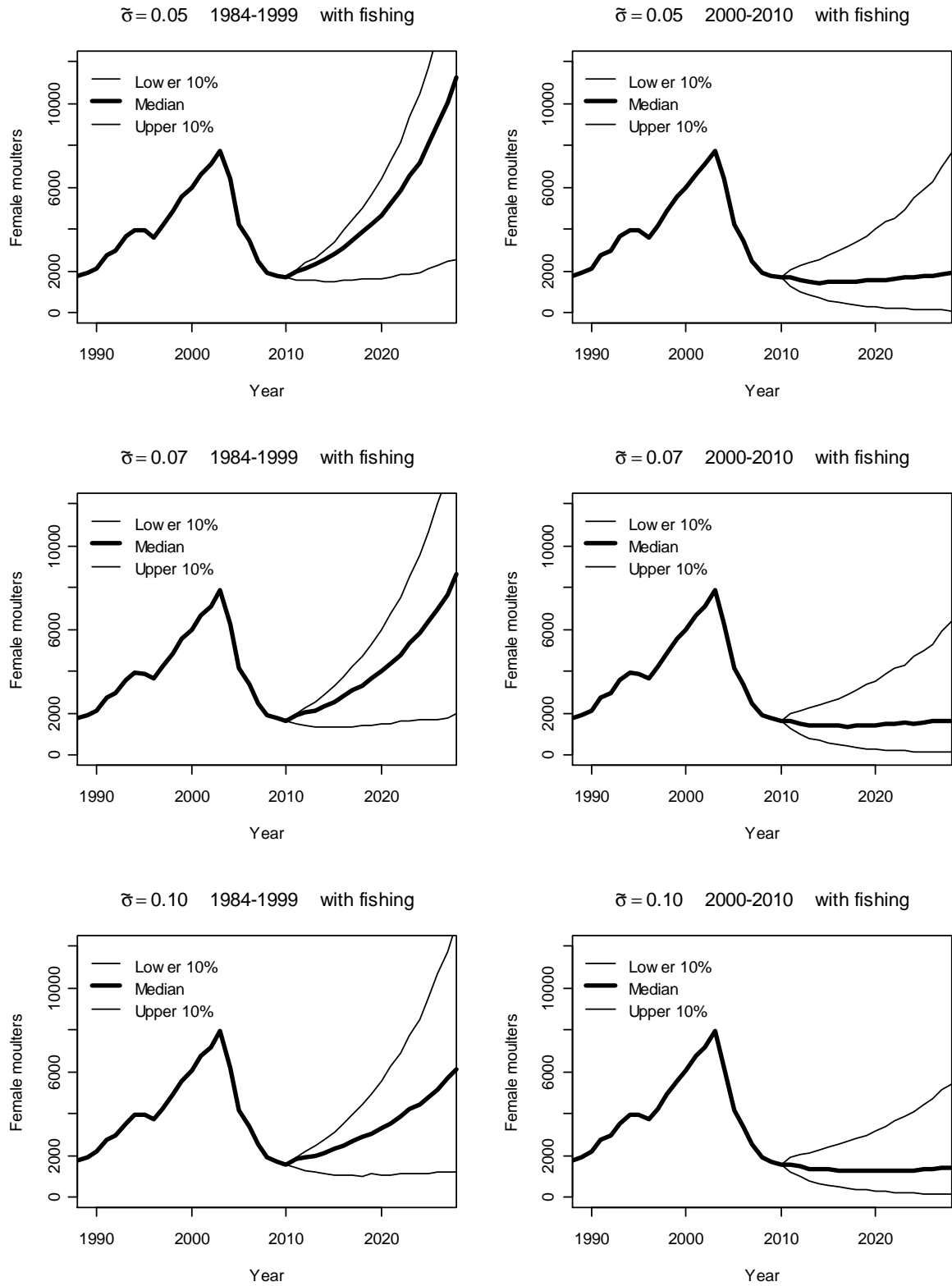


Figure 1: Projections of Robben Island penguins with the log normal bias correction with fishing under OMP-08. In the left column, the future annual proportion of sardine west of Cape Agulhas is picked at random from the 1984–1999 proportions. In the right column, the 2000–2010 proportions are used.

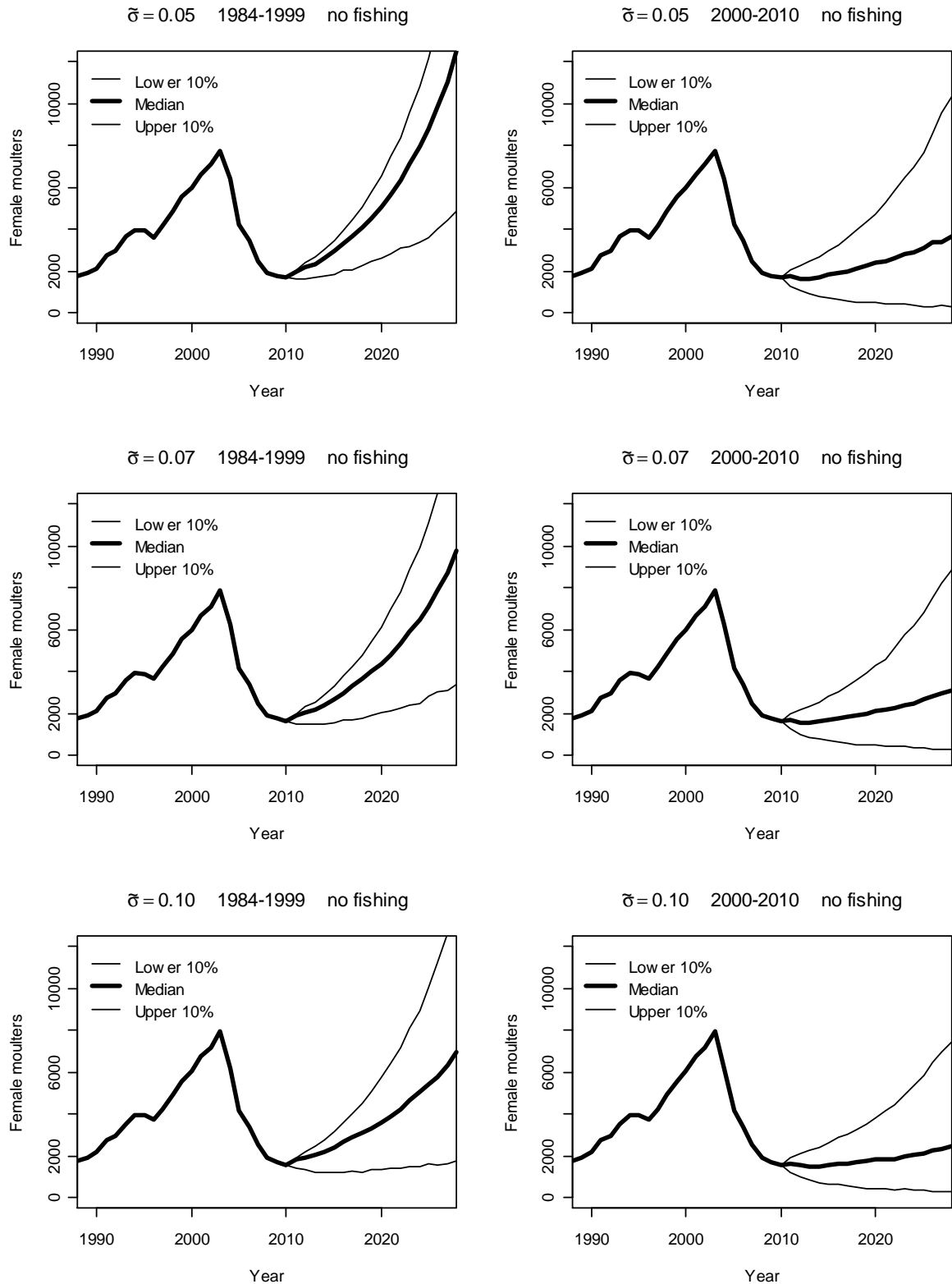


Figure 2: Projections of Robben Island penguins with the log normal bias correction without fishing. In the left column, the future annual proportion of sardine west of Cape Agulhas is picked at random from the 1984–1999 proportions. In the right column, the 2000–2010 proportions are used.

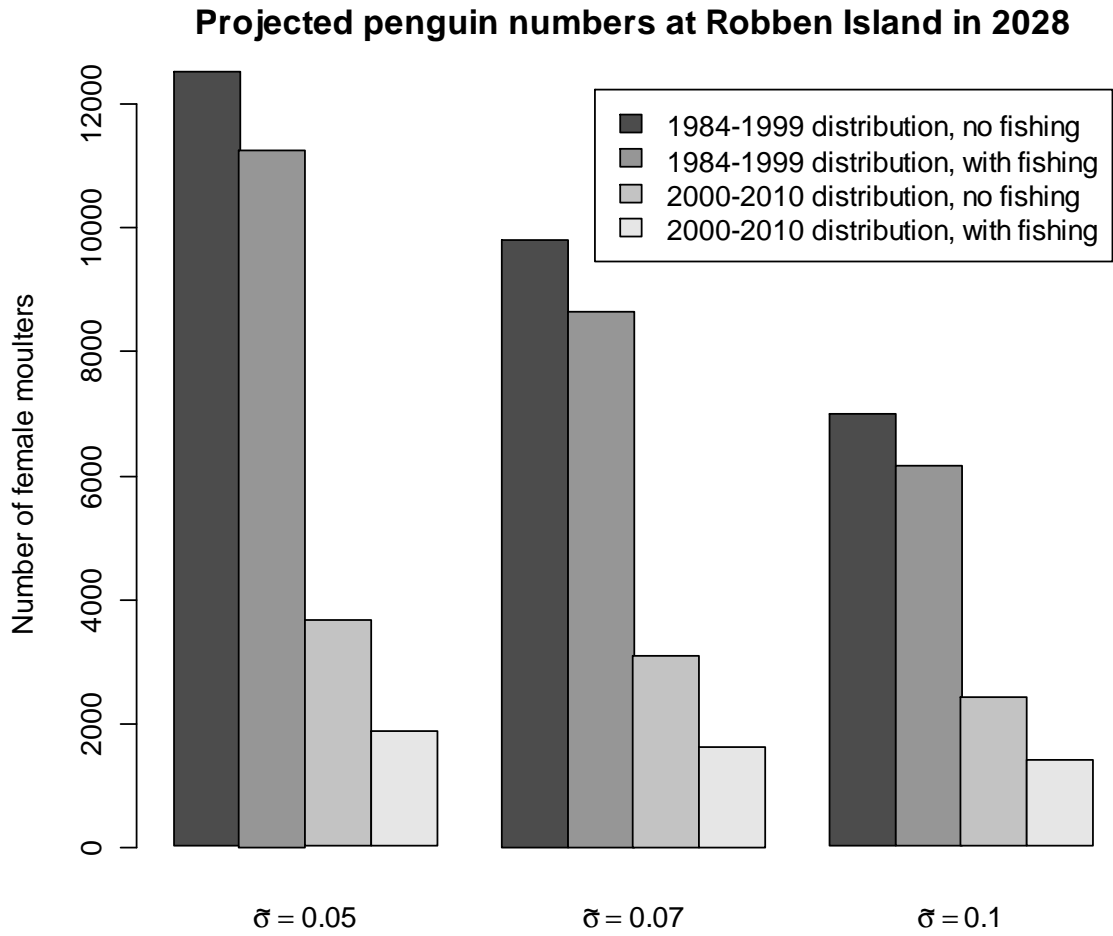


Figure 3: Projected median numbers of female penguins at Robben Island in 2028. The log normal bias correction is included in these projections.

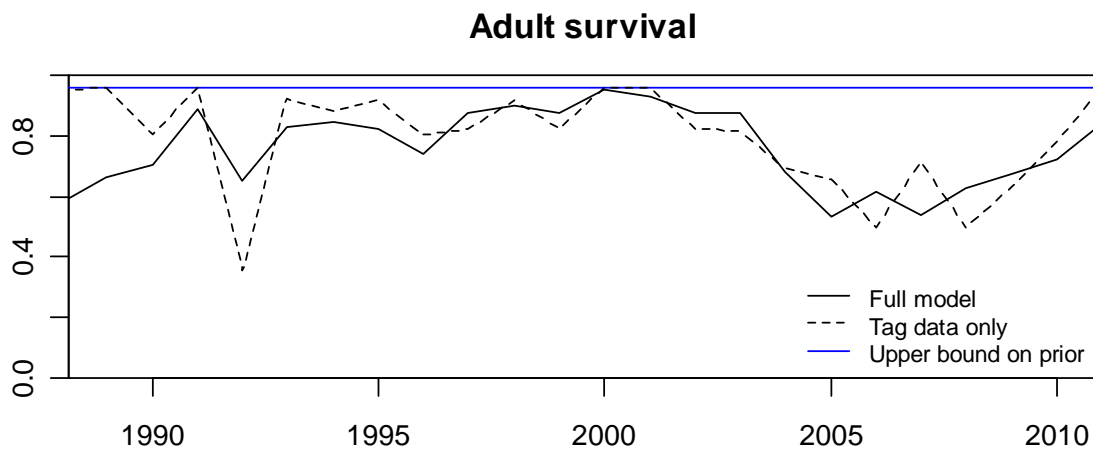


Figure 4: Full model estimates for survival, and estimates using only the tag-recapture component of the likelihood.

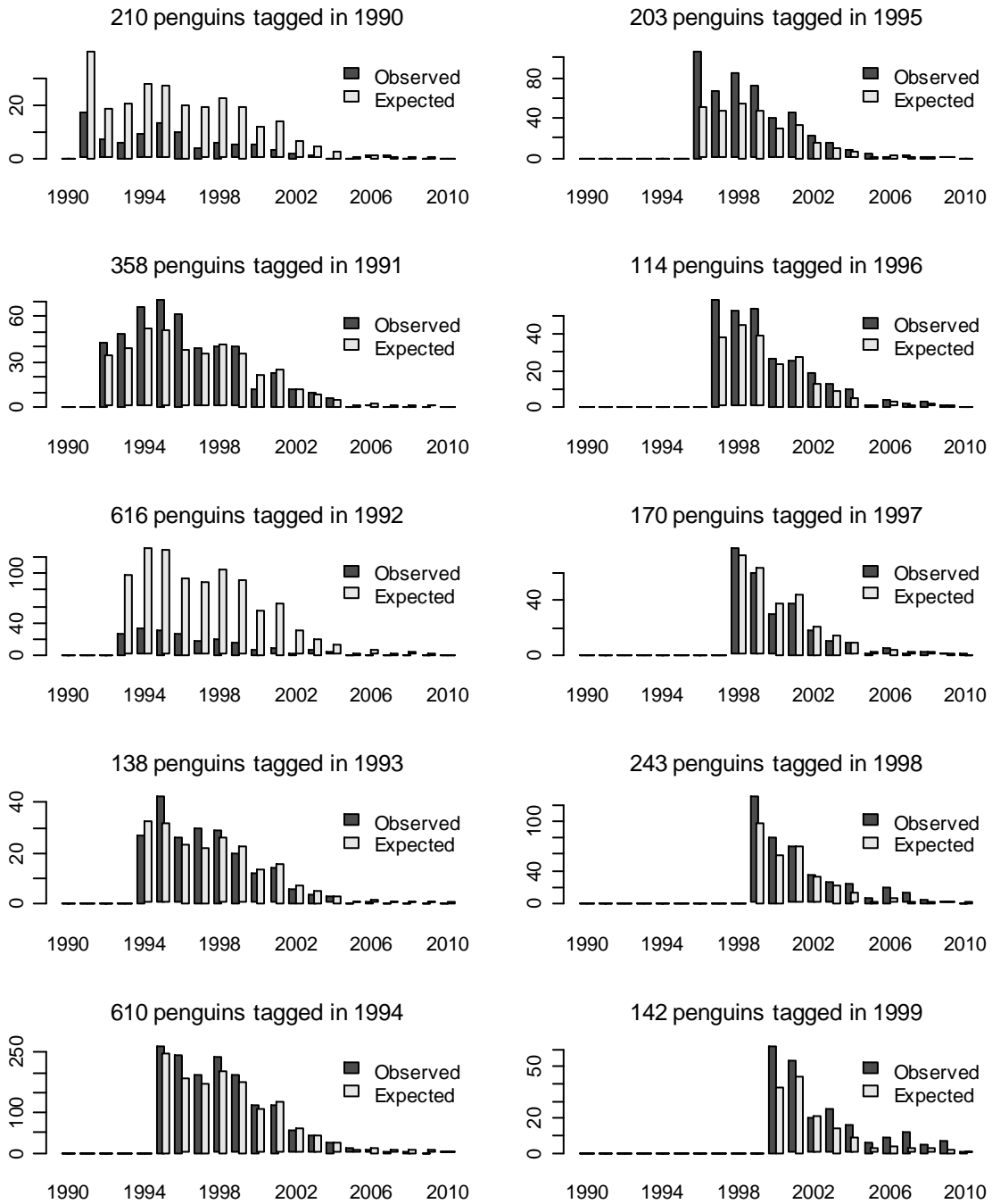


Figure 5: Fits to tagging data for birds tagged in the years 1991–2000.

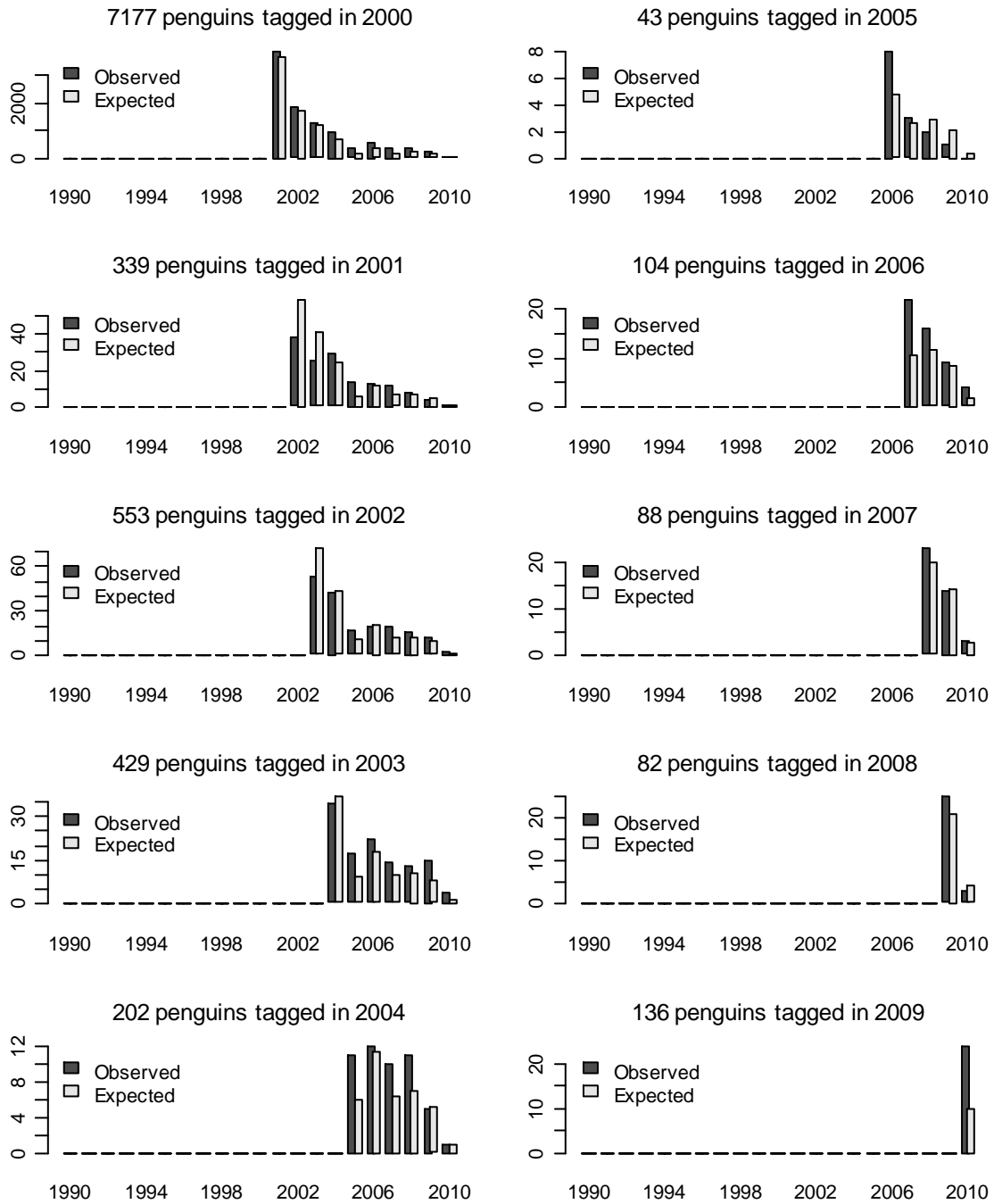


Figure 6: Fits to tagging data for birds tagged in the years 2001–2010.

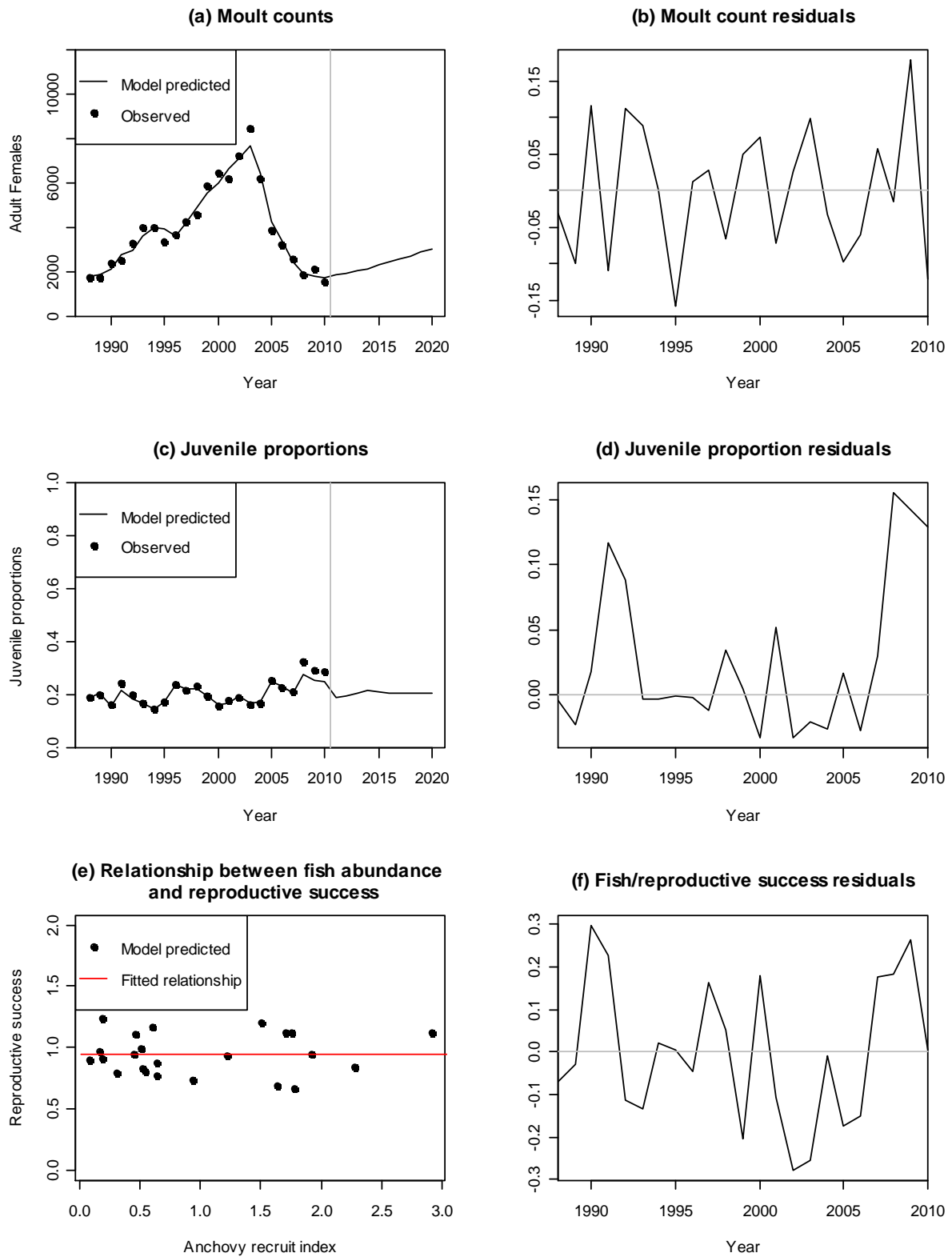


Figure 7: For these plots, $\tilde{\sigma} = 0.05$ rather than 0.1.

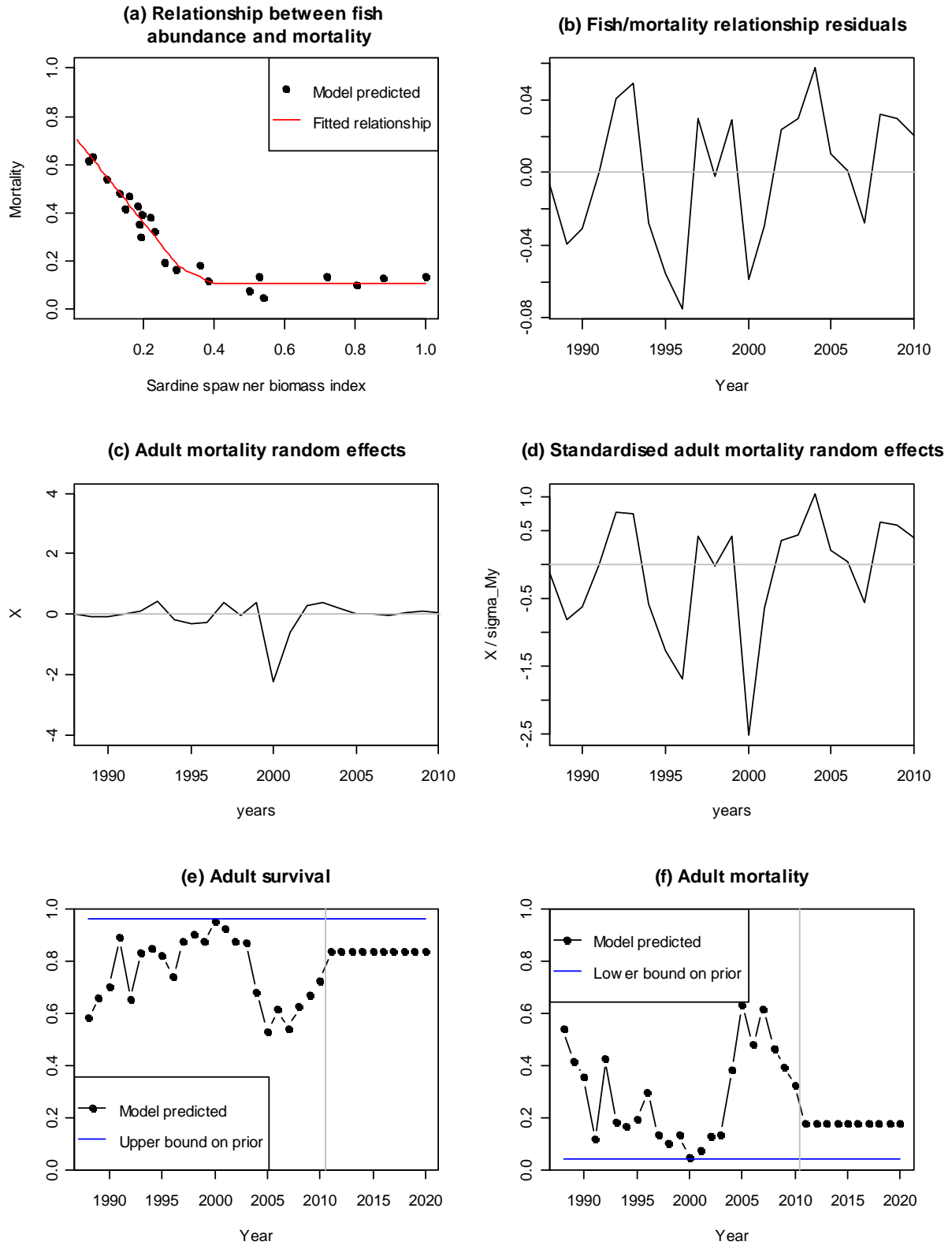


Figure 8: For these plots, $\tilde{\sigma} = 0.05$ rather than 0.1