Operating model results for Nightingale island using an age-structured production model approach

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Three alternate RC models have been selected. For both, the most recent value of the fishing proportion F_{2009} is set equal to 0.3. As this is a somewhat arbitrary selection, two sensitivity runs are reported for alternate values of F_{2009} of 0.2 (SEN1) and 0.4 (SEN2). These are the same values chosen for the Inaccessible RC and SEN models.

- **RC1**: The relative weights of GLMM-standardised longline CPUE and CAL data in the –lnL function are **1.0** and 0.1 respectively.
- **RC2**: The relative weights of GLMM-standardised longline CPUE and CAL data in the –lnL function are **5.0** and 0.1 respectively, i.e. the CPUE data are up-weighted compared to RC1.
- **RC3**: The relative weights of GLMM-standardised longline CPUE and CAL data in the –lnL function are **10.0** and 0.1 respectively, i.e. the CPUE data are up-weighted compared to RC1.

RC2 and RC3 are included to provide scenarios that reflect a recent decline in CPUE more closely.

Figures 1a-c report model fits for RC1 and its two associated sensitivity analyses, Figures 2a-c report model fits for RC2 and its two associate sensitivity analyses, and Figures 3a-c likewise for RC3.

Figures 4a-c show the estimated exploitable biomass trends from each of the three RC models compared to the standardised longline CPUE trend (to which the models are fitted) as well as to nominal powerboat CPUE trend which is shown for comparative purposes only. The powerboat CPUE data are not included in the likelihood for the model fit as they pertain to only a small part of the areal distribution of the resource. In broad quantitative terms these powerboat trends are compatable with the abundance trends assessed by the model.

Table 1: RC1 and RC2 model results with the associated sensitivity model results. Shaded blocks show fixed model parameters.

	RC1 (CPUE*1, CAL*0.1)			RC2 (CPUE*5, CAL*0.1)			RC3 (CPUE*10, CAL*0.1)		
	RC1	SEN1	SEN2	RC2	SEN1	SEN2	RC3	SEN1	SEN2
	F_{2009}=0.3	F_{2009}=0.2	F_{2009}=0.4	F_{2009}=0.3	F_{2009}=0.2	F_{2009}=0.4	F_{2009}=0.3	F_{2009}=0.2	F_{2009}=0.4
K	729	886	660	723	906	634	728	917	645
h	0.967	0.974	0.964	0.991	1.000	0.975	0.998	1.000	0.975
M	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
σ_{length}	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
F_{2009} fixed at	**0.3**	**0.2**	**0.4**	**0.3**	**0.2**	**0.4**	**0.3**	**0.2**	**0.4**
Male selectivity μ	0.0	0.006	0.0	0.013	0.019	0.004	0.030	0.031	0.032
Female selectivity μ	0.126	0.126	0.126	0.133	0.132	0.133	0.149	0.146	0.155
θ	0.448	0.408	0.476	0.471	0.434	0.493	0.489	0.452	0.503
L_∞^m	150	150	150	150	150	150	150	150	150
L_∞^f	90	90	90	90	90	90	90	90	90
-lnL CPUE	-10.90	-10.88	-10.96	-11.73	-11.78	-11.60	-12.51	-12.43	-12.63
-lnL CAL	-18.67	-16.92	-17.73	-14.49	-9.65	-12.38	19.78	12.12	34.50
-lnL total	-12.71	-12.53	-12.67	-58.16	-58.22	-57.87	-118.80	-118.76	-118.47
SR1	0.737	0.712	0.754	2.21	2.28	2.04	4.97	4.99	5.00
Bsp(1990)/Ksp	0.395	0.360	0.420	0.416	0.383	0.435	0.429	0.399	0.444
Bsp(2009)/Ksp	0.718	0.751	0.670	0.725	0.762	0.691	0.752	0.788	0.721
Bsp(2009)/Bsp(1990)	1.817	2.087	1.659	1.745	1.989	1.589	1.756	1.978	1.624
Bexp(2009)/Bexp(1990)	0.863	1.29	0.656	0.975	1.400	0.670	1.149	1.514	0.926
Program (nfitall.tpl)	N3.rep	N2.rep	N4.rep	Nn3.rep	Nn2.rep	Nn4.rep	Nnn3.rep	Nnn2.rep	Nnn4.rep

Figure 1a: RC1 (F_{2009}=0.3). Note that here and in Figure 2 the CPUE refers to the longline CPUE.
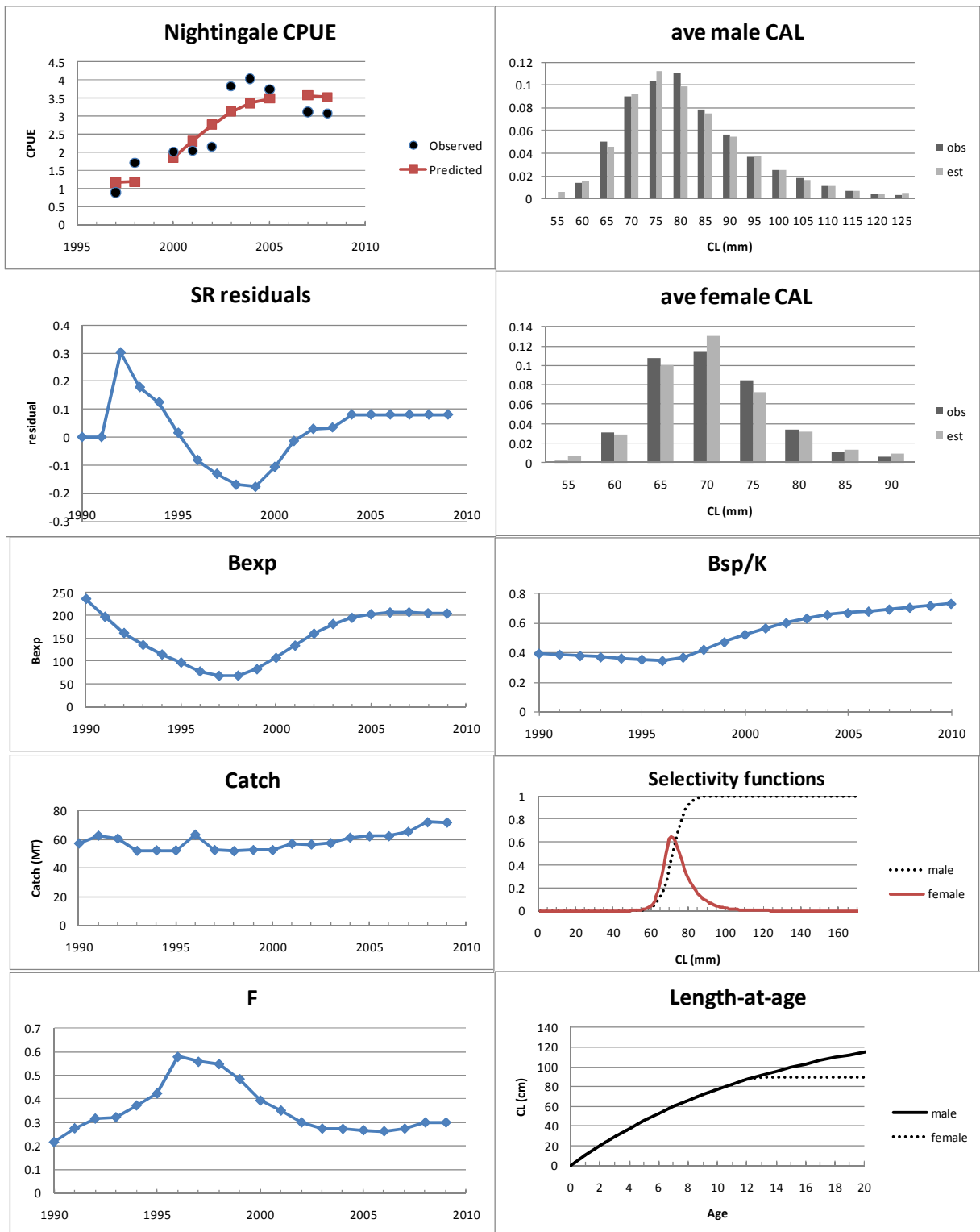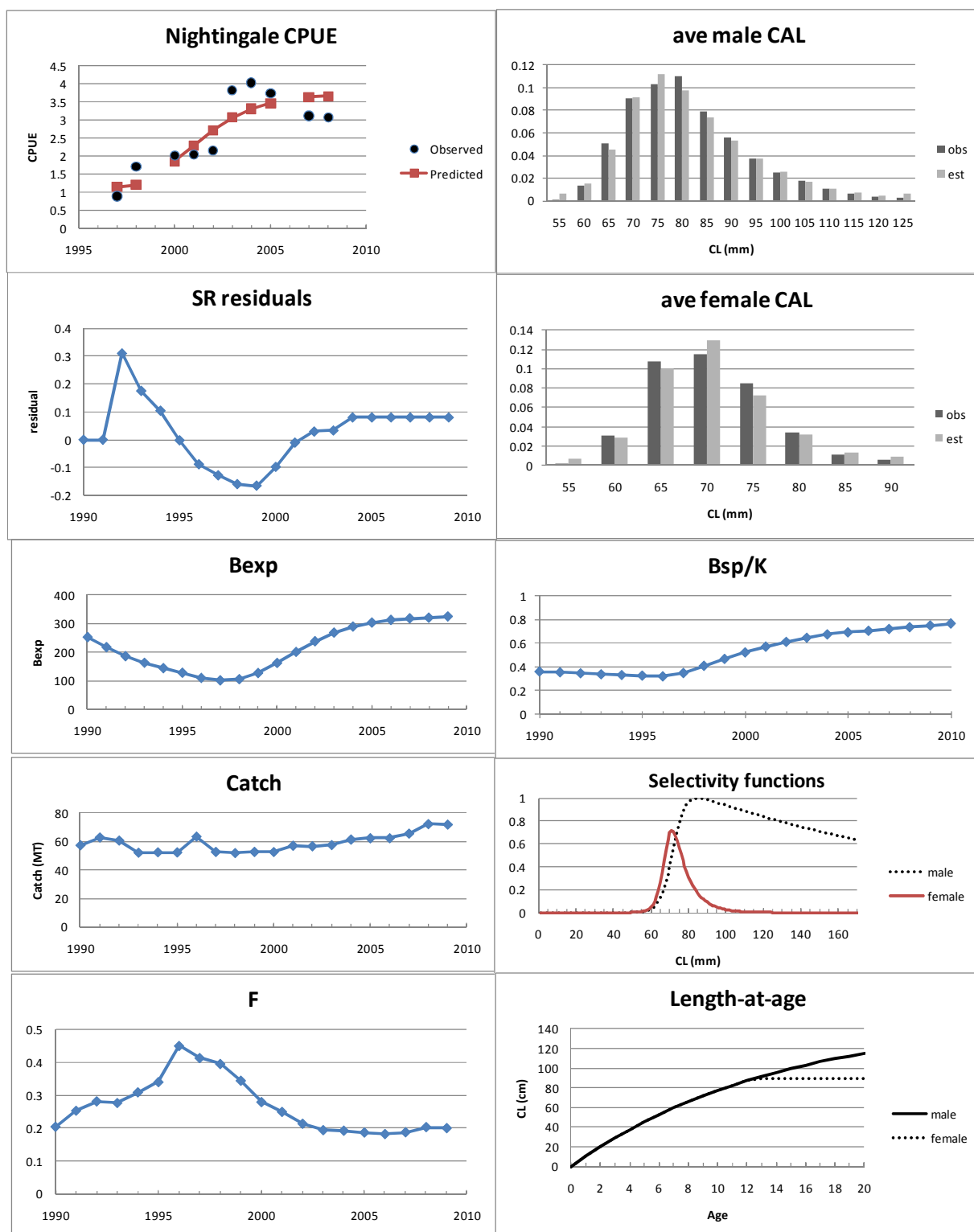
Figure 1b: RC1 SEN1 ($F_{2009}=0.2$).

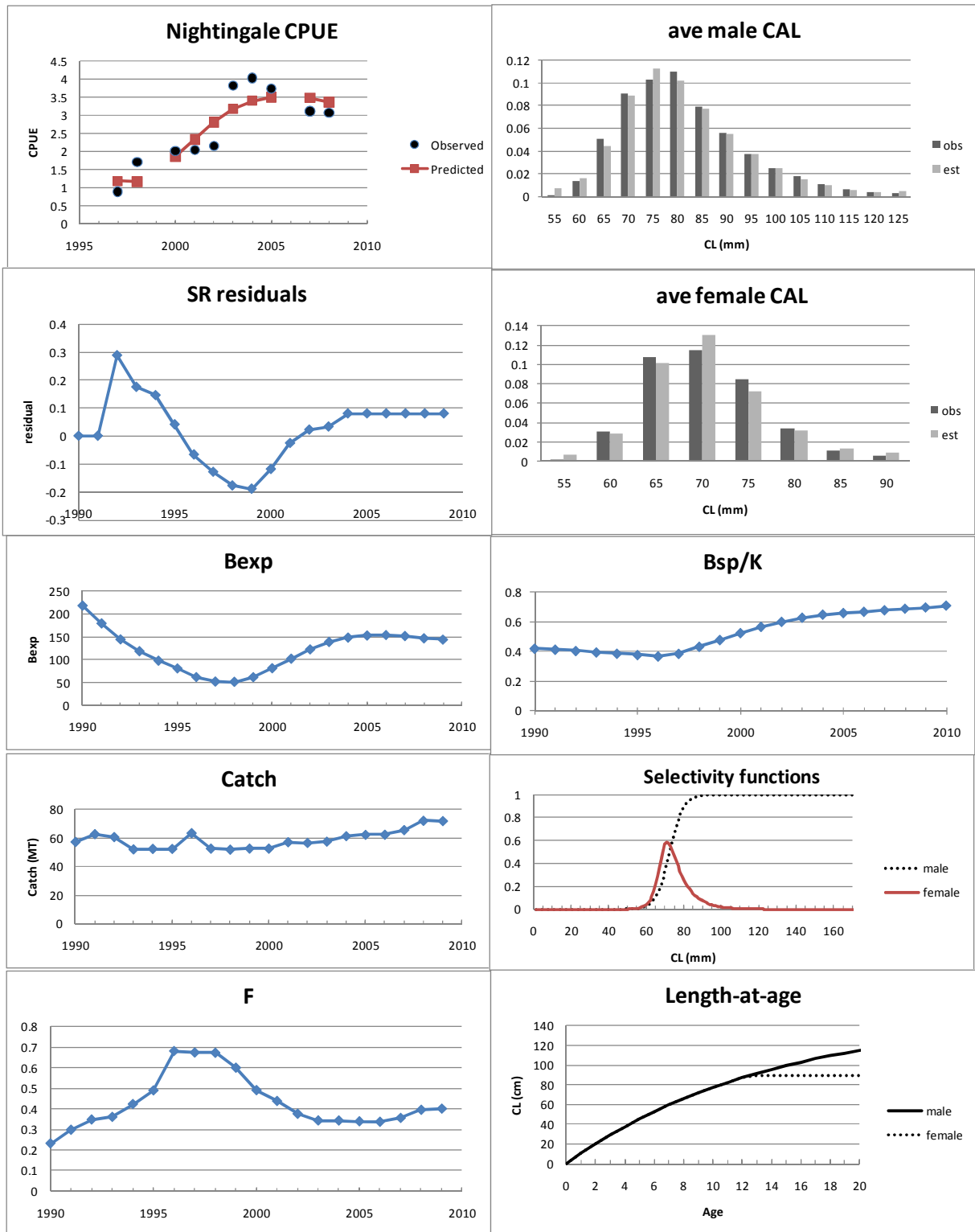Figure 1c: RC1 SEN2 (F_{2009}=0.4).

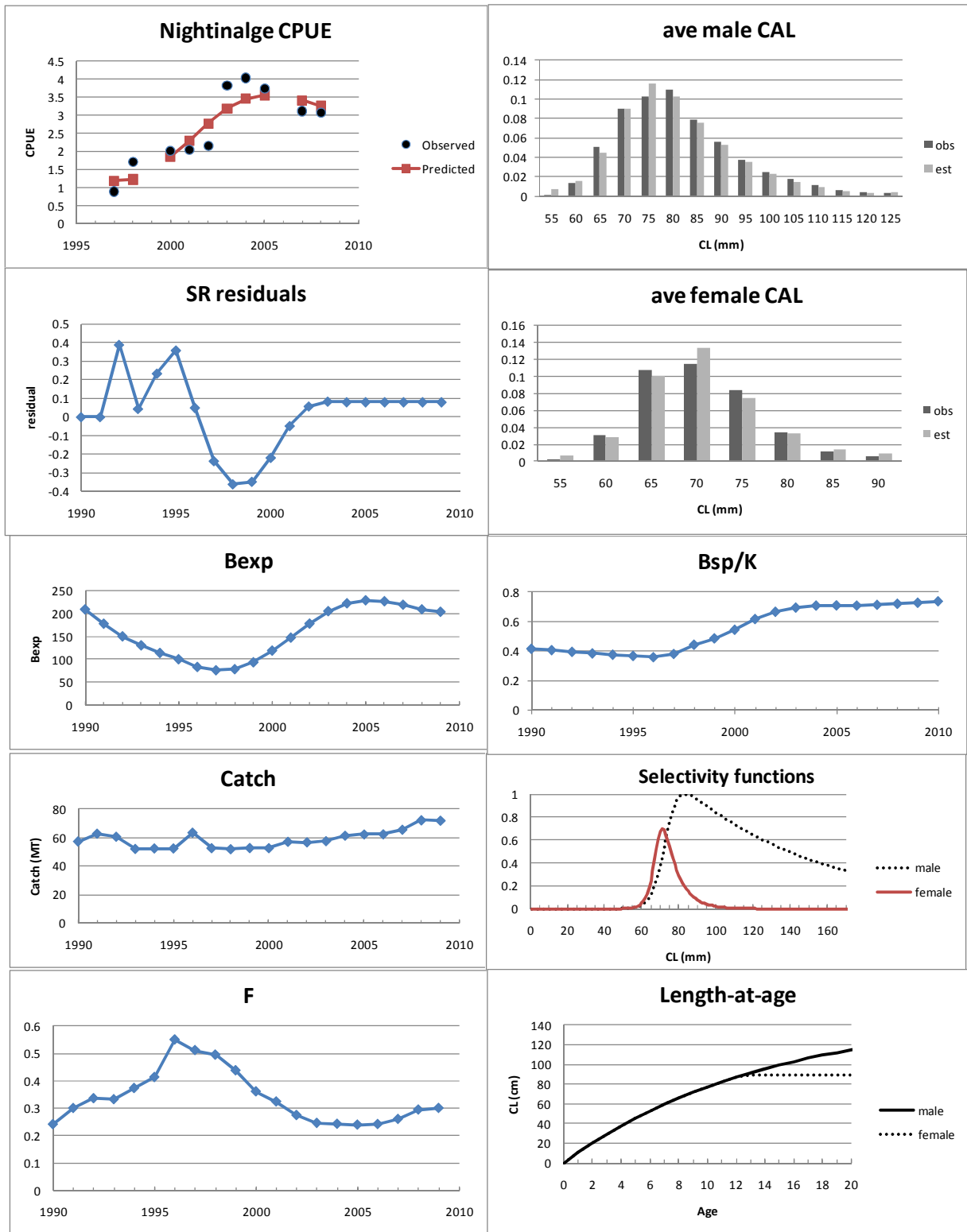Figure 2a: RC2 ($F_{2009}=0.3$)
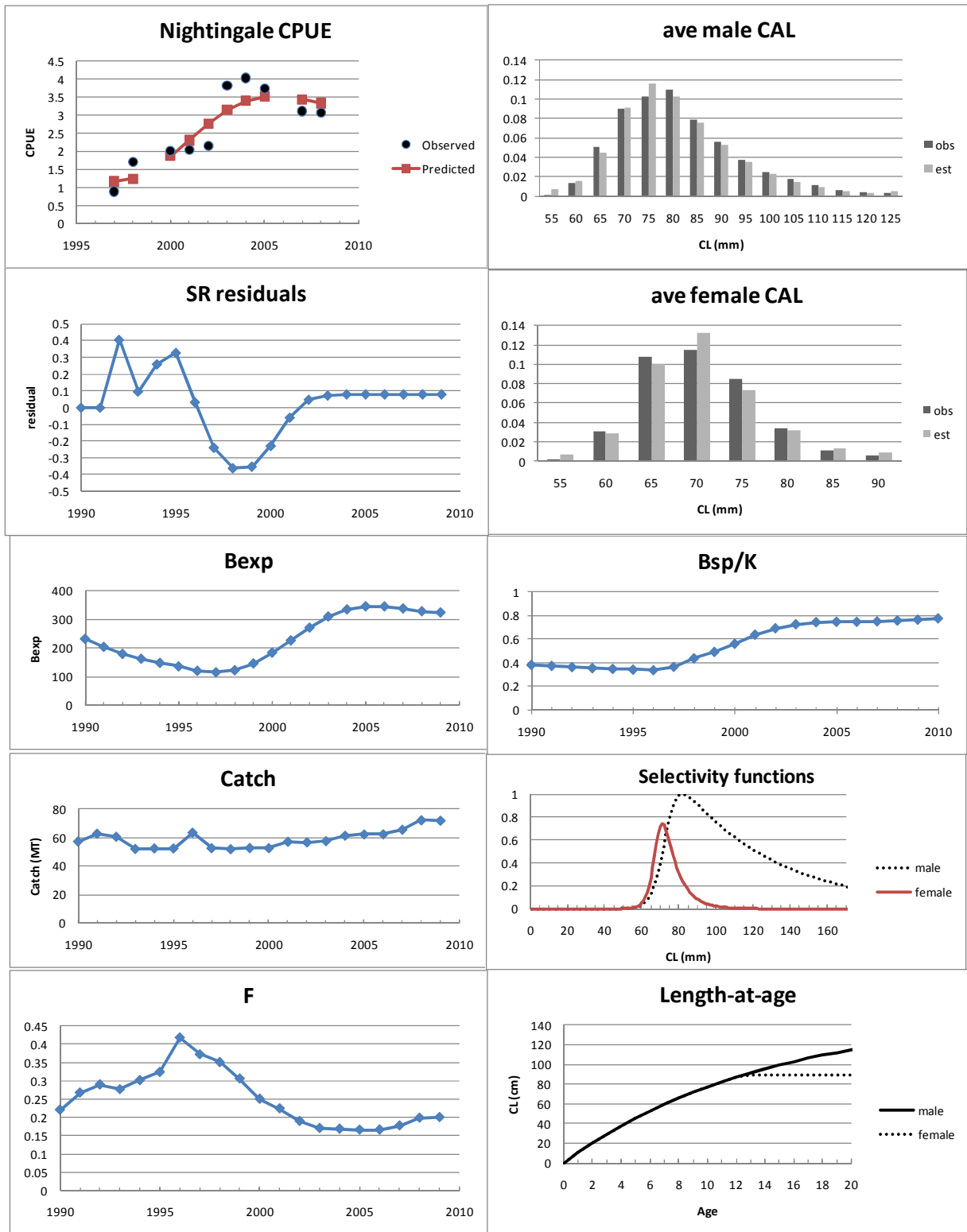
Figure 2b: RC2 SEN1 F(2009)=0.2
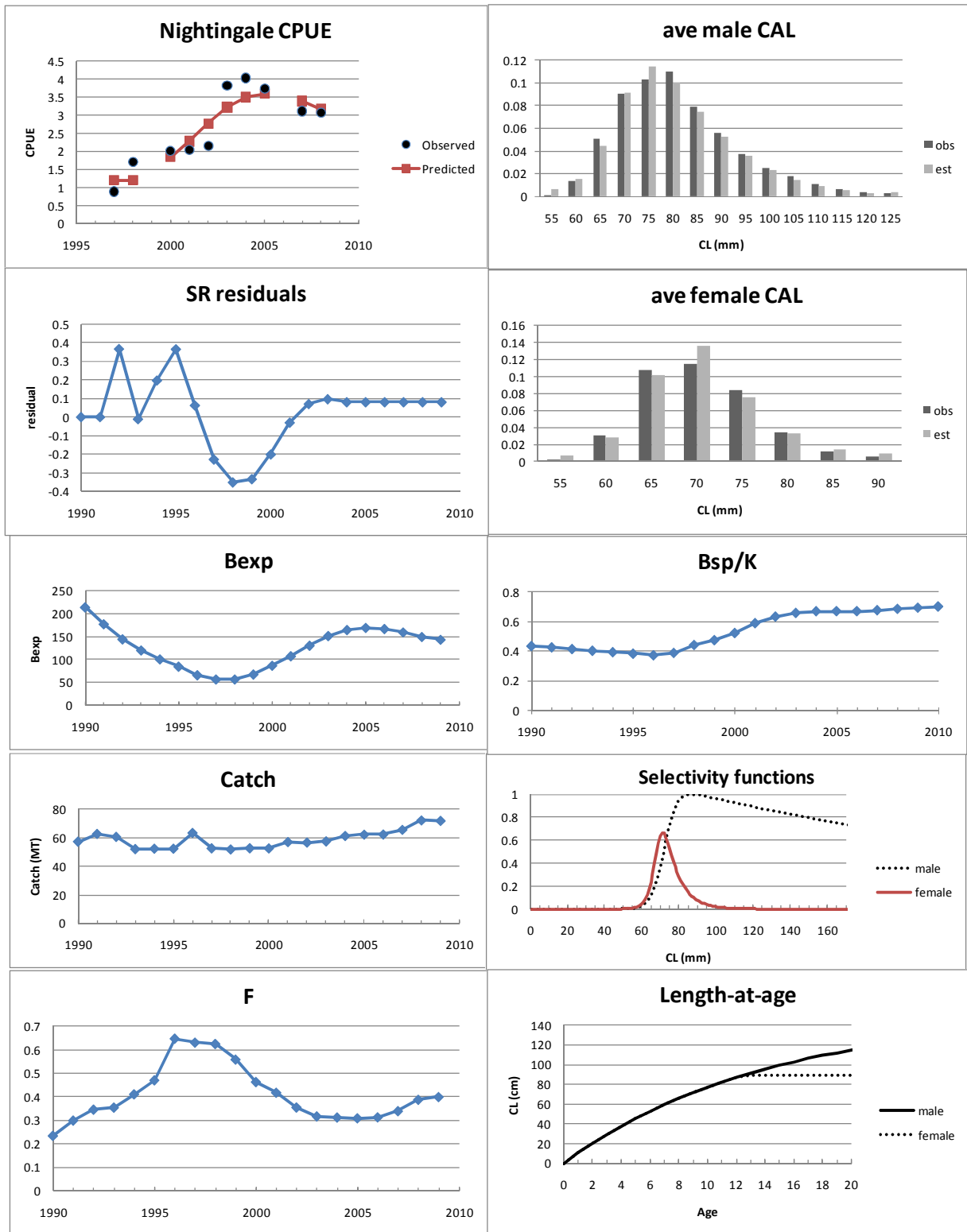
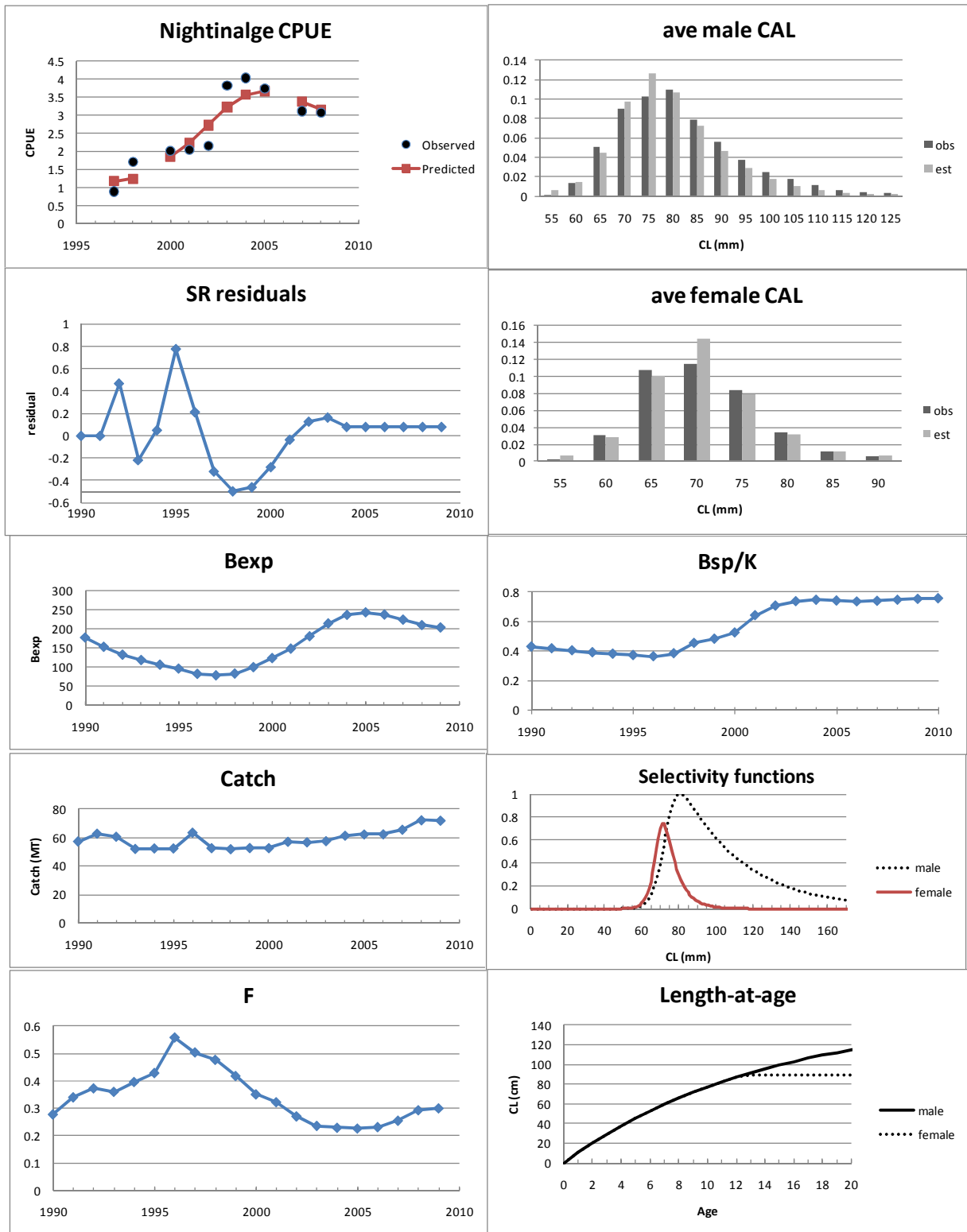Figure 2c: RC2 SEN2 (F_{2009}=0.4)
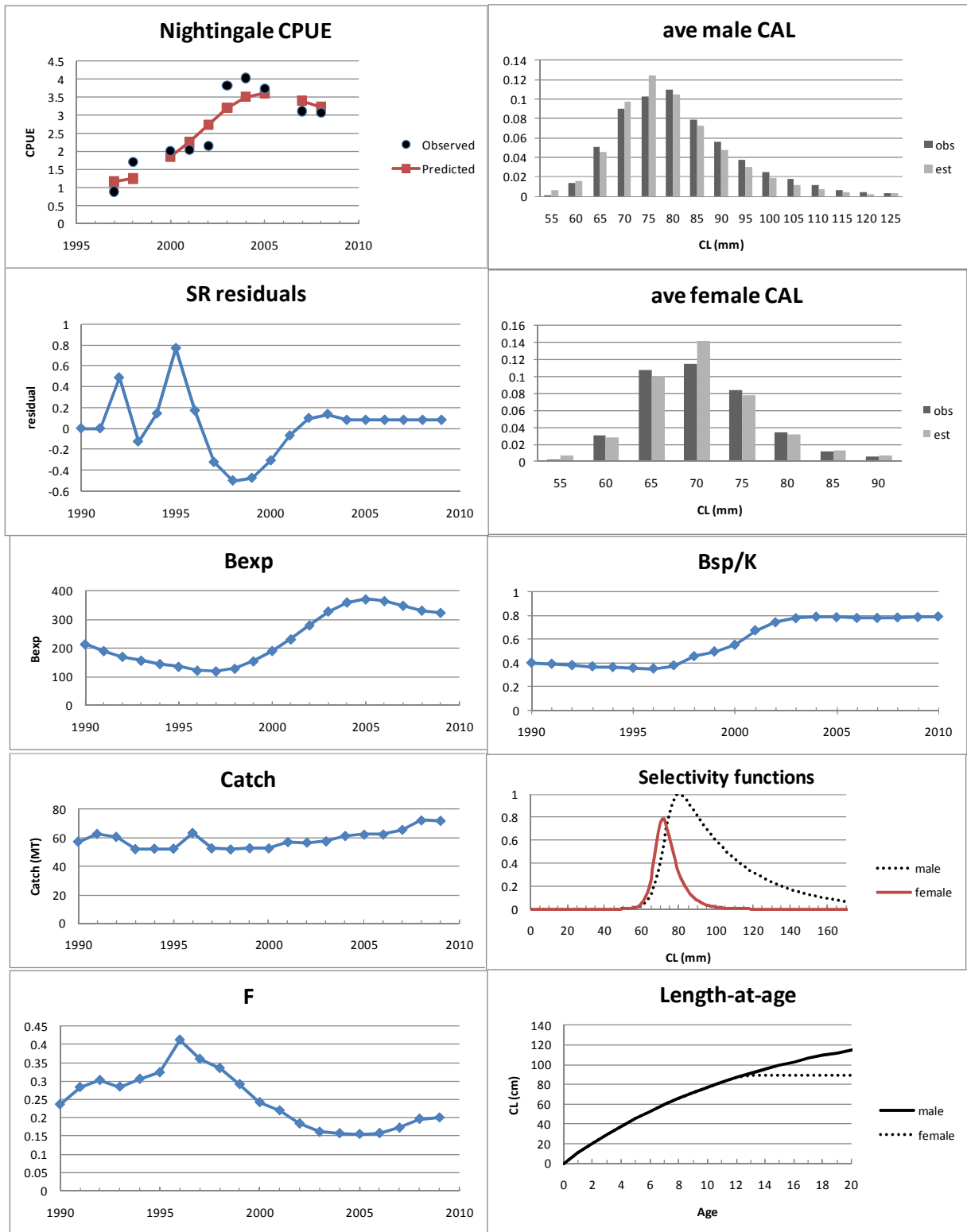
Figure 3a: RC3 (F_{2009}=0.3)

Figure 3b: RC2 SEN2 (F_{2009}=0.2)
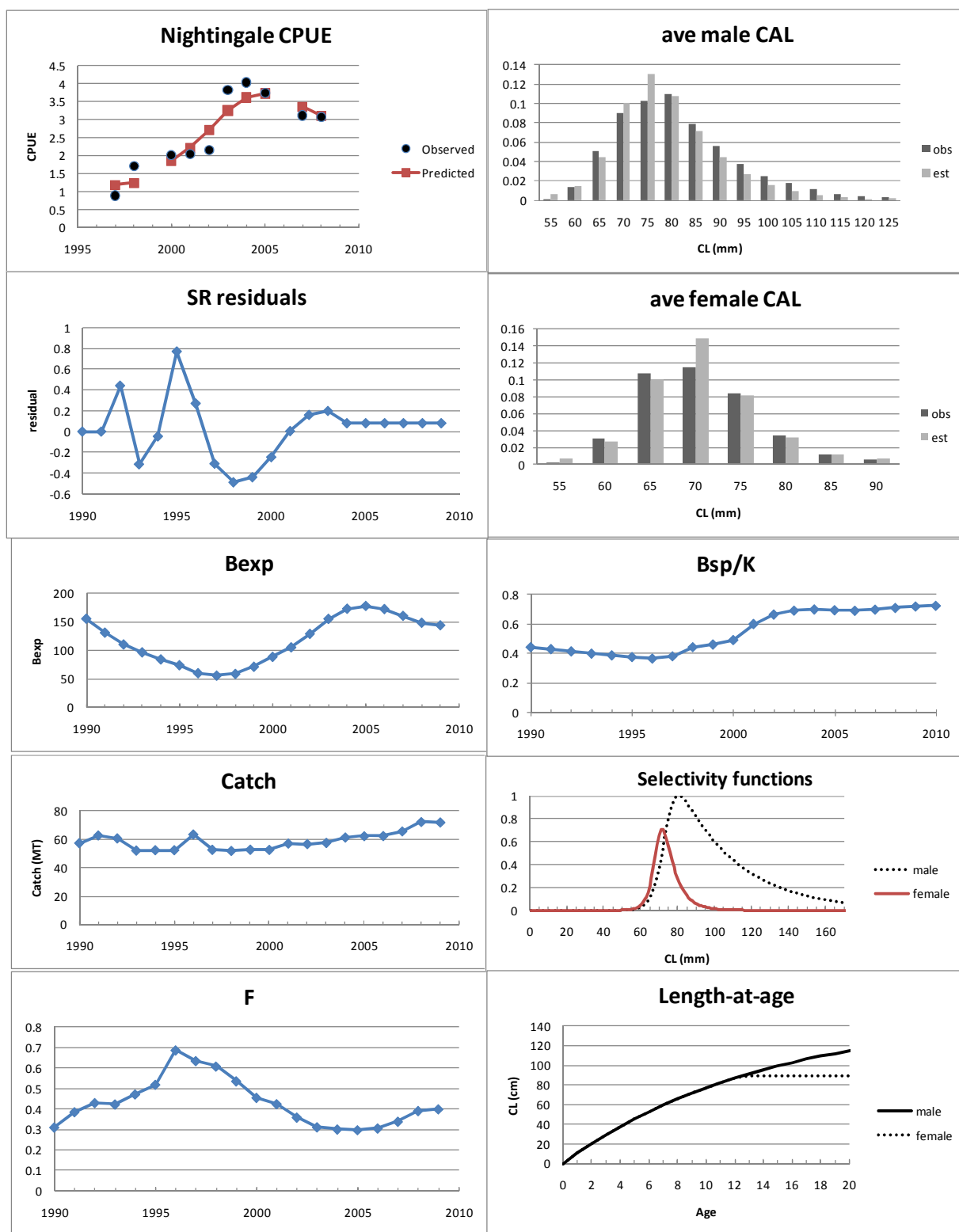
Figure 3c: RC2 SEN2 (F_{2009}=0.4)

Figure 3a: Model RC1 estimated B_{exp} trend compared with both the GLMM-standardized longline CPUE trend (to which the model is fitted in minimizing the –lnL) and the nominal powerboat CPUE trend.
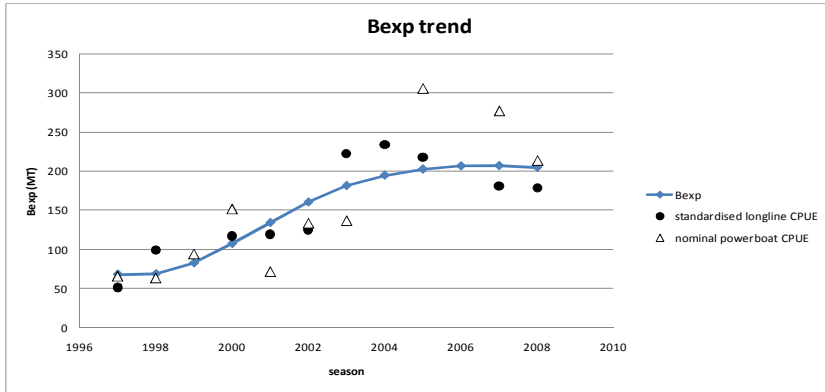

Figure 3b: Model RC2 estimated B_{exp} trend compared with both the GLMM-standardized longline CPUE trend (to which the model is fitted in minimizing the –lnL) and the nominal powerboat CPUE trend.
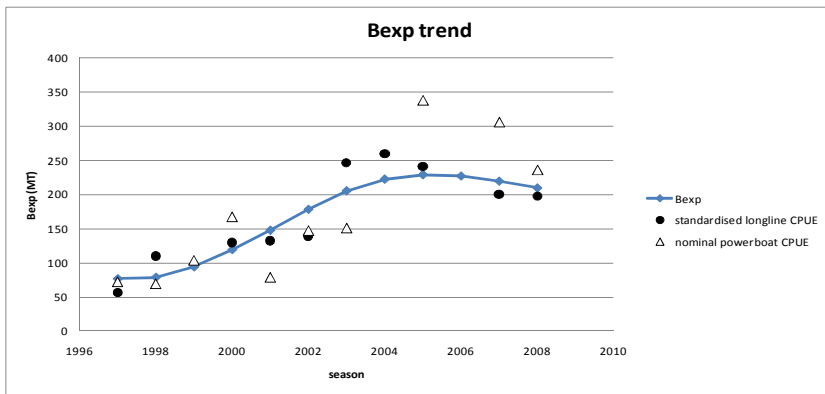

Figure 3c: Model RC3 estimated B_{exp} trend compared with both the GLMM-standardized longline CPUE trend (to which the model is fitted in minimizing the –lnL) and the nominal powerboat CPUE trend.