

Supplementary Material

Tables

Table S1. Sampling approaches investigated.

Sampling Strategy	Sample Size	t_0	Supplemental Sampling
FOS	300	t_0 estimated	none
FOS	75	t_0 estimated	none
FOS	300	t_0 fixed	none
FOS	75	t_0 fixed	none
FOS	300	t_0 estimated	small
FOS	75	t_0 estimated	small
FOS	300	t_0 fixed	small
FOS	75	t_0 fixed	small
POS	300	t_0 estimated	none
POS	75	t_0 estimated	none
POS	300	t_0 fixed	none
POS	75	t_0 fixed	none
POS	300	t_0 estimated	large
POS	75	t_0 estimated	large
POS	300	t_0 fixed	large
POS	75	t_0 fixed	large
POS	300	t_0 estimated	small
POS	75	t_0 estimated	small
POS	300	t_0 fixed	small
POS	75	t_0 fixed	small
POS	300	t_0 estimated	both
POS	75	t_0 estimated	both
POS	300	t_0 fixed	both
POS	75	t_0 fixed	both

Table S2. Estimated mean and standard deviation (SD) of L_{∞} , K , and t_0 for *Pristipomoides auricilla* under different levels of fishery exploitation and minimum size at fishery selectivity ($mincat = 10$ cm or 20 cm).

Sampling Strategy	N	Supplemental Sampling	Low Exploitation $mincat = 10$ cm						High Exploitation $mincat = 10$ cm					
			L_{∞}	SD	K	SD	L_0	SD	L_{∞}	SD	K	SD	L_0	SD
FOS	300	none	36.5	0.3	0.384	0.023	11.8	0.6	36.8	0.3	0.439	0.020	10.0	0.4
FOS	75	none	37.6	0.7	0.361	0.045	11.2	1.2	37.8	0.7	0.422	0.030	9.3	0.4
FOS	300	small	36.5	0.3	0.383	0.017	11.8	0.4	37.0	0.3	0.420	0.018	10.6	0.3
FOS	75	small	37.7	0.6	0.345	0.028	11.7	0.4	38.2	0.7	0.384	0.026	10.5	0.3
POS	300	none	32.9	0.2	0.535	0.029	12.6	0.7	32.9	0.3	0.540	0.033	12.5	0.6
POS	75	none	32.8	0.4	0.546	0.064	12.5	1.4	33.1	0.7	0.524	0.069	12.8	1.3
POS	300	large	33.7	0.2	0.470	0.030	13.6	0.7	33.9	0.4	0.468	0.035	13.3	0.6
POS	75	large	36.1	0.9	0.349	0.058	15.2	1.5	37.3	1.6	0.343	0.064	14.5	1.3
POS	300	small	32.9	0.2	0.530	0.019	12.7	0.3	32.9	0.3	0.531	0.022	12.7	0.3
POS	75	small	33.1	0.4	0.502	0.030	12.6	0.4	33.5	0.6	0.494	0.035	12.8	0.4
POS	300	both	33.7	0.2	0.483	0.019	13.0	0.3	33.9	0.4	0.477	0.024	13.0	0.3
POS	75	both	36.5	0.7	0.369	0.032	13.0	0.4	37.2	1.1	0.371	0.036	13.0	0.4

Table S2 continued...

Sampling Strategy	N	Supplemental Sampling	Low Exploitation <i>mincat</i> = 20 cm						High Exploitation <i>mincat</i> = 20 cm					
			L_{∞}	SD	K	SD	L_0	SD	L_{∞}	SD	K	SD	L_0	SD
FOS	300	none	36.3	0.3	0.350	0.026	13.3	1.0	37.8	0.5	0.343	0.023	12.0	0.8
FOS	75	none	37.8	0.7	0.287	0.040	14.3	1.4	38.4	1.2	0.347	0.052	11.3	2.0
FOS	300	small	36.3	0.3	0.357	0.015	12.8	0.4	38.0	0.4	0.332	0.015	12.4	0.4
FOS	75	small	37.6	0.6	0.308	0.023	12.9	0.4	39.1	1.1	0.312	0.027	12.5	0.4
POS	300	none	32.9	0.2	0.496	0.061	15.8	2.2	33.0	0.5	0.477	0.080	16.3	2.3
POS	75	none	32.8	0.5	0.550	0.151	13.2	6.6	32.9	1.1	0.517	0.175	14.6	6.7
POS	300	large	33.6	0.3	0.424	0.062	17.4	2.0	34.0	0.7	0.384	0.066	18.0	1.7
POS	75	large	36.1	1.5	0.304	0.096	18.6	3.4	39.8	13.6	0.256	0.096	18.8	2.5
POS	300	small	32.8	0.2	0.558	0.019	12.4	0.4	32.6	0.2	0.574	0.023	12.5	0.4
POS	75	small	33.2	0.5	0.502	0.034	12.5	0.4	33.2	0.6	0.511	0.037	12.6	0.4
POS	300	both	33.4	0.2	0.516	0.021	12.7	0.4	33.4	0.3	0.520	0.023	12.8	0.4
POS	75	both	36.4	0.7	0.369	0.032	12.8	0.4	37.6	1.2	0.354	0.039	12.9	0.4

Table S3. Estimated mean and standard deviation (SD) of L_∞ , K , and t_0 for *Etelis coruscans* under different levels of fishery exploitation and minimum size at fishery selectivity ($mincat = 10$ cm or 30 cm).

Sampling Strategy	N	Supplemental Sampling	Low Exploitation $mincat = 10$ cm						High Exploitation $mincat = 10$ cm					
			L_∞	SD	K	SD	L_0	SD	L_∞	SD	K	SD	L_0	SD
FOS	300	none	101.7	0.3	0.135	0.002	10.9	0.3	101.6	0.5	0.137	0.002	10.6	0.3
FOS	75	none	102.8	0.6	0.131	0.003	11.3	0.7	101.7	0.9	0.137	0.004	10.2	0.6
FOS	300	small	101.7	0.3	0.135	0.001	11.0	0.3	101.7	0.5	0.136	0.002	10.7	0.3
FOS	75	small	102.9	0.6	0.131	0.002	11.5	0.6	102.0	1.0	0.135	0.003	10.6	0.5
POS	300	none	100.4	0.5	0.138	0.002	11.4	0.3	102.1	1.4	0.132	0.004	11.8	0.3
POS	75	none	100.7	1.0	0.137	0.004	11.6	0.7	102.3	3.5	0.132	0.009	11.9	0.7
POS	300	large	100.4	0.5	0.138	0.002	11.4	0.3	102.1	1.4	0.132	0.004	11.8	0.3
POS	75	large	100.7	1.0	0.137	0.004	11.6	0.7	102.6	3.6	0.131	0.009	11.9	0.7
POS	300	small	100.5	0.5	0.138	0.002	11.4	0.3	102.0	1.4	0.133	0.004	11.8	0.3
POS	75	small	100.9	1.1	0.136	0.004	11.5	0.7	102.4	3.3	0.132	0.008	11.8	0.7
POS	300	both	101.5	0.5	0.134	0.002	11.7	0.3	103.0	0.8	0.130	0.002	11.9	0.3
POS	75	both	103.5	0.7	0.128	0.003	12.0	0.6	103.1	0.9	0.130	0.003	11.8	0.6

Table S3 continued...

Sampling Strategy	N	Supplemental Sampling	Low Exploitation <i>mincat</i> = 30 cm						High Exploitation <i>mincat</i> = 30 cm					
			L_∞	SD	K	SD	L_0	SD	L_∞	SD	K	SD	L_0	SD
FOS	300	none	102.3	0.4	0.128	0.002	13.8	0.4	102.7	0.4	0.129	0.002	13.25	0.5
FOS	75	none	103.0	0.7	0.126	0.003	14.2	1.0	103.0	0.9	0.128	0.004	13.33	1.1
FOS	300	small	102.1	0.3	0.131	0.001	12.5	0.3	102.5	0.4	0.131	0.002	12.38	0.4
FOS	75	small	102.7	0.8	0.130	0.003	12.3	0.6	102.9	1.0	0.130	0.003	12.22	0.6
POS	300	none	100.3	0.5	0.138	0.002	11.4	0.7	101.3	1.6	0.134	0.005	12.16	0.8
POS	75	none	100.3	1.0	0.139	0.005	11.0	1.3	101.3	3.4	0.135	0.011	11.91	1.5
POS	300	large	103.4	0.5	0.125	0.002	13.8	0.6	103.1	0.8	0.128	0.003	12.91	0.6
POS	75	large	100.6	1.1	0.137	0.005	11.6	1.4	101.7	3.1	0.133	0.010	12.24	1.8
POS	300	small	100.7	0.5	0.136	0.002	11.9	0.4	101.7	1.2	0.133	0.003	12.20	0.4
POS	75	small	101.0	1.0	0.136	0.004	11.5	0.8	101.5	2.2	0.135	0.006	11.55	0.9
POS	300	both	103.4	0.4	0.128	0.002	12.6	0.4	103.0	0.6	0.129	0.002	12.36	0.4
POS	75	both	103.6	0.7	0.128	0.003	12.0	0.7	103.0	1.0	0.131	0.004	11.66	0.8

Figures

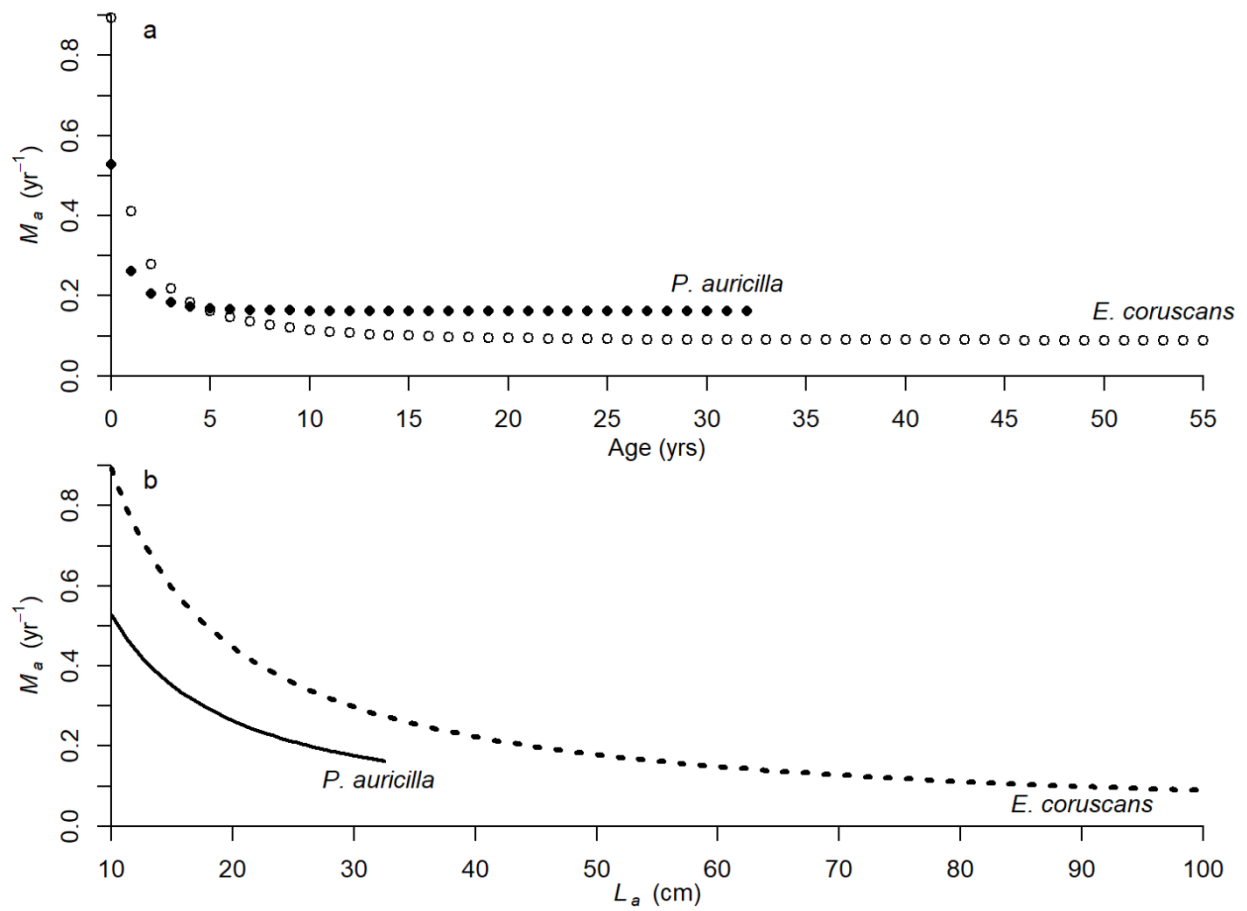


Figure S1. Mean expected natural mortality at age (M_a , yr^{-1}) for *P. auricilla* and *E. coruscans* as a function of (a) age and (b) length at age (L_a , cm). For *P. auricilla*, $M_{\text{constant}} = 0.18$ and $MI = 5.29$. For *E. coruscans*, $M_{\text{constant}} = 0.125$ and $MI = 8.94$.

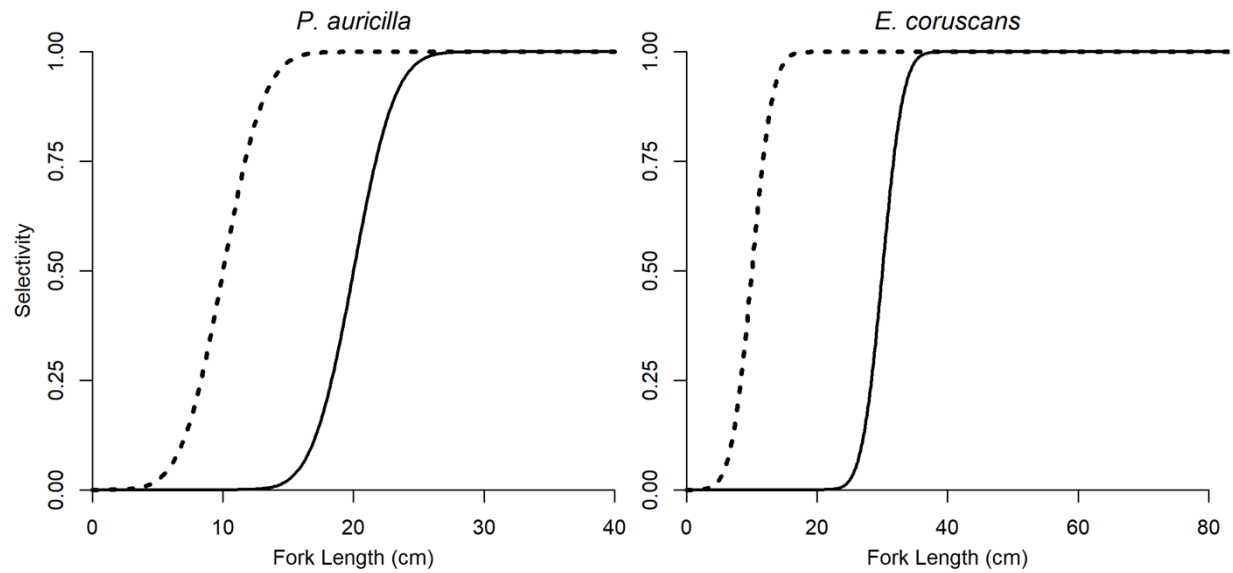


Figure S2. Fishery selectivity at length for simulated *Pristipomoides auricilla* and *Etelis coruscans* populations where length at 50% selectivity (*mincat*) was assumed equal to 20 cm and 30 cm, respectively (no small fish in the catch; solid lines) and 10 cm (small fish included in the catch; broken lines).

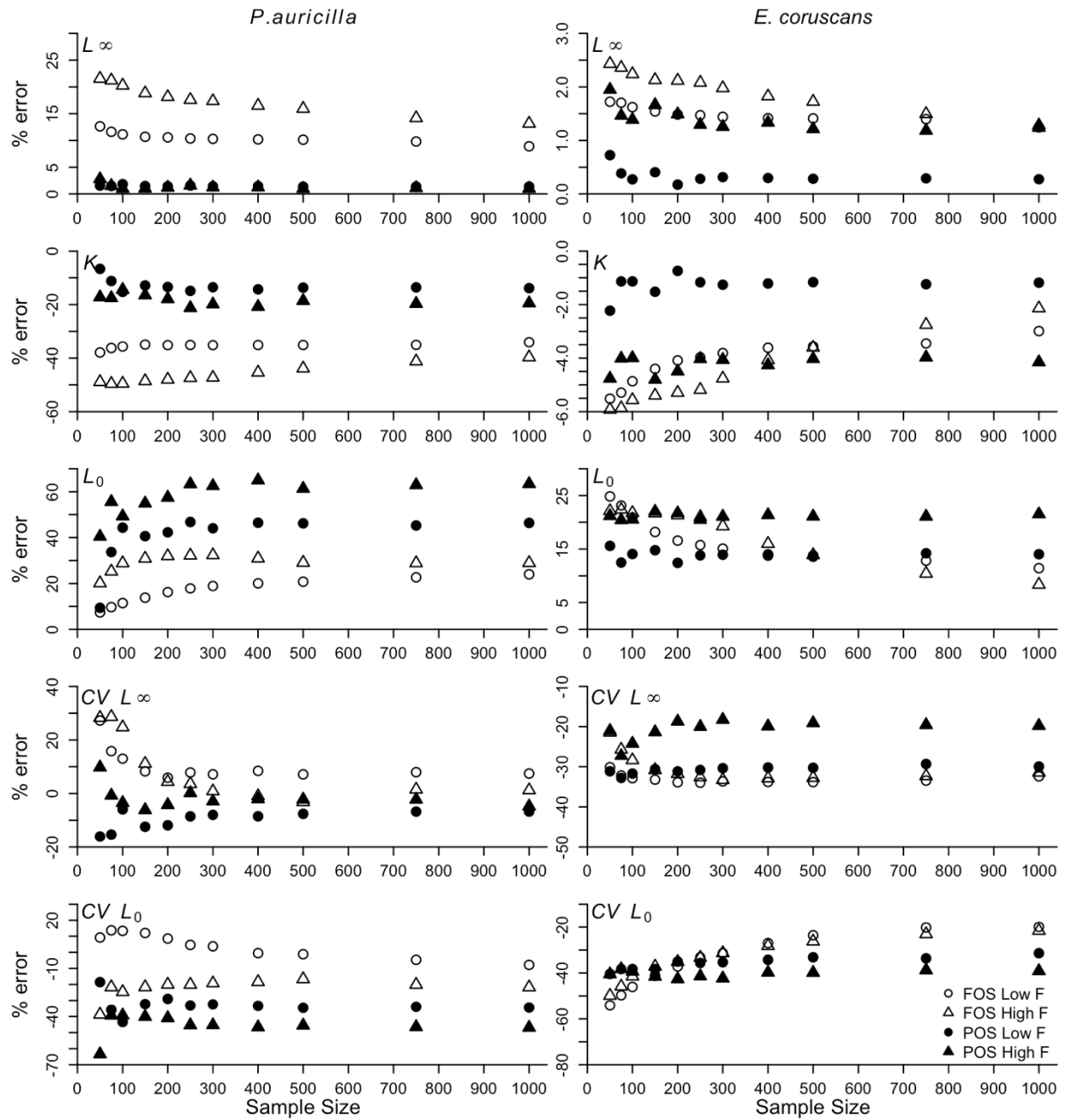


Figure S3. Relative percent error (% error) of growth parameter estimates as a function of sample size with FOS (open symbols) and POS (filled symbols) for *Pristipomoides auricilla* (left column) and *Etelis coruscans* (right column). Fishery exploitation was either low (circles) or high (triangles) and minimum size at fishery selectivity ($mincat$) = 20.0 cm for *P. auricilla* and 30.0 cm for *E. coruscans*. Note the y-axis scales differ between *P. auricilla* and *E. coruscans*.

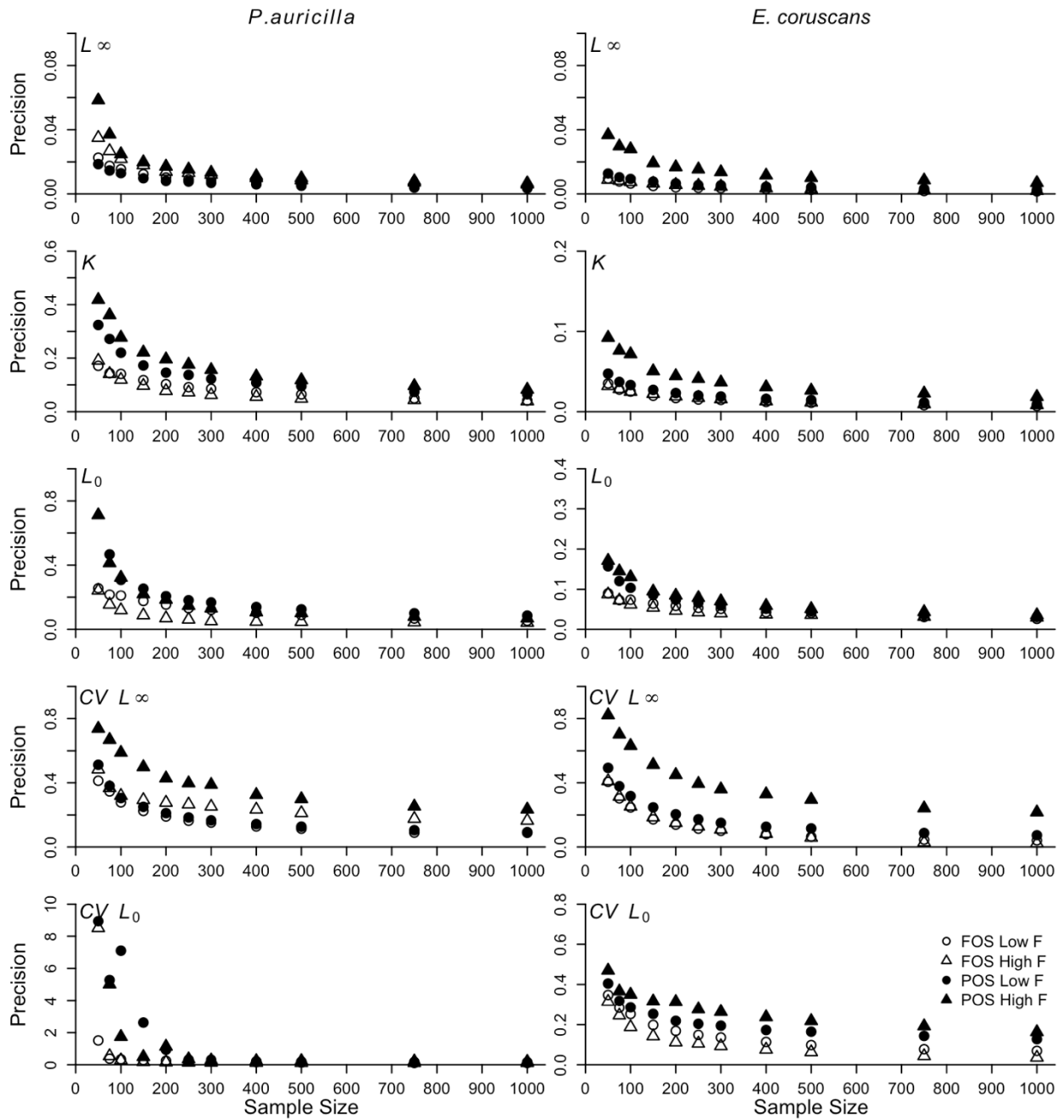


Figure S4. Precision of growth parameter estimates as a function of sample size with FOS (open symbols) and POS (filled symbols) for *Pristipomoides auricilla* (left column) and *Etelis coruscans* (right column). Fishery exploitation was either low (circles) or high (triangles) and minimum size at fishery selectivity ($mincat$) = 20.0 cm for *P. auricilla* and 30.0 cm for *E. coruscans*. Note the difference in the precision scales for *P. auricilla* and *E. onaga*. Precision was assessed following Kritzer et al. (2001).

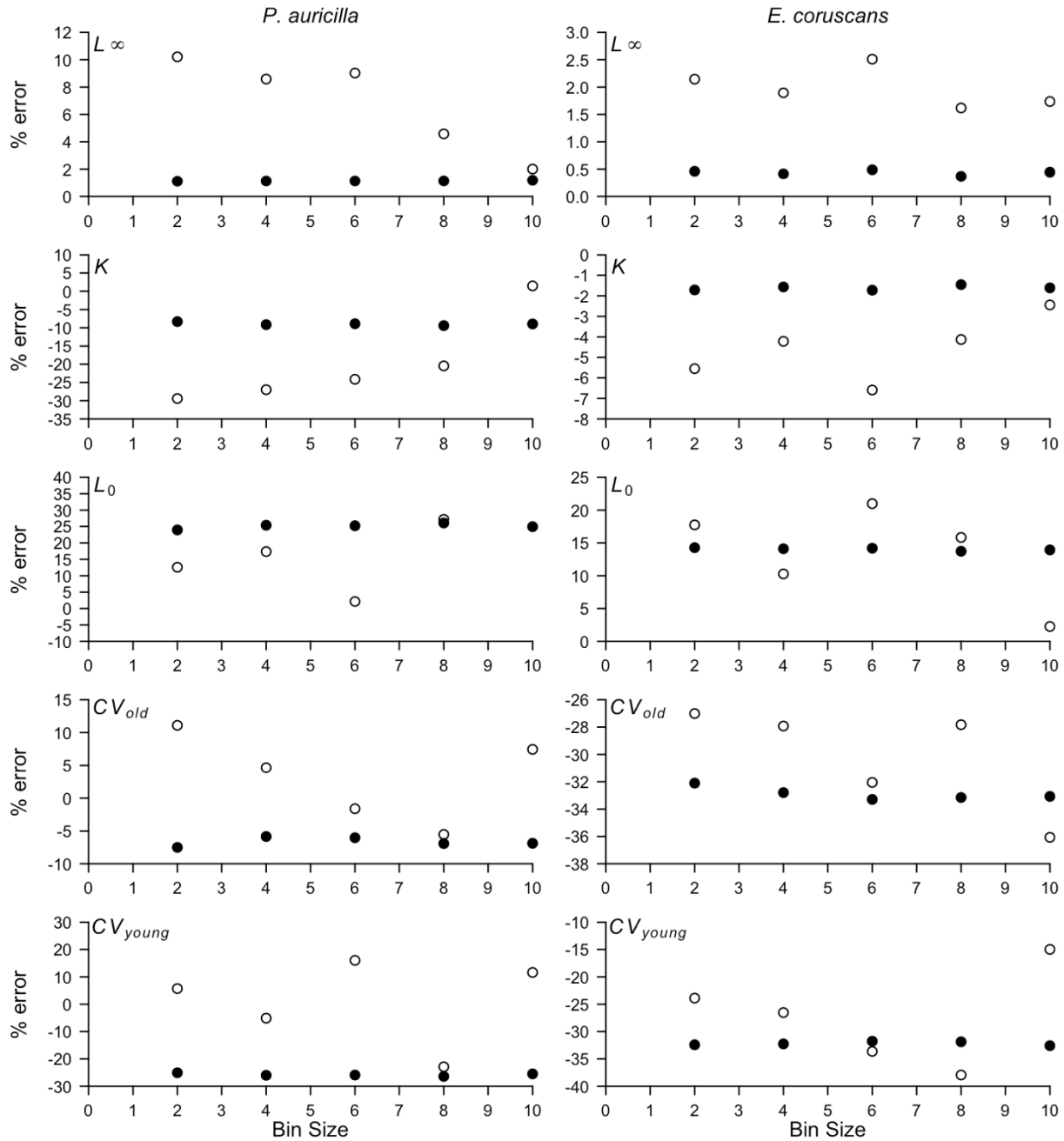


Figure S5. Relative percent error (% error) of growth parameter estimates as a function of length bin width (cm) with FOS (open symbols) and POS (filled symbols) for *Pristipomoides auricilla* (left column) and *Etelis coruscans* (right column). Minimum size at fishery selectivity ($mincat$) = 10.0 cm and low fishery exploitation were simulated. Note the difference in the % error scales for *P. auricilla* and *E. onaga*.

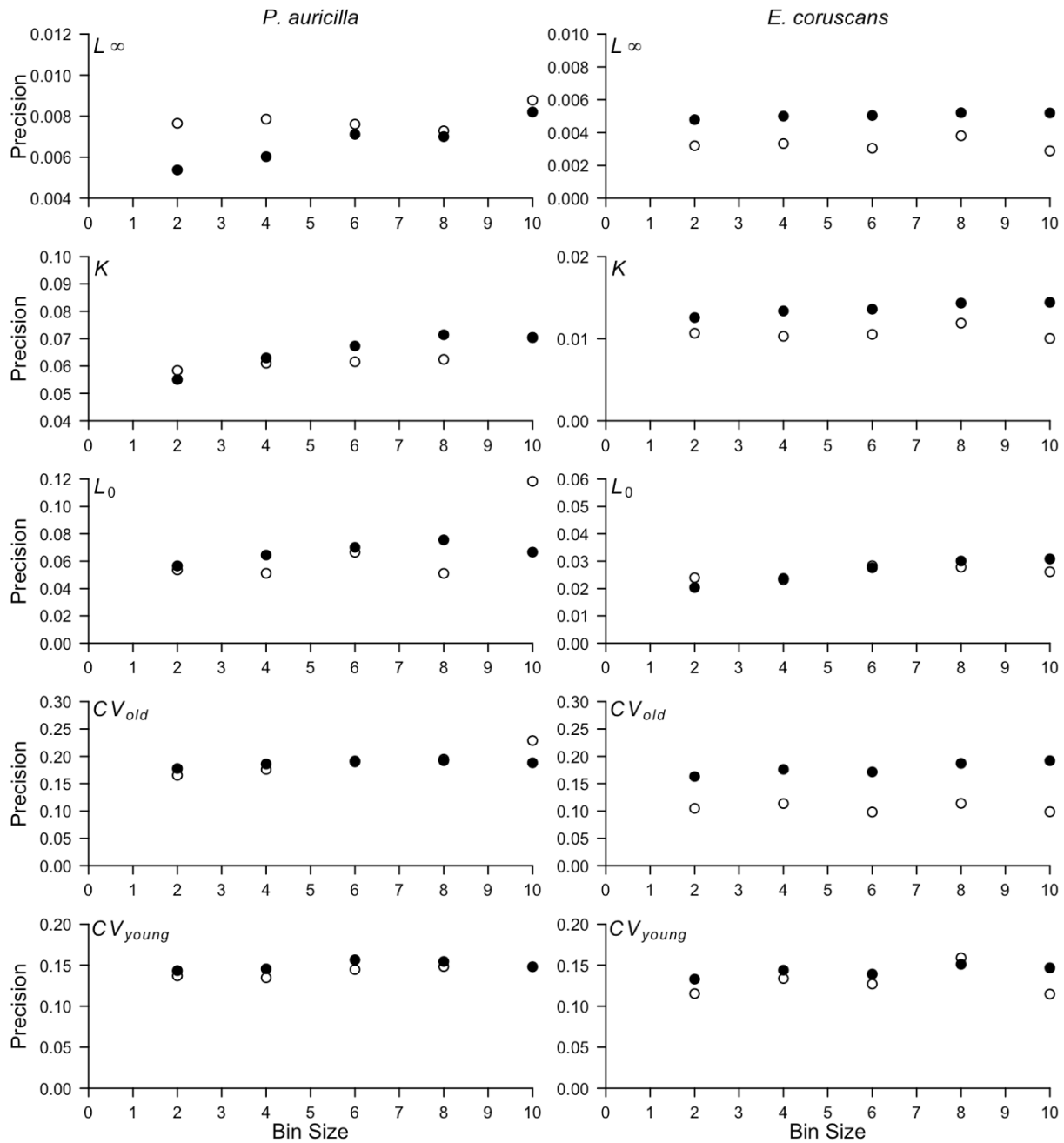


Figure S6. Precision of growth parameter estimates as a function of length bin width (cm) with FOS (open symbols) and POS (filled symbols) for *Pristipomoides auricilla* (left column) and *Etelis coruscans* (right column). Minimum size at fishery selectivity ($mincat$) = 10.0 cm and low fishery exploitation were simulated. Note the difference in the precision scales for *P. auricilla* and *E. onaga*. Precision was assessed following Kritzer et al. (2001).

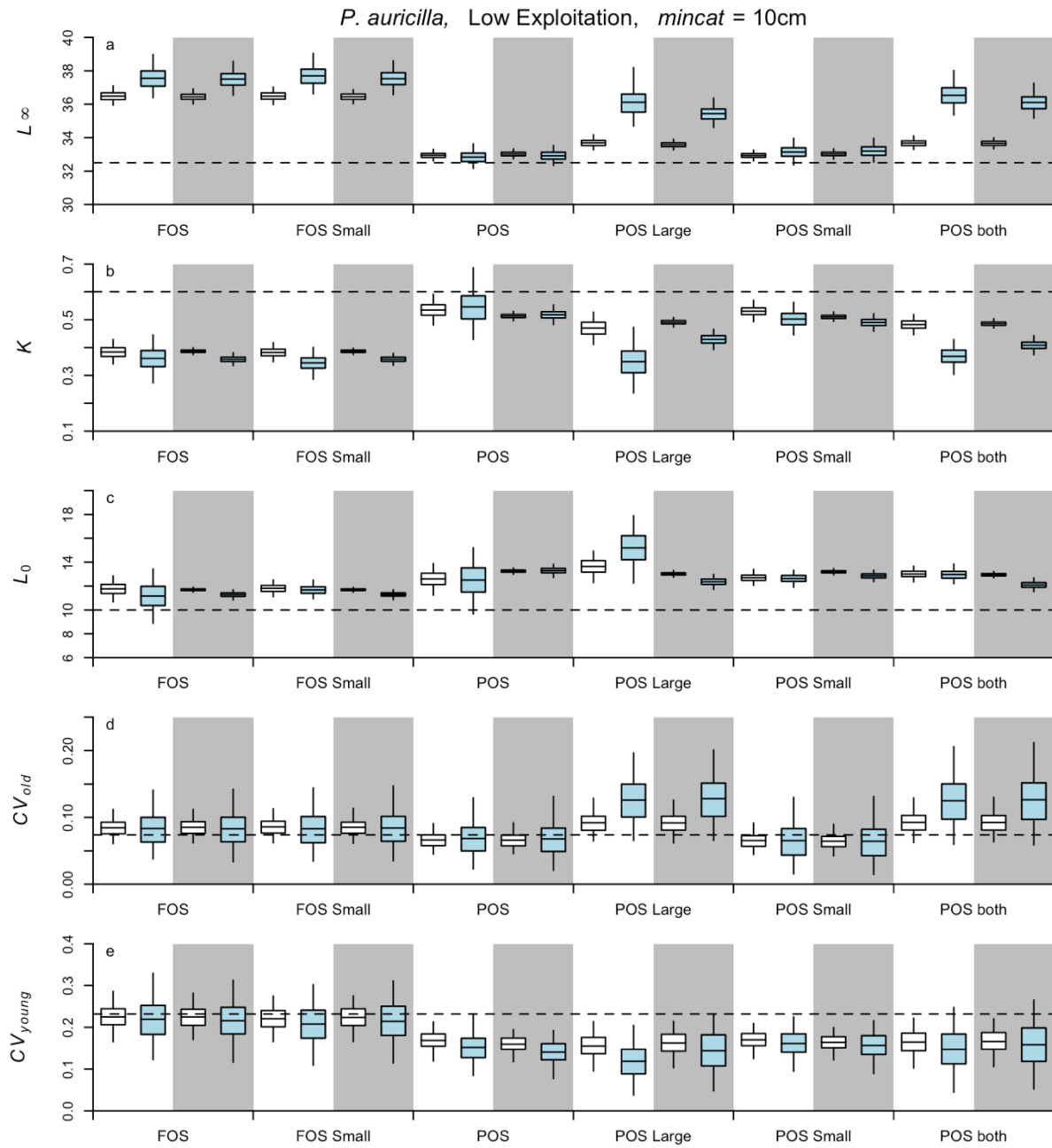


Figure S7. Estimated mean, interquartile, and 95% confidence intervals of *Pristipomoides auricilla* growth parameters for low fishery exploitation and minimum size at fishery selectivity = 10 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

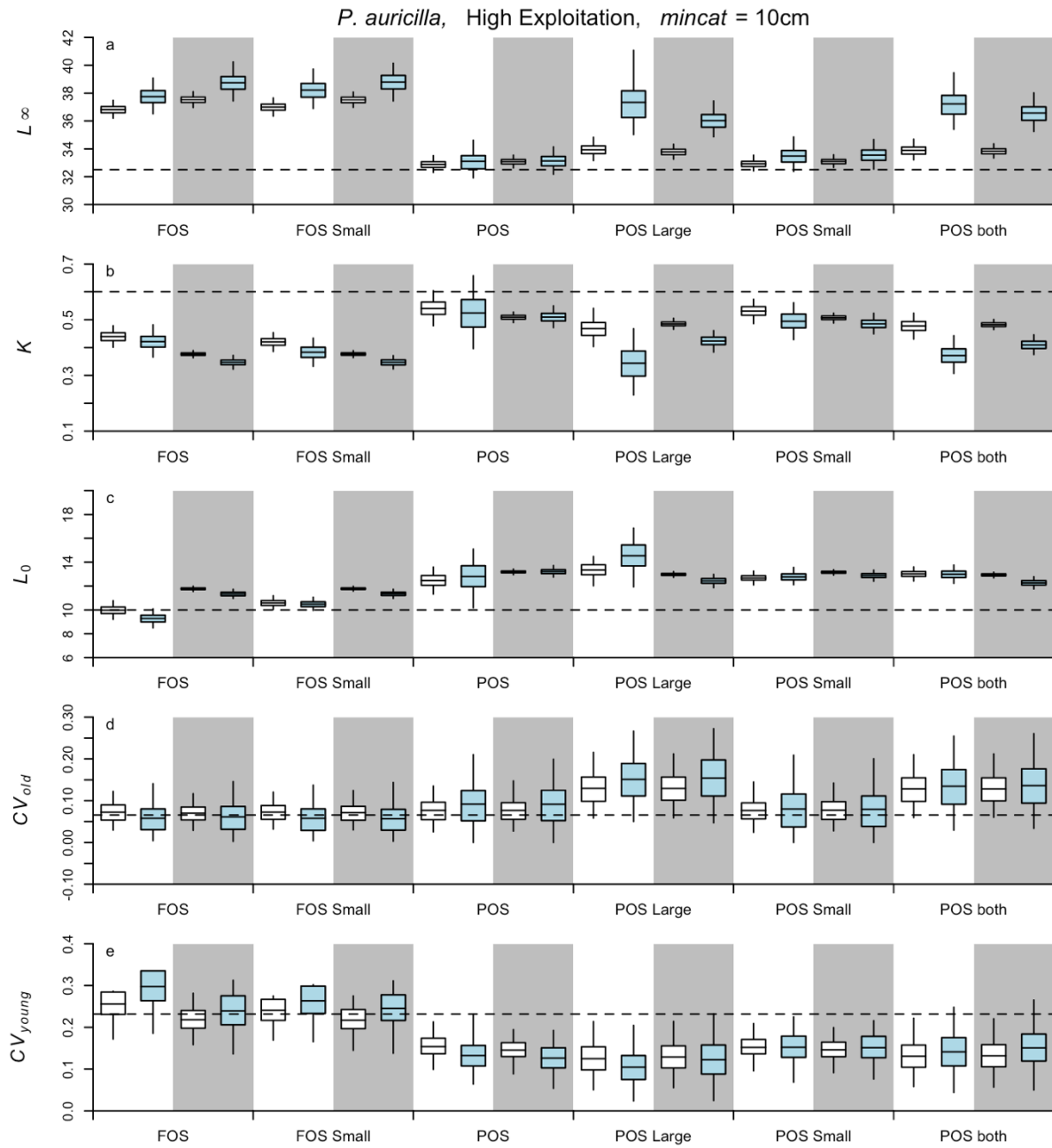


Figure S8. Estimated mean, interquartile, and 95% confidence intervals of *Pristipomoides auricilla* growth parameters for high fishery exploitation and minimum size at fishery selectivity = 10 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

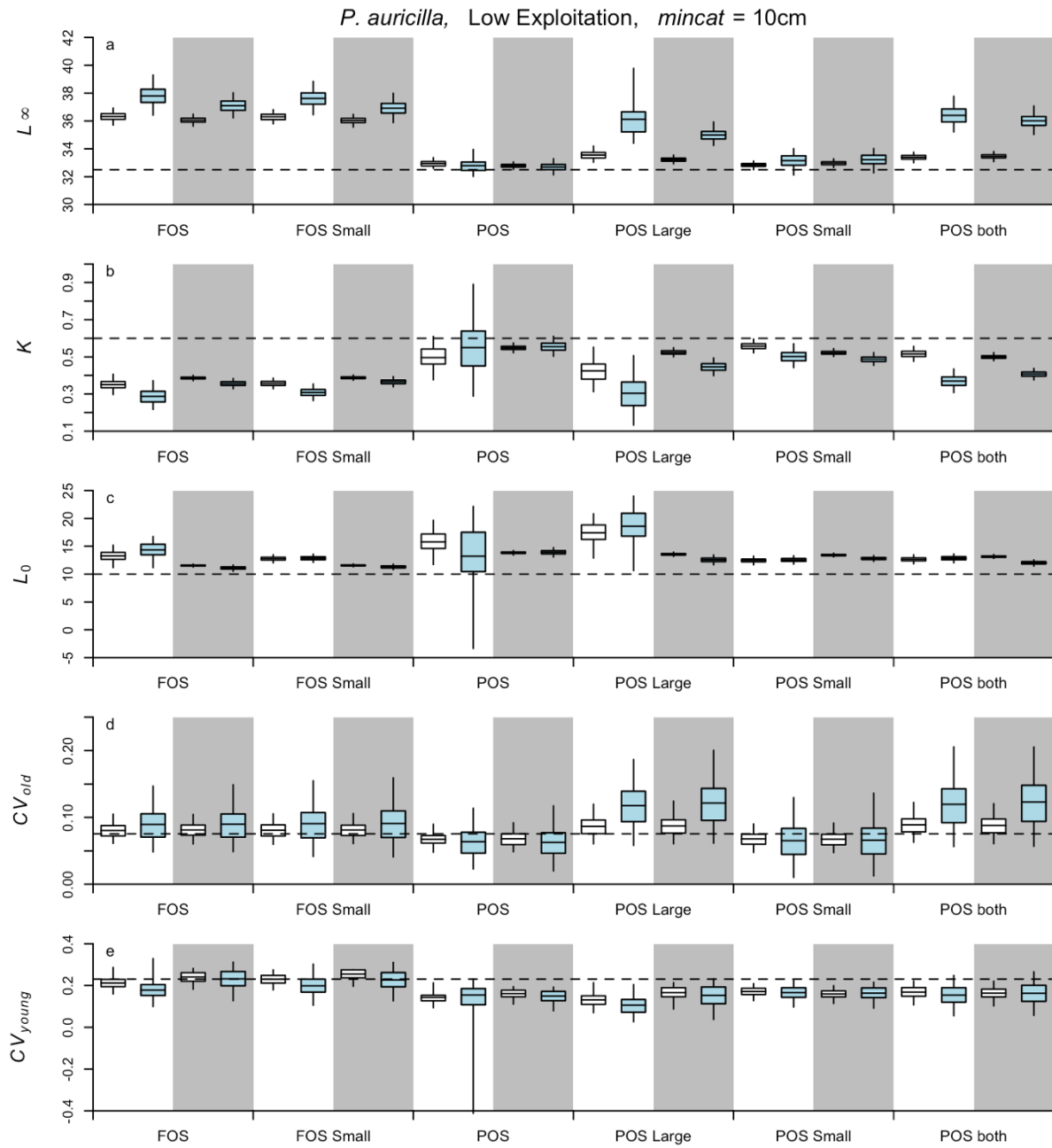


Figure S9. Estimated mean, interquartile, and 95% confidence intervals of *Pristipomoides auricilla* growth parameters for low fishery exploitation and minimum size at fishery selectivity = 20 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

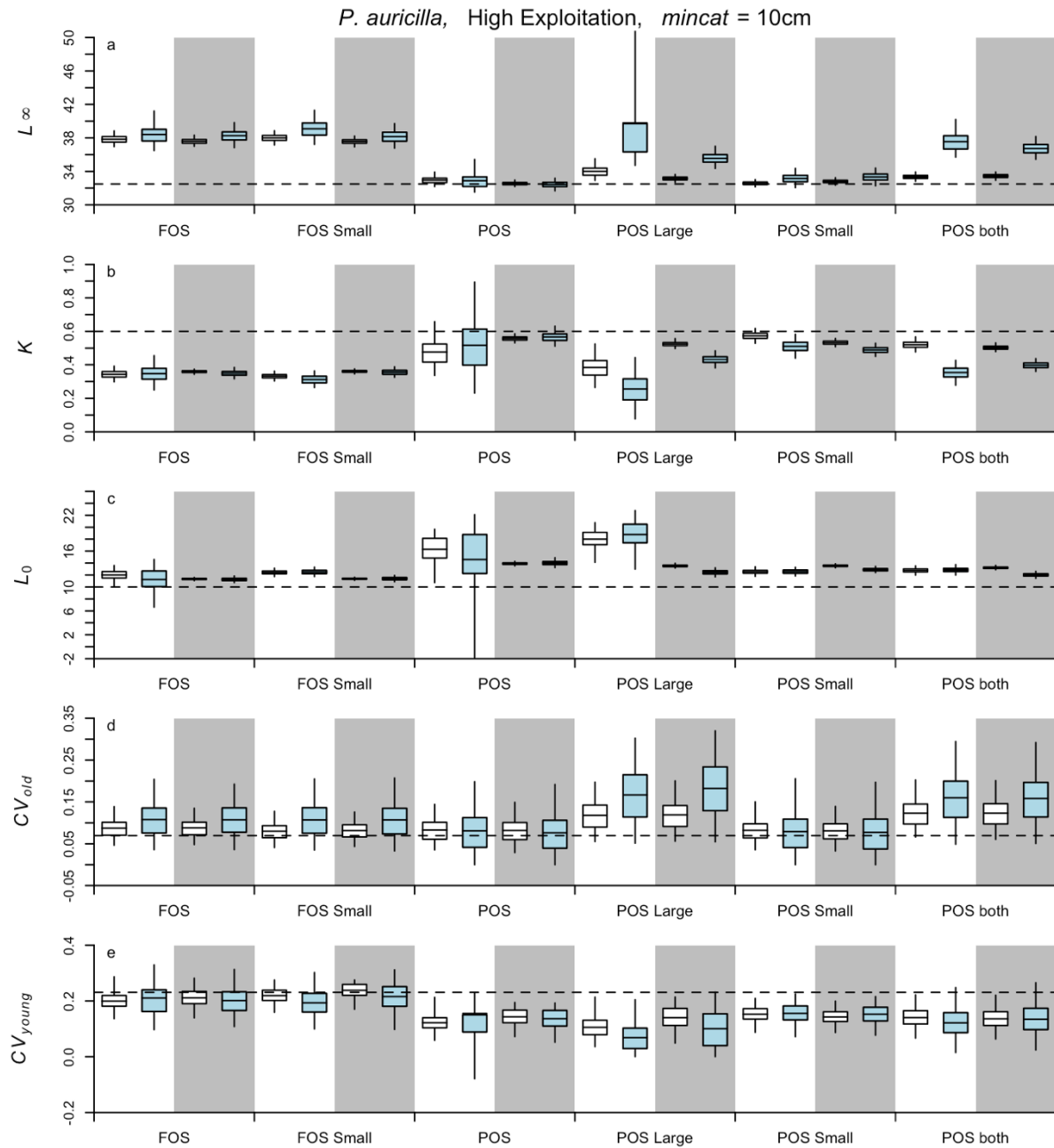


Figure S10. Estimated mean, interquartile, and 95% confidence intervals of *Pristipomoides auricilla* growth parameters for high fishery exploitation and minimum size at fishery selectivity = 20 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

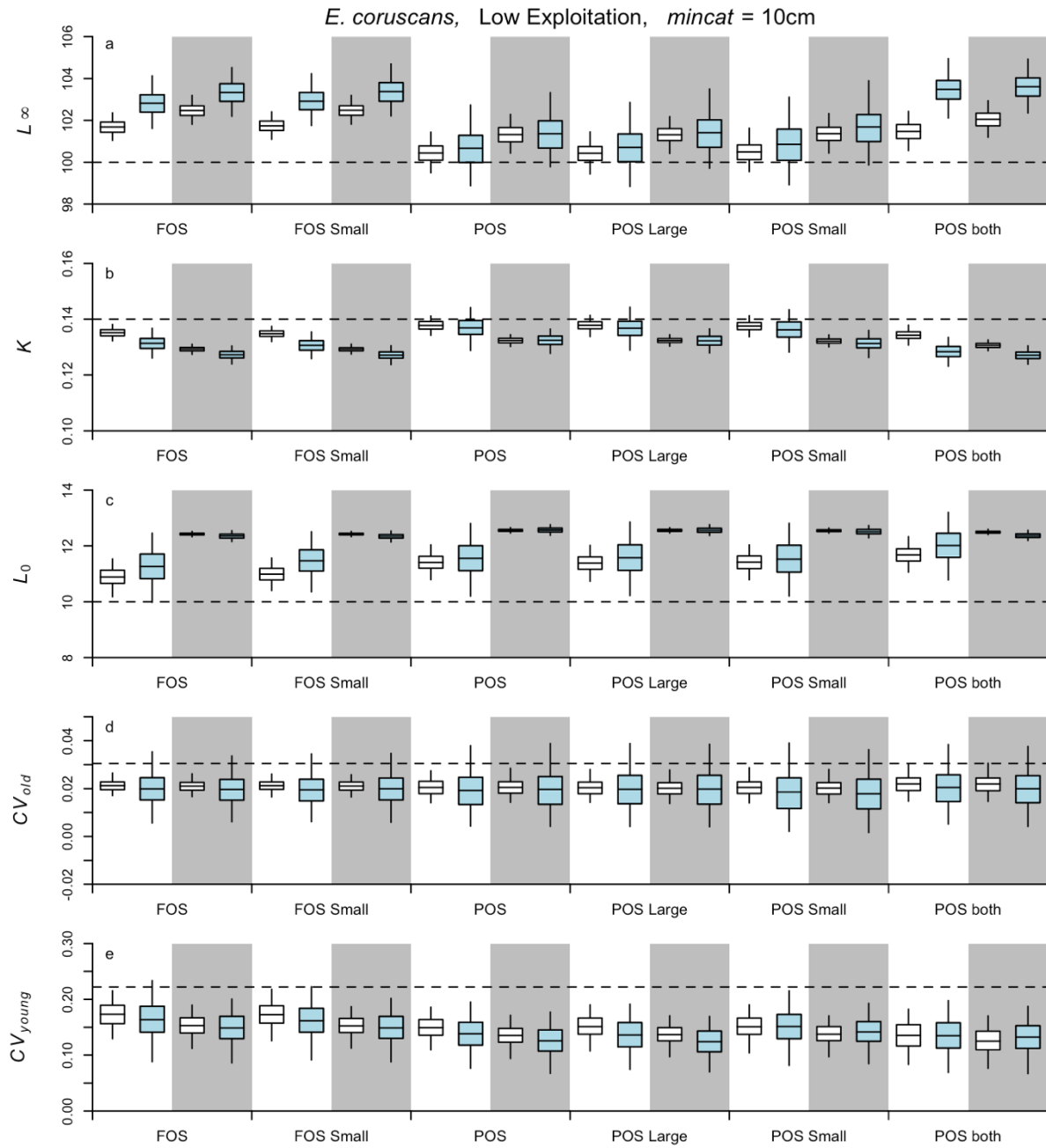


Figure S11. Estimated mean, interquartile, and 95% confidence intervals of *Etelis coruscans* growth parameters for low fishery exploitation and minimum size at fishery selectivity = 10 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

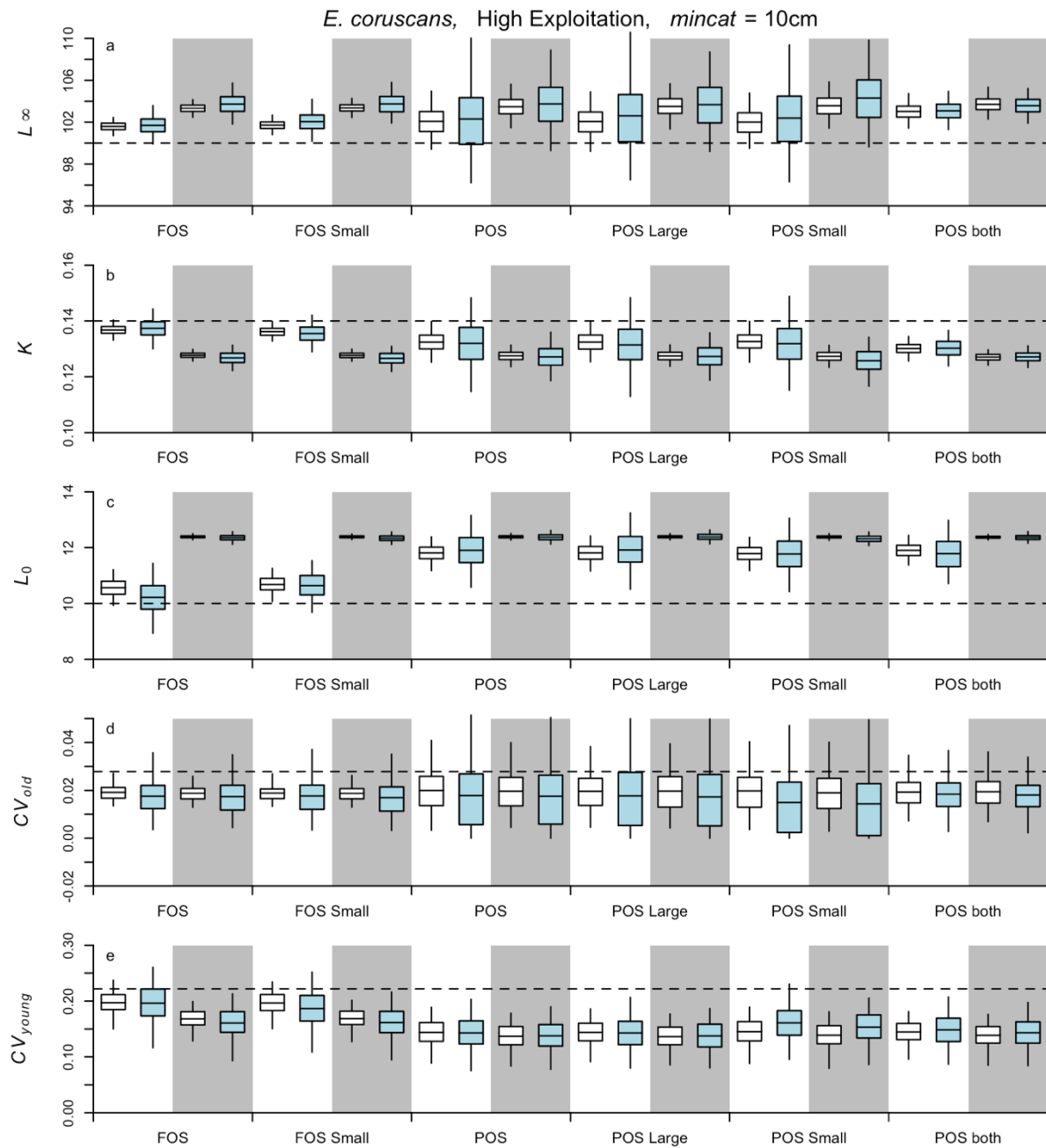


Figure S12. Estimated mean, interquartile, and 95% confidence intervals of *Etelis coruscans* growth parameters for high fishery exploitation and minimum size at fishery selectivity = 10 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

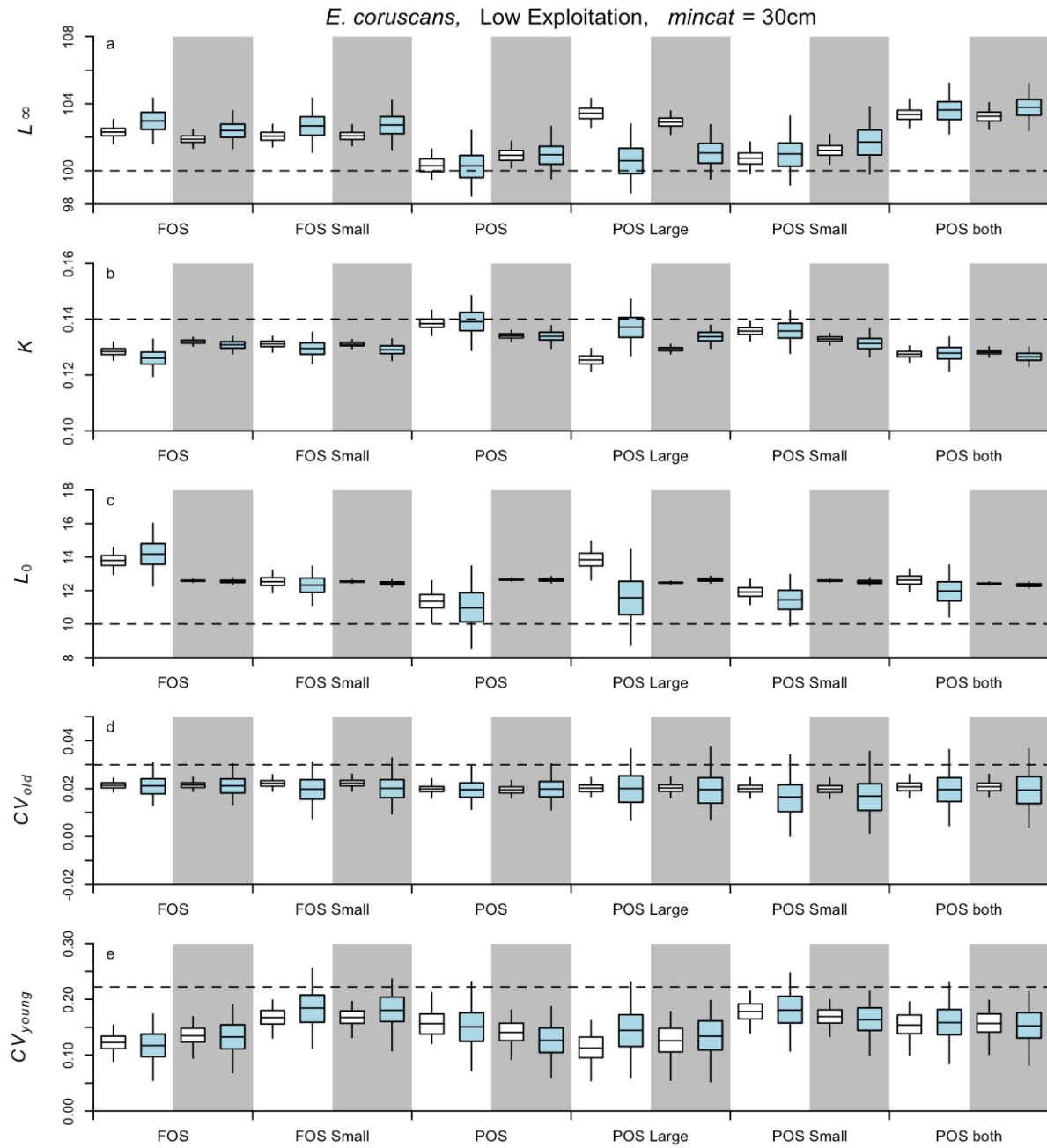


Figure S13. Estimated mean, interquartile, and 95% confidence intervals of *Etelis coruscans* growth parameters for low fishery exploitation and minimum size at fishery selectivity = 30 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

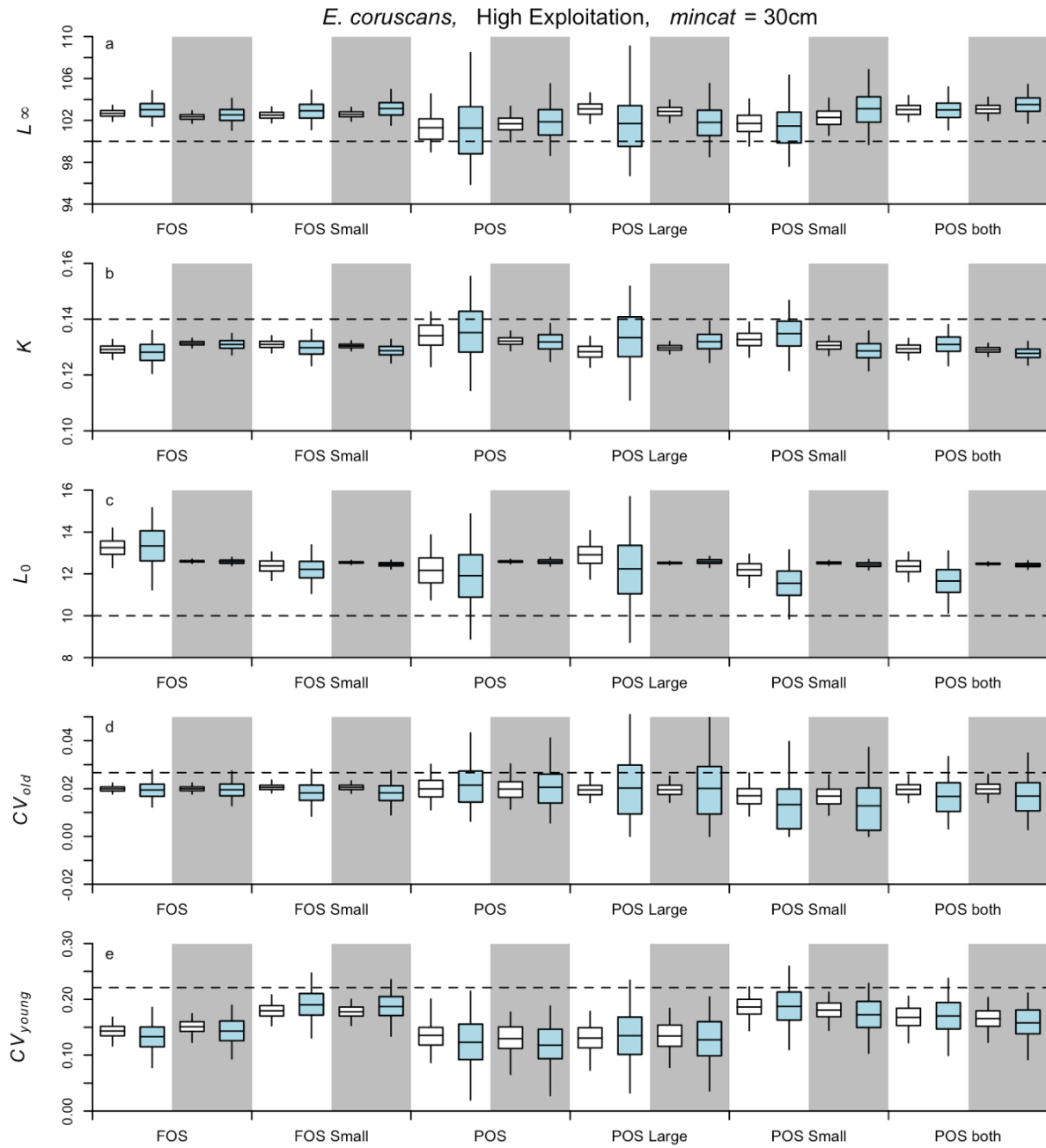


Figure S14. Estimated mean, interquartile, and 95% confidence intervals of *Etelis coruscans* growth parameters for high fishery exploitation and minimum size at fishery selectivity = 30 cm. Two sample sizes are shown, $N = 300$ (white boxes) and $N = 75$ (blue boxes), and with t_0 estimated and t_0 fixed (grey shaded regions). Dashed lines are the true growth parameter values.

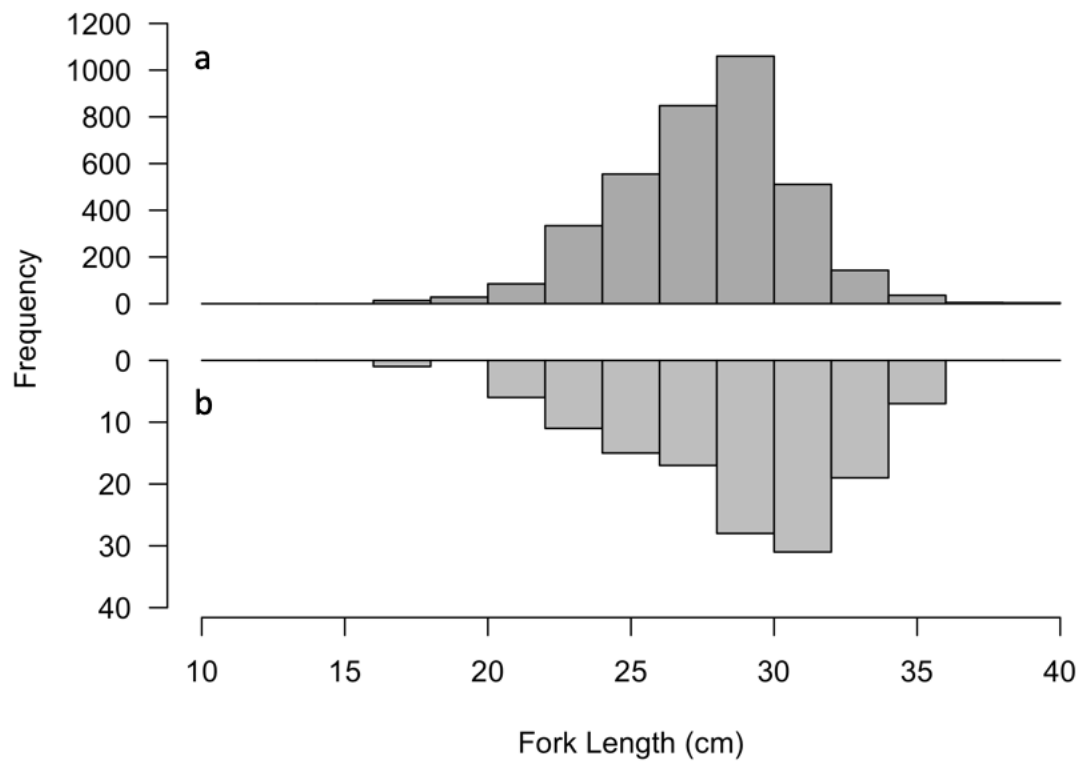


Figure S15. Length distributions of *Pristipomoides auricilla* from the fishery catches from Guam and Saipan (a) and the length distribution of aged *P. auricilla* from Guam and Saipan (b).