Non-Spawner (Oct-May Catch) Covariates Analysis

Table 1: Table B1. Model selection tests of GPCP precipitation as an explanatory variable for the catch (N_t) during post-monsoon months (Oct-May) using 1983 to 2014 data. The data range is determined by the years for which SST was available in order to use a consistent dataset across covariate tests. The base model (M) with prior catch dependency was selected independently (Appendix A). To the base model, covariates are added. V_t is the covariate in the calendar year, and V_{t-1} is the covariate in the prior calendar year. The specific hypothesis (Table 1) being tested is noted in parentheses. The models are tested as nested sets. Thus 1, 2a, 3a is a set and 1, 2b, 3b is another set.

Model	Residual df	MASE	Adj. R2	F	p value	AIC
base model (M) 1983-2014 data						
1. $ln(N_t) = \alpha + s(ln(N_{t-1})) + \epsilon_t$	28.6	0.879	45.9			86.3
V_t = Jun-Jul Precipitation (S1)						
2a. $ln(N_t) =$ M + βV_t	27.6	0.877	44	NA	NA	88.29
3a. $ln(N_t) =$ M + $s(V_t)$	26	0.851	46.1	1.35	0.275	88.01
4a. $ln(N_t) =$ M + $s(V_t) + \beta V_{t-1}$	25	0.846	44.1	NA	NA	89.93
5a. $ln(N_t) =$ M + $s(V_t) + s(V_{t-1})$	23.5	0.844	44	0.65	0.495	90.81
2b. $ln(N_t) =$ M + βV_{t-1}	27.6	0.879	44.7	0.36	0.549	87.87
3b. $ln(N_t) =$ M + $s(V_{t-1})$	25.9	0.871	44.2	0.57	0.552	89.22
V_t = Apr-May Precipitation (S2)						
2a. $ln(N_t) =$ M + βV_t	27.6	0.878	44	0.03	0.863	88.24
3a. $ln(N_t) =$ M + $s(V_t)$	25.7	0.875	41.9	0.14	0.859	90.52
4a. $ln(N_t) =$ M + $s(V_t) + \beta V_{t-1}$	24.8	0.867	40.2	0.2	0.65	92.23
5a. $ln(N_t) =$ M + $s(V_t) + s(V_{t-1})$	23	0.839	41.2	0.94	0.395	92.57
2b. $ln(N_t) =$ M + βV_{t-1}	27.6	0.868	44.5	0.28	0.594	87.96
3b. $ln(N_t) =$ M + $s(V_{t-1})$	25.7	0.841	45.4	0.93	0.404	88.52

Table 2: Table B2. Model selection tests of average sea surface temperature off the Kerala coast (up to 80km offshore in boxes 2-5 in Figure 1) as the explanatory variable (V_t) for the catch during post-monsoon months (Oct-May) using 1983 to 2014 data. The hypothesis tested (Table 1) is noted in parentheses. See Table B1 for an explanation of the models.

Model	Residual df	MASE	Adj. R2	F	p value	AIC
base model (M) 1983-2014 data						
1. $ln(N_t) = \alpha + s(ln(N_{t-1})) + \epsilon_t$	28.6	0.879	45.9			86.3
V_t = Ave Mar-May SST (S5)						
2a. $ln(N_t)$ = M + βV_t	27.6	0.866	46.6	1.56	0.223	86.77
3a. $ln(N_t)$ = M + $s(V_t)$	25.8	0.851	46.8	0.86	0.427	87.67
4a. $ln(N_t)$ = M + $s(V_t) + \beta V_{t-1}$	24.9	0.851	48.4	2.12	0.16	87.43
5a. $ln(N_t)$ = M + $s(V_t) + s(V_{t-1})$	23.3	0.799	53.2	2.34	0.127	85.13
2b. $ln(N_t)$ = M + βV_{t-1}	27.6	0.824	48.3	2.46	0.13	85.68
3b. $ln(N_t)$ = M + $s(V_{t-1})$	25.6	0.79	49.3	0.95	0.4	86.24
V_t = Ave Oct-Dec SST (L1)						
2. $ln(N_t)$ = M + βV_{t-1}	27.6	0.829	46.3	1.23	0.278	86.91
3. $ln(N_t)$ = M + $s(V_{t-1})$	26.1	0.84	45.3	0.28	0.69	88.36

Table 3: Table B3. Model selection tests of upwelling intensity off Cochi as the explanatory variable. See Table B1 for an explanation of the models. Two upwelling indices were tested. The nearshore-offshore temperature diferential (UPW), which is the offshore (box 13) minus nearshore (box 4) SST, and the average nearshore SST along the Kerala coast (boxes 2-5). These are highly correlated but not identical.

Model	Residual df	MASE	Adj. R2	F	p value	AIC
base model (M) 1983-2014 data						
1. $ln(N_t) = \alpha + s(ln(N_{t-1})) + \epsilon_t$	28.6	0.879	45.9			86.3
V_t = Ave. Jun-Sep UPW (L2)						
2a. $ln(N_t)$ = M + βV_t	27.6	0.86	54.7	6.74	0.017	81.52
3a. $ln(N_t)$ = M + $s(V_t)$	25	0.834	56.8	1.22	0.323	81.56
4a. $ln(N_t)$ = M + $s(V_t)$ + βV_{t-1}	24.1	0.836	56.2	0.62	0.437	82.74
5a. $ln(N_t)$ = M + $s(V_t)$ + $s(V_{t-1})$	21.7	0.804	55.3	0.54	0.622	84.59
2b. $ln(N_t)$ = M + βV_{t-1}	27.6	0.881	44	0.01	0.942	88.28
3b. $ln(N_t)$ = M + $s(V_{t-1})$	25	0.821	47.2	1.4	0.267	87.95
V_t = Ave. Jun-Sep SST (L2)						
2a. $ln(N_t)$ = M + βV_t	27.6	0.856	52.3	4.55	0.044	83.14
3a. $ln(N_t)$ = M + $s(V_t)$	25.6	0.858	52.1	0.6	0.56	84.51
4a. $ln(N_t)$ = M + $s(V_t)$ + βV_{t-1}	24.6	0.838	50.5	0.12	0.724	86.32
5a. $ln(N_t)$ = M + $s(V_t)$ + $s(V_{t-1})$	22.6	0.837	48	0.1	0.904	88.88
2b. $ln(N_t)$ = M + βV_{t-1}	27.6	0.832	45.6	0.85	0.361	87.31
3b. $ln(N_t)$ = M + $s(V_{t-1})$	25.5	0.807	44.4	0.42	0.67	89.27