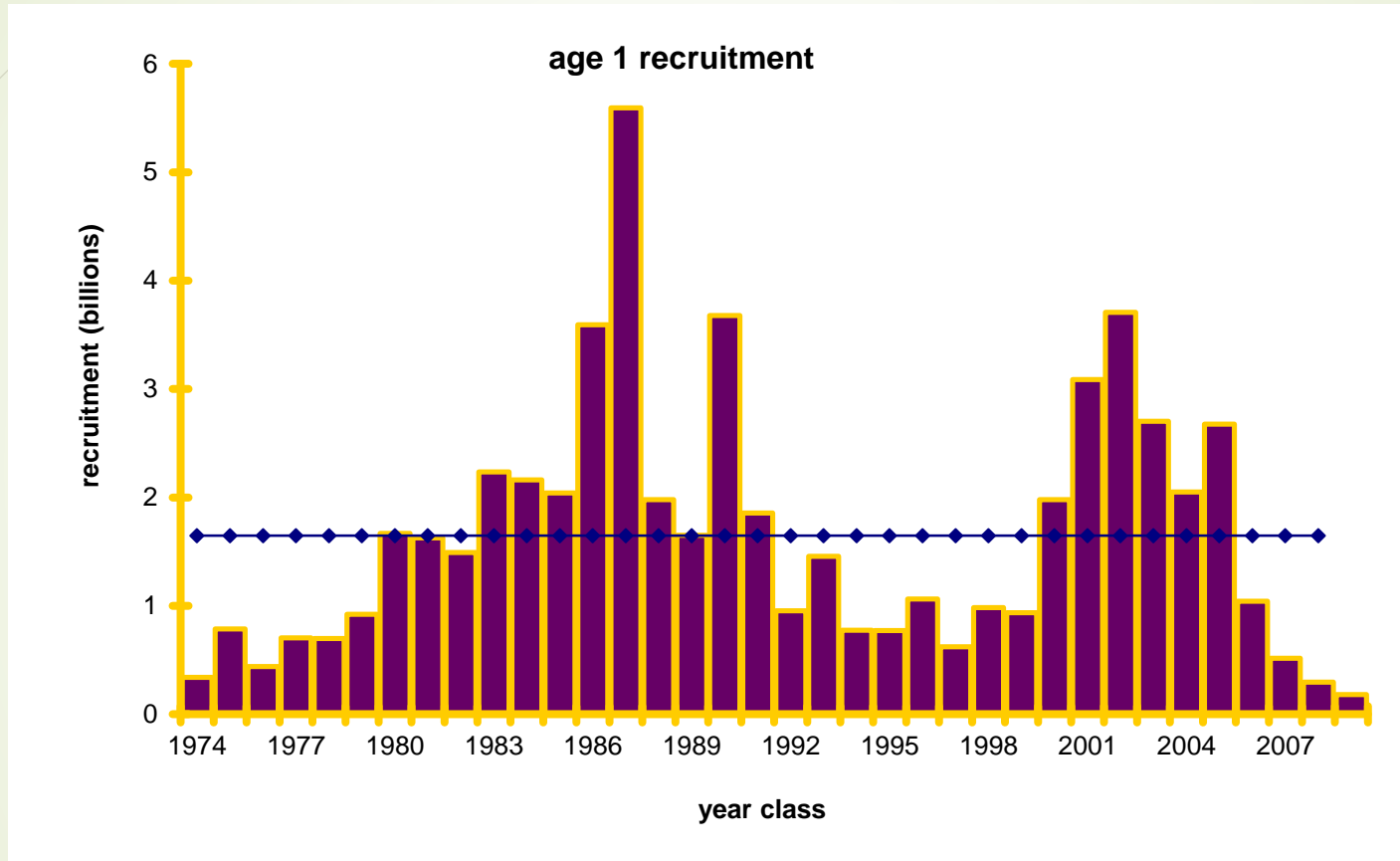


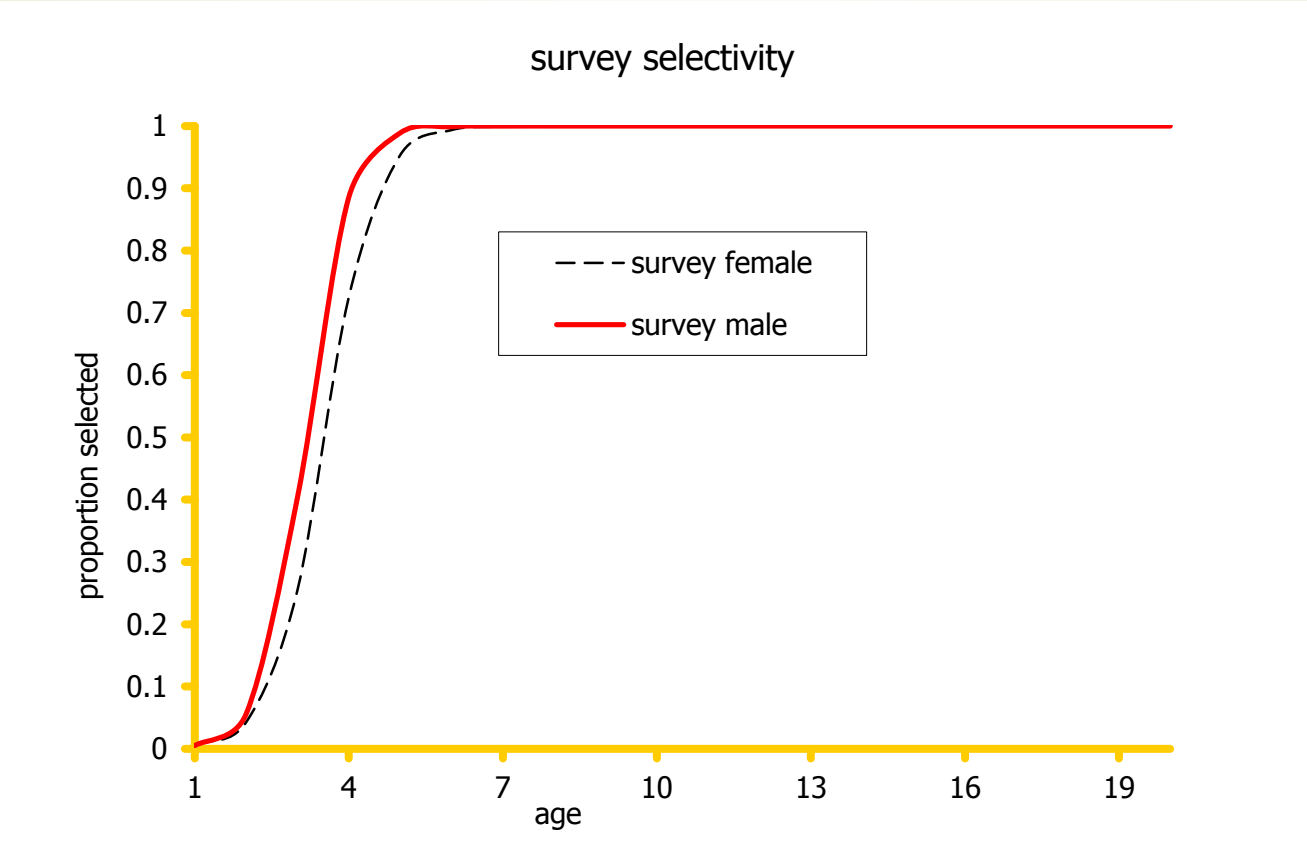
Appendix

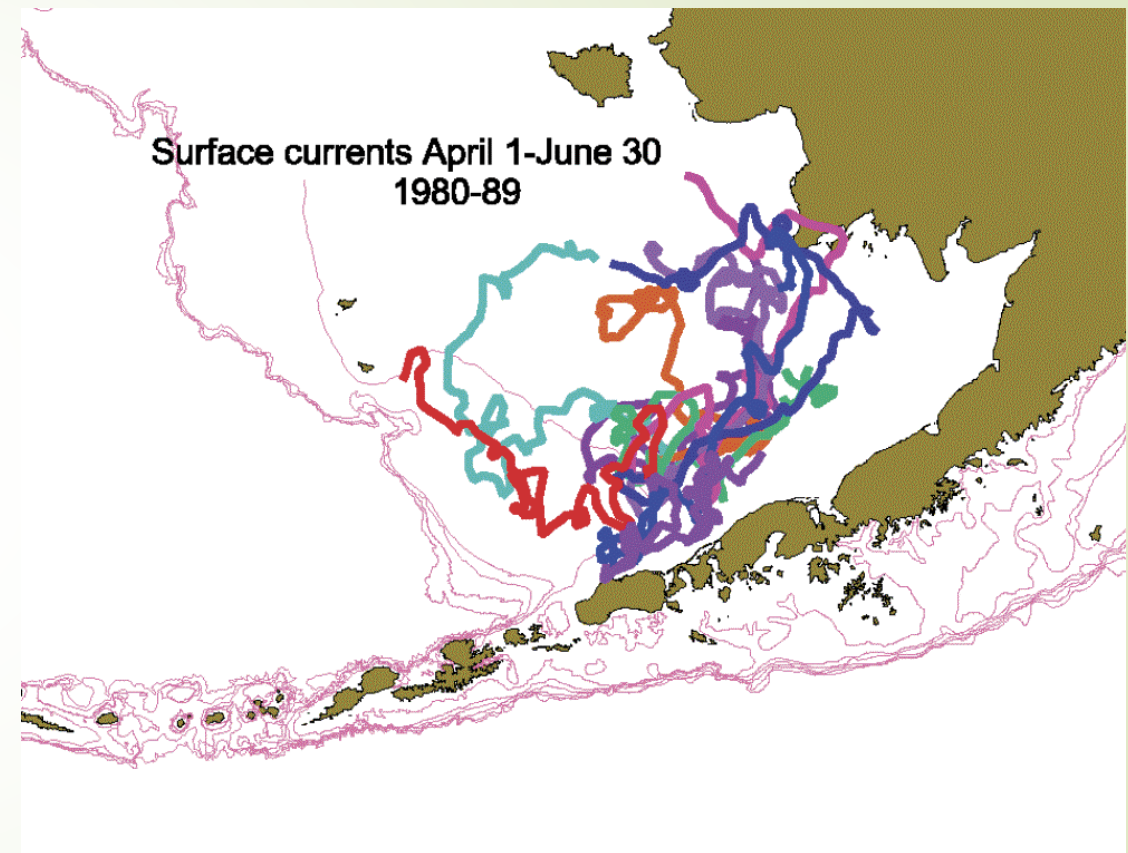
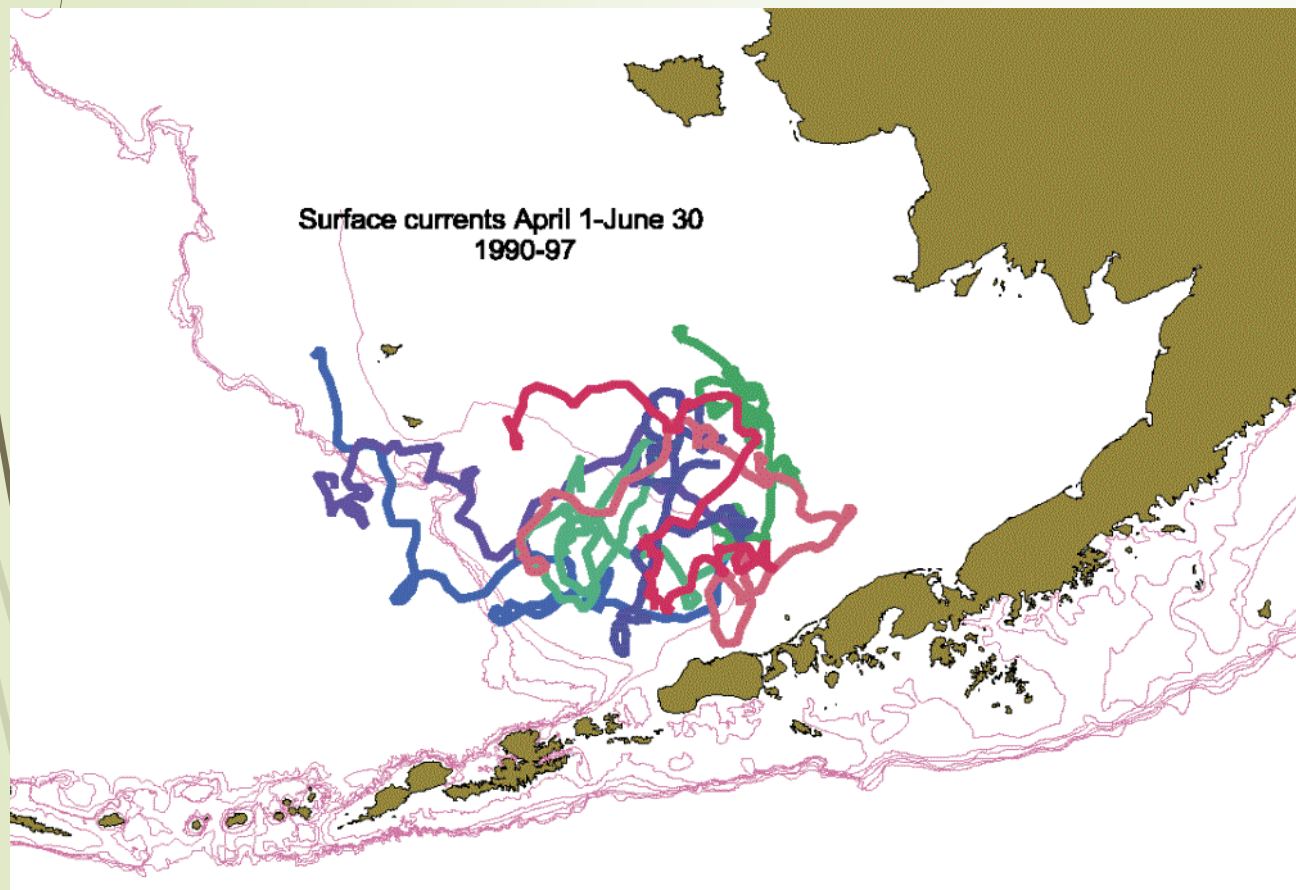
Estimating northern rock sole recruitment in the
last (most recent) 6 years of the assessment
using environmental covariates

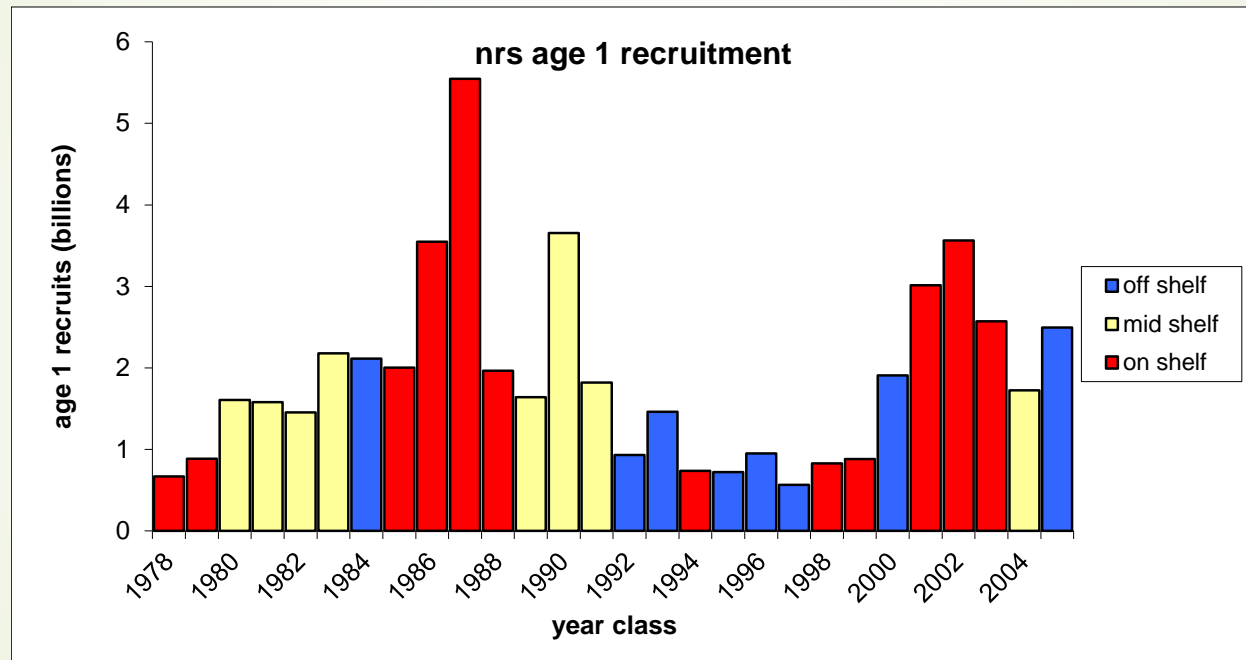
Dan Cooper, Lauren Rogers, Tom Wilderbuer



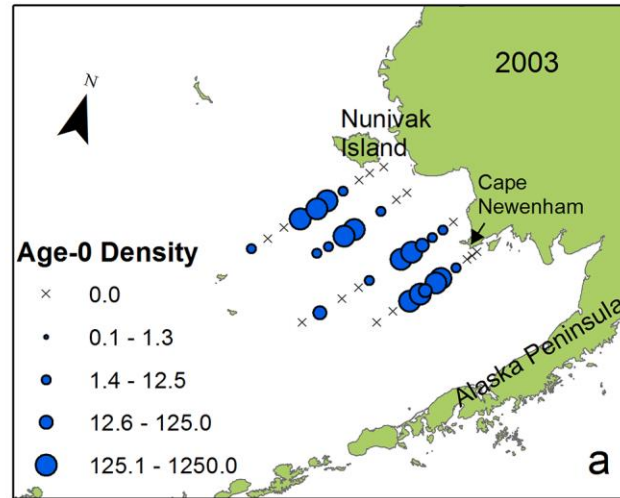




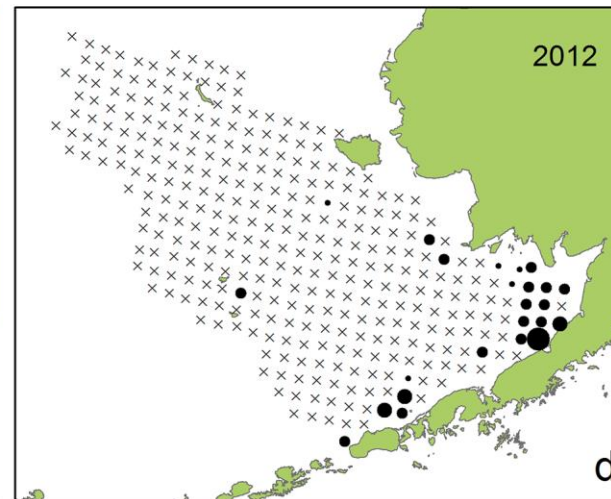
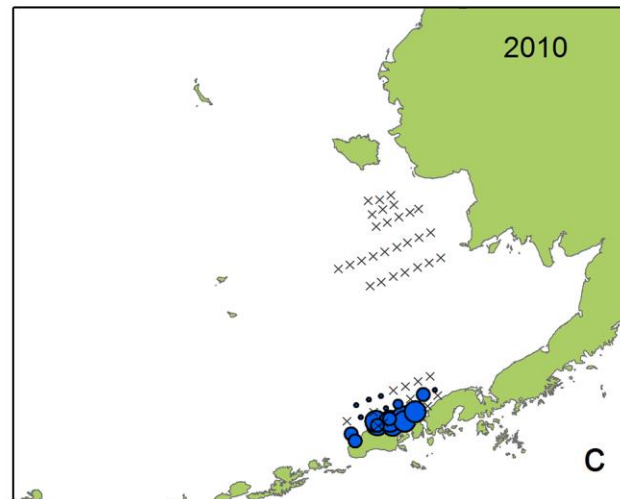
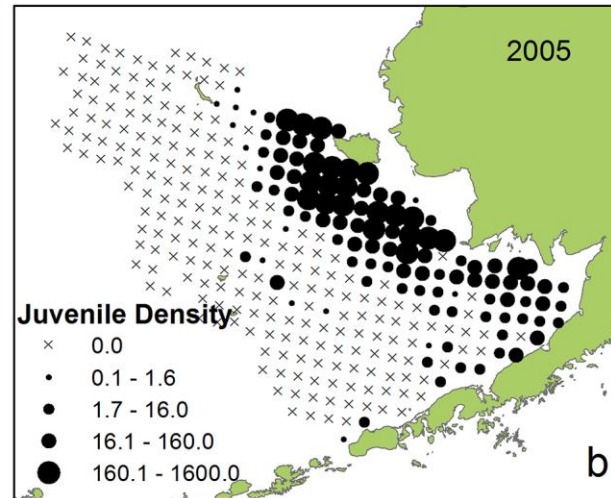


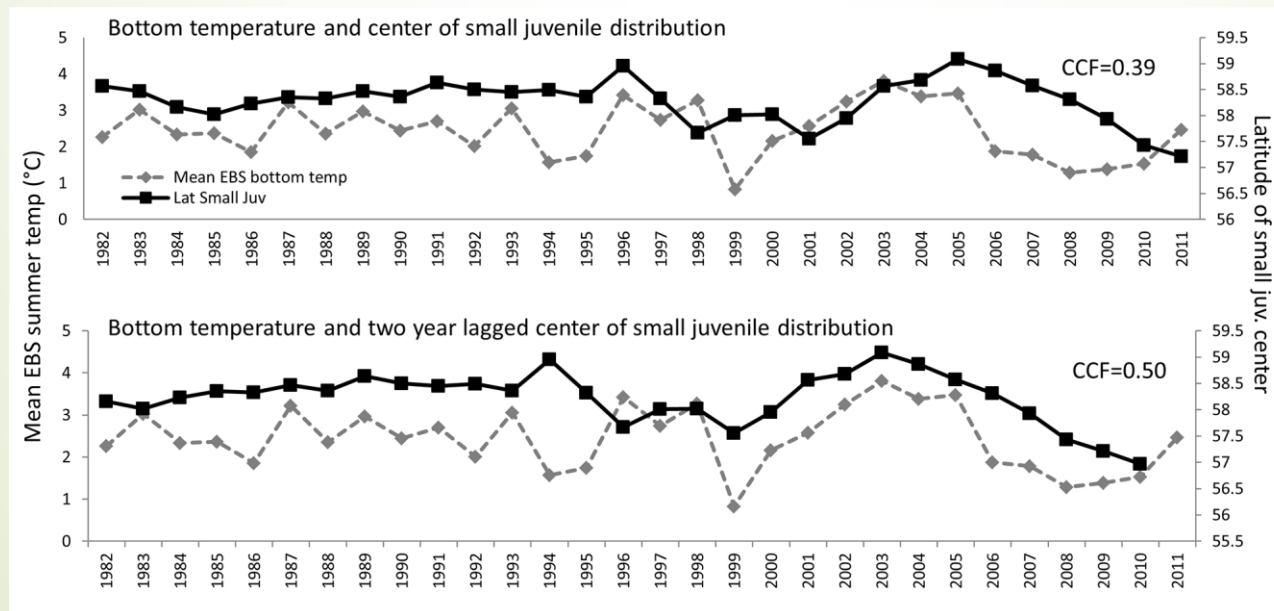
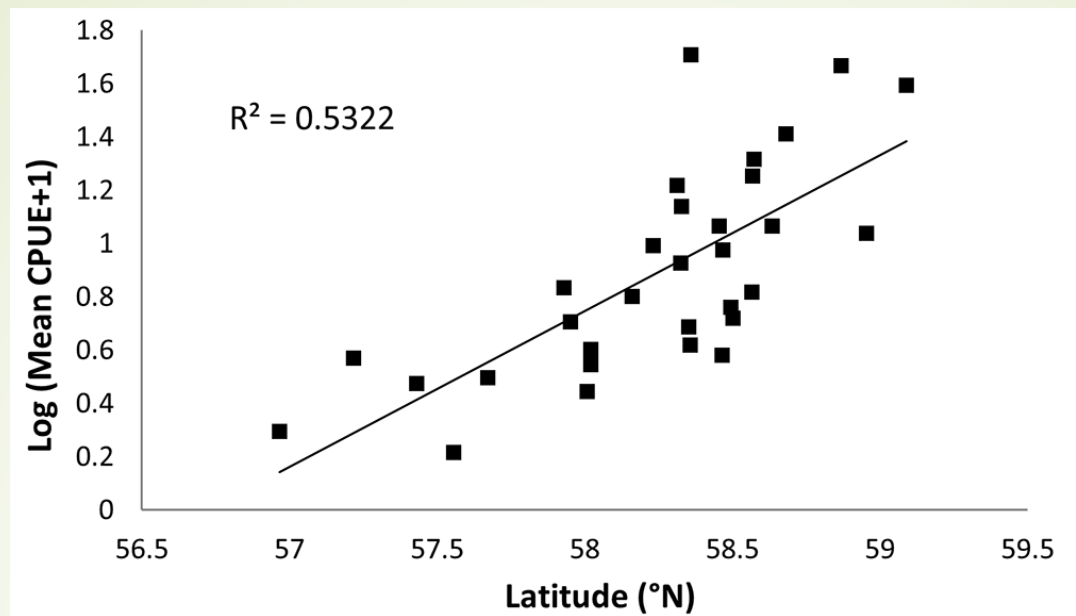


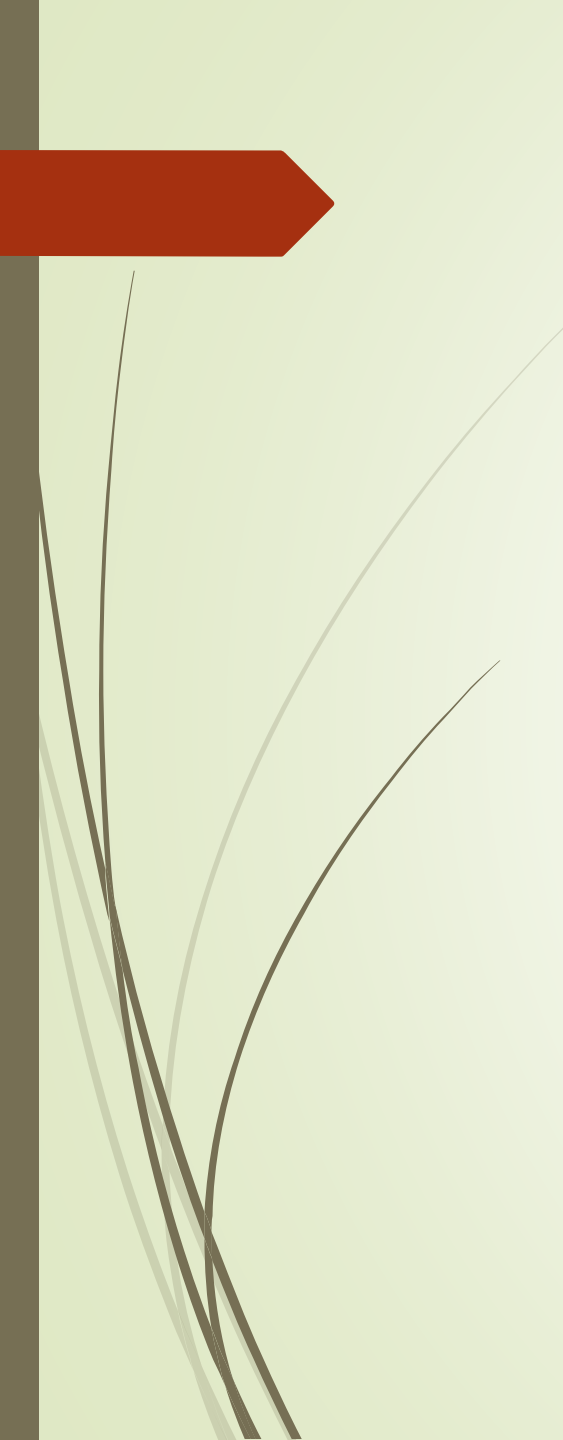
Age-0



Juveniles ≤ 11 cm FL







Question: Do onshore winds and the size of the cold pool (as a percentage of the nursery area) affect recruitment of Northern Rock Sole?

Question: Does the effect of the cold pool on recruitment depend on the presence of favorable winds? (i.e. is there a significant interaction?)

Question: Does including wind and cold pool covariates in the stock-recruitment model improve predictions of age-4 recruitment?



13 models considered

- 1) Ricker model
- 2) Ricker model with % cold pool covariate
- 3) Ricker model with wind covariate
- 4) Ricker model with % cold pool covariate + wind covariate
- 5) Ricker model with an interaction between % cold pool and wind (hypothesis is that the thermal conditions on the nursery grounds only matter if winds are favorable).
- 6) Same as above, but cold pool slope set to 0 if unfavorable winds.
- 7) Regression model with % cold pool
- 8) Regression model with wind
- 9) Regression model with % cold pool + wind
- 10) Regression model with interaction between % cold pool and wind.
- 11) Same as above, but cold pool slope set to 0 if unfavorable winds.
- 12) Previous year recruitment ($t-1$)
- 13) Running mean recruitment ($t:(t-1)$)

Model	df	AIC	MSE (LOYO, log-scale)	MSE (1 step ahead, log-scale)	MSE (LOYO, real scale)	MSE (1 step ahead, real scale)
Ricker	3	75.1	0.82	1.17	2,069,732	1,795,617
Ricker + coldpool	4	72.4	1.06	1.33	1,783,790	1,372,482
Ricker + wind	4	76.0	0.84	1.16	2,018,072	1,849,097
Ricker + coldpool + wind	5	71.3	1.04	1.19	1,547,723	1,160,685
Ricker + coldpool*wind	6	72.0	1.01	1.43	1,567,966	1,173,292
Ricker + coldpool*wind (slope=0)	5	72.9	1.08	1.25	1,639,531	1,276,978
coldpool	3	64.8	0.80	0.76	1,360,140	1,246,889
wind	3	70.0	0.68	0.90	1,623,021	1,510,268
coldpool + wind	4	63.7	0.80	0.72	1,180,171	980,932
coldpool*wind	5	64.5	0.77	0.90	1,191,203	1,219,212
coldpool*wind (slope=0)	4	65.5	0.83	0.76	1,254,250	1,075,218
Previous Year	NA	NA	0.28	0.26	1,371,833	525,885
Running Mean	NA	NA	0.66	0.89	1,531,793	1,299,166



some modeling results

- Models with winds and cold pool index outperformed models which assumed pure Ricker dynamics.
- Models that included Ricker dynamics in addition to winds and the cold pool index generally performed more poorly in terms of prediction relative to models with only the environmental covariates.
- Models with both winds and cold pool index outperformed models with only one or the other covariate. Interaction between indexes was also supported indicating that thermal conditions on the nursery grounds depends on favorable winds.
- “Previous year” model was one of the best suggesting that this year’s recruitment can best be predicted by last years recruitment.
- autocorrelation