# Index of Abundance

## Simple Linear Regressions

Simple linear regression models were constructed using all available size (juvenile, subadult, adult, sublegal and legal) and sex/maturity class (immature female mature female, immature male and mature male) variables with either a 1 yr.- or 2 yrs.- lag to predict future total survey CPUEs. No survey, or its size or sex/maturity variables, had significant explanatory relationships with other survey CPUEs. Only the CRMS Harbor Trawl and Creek Trawl surveys had any predictive relationships within their own surveys, and only the Creek Trawl survey had multiple variables with predictive relationships within its own survey (Table 1). Although a number of lagged Creek Trawl size and sex/maturity variables do have significant predictive relationships with Creek Trawl total survey CPUE, none of the relationships held any substantial correlative relationship, with the Creek Trawl survey 2-yr lagged subadult crab CPUE (>60 mm to < 126mm carapace width) showing the strongest relationship with total Creek Trawl CPUE (R2 = 0.2432) (Figure 1).

Table 1: All predictive relationships with a lagged variable predicting a total CPUE. All surveys and all life stages were modeled. Only the significant relationships are shown. Sorted by largest correlation to smallest. Only lagged independent variables were tested (1- and 2-year lags).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Dependent  Variable | Ind Variable Survey | Ind. Variable | Lag | f-statistic | p-value | R2 |
| T38 CPUE | T38 | Subadult | 2 | 11.25 | 0.001926 | 0.2432 |
| T38 CPUE | T38 | Mature Male | 1 | 10.88 | 0.002197 | 0.2321 |
| T38 CPUE | T38 | Immature Male | 2 | 9.481 | 0.004023 | 0.2131 |
| T38 CPUE | T38 | Sublegal | 2 | 9.316 | 0.004317 | 0.2102 |
| T38 CPUE | T38 | Total | 2 | 9.024 | 0.004898 | 0.205 |
| T38 CPUE | T38 | Subadult | 1 | 7.949 | 0.007774 | 0.1809 |
| T38 CPUE | T38 | Immature Female | 2 | 7.337 | 0.01038 | 0.1733 |
| T38 CPUE | T38 | Mature Female | 2 | 6.048 | 0.019 | 0.1473 |
| T38 CPUE | T38 | Total | 1 | 6.027 | 0.01906 | 0.1434 |
| T38 CPUE | T38 | Sublegal | 1 | 5.448 | 0.02529 | 0.1314 |
| B90 CPUE | B90 | Subadult | 2 | 5.181 | 0.02906 | 0.1289 |
| T38 CPUE | T38 | Mature Male | 2 | 5.067 | 0.03076 | 0.1265 |
| T38 CPUE | T38 | Adult | 1 | 5.028 | 0.0312 | 0.1225 |
| T38 CPUE | T38 | Legal | 1 | 5.028 | 0.312 | 0.1225 |
| T38 CPUE | T38 | Immature Male | 1 | 4.169 | 0.04854 | 0.1038 |
| T38 CPUE | T38 | Immature Female | 1 | 4.111 | 0.05007 | 0.1025 |

## Multiple Linear Regressions

A list of multiple regression models was generated using a dredge function to explore all possible combinations of the above fifteen life stage CPUE variables and their lags as multiple independent variables to predict Creek Trawl abundances (Table 2). Twenty-one models with Δ AIC < 2.0 were identified as the best fitting models. Due to the <2.0 Δ AICc, they cannot be distinguished from each other using Akaike Information Criterion for small samples (AICc) as a measure of the goodness of fit of the model. These exploratory models consider every size (juvenile, subadult, adult, sublegal and legal) and sex/maturity class (immature female mature female, immature male and mature male) as independent variables, but only include those variables relevant in the top scoring goodness of fit models. Interactive terms were included in these models and the all interactive models showed significant relationships, but no interactive effects were determined to be significant and all models with additive terms scored better.

Although twenty-one significant models scored as indistinguishable from each other using AICc Δ, some of these models should be considered illogical. Two models using Adult 1-yr. lag, immature male 2-yr. lag and mature male 1-yr. lag variables as independent variables (model 12 & model 13) are identical models, and a third (model 11) essentially replacing a model effect (Adult 1-yr lag) with an identical effect (Legal-sized 1-yr lag). It does seem that sex/maturity variables are more predictive of CPUEs than size-based variables. Mature male 1-yr. lag is included in 71% of all models (15/21), while immature males 2-yr. lag are found in 47% (10/21) and immature females are found in 38% (8/21) of all top scoring goodness of fit models. Despite the many lagged Creek Trawl size and sex/maturity variables with significant predictive relationships with the Creek Trawl total survey CPUE, no model performed well enough to use as an index of relative abundance for any of these fisheries independent surveys.

Table 2: Results of model generator (dredge function) employed on all variables with significant explanatory relationships with Creek Trawl survey CPUEs and lag. Variables shown are only the variables found in models with < 2.0 ΔAICc.

