Chapter 1

Landings Values Computation Methods

Landings are a sum of total pounds of landings accross all reporting areas in the Charleston Harbor watershed from 1972-2018. These data show crab landings reported in the Ashley River (2003-2018), Cooper River (2003-2018), Wando River (1974, 1978-2018) and Charleston Harbor (1972-2018). Landings from 2003 to 2018 are the only time period covering all 4 reporting areas. Standard error bars for these total sum landings show a sum total monthly range across all reporting areas.

The Landings04 data set is the Total Landings dataset subset to 2003-2018. 2003 was the first year for landings in the Ashley and Cooper Rivers, and the first first year for effort data.

Landings CPUE are landings with number of pots pulled as a metric of fishing effort. These mean annual data were computed as: $\overline{X}$annual($\overline{x}$monthly(Σlbs month/year/watershed / Σpots pulled month/year/watershed)) or: Sum total monthly/Annual (ex. 01-1980) landings by watershed -> mean monthly/annual all watersheds -> mean annual all watersheds

Questions

Should I plot number of pots pulled? I would like to stay away from talk of the fishery, as it would be distracting from the message of the chapter.

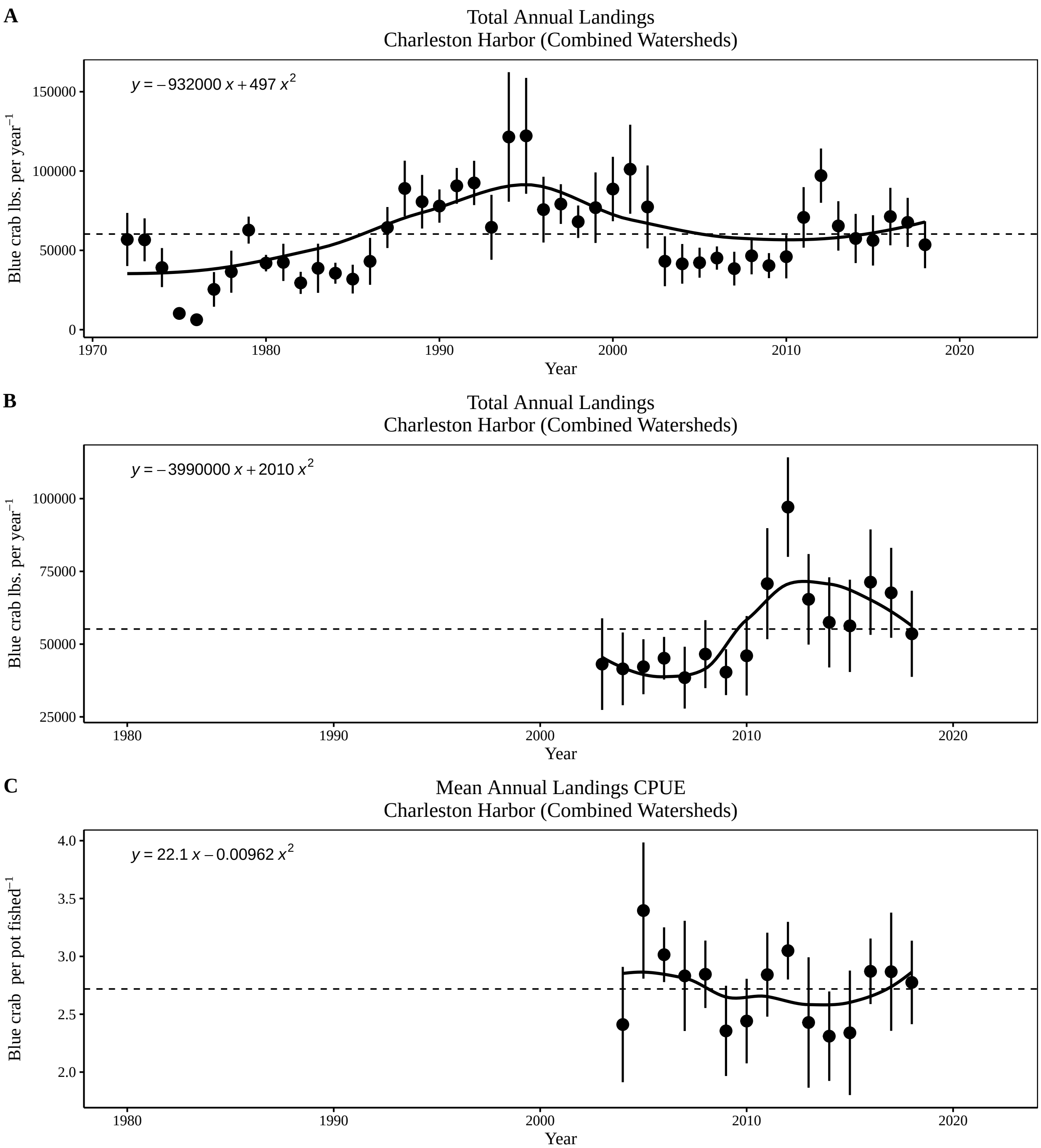

Figure 1: (A) Total annual blue crab Landings (mean ± standard error),(B) total annual blue crab landings (mean ± standard error) subset to 2004-2018, and (C) mean annual landings CPUE (mean ± standard error) for all reporting areas within the Charleston Harbor watershed (Ashley River, Wando River, Cooper River and Charleston Harbor)

Survey	Gear Method	Gear Type	Sample Area	Sample Interval	Sample Method	N(events)	CPUE Standardization
	Gear		Sample			Data	
CRMS							
Creek Trawl	Active	6m Trawl, 2.54cm stretch mesh	Ashley River, Wando River	Monthly, May-Sep	Fixed Stations	1827	Time
Harbor Trawl	Active	4.6m Trawl, 0.6cm D mesh	Ashley River, Charleston Harbor	Monthly	Fixed Stations	2956	Time, Gear
Ashley Fall Potting	Passive	0.6 x 0.6 x 0.46m Pot, 3.8 cm mesh	Ashley River	Monthly, Oct-Nov	Randomized Block w/in a Fixed Station	128	Time
ERS							
SCECAP Tidal Creeks	Active	5m trawl, 1.9cm bar mesh	Charleston Harbor Systemwide	Jun - Aug	Random Stratified	62	Volumetric
SCECAP Open Water	Active	5m trawl, 1.9cm bar mesh	Charleston Harbor Systemwide	Jun - Aug	Random Stratified	92	Volumetric
IFRS							
Trammel Net	Passive	183 x 2.1m trammel net	Charleston Harbor Systemwide	Monthly	Random Stratified	4736	None (Total)

Table 1: SCDNR fisheries independent survey methodology

Survey	Total CPUE	Size			Legal (Size)		Class (Sex/Maturity)			
		Juvenile	Subadult	Adult	Legal	Sublegal	Immature Female	Mature Female	Immature Male	Mature Male
CRMS										
Creek Trawl	X	X	X	X	X	X	X	X	X	X
Harbor Trawl	X	X	X	X	X	X	X	X	X	X
Ashley Fall Potting	X				X	X				
ERS										
SCECAP Tidal Creeks	X	X	X	X	X	X				
SCECAP Open Water	X	X	X	X	X	X				
IFRS										
Trammel Net	X									

Table 2: Lifestage data for blue crab by SCDNR fisheries independent survey

Chapter 1 Time Series
All Abundance Surveys and Landings

Discussion Mean annual blue crab abundances from South Carolina Department of Natural Resources (SCDNR) fisheries independent population surveys and landings from fisheries dependent SCDNR landings data show high annual variability.

Questions SHOULD I LOG TRANFORM Habor Trawl IF, MF, AND MM? Should I LOG Transform Creek Trawl JUVENILEs, and IF, MF AND MM?

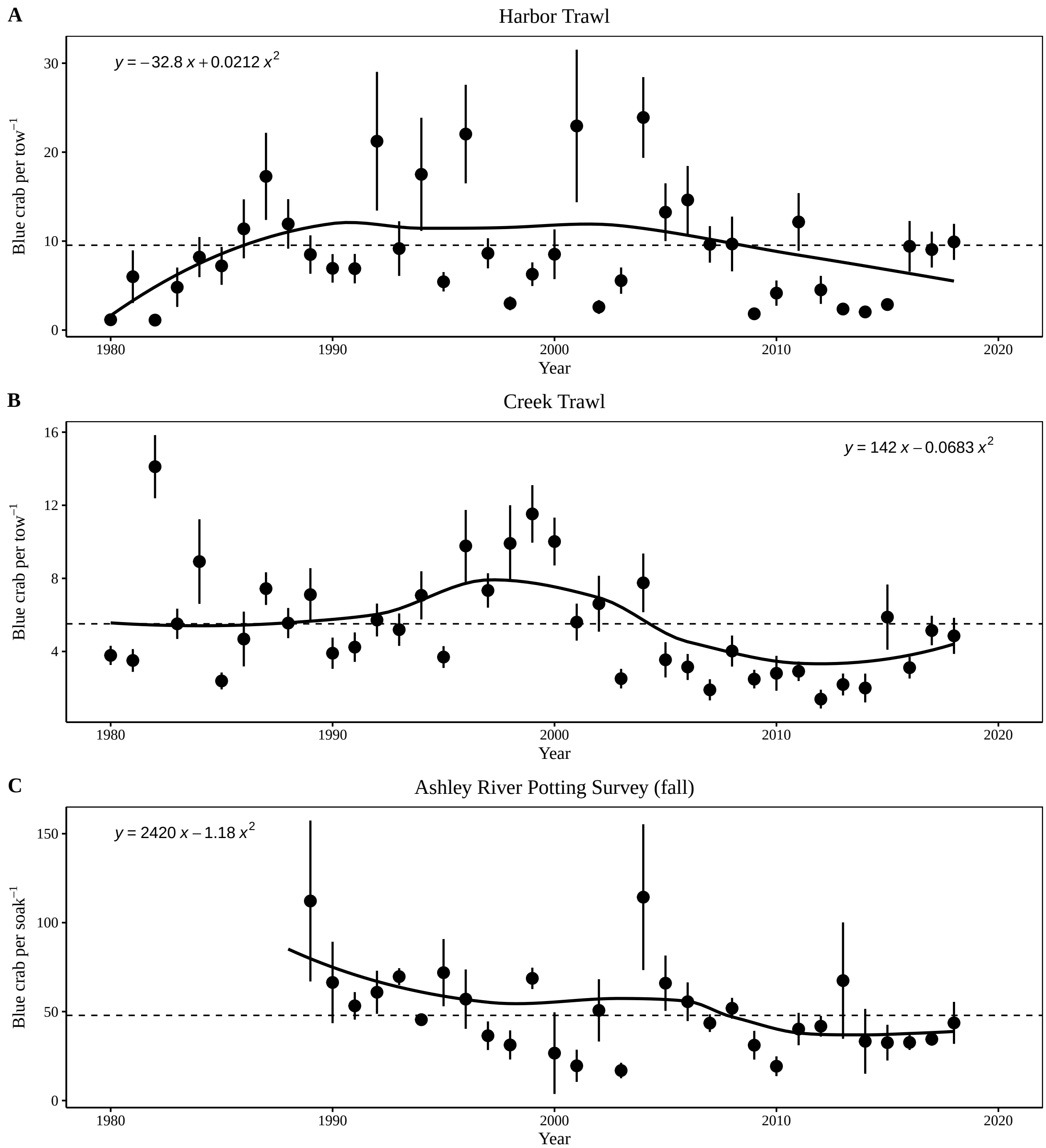

Figure 1: Mean annual blue crab (total catch) CPUE (mean ± standard error) for all SCDNR Crustacean Section fisheries independent surveys, including Harbor Trawl (A), Creek Trawl (B), and Ashley River Potting Survey (C).

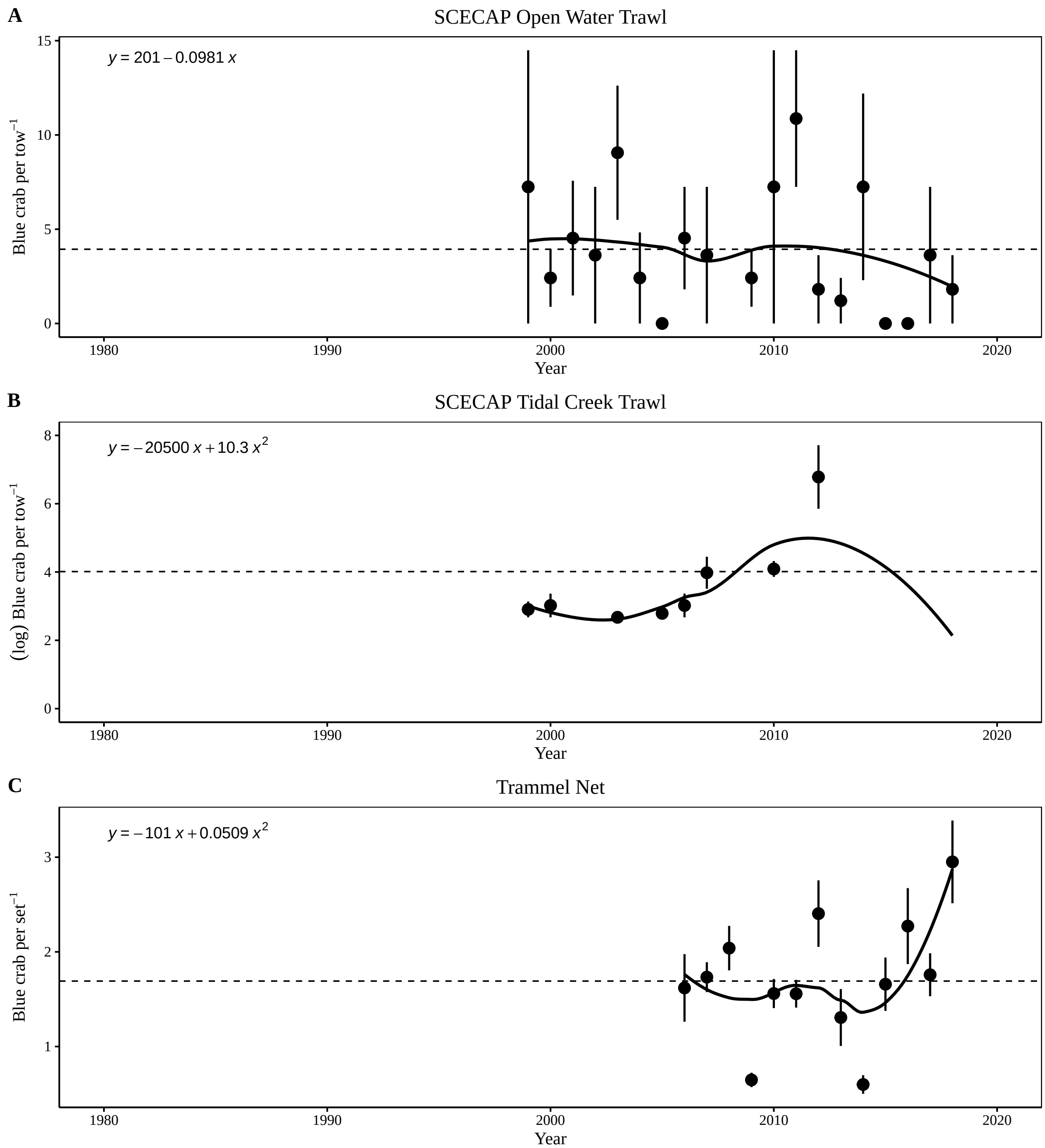

Figure 2: Mean annual blue crab (total catch) CPUE (mean ± standard error) from SCDNR non-CRMS fisheries independent surveys, including SCECAP Open Water Trawl (A), SCECAP Tidal Creek Trawl (B), and the Inshore Fisheries Trammel Net survey

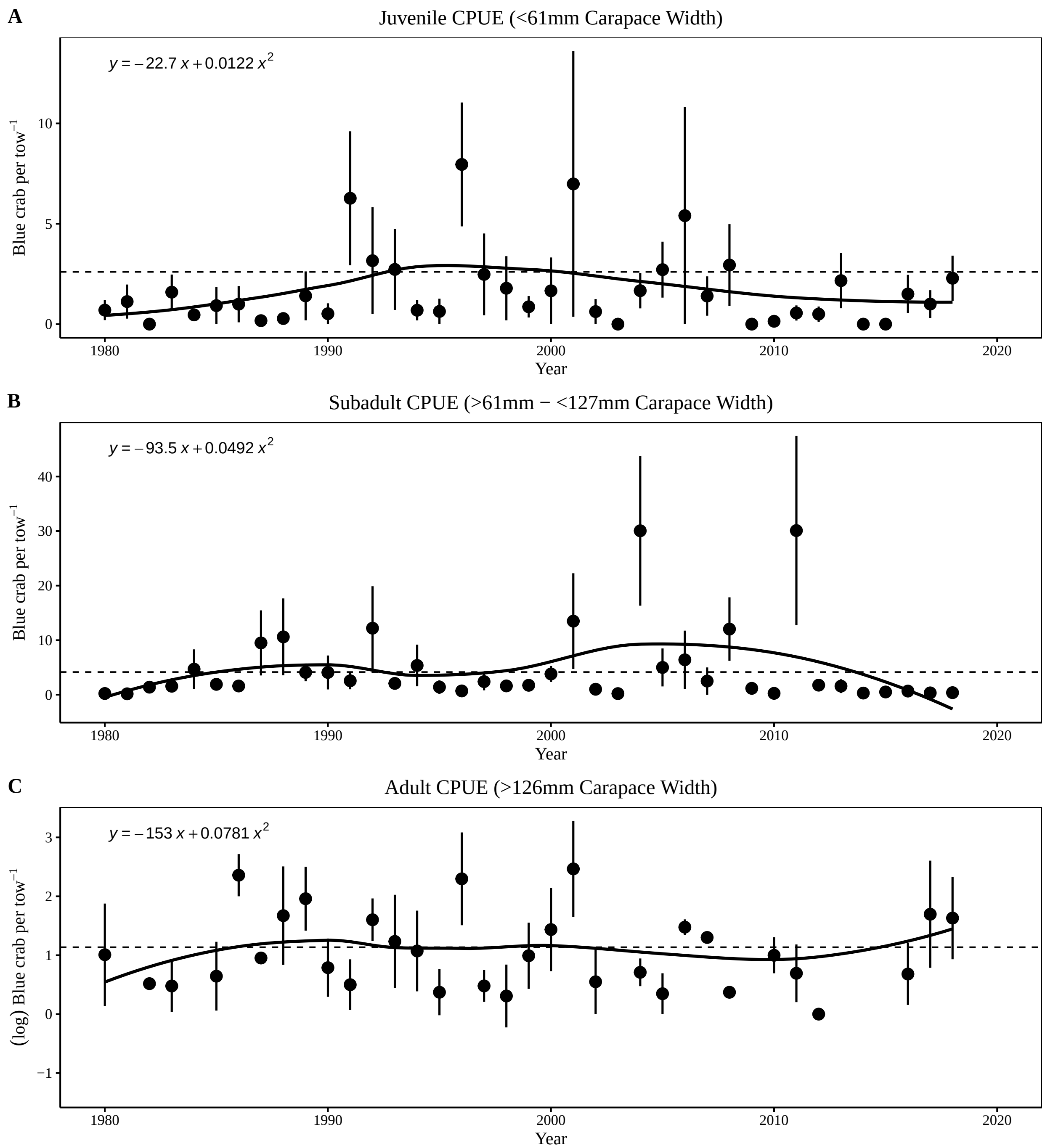

Figure 3: Harbor Trawl survey mean annual blue crab abundance (CPUE) by size (mean ± standard error) for all sites within the Charleston Harbor watershed. Juvenile CPUEs (A), Subadult CPUEs (B) and Adult CPUEs (C) are shown. Adult mean annual CPUEs were logarithmically transformed to help aid in visual scaling.

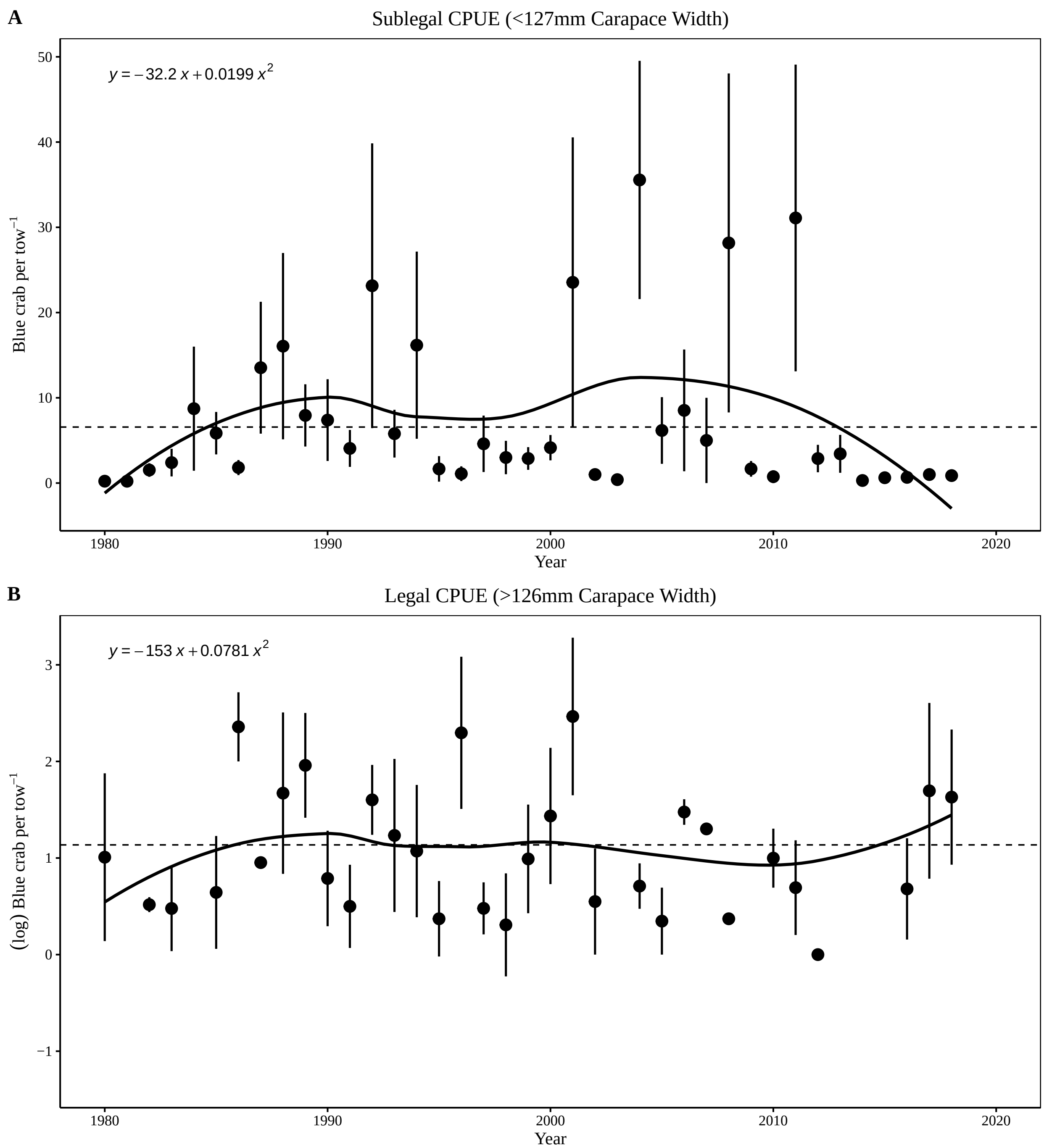

Figure 4: Harbor Trawl survey mean annual blue crab abundance (CPUE) by legal-size (mean ± standard error) for all sites within the Charleston Harbor watershed. Sublegal (<127mm carapace width) CPUEs (A), and legal (>126mm carapace width) CPUEs (B) are shown.

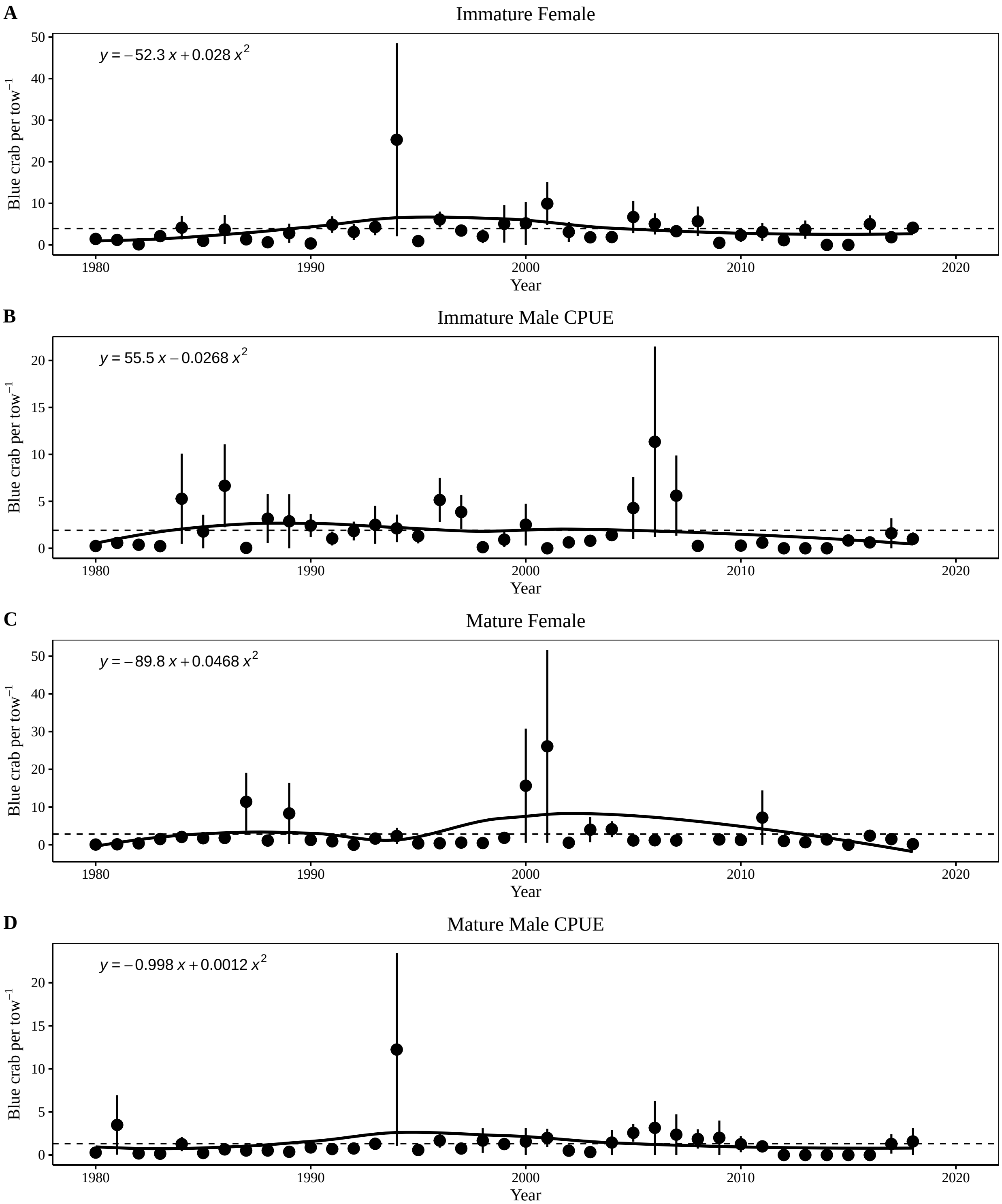

Figure 5: Harbor Trawl survey mean annual blue crab abundance (CPUE) by sex and maturity class (mean $\pm$ standard error) for all sites within the Charleston Harbor watershed. Immature female CPUEs (A), mature Female CPUEs (B), mature male CPUEs (C) and mature male CPUEs (D) are shown.

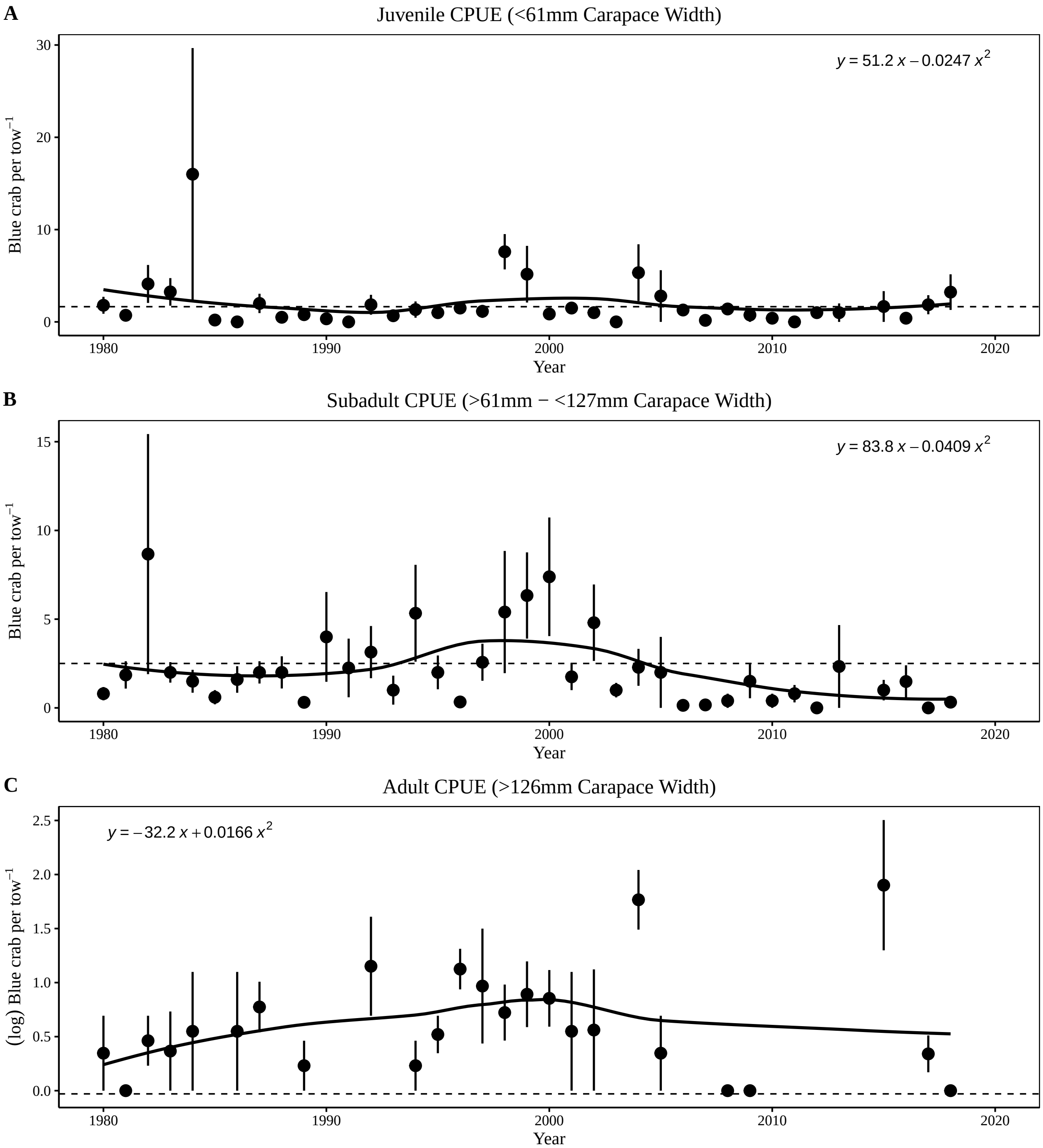

Figure 6: Creek Trawl survey mean annual blue crab abundance (CPUE) by size (mean ± standard error) for all sites within the Charleston Harbor watershed. Juvenile CPUEs (A), Subadult CPUEs (B) and Adult CPUEs (C) are shown.

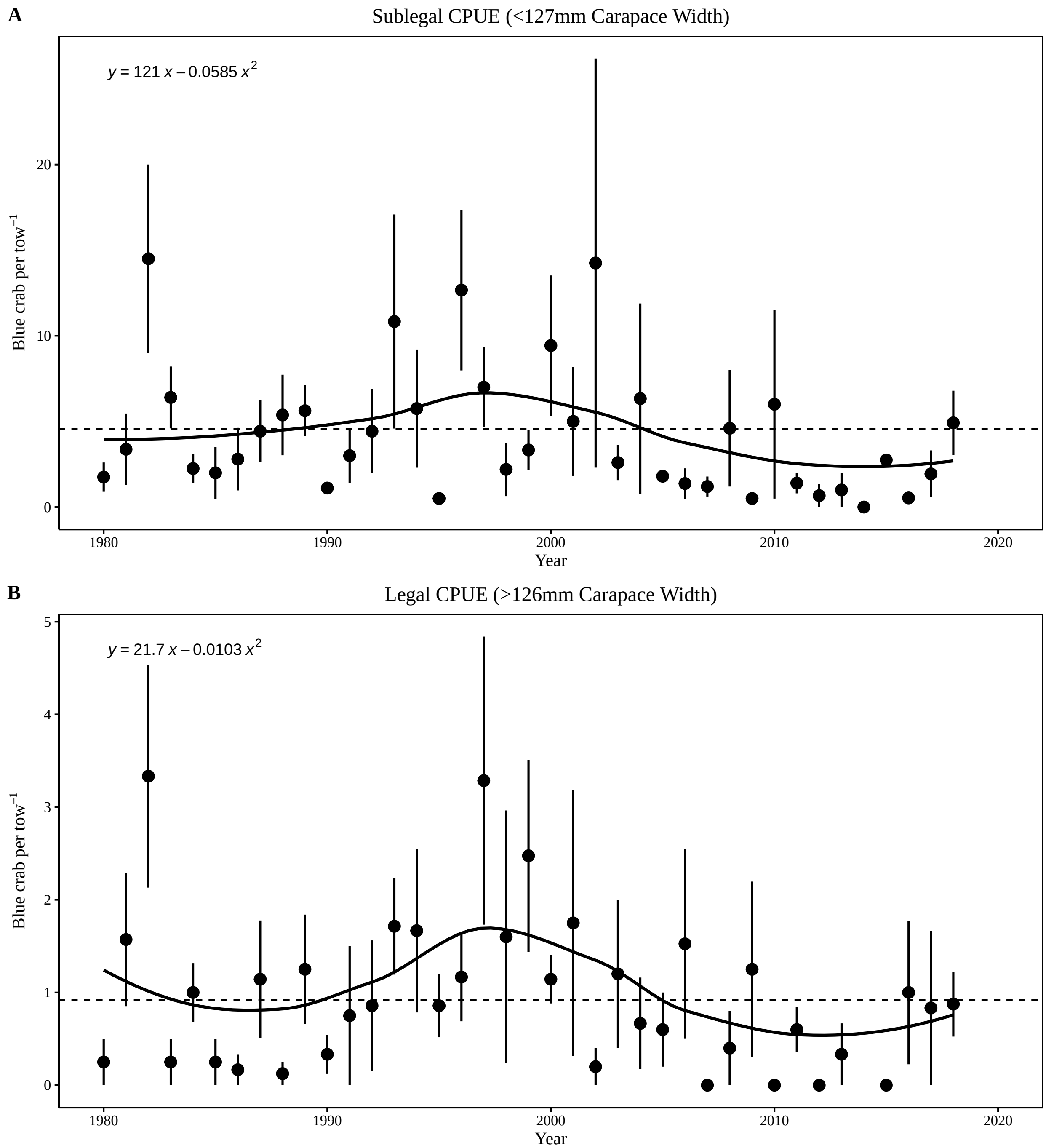

Figure 7: Creek Trawl survey mean annual blue crab abundance (CPUE) by legal-size (mean ± standard error) for all sites within the Charleston Harbor watershed. Sublegal (<127mm carapace width) CPUEs (A), and legal (>126mm carapace width) CPUEs (B) are shown.

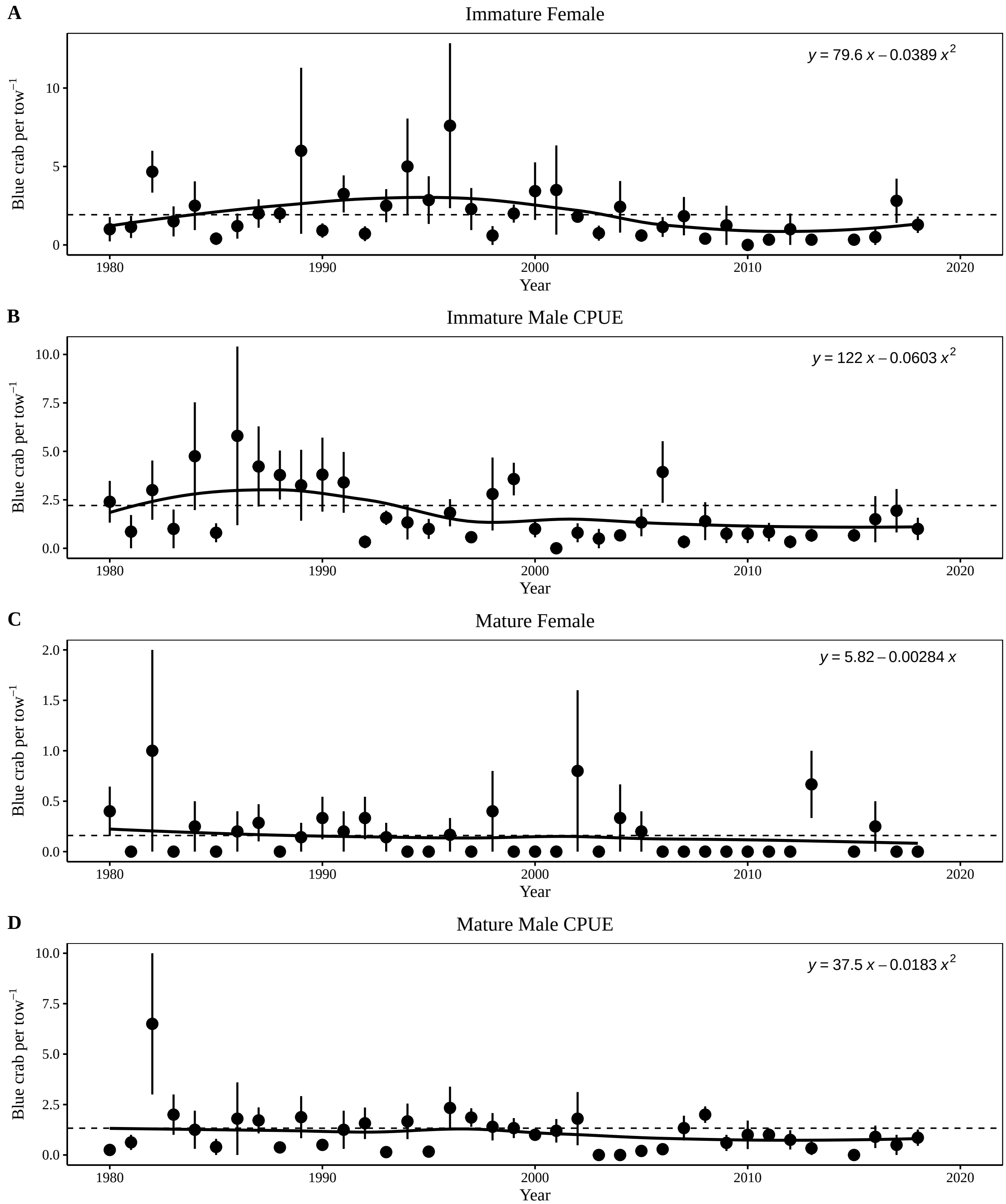

Figure 8: Creek Trawl survey mean annual blue crab abundance (CPUE) by sex and maturity class (mean ± standard error) for all sites within the Charleston Harbor watershed. Immature female CPUEs (A), mature Female CPUEs (B), mature male CPUEs (C) and mature male CPUEs (D) are shown.

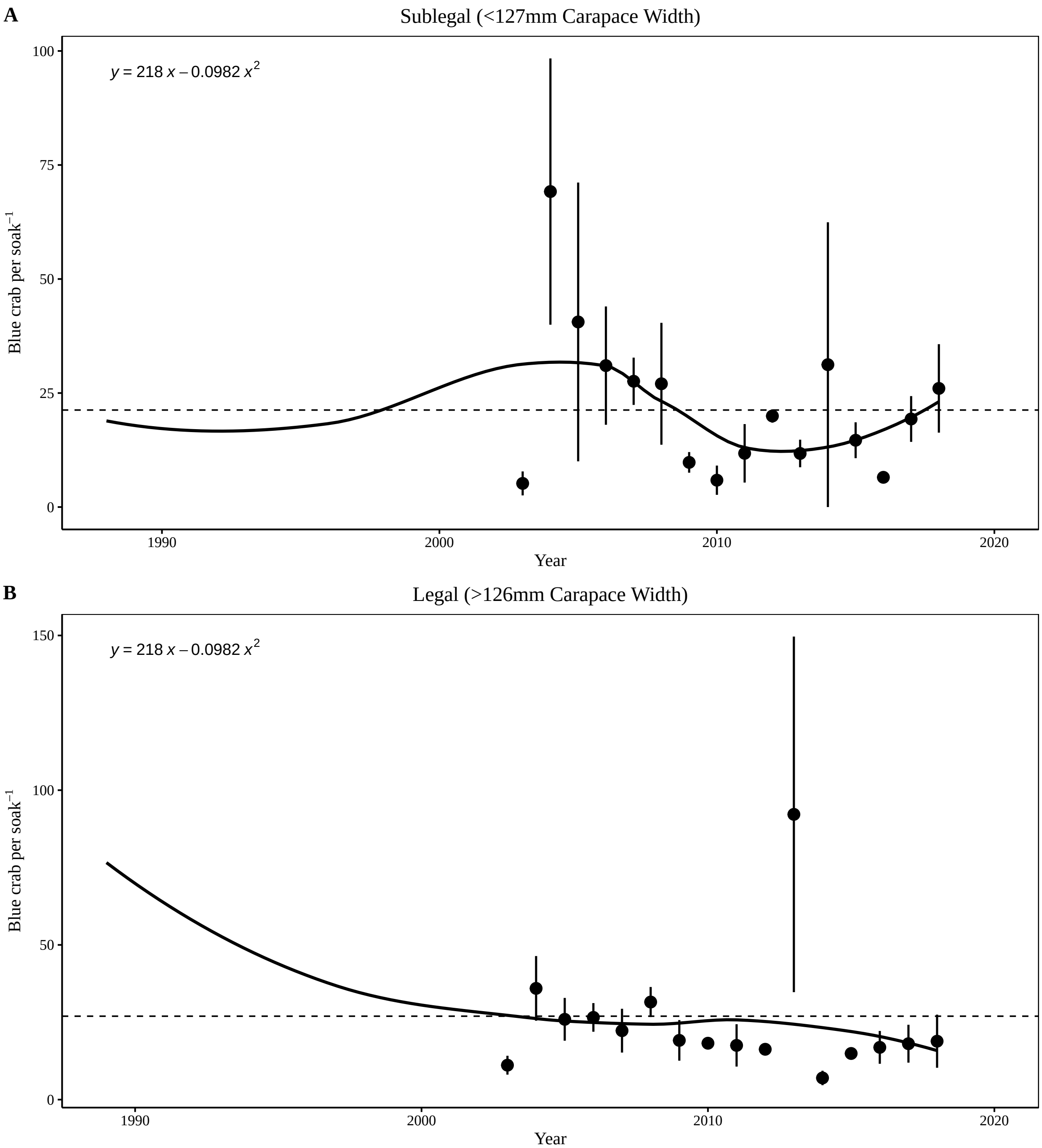

Figure 9: Ashley Potting Survey mean annual blue crab abundance (CPUE) by legal-size (mean ± standard error) for all sites within the Charleston Harbor watershed. Sublegal (<127mm carapace width) CPUEs (A), and legal (>126mm carapace width) CPUEs (B) are shown.

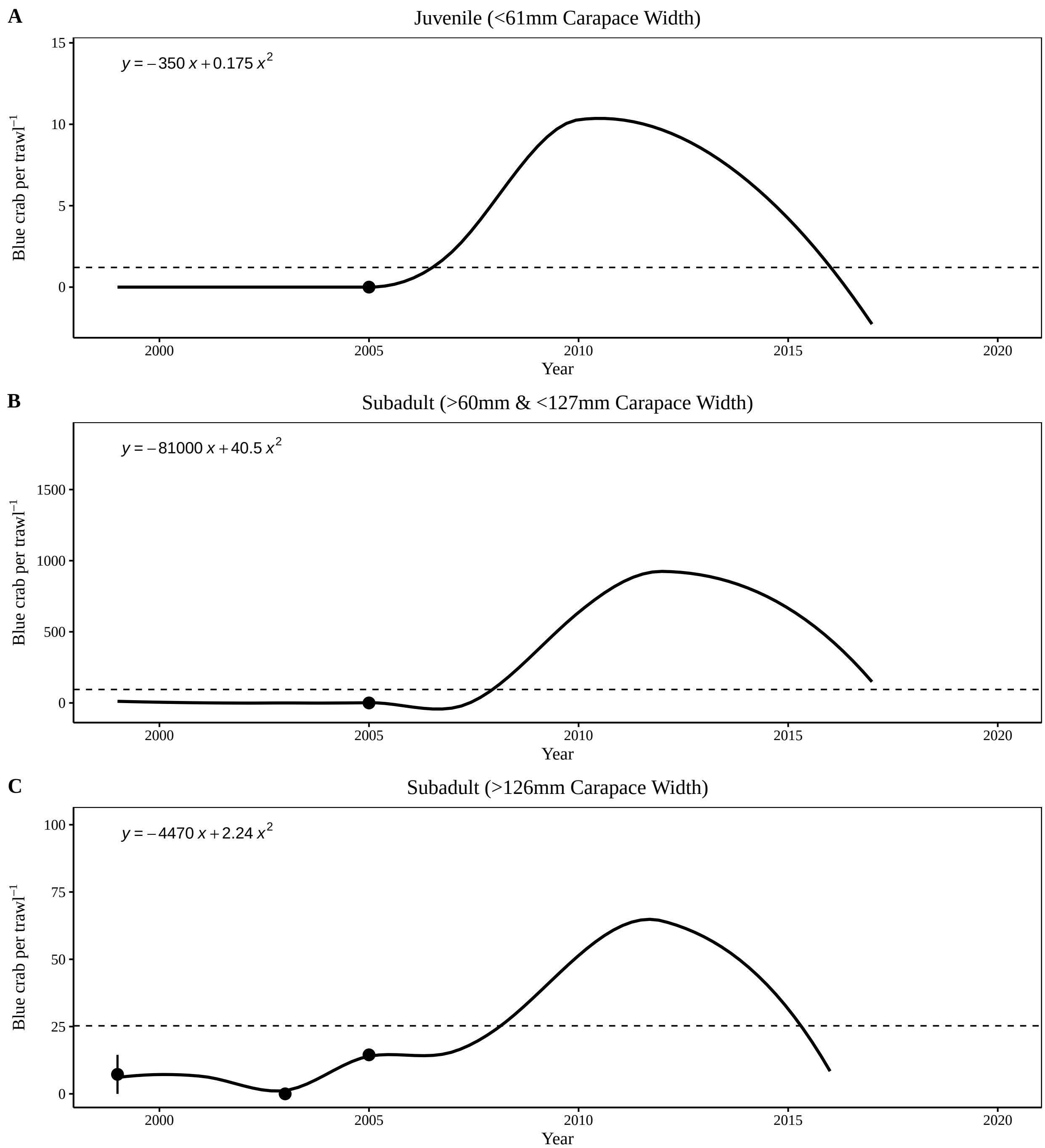

Figure 10: SCECAP Tidal Creek Trawl survey mean annual blue crab abundance (CPUE) by size (mean $\pm$ standard error) for all sites within the Charleston Harbor watershed. Juvenile CPUEs (A), Subadult CPUEs (B) and Adult CPUEs (C) are shown. Tidal Creeks within the Charleston Harbor watershed were not sampled in 2009, 2011, 2013 or 2014.

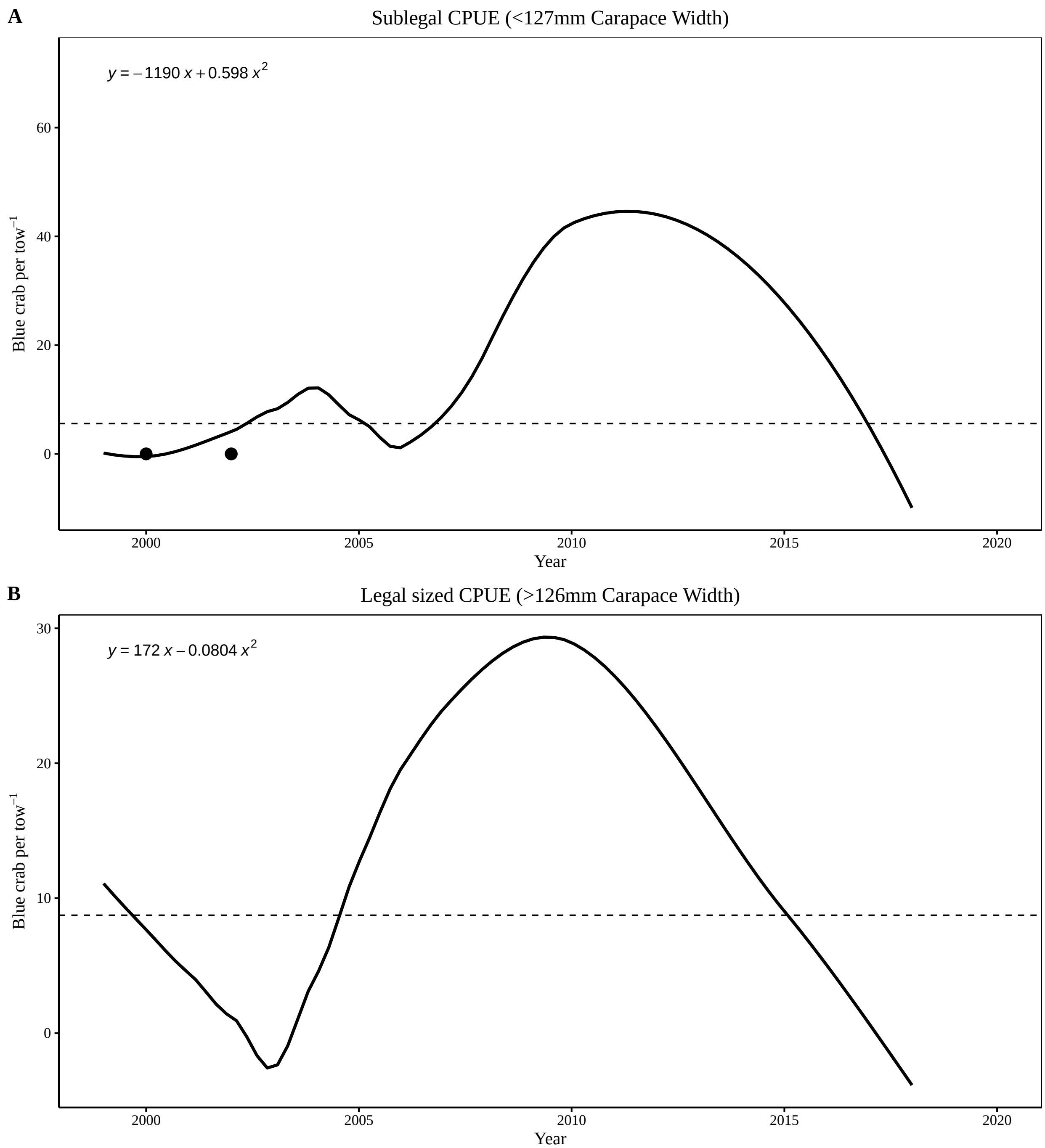

Figure 11: SCECAP Tidal Creek Trwal survey mean annual blue crab abundance (CPUE) by legal-size (mean ± standard error) for all sites within the Charleston Harbor watershed. Sublegal (<127mm carapace width) CPUEs (A), and legal (>126mm carapace width) CPUEs (B) are shown. Tidal Creeks within the Charleston Harbor watershed were not sampled in 2009, 2011, 2013 or 2014.

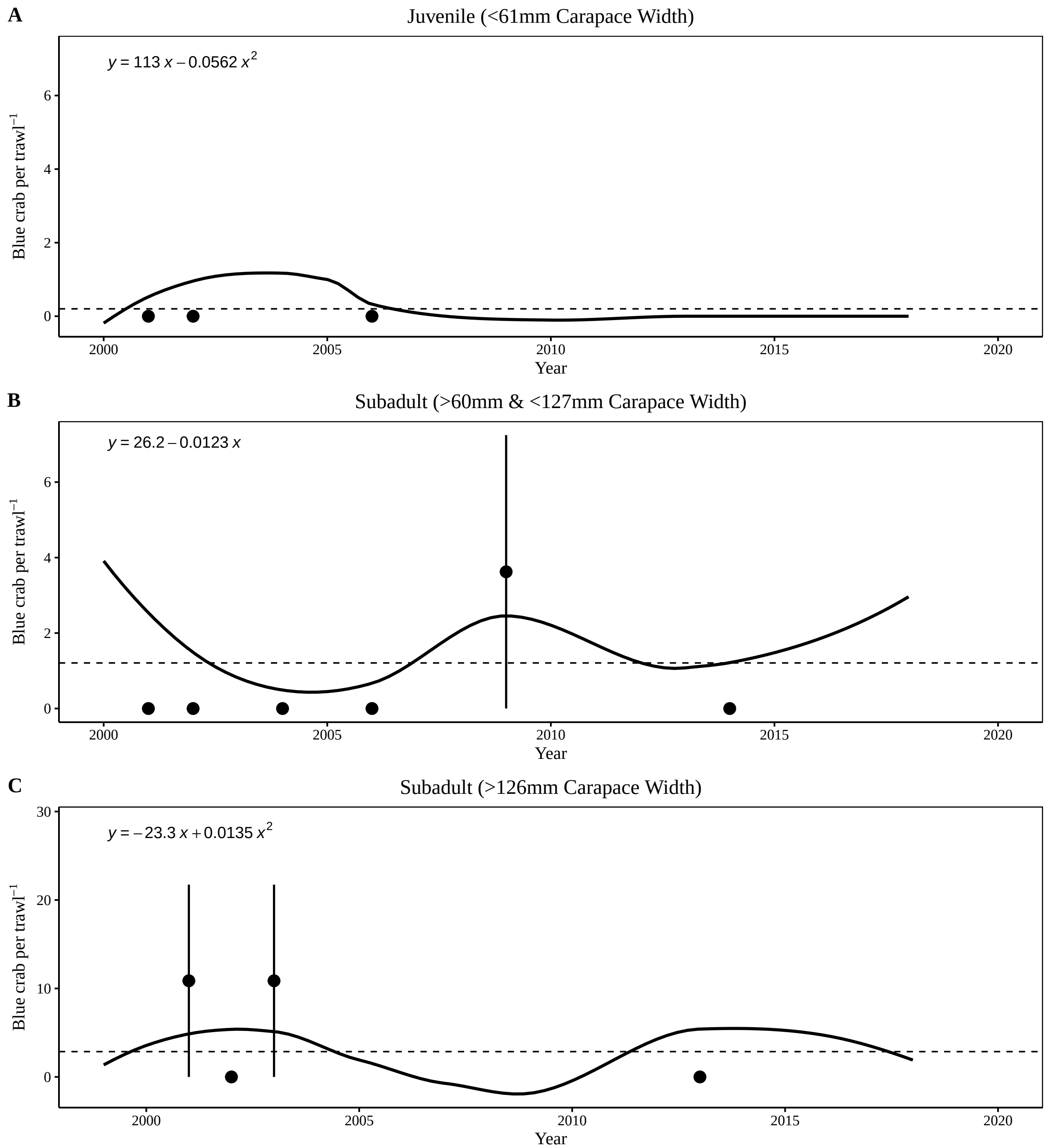

Figure 12: SCECAP Open Water Trawl survey mean annual blue crab abundance (CPUE) by size (mean ± standard error) for all sites within the Charleston Harbor watershed. Juvenile CPUEs (A), Subadult CPUEs (B) and Adult CPUEs (C) are shown. No Open Water SCECAP sampling occured in 2008.

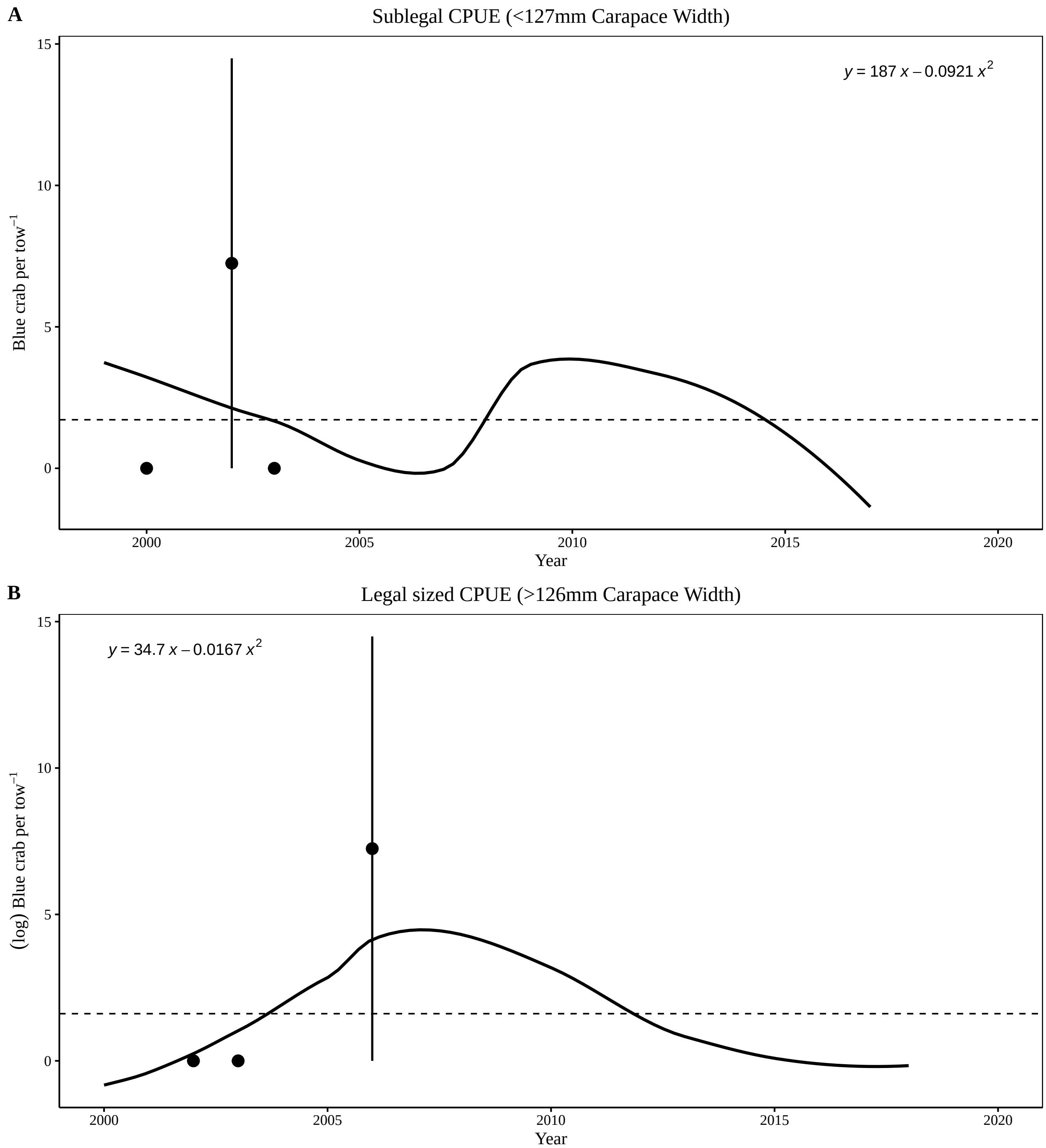

Figure 13: Ashley Potting Survey mean annual blue crab abundance (CPUE) by legal-size (mean ± standard error) for all sites within the Charleston Harbor watershed. Sublegal (<127mm carapace width) CPUEs (A), and legal (>126mm carapace width) CPUEs (B) are shown. No Open Water SCECAP sampling occured in 2008.

Discussion OLS single regression models were constructed using mean annual total CPUEs for all surveys as the dependent varaibale and mean annual CPUEs of every lifestage of every survey with 1- and 2- yr. lags as the explanatory variable - i.e., the mean annual CPUEs of all available blue crab lifestages of all 6 SCDNR fisheries independent surveys were used as independent explanatory variables to predict Harbor Trawl total CPUE. Results show only the Creek Trawl has consist significant results accross all lifestages lagged (Table 3). One significant relationship predicting Harbor Trawl CPUEs was found (Table 4), and one significant relationship predicting the Trammel Net survey (Table 4) were found. Scatterplots for select models showing the highest correlation scores for each survey's total CPUE dependent variable were generated showing none of the models have a high correlation (Figure 16).

Each explanatory variable populating a significant relatioship model will be used to populate an exploratory dredge to suggest multiple regression models.

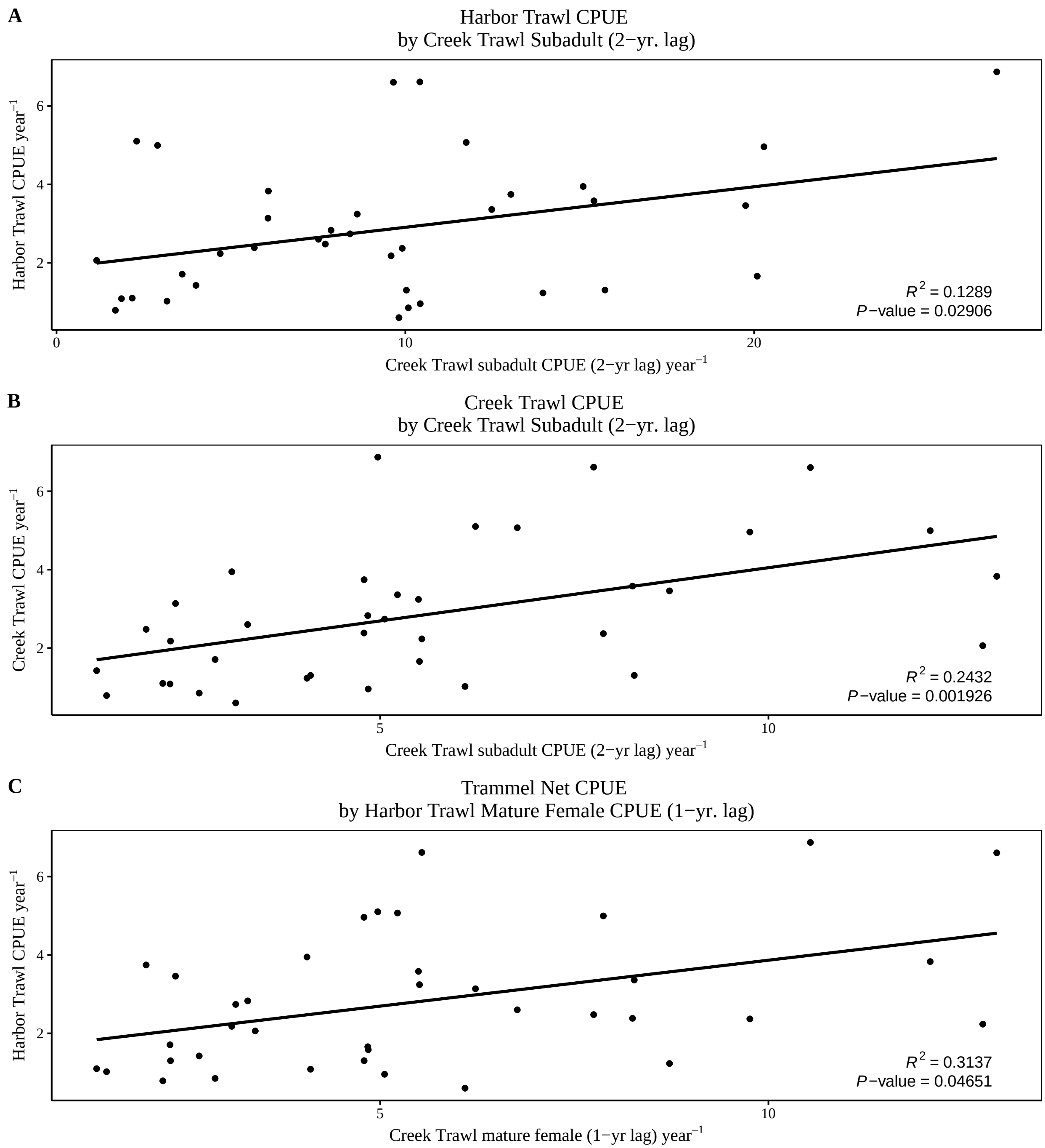

Figure 1: Ordinary Least Squares regression plots of select significant explanatory relatioships using lagged variables to predict survey total CPUEs. Mean annual Harbor Trawl total CPUE by Creek Trawl subadults with a 1-yr lag (A), mean annual Creek Trawl total CPUE by Creek Trawl subadult CPUE with a 2-yr. lag (B), and Trammel Net total CPUE by Harbor Trawl mature female CPUE with a 1-yr. lag (C).

Ordinary Least Squares Single Regression Abundance Models

Discussion OLS regression models using all lifestages from all surveys with a 1- and 2-yr lag to predict all survey's total CPUEs were constructed to find all explanatory relationships. All significant relationships are displayed in the following tables. The CRMS Creek Trawl is the most consistently responsive of the surveys when used in regression modeling. Fifteen significant relationships exist between total CPUEs from the Creek Trawl survey and several 1- and 2-yr.lagged lifestage variables (Table 3). The CRMS Harbor Trawl had one significant explanatory relationship with subadults from the same survey lagged 1-yr (Table 4). The Trammel Net survey had one significant explanatory relatioship with mature females from the Harbor Trawl lagged 1-yr (Table 4), which is the highest correlation (r2=0.36) of all the single regression models.

Although there were several significant regression models constructed using fisheries independent survey life stage abundance CPUEs, no relationships correlate strong enough to be effective models. Using OLS single regression modeling, the six SCDNR fisheries independent surveys used to monitor blue crab populations in the Charleston Harbor watershed are ineffective are ineffective predictors of their own abundance CPUEs.
The next step in this chapter is to put all relevant variables for the Creek Trawl into an exploratory dredge to find combinations of variables to populate multiple regression models. These models will be constucted using the suggestions of the dredge.

Table 3: OLS regression of total Creek Trawl CPUE by all lifestages from all surveys.

		Summary Statistics			
Dependent Variable	Explanatory Variable	p-value	r2	F-statistic	Degrees of Freedom
Total CPUE	Subadult (1-yr. lag)	0.007774	0.1809	7.949	36
Total CPUE	Adult (1-yr. lag)	0.031200	0.1225	5.028	36
Total CPUE	Immature Female (1-yr. lag)	0.050070	0.1025	4.111	36
Total CPUE	Immature Male (1-yr. lag)	0.048540	0.1038	4.169	36
Total CPUE	Mature Male (1-yr. lag)	0.002197	0.2321	10.880	36
Total CPUE	Sublegal (1-yr. lag)	0.025290	0.1314	5.448	36
Total CPUE	Legal (1-yr. lag)	0.031200	0.1225	5.028	36
Total CPUE	Total CPUE (1-yr lag)	0.019060	0.1434	6.027	36
Total CPUE	Subadult (2-yr. lag)	0.001926	0.2432	11.250	35
Total CPUE	Immature Female (2-yr. lag)	0.010380	0.1733	7.337	35
Total CPUE	Immature Male (2-yr. lag)	0.004023	0.2131	9.481	35
Total CPUE	Mature Female (2-yr lag)	0.019000	0.1473	6.048	35
Total CPUE	Mature Male (2-yr. lag)	0.030760	0.1265	5.067	35
Total CPUE	Sublegal (1-yr. lag)	0.004317	0.2102	9.316	35
Total CPUE	Total CPUE (2-yr lag)	0.004898	0.2050	9.024	35

Table 4: OLS regression of all non-Creek Trawl survey total CPUEs by all lifestages from all surveys.

		Summary Statistics			
Dependent Variable	Explanatory Variable	p-value	r2	F-statistic	Degrees of Freedom
Harbor Trawl					
Total CPUE	Harbor Trawl Subadult (1-yr. lag)	0.02906	0.12890	5.181	35
Trammel Net					
Total CPUE	Harbor Trawl Mature Female (1-yr lag)	0.04651	0.36137	5.028	11

Creek Trawl (Relevant Variables) Dredge Table

Discussion An exploratory dredge was performed, populated with Creek Trawl total CPUE as an dependent variable and all lifestage variables from the Creek Trawl as explanatory variables. All lifestage variables with 1- and 2-yr lags were added as explanatory variables although not all of these variables have single regression relationships with the Creek Trawl total CPUEs. The results shown in Table 5, are models suggested by the dredge subset to show only models below a 2.5 delta. Models are ranked by the dredge using Akaike information criterion with a correction for small samples (AICc) to estimate the goodness-of-fit of all linear models relative to all other linear models. "Parameters for the dredge are estimated using randomly sampled half of the data" with "log-likelihood given the remianing half of the data is used to calculate the AIC weights" (Package 'MuMln') Any model within 2.0 delta away from another model is not significantly different according to the AICc estimator.

Many of the models in Table 5 are illogical (e.g., Adult 1-yr. lag and Legal 1-yr. lag which are the same data). Multiple OLS regression models, both additive and with interaction, will be constructed using the models suggested by thi dredge in the next step.

Table 5: Exploratory dredge results of Creek Trawl total CPUE predicted with all relevant Creek Trawl lifestage variables with 1- and 2-yr. lags previously shown to have a significant relationhsip using single regression. Results show a subset of models ranked by AICc.

	(Intercept)	Adult_1	CPUE_1	CPUE_2	IF_1	IF_2	IM_1	IM_2	Legal_1	MF_2	MM_1	MM_2	Subadult_1	Subadult_2	Sublegal_1	Sublegal_2	df	logLik	AICc	delta	weight
577	2.048715	NA	NA	NA	NA	NA	NA	0.8323343	NA	NA	1.407664	NA	NA	NA	NA	NA	4	-86.94127	183.1325	0.0000000	0.05667785
4609	2.089726	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.235158	NA	NA	0.6427287	NA	NA	4	-87.14589	183.5418	0.4092347	0.04619013
5633	2.198434	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.527236	-1.4447348	NA	1.1482471	NA	NA	5	-86.01736	183.9702	0.8376703	0.03728341
16897	2.069273	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.357606	NA	NA	NA	NA	0.3786129	4	-87.39330	184.0366	0.9040618	0.03606607
2121	2.437171	NA	NA	NA	-1.7088688	NA	NA	1.0623723	NA	NA	NA	NA	1.5374922	NA	NA	NA	5	-86.20315	184.3418	1.2092434	0.03096204
585	2.248133	NA	NA	NA	-0.6871037	NA	NA	0.9432763	NA	NA	2.090497	NA	NA	NA	NA	NA	5	-86.23272	184.4009	1.2683767	0.03005999
6153	2.420101	NA	NA	NA	-1.6584166	NA	NA	NA	NA	NA	NA	NA	1.4090661	0.8346349	NA	NA	5	-86.26664	184.4688	1.3362311	0.02905725
517	2.043117	NA	NA	0.3128939	NA	NA	NA	NA	NA	NA	1.350200	NA	NA	NA	NA	NA	4	-87.61863	184.4873	1.3547248	0.02878980
75	1.996908	NA	1.3457498	NA	-3.2190656	NA	NA	1.2043350	NA	NA	NA	NA	NA	NA	NA	NA	5	-86.30542	184.5463	1.4137767	0.02795218
4107	2.025106	NA	1.2108905	NA	-2.9966652	NA	NA	NA	NA	NA	NA	NA	NA	0.9341202	NA	NA	5	-86.39164	184.7188	1.5862178	0.02564310
705	2.365478	NA	NA	NA	NA	NA	NA	0.7800641	-1.630722	NA	2.534600	NA	NA	NA	NA	NA	5	-86.39286	184.7212	1.5886719	0.02561166
578	2.365478	-1.630722	NA	NA	NA	NA	NA	0.7800641	NA	NA	2.534600	NA	NA	NA	NA	NA	5	-86.39286	184.7212	1.5886719	0.02561166
706	2.365478	-1.630722	NA	NA	NA	NA	NA	0.7800641	NA	NA	2.534600	NA	NA	NA	NA	NA	5	-86.39286	184.7212	1.5886719	0.02561166
2633	2.179287	NA	NA	NA	-1.7252406	NA	NA	1.0200873	NA	NA	1.374381	NA	1.0195563	NA	NA	NA	6	-85.01337	184.8267	1.6941955	0.02429537
4617	2.285636	NA	NA	NA	-0.6790476	NA	NA	NA	NA	NA	1.883583	NA	NA	0.7314305	NA	NA	5	-86.46318	184.8618	1.7293086	0.02387255
1541	1.972111	NA	NA	0.6312037	NA	NA	NA	NA	NA	NA	1.712370	-1.6140517	NA	NA	NA	NA	5	-86.48838	184.9123	1.7797140	0.02327842
529	2.106091	NA	NA	NA	NA	0.7870402	NA	NA	NA	NA	1.449485	NA	NA	NA	NA	NA	4	-87.88325	185.0165	1.8839679	0.02209607
10305	2.420795	NA	NA	NA	NA	NA	NA	0.9208636	NA	NA	NA	NA	2.1378330	NA	-1.0566238	NA	5	-86.55564	185.0468	1.9142345	0.02176420
18441	2.363802	NA	NA	NA	-1.6847298	NA	NA	NA	NA	NA	NA	NA	1.4991827	NA	NA	0.5002569	5	-86.55833	185.0521	1.9196076	0.02170581
5889	2.094856	NA	NA	NA	NA	NA	NA	NA	NA	6.880823	1.561640	-2.0947128	NA	1.1068152	NA	NA	6	-85.13834	185.0767	1.9441321	0.02144127
1601	2.164634	NA	NA	NA	NA	NA	NA	1.0641443	NA	NA	1.630908	-0.6493511	NA	NA	NA	NA	5	-86.59595	185.1274	1.9948528	0.02090435
6145	2.270023	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.4660661	0.6965162	NA	NA	4	-87.95574	185.1615	2.0289455	0.02055103
14337	2.408503	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9976690	0.7240101	-1.0202498	NA	5	-86.62351	185.1825	2.0499759	0.02033606
2113	2.292316	NA	NA	NA	NA	NA	NA	0.8728956	NA	NA	NA	NA	0.5510995	NA	NA	NA	4	-87.98177	185.2135	2.0809972	0.02002307
833	1.938033	NA	NA	NA	NA	NA	NA	0.7161515	NA	3.059979	1.313251	NA	NA	NA	NA	NA	5	-86.69494	185.3254	2.1928184	0.01893429
4610	2.400188	-1.495492	NA	NA	NA	NA	NA	NA	NA	NA	2.291072	NA	NA	0.5919975	NA	NA	5	-86.69856	185.3326	2.2000739	0.01886572
4737	2.400188	NA	NA	NA	NA	NA	NA	NA	-1.495492	NA	2.291072	NA	NA	0.5919975	NA	NA	5	-86.69856	185.3326	2.2000739	0.01886572
4738	2.400188	-1.495492	NA	NA	NA	NA	NA	NA	NA	NA	2.291072	NA	NA	0.5919975	NA	NA	5	-86.69856	185.3326	2.2000739	0.01886572
579	2.216950	NA	-0.1748587	NA	NA	NA	NA	0.8596377	NA	NA	1.964384	NA	NA	NA	NA	NA	5	-86.69867	185.3328	2.2002759	0.01886382
4097	3.024960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8954896	NA	NA	3	-89.33752	185.4023	2.2697679	0.01821963
2061	2.272273	NA	NA	0.4226636	-1.6824756	NA	NA	NA	NA	NA	NA	NA	1.4951554	NA	NA	NA	5	-86.73557	185.4066	2.2740944	0.01818026
5641	2.388360	NA	NA	NA	-0.6635263	NA	NA	NA	NA	NA	2.156790	-1.4247015	NA	1.2279116	NA	NA	6	-85.32455	185.4491	2.3165592	0.01779832
8777	2.137690	NA	NA	NA	-2.2863942	NA	NA	1.0517385	NA	NA	1.801555	NA	NA	NA	0.7577368	NA	6	-85.33142	185.4628	2.3302949	0.01767650
17921	2.137778	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.630044	-1.0070572	NA	NA	NA	0.5847866	5	-86.77412	185.4837	2.3511905	0.01749278
16395	1.952775	NA	1.2757032	NA	-3.0594789	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5601649	5	-86.79917	185.5338	2.4012809	0.01706011
16905	2.251285	NA	NA	NA	-0.6350110	NA	NA	NA	NA	NA	1.980412	NA	NA	NA	NA	0.4269628	5	-86.80057	185.5366	2.4040940	0.01703613
8769	2.144807	NA	NA	NA	NA	NA	NA	0.8573795	NA	NA	1.721772	NA	NA	NA	-0.1267169	NA	5	-86.81182	185.5591	2.4265790	0.01684568
5634	2.562322	-1.718783	NA	NA	NA	NA	NA	NA	NA	NA	2.759806	-1.5387055	NA	1.1228219	NA	NA	6	-85.39130	185.5826	2.4500687	0.01664898
5761	2.562322	NA	NA	NA	NA	NA	NA	NA	-1.718783	NA	2.759806	-1.5387055	NA	1.1228219	NA	NA	6	-85.39130	185.5826	2.4500687	0.01664898
5762	2.562322	-1.718783	NA	NA	NA	NA	NA	NA	NA	NA	2.759806	-1.5387055	NA	1.1228219	NA	NA	6	-85.39130	185.5826	2.4500687	0.01664898
6665	2.234726	NA	NA	NA	-1.6516224	NA	NA	NA	NA	NA	1.195691	NA	0.9603402	0.7793057	NA	NA	6	-85.39184	185.5837	2.4511489	0.01663999
16961	2.128867	NA	NA	NA	NA	NA	NA	1.4550017	NA	NA	1.486587	NA	NA	NA	NA	-0.3171438	5	-86.83004	185.5956	2.4630232	0.01654149
26625	2.363076	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1246212	NA	-1.0614590	0.4335393	5	-86.83973	185.6150	2.4824133	0.01638190

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Discussion

OLS multiple regression models for the Creek Trawl, the only survey with multiple significant single regression relationships with lagged lifestage variables, were constructed based-on the exploratory dredge suggestions. Additive multiple regression models and interactive multiple regression models were run.

Interactive Models Although analyses show all interactive models are significant, no model has a significant interactive term, and few had significant main effects. Only two interactive models, dredge models 75 and 4107 (Table 5), have main effects with significance. None of the models has an adjusted $R^2 > 0.32$. This suggests that the main effects have some degree of collinearity, but there are no significant interactive effects within these relationships. Creek Trawl lifestage variables with 1- and 2-yr. lag do not explain the variation between the observed and expected outcome values.

Additive Models All additive OLS multiple regression models suggested by the exploratory dredge are significant. However, only dredge models 577, 4609, 16897, 517 and 75 (Table 5), are populated with main effects that have significant relationships. None of these models has an adj $R^2 > 0.30$ (Table 6).

Table 6: OLS multiple regression model results suggested by the dredge with all main effects significant.

	CPUE			CPUE			CPUE			CPUE			CPUE		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	2.05	0.10 – 3.99	**0.040**	2.09	0.14 – 4.04	**0.037**	2.07	0.07 – 4.07	**0.043**	2.04	-0.01 – 4.09	0.051	2.00	-0.04 – 4.03	0.054
Immature Male 2-yr lag	0.83	0.12 – 1.55	**0.024**										1.20	0.43 – 1.97	**0.003**
Mature Male 1-yr lag	1.41	0.26 – 2.55	**0.017**	1.24	0.02 – 2.45	**0.046**	1.36	0.17 – 2.54	**0.026**	1.35	0.15 – 2.55	**0.029**			
Subadult 2-yr lag				0.64	0.07 – 1.22	**0.030**									
Sublegal 2-yr lag							0.38	0.02 – 0.74	**0.039**						
CPUE 2-yr lag										0.31	0.00 – 0.62	**0.049**			
CPUE 1-yr lag													1.35	0.26 – 2.44	**0.017**
Immature Female 1-yr lag													-3.22	-6.30 – -0.14	**0.041**
Observations	37			37			37			37			37		
R^2 / R^2 adjusted	0.335 / 0.296			0.328 / 0.288			0.319 / 0.279			0.310 / 0.270			0.358 / 0.299		