Sample Statistical Analysis Plan for Dungeness Crab Growth

Population

- Female Dungeness crabs found in the Pacific Coast of North America

Primary Objective:

- Estimate the change in width of a female Dungeness crab shell based on its post-molt width for the population of female Dungeness Crabs found in the Pacific Coast of North America

Secondary Objectives:

- Assess whether the change in crab size is different for capture-recapture crabs than laboratory crabs
- Assess (within the capture-recapture crabs only) whether the change in size differs depending on season of capture

Data Collection:

- Laboratory and capture-recapture data
- Capture-recapture for seasons in 1981, 1982 and 1992
- Capture-recapture crabs data found by tagging 12,000 female crabs that were caught, measured and tagged with a unique identification number and returned to the water during January to March of each of the three seasons.
- Commercial fisheries brought tagged crabs caught in their traps to the laboratory for second measurements. For an incentive to return the tagged crabs, a lottery of the returned crabs tags, with a $500 prize was held at the end of each fishing season.
- For laboratory data, crabs caught in the premating embrace were brought to the laboratory and measured for premolt size. Postmolt measurement was taken 3 to 4 days after the crab had left its old shell. The crabs were then released

Variables Under Consideration:

- Increment (continuous variable) – postmolt size of the external carapace along the widest part of the shell excluding spines minus the premolt size of the external carapace along the widest part of the shell excluding spines (in mm) – **Primary outcome variable**
- Postmolt size (continuous variable) – postmolat size of the external carapace along the widest part of the shell excluding spines (in mm) – **Primary explanatory variable**
- Year (categorical variable) – collection year (1981, 1982, 1992 – only available for capture-recapture crabs not laboratory ones – **Secondary explanatory variable**
- Source (binary variable) – laboratory (1) , capture-recapture (0) – **Secondary explanatory variable**

Missing Data Procedures:

- If data on any of the following are missing, that crab is excluded from analysis: postmolt, increment size
- If data on the source is missing, or if data on the year of the capture-recapture crabs are missing this could be multiply imputed and incorporated in the analysis

Summaries to be presented:

- Counts of number of missing observations to be given for each variable
- Boxplot, mean, standard deviation, five number summary to be presented for increment data, as well as post molt and pre-molt
- Mean, standard deviation for increment , post molt and pre-molt data separately on laboratory and capture-recapture data
- Boxplots of increment, pre molt data against laboratory and capture-recapture groups
- Mean, standard deviation for increment data on capture-recapture crabs separately for each season
- Boxplots of increment data for capture-recapture data against season groups
- Mean, standard deviation, five number summary to be presented for postmolt size
- Scatterplot of increment (y-axis) versus post molt size (x- axis) with different symbols for laboratory and capture-recapture groups
- Scatterplot of pre-molt (y-axis) versus post molt size (x- axis) with different symbols for laboratory and capture-recapture groups
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Models to be fitted

- Main models will have increment as response, post molt (or pre-molt) as explanatory
- In all analyses, 5 % significance level is used.
- simple Linear regression could be used with increment ~ post molt
- Residual plots (residuals versus fitted values and qq-norm plots on the residuals) are to be presented and used to check for signs of heterogeneity, non-linearity and non-normality.
- Check for significance of post molt, and also 95% confidence interval for parameters
- Model increment~ source + year+ interaction
- Residual plots are to be presented for this model and checks for non-normality, heterogeneity and any remaining un-modeled relationship
- Non -significant terms in model removed (p-value>0.05), if non-significant, remove interaction and re-fit reduced model