

Estimating natural mortality of sub-legal male Dungeness crab on the Oregon Coast

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Summary

An emerging management uncertainty in the Dungeness crab fishery is the mortality rate of 'sub-legal' male crab. These are the portion of the population that are below the legal size limit during the spring/summer harvest season and then molt into the legal size class before the subsequent season. Obtaining better estimates of the mortality rate of sub-legal crab during that period is important for two reasons. First, because sub-legal crab can enter traps and experience handling mortality or cannibalism, it could be that a management change ending the season earlier in the summer would reduce sub-legal mortality and preserve more of that cohort for harvest in the subsequent season. Second, more precise estimates of that mortality rate will be important parameters in any type of data-integrated assessment modeling of the crab fishery. Current estimates of the instantaneous mortality rate of sub-legal crab range as high as 4.27 year^{-1} , implying extremely high mortality during that timeframe, but also great uncertainty about the precise magnitude.

The goal of this project was to produce refined estimates of the mortality rate during the transition from sub-legal to legal sizes of male crab, specifically for the Oregon fishery. To accomplish this we collected new data from the Oregon crab population, aggregated historical data from Oregon and Washington, and developed new numerical methods for mortality estimations.



Image 1: The fishing vessel "Longfin" was utilized to conduct the research project.

Our analytical method was based on the assumption that the abundance of post-molt legal-size male crab in the late summer could be predicted from the abundance of pre-molt sub-legal male crab in the spring. Using published estimates of the probability of sub-legal crab molting, we compared sampled abundances from spring and late summer to estimate the mortality rate during that transition. We additionally improved published numerical approaches for this calculation, modifying it to account for the patchy nature of data sampled in crab pots.



Image 2: Principal Investigator Will White deploying a crab pot.

Our findings were twofold. First, that our most reliable estimates of the mortality rate of sub-legal crab during the summer were lower than the previously published estimate, but still high, likely ranging from 1-2 year⁻¹ (primarily from data collected in Hood Canal, WA). This implies approximately 65% survival during that time period. Second, however, new research is needed to improve our ability to estimate mortality. We had to discount mortality estimates from many locations because very few sub-legal crabs were sampled in the spring, implying that we need better information on the spatial distribution and movement of those crabs at that time. Additionally, better understanding of the selectivity of crab pot gear for sub-legal crabs would improve our ability to estimate mortality.