

Survey app - methodological annex

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1 Summary statistics

Summary statistics are calculated as weighted means:

$$\bar{x}_w = \frac{\sum_{i \in N} w_i x_i}{\sum_{i \in N} w_i} \quad (1)$$

where \bar{x}_w is a weighted mean of variable x , i ($i \in N$) indicates observation, w_i is a weight assigned to observation i and x_i is a value for observation i . Observation in this case represent a vessel.

The weights are derived as follows:

$$w_i = \sum_{j \in M} H_j \frac{h_{ij}}{h_j} \quad (2)$$

where j ($j \in M$) indicates distinct strata for which population data are available. Here, these are defined by the area in which the harvest occurred and management program under which the landing occurred (IFQ or CDQ). The harvest areas are aligned with the [IPHC management strategy evaluation \(MSE\)](#) program for the Pacific halibut resource occurring within the Convention Area (figure 1). Then, H_j is total harvest within strata j , h_{ij} is harvest of vessel i within strata j and h_j is total harvest within strata j included in the sample.

Variance of the weighted mean is calculated as follows:

$$s_w^2 = \frac{\sum_{i \in N} w_i (x_i - \bar{x}_w)^2}{\sum_{i \in N} w_i - 1} \quad (3)$$

The standard error is calculated as:

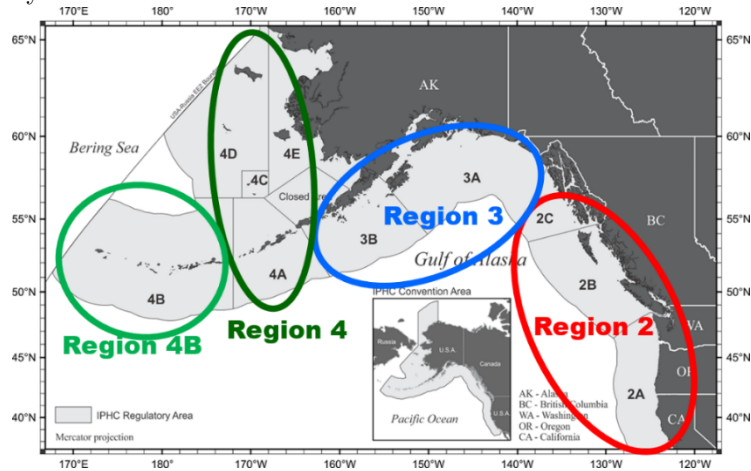
$$SE_w = \sqrt{\frac{s_w^2}{n}} \quad (4)$$

2 Calculation of population totals

The total estimates for aggregates (estimates representing multiple strata) are calculated as follows:

$$X = \sum_{j \in M} \begin{cases} \frac{\sum_{i \in N} (x_i h_{ij} / h_i)}{h_j / H_j} & \text{for } j \in M^* \text{ } (h_j > 0) \\ \frac{h_j}{\sum_{j' \in M^*} H_{j'}} \left(\sum_{j' \in M^*} \frac{\sum_{i \in N} (x_i h_{ij'} / h_i)}{h_{j'} / H_{j'}} \right) & \text{for } j \notin M^* \text{ } (h_j = 0) \end{cases} \quad (5)$$

Figure 1: Biological Regions overlaid on IPHC Regulatory Areas with Region 2 comprised of 2A, 2B, and 2C, Region 3 comprised of 3A and 3B, Region 4 comprised of 4A and 4CDE, and Region 4B comprised solely of 4B.



where h_i is the total harvest of vessel i , M^* indicates a subset of strata with positive harvest in the sample ($h_j > 0$) and j' ($j' \in M$) indicates strata. This calculation method implies that strata not represented in the sample are assigned value based on the weighted mean from all represented strata scaled based on stratum's total harvest.