# Chapter 8
# ADJUSTMENT OF MISSING WEIGHTS

Weight estimates for Type A and B1 catches are calculated from the mean weight of individual species within a year/state/wave/mode/area stratum. In some instances, it may be impossible to calculate weight estimates at the stratum level. Intercept survey interviewers may be unable to weigh any individual fish, making it impossible to calculate a mean weight for that stratum. In some cases, only one fish weight is present for a stratum, providing a mean weight but no variance estimate. Factors affecting the ability to collect weight data include abundance of the species in the recreational fishery, seasonality of the species, and limited sample sizes within a stratum.

Lack of weight data varies by species and fishing area. Using the New England subregion as an example, Maine has a low percentage of Type 3 records with missing individual weights, but the highest number of missing strata weight estimates (Figure 22). Massachusetts has the highest number of missing individual weights, but an intermediate number of missing strata weight estimates. Comparison of five New England species shows the highest percentage of missing estimates and variances for cunner, even though this species has an intermediate number of missing weights on individual fish (Figure 23).
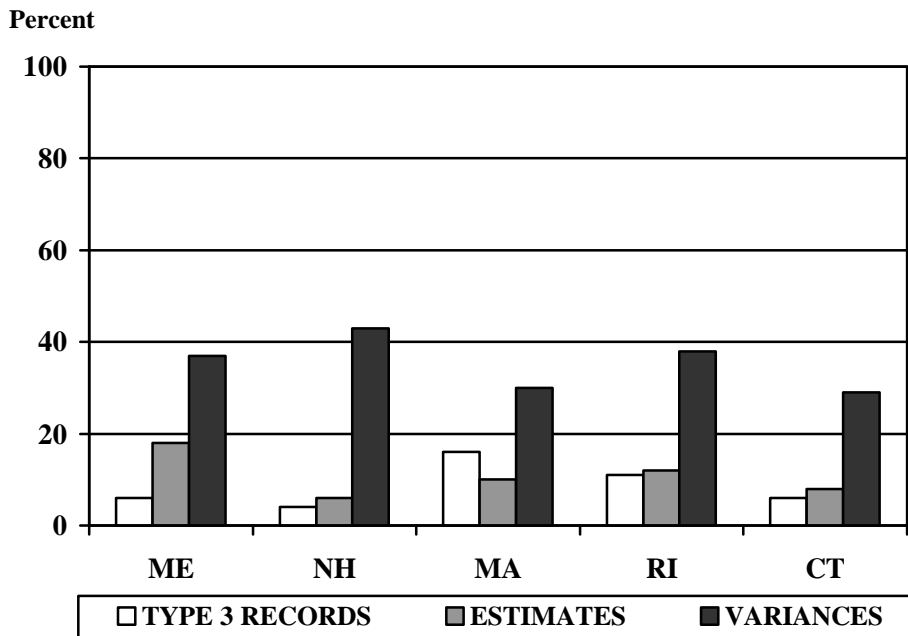


Figure 22.　　Comparison of the number of Type 3 record containing individual fish weight measurements with missing strata weight and variance estimates for individual states in the New England region.
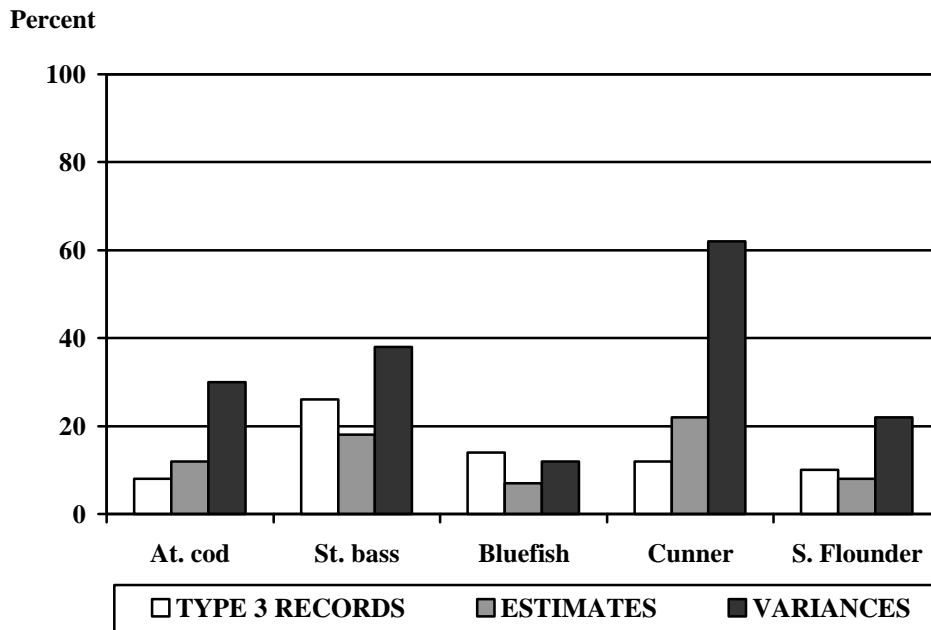
Percent



Figure 23.    Comparison of the number of Type 3 records containing individual fish weight measurements with missing strata weight and variance estimates for individual species in the New England region.

Catch and variance by species are estimated by year/state/wave/mode/area stratum and are then additive across stratum. If weight and/or variance estimates are missing for a stratum, the addition of estimates across strata will result in an underestimate of total weight and its associated variance. Therefore, an adjustment for missing weights and variances must be performed. The simplest adjustment is to substitute mean weights and/or variances from pooled strata. Prior analysis of the data is necessary to determine homogenous strata for pooling.

*Computational Steps:*

1.    Examine the catch estimate data to determine the presence of missing weights and/or variances.

2.    If weights and/or variances are missing within a stratum, examine the raw intercept weight data by wave, fishing mode, and fishing area within a state to determine which combinations are most homogenous for substitution. Data may be pooled across years to compensate for yearly variations in sampling the recreational catch or sparse data. This may be particularly important for species with a wide range in length across years, seasons, and/or modes of fishing.

3.    Calculate mean weights and/or variances from the raw intercept data for the selected pooling combinations.

4.    Substitute the pooled mean weights and/or variances into the estimate records where values are missing.

5.    After substitution at the base strata level (for example: state/wave/mode/area), the procedure is

repeated using incrementally larger strata (state/wave/mode stratum followed by state/wave, and finally subregion/wave stratum) until all records with Type A or B1 catches have associated weights and variances.

MRFSS data for striped bass during 1992 are used to illustrate this process. The fishing area level of stratification was ignored in this analysis for simplicity. Examination of the catch estimates for striped bass in Connecticut and Delaware shows missing weight and variance estimates for several waves and modes (Table 12). There are missing variance estimates for Connecticut in waves 2, 3, 4, and 5; however, not all of these missing variance estimates need adjustment. In several strata, no striped bass of Catch Type A or B1 were reported; therefore, there are no weight or variance estimates since the MRFSS does not estimate weights for released fish. Examination of the observation for wave 5 in Connecticut shows that striped bass Catch Types A and B1 were reported, but no associated weight or variance estimates were calculated for this stratum because no fish were weighed. For Delaware, only the observation for wave 5 needs to be adjusted. This stratum has an estimated mean weight value but no associated variance estimate due to the measurement of only one fish.

Table 12.       Striped bass MRFSS data with missing weight and/or variance estimates, 1992. Periods indicate missing data.

| Wave | State | Mode | Mean Weight (kg) | # Type A Fish Harvested | # Type B1 Fish Harvested | Estimated Weight of Catch | Estimated Variance of Catch |
|------|-------|------|------|------|------|------|------|
| 2 | CT | P/R | 0.00 | 0.00 | 0.00 | 0.00 | . |
| 3 | CT | P/C | 2.89 | 797.71 | 0.00 | 2,305.37 | 624,247.21 |
| 3 | CT | S | 0.00 | 0.00 | 0.00 | 0.00 | . |
| 4 | CT | P/C | 9.70 | 408.54 | 1,021.34 | 3,962.80 | 163,564.04 |
| 4 | CT | S | 0.00 | 0.00 | 0.00 | 0.00 | . |
| **5** | **CT** | **P/C** | **.** | **15.45** | **7.27** | **0.00** | **.** |
| **2** | **DE** | **P/R** | **5.50** | **69.92** | **0.00** | **384.54** | **.** |
| 3 | DE | S | 4.90 | 2,392.71 | 0.00 | 11,724.28 | 8,415,842.49 |
| 3 | DE | P/C | 0.00 | 0.00 | 0.00 | 0.00 | . |
| 4 | DE | P/R | 0.00 | 0.00 | 0.00 | 0.00 | . |

Mean weights and variances were calculated from all modes combined within a state and wave to adjust for missing mean weights and variances (Table 13). However, if no data was present at the state/wave level, as was the case for Connecticut Wave 5 and Delaware Wave 2, pooling was conducted at the subregion/wave level. Before substitution at the state/wave level, 48 records had incomplete weight and variance estimates (Table 14). After the first substitution, 28 records at the state/wave/mode level were corrected. A second iteration was necessary at the subregion/wave level to adjust for the 20 records still uncorrected. Missing weight and variance data may still exist after this iteration if mean weights and variances are missing at the subregion level. Further pooling would be needed until all records are complete.

Table 13.    Striped bass MRFSS data with substitute values for missing weight and variance estimates. Substitutions were calculated from pooled mode data within a state and wave or within a subregion and wave. Periods indicated missing data.

| Wave | State | Mode | Mean Weight (kg) | # Type A Fish Harvested | # Type B1 Fish Harvested | Estimated Weight of Catch | Estimated Variance of Catch |
|---|---|---|---|---|---|---|---|
| 2 | CT | P/R | 0.00 | 0.00 | 0.00 | 0.00 | . |
| 3 | CT | P/C | 2.89 | 797.71 | 0.00 | 2,305.37 | 624,247.21 |
| 3 | CT | S | 0.00 | 0.00 | 0.00 | 0.00 | . |
| 4 | CT | P/C | 9.70 | 408.54 | 1,021.34 | 3,962.80 | 163,564.04 |
| 4 | CT | S | 0.00 | 0.00 | 0.00 | 0.00 | . |
| **5** | **CT** | **P/C** | **.** | **15.45** | **7.27** | **0.00** | **.** |
| **2** | **DE** | **P/R** | **5.50** | **69.92** | **0.00** | **384.54** | **.** |
| 3 | DE | S | 4.90 | 2,392.71 | 0.00 | 11,724.28 | 8,415,842.49 |
| 3 | DE | P/C | 0.00 | 0.00 | 0.00 | 0.00 | . |
| 4 | DE | P/R | 0.00 | 0.00 | 0.00 | 0.00 | . |

Table 14.    Number of records with complete and incomplete weight and variance estimates for striped bass MRFSS data before and after substitution at the state/wave and subregion/wave level.

|  | Before Substitution | After Substitution |
|---|---|---|
| Records with complete weights and variances | 44 | 72 |
| Records with no Type A or B1 catch (no substitution needed) | 66 | 66 |
| Records with incomplete weights and variances | 48 | 20 |
| Total | 158 | 158 |

The NMFS is currently modifying their estimation programs to automate the adjustment of estimates for missing weights and variances. Those adjustments first pool all modes within a state and wave, followed by subregion/wave pooling. These programs have been applied to the most recently generated 1992 and 1993 MRFSS survey data, therefore, no adjustments should be required of this data. There may be a few missing weights or variances if the subregion/wave level pooling was not adequate to substitute for all remaining missing weights. All historical data prior to 1992 will eventually be processed with these programs. Until this is accomplished, it is necessary for all users of the 1979-1991 MRFSS estimates to perform these adjustments. The pooling combinations used in this manual may not meet the needs of all users or substitute for rigorous analytical examination of the data. Different poolings may be more appropriate for a specific analysis or stock assessment.