Rhode Island Department of Environmental Management
Division of Fish and Wildlife, Marine Fisheries Section

Validation of Commercial Shellfish Conversion Factor in RI

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Introduction

The Rhode Island Division of Fish and Wildlife (RIDFW) received funds from the Atlantic Coastal Cooperative Statistics Program (ACCSP) to update shellfish conversion factors which are used for data reporting to NOAA Fisheries. For standardization purposes, NOAA Fisheries reports all of their shellfish statistics in meat weights while the commercial harvest of shellfish is reported in counts or live weights at the dealer. Hence accurate conversion factors are crucial to data reporting. The last time conversion rates were calculated in RI was during 1993, nearly 20 years ago, periodic updates are necessary to account for potential changes over time.

The target species for this project were northern quahog (*Mercenaria mercenaria*), soft shell clam (*Mya arenaria*), eastern oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), and channeled whelk (*Busycotypus canaliculatus*). All but one of the target species were effectively sampled and conversion factors calculated, the exception being channeled whelk. Whelks proved to be a difficult species to procure at local dealers in the shell, most are processed into meats soon after purchase. For this reason samples were attempted to be collected as a part of ongoing whelk fishery research underway at RIDFW. This was not successful as only roughly half of the sample target was achieved and differences in processing procedure between the dealers and the biological study were significant enough to warrant not considering the data for a commercial conversion factor. Channeled whelk data will not be presented in this report.

Materials and Methods

Shellfish samples were procured from a local dealer (American Mussel Harvesters, North Kingston, RI) based on availability and processed when possible, on a monthly basis. The logistics of setting up purchase orders through the state purchasing system would have made purchasing samples from multiple dealers difficult. The single dealer was chosen on the basis that they bought all of the shellfish target species and they buy shellfish from diverse areas within state waters.

Data for each shellfish sample purchased was recorded as they were processed. Data specific to the sample such as harvest area, market category, grade, unit measured, and harvest date were recorded before processing. Data specific to the individual shellfish specimens such as live weight, shell length, hinge width, meat weight and shell weight data was collected from each sample as they were being processed. Shellfish used in the analysis were harvested throughout Narragansett Bay and the Washington County coastal ponds. Samples used in the analysis were harvested in March, May, June, July, August, September, October, November, and December of 2011 and 2012. The sample target for this study attempted a minimum of 400 samples per each species/market category sampled from 5 different harvest dates staggered throughout the year. The procedure for processing the samples was as follows. Individual shellfish specimen dimensions were measured using calipers and weighed on a digital balance. Shellfish were then shucked and the meats completely removed and strained in a colander. Meat and empty shell weights were then recorded separately. Measurements were recorded to the nearest millimeter or tenth of a gram. All sample data was data entered into a custom Microsoft Accesses database. Queries were run against the data for quality control

checks to detect keypunch errors. Conversion factors for live and meat weight were determined by calculating the average weights measured from the samples of a given species or market category.

Results

Northern Quahaug (*Mercinaria mercinaria*)

For sampling purposes quahaugs are segregated into market catagories based on size for conversion factor analysis. Quahaugs are sold at the dealer and reported within a market category and most often by count, making the determination of market level conversion factors for this species a necessity. A total of 2,605 quahaugs were sampled evenly across each of the four market catagories (table 1). Shell widths are the predominant size dimension used in monitoring surveys and for management of this species. The shell width frequencies for each market category of quahaugs can be found in figures 1 – 4. Most of the market categories have discrete size ranges with a minor degree of overlap. Notably, the topneck market category overlaps its two adjacent sizes the most, which makes sense given that most dealers will sort quahaugs into either topnecks or cherries, not both (figure 5).

The conversion factors and standard deviations for live weight of the four market categories of quahaugs were calculated as:

1 live littleneck quahaug =	51.53 g	+/- 18.70 g
1 live topneck quahaug =	104.10 g	+/- 20.72 g
1 live cherry quahaug =	164.59 g	+/- 28.24 g
1 live chowder quahaug =	275.16 g	+/- 54.72 g

The conversion factors and standard deviations for meat weight of the four market categories of quahaugs were calculated as:

1 littleneck quahaug meat =	8.29 g	+/- 3.46 g
1 topneck quahaug meat =	16.86 g	+/- 4.06 g
1 cherry quahaug meat =	27.24 g	+/- 6.65 g
1 chowder quahaug meat =	43.46 g	+/- 10.08 g

The ratio of meat to live weight was calculated as:

Littleneck meat/live ratio =	0.161
Topneck meat/live ratio =	0.162
Cherry meat/live ratio =	0.166
Chowder meat/live ratio =	0.158

Soft Shell Clam (*Mya arenaria*)

Soft shelled clams are reported in pounds by dealers. A total of 2,032 soft shell clams were sampled spanning the size ranges available to be sold (table 1). Shell length is the predominant measurement used in monitoring surveys and management of this species. The shell length frequencies of the samples analyzed can be found in figure 6.

The conversion factor and standard deviation for live weight of soft shell calm was calculated as:

1 live soft shell clam = 33.01 g +/- 13.38 g

The conversion factor and standard deviation for meat weight of soft shell clam was calculated as:

1 soft shell clam meat = 10.48 g +/- 3.79 g

The ratio of meat to live weight was calculated as:

Soft shell meat/live ratio = 0.317

Eastern Oyster (*Crassostrea virginica*)

Eastern oysters are reported in both pounds and by count at the dealers. A total of 372 oysters were sampled for this study. Although the target of 5 discrete batches was met, the original sample target of 400 oysters was not. Wild caught oysters are not as common as other species at local RI seafood dealers and proved more difficult to procure. Shell length is the predominant measurement used in monitoring surveys and management of this species. The shell length frequencies of the samples analyzed can be found in figure 7.

The conversion factor and standard deviation for live weight of eastern oyster was calculated as:

1 live eastern oyster = 78.99 g +/- 27.13 g

The conversion factor and standard deviation for meat weight of eastern oyster was calculated as:

1 eastern oyster meat = 11.77 g +/- 4.40 g

The ratio of meat to live weight was calculated as:

E. Oyster meat/live ratio = 0.149

Blue Mussel (*Mytilus edulis*)

Blue mussels are reported in pounds at the dealers. A total of 536 mussels were sampled for this study. Shell length is the predominant measurement used in monitoring surveys and management of this species. The shell length frequencies of the samples analyzed can be found in figure 8.

The conversion factor and standard deviation for live weight of blue mussel was calculated as:

1 live blue mussel = 37.42 g +/- 11.28

The conversion factor and standard deviation for meat weight of blue mussel was calculated as:

1 blue mussel meat = 9.74 g +/- 3.30

The ratio of meat to live weight was calculated as:

B. mussel meat/live ratio = 0.260

Discussion

The conversion factors calculated in this study can be compared to a conversion factor study conducted by RIDFW in 1993. The only results currently available for comparison from the 1993 study are the meat/live weight ratios. It is unfortunate, but the only documentation available from the 1993 study is a one page memo listing the meat ratios and a brief description of the procedures used in the study. The 1993 study was conducted with slightly different methodology, only one bushel of shellfish was used in the meat/live ratio calculations. Quahaug meat/live ratio was not calculated for each market category in 1993, instead the meat/live ratio was calculated based on pooled data taken from one bushel each of the littleneck, cherry and chowder market grades. Table 2 displays a side by side comparison of the shellfish meat/live ratios calculated in 2012 and 1993.

The results from the two studies are quite similar with the exception soft shell clam meat/live ratio which is notably higher in 2012. The 1993 study is likely low as a result of the small sample size, which was only sampled from one batch, one location in RI waters, and one sampling date. Seasonal and regional differences arising from reproductive stage, density, or substrate could explain the differences between the two studies. Another source of variability could be related to shucking the soft shell clam. It was noted during this study that soft shell clams were the most difficult to keep intact during shucking. The stomach of the soft shell clam can easily become detached from the rest of the sample. Great care was used during the current study to assure that the entire clam was extracted and weighed. A study by Wheaton et al. (2008) in Chesapeake bay found the soft shell clam meat/live weight ration to be 0.29 and also noted that shucking was a source of variability for meat weight.

The comparable results to 1993 and the comprehensive spatial and seasonal methodology used to collect samples, lend confidence to the conversion factors determined in this study. It is our recommendation that these factors be used going forward when appropriate RI shellfish statistics are reported to NOAA Fisheries.

Literature Cited

Wheaton, F. W., G.U. Schaffer, A. L. Ingling, L. W. Douglass, 2008, Physical properties of soft shell clams, *Mya arenaria*, *Aquacultural Engineering*, vol. 38, issue 3, pp 181-188.

Tables and Figures

Table 1. Number of shellfish samples and batches measured for the 2012 conversion factor study.

Species	Market	Samples	Batches
Mussel		536	5
Oyster		372	5
Quahaug	cherry	612	12
Quahaug	chowder	514	13
Quahaug	little neck	733	10
Quahaug	top neck	746	10
Steamers		2032	7
Channeled Whelk		195	24

Table 2. Meat/live ratios for both a RIDFW 1993 conversion factor study and the current 2012 study.

Species	Market	1993 meat/live ratio	2012 meat/live ratio
Blue Mussel		0.3	0.26
Eastern Oyster		0.133	0.149
Northern Quahaug	little neck	0.153	0.161
Northern Quahaug	top neck	0.153	0.162
Northern Quahaug	cherry	0.153	0.166
Northern Quahaug	chowder	0.153	0.158
Soft Shell Clam		0.091	0.317

Figure 1. Shell hinge frequency for quahaug littleneck market size samples.

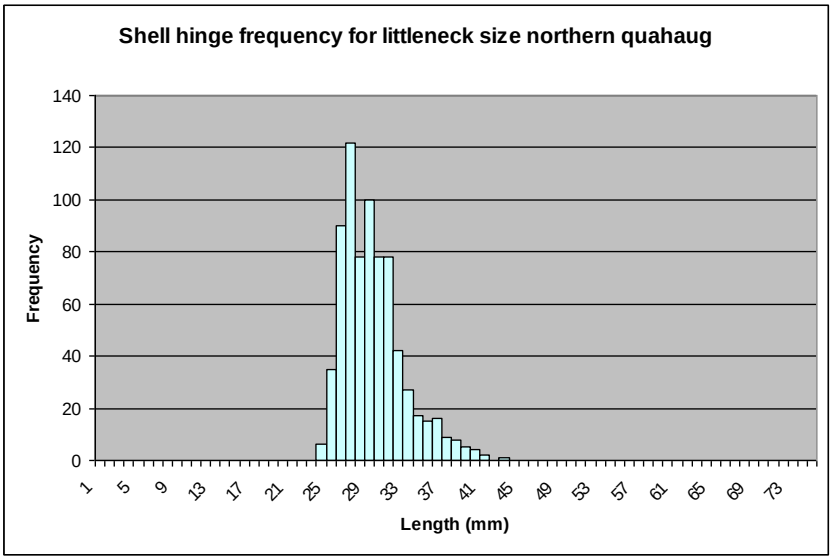

Figure 2. Shell hinge frequency for quahaug topneck market size samples.

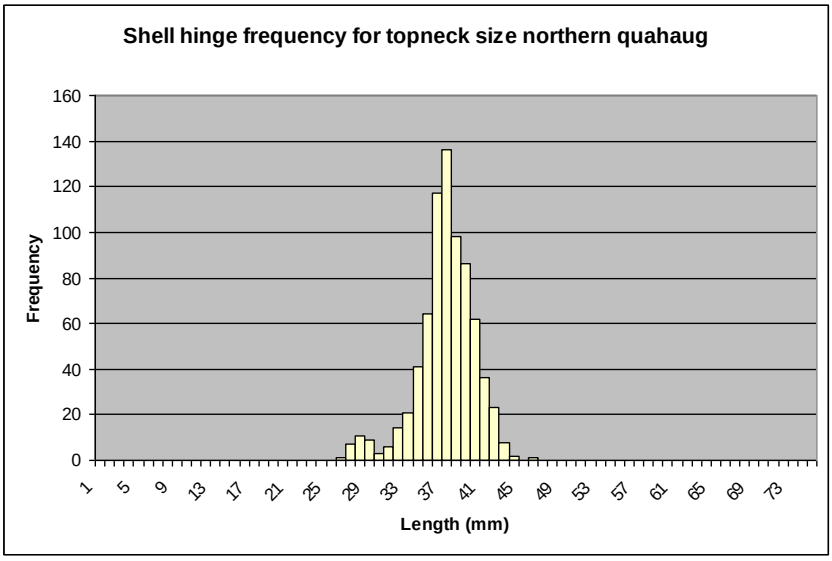

Figure 3. Shell hinge frequency for quahaug cherry market size samples.

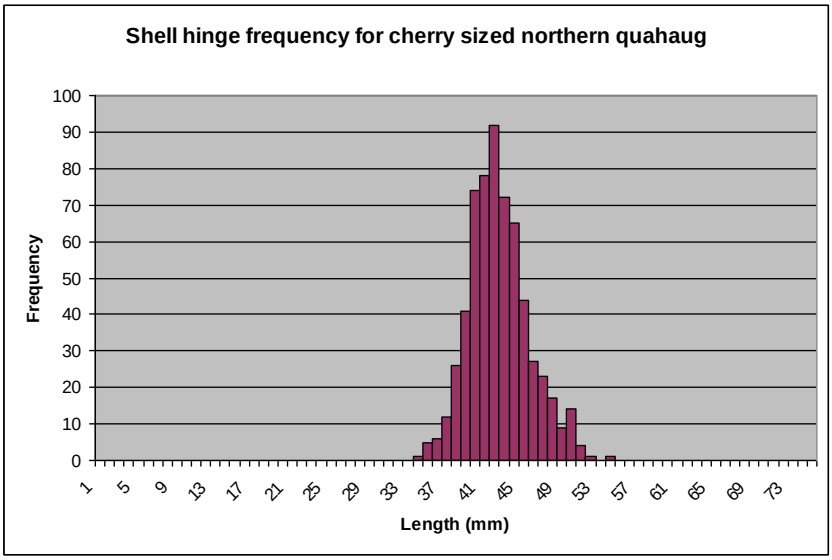

Figure 4. Shell hinge frequency for quahaug chowder market size samples.

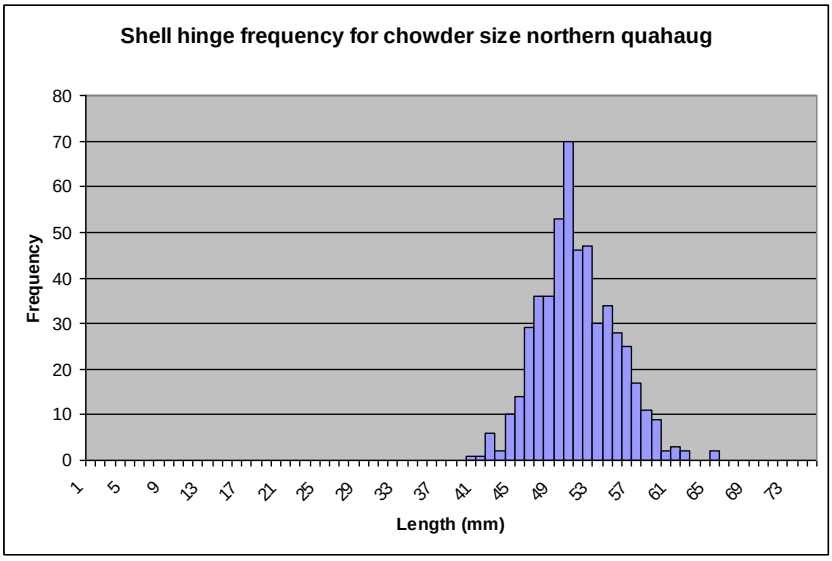

Figure 5. Shell hinge frequency for quahog all market sizes combined.

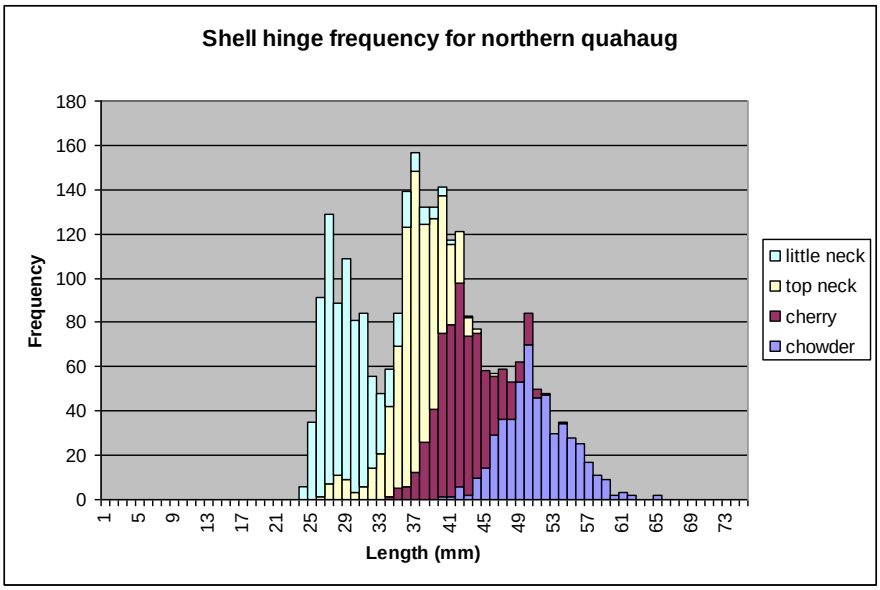

Figure 6. Shell length frequencies for soft shelled clam samples.

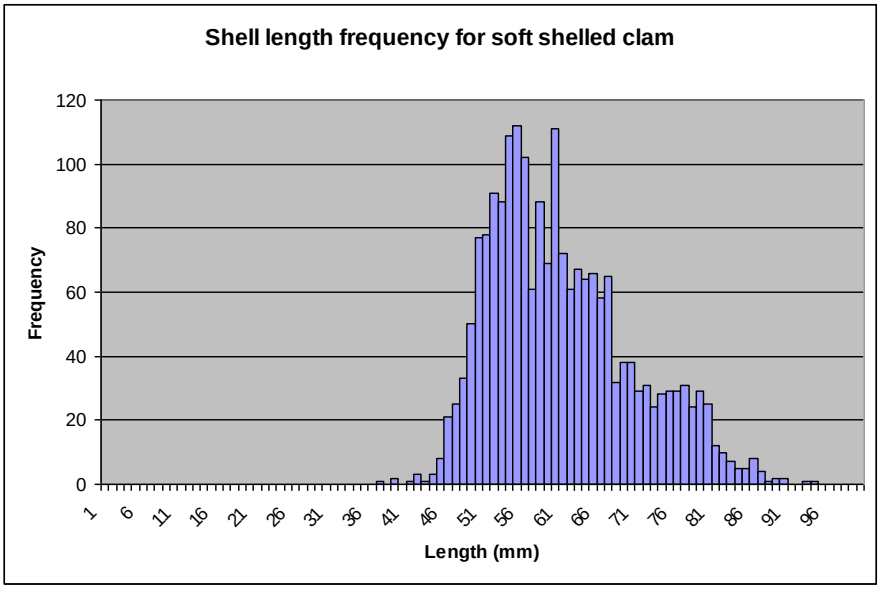

Figure 7. Shell length frequencies for eastern oyster samples.

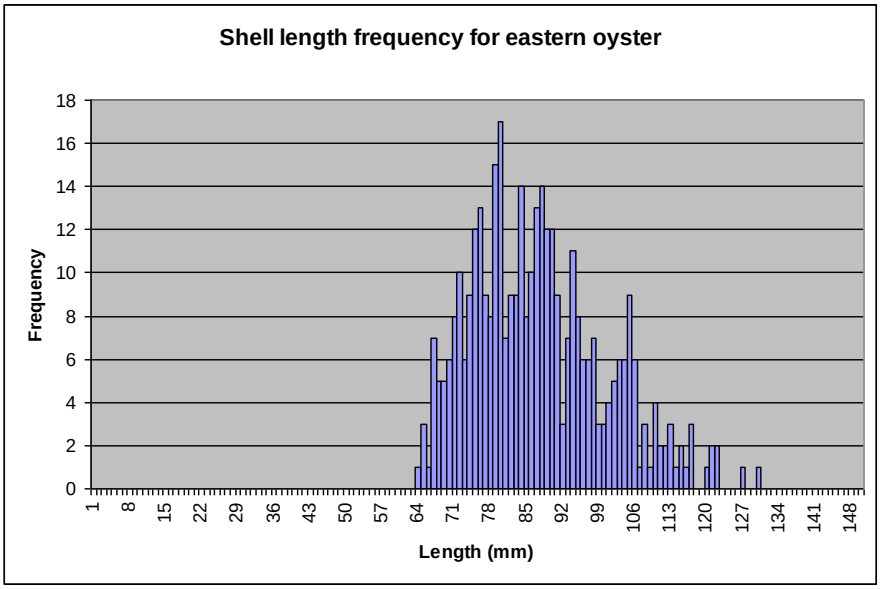

Figure 8. Shell length frequencies for blue mussel samples.