DRAFT – Seasonal meat weight variation data

Issue

The PDT recommends the Committee consider an alternative that would close all MA AA between September 15 – November 30 (2.5 months) to increase scallop yield and reduce overall mortality.

The PDT recognizes that seasonal closures are not widely supported by the industry and they reduce flexibility and can have unintended consequences on business plans, seafood markets etc. However, there are large seasonal variations in meat weight and quality in the Mid-Atlantic. Since fishing effort is not "on the clock" in access areas and vessels are only under a possession limit, there is more incentive to fish in access areas in poorer meat weight seasons compared to open areas, when vessels are on the clock under DAS. Many times in the past Mid-Atlantic access areas have not performed as projected. This could be for a variety of reasons, and likely a combination of reasons. But limiting effort during poor meat weight seasons could increase yield overall from these areas and improve the overall performance and total catches from MA access areas.

Scallops that are spawning in the fall have smaller meats and the quality of meats is lower. There is inter-annual variation, but for the most part there can be a 20% difference in meat weights in the summer compared to the fall.

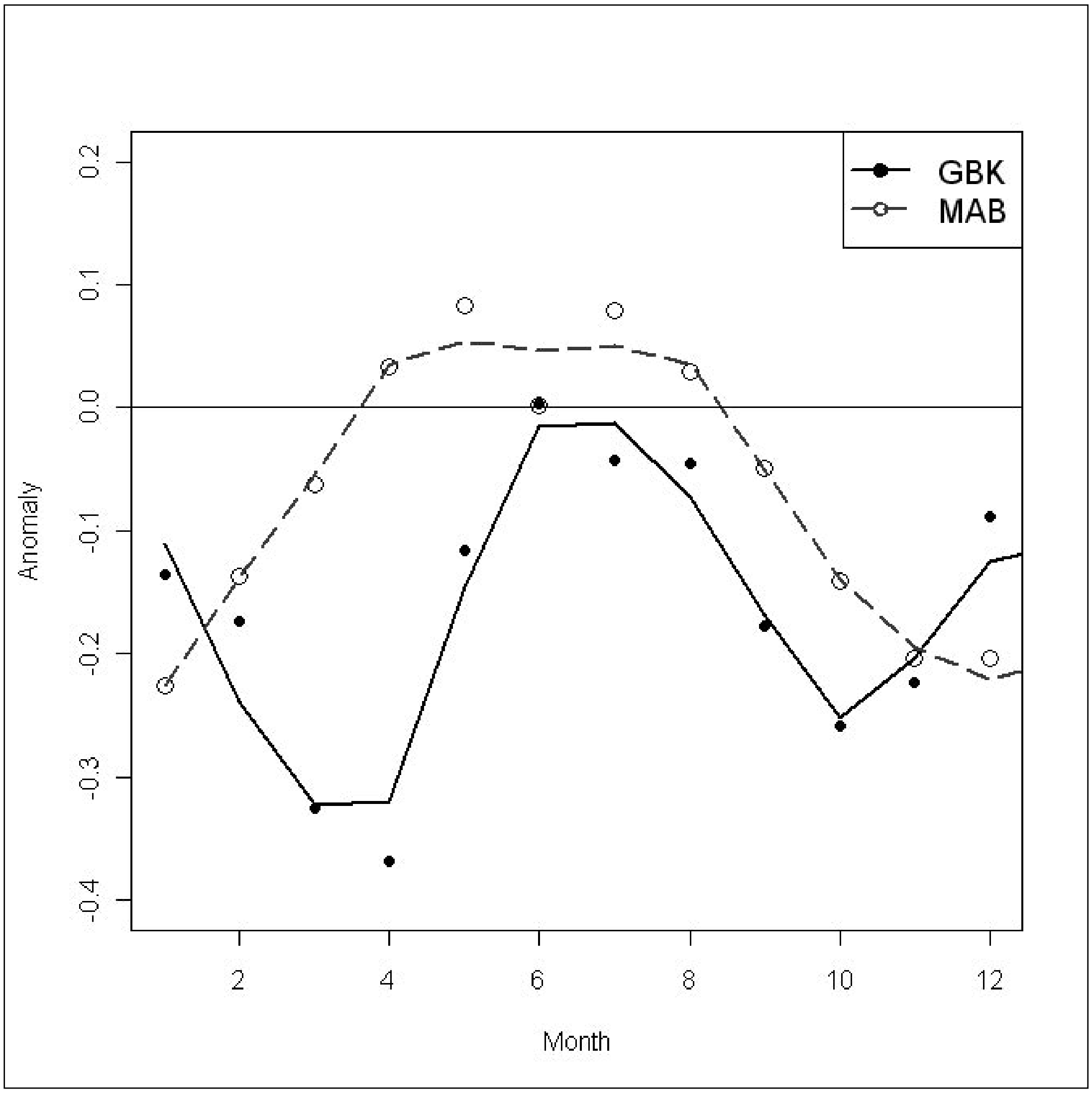
While not the primary rationale for the suggestion, reducing effort between September 15-November 30 could also have beneficial impacts on sea turtles, if vessels do not fish in MA areas during that time and either do not fish at all, or fish in open areas farther north that do not overlap with higher concentrations of turtle distribution.

Data

The PDT reviewed several sources of data that all support that meat weights are higher in the summer and decline rapidly in the fall when scallops spawn.

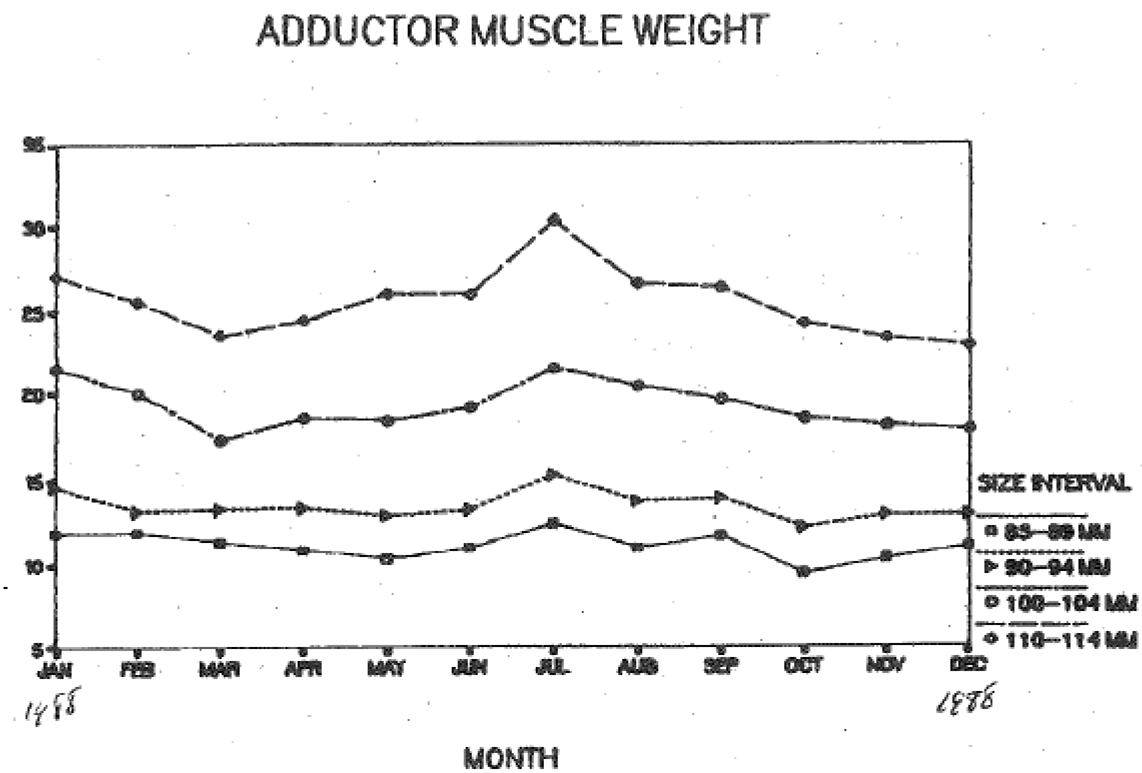
1. Seasonal meat weight data from observer scallop trips compared to meat weight data from federal survey (July)

Figure 1 – Scallop shell height: meat weight anomaly for GB and MA (Hennen and Hart, 2012)



2. Historic meat weight data from 1987 and 1988 (VIMS Masters Student)

Ann Schmitzer, a Master's student at VIMS analyzed monthly meat weights from about 7,000 scallops throughout the year in 1988. A peak was observed for all size classes in the summer, followed by a rapid decline in the fall.



23 Sampling DATES
2-3 per month

110-114 mm N= 1365
100-104 mm N= 1908
90-94 mm N= 1859
85-89 mm N= 1438

MATURE GAMETE VOLUME FRACTIONS AT THREE SAMPLING AREAS

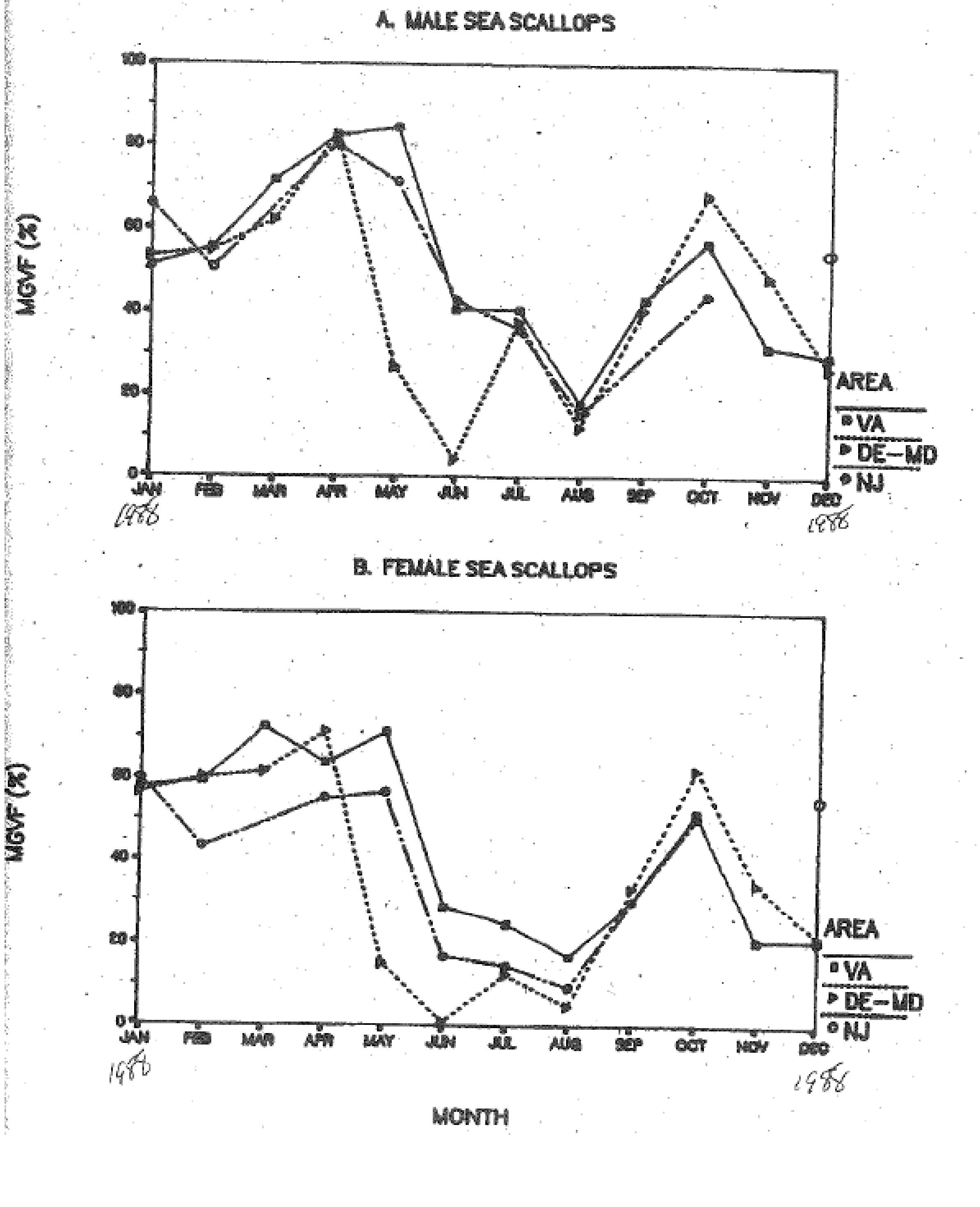


Table 11. Estimated adductor muscle weights and meat counts for 92 and 102 mm sea scallops.

	92 MM SCALLOPS				102 MM SCALLOPS			
	MALE		FEMALE		MALE		FEMALE	
MONTH	MEAT WT(g)	MEAT CT	MEAT WT(g)	MEAT CT	MEAT WT(g)	MEAT CT	MEAT WT(g)	MEAT CT
JAN	15.04	30	14.87	30	20.96	21	20.22	22
FEB	13.30	34	14.02	32	17.85	25	18.98	23
MAR	12.74	35	12.03	37	17.17	26	17.29	26
APR	10.18	44	10.72	42	13.21	34	13.25	34
MAY	13.69	33	13.74	33	18.96	23	18.21	24
JUN	13.41	33	13.64	33	19.75	22	18.81	24
JUL	16.36	27	16.48	27	23.42	19	23.68	19
AUG	14.48	31	14.28	31	20.23	22	20.61	22
SEP	16.18	28	17.02	26	23.54	19	22.81	19
OCT	13.14	34	13.06	34	17.96	25	17.11	26
NOV	11.89	38	12.38	36	15.72	28	15.26	29
DEC	12.35	36	12.64	35	17.12	26	16.24	27

3. Seasonal meat weight data from RSA seasonal bycatch research

While this research was conducted on GB, there are similar seasonal variations for the MA, higher meat weights in the summer and lower meat weights in the fall.

A Research Set-Aside project (Coonamessett Farm Foundation bycatch survey) has been evaluating the seasonal changes in bycatch rates in the scallop fishery in both Closed Area I and II for over two years. Shell height/meat weight samples were collected during monthly cruises. Data have been collected during most months since March 2011. In the first year of this study (2011) about 3,000 scallops were measured, and when all available data are combined for March 2011 through September 2013 almost 9,000 scallops have been measured to date. The meat weight model includes the following fixed effects: shell height, area (Eastern Georges Bank, Western Georges Bank), month, and an interaction between month and area. Non-parametric smoothers were used to display annual and inter-annual trends in the relationship for the two areas analyzed and interpolate across any missing months.

Figure 2 and Figure 3 display trends for the two areas together as well as each area separately with the proposed temporal closures specific to each resource area. Results graphically depict the relative position of temporal closures with respect to observed patterns in meat weight maxima and minima. Overall, it seems that Closed Area I has higher meat weights than Closed Area II, at least for the first year of the study. This could be related to depth differences between the stations since scallops have different growth rates at different depths. But for these analyses depth was not considered separately. In general, the spawning closure season under consideration in the EFH Omnibus Amendment of February 1-April 15 seems to overlap when scallops on Georges Bank are ascending to their max weight in June/July. The yellow bars indicate the time of year the scallop access areas are currently closed in CA2 to reduce scallop fishing when YT bycatch rates are highest. This season (fall) is also when scallop meats are lowest.

It is important to keep in mind that this data set is only 2.5 years long. The spring cycle of scallop growth does vary from year to year based on a variety of factors, so the monthly meat weight variation may not match up precisely with the observer data analyses in Figure 1, which is from a larger area (all of Georges Bank) and longer time series.

Figure 2 – Model generated estimate of meat weights for scallops larger than 125mm for Eastern and Western GB (based on scallops measured in CFF bycatch survey)

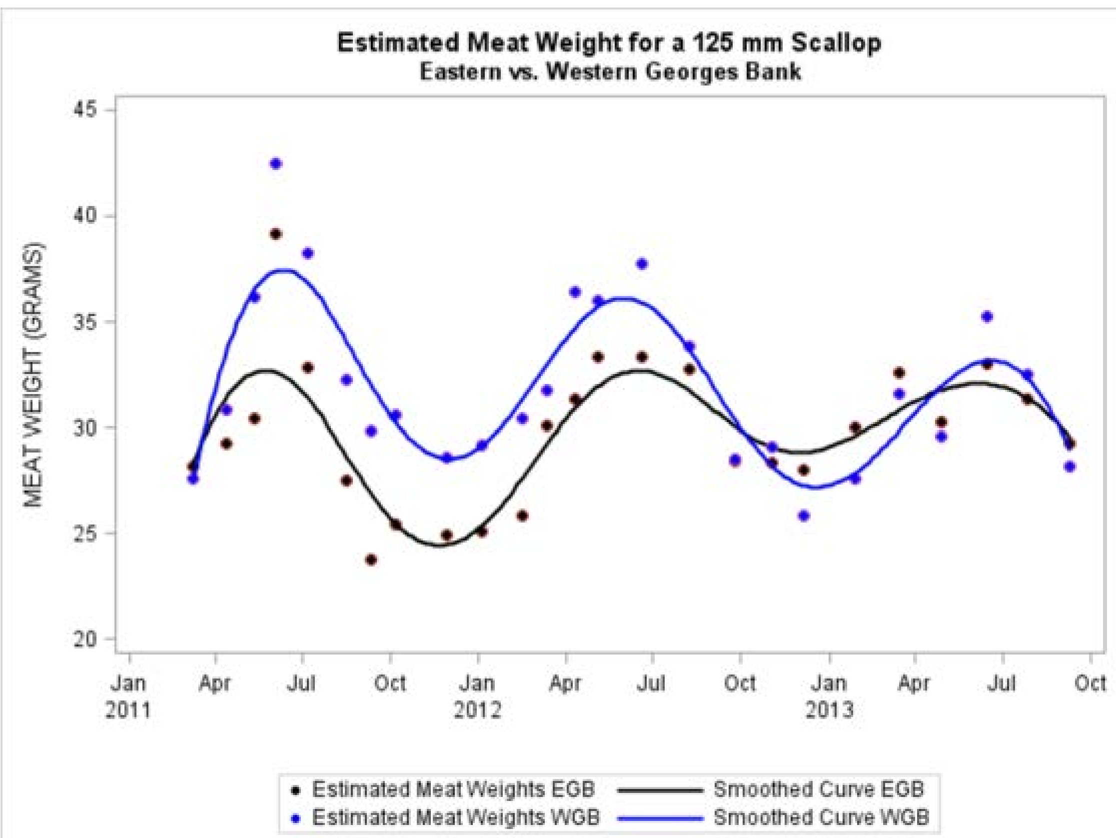
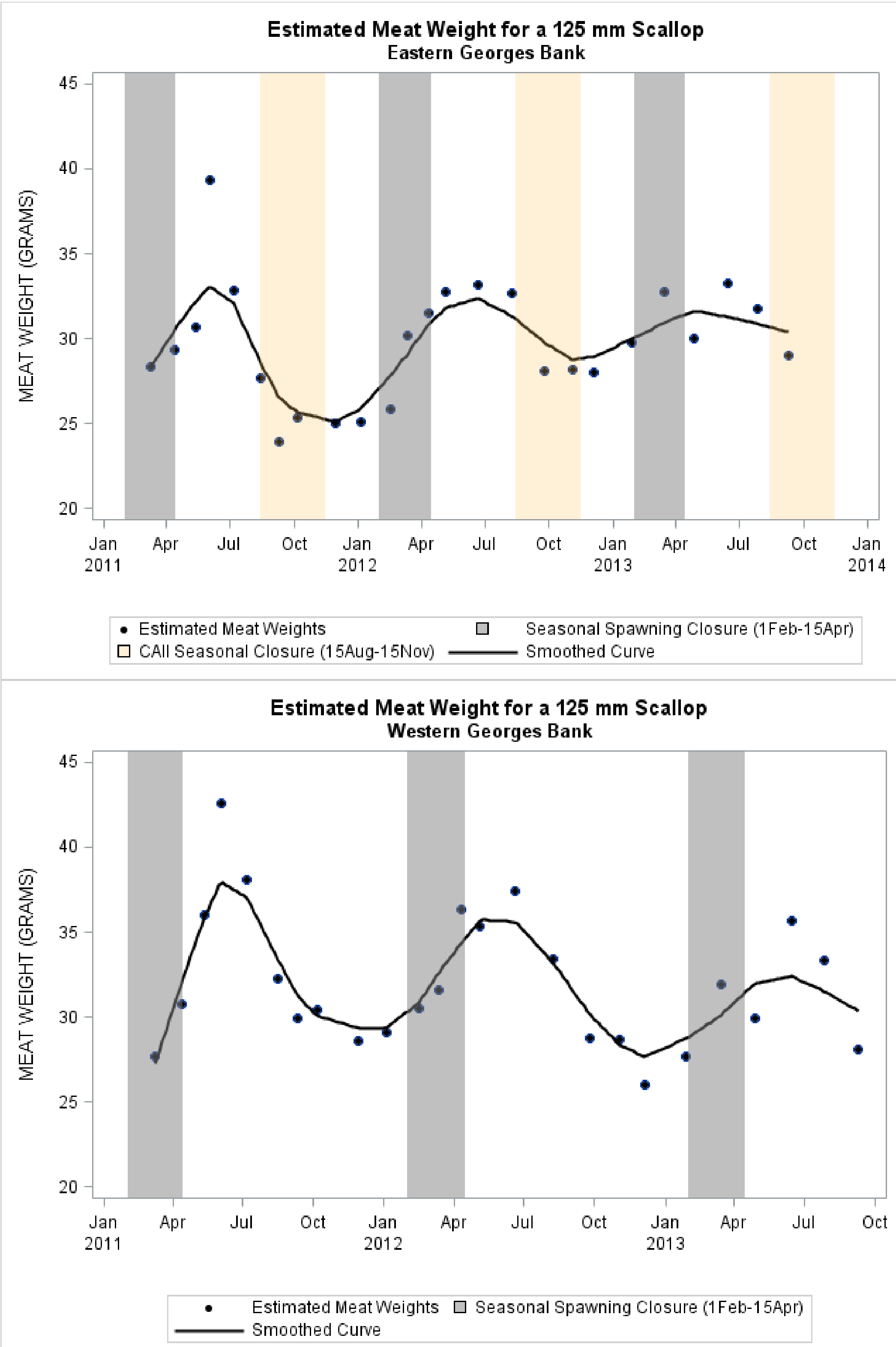


Figure 3 – Model generated estimates of meat weights for scallops larger than 125mm for Eastern (top) and Western GB (bottom) with potential seasonal closures included. Grey is spawning closure under consideration and yellow is in effect already for CAII to reduce yellowtail bycatch.



4. SARC59 – Appendix B3. Shell height meat weight relationships

2 Results and Discussion

In general, the observed meat weights (from observed volumes) should be less than the survey-based, predicted meat weights (a negative anomaly) because the commercially shucked scallops leave some meat on the shell, and because the surveys occur in late spring or summer (depending on the year), a time of typically high meat weight. The pattern in the anomaly calculated for MAB roughly follows this pattern in that the anomaly is negative in all months excluding April through July, a period that overlaps the survey (Figure 12). On Georges Bank, however, there were months of the year where the observed scallop meats were almost 15% heavier than the predicted meats, resulting in a positive anomaly (Figure 13). The positive anomaly appears in February through July. It is clear from examination of Figure 13 that either observed meat weights were heavier than expected and/or predicted meat weights lighter between January and May since 2009. In 2009, the timing of the survey was shifted to earlier in the year. Predicted meat weights have increased for scallops greater than about 130 mm since the last assessment (Figure 8). Therefore observed meat weights must have increased. In fact, observed meat weights have both increased and stabilized dramatically in the years since 2009 (Figure 14). It is possible that this reflects an increase in efficiency among fishers by selecting areas and time periods when meat weights were high. The early months of the year were not as well sampled by observers relative to the summer months and smaller sample sizes may be influencing this pattern as well (Table 6). There is also some indication of a systemic increase in meat weight for the region generally, based on the shell height to meat weight model estimates reflected in Figure 8, but this result is confounded with the shift in the timing of the survey.

The anomalies refine assessment model estimates of the total annual weight of meats removed by the fishing fleet, based on the lengths recorded by port-side samplers. To make the conversion from port-side shell height to meat weight, the median monthly meat weight anomalies were smoothed by a second order polynomial loess function with a span of 0.25 (months). This short smoothing span provided a modest smooth that allowed the data to strongly influence the model fit (Figures A15). The smooth was applied to a duplicated annual cycle (i.e. 24 months were fit, using identical data in each 12 month period) and the middle 12 months were selected and reordered so that January was the first month in the resulting model fit. This manipulation guaranteed that December and January produced linking estimates and minimized edge effects. The smoothed monthly anomalies were then weighted by the landings in each month in each year for which we have landings data ($1975 - 2012$) and annual median values were calculated.

The annual values were somewhat different from similar values calculated for the last assessment (Figures A16 -A17). The anomalies are generally lower ($\sim$ 2%) in the MAB and higher ($\sim$ 15%) in the GBK. The difference in the GBK region is due to the large shift in the monthly anomalies between the last assessment and the current one, based primarily on the increase in observed meat weight (Figure 14). The shift in the MAB is relatively minor and is likely attributable to a combination of the various manipulations to the observer data and small changes in the shell height to meat weight model.

3 Literature Cited

K.P. Burnham and D.R. Anderson. Model selection and multimodel inference: a practical information-theoretic approach. Springer, 2002.

J.F. Caddy and C. Radley-Walters. Estimating count per pound of scallop meats by volumetric measurement. Technical Report 1202, Fish. Res. Brd. Can. Man. Rep., 1972.

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R.J. Smolowitz, F.M. Serchuk, and R.J. Reidman. The use of a volumetric measure for determining sea scallop meat count. NOAA Tech. Mem. F/NER-1, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543-1026, 1989.

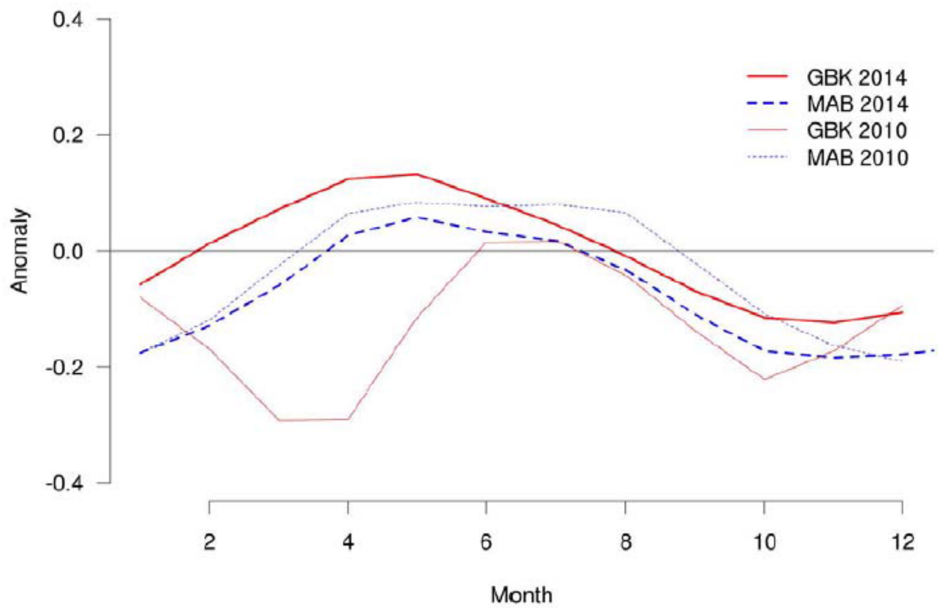

Figure 11: The anomalies estimated in the last assessment compared to the current anomalies.

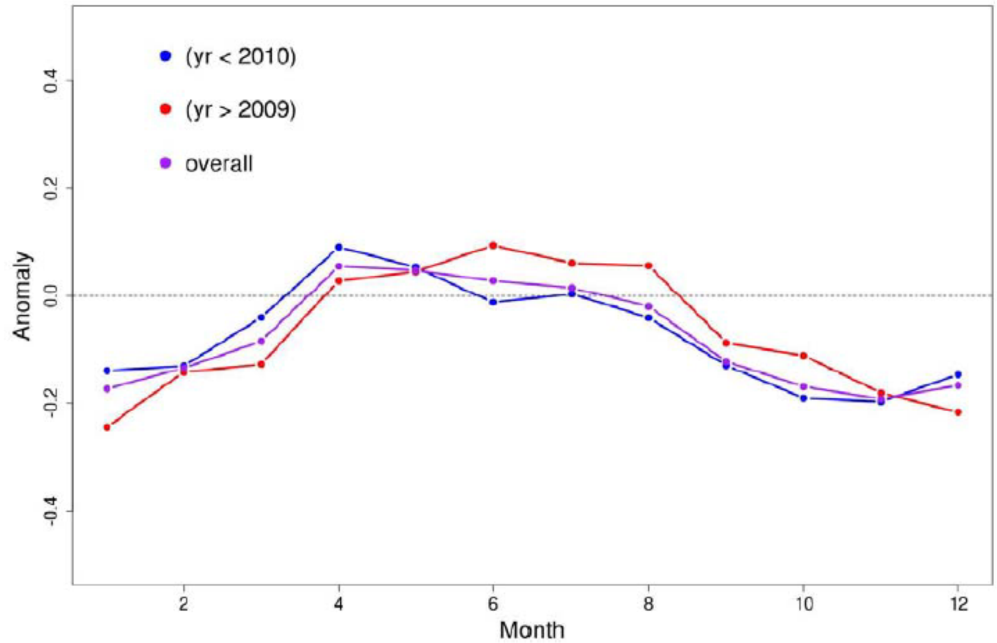

Figure 12: Monthly meat weight anomalies for the period prior to 2010, the period after 2010 and overall in the MAB.

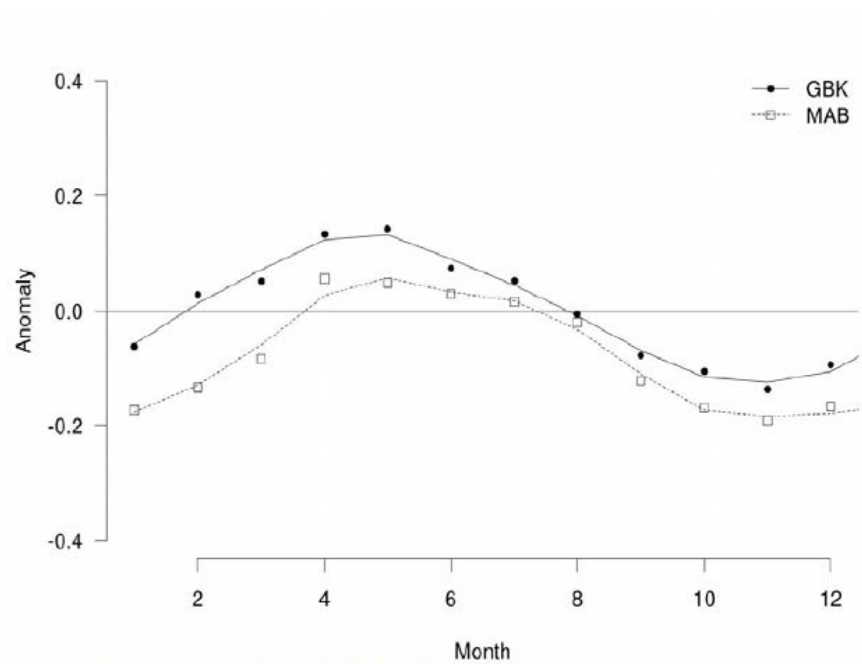

Figure 15: Smoothed anomalies for MAB and GBK.