New England Fishery Management Council
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John F. Quinn, J.D., Ph.D., *Chairman* | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: **October 12, 2016**

TO: Science and Statistical Committee

FROM: Scallop Plan Development Team (PDT)

SUBJECT: **PDT recommendations for OFL and ABC for Framework 28 (FY2017 and FY2018 default)**

This memorandum forwards the Scallop PDT recommendation for an OFL and ABC for the scallop resource for FY2017 and FY2018 (default) (Table 1). It should be noted that the values are the same for both years. The original model outputs are also provided, which have different values for each year (Table 2). PDT recommends that the OFL and ABC limits be restricted to the 2017 values for both years.

The PDT met on October 6, 2016 to review these estimates and drafted the consensus statement below. More details will be provided during the presentation of this recommendation at the SSC meeting on October 18, 2016.

By consensus, the Scallop PDT recommends that the model estimates for OFL and ABC for 2017 and 2018 be presented to the SSC; however, the PDT recommends that the OFL and ABC should be set at the 2017 values for both years. While biomass is expected to increase in 2018, the PDT is concerned that the current configuration of the model may lead to an overestimation of the growth of juvenile scallops, particularly in areas where scallops have not historically settled. The PDT recommends that finer-scale estimates of growth and weight be used in the model this year to account for anomalously slow growth, specifically in portions of the Nantucket Lightship area. The PDT also notes that if higher than normal natural mortality occurs, the estimates will be overestimated, especially for 2018. As FY2017 will be a 13 month fishing year to account for the change in the start of the scallop fishing year from March to April, the PDT is recommending prorating the ABC and OFL to account for the additional month. There are practical management risks with setting the 2018 default values high and potentially needing to correct them later. The IFQ allocations for the LAGC fishery and observer set-aside program are currently based on the ABC/ACL value and those go into effect at the start of the fishing year.

Table 1 – Scallop PDT recommendation for OFL and ABC for Framework 28, Fishing years 2017 and 2018 (default).

Year	ABC_Land	ABC_Disc	ABC_Tot	OFL_Land	OFL_Disc	OFL_Tot
2017	46737	15004	61741	56533	18952	75485
2018	46737	15004	61741	56533	18952	75485

Note: 2018 default is the same as 2017 estimates

Table 2 – Original model estimates for OFL and ABC for Framework 28

Year	MABms	GBBms	TotBms	ExplBms	ABC_Land	ABC_Disc	ABC_Tot	OFL_Land	OFL_Disc	OFL_Tot
2016	93798	141174	234971	52503	37852					68418
2017	124645	183983	308628	106681	43142	13850	56992	52184	17494	69678
2018	127899	182259	310158	157768	50946	13461	64407	61265	17004	78269

Background

There was a benchmark assessment for Atlantic sea scallop in 2014 (SARC59). Through 2013 the biomass estimate was well above its target, and overfishing was not occurring. The PDT updated these reference points through 2015 and concluded that biomass has continued to increase, and fishing mortality remains below the threshold (Figure 1).

In its 2015 memo to the SSC, the PDT expressed concern that the model may be seriously underestimating natural mortality of juvenile scallops in high density areas based on an earlier experience in 2003 in the Elephant Trunk when a large set of scallops was observed in the area. At the time (2003) the Elephant Trunk area was closed but biomass declined rapidly in the absence of fishing based on subsequent survey results. There were no changes made to natural mortality assumptions in the 2015 model run (last year), and the PDT recommended that out year default measures for 2017 be set equal to the 2016 ABC values. The SSC agreed with this approach, and recommended that the 2017 default specifications be set equal to the 2016 ABC. The PDT noted and discussed the SSC's 2015 recommendations to the Council, and did not pursue changes to natural mortality assumptions this year.

The 2016 surveys of the scallop resource confirmed that the 2017 estimate from FW27 (2015) model run was indeed overly optimistic. The PDT remains concerned about the model underestimating natural mortality and/or growth. One reason for the optimistic estimate appears to be anomalous slow growth of scallops, particularly in the southern part of the NLS-AC-S (Figure 6) where densities can be as high as 40-100 animals per square meter. The PDT recommends adjusting model parameters to better account for the observed slow growth in the Nantucket Lightship area (see Figure 2 and Figure 3). Changes to the 2016 model include finer scale shell height/meat weight (SH/MW) estimates of areas in the Nantucket Lightship (NLS) based on the 2016 VIMS dredge survey of the area, and reducing the value of the asymptotic maximum length ($L\infty$) in the NLS-AC-S zone to 90 mm. The SH/MW estimates from the 2016 VIMS dredge survey allow for the comparison of meat weights between the four NLS zones. Table 3 shows the relative meat yield (assuming equal depth and length), relative to the productive NLS-AC-N. The north area is typically considered to be one of the more productive resource areas. The PDT also noted that based on observed length frequency obtained from 2016 surveys, the four year old animals found in the shallower portions (<70m) of the NLS-AC-S zone did not appear to exhibit the same anomalous slow growth as their counterparts in the deeper portions of the southern NLS-AC-S zone (Figure 5). The PDT recommends applying the SARC 59 SH/MW relationship for this area. With regard to growth potential in NLS-AC-S, reducing $L\infty$ was viewed as an appropriate update to the projection model because scaling back $L\infty$ reduces growth (K) proportionally (Figure 4). Ultimately, the updated 2016 VIMS SH/MW estimates in combination with a lower $L\infty$ value result in reductions to the biomass estimates for the NLS-AC-S. Given the observed and projected shell height of the slow growing scallops in the NLS-AC-S, the PDT also discussed applying the Yochum and DuPaul (2008) selectivity curve for a 4" ring in the deeper portion of this area (>70 meters). This gear only selectivity assumption results in an increase of the exploitable biomass estimate relative to the fishery

selectivity curves from SARC 59 that generally select larger animals as a result of both gear and crew that typically selects a larger animal due to market factors (NEFSC 2014).

Table 3 - Description of the SH/MW changes in Nantucket Lightship SAMS areas.

SAMS area	SH/MW applied in 2015	SH/MW applied this year (2016, FW28)	Relative meat weight compared to scallops in NLS N in 2016 survey (assuming equal SH and depth)
NLSAC-N	SARC 59	SARC 59	-
NLS-AC-S 'Shallow' (>70m)	SARC 59	SARC 59	-
NLS-AC-S 'Deep' (<70m)	SARC 59	VIMS 2016 (NLS S)	~61%
NLS ext	SARC 59	VIMS 2016 (NLS ext)	~80%
NLS NA	SARC 59	VIMS 2016 (NLS NA)	~69%

In addition to uncertainty related to the assumptions of natural mortality and anomalous growth, there is also uncertainty related to the estimates of biomass. In 2016 there were multiple surveys conducted, including intensive surveys in some areas that contained high densities of small scallops (Table 1). There is uncertainty in the survey biomass estimates where in some cases, variation between estimates is considerable. Some variation in survey biomass estimates can be expected because survey methods and coverage levels vary by area, however the PDT feels that the divergence of the estimates in 2016 cannot be explained by this alone. The PDT has identified as possible causative factors; a reduction of dredge efficiency in high scallop densities, biomass estimation methods from optical surveys, and methods for combining biomass estimates as issues to investigate after the completion of Framework 28. Individual survey biomass results for a given subarea are averaged together to calculate a final biomass estimate. The uncertainty surrounding this estimate should be considered as well. The Council has identified a follow-up to the scallop survey peer review as a potential work priority for 2017, and the PDT plans to continue exploratory analyses in an attempt to gain clarity into the factors contributing to the divergent values observed in some areas during 2016.

Finally, there are practical reasons why it may not be advantageous to have the ABC increase in 2018. Framework 28 is a one year action and the OFL and ABC estimates will be reviewed again next year. Therefore, FY2018 is default only and will be in place at the start of the fishing year (currently March 1) until a subsequent action replaces it. Some fishery specifications are determined directly from the ABC/ACL value (i.e. general category IFQ and observer set-aside). The PDT recommends that precaution should be taken when considering out year projections given the anomalous slow growth of scallops in portions of the Nantucket Lightship area, which is driving the large increase in overall projected biomass in 2018. Overly optimistic default allocations (2018) will need to be reduced if greater than next year's ABC recommendation. This can have negative impacts and cause confusion for fisheries managers and participants in the fishery.

For all these reasons the PDT recommends that the same OFL and ABC values be set for FY2017 and FY2018 (default). FY2018 values will be revisited next year and can be adjusted accordingly based on more updated survey and fishery information.

References:

NEFSC. 2014. 59th Northeast Regional Stock Assessment Workshop (59th SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 14-09; 782 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/

Yochum, N. and Dupaul, W. D. Journal of Shellfish Research, Vol. 27, No.2, 265-271, 2008.

Figure 1 – (Top) Total biomass through 2015 (with MA and GB subareas), estimated by the updated CASA model. (Bottom) Total estimate of fishing mortality through 2015 (with MA and GB subareas), estimated by the updated CASA model

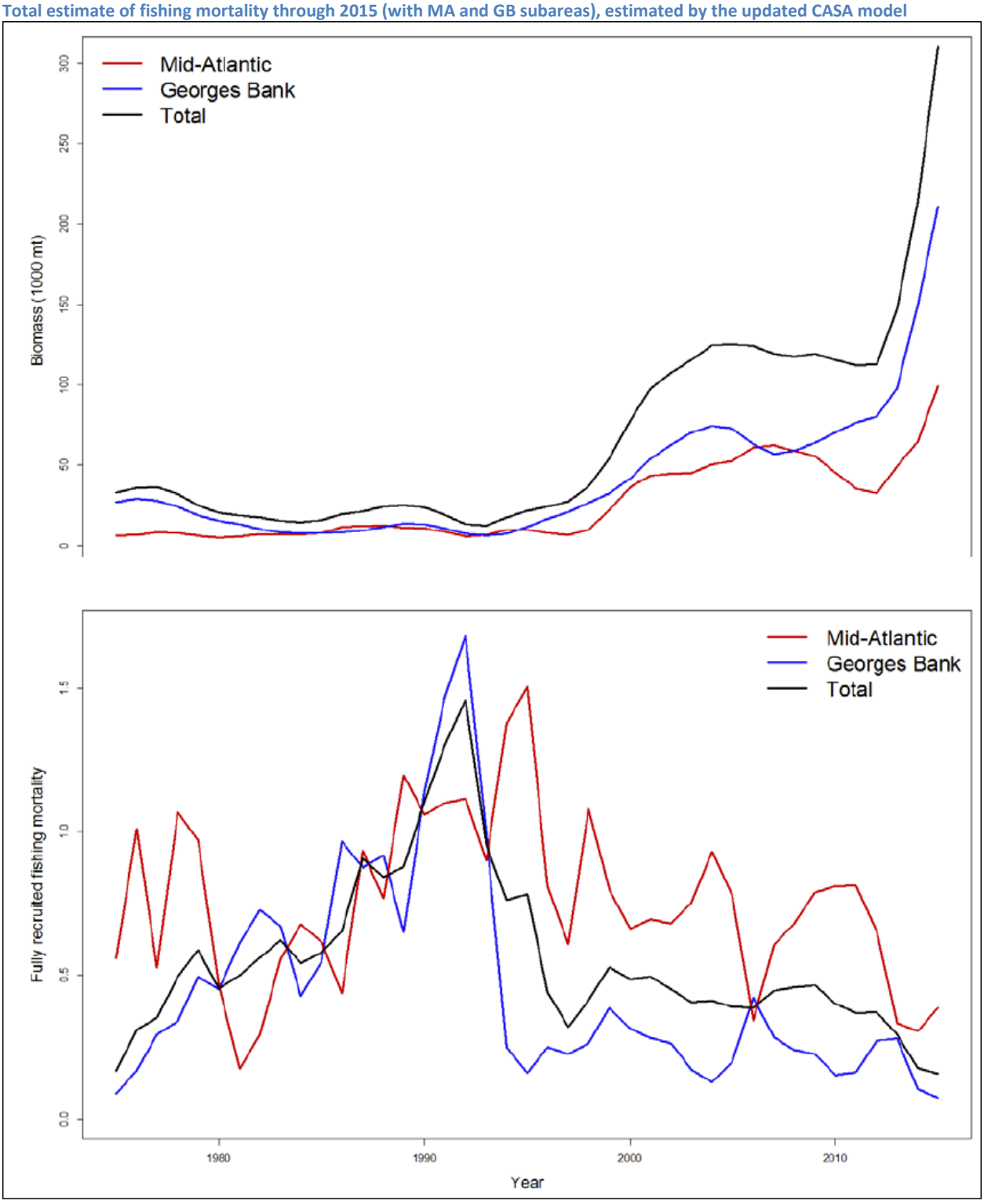

Figure 2 – Shell height frequencies for the Nantucket Lightship Access South zone from the 2015 model run.

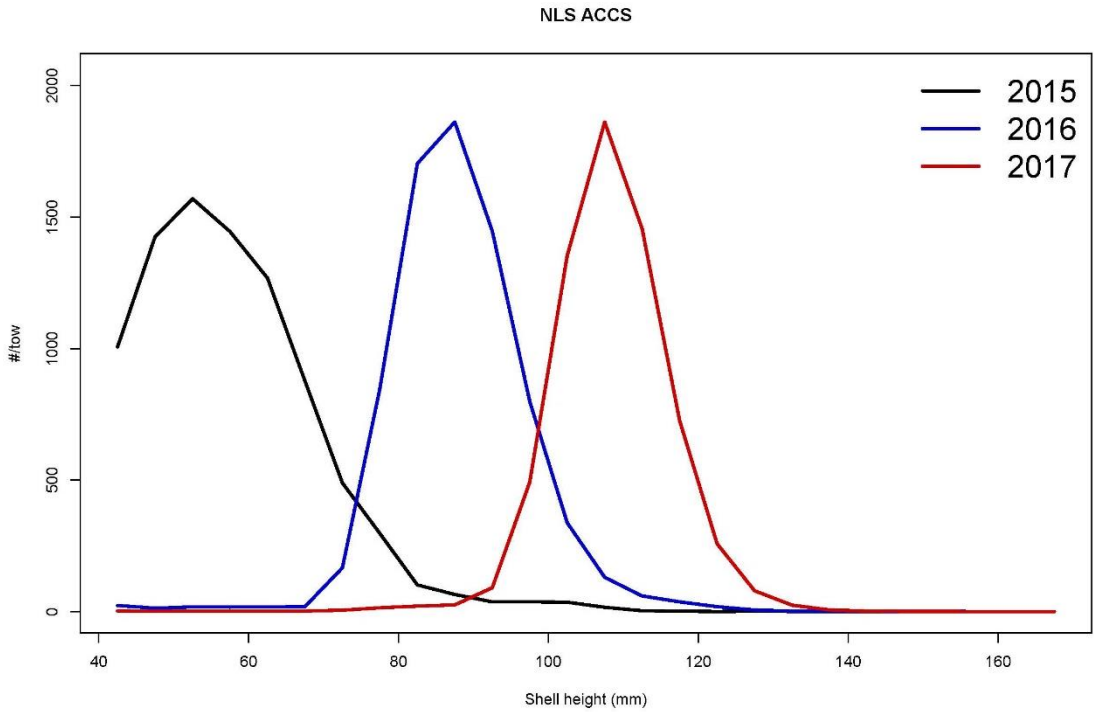

Figure 3 - Shell height frequencies for the Nantucket Lightship Access South (NLS-AC-S) zone from the 2016 model run. The 2016 run used a finer scale SH/MW relationship based on samples from the 2016 VIMS dredge survey, and reduced the L infinity for this zone to 90mm.

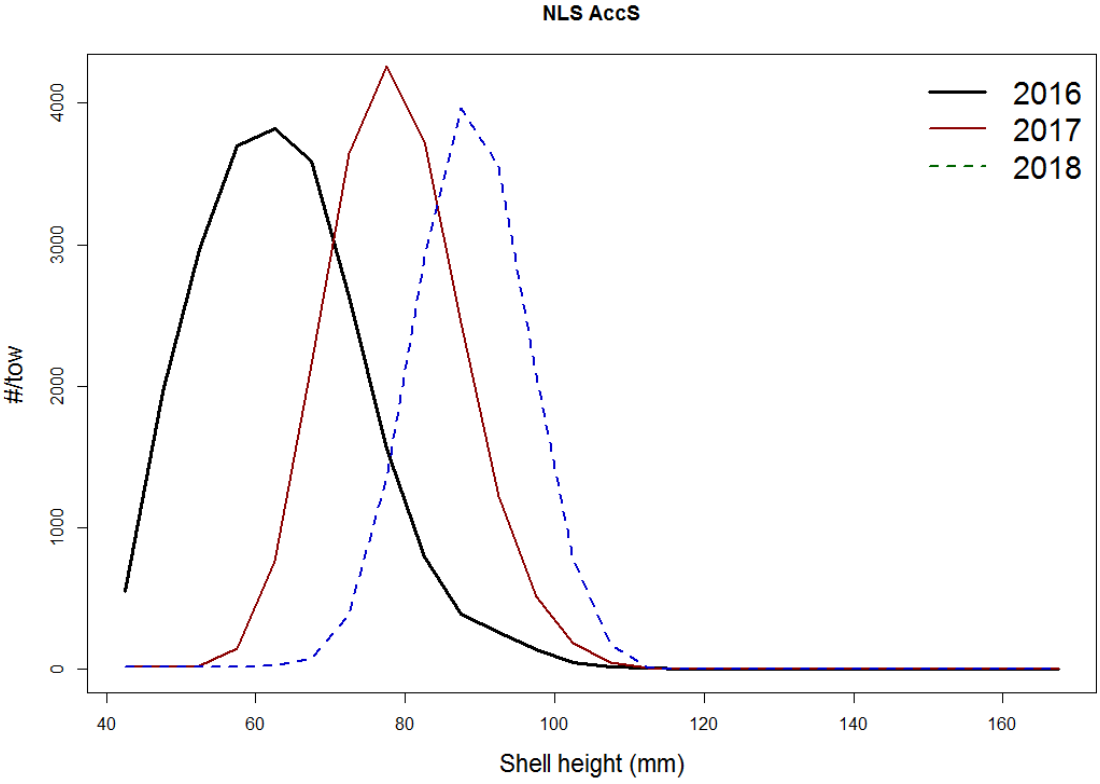

Figure 4 - Observed and projected growth in the Nantucket Lightship access area South (NLS ACC S) based on HabCam data.

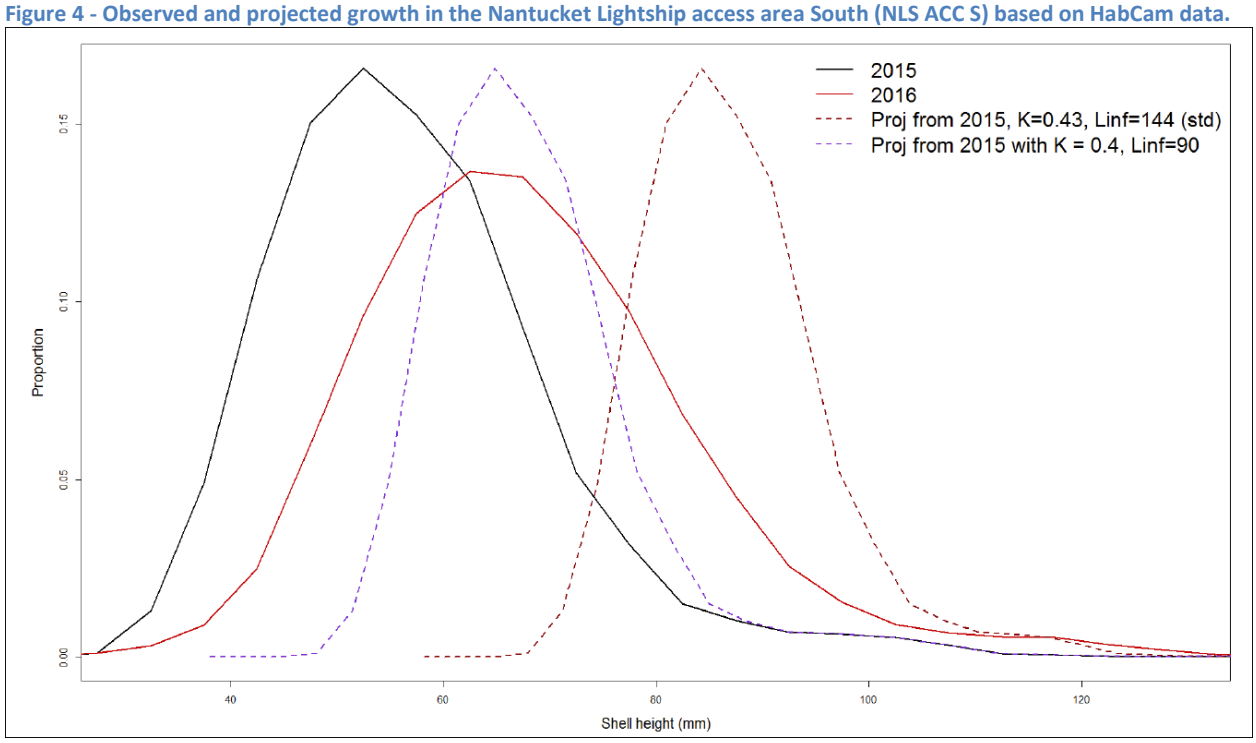

Figure 5 - Shell height frequencies of animals in the NLS-AC-S by depth zone from HabCam data.

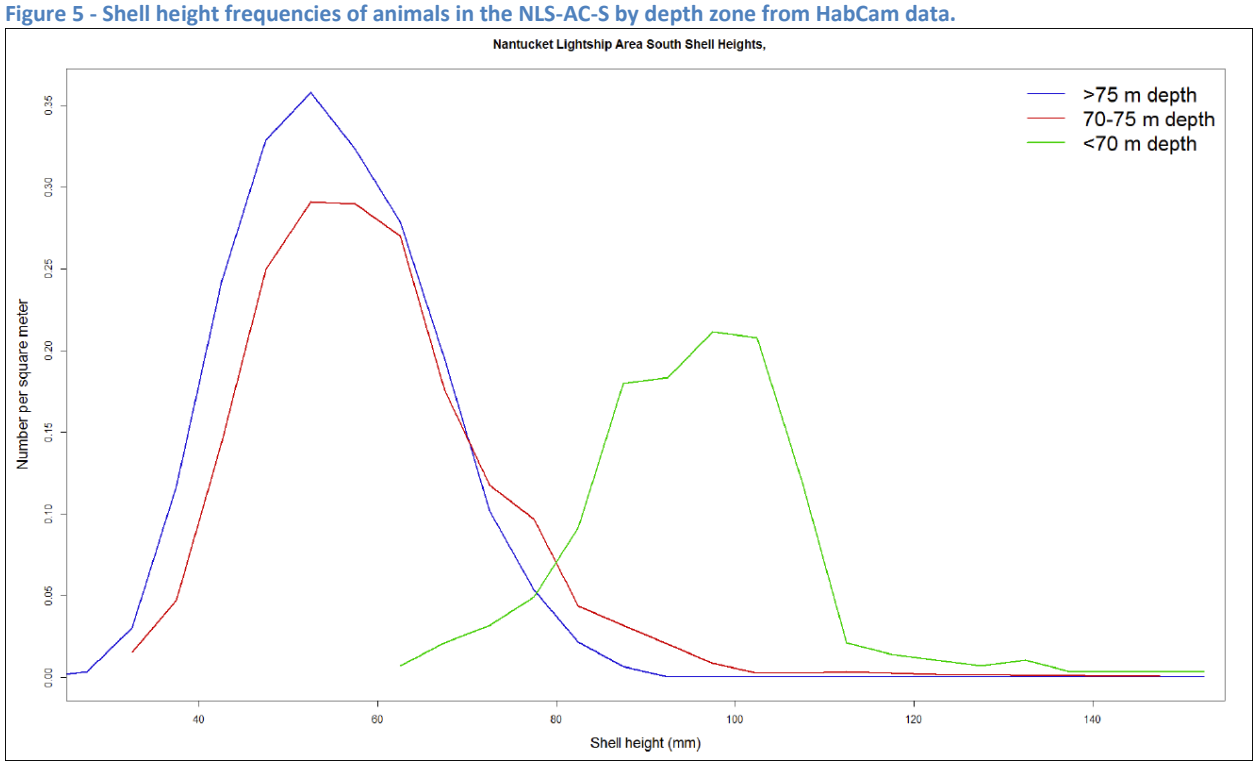

Table 4 - Combined survey estimates for 2016, including averaged estimates for each model area. Areas/rows in italics and gray have been identified for closure (no access) in FY2017, and are not included as part of the spatial management of the fishery.

2016 Scallop Survey Estimates

	Dredge				Drop Camera (Digital)				Habcam				Means					
Georges Bank	**NumMill**	**BmsMT**	**SE**	**MeanWt**	**NumMill**	**BmsMT**	**SE**	**MeanWt**	**NumMill**	**BmsMT**	**SE**	**MeanWt**	**NumMill**	**BmsMT**	**SE**	**MeanWt**	**IVWMBms**	**SE**
CL1ACC	*82*	*2250*	*815*	*27.3*	*85*	*1374*	*283*	*16.2*	*41*	*1135*	*11*	*27.7*	*70*	*1586*	*862*	*22.8*	*1136*	*11*
CL1NA	*428*	*11539*	*4631*	*27.0*	*231*	*5524*	*1403*	*23.9*	*973*	*16518*	*1734*	*17.0*	*544*	*11194*	*5140*	*20.6*	*9961*	*1062*
CL-2(N)	*209*	*4391*	*1288*	*21.0*					*260*	*6887*	*1092*	*26.5*	*234*	*5639*	*1689*	*24.1*	*5843*	*833*
CL-2(S)	688	13876	866	20.2					500	8632	765	17.3	594	11254	1156	18.9	10932	574
CL2Ext	*478*	*4963*	*427*	*10.4*					*472*	*3877*	*154*	*8.2*	*475*	*4420*	*454*	*9.3*	*4002*	*145*
NLSAccN	100	3580	297	35.7	168	6057	1234	35.6	150	6352	613	42.3	139	5330	1410	38.3	4196	261
NLSAccS	5598	27570	2760	4.9	7305	43307	10909	5.9	12559	64982	2453	5.2	8487	45287	11517	5.3	48333	1808
NLSNA	*1274*	*13313*	*2394*	*10.5*	*1768*	*22499*	*11959*	*14.9*	*5229*	*76561*	*3046*	*14.6*	*2757*	*37458*	*12571*	*13.6*	*37107*	*1860*
NLSExt	98	1415	427	14.4	291	4697	4227	16.1	256	6707	506	26.2	215	4273	4279	19.9	3621	325
NF	955	6476	3380	6.8					106	1033	735	9.8	530	3755	3460	7.1	1279	719
SCH	661	9166	3212	13.9					392	3015	214	7.7	526	6090	3219	11.6	3042	214
SF	429	5313	2	12.4					287	3774	146	13.2	358	4544	146	12.7	5313	2
Total Rotational	*7045*	*53655*	*3050*	*7.6*					*13978*	*91686*	*2690*	*6.6*	*9980*	*72150*	*12451*	*7.2*	*75049*	*2017*
Total EFH Closures	*1910*	*29243*	*5370*	*15.3*					*6462*	*99966*	*3671*	*15.5*	*3535*	*54290*	*13686*	*15.4*	*77437*	*3031*
Total Open	*2045*	*20955*	*4663*	*10.2*					*784*	*7823*	*780*	*10.0*	*1415*	*14389*	*4728*	*10.2*	*8180*	*769*
TOTAL	**11001**	**103852**	**8409**	**11.6**					**21224**	**199474**	**4620**	**9.4**	**14930**	**140828**	**19102**	**9.4**	**177301**	**4049**
MidAtlantic																		
Block Island	74	1510	83	20.4									74	1510	83	20.4	1510	83
Long Island	849	14711	735	17.3					1433	21883	10173	15.3	1141	18297	10200	16.0	14749	733
NYB	692	7600	978	11.0					396	6129	4	15.5	544	6865	978	12.6	6129	4
MA inshore	60	726	74	12.2					27	285	1	10.6	43	506	74	11.7	285	1
HCSAA	1171	13824	634	11.8					2046	22311	791	10.9	1609	18068	1013	11.2	17146	495
ET Open	981	11250	450	11.5					2300	26039	1922	11.3	1640	18645	1974	11.4	12018	438
ET Closed	*990*	*10682*	*821*	*10.8*					*4235*	*39140*	*4342*	*9.2*	*2613*	*24911*	*4419*	*9.5*	*11665*	*807*
DMV	382	4096	394	10.7					474	6070	1046	12.8	428	5083	1118	11.9	4341	369
Virginia	7	17	3	2.2									7	17	3	2.2	17	3
Total Access	*2534*	*29170*	*1197*	*11.5*					*4819*	*54421*	*4926*	*11.3*	*3677*	*41795*	*5069*	*11.4*	*30579*	*1164*
Total Open	*1682*	*24564*	*1228*	*14.6*					*1856*	*28298*	*10173*	*15.2*	*1810*	*27195*	*10247*	*15.0*	*24618*	*1220*
TOTAL	**5207**	**64416**	**1716**	**12.4**					**10910**	**121859**	**11303**	**11.2**	**8099**	**93901**	**11433**	**11.6**	**65710**	**1696**
OVERALL TOTAL	**16207**	**168268**	**8582**	**10.4**					**32134**	**321333**	**12211**	**10.0**	**23029**	**234729**	**22262**	**10.2**	**218876**	**7021**

4-Oct-16

PRELIMINARY ESTIMATES FOR PDT DISCUSSION PURPOSES ONLY

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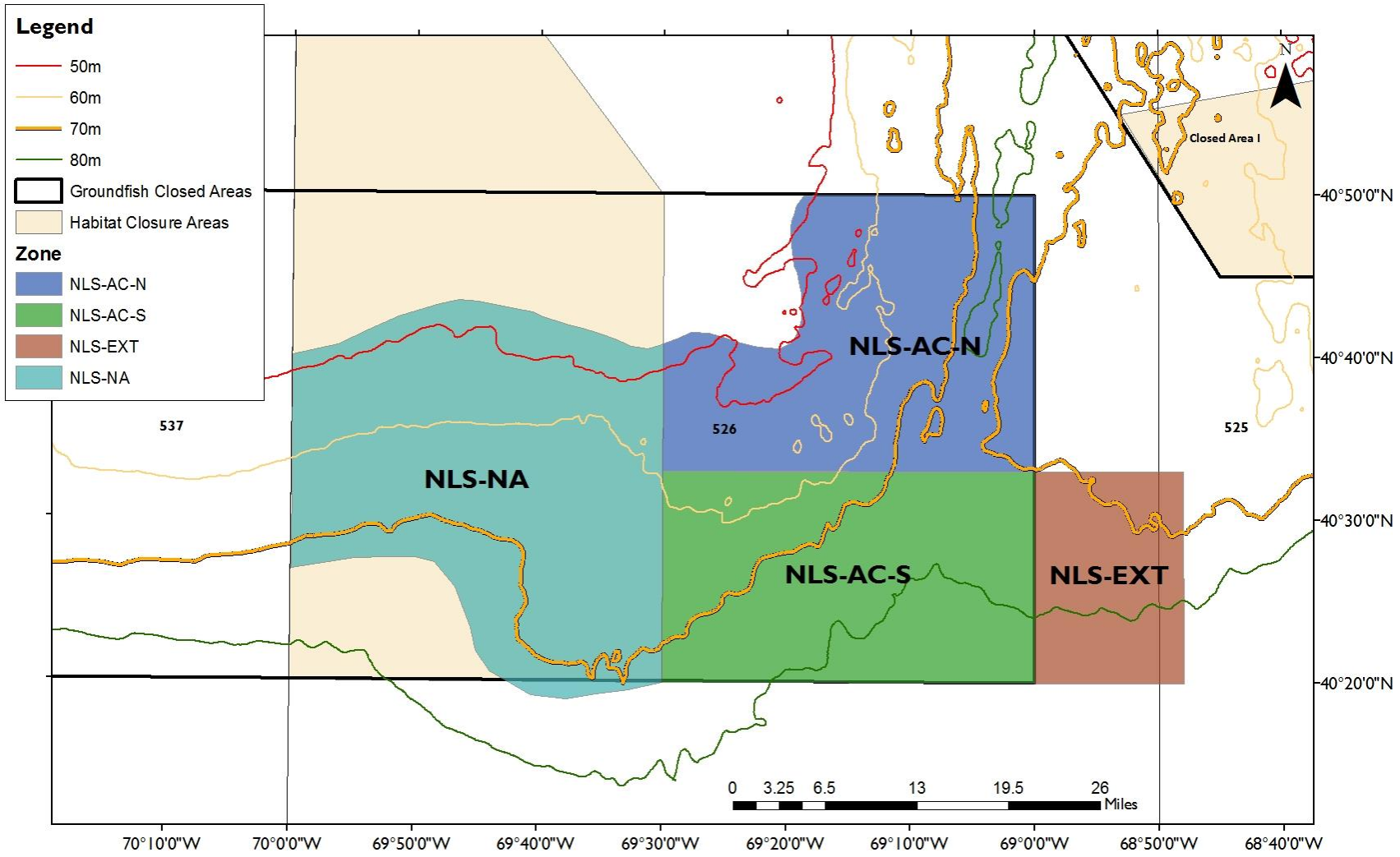
Figure 6 - Depth contours within the Nantucket Lightship zones, as configured in FW28. Note that the 70 m depth contour makes the split between the Nantucket Lightship access South "Shallow" and the Nantucket Lightship access South "Deep" zones.



Appendix I: 2016 VIMS Survey SH/MW Calculations for NLS

Parameter estimates for shell height meat weight relationships for the NLCA derived from 2016 VIMS dredge survey data using the updated region/zone designations. log = ln

Equation:
Meatweight= intercept+(B1* logsh)+(B2*logdepth)+(B3*(logsh*logdepth)) + SAMS_zone_2016

Parameter	Parameter Estimate
Intercept	-25.7615
B1 logsh	6.7540
B2 logdepth	4.1120
B3 logsh:logdepth	-1.0054
SAMS_zone_2016NLS_AC_S	-0.4917
SAMS_zone_2016NLS_EXT	-0.2214
SAMS_zone_2016NLS_NA	-0.3743
SAMS_zone_2016VIMS_45	-0.2198