Dredge-Based Sea Scallop Assessment in the Northern Gulf of Maine

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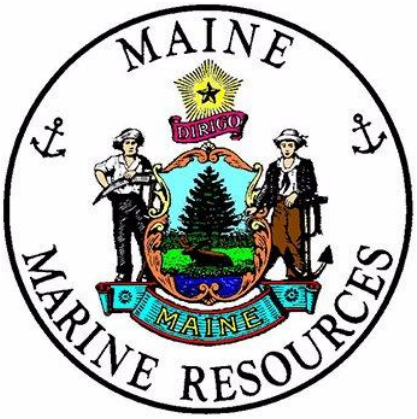

Updated 8/21/26

Executive Summary

The Maine Department of Marine Resources (DMR) has completed the 2026 Gulf of Maine (GOM) dredge-based sea scallop (*Placopecten magellanicus*) survey, covering 231 stations between Machias Seal Island and Southern Stellwagen Bank. The data was analyzed after a full quality control check of the data in preparation for the standardized survey report for the August Scallop Plan Development Team (PDT) meeting. Overall, there was a similar estimated biomass of scallop for the full survey domain. Most survey areas were similar to the previous year except on Stellwagen bank, where the was a substantial decline in the area of interest, and an increase in the other areas within Northern Stellwagen (Fig. 1). Data parameters may be adjusted based upon input from the PDT for final results utilized in the specification setting process.

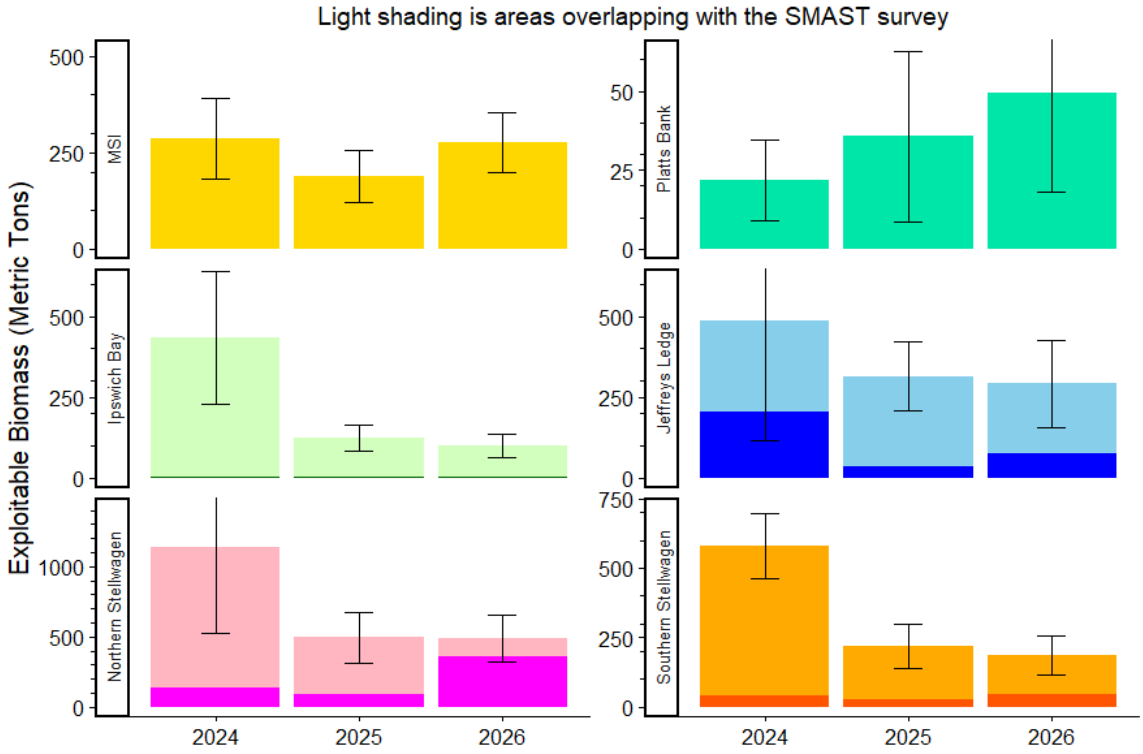

Figure 1. *Total exploitable biomass estimates for each survey year for each survey area within the ME DMR survey domain. The SMAST drop camera survey overlaps with this survey for all areas besides Machias Seal Island. These overlapping areas are shaded with lighter colors and on top in each plot, note all the biomass on Platts bank is within the area of overlap. Error bars represent the standard error.*

Project Objectives

The goal of this project is to provide estimates of total and exploitable scallop biomass across the NGOM management area and Southern Stellwagen Bank to be utilized in season setting decisions beginning in August each year. These estimates will be calculated with a dredge-based scallop survey which will produce annual density estimates, size frequencies, and shell height meat-weight relationships by area.

Methods & Results

Survey Domain: The survey domain covers the known scallop beds within the GOM, excluding habitat management areas that are closed to mobile scallop gear (Fig. 2).

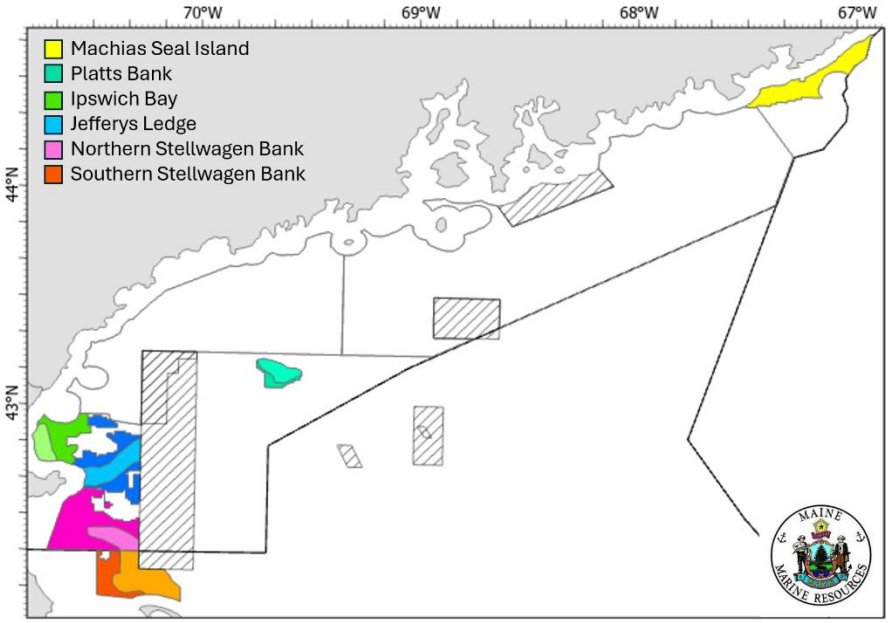

Figure 2. *Survey domain for the 2026 ME DMR GOM Scallop survey with each survey area shaded with a unique color. Lighter shading in the subareas represents overlap of other RSA dedicated scallop surveys.*

Survey design: Similar to previous surveys, a stratified random sampling design was used to allocate effort within the survey subareas. This method is an effective and widely used tool to estimate the abundance and distribution of different fish species (Cochran 1977, Doubleday 1981). This type of design tends to be cost-effective and produces estimates of abundance with relatively higher precision compared to other sampling designs under similar levels of effort. The total effort for each subarea was allocated based on area size and previous survey results for each area (Appendix A).

In 2009 the ME DMR and University of Maine overlaid a 1 km grid across the GOM waters to stratify the area by expected density of scallops into three categories: low, medium, and high density (Truesdell 2014). This survey grid has been updated over the years as new survey data has become available. The allocations across density strata for each area were 50% randomly selected, 25% stratified by using the Neyman allocation based on variance in biomass, and 25% stratification using the Neyman allocation based on the variance in abundance. Where the Neyman equation: $n_h = n\frac{W_h S_h}{\sum_{h=1}^{H} W_h S_h}$ where n is the total number of sampling stations for the survey area, H is the total number of strata, W_h is the proportion of stratum h area over the survey area, and S_h is the estimated standard deviation of historical data in stratum h.

Data collection: The ME DMR GOM scallop survey occurred on one of two collaborating scallop vessels between May 4th through May 13th, 2026, taking 8 vessel days to complete. Each vessel is approximately 40 ft LOA and specifically rigged for commercial scallop fishing in the Gulf of Maine with a dredge similarly sized to the survey dredge. Each survey captain has many years of experience scalloping in these waters.

The survey dredge was identical to the dredges used on previous NGOM scallop surveys carried out by ME DMR. The Department owns four standardized 7 ft. wide New Bedford-style chain sweep dredges with 2 inch rings, 1¾ inch head bale, 5 inch twine top and 10 inch pressure plate. Each dredge is equipped with rock chains and unlined. Throughout the survey, the participating captains and lead scientist ensured that the dredges were rigged and fishing correctly. These are the same specifications for survey dredges used since 2009 in state and federal waters of the GOM. Use of this survey dredge configuration in NGOM has proven successful for the often rocky and cobble substrates encountered in the area.

There were 209 valid tows. All tows were in a straight line, for a target time of 5 minutes in length at a target speed of 3.5-4 kts. Positional location (tow start and haul back) and exact speed and tow times were recorded on board with a ruggedized tablet computer equipped with GPS. A continuous GPS track was recorded as a backup to ensure data accuracy. An onboard marine navigation program was used to chart tow locations. Pitch and roll of the drag, as well as depth and water temperature, were measured using Star-Oddi™ sensors mounted to the neck of the survey drag. The tow distance utilized for area swept analysis was calculated from the GPS log by summing the distance between points using the haversin equation.

The DMR and vessel captains took advantage of the long history of cooperation with the lobster harvesters to minimize conflicts with fixed gear utilizing industry outreach prior to the survey and VHF communication at sea. Despite this outreach, there were still concentrated areas of high densities of fixed gear. When possible in these high gear areas, alternative tow paths were located or shortened tows were required, yet occasionally no towable areas were identified, resulting in 22 stations being abandoned, 7 in Ipswich Bay, 9 on Jefferys Ledge, 1 on Stellwagen Bank, 1 on Platts bank and 4 in Machias Seal Island.

Biological samples: All scallops in each tow were counted, sorted into bushel baskets for an estimated volume, and then weighed. All scallops and clappers were measured for shell height with an electronic measuring board (Zebra-Tech LTD ±0.5 mm). To determine shell height-meat weight relationships for each subarea, which are necessary to generate biomass estimates, eight representative scallops were selected for meat weights at each station. These scallops were measured for shell height, shell depth and shell width and then shucked and visually examined for meat quality, common diseases/infections and other abnormalities. Scallops were weighed at sea using a motion compensated scale (M1100 PL2262 ±0.5 g).

***Figure 3**: Examples of the meat quality categories used by the DMR based on texture, color and relative size of the abductor muscle.*

All remaining catch including bycatch, shells, and substrate were estimated by volume by lowest practical type as described by DMR scallop survey protocol (Kelly 2012, 2013; Schick and Feindel 2005). In addition, for fish species of interest that present potential bycatch issues for the fishery, abundance, biomass, and the total length was recorded.

Data analysis: To improve comparison between our survey and the other scallop dedicated survey in the region, the drop camera survey conducted by the School of Marine Science and Technology, University of Massachusetts Dartmouth (SMAST), the PDT recommended that we conduct analysis for the overlapping areas of interest (AOIs) and nonoverlapping areas separately. Totals for the subareas are then calculated by summing the AOIs and non-AOIs.

Using the swept area method, total and exploitable stock biomass and abundance were estimated for each survey area, accounting for the efficiency of the dredge and the approximate

selectivity. After appropriate quality control procedures, the total catch of scallops by weight for pre-recruits (<35mm), recruits (35-75mm) and scallops (>75mm) was calculated for each valid tow by applying the appropriate SHMW relationship as recommended by the scallop PDT (Appendix B). The area swept was calculated based on the dredge width tow distance from the GPS log, verified using the timestamps recorded on the tilt sensor. The biomass estimates were calculated using an assumed dredge efficiency of 0.4 for our standard dredge.

For each survey area, identified in table 1 above, the overall average abundance of swept area was estimated as: $\bar{X} = \sum_{h=1}^{H} W_h \bar{X}_h$ where $\bar{X}_h$ is the average abundance of swept area for stratum h, H is the total number of strata, and W_h is proportion of the area of stratum h with respect to the survey area.

Catch Results:

Scallops were by far the dominant catch despite there being a decline in abundance from our 2025 survey, with an 8% decline over the entire domain (Fig. 4). Newly discarded shells were observed in all areas which were open in the 2026 season. Jeffreys Ledge and Northern Stellwagen Bank had the highest number of exploitable scallops (Fig. 5). This was the first year since 2024 there were no stations with high (>1/m^2) or moderate (0.5-1/$m^{2)}$ densities (Fig. 6). There were no recruit scallops (35-75mm) observed in the Machias Seal Island area, but many were observed in the other areas with the highest concentration on southern Stellwagen Bank. Few pre-recruits (<35mm) were observed in the 2026 survey, but they were observed in all areas.

The scallop size frequency documents the 2022-year class on Platts Bank has grown to 80-100mm, slightly less than the expected growth of around 100-110mm (Fig. 7). These data also document a clear decline of larger >100mm scallops from the areas with reports of heavy fishing pressure (Jeffreys Ledge and Stellwagen) over the past three years (Figs. 7 & 8).

Meat quality was visually estimated for each scallop measured for meat weights (n=987). There was one observation of shell blistering from a scallop on Jefferys ledge. In the Machias Seal Island area 28% of the meats were “fair” quality and 6% were “poor”. There was one fair quality scallop documented in the southern stations and one on Jeffreys Ledge.

Yellowtail Flounder were the highest fish bycatch with the most fish located in Ipswich Bay. American Lobsters were the second highest bycatch species with the majority being caught on Stellwagen Bank. Winter Flounder, Monkfish, and American Plaice were also common in all survey areas (Table 1).

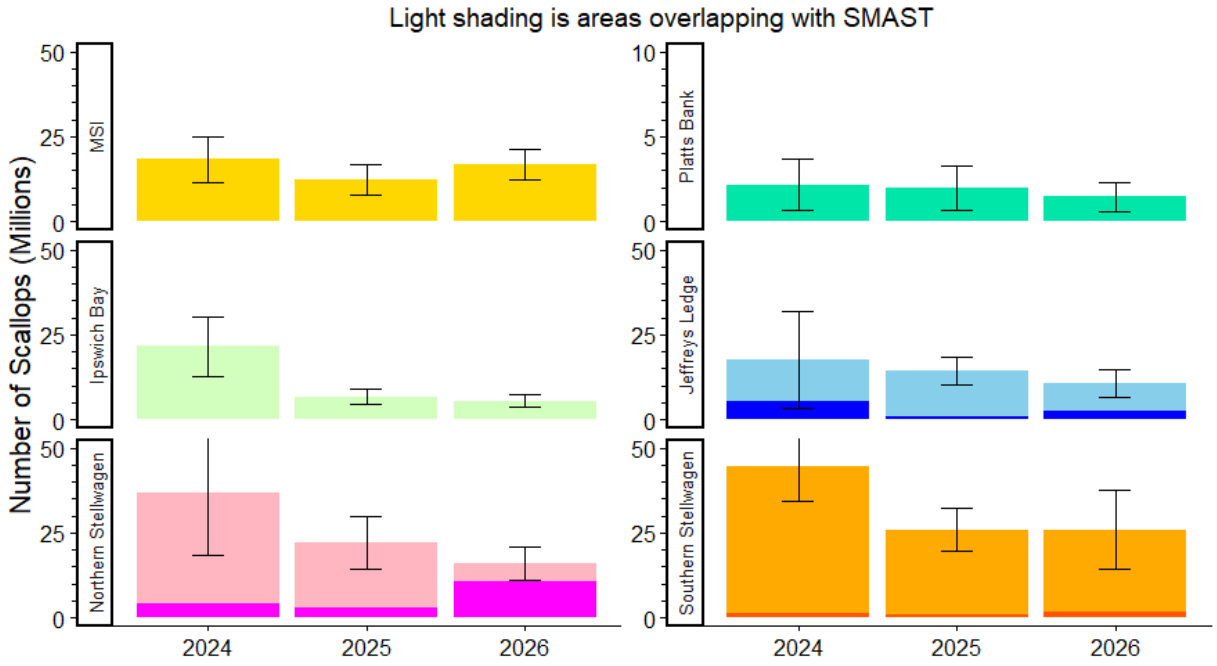

Figure 4. *Estimates of the abundance of scallops (millions) with associated standard error for the 2024, 2025 and 2026 ME DMR GOM scallop dredge survey. Estimates were calculated separately for areas overlapping with the SMAST survey (light colors on top) and the remainder of the domain and then added together for each subarea. These data have not been reviewed by the PDT and are preliminary.*

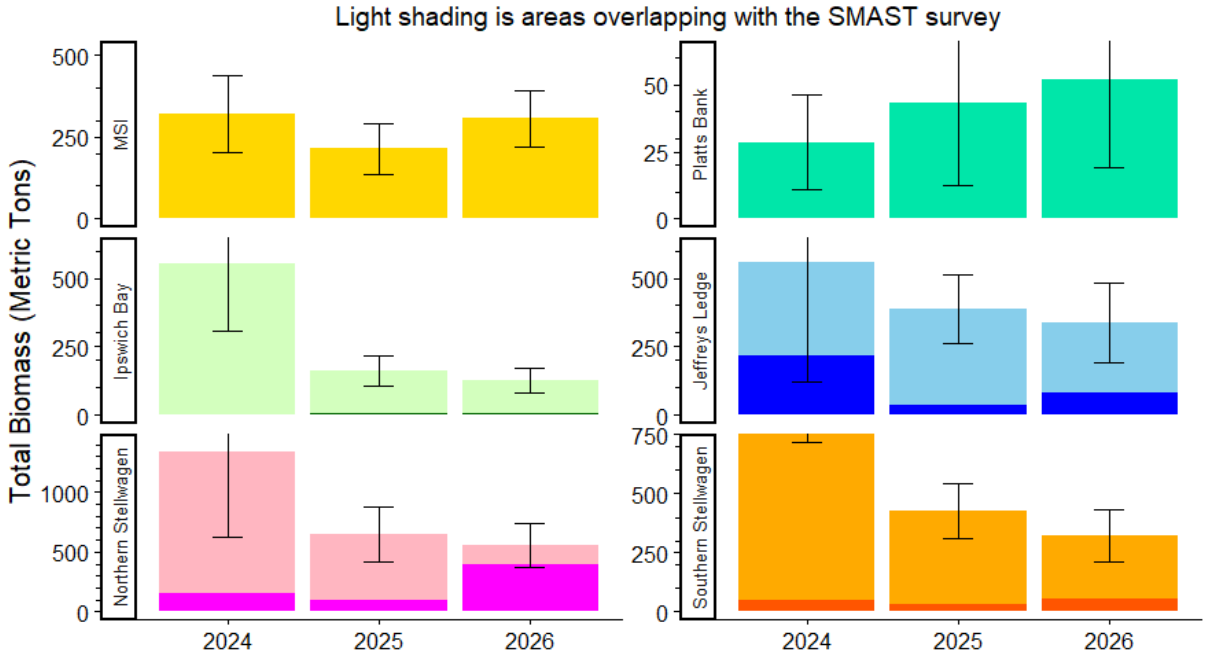

Figure 5. *Estimates of the biomass of scallops (metric tons) with associated standard error for the 2024, 2025 and 2026 ME DMR GOM scallop dredge survey. These estimates were calculated using the latest recommendations for SHMW relationships for each subarea (Appendix B). Estimates were calculated separately for areas overlapping with the SMAST survey (light colors on top) and the remainder of the domain and then added together for each subarea. These data have not been reviewed by the PDT and are preliminary.*

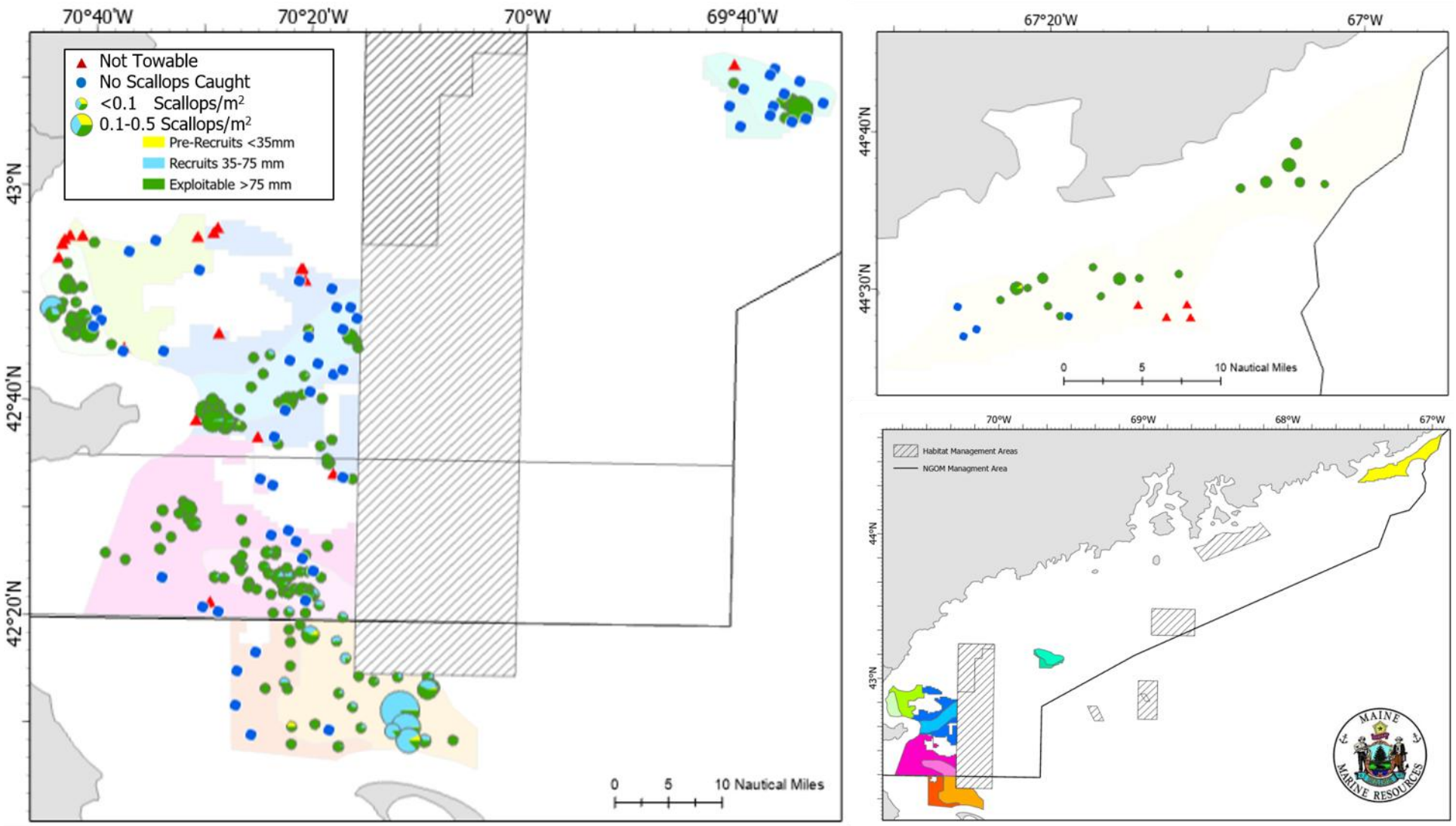

Figure 6. *Map of the number of scallops per square meter, with the proportion of each size bin represented by the color, and the size relative to the total number of scallops. The smaller lighter shaded areas within each subarea are areas overlapping with the SMAST survey. Red triangles are sites which were not towable due to high concentrations of fixed gear or unsuitable bottom. Dark blue circles are sites with zero scallops.*

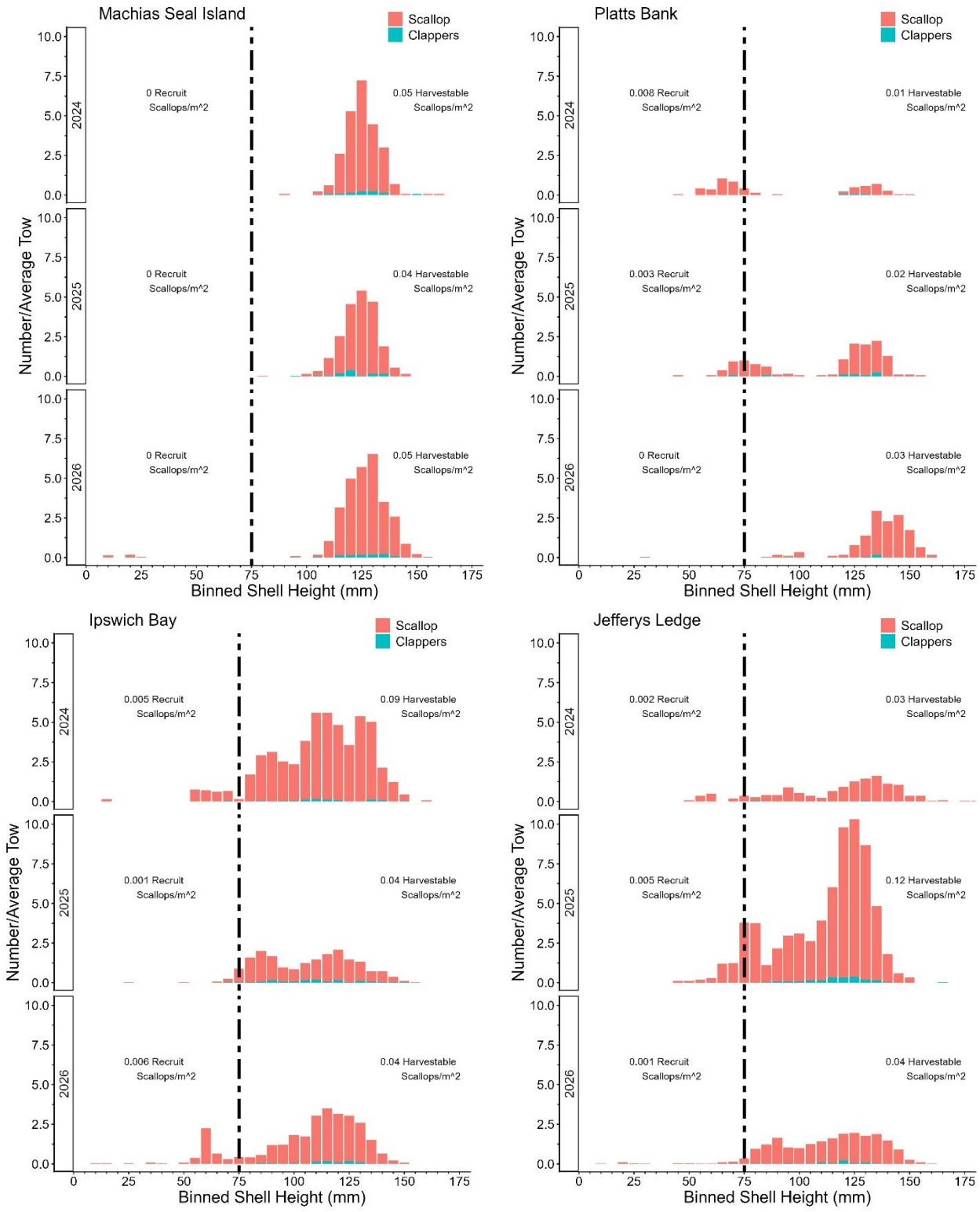

Figure 7. *Size frequency plots of scallops and clappers from the northern areas of the past three years of the ME DMR scallop survey. The height of each bar is the average number of scallops (orange) or clappers (blue) for each size bin by tow.*

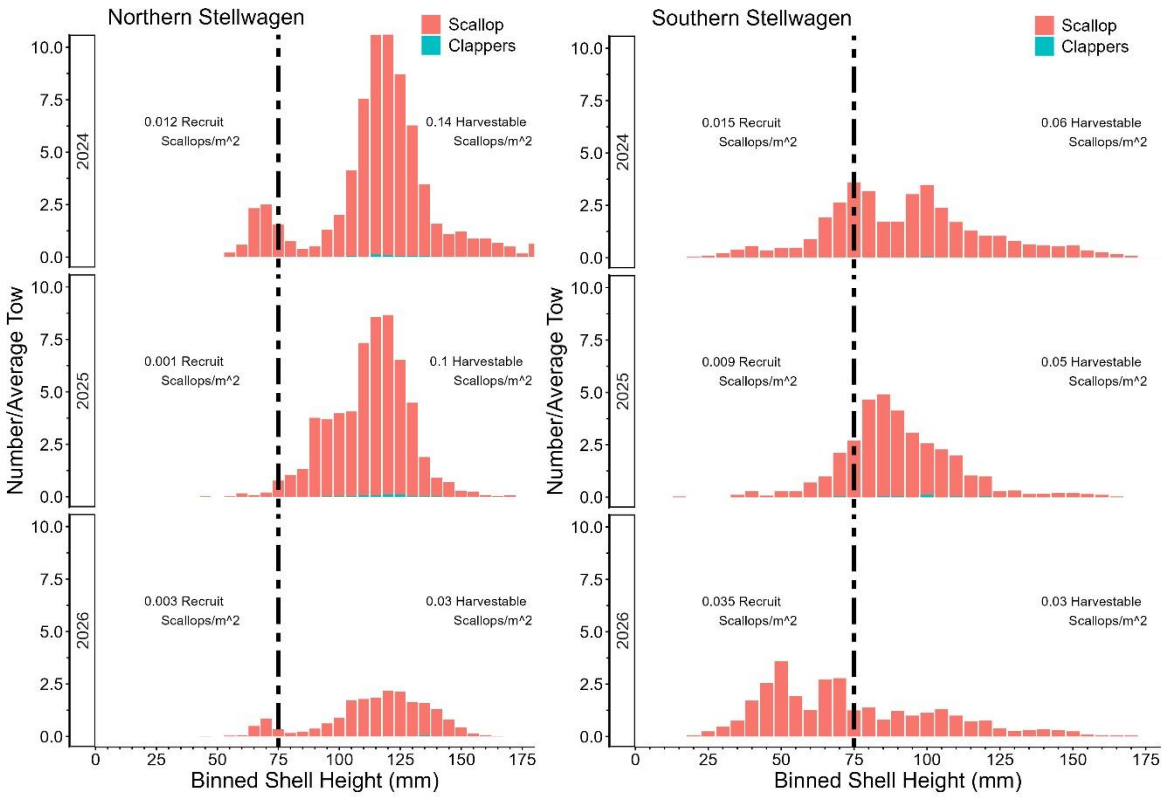

Figure 8. *Size frequency plots of scallops and clappers from the Stellwagen Bank areas of the past three years of the ME DMR scallop survey. The height of each bar is the average number of scallops (orange) or clappers (blue) for each size bin by tow.*

Table 1 Total number of scallops, clappers, lobsters and fish caught in each survey area. Total weight (kg) is included for the priority species.

Common Name	Scientific Name	Machias Seal Island	Platts Bank	Ipswich Bay	Jeffreys Ledge	Northern Stellwagen	Southern Stellwagen	Total Count	Total Whole Weight (kg)
Sea Scallops	*Placopecten magellanicus*	593	241	763	992	1199	1025	4813	1786.25
Yellowtail Flounder	*Limanda ferruginea*		4	78	49	50	39	220	34.25
American Lobster	*Homarus americanus*	27	3	43	17	46	9	145	36.05
Winter Flounder	*Pseudopleuronectes americanus*	19	3	22	13	27	7	91	17.9
Scallop Clapper		22	4	22	29	5		82	
Monkfish	*Lophius americanus*	10	9	11	8	7	13	58	27.4
American Plaice	*Hippoglossoides platessoides*	1	3	14	23	13	2	56	14.55
Little Skate	*Leucoraja erinacea*	3		3		4	23	33	
Windowpane Flounder	*Scophthalmus aquosus*			1		6	7	14	1.7
Grey Sole	*Glyptocephalus cynoglossus*		3		5	6		14	3.35
Longhorn Sculpin	*Myoxocephalus octodecemspinosus*	1		3		3	7	14	
Fourspot Flounder	*Paralichthys oblongus*			2	1	5	5	13	1.85
Shorthorn Sculpin	*Myoxocephalus scorpius*					5		5	
Atlantic Cod	*Gadus morhua*		1	1	2			4	1.45
Haddock	*Melanogrammus aeglefinus*				3			3	1
Winter Skate	*Leucoraja ocellata*		1			1	1	3	
Cunner	*Tautogolabrus adspersus*					2		2	0.1
Silver Hake	*Merluccius bilinearis*				1	1		2	0.35
Acadian Redfish	*Sebastes fasciatus*		1		1			2	0.45
Sea Raven	*Hemitripterus americanus*					1	1	2	
Northern Searobin	*Prionotus carolinus*					1		1	

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Appendix A-Station Data

Table 1. Allocations of total stations, dates sampled, average bottom temperature, and the number of stations by tow type for each priority area of the 2026 ME DMR NGOM survey.

Area	Stations Allocated	Dates Sampled	Average Bottom Temp (°C)	Valid Tows	No Tow-Bottom Type	No Tow-Fixed Gear
MSI	25	May 13th	4.8	21	3	1
PB	20	May 11th	4.9	18	0	1
IB	35	May 8th	5.4	27	4	3
SJ	60	May 8-10th	4.5	48	0	9
NS	65	May 4,5,7,10th	5.3	61	0	1
SS	35	May 7,10th	5.9	34	0	0

Appendix B-SHMW Relationships

SHMW Equation-Stellwagen, Jefferys & Ipswich Bay Estimated from combined DMR and SMAST data 2016-2026

W=exp(-10 +2.946*ln(SH_mm) -0.1955*ln(Depth_M) – 0.0004299*LatitudeDD + Area

Areas: Sellwagen=0.0852951, Ipswich= 0.1120070 Jeffreys = 0.0206076

SHMW Equation-Platts Bank & MSI Estimated from DMR data 2016-2026

Platts_MTW_g=exp(189.9926+ 2.1389*ln(SH) -4.5429*LatDD -0.2476*ln(DepthM))

MSI_MTW_g=exp(-4.09802+ 2.65455*ln(SH) -0.13945 *LatDD +0.06916*ln(DepthM))

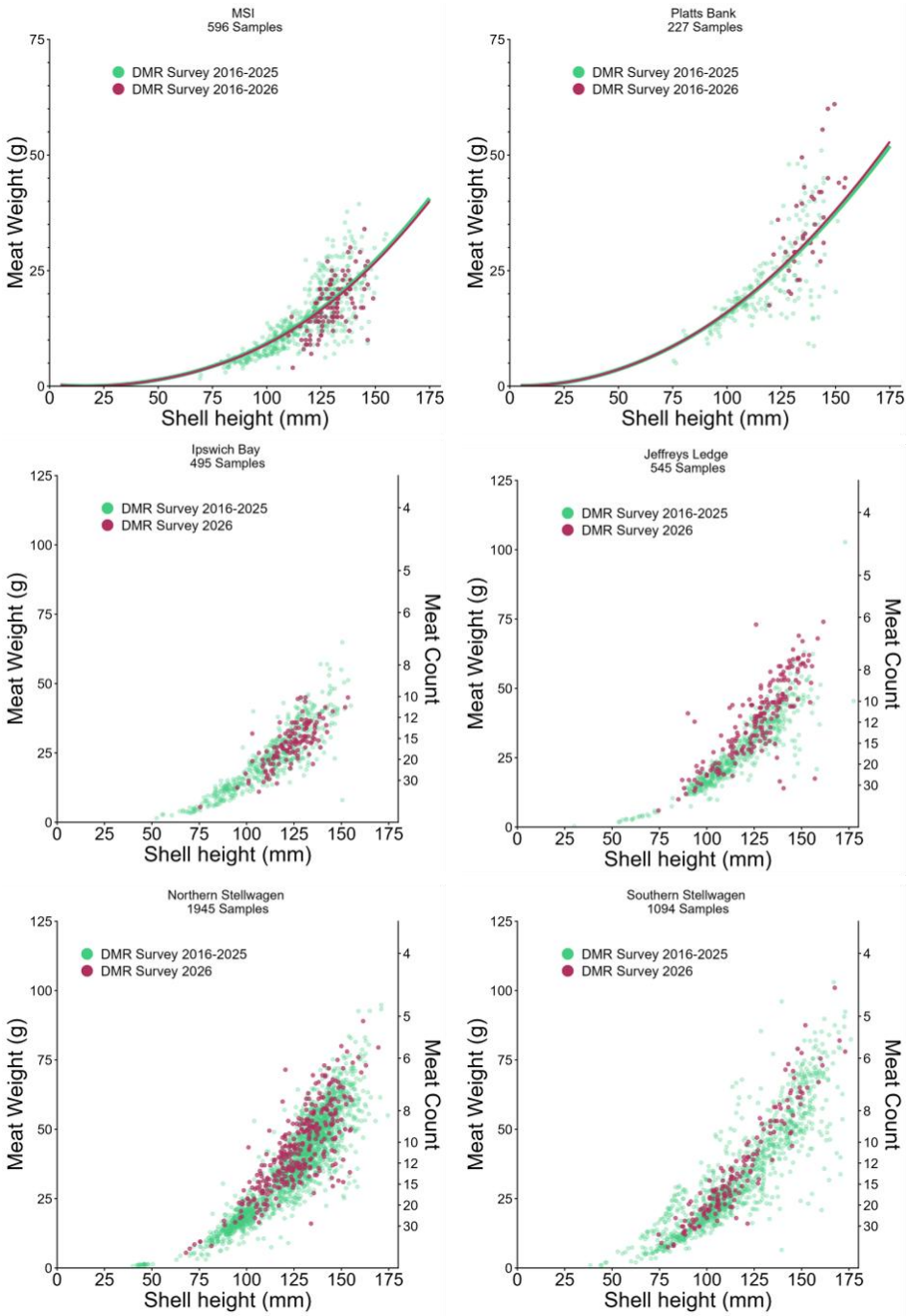

Figure A.1 Recorded meat weight to shell height data 2026 survey (Red) compared with past years data (green) for each survey area.