An Assessment of Sea Scallop Abundance and Distribution in the Mid-Atlantic Bight, Nantucket Lightship, Closed Area II and Southern Flank

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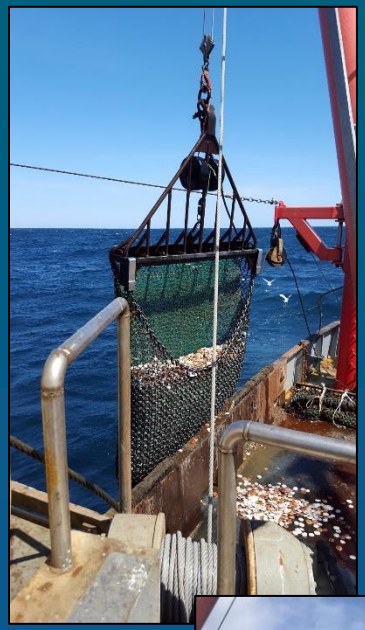
Preliminary – PDT use only.

2022 VIMS-Industry Cooperative Surveys



- Sampling design
  - Stratified random design
    - NMFS shellfish strata
    - SAMS Areas included in survey domains
  - Station Allocation
    - Hybrid approach – stratum area & prior year catch data (biomass & number)
- Tow a survey dredge & commercial dredge simultaneously
  - Survey dredge – 8 ft in width, 2 in rings & 1.5 in diamond mesh liner
  - Commercial dredge – varies by vessel and area
  - Survey dredge performance monitored

Biomass Estimation

- **Biomass calculated using swept area method (Cochran, 1997)**
- **Area swept per tow (a_s)**
  - **Navigational info**
  - **Tilt sensor**
- **Catch weight per tow (C_h)**
  - **Expanded length frequencies ≥ 40 mm**
  - **SHMW relationships from SARC 65**
    - **NLS South Deep – sensitivity**
    - **NYB Closure – sensitivity**
  - **Selectivity (Roman and Rudders, 2019)**
- **Efficiency (E_s)**
  - **Values from Miller et al. (2018) for survey dredge:**
    - **.40 in soft bottom**
  - **Commercial Dredge = .65**

Stratified mean biomass per tow in stratum and SAMS Area

$$\bar{C}_{h,s} = \frac{1}{n_h}\sum_{i=1}^{h} C_{i,h,s}$$

$$Var(\bar{C}_{h,s}) = \frac{1}{n_h(n_h-1)}\sum_{i=1}^{n_h}\left(C_{i,h,s} - \bar{C}_{h,s}\right)^2$$

Stratified mean biomass per tow in SAMS Area

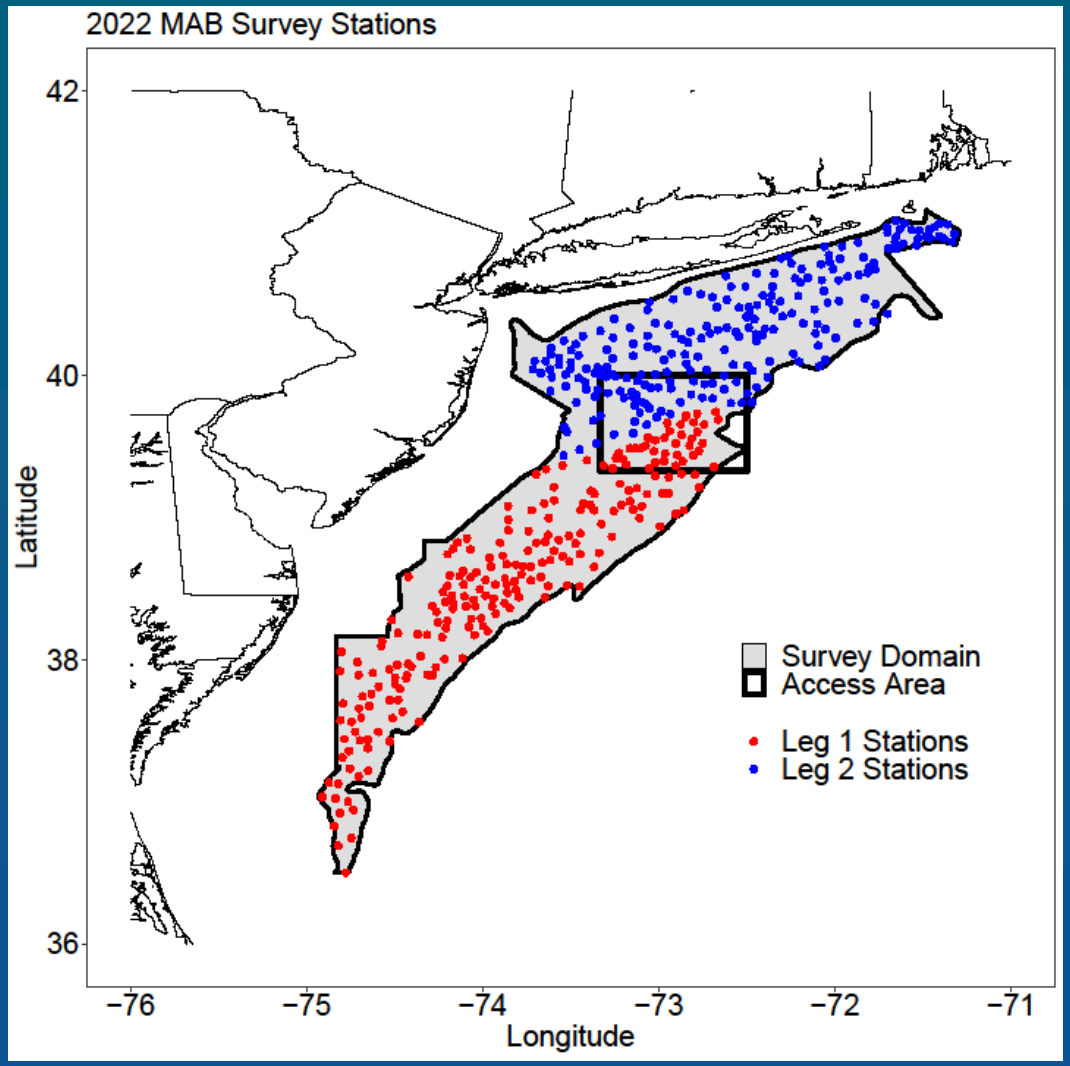
$$\bar{C}_s = \sum_{h=1}^{L} W_h \cdot \bar{C}_{h,s}$$

$$Var(\bar{C}_s) = \sum_{h=1}^{L} W_h^2 \cdot Var(\bar{C}_h)$$

Total biomass in SAMS Area

$$\widehat{B_s} = \left(\frac{\left(\frac{\bar{C}_s}{\bar{a}_s}\right)}{E_s}\right) A_s \qquad Var(\widehat{B_s}) = Var(\bar{C}_s) \cdot \left(\frac{A_s}{\bar{a}_s}\right)^2$$

2022 MAB Survey



First Leg

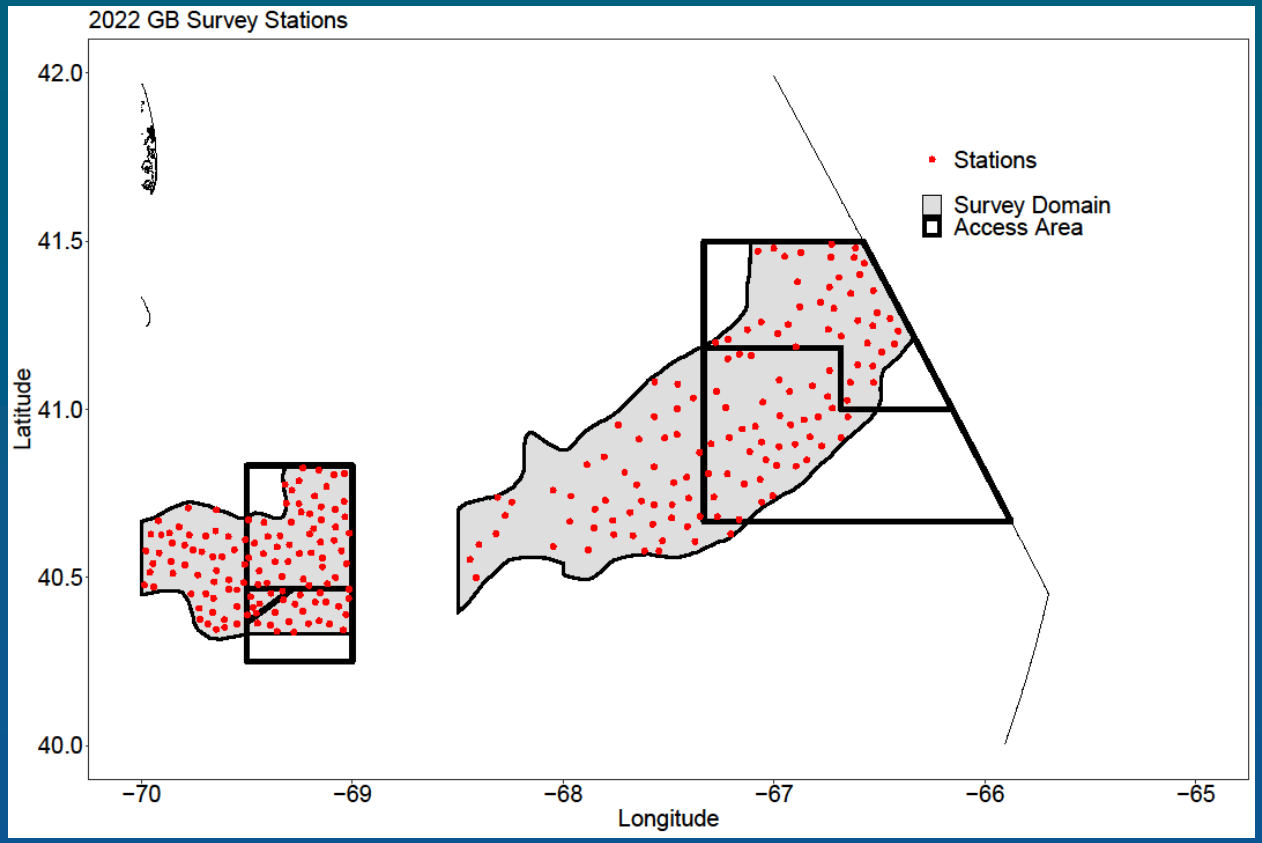
- **F/V Carolina Capes II**
  - **5/12 – 5/22/2022**

Second Leg

- **F/V Italian Princess**
  - **6/1 – 6/11/2022**

- **447 stations completed**

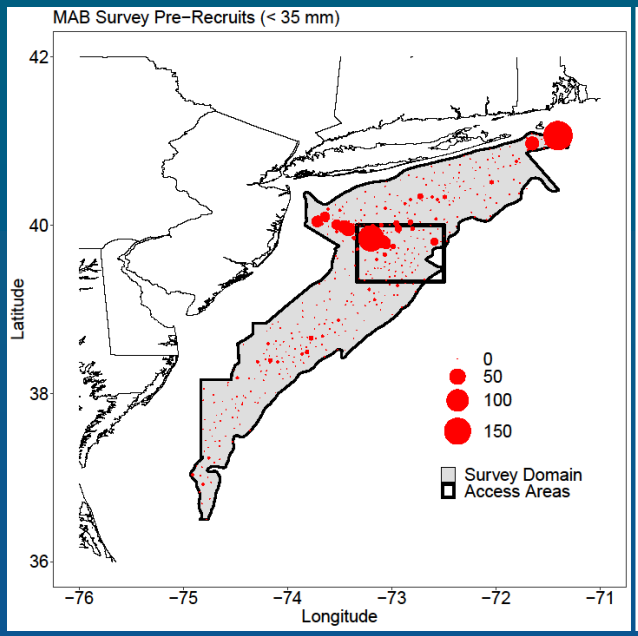
2022 GB Survey

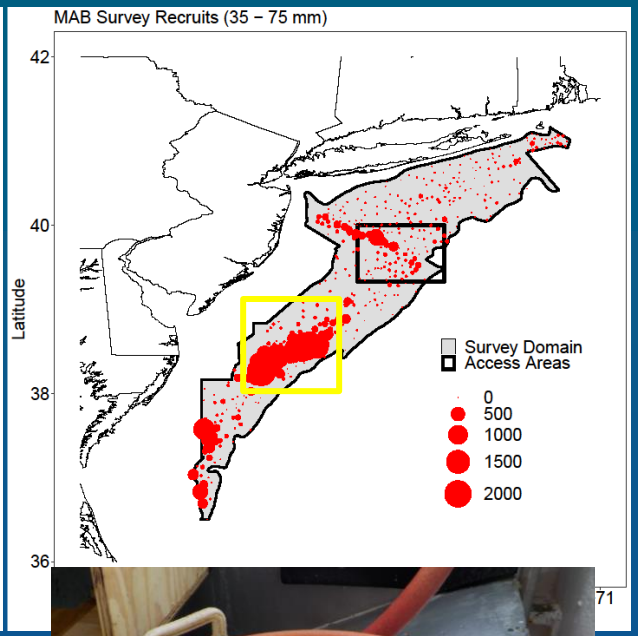


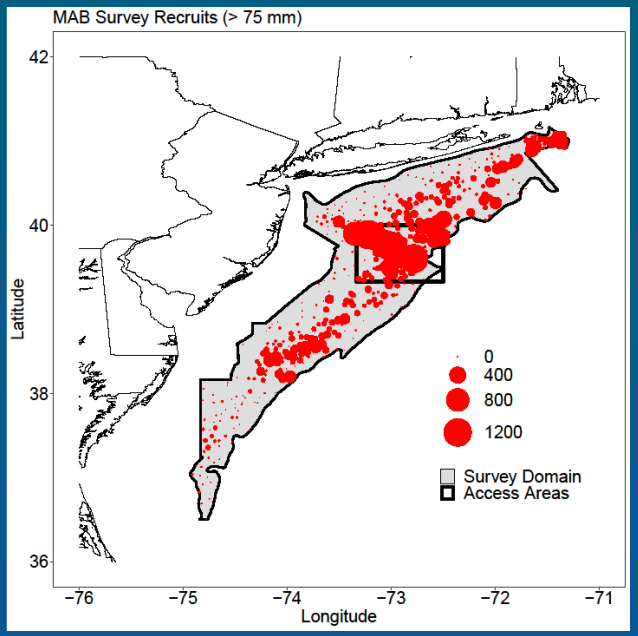
- F/V Celtic
- 6/17 – 6/28/2022

- 256 Stations completed

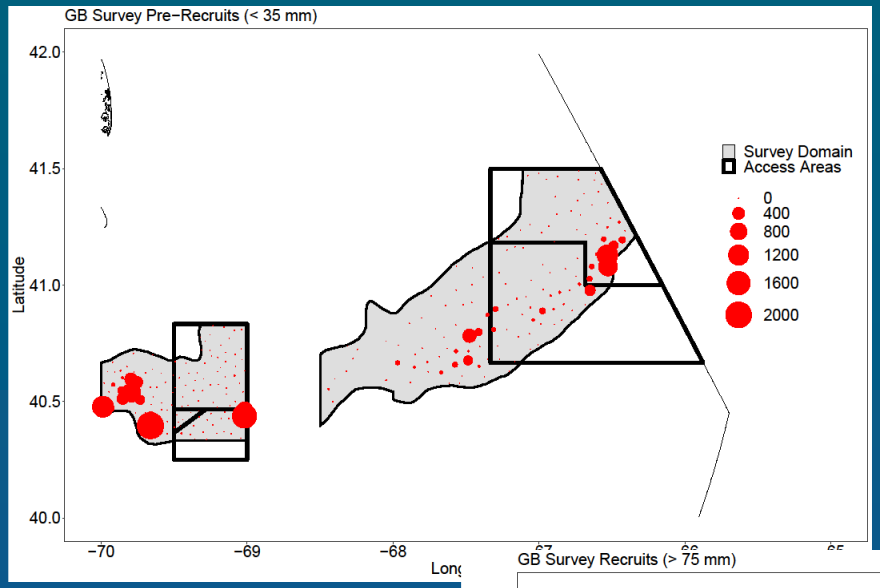
2022 MAB Survey
Scallop Distribution – Number per Tow

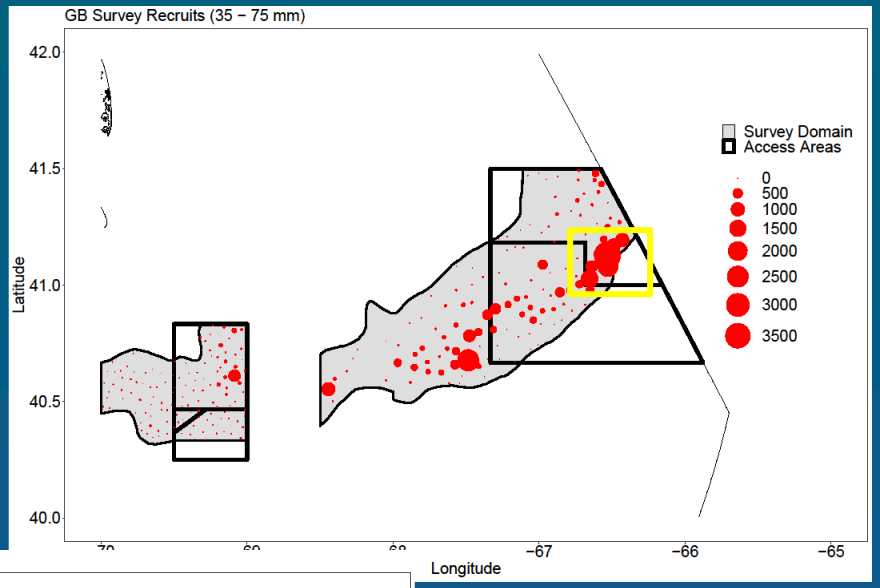


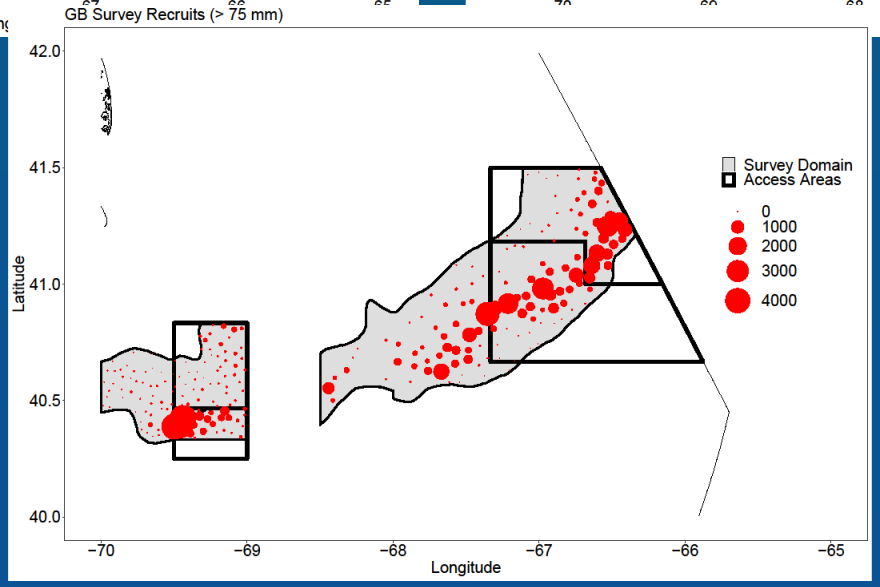




2022 GB Survey
Scallop Distribution – Number per Tow



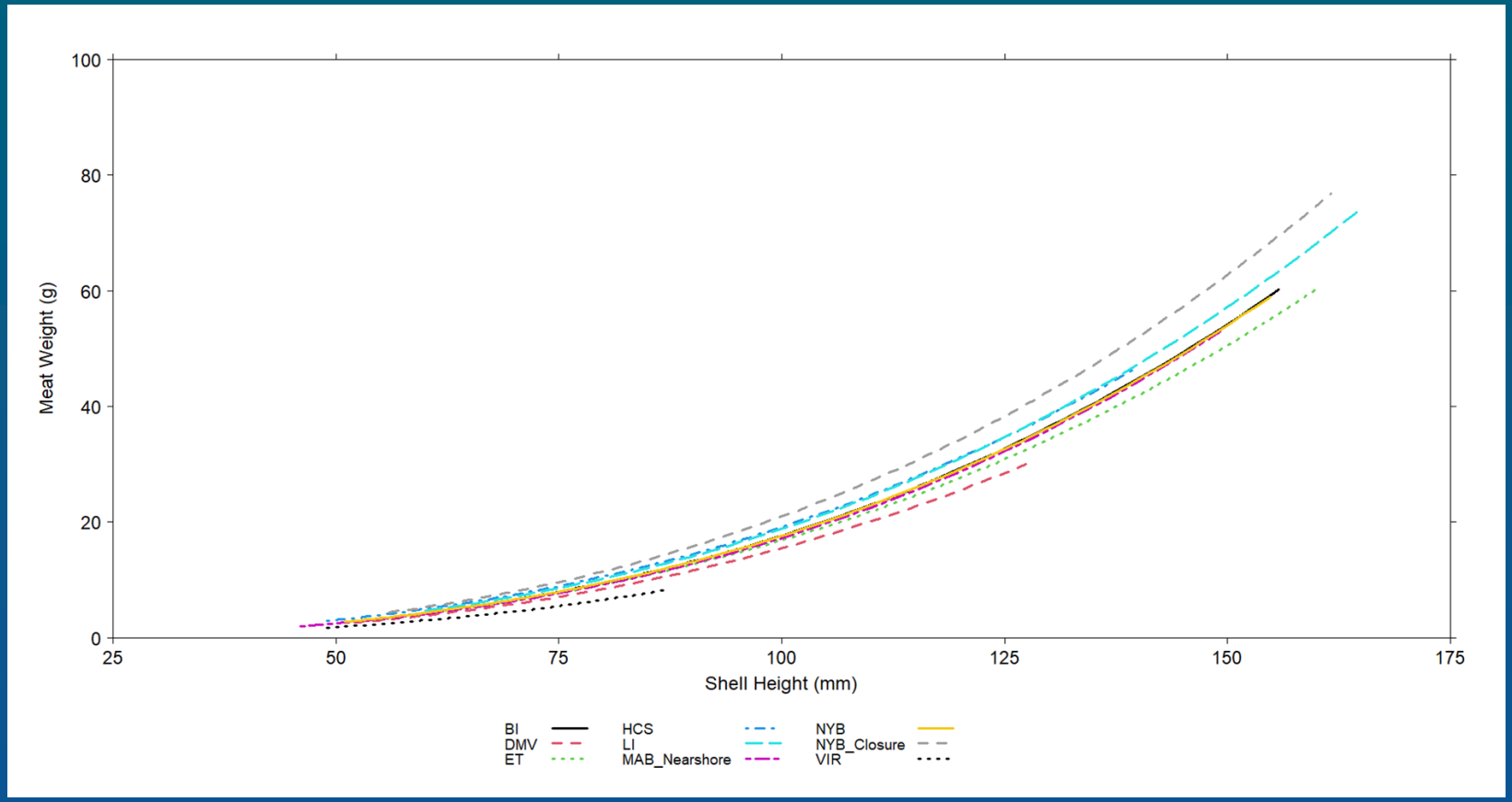




SHMW Relationship

- SHMW samples (meat & gonad weight) were taken from all stations with scallop catch (15/station):
  - MAB Survey: 4,813 (380 stations)
  - GB Survey:
    - NL 1,267 (107 stations)
    - SF, CA Ext & CAII 1,502 (113 stations)
- Predict meat weight based on a suite of potential covariates (i.e. shell height, depth, SAMS Area, disease…)
- GLMM (Gamma distribution, log link, random effect at the station level) with R Package lme4

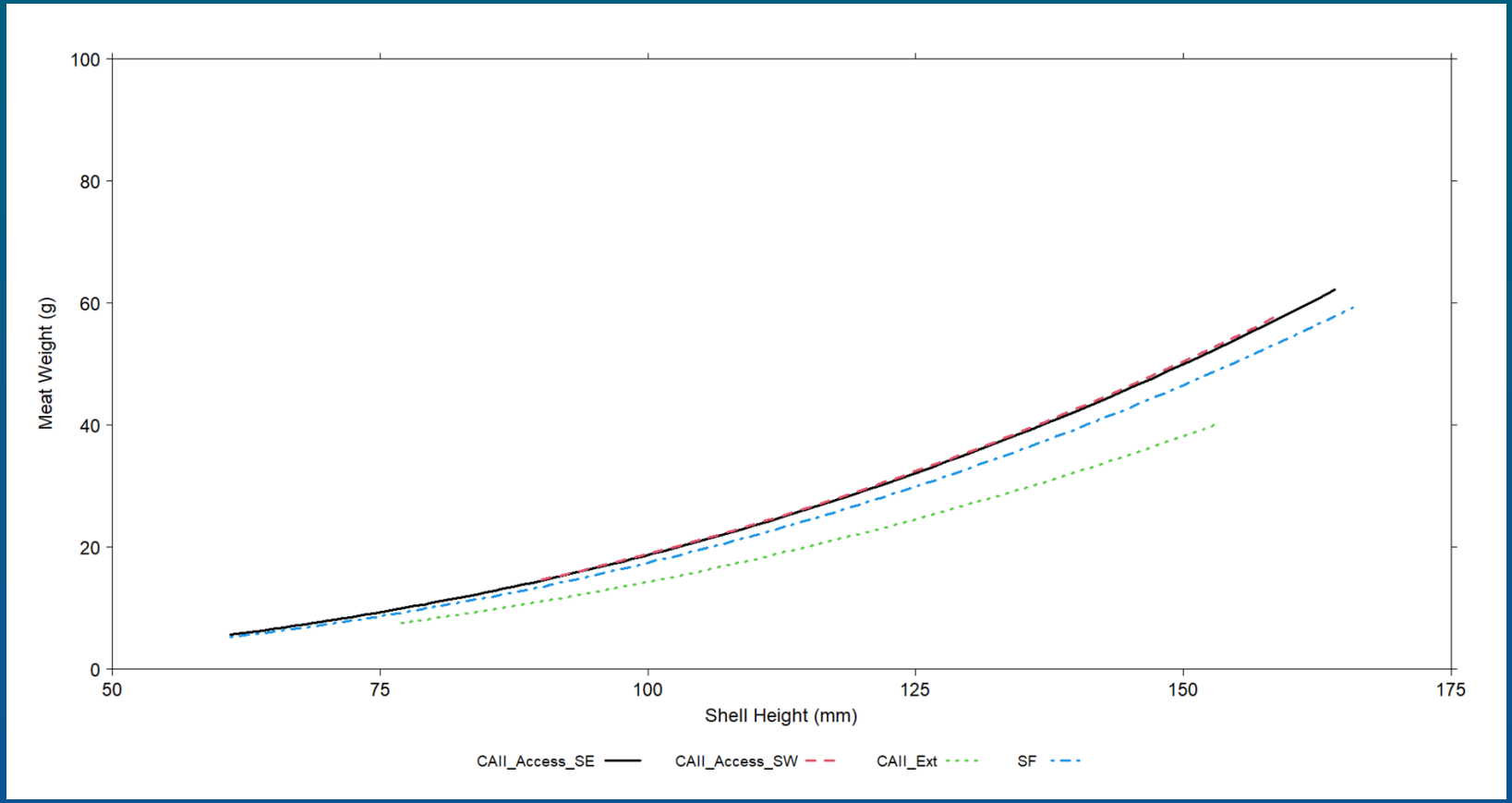
2022 MAB SAMS Area
SHMW Results



New NYB Closure Area SHMW relationship is highest

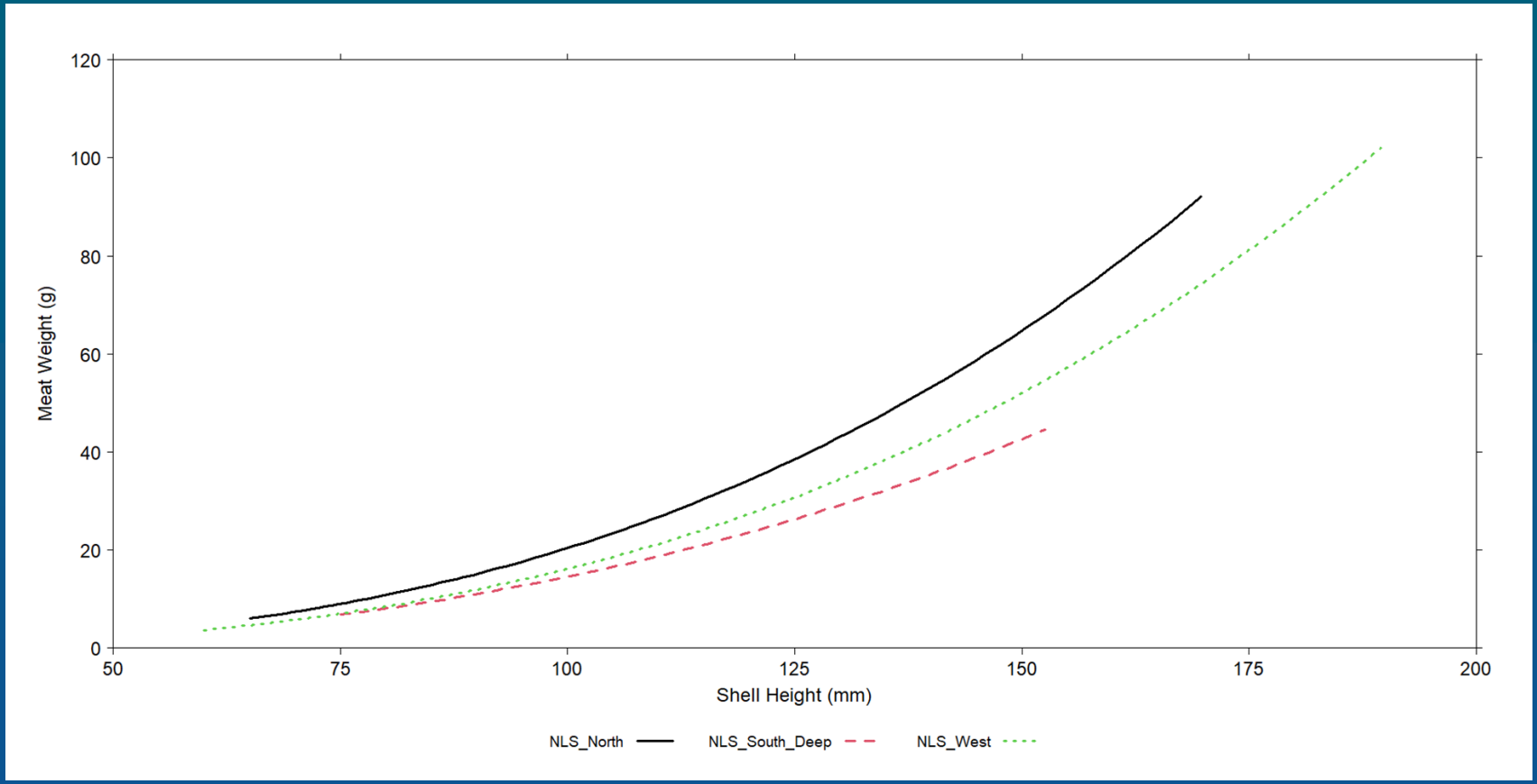
Northern gradient of increasing SHMW relationship

2022 SF, CA II Ext & CA II SAMS Area
SHMW Results



Extension and SF curves are lower than the Access Area SAMS Areas – similar to 2020 & 2021

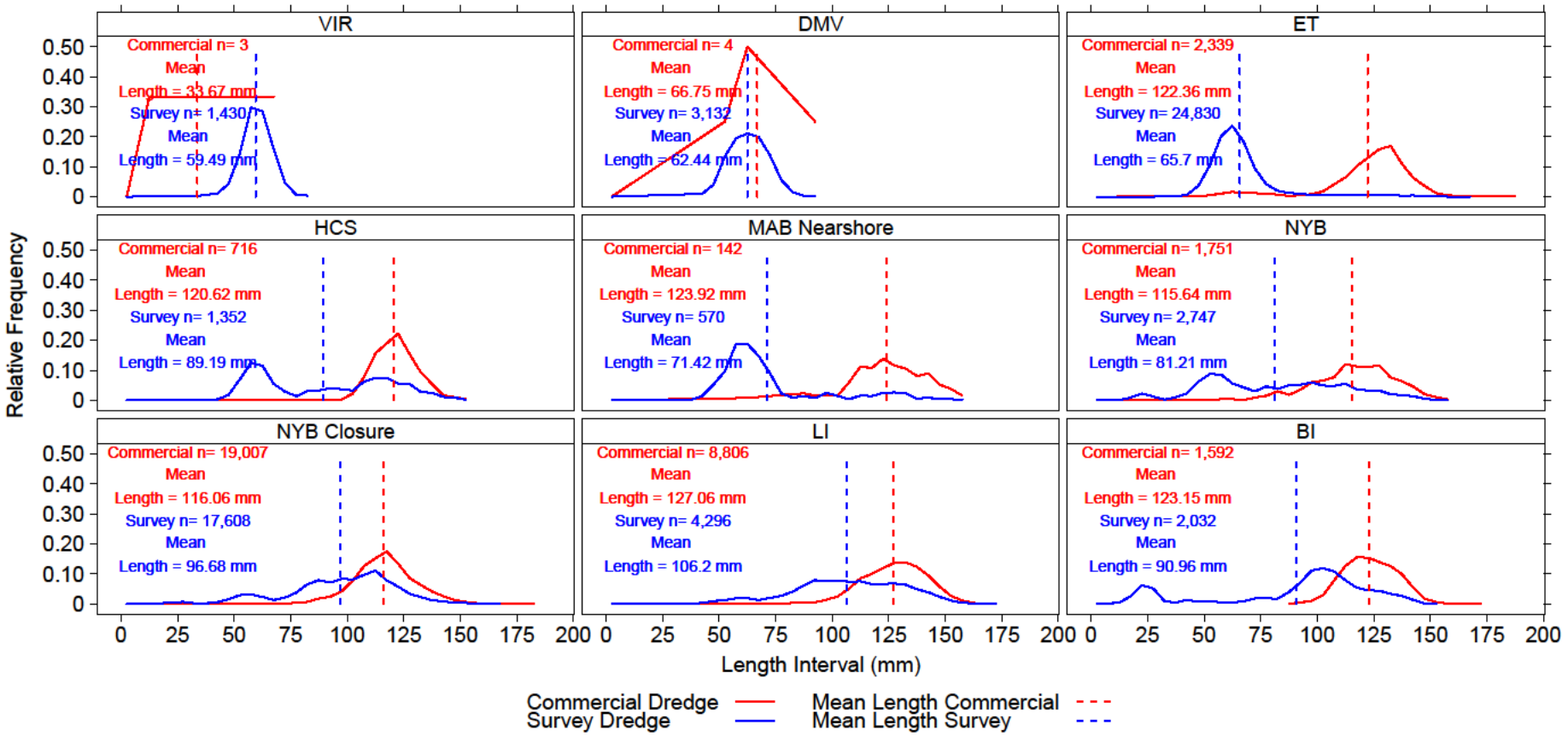
2022 NL SAMS Area
SHMW Results



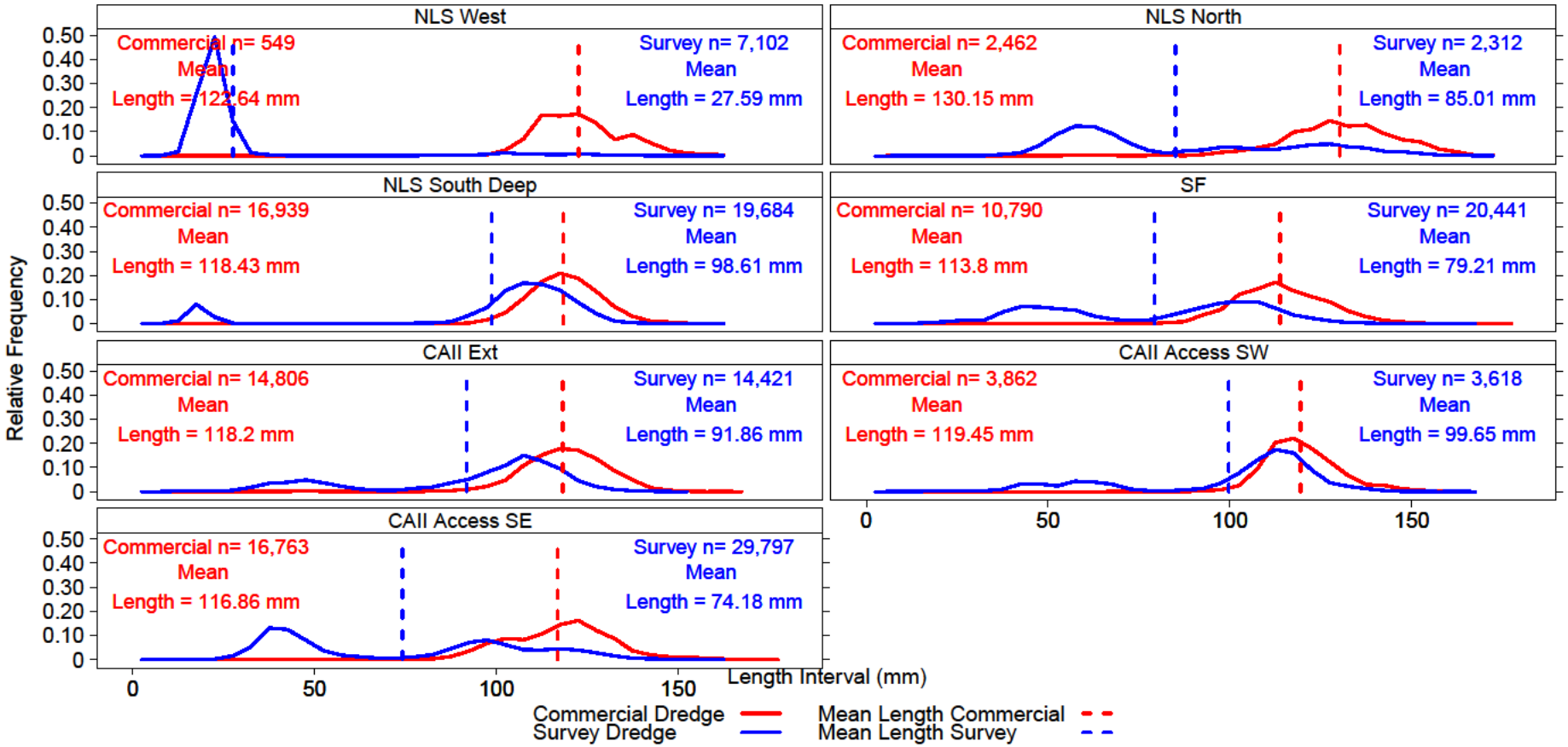
Similar trend to previous years - South Deep SAMS Area has the lowest meat weight at shell height

South Deep SAMS Area significantly lower SHMW relationship compared to other 2 SAMS Areas

2022 MAB SAMS Area
Length Frequency



2022 GB SAMS Area
Length Frequency



2022 Total Biomass Survey Gear – SAMS Areas

SAMS Area	Total Biomass (mt)	SE Biomass (mt)	CV Biomass (mt)	Density (scal/m^2)	Avg MW (g)	Total Number
BI	679.65	47.87	17.61	0.04	23.54	28,820,859
LI	5,402.99	280.38	12.97	0.02	24.88	224,639,735
NYB	1,183.27	92.95	19.64	0.04	13.19	90,672,656
NYB_Closure	8,029.07	462.38	14.4	0.12	18.77	422,815,488
MAB_Nearshore	499.88	98.31	49.17	0.01	10.06	52,039,048
HCS	1,141.92	97.19	21.28	0.03	16.15	70,738,527
ET	4,733.39	258.53	13.65	0.2	6.85	675,961,938
DMV	756.21	99.77	32.98	0.04	5.57	141,130,493
VIR	327.25	46.74	35.71	0.06	4.73	69,137,546
SF	11,713.79	1,206.85	25.76	0.2	15.42	763,947,653
CAII_Ext	9,371.36	950.58	25.36	0.25	23.12	408,245,645
CAII_Access_SW	3,783.21	384.24	25.39	0.16	26.82	143,209,272
CAII_Access_SE	11,619.43	813.30	17.5	0.32	17.92	644,521,319
NLS_West	292.95	31.49	26.88	0.01	39.12	7,455,449
NLS_North	857.20	62.57	18.25	0.03	21.79	43,914,395
NLS_South_Deep	3,381.79	434.80	32.14	0.34	21.64	161,536,445

2022 Exploitable Biomass Commercial Gear - SAMS Areas

SAMS Area	Exp Biomass (mt)	SE Biomass (mt)	CV Biomass (mt)	Density (scal/m^2)	Avg MW (g)	Exp Number
BI	325.36	30.73	14.53	0.01	34.81	9,271,770
LI	5,586.36	347.87	9.58	0.01	36.8	153,368,976
NYB	598.35	72.76	18.71	0.01	26.03	19,370,879
NYB_Closure	4,626.65	473.82	15.76	0.04	27.31	166,491,340
MAB_Nearshore	144.60	69.11	73.53	0.001	34.65	4,172,843
HCS	383.70	43.68	17.51	0.01	29.04	13,213,231
ET	821.24	53.24	9.97	0.01	32.16	25,085,877
DMV	0.65	0.24	58.12	0.00002	6.94	107,990
VIR	0.11	0.06	84.52	0.00004	2.2	53,971
SF	4,900.93	753.74	23.66	0.04	29.9	158,853,011
CAII_Ext	5,628.08	915.29	25.02	0.1	35.9	157,443,878
CAII_Access_SE	5,537.93	743.80	20.66	0.08	32.88	166,736,970
CAII_Access_SW	2,221.73	384.85	26.65	0.06	37.87	57,005,062
NLS_West	130.37	20.47	24.16	0.002	45.14	2,865,495
NLS_North	733.64	89.42	18.75	0.01	51.45	14,256,909
NLS_South_Deep	1,373.37	359.07	40.22	0.12	27.19	50,950,478

Biomass Sensitivity

SAMS Area	SARC 65	VIMS
NLS South Deep	3,381 mt	2,842 mt
NYB Closure	8,029 mt	8,626 mt

- **NLS South Deep 2016 - 2022**
- **NYB Closure 2015 - 2022**

Acknowledgements

- The owners, captains and crews:
  - *F/V Carolina Capes II*
  - *F/V Italian Princess*
  - *F/V Celtic*
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