

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

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Zoom Meeting

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2021 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 or determined by PDT
 - NLS South Deep - sensitivity
 - Selectivity (Roman and Rudders, 2019)
- Efficiency (E_s)
 - Values from Miller et al. (2018) for survey dredge:
 - .40 in soft bottom
 - .13 NLS South Deep - sensitivity
 - Commercial Dredge = .65

Stratified mean biomass per tow in stratum and SAMS Area

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

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

Stratified mean biomass per tow in SAMS Area

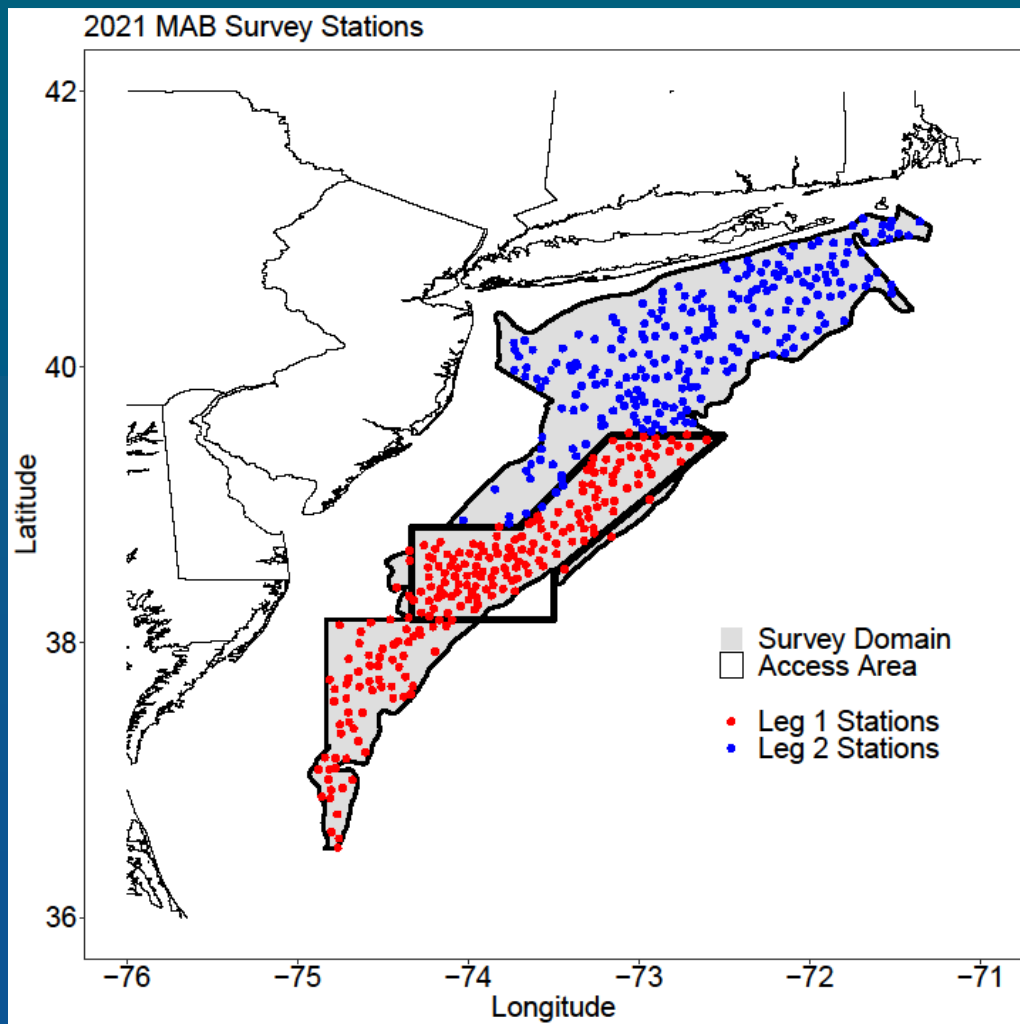
$$\bar{C}_s = \sum_{h=1}^L W_h \cdot \bar{C}_{h,s}$$

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

Total biomass in SAMS Area

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

2021 MAB Survey



First Leg

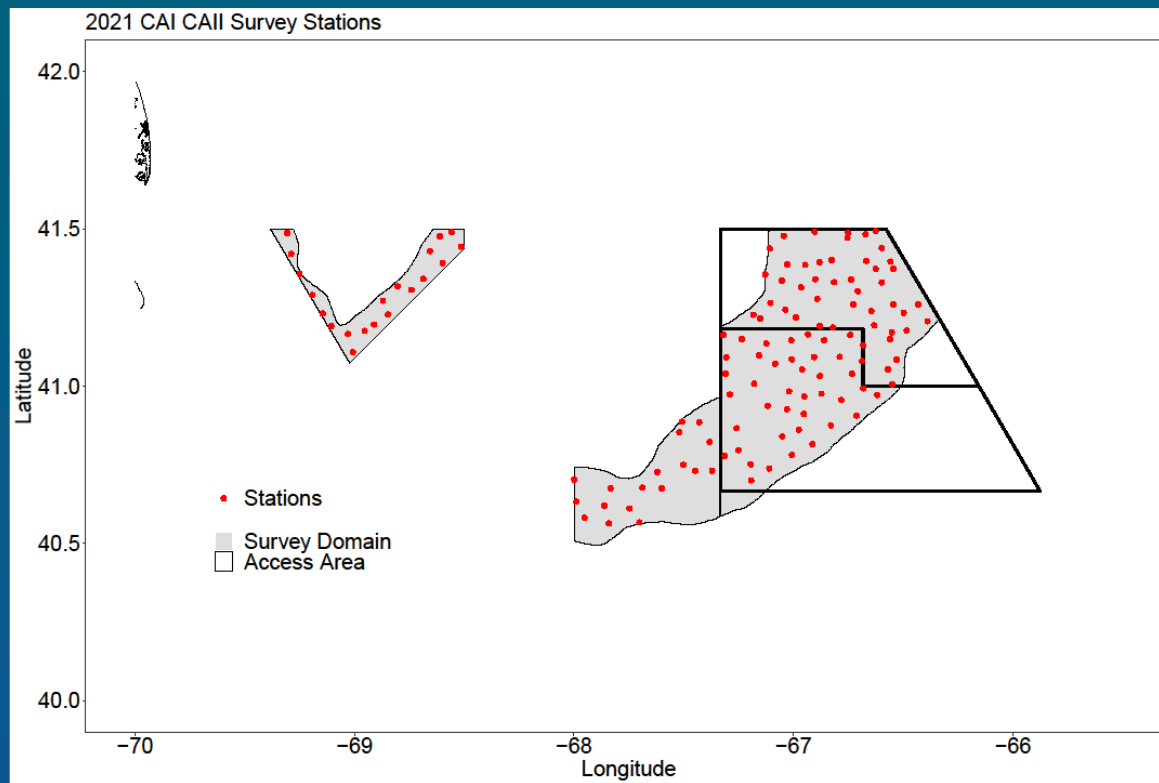
- F/V Carolina Boy
- 5/7 – 5/16/2021

Second Leg

- F/V Carolina Capes II
- 5/27– 6/7/2021

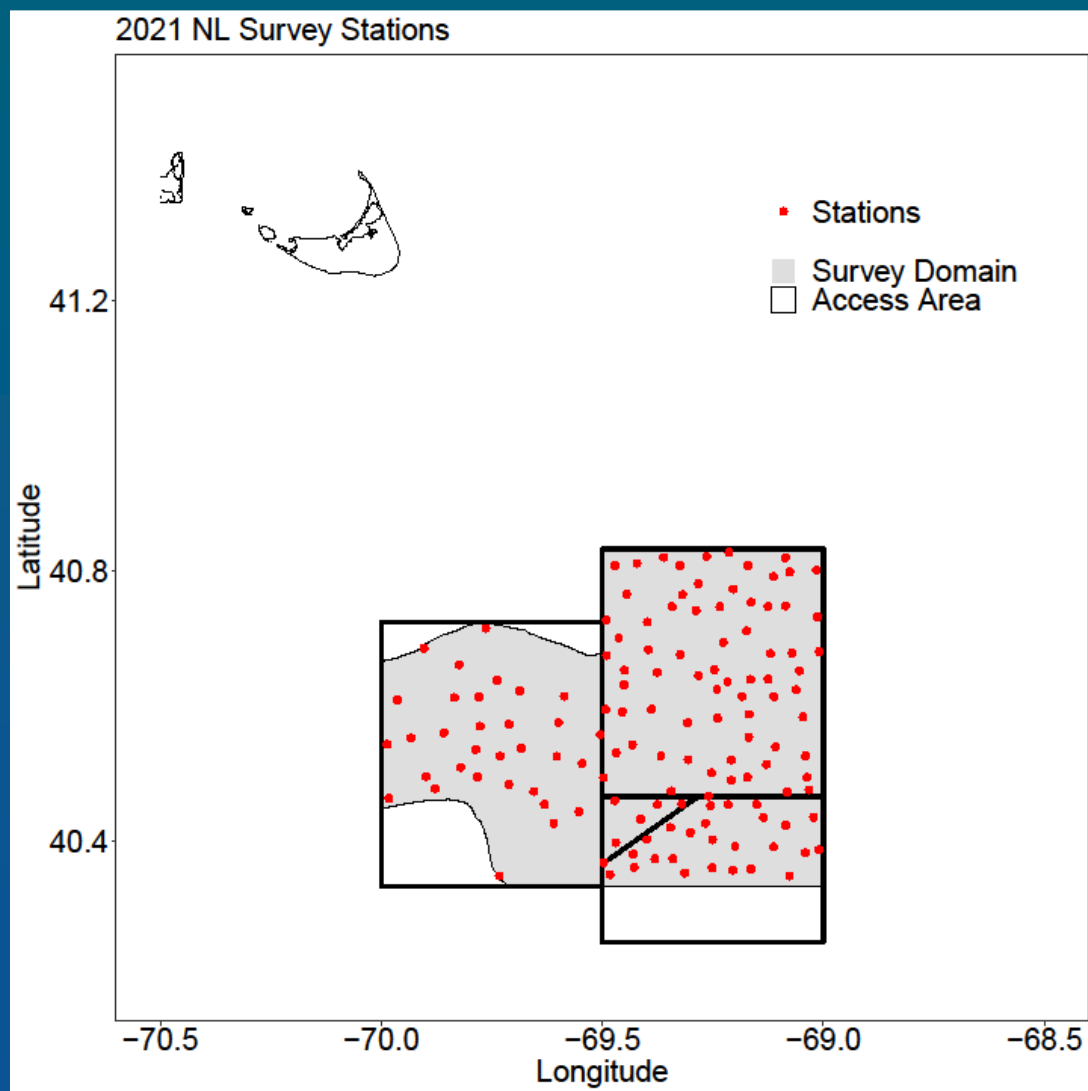
- 450 stations completed

2021 CA I & CA II Survey



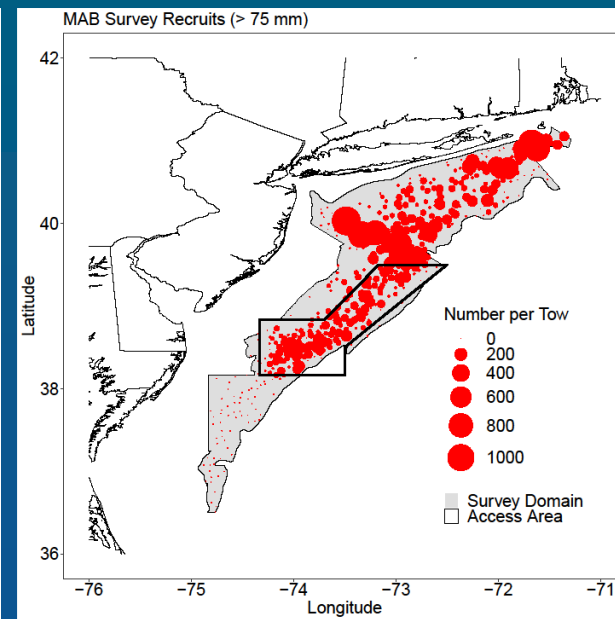
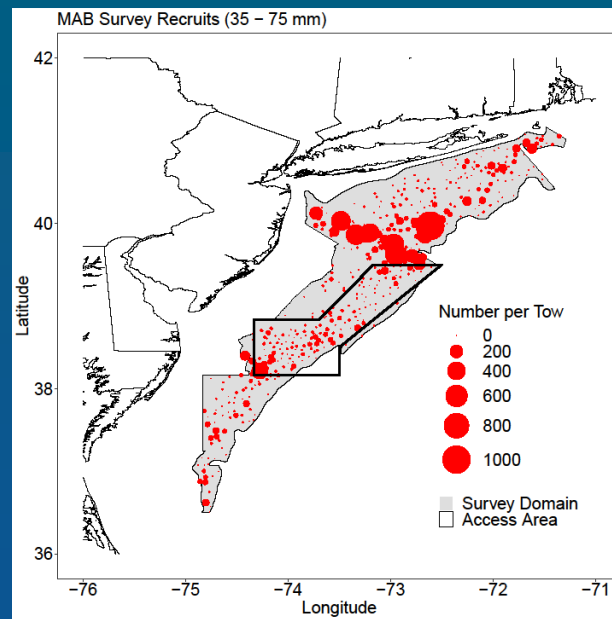
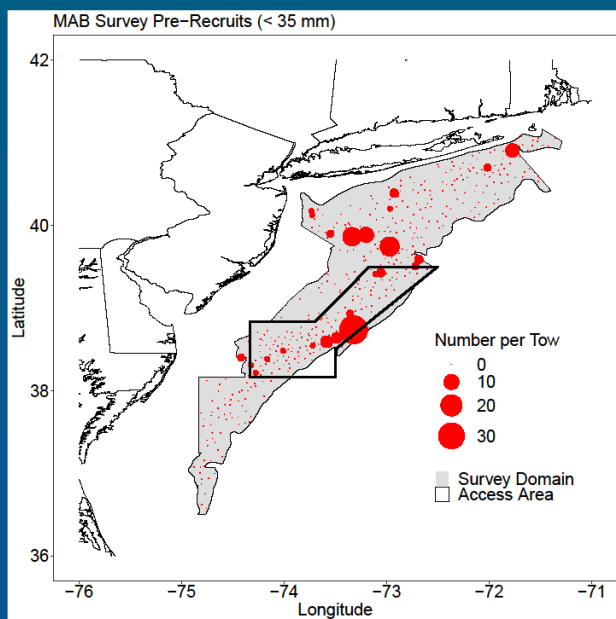
- F/V Norseman
- 6/10 - 6/17/2021
- 125 Stations completed

2021 NL Survey



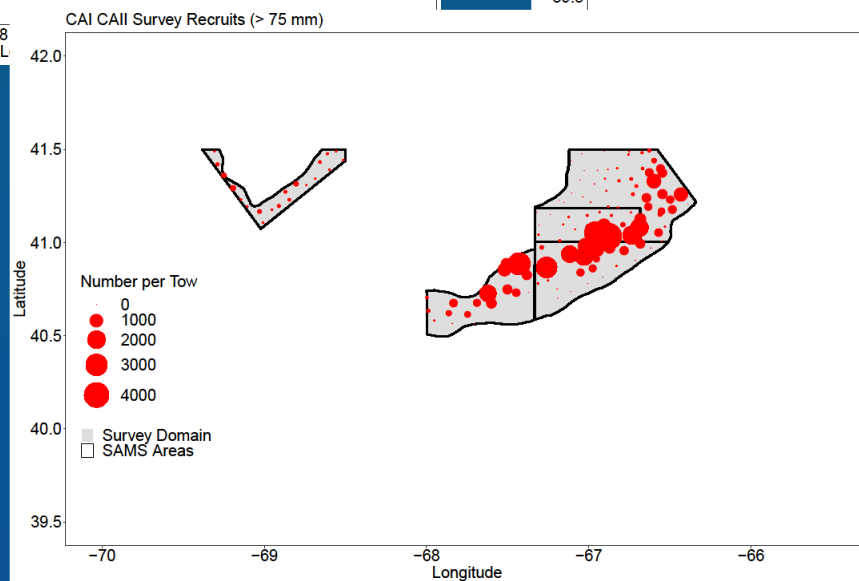
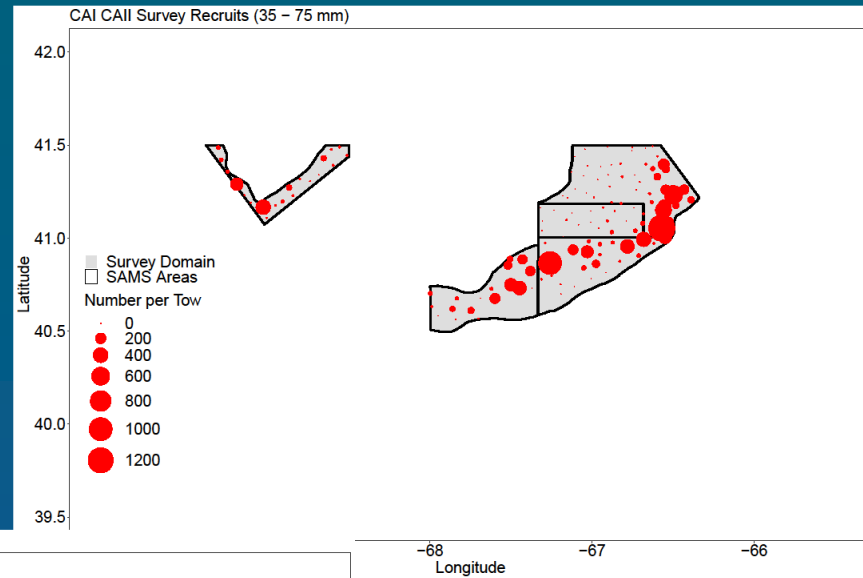
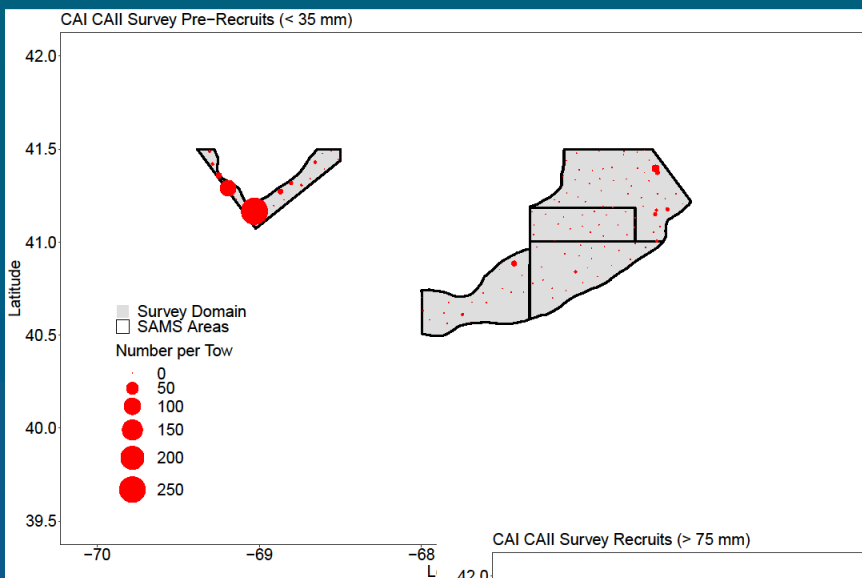
- F/V Celtic
- 6/19 – 6/25/2021
- 135 stations completed

2021 MAB Survey Scallop Distribution – Number per Tow



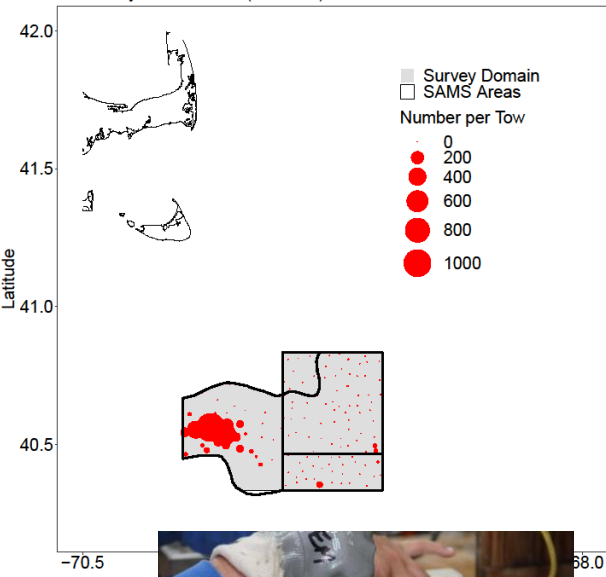
2021 CA I & CA II Survey

Scallop Distribution – Number per Tow

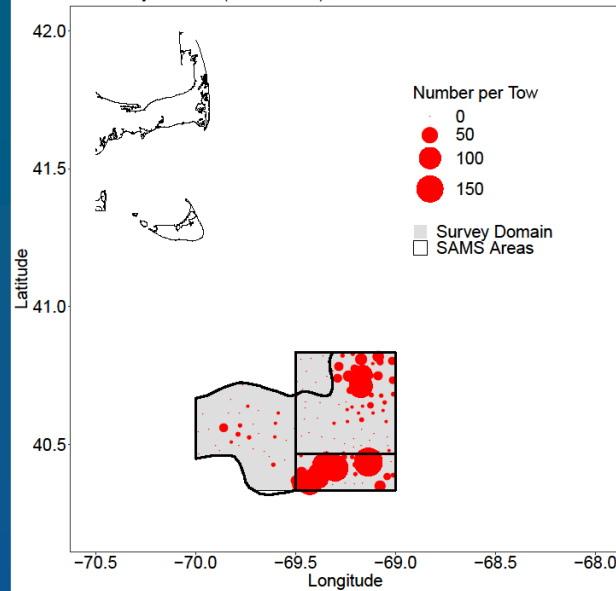


2021 NL Survey Scallop Distribution – Number per Tow

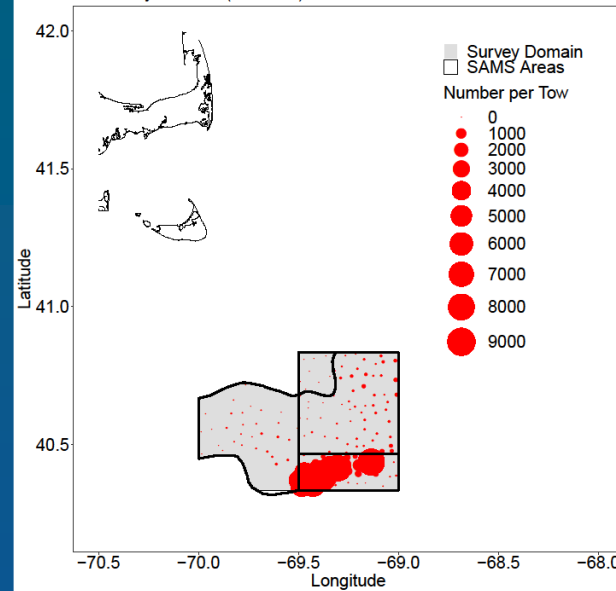
NL Survey Pre-Recruits (< 35 mm)



NL Survey Recruits (35 – 75 mm)



NL Survey Recruits (> 75 mm)

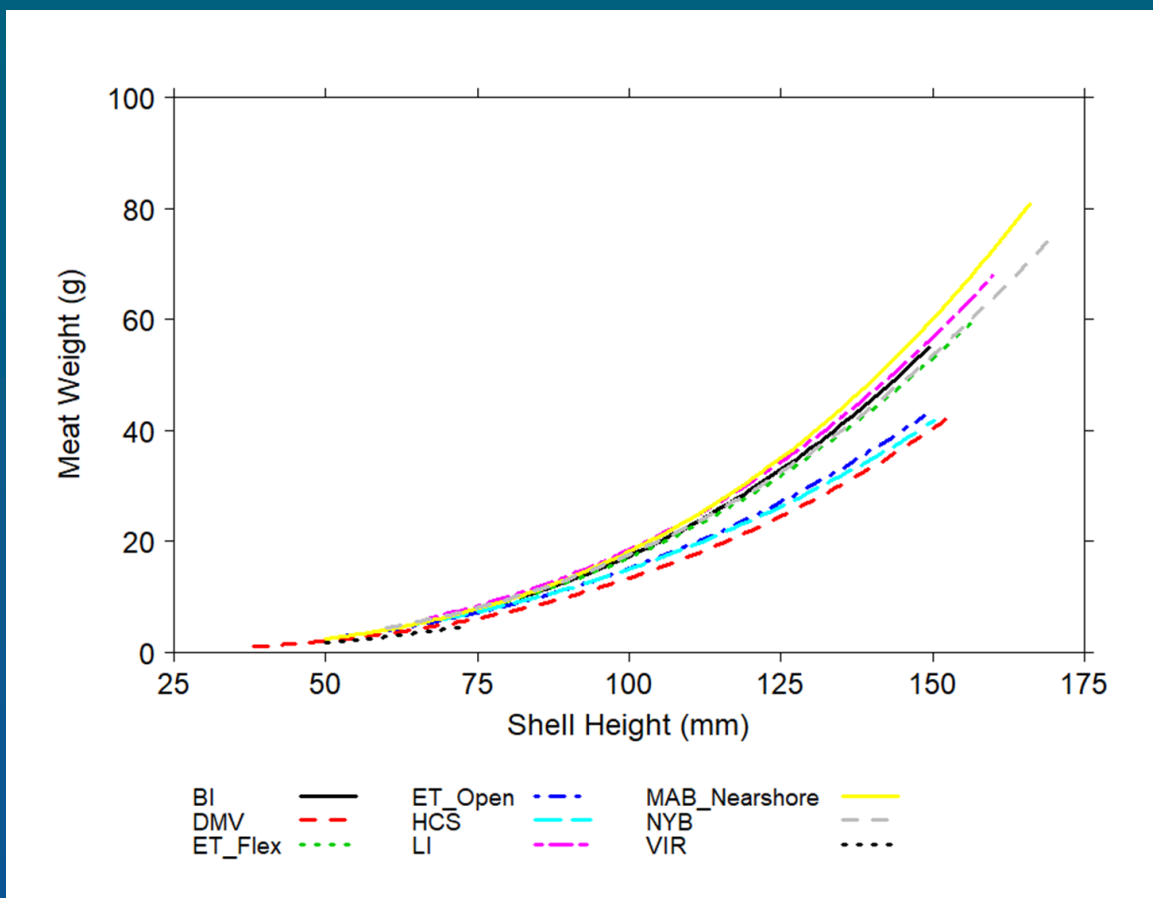


SHMW Relationship

- SHMW samples (meat & gonad weight) were taken from all stations that had scallops (15/station):
 - MAB Survey: 4,840 (376 stations)
 - CA I II Survey: 1,524 (117 stations)
 - NL Survey: 1,500 (121 stations)
- Predict meat weight based on a suite of potential covariates (i.e. shell height, depth, SAMS Area, sex, disease...)
- A GLMM was used to fit model (Gamma distribution, log link, random effect at the station level) with R Package lme4

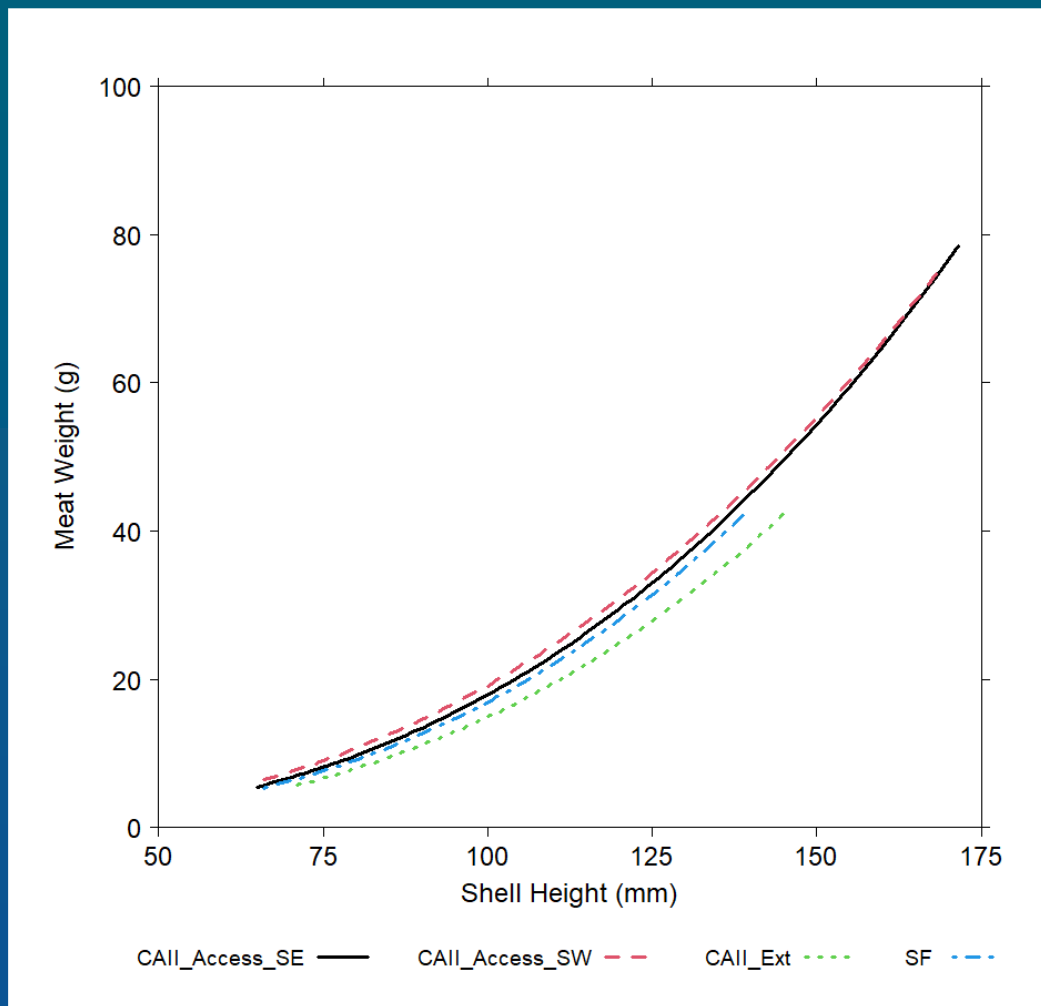


2021 MAB Survey SHMW Results



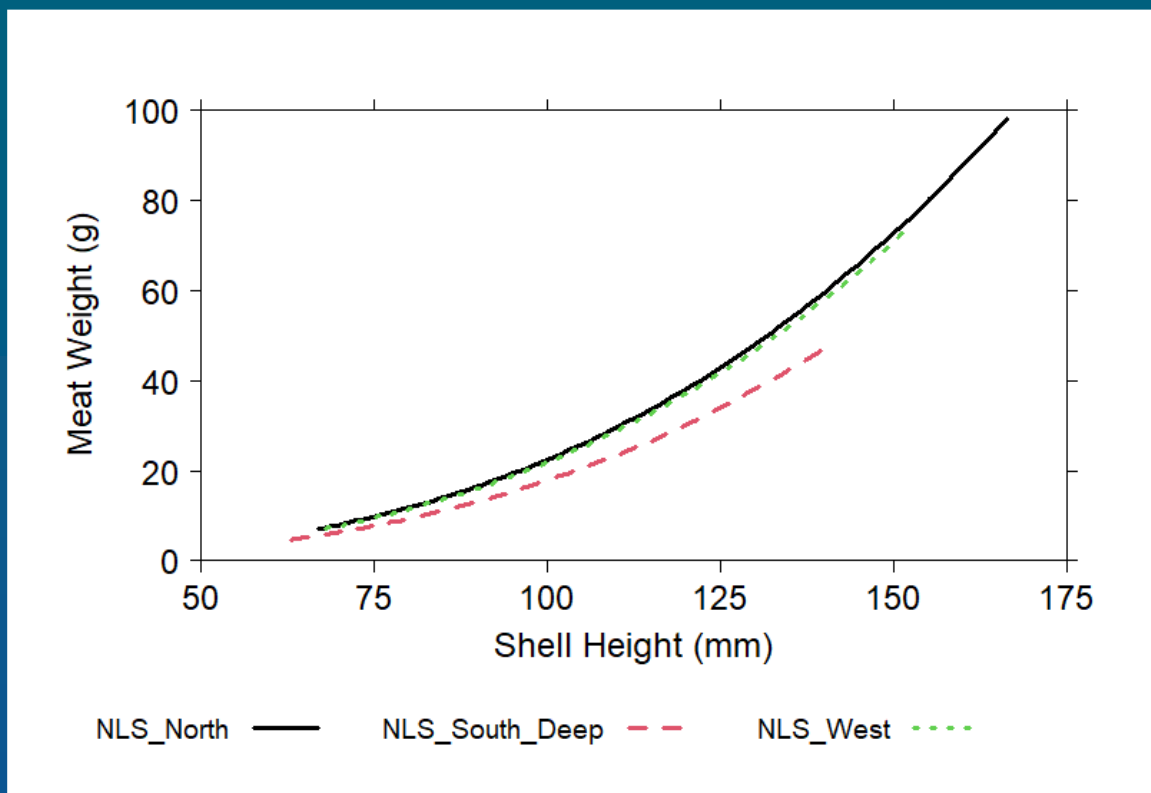
More southern & offshore SAMS Areas have lower SHMW relationships compared to the northern & inshore areas this year for larger scallops

2021 CA II Survey SHMW Results



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

2021 NL Survey SHMW Results

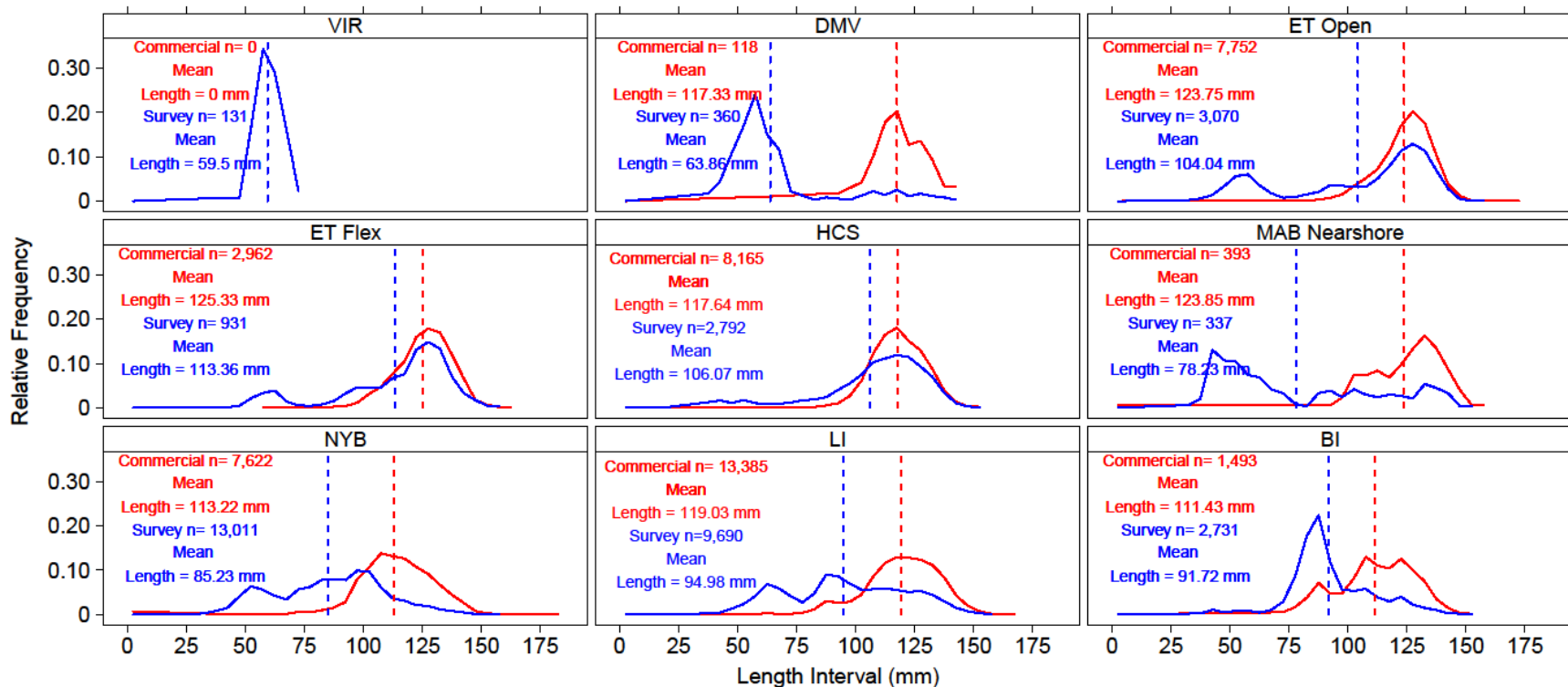


Similar trend to previous years - South Deep SAMS Area has the lowest meat weight at shell height

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

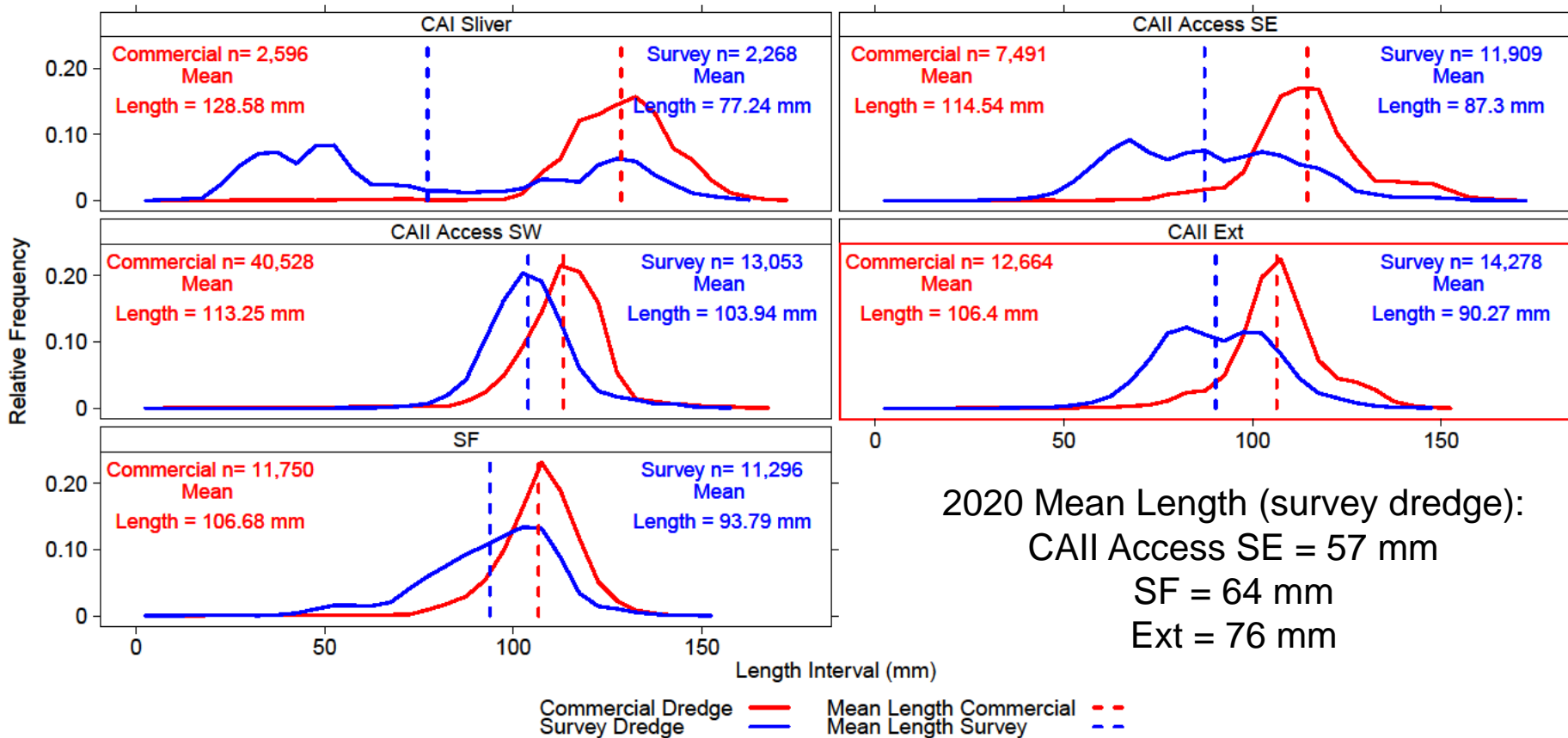
2021 MAB Survey

Length Frequency- SAMS Areas

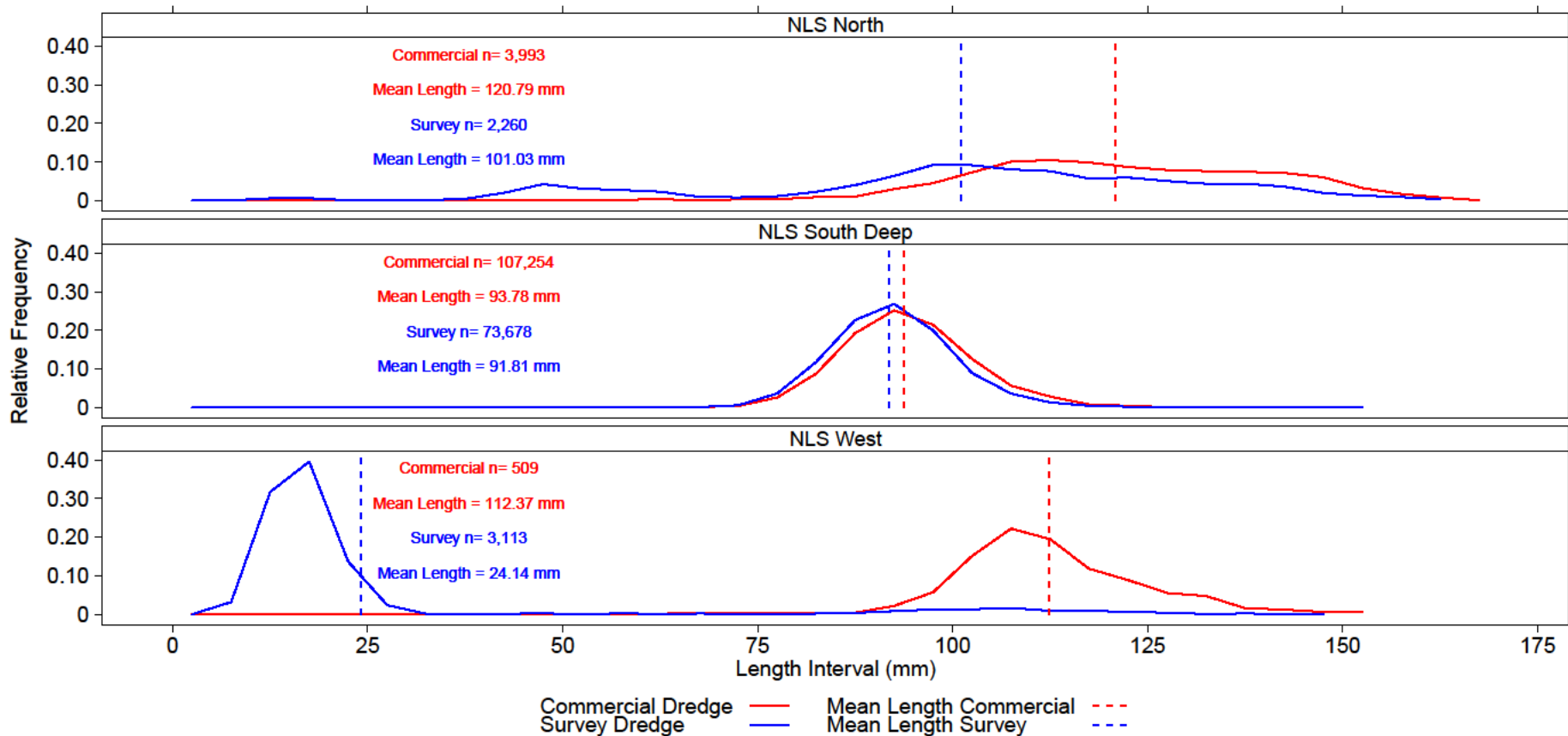


Commercial Dredge ——— Mean Length Commercial
 Survey Dredge ——— Mean Length Survey

2021 CA I & CA II Survey Length Frequency- SAMS Areas



2021 NL Survey Length Frequency- SAMS Areas



2021 VIMS-Industry Cooperative Surveys

Total Biomass Survey Gear – SAMS Areas

- SARC 65 SHMW
- q = 0.4

SAMS Area	Total Biomass (mt)	SE Biomass (mt)	CV Biomass	Density (scal/m ²)	Avg MW (g)	Total Number
BI	1,564	274	44	0.14	17.09	92,957,827
LI	8,302	367	11	0.04	19.25	436,496,307
NYB	6,043	446	18	0.11	14.37	414,752,525
HCS	2,019	94	12	0.03	22.83	89,350,604
MAB Nearshore	513	44	21	0.01	15.2	33,964,176
ET Flex	812	58	18	0.02	27.07	33,096,750
ET Open	1,814	71	10	0.04	22.73	80,967,964
DMV	115	15	33	0	7.16	17,544,959
VIR	16	2	38	0	4.59	3,564,875
CAI Sliver	792	55	17	0.05	19.99	37,838,724
CAII Access SE	5,943	410	17	0.15	16.74	353,733,179
CAII Access SW	11,853	1,684	36	0.39	26.34	452,368,169
CAII Ext	13,602	1,582	29	0.37	17.96	767,774,685
SF	11,582	1,505	32	0.36	17.96	644,784,839
NLS North	887	85	10	0.02	30.84	27,907,754
NLS South Deep	9,863	2,235	23	1.28	12.18	802,244,530
NLS West	228	51	22	0.01	28.02	8,142,377

2021 VIMS-Industry Cooperative Surveys

Exploitable Biomass Commercial Gear - SAMS Areas

- SARC 65
- SHMW
- q = 0.4

SAMS Area	Exp Biomass (mt)	SE Biomass (mt)	CV Biomass	Density (scal/m ²)	Avg MW (g)	Exp Number
BI	451	66	23	0.03	27.4	16,606,923
LI	7,140	387	8	0.02	31.38	222,101,837
HCS	2,455	196	12	0.03	26.52	92,898,248
NYB	2,405	201	13	0.02	26.84	87,473,638
MAB Nearshore	509	95	29	0	35.14	14,483,496
ET Flex	1,230	159	20	0.02	32.99	35,837,104
ET Open	2,316	190	13	0.03	30.48	78,438,915
DMV	45	22	76	0	26.78	1,678,374
VIR	0	0	0	0	0	0
CAI Sliver	837	78	14	0.03	37.71	21,994,160
CAII Access SE	2,463	292	18	0.03	30.93	79,121,153
CAII Access SW	15,696	4,959	49	0.42	33.11	475,246,154
CAII Ext	6,220	1,117	28	0.12	27.2	228,457,520
SF	5,804	1,523	40	0.13	24.53	236,570,731
NLS North	782	69	9	0.01	43.24	17,677,566
NLS South Deep	5,657	1,536	27	0.68	13.04	428,687,256
NLS West	164	32	19	0	32.68	5,004,626

SARC 65 Total Biomass Estimates Compared to VIMS 2016-2021 Estimates & reduced q for NL South Deep

SAMS Area	Total Biomass (mt)	Total Biomass (mt)	Total Biomass (mt)	Total Biomass (mt)
	SARC 65	VIMS 2016-2021	SARC 65	VIMS 2016-2021
	q=.40	q=.40	q=.13	q=.13
NLS South Deep	9,863.43	9,375.19	30,349.02	28,846.75

Acknowledgements

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