

## Estimated Proportion of Undersized Surfclam Landings for 2019

John Sullivan.  
Analysis and Program Support Division  
Greater Atlantic Regional Fisheries Office  
National Marine Fisheries Service  
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### Introduction

The Code of Federal Regulations includes a provision for the suspension of minimum landing size regulations for surfclam (*Spisula solidissima*) [CFR 50, §648.75 (b)(3)]:

*“upon recommendation of the Mid-Atlantic Fishery Management Council (MAFMC), the Regional Administrator may suspend annually, by publication in the Federal Register, the minimum shell-height standard unless discard, catch, and survey data indicate that 30 percent of the surfclams are smaller than 4.75 inches (12.065 cm) and the overall reduced shell height is not attributable to beds where the growth of individual surfclams has been reduced because of density dependent factors.”*

Each year an analysis of the size composition of surfclam landings is conducted to inform any recommendation by the Mid-Atlantic Council to the Regional Administrator concerning surfclam minimum size restrictions. The following report summarizes the analysis of Atlantic surfclam landings in 2019.

### Data Sources and Procedures

Samples of surfclam landings were collected from the Georges Bank, New Jersey and DelMarVa stock areas. These samples were not evenly distributed and, therefore, had to be weighted by stock area and volume. The coast-wide distribution of undersized surfclams was then calculated.

The estimate for coast wide undersized surfclams landed was determined by calculating a weighted average proportion of undersized surfclams with equation 1:

$$\hat{P}_c = \left( \sum_{j=1}^n W_j \hat{P}_j \right) \quad (1)$$

where

$\hat{P}_c$  is the estimated coast wide proportion of undersized surfclams landed

$W_j$  is the proportion of landings from stock area  $j$  in the coast wide reported landings, as calculated with equation 2:

$$W_j = \frac{L_j}{\sum_1^3 L_j} \quad (2)$$

$L_j$  is the volume landed (bushels) from stock area  $j$

$\hat{P}_j$  is the estimated proportion of undersized surfclams in stock area  $j$ , as calculated with equation 3

$$\hat{P}_j = \left( \sum_{i=1}^n w_{ij} p_{ij} \right) \quad (3)$$

$w_{ij}$  is the proportion of the landings of sample  $i$  to total landings of all samples from stock area  $j$ , as calculated with equation 4:

$$w_{ij} = \frac{l_{ij}}{\sum_{i=1}^n l_{ij}} \quad (4)$$

$l_{ij}$  is the volume (bushels) for sample  $i$  from stock area  $j$

$p_{ij}$  is the proportion of undersized surfclams in sample  $i$  from stock area  $j$ , as calculated with equation 5:

$$p_{ij} = \frac{x_{ij}}{n_{ij}} \quad (5)$$

$n_{ij}$  is the number of surfclams in sample  $i$  from stock area  $j$

$x_{ij}$  is the number of surfclams <121 mm in size from sample  $i$  of stock area  $j$

Once the coast wide weighted average proportion of undersized surfclams was determined, the coast wide variance of the proportional mean was calculated and used to determine the 95% confidence intervals around that estimate.

The variance estimate for the proportion of undersized coast wide landings was calculated using equation 6:

$$\text{var}(\hat{P}_c) = \sum_{j=1}^3 W_j^2 \times \text{var}(\hat{P}_j) \quad (6)$$

where

$W_j$  is the proportion of all landings from stock area  $j$  to the coast wide landings from all three areas (Georges Bank, New Jersey and DelMarVa), as calculated with equation 2

$\text{var}(\hat{p}_j)$  is the variance associated with each stock area  $j$  estimated with equation 7:

$$\text{var}(\hat{p}_j) = \sum_{i=1}^n w_{ij}^2 \times \text{var}(\hat{p}_{ij}) \quad (7)$$

$w_{ij}$  is the proportion of the landings of sample  $i$  to total landings of all samples from stock area  $j$ , as calculated with equation 4

$\text{var}(\hat{p}_{ij})$  is the variance of the proportion of sample  $i$  in stock area  $j$  estimated with equation 8:

$$\text{var}(\hat{p}_{ij}) = \frac{(p_{ij} \times (1 - p_{ij}))}{n_{ij}} \quad (8)$$

The 2019 sampling period extended from August 1, 2018 through July 31, 2019. Surfclam samples were collected from vessels fishing in Georges Bank statistical areas 521, 522, 525, and 562; in New Jersey statistical areas 612, 613, 614, and 615; and in DelMarVa statistical area 622. A total of 159 samples from 18 distinct vessels were used for this analysis of the 2019 sampling period.

Two types of data were used in the analysis: (1) landings information and (2) biological sampling data. Surfclam landings data were collected as part of the Greater Atlantic Regional Fisheries Office mandatory reporting requirements. Vessel and dealer permit holders reported landed volume (bushels), vessel permit number, and fishing location, as well as other information from each vessel trip. This information provided landings data for the principle stock areas. Stakeholder Engagement Division (SED) field staff collected biological samples from selected vessels upon docking. Each sample consisted of shell height measurements from approximately 30 randomly selected individual surfclams. Fishing location of the sampled catch was recorded by SED field staff from information reported by the vessel operators. For length records that lacked area fished information, area fished was determined from the vessel log report for the trip or from the most recent available surfclam log report that included area fished for a particular vessel. Volume of the catch from which the sample was derived was pulled from vessel clam log data for the sampled trip. Oracle tables (sfoqpr and sfoqvr in the sfclam schema on the nero oracle server) were used to query and match vessel trip landings by date and permit

number. If vessel clam log data could not be matched to a sampled trip, dealer-reported volume information for the sampled trip was used. There were several instances where a sampled trip lacked volume landed information from either the vessel clam logs or dealer reports. The volume of these unmatched samples was estimated using the average number of bushels of surfclams landed on all trips by that vessel in fishing year 2019.

Landings information from the principle stock areas indicated that DelMarVA landings made up approximately 39% of the coast wide catch. The remaining 61% of the catch came from the Georges Bank and New Jersey stock areas (Table 1).

Table 1. FY2019 Landings of surfclams reported by vessels August 1, 2018 – July 31, 2019.

Stock area	Reported Landings (bushels) August, 2018 - July, 2019	Meat weight of reported landings (lbs.)	Percent of reported landings
Georges Bank	705,477	11,993,109	37.4%
New Jersey	454,698	7,729,866	24.1%
DelMarVa	726,464	12,349,888	38.5%
Grand Total	1,886,639	32,072,863	100.0%

The nominal length distribution of all biological samples obtained from August 1, 2018 – July 31, 2019 indicated that the majority of surfclams sampled were equal to or larger than 121 mm. The mean length of the coast wide samples was 129 mm (Figure 1).

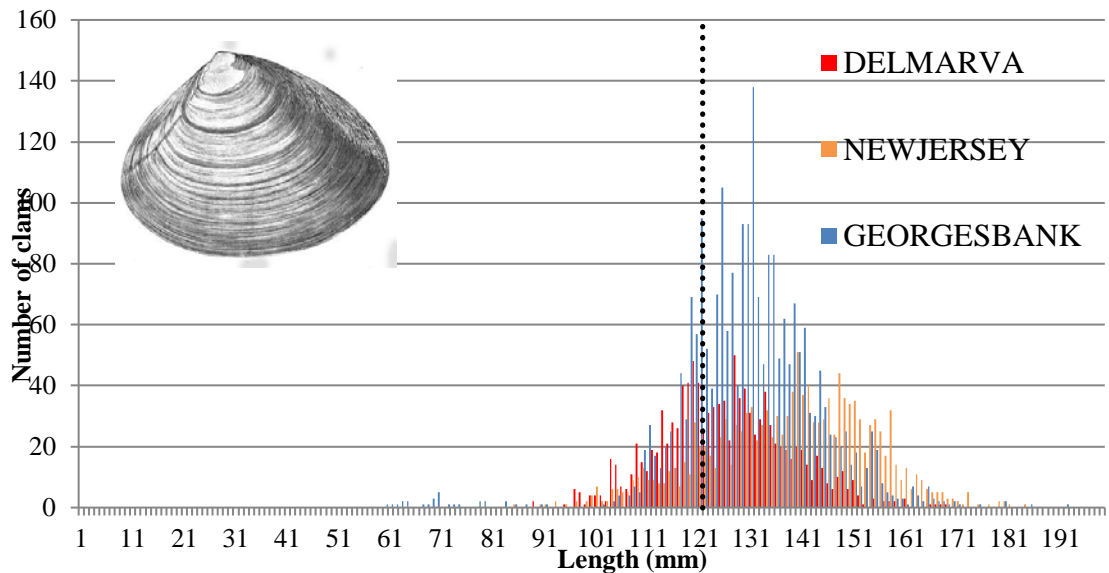


Figure 1. Length frequency distribution of surfclams from dockside sampling for FY2019. The dashed vertical line separates surfclams above and below 121 mm.

The 159 samples used in this analysis contained 4771 measured surfclams, of which 856 individual surfclams were undersized. Fourtyone of the 159 samples collected had 30% or more undersized surfclams; 19 of those samples came from the DelMarVa stock area, 15 came from George’s Bank, an the remaining seven samples with 30% or more undersized surfclams came from the New Jersey stock area (Table 2).

Table 2. Description of the 159 individual surfclam samples collected in 2019, with the proportion of undersized surfclams in each sample.

Sample Number	Stock Area	Number of surfclams in sample	Proportion of undersized surfclams*	Volume of catch (bushels)
1	DelMarVa	30	0.10	288
2	DelMarVa	30	0.13	960
3	DelMarVa	30	0.27	960
4	DelMarVa	30	0.40	512
5	DelMarVa	30	0.07	480
6	DelMarVa	30	0.20	3040
7	DelMarVa	30	0.50	960
8	DelMarVa	30	0.23	896
9	DelMarVa	30	0.27	768
10	DelMarVa	30	0.07	800
11	DelMarVa	30	0.43	4352
12	DelMarVa	30	0.13	832
13	DelMarVa	30	0.30	64
14	DelMarVa	30	0.27	3584
15	DelMarVa	30	0.70	1088
16	DelMarVa	30	0.37	1664
17	DelMarVa	30	0.47	960
18	DelMarVa	30	0.40	960
19	DelMarVa	30	0.23	960
20	DelMarVa	30	0.40	1664
21	DelMarVa	30	0.20	896
22	DelMarVa	30	0.30	960
23	DelMarVa	30	0.27	96
24	DelMarVa	30	0.13	672
25	DelMarVa	30	0.63	480
26	DelMarVa	30	0.23	1152
27	DelMarVa	30	0.07	544
28	DelMarVa	30	0.33	1024

29	DelMarVa	30	0.23	1344
30	DelMarVa	30	0.43	1440
31	DelMarVa	30	0.10	1440
32	DelMarVa	30	0.30	992
33	DelMarVa	30	0.27	1664
34	DelMarVa	30	0.47	160
35	DelMarVa	30	0.37	1952
36	DelMarVa	30	0.63	1148
37	DelMarVa	30	0.30	960
38	DelMarVa	30	0.67	960
39	Georges Bank	30	0.07	1984
40	Georges Bank	30	0.07	3552
41	Georges Bank	30	0.10	2720
42	Georges Bank	32	0.00	4800
43	Georges Bank	30	0.27	2080
44	Georges Bank	30	0.33	1408
45	Georges Bank	30	0.07	2048
46	Georges Bank	30	0.33	5120
47	Georges Bank	30	0.23	2485
48	Georges Bank	30	1.00	5440
49	Georges Bank	30	0.20	3520
50	Georges Bank	30	0.20	4544
51	Georges Bank	30	0.23	2464
52	Georges Bank	30	0.20	4800
53	Georges Bank	30	0.30	4800
54	Georges Bank	30	0.00	2432
55	Georges Bank	30	0.13	2912
56	Georges Bank	30	0.00	3968
57	Georges Bank	30	0.00	4576
58	Georges Bank	30	0.07	640
59	Georges Bank	30	0.20	3072
60	Georges Bank	30	0.23	4000
61	Georges Bank	30	0.00	2048
62	Georges Bank	30	0.00	4224
63	Georges Bank	30	0.17	3232
64	Georges Bank	30	0.33	4800
65	Georges Bank	30	0.33	3168
66	Georges Bank	30	0.33	4800
67	Georges Bank	30	0.30	4320
68	Georges Bank	30	0.20	1600
69	Georges Bank	30	0.50	4256

70	Georges Bank	30	0.13	3744
71	Georges Bank	30	0.17	3360
72	Georges Bank	30	0.03	4288
73	Georges Bank	30	0.17	4800
74	Georges Bank	30	0.07	3559
75	Georges Bank	30	0.17	4800
76	Georges Bank	30	0.30	4800
77	Georges Bank	30	0.37	4064
78	Georges Bank	30	0.07	4288
79	Georges Bank	30	0.33	2432
80	Georges Bank	30	0.07	4128
81	Georges Bank	30	0.30	3872
82	Georges Bank	30	0.10	4800
83	Georges Bank	30	0.30	4096
84	Georges Bank	30	0.20	704
85	Georges Bank	30	0.30	4864
86	Georges Bank	30	0.10	5440
87	Georges Bank	30	0.07	4288
88	Georges Bank	30	0.07	2752
89	Georges Bank	30	0.00	2624
90	Georges Bank	30	0.03	3392
91	Georges Bank	30	0.13	3584
92	Georges Bank	30	0.10	3584
93	Georges Bank	30	0.07	2400
94	Georges Bank	30	0.23	3520
95	Georges Bank	30	0.07	4288
96	Georges Bank	29	0.10	2080
97	Georges Bank	30	0.03	2720
98	Georges Bank	30	0.03	288
99	Georges Bank	29	0.00	4800
100	Georges Bank	30	0.10	928
101	Georges Bank	30	0.03	5024
102	Georges Bank	30	0.03	896
103	Georges Bank	30	0.00	2432
104	Georges Bank	30	0.00	5440
105	Georges Bank	29	0.10	2752
106	Georges Bank	30	0.00	3840
107	Georges Bank	30	0.00	3232
108	Georges Bank	30	0.00	3520
109	Georges Bank	30	0.07	3040
110	Georges Bank	30	0.00	5440

111	Georges Bank	31	0.03	3392
112	Georges Bank	30	0.10	4288
113	Georges Bank	30	0.00	5440
114	New Jersey	30	0.50	928
115	New Jersey	30	0.03	480
116	New Jersey	30	0.53	996
117	New Jersey	30	0.07	480
118	New Jersey	30	0.20	960
119	New Jersey	30	0.17	512
120	New Jersey	30	0.03	704
121	New Jersey	30	0.43	1024
122	New Jersey	30	0.10	512
123	New Jersey	30	0.37	747
124	New Jersey	30	0.03	480
125	New Jersey	30	0.07	480
126	New Jersey	30	0.13	480
127	New Jersey	30	0.03	480
128	New Jersey	30	0.00	896
129	New Jersey	30	0.00	960
130	New Jersey	30	0.10	480
131	New Jersey	30	0.00	480
132	New Jersey	30	0.00	480
133	New Jersey	30	0.00	2048
134	New Jersey	30	0.00	2048
135	New Jersey	30	0.03	704
136	New Jersey	30	0.00	480
137	New Jersey	30	0.00	1472
138	New Jersey	30	0.00	640
139	New Jersey	30	0.07	832
140	New Jersey	30	0.07	1760
141	New Jersey	30	0.13	480
142	New Jersey	30	0.03	1536
143	New Jersey	30	0.47	1440
144	New Jersey	30	0.03	960
145	New Jersey	30	0.17	960
146	New Jersey	30	0.10	480
147	New Jersey	30	0.03	544
148	New Jersey	30	0.00	960
149	New Jersey	30	0.63	960
150	New Jersey	30	0.00	960
151	New Jersey	30	0.20	864



152	New Jersey	30	0.03	768
153	New Jersey	30	0.00	736
154	New Jersey	30	0.00	672
155	New Jersey	30	0.13	1920
156	New Jersey	31	0.16	1344
157	New Jersey	30	0.30	2688
158	New Jersey	30	0.23	1344
159	New Jersey	30	0.07	1344

\*samples with more than 30% undersized surfclams are highlighted.

### Estimation Results

An estimated 22.0% of the coast wide surfclam landings to date in 2019 were undersized. The lower and upper 95% confidence bounds for this estimate were 21.1% and 22.8%. These estimates are below the 30% maximum that would preclude the Regional Administrator from suspending the minimum shell height standard (Table 3).

Table 3. Proportional distribution of 2019 undersized surfclams by area and coast-wide.

Area	Estimated percentage of surfclams <121 mm	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Georges Bank	18.2%	18.2%	18.3%
New Jersey	11.0%	10.9%	11.0%
DelMarVa	32.5%	32.2%	32.7%
<b>Coast-wide*</b>	22.0%	21.1%	22.8%

\* weighted mean