Technical Report #6

2024 SHELLFISH RECRUITMENT MONITORING RESULTS

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In Partnership With:

Wells Shellfish Conservation Committee
Scarborough Shellfish Conservation Committee
Brunswick Marine Resources Committee
Phippsburg Shellfish Conservation Committee
Bremen Shellfish Conservation Committee
Islesboro Shellfish Conservation Committee
Stonington & Deer Isle Shellfish Conservation Committee
Frenchman's Bay Regional Shellfish Conservation Committee
Beals Shellfish Conservation Committee
Machiasport Shellfish Conservation Commission
Unorganized Townships of Washington County
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This work was made possible by the following major collaborators:

Mike Yorke, Wells
Noah Nygren, Scarborough
Dan Deveareaux and Dan Sylvain, Brunswick
Boe Marsh and Kristen Roberts, Bremen
Janis Petzel, Ken Smith, and Rachel Rolerson-Smith, Islesboro
Crystal Gove, Stonington & Deer Isle
Joe Porada and Cathy Pickard, Frenchman's Bay
Mark Whiting, Hancock Conservation District
Rep. Robert Alley and Kevin Beal, Beals
Brea Salter, Asher Michalski, Alanna McGovern, Kyle Pepperman, Madeline Wren, and Ben Capuano, Downeast Institute
Brian Smith and Heron Weston, Unorganized Territories of Washington County
Chris Bartlett, Maine Sea Grant
Erik Francis, Sipayik

FUNDING PROVIDED BY: **THE MAINE CLIMATE ACTION FUND**

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OVERVIEW

This year, the **Soft-shell Clam Recruitment Monitoring Network** partnered with twelve community shellfish programs spanning the coast of Maine to conduct intertidal monitoring to increase understanding of the dynamics of the clam fishery. We measure densities of young-of-the-year soft-shell clams, and other commercially important species recruiting to the mudflats, determine how much the recruits grew in their first year of life, conduct shellfish surveys in the spring and fall, and record seawater temperatures. We also determine densities and sizes of green crabs, a major clam predator.

This report details the 2024 results of this effort.

OBJECTIVES & GOALS

We are building a long-term database to better understand local, regional, and coastwide trends in clam production. Our goal is that this information will be used to sustain the fishery for current and future generations of clammers and coastal communities.

This information is crucial to understanding the impacts of a warming marine environment on clam populations, and equips managers for the challenges of sustaining and enhancing clam populations under these warming conditions.

INTRODUCTION and METHODOLOGY

What is Clam Recruitment?

Clams have two major life history stages — 1) a planktonic (swimming) larval stage that has three major developmental components: trochophore (0.075 mm; 0.003 in), veliger (0.1 mm; 0.004 in), and pediveliger (0.175 mm; 0.007 in); and, 2) a settlement stage (0.2-0.25 mm; 0.008-0.009 in) where the swimming larvae encounter (i.e. "settle onto") the seafloor bottom (typically a mudflat) followed by a rapid metamorphosis into a miniature (juvenile) version of the adult. Once settled, juvenile clams may be moved around on the mudflats by physical forces such as tidal or wind-driven currents, but will reside in sediments for the rest of their lives where they will, in time, grow into adult clams.

After clams settle out of the water column and onto the mudflat, a process called "recruitment to the benthos (bottom)," they are called "recruits" when scientists sample them. Specifically, recruitment involves the process of settling onto the mudflat, and then a period (days, weeks, months) of post-settlement survival prior to being sampled. Therefore, the size of a clam recruit could be anywhere from a microscopic speck to a half-inch or larger animal depending on the length of time between when the clam settled and when the clam is sampled from the mudflat. Recruits also are referred to as "0-year class individuals" because they are not yet 1-year old. They are also called "young-of-the-year."

Why is the Fate of Clam Recruits Important?

Recruitment is a critical stage in the early life-history of the clam. Robust commercial harvests rely on strong recruitment followed by relatively high survival.

Because of their small size, recruits are extremely vulnerable to mortality. Previous independent field research conducted in three southern Maine towns (Wells, Portland, and Freeport) found that less than 1% of clam recruits survive to reach 1-year-old (Beal et al. 2018). Repeated field research through the years has found that predation is the most important factor causing clam mortality on flats along the entire coast of Maine (Beal et al. 2001, Beal & Kraus 2002, Beal 2006a,b, Beal et al. 2016, Beal et al. 2018, Beal et al. 2020a,b, Beal 2023). While the invasive green crab, *Carcinus maenas*, is credited correctly as being the major predator of soft-shell clams along the Maine coast, other predators (most of which are native) exist, and most focus their activities on juvenile (shallow-burrowing) clams. These include, but are not limited to: milky ribbon worms (*Cerebratulus lacteus*), moon snails (*Euspira heros* & *Euspira triseriata*), sand shrimp (*Crangon septemspinosa*), mummichogs (*Fundulus heteroclitus*) and killifish (*Fundulus majalis*) as well as common eider and black ducks (*Somateria mollissima* and *Anas rubripes*, respectively).

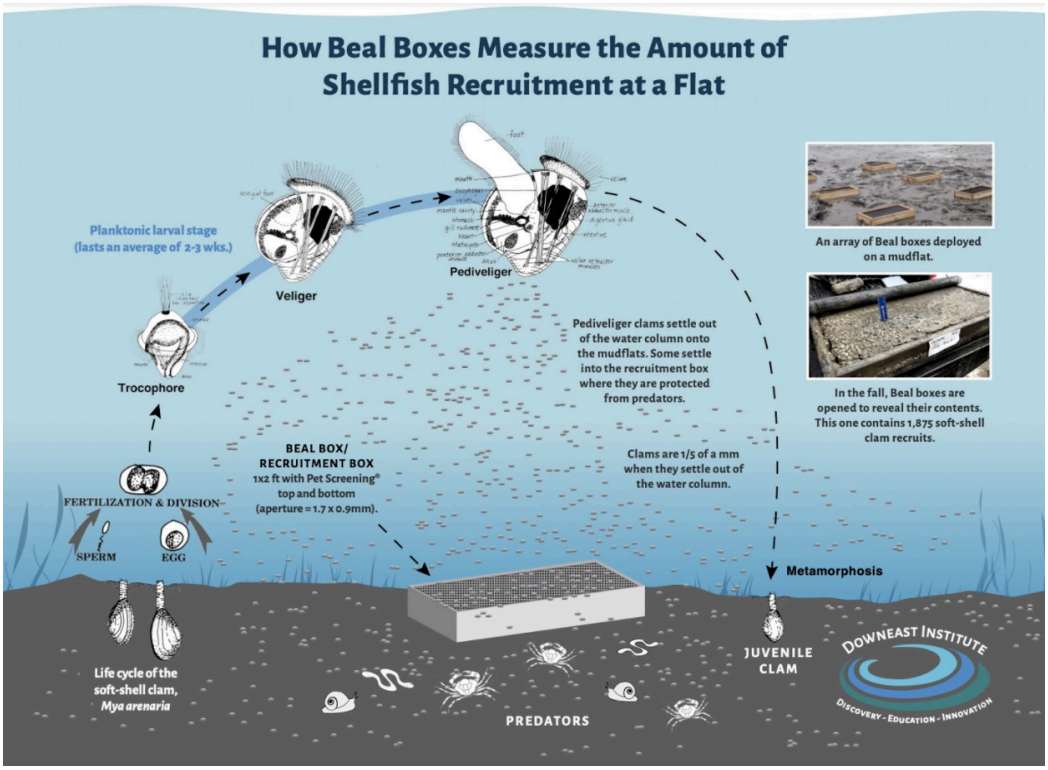
The Gulf of Maine has been warming for the last 40 years (Pershing et al. 2015), and the warming is changing Maine's marine environment. Ecological processes in the intertidal zone where clams live

are being altered due to the proliferation of predators such as the invasive green crab, which thrives in warmer waters. In addition, warming has the effect of increasing the metabolism of native and non-native shellfish predators, resulting in higher predation rates. Adding to that problem, as summertime and fall seawater temperatures continue to warm, invertebrate predators especially will respond by increasing their foraging rates on clams and other infaunal organisms (Papastamatiou et al. 2015, Huey & Kingsolver 1989). This means it is even more important than ever to monitor annual clam recruitment abundance and distribution (i.e. how many and where) as well as the number of clams that survive their first year of life.

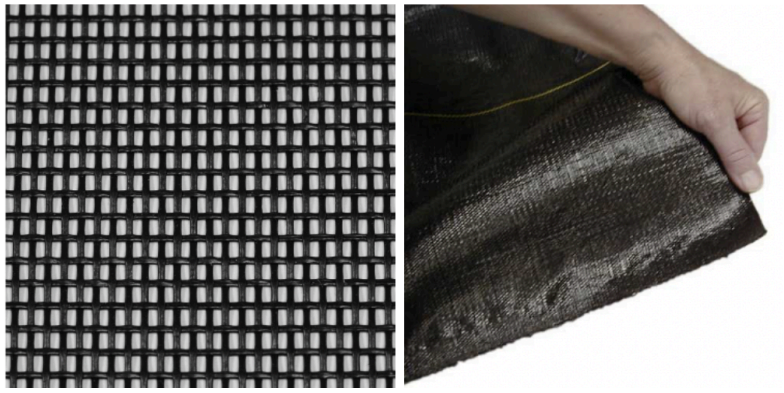
Using Clam Recruitment Boxes (Beal Boxes) to Monitor Clam Recruitment

In 2015, Downeast Institute (DEI) invented a simple, low-tech method to measure clam recruitment (abundance of recruits) and estimate survival of 0-year class clams. Recruitment boxes, also called Beal boxes, are affixed to the mudflat surface and passively collect settling clams. The 0-year class clams that settle into them are protected from most predators, and therefore can survive and grow.

Boxes are wooden frames (1-ft x 2-ft x 3-inches deep) with mesh on the top and a piece of polyethylene agricultural ground cover (garden weed barrier) on the bottom. All boxes (12 at each site) in the Soft-shell Clam Recruitment Monitoring Network have ***PetScreen*® mesh** tops. Pet- Screen® has an aperture size of 1.7 x 0.9 mm, or 0.067-inches x 0.035-inches (0.002 in^2). This size is large enough so that approximately 50 settling soft-shell clams could all fit at the same time through one of the thousands of apertures in the screening.



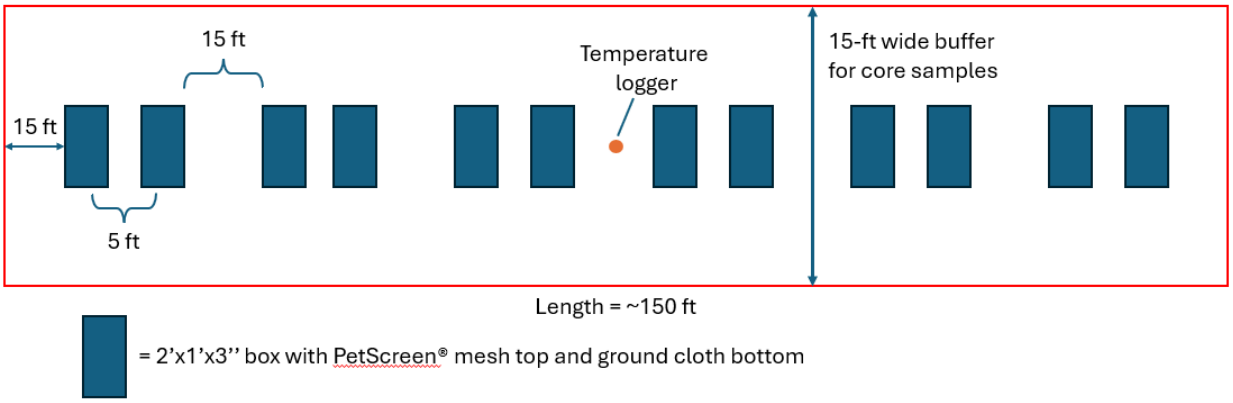
Juvenile clams settle into recruitment boxes where they are protected from most predators and can survive the growing season (April to November).



PetScreen® mesh (left) and ground cover fabric (right).

2024 Site Deployment

12 boxes were deployed at each of two mudflats within the 12 participating communities during April and early May 2024. Recruitment boxes were deployed near the lower mid-intertidal in a line parallel to the incoming tide before clams began spawning. All boxes were affixed onto the mudflat surface at each site by driving wooden laths into the mud to a depth of 20-inches at the short end of each box, and then pounding small, galvanized nails through the laths and into the ends of the box.



Field design with 12 recruitment boxes grouped in blocks of two and a temperature logger deployed in the center of the matrix. The overall distance the boxes cover varies depending on the site.

Spring Shellfish Site Surveys

To establish density (# clams/ft^2) and size range of clams occurring at each site at the beginning of the monitoring season, 12 core samples were taken at each intertidal site (with a coring device that has a surface area of 0.1963 ft^2) on the same day that Beal boxes were deployed. Cores were taken to a depth of 8-inches or to a hardpan layer, whichever came first, with each sample weighing about 10 lbs.

Samples were tagged with location information and transported from the mudflat to a location where each was washed with seawater through a sieve (1-mm mesh) to remove the mud, detritus, and other debris. Commercially important shellfish 1-mm or larger were identified, counted, measured (to the nearest 0.01 mm using digital calipers), and then the data was recorded. Clam

predators (milky ribbon worms and green crabs) in the cores also were counted and the carapace width of each green crab was measured.

Site Temperatures

As in previous years, temperature loggers (HOBOs) were deployed at each site to determine site-specific seawater temperatures throughout the tidal cycle for the duration of the monitoring period. Loggers recorded air (low tide) and seawater (high tide) temperatures every 30 minutes.

Appendix E contains graphs showing how ***seawater temperatures*** changed throughout the deployment period (April-November). Each point represents an average of five temperature recordings taken thirty minutes apart – one at high tide, two prior to, and two following each high tide. The resulting graphs show seawater temperature only around the high tide period, as this is what clams experience while they are consuming food (filtering microalgae from the overlying water), and the seawater temperature during feeding correlates directly with growth rate (Appledoorn 1983).

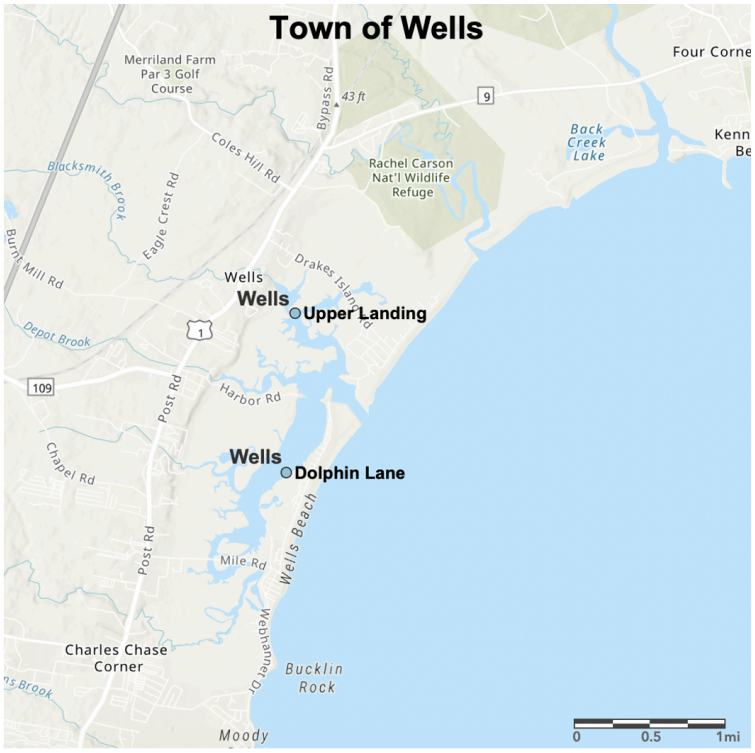
End of the Year Sampling: Recruitment Boxes and Fall Shellfish Survey

In each community, at the end of the clam growing season (late October/early November), the 12 recruitment boxes from each flat (N=24) were retrieved, and an additional 12 benthic core samples per flat (same size and technique as the spring survey) were taken haphazardly adjacent (2 m) to the boxes.

For each flat in each community, the contents of all 12 recruitment boxes and 12 core samples were individually processed by washing samples through a 1-mm mesh sieve (as described above) so that any commercial shellfish species as well as green crabs larger than 1 mm would be retained on the screen, identified, counted, and measured. In addition, a representative sample of up to 20 clams was taken from each recruitment box and the shell length (the longest anterior-posterior distance) of each measured to the nearest 0.01 mm using a digital caliper. All green crabs in each recruitment box were counted, and the carapace width of each measured to the nearest 0.01 mm. This report details the results from these activities.

Results from the fall survey show the number of soft-shell clams and other commercially important shellfish present in the lower mid-intertidal area of the monitoring site at the end of the clam growing season. Comparing clam densities from the fall core survey (i.e. clams not protected from predators) to clam densities from the recruitment boxes (i.e. clams somewhat protected from predators) provides an estimate of how predators affect abundance and size of young-of-the-year clams.

SOUTHERN MAINE
WELLS



Site locations: Upper Landing and Dolphin Lane

CLAMMING PROFILE:

- 511.2 intertidal acres (DMR Acreage by Town, 2016).
- Wells has no commercial clamming program; instead, it has a strong recreational program, with 124 recreational licenses allocated in 2024 (DMR General Town Shellfish Information, 2024).

Beginning (Deployment) Date: April 6, 2024
Ending (Fall Sampling) Date: October 16, 2024 (194 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2023 Seawater Temperatures	2024 Seawater Temperatures
Upper Landing	Max: 21.8°C (July 11) Min: 5.7°C (May 10)	Max: 21.9°C (August 26) Min: 7.3°C (May 2)	Max: 22.5°C (August 26) Min: 5.9°C (April 28)	Max: 22.4°C (July 23) Min: 5.1°C (April 9)	Max: 21°C (Aug 10) Min: 4.8°C (April 14)
Dolphin Lane	Max: 21.4°C (July 24) Min: 5.6°C (May 10)	Lost recorder	Max: 22.8°C (August 28) Min: 6.2°C (April 23/28)	Max: 22.0°C (July 23) Min: 5.2°C (April 9)	Recorder failed

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

The recorder deployed at Dolphin Lane in 2024 failed after five days. Analysis of how seawater temperatures changed through the season at Upper Landing can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Wells (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2), and accompanied by the 95% confidence interval (CI)* in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities	Average size of clams sampled	
	Spring	Fall		Spring	Fall
Dolphin Lane	7.64 (±5.26) clams/ft^2	7.64 (±8.67) clams/ft^2	No change	4.71 mm [0.19 in]	2.77 mm [0.11 in]
Upper Landing	6.38 (±3.42) clams/ft^2	0 clams/ft^2	Loss of 6.38 clams/ft^2	4.01 mm [0.16 in]	N/A

*Confidence intervals are used by ecologists to understand the boundaries that capture the true mean. It is used because the actual ("true") average of clam numbers/ft^2 cannot be known unless every inch of mud on the flat is processed through a 1 mm sieve. The most common type of confidence interval is the 95% CI, which is usually listed with the plus/minus symbol (±). Using the spring 2024 survey results from Dolphin Lane as an example, CI can be understood thusly: the best estimate of the true mean is the sample mean (7.64 clams per square feet), and we are 95% confident that the true mean lies between 7.64 **+** 5.26 = 12.9 clams/ft^2, **and** 7.64 **-** 5.26 = 2.38 clams/ft^2. This means that the true mean would, with 95% confidence, fall somewhere between 12.9 and 2.38 clams per square foot.

In 2024, the average clam density was similar at both sites in the spring survey, but higher in the fall at Dolphin Lane compared to Upper Landing where zero clams were found in the fall surveys. There was a decline in the average clam density from spring to fall at Upper Landing, but the density stayed the same during this period at Dolphin Lane. In previous years, the average clam density declined from spring to fall at both sites. Additional data on the densities of surveyed clams across all years and sites can be found in Appendix A.

The average size of soft-shell clams was slightly larger at Dolphin Lane than Upper Landing which contrasts results from the past 4 years. Additional data on the size distribution of surveyed clams across all years and sites can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

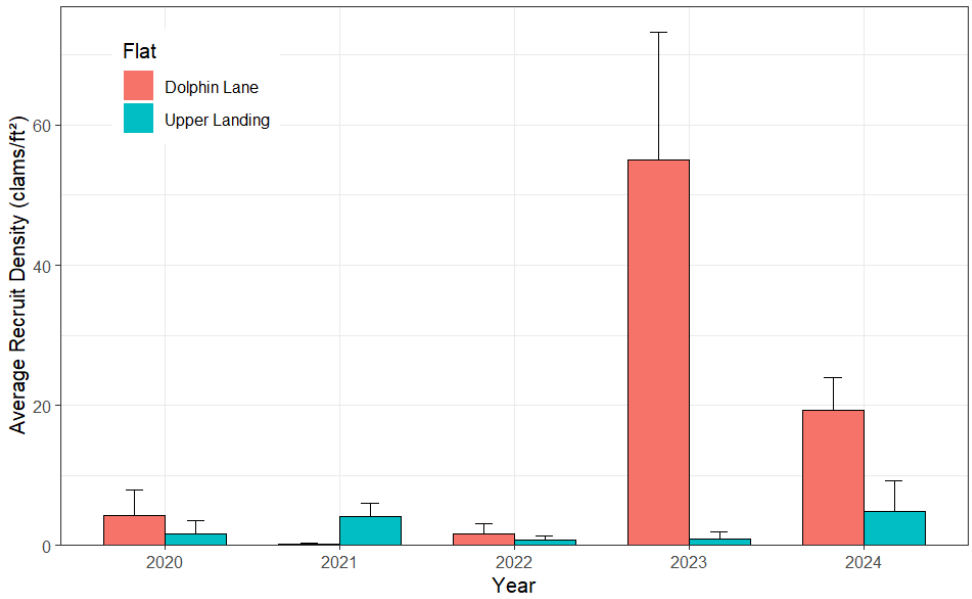
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Dolphin Lane	19.27 (±4.71)	In 2024, there were approximately 4x more clam recruits at Dolphin Lane than Upper Landing. This difference was statistically significant ($p < 0.0001$).
Upper Landing	4.87 (±4.34)	The average density for both flats combined was 12.07 ±4.53 clams/ft^2 (n = 24).

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Upper Landing, clam recruit density increased in 2024 from previous years to the highest density yet of 4.87 clams/ft^2. The average clam density at Upper Landing increased from 2020 (1.6 clams/ft^2) to 2021 (4.2 clams/ft^2), then decreased again in 2022 (0.73 clams/ft^2), and finally increased slightly in 2023 (0.97 clams/ft^2). At Dolphin Lane in 2024, average clam recruit density decreased to 19.27 clams/ft^2 from 54.99 clams/ft^2 in 2023. Comparing this average to previous years, recruit density at Dolphin Lane decreased from 2020 (4.3 clams/ft^2) to 2021 (0.2 clams/ft^2) and then increased in 2022 (1.72 clams/ft^2). Additional data on the density of soft-shell clam recruits across all years and sites can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from the two study sites in the town of Wells (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2021 (n = 16), all boxes at Dolphin Lane had fabric bottoms, and all boxes at Upper Landing had PetScreen® bottoms. In 2022 (n = 16), all bottoms were comprised of PetScreening®.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits from 2024 is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI):

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Dolphin Lane	239	14.2 mm [0.56 in]	45.57 mm [1.79 in]	32.3 (±0.72) mm [1.27 in]
Upper Landing	70	1.56 mm [0.06 in]	35.92 mm [1.41 in]	18.18 (±1.85) mm [0.72 in]

In 2024, the average size of clam recruits at Dolphin Lane was significantly larger than at Upper Landing ($p < 0.0001$). This same trend was seen in 2020-2022, but differed in 2023 when the average recruit size was similar across both sites. Additional data on the size of soft-shell clam recruits can be found in Appendices C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

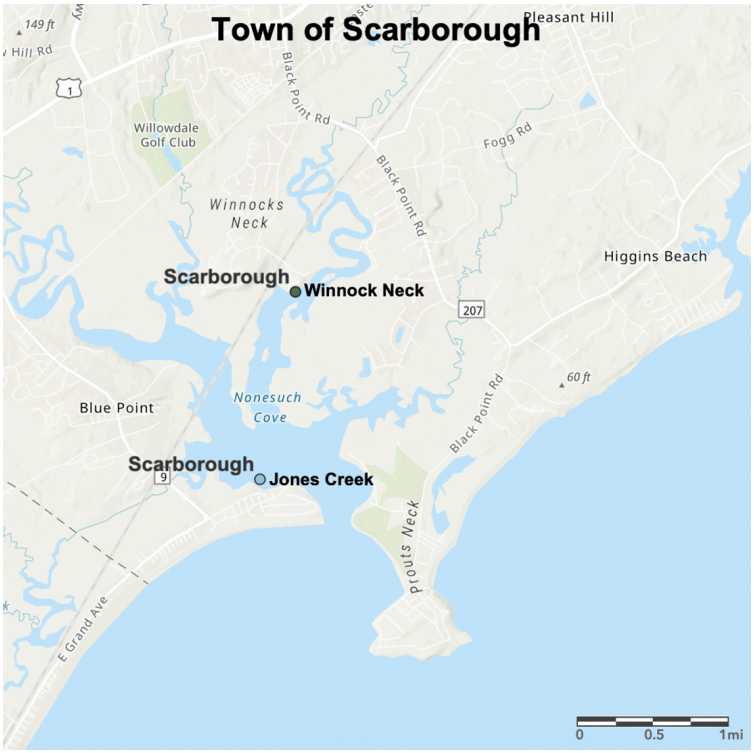
Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Dolphin Lane	122	6.25 (±0.83) crabs/ft^2	3.82 mm [0.15 in]	26.47 mm [1.04 in]	13.81 mm (±0.78) [0.54 in]
Upper Landing	75	3.84 (±0.65) crabs/ft^2	5.36 mm [0.21 in]	22.98 mm [0.9 in]	12.14 mm (±0.94) [0.48 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average density of green crabs was significantly higher at Dolphin Lane than Upper Landing ($p < 0.0001$), which was also observed in 2023. The average size of green crabs was slightly larger at Dolphin Lane than Upper Landing, which was also seen in 2021 and 2022. Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

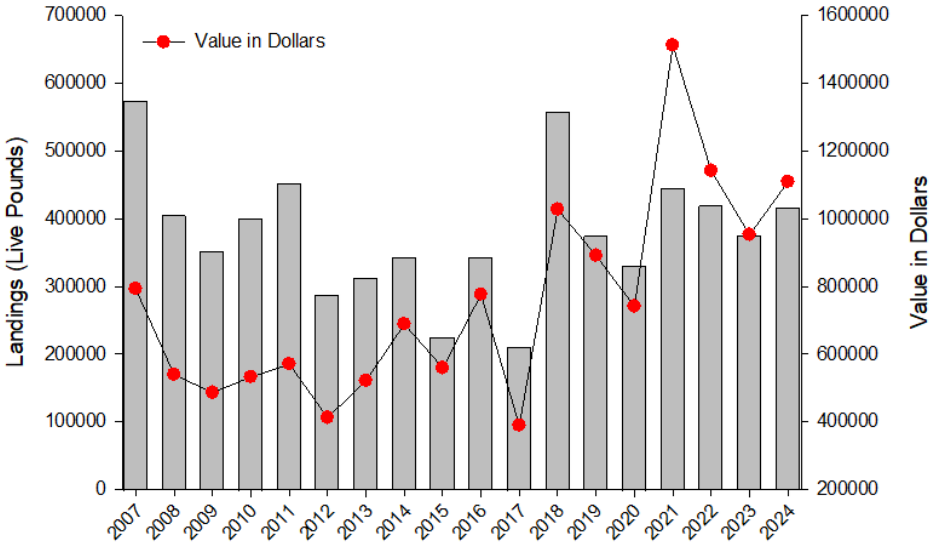
SCARBOROUGH



Site locations: Winnock Neck and Jones Creek

CLAMMING PROFILE:

- 1,008.7 intertidal acres (DMR Acreage by Town, 2016).
- 46 commercial and 374 recreational clamming licenses were allocated in 2024 (DMR General Town Shellfish Information, 2024).
- In 2024, 415,893 live pounds of soft-shell clams were landed in Scarborough (ex-vessel value of $1,109,579) (DMR Landings, 2024). A graph of the live pounds and value of landings since 2007 is below.



Beginning (Deployment) Date: April 7, 2024
Ending (Fall Sampling) Date: October 18, 2024 (195 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2024 Seawater Temperatures
Jones Creek	Max: 20.8°C (August 25) Min: 5.7°C (May 10)	Max: 23.4°C (August 14) Min: 7.6°C (May 1)	Max: 21.9°C (August 25) Min: 6.1°C (April 23/29)	Lost recorder
Winnock Neck	Max: 23.9°C (July 12) Min: 6.0°C (May 10)	Max: 24.3°C (August 14) Min: 7.4°C (May 1/2)	Max: 22.4°C (August 21) Min: 5.9°C (April 23)	Max: 22.6°C (July 16) Min: 4.8°C (April 8)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

No temperature recorders were recovered in Scarborough for 2023 and the Jones Creek logger was lost in 2024. Analysis of how seawater temperatures changed through the season at Winnock Neck can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Scarborough (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Jones Creek	1.69 (±2.11) clams/ft^2	61.56 (±20.68) clams/ft^2	Gain of 59.87 clams/ft^2		5.34 mm [0.21 in]	2.62 mm [0.1 in]
Winnock Neck	2.12 (±2.91) clams/ft^2	17.83 (±11.42) clams/ft^2	Gain of 15.71 clams/ft^2		5.68 mm [0.22 in]	2.77 mm [0.11 in]

In 2024, the average soft-shell clam density was higher at Jones Creek than Winnock Neck in the fall, but was slightly higher at Winnock Neck in the spring. In 2023, the average clam density was higher at Jones Creek in both the spring and fall and in 2020-2022, the average clam density was higher at Winnock Neck than Jones Creek. Additional data on the densities of surveyed clams across all years and sites can be found in Appendix A.

Both sites experienced an increase in clam density from spring to fall while in all previous years, both sites experienced either a loss in clam density from spring to fall or a very small gain of less than 1

clam/ft². Additional data on the size-frequency distribution of surveyed clams across all years and sites can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

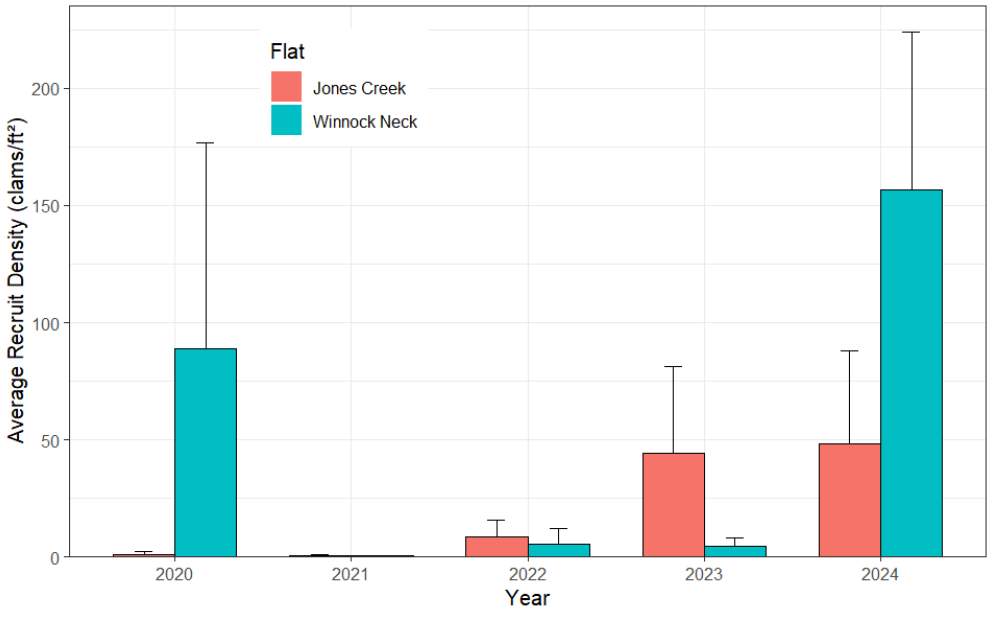
Clam recruit density is presented as the average number of clams per square foot (ft²) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft²	Conclusion
Jones Creek	48.37 (±39.57)	In 2024, there were approximately 3x more clam recruits at Winnock Neck than Jones Creek. This difference was statistically significant (p = 0.007). The average density for both flats combined was 102.45 ±53.55 clams/ft² (n = 24).
Winnock Neck	156.53 (±67.53)	

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

The clam recruit density at Jones Creek increased from 2023 (average of 44.44 clams/ft²) to 2024 (48.37 clams/ft²), and increased from 2021 (0.8 clams/ft²) and 2022 (8.8 clams/ft²). At Winnock Neck, the average clam density increased from 2023 (4.66 clams/ft²) to 2024 (156.53 clams/ft²) after decreasing from 2022 (5.61 clams/ft²). Additional data on the density of soft-shell clam recruits across all years and sites can be found in a table in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Scarborough (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2021 and 2022 (n = 16), all bottoms were comprised of PetScreening®.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Jones Creek	200	1.64 mm [0.06 in]	36.83 mm [1.45 in]	23.5 (±0.91) mm [0.93 in]
Winnock Neck	240	1.35 mm [0.05 in]	40.78 mm [1.61 in]	12.35 (±0.97) mm [0.49 in]

In 2024, the average size of clam recruits was significantly larger at Jones Creek compared to Winnock Neck ($p < 0.0001$). This same trend was observed in 2023 and 2021, but is the opposite of what was observed in 2022 and 2020. Additional data on the size of soft-shell clam recruits across all years and sites can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

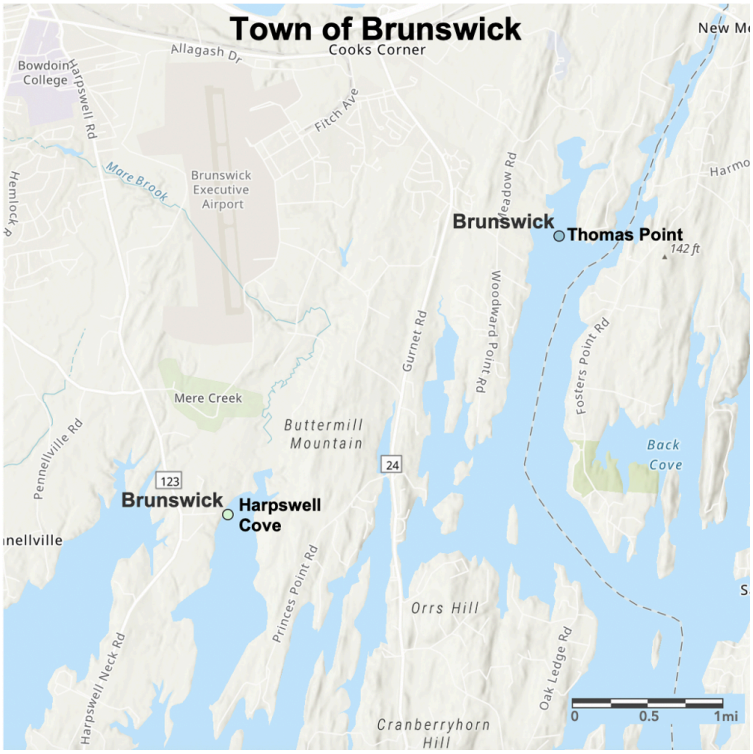
Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Jones Creek	379	21.2 (±5.75) crabs/ft^2	2.18 mm [0.09 in]	32.34 mm [1.27 in]	12.25 (±0.63) mm [0.48 in]
Winnock Neck	34	1.74 (±1.21) crabs/ft^2	1.94 mm [0.08 in]	20.83 mm [0.82 in]	9.62 (±1.49) mm [0.38 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average density of green crabs was significantly higher at Jones Creek than Winnock Neck ($p < 0.0001$). The density of green crabs at Jones Creek has increased from 2022 (1.11 crabs/ft^2) to 2023 (13.27 crabs/ft^2) to 2024 (21.2 crabs/ft^2). At Winnock Neck, the average density of green crabs increased slightly from 2023 (0.36 crabs/ft^2) to 2024 (1.74 crabs/ft^2), but was still lower than densities seen in 2022 (9.38 crabs/ft^2). The average green crab size was also larger at Jones Creek, which was also seen in 2023, but the average size was larger at Winnock Neck in 2022 and 2021. Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

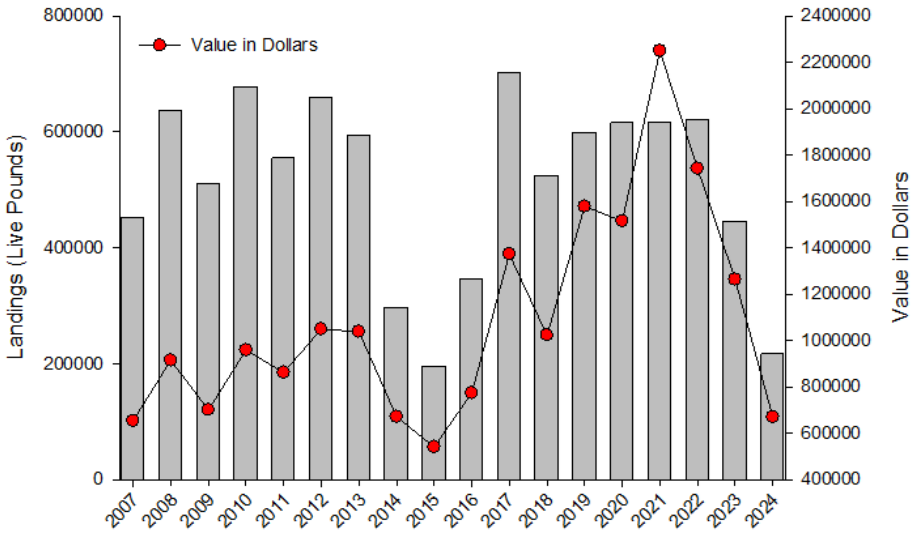
BRUNSWICK



Site locations: Thomas Point and Harpswell Cove

CLAMMING PROFILE:

- 2,254.53 intertidal acres (DMR Acreage by Town, 2016).
- 81 commercial clamming licenses were allocated in 2024. There was no limit on the number of recreational licenses sold to residents, and a 10% limit on recreational licenses sold to nonresidents (DMR General Town Shellfish Information, 2024).
- In 2024, 217,876 live pounds of soft-shell clams were landed in Brunswick (ex-vessel value of $668,825) (DMR Landings, 2024). A graph of the live pounds and value of landings since 2007 is below.



Beginning (Deployment) Date: April 5, 2024
Ending (Fall Sampling) Date: October 15, 2024 (194 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2023 Seawater Temperatures	2024 Seawater Temperatures
Harpswell Cove	Max: 23.5°C (Aug 13) Min: 7.3°C (Nov 5)	Max: 22.8°C (Aug 14) Min: 8.5°C (April 30)	Max: 23.6°C (Aug 8) Min: 7.0°C (Oct 9)	Max: 24.0°C (July 26) Min: 6.4°C (April 9)	Max: 23.6°C (July 17) Min: 4.9°C (April 5/6)
Thomas Point	Max: 25.0°C (Aug 13) Min: 6.7°C (Nov 5)	Max: 23.6°C (Aug 14) Min: 9.1°C (April 30)	Lost Recorder	Lost Recorder	Max: 26.1°C (July 17) Min: 5.3°C (April 5-7)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Brunswick (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Harpswell Cove	4.25 (±2.7) clams/ft^2	0 clams/ft^2	Loss of 4.25 clams/ft^2		9.43 mm [0.37 in]	N/A
Thomas Point	0.42 (±0.93) clams/ft^2	1.69 (±2.11) clams/ft^2	Gain of 1.28 clams/ft^2		8.2 mm* [0.32 in]	4.19 mm [0.16 in]

*Only 1 clam found in survey

In 2024, average clam density was higher at Harpswell Cove than Thomas Point in the spring which was the same as in 2021-2023. No clams were found in the fall sampling at Harpswell Cove, so the clam density was higher at Thomas Point in the fall. Additional data on the densities of surveyed clams across all years and sites can be found in Appendix A.

No soft-shell clams were found in the sampling at Harpswell Cove in the fall, so there was a decline in clam density at Harpswell Cove from spring to fall while there was a slight gain at Thomas Point. In 2023, no clams were found in surveys at both flats in the fall. The average clam size was slightly higher at Harpswell Cove than Thomas Point in the fall which is similar to previous years. Additional data on the size-frequency distribution of surveyed clams can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

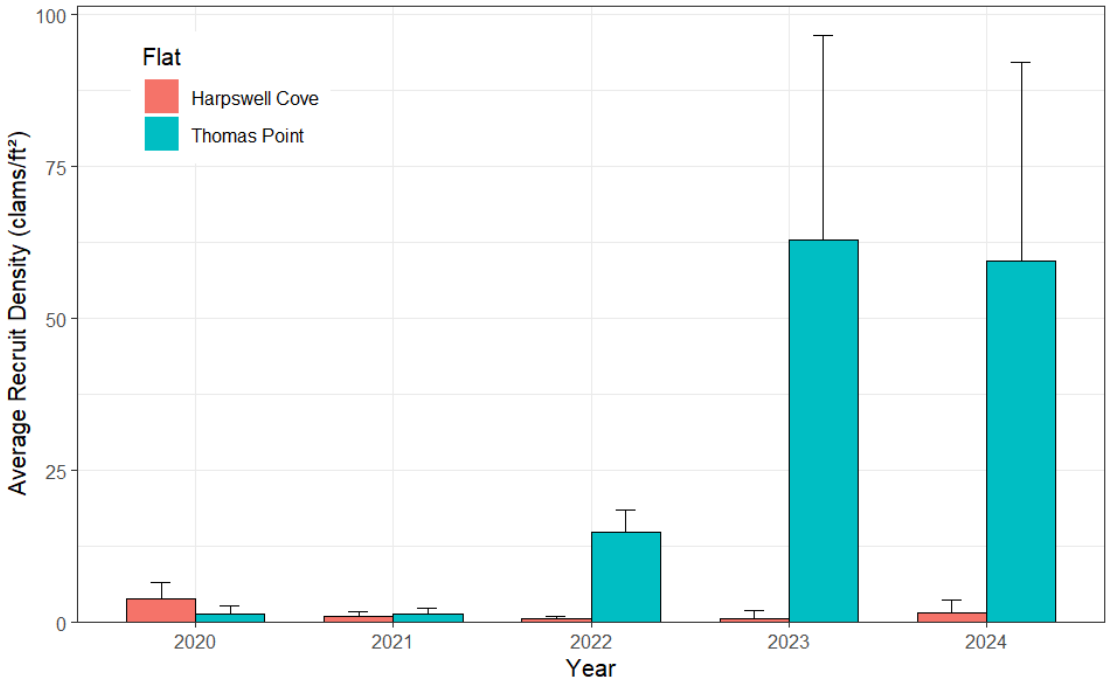
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Harpswell Cove	1.59 (±2.21)	In 2024, there were 37x more clam recruits at Thomas Point than Harpswell Cove. This difference was statistically significant (p = 0.003). The average density for both flats combined was 30.5 ±17.46 clams/ft^2 (n = 24).
Thomas Point	59.4 (±32.7)	

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Thomas Point, clam recruit density increased from 2021 (1.5 clams/ft^2 average) and 2022 (14.95 clams/ft^2) to 2023 (62.94 clams/ft^2), but decreased slightly in 2024 (59.4 clams/ft^2). At Harpswell Cove, the average clam density increased slightly in 2024 (1.59 clams/ft^2) from 2023 (0.67 clams/ft^2), 2022 (0.65 clams/ft^2), and 2021(1.0 clams/ ft^2), but is still lower than the average density in 2020(3.85 clams/ft^2). Additional data on the density of soft-shell clam recruits can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Brunswick (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2021 and 2022 (n = 16), all bottoms were comprised of PetScreening®.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Harpswell Cove	31	2.16 mm [0.09 in]	27.3 mm [1.07 in]	14.62 (±2.75) mm [0.58 in]
Thomas Point	214	1.67 mm [0.07 in]	42.62 mm [1.68 in]	10.69 (±1.16) mm [0.42 in]

In 2024 and 2023, the average clam recruit size was significantly larger at Harpswell Cove ($p = 0.011$), while in 2022 and 2021, the average recruit size was larger at Thomas Point. Additional data on the size of soft-shell clam recruits can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Harpswell Cove	17	0.87 (±0.31) crabs/ft^2	14.68 mm [0.58 in]	33.06 mm [1.3 in]	22.48 (±2.77) mm [0.89 in]
Thomas Point	2	0.1 (±0.15) crabs/ft^2	10.51 mm [0.41 in]	13.46 mm [0.53 in]	11.99 (±18.74) mm [0.47 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

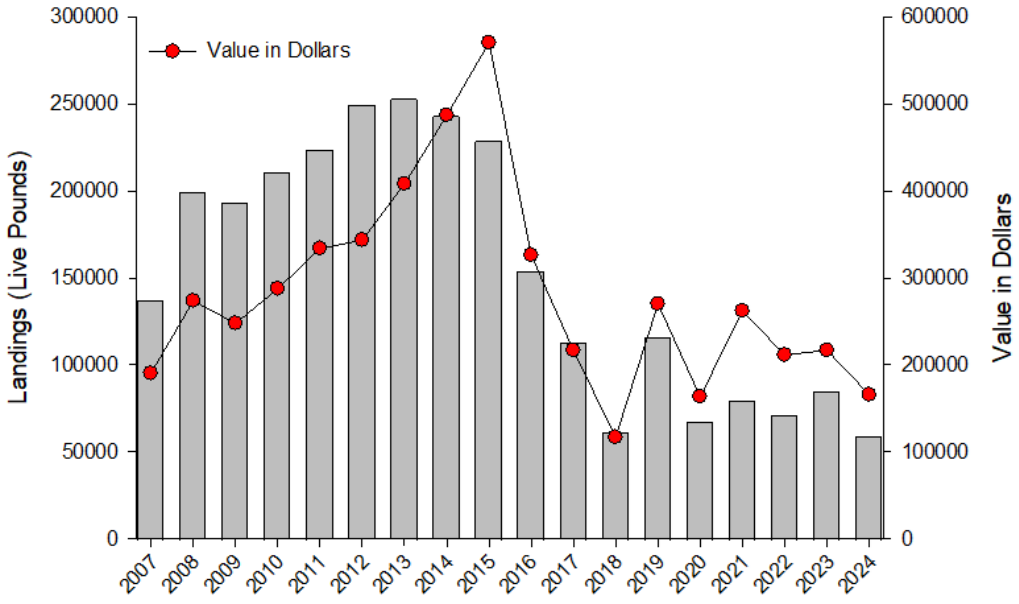
In 2024, the density of green crabs was significantly higher at Harpswell Cove than Thomas Point ($p < 0.0001$) which was also seen in 2023. The average carapace width was also higher at Harpswell Cove, a result observed in 2023 as well. Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits can be found in Appendix I.

PHIPPSBURG

Site locations: Atkins Flat and Branch Flat

CLAMMING PROFILE:

- 2,224.12 intertidal acres (DMR Acreage by Town, 2016).
- 28 commercial and 660 recreational clamming licenses were allocated for residents and nonresidents in 2024 (DMR General Town Shellfish Information, 2024).
- In 2024, 59,281 live pounds of soft-shell clams were landed in Phippsburg (ex-vessel value of $165,755) (DMR Landings, 2024). A graph of the live pounds and value of landings since 2007 is below.



Beginning (Deployment) Date: April 8, 2024
Ending (Fall Sampling) Date: October 17, 2024 (193 days total duration)

SEAWATER TEMPERATURE

Site	2023 Seawater Temperatures*	2024 Seawater Temperatures
Atkins Flat	Lost Recorder	Lost Recorder
Branch Flat	Max: 23.6°C (July 29) Min: 5.5°C (April 8)	Max: 23.7°C (July 15) Min: 5.7°C (April 11)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

Temperature data was only recovered from Branch Flat in 2024. No temperature recorders were recovered in 2022. Analysis of how seawater temperatures changed at Branch Flat through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Phippsburg (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Atkins Flat	24.19 (±9.06) clams/ft^2	46.7 (±12.18) clams/ft^2	Gain of 22.51 clams/ft^2		3.34 mm [0.13 in]	2.38 mm [0.09 in]
Branch Flat	2.12 (±2.16) clams/ft^2	4.67 (±2.91) clams/ft^2	Gain of 2.55 clams/ft^2		8.44 mm [0.33 in]	3.3 mm [0.13 in]

In 2024, the average clam density was higher in both the spring and the fall at Atkins Flat than Branch Flat. In previous years, clam density was also higher or the same at Atkins Flat in both the fall and spring. Additional data on the densities of surveyed clams across all sites and years can be found in Appendix A.

An increase in clam density occurred from spring to fall at both flats, which was also observed in 2022, but both flats experienced a decline in clam density in 2023. The average size of surveyed clams was

higher at Branch Flat in both the spring and fall. Additional data on the size-frequency distribution of surveyed clams across all years and sites can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

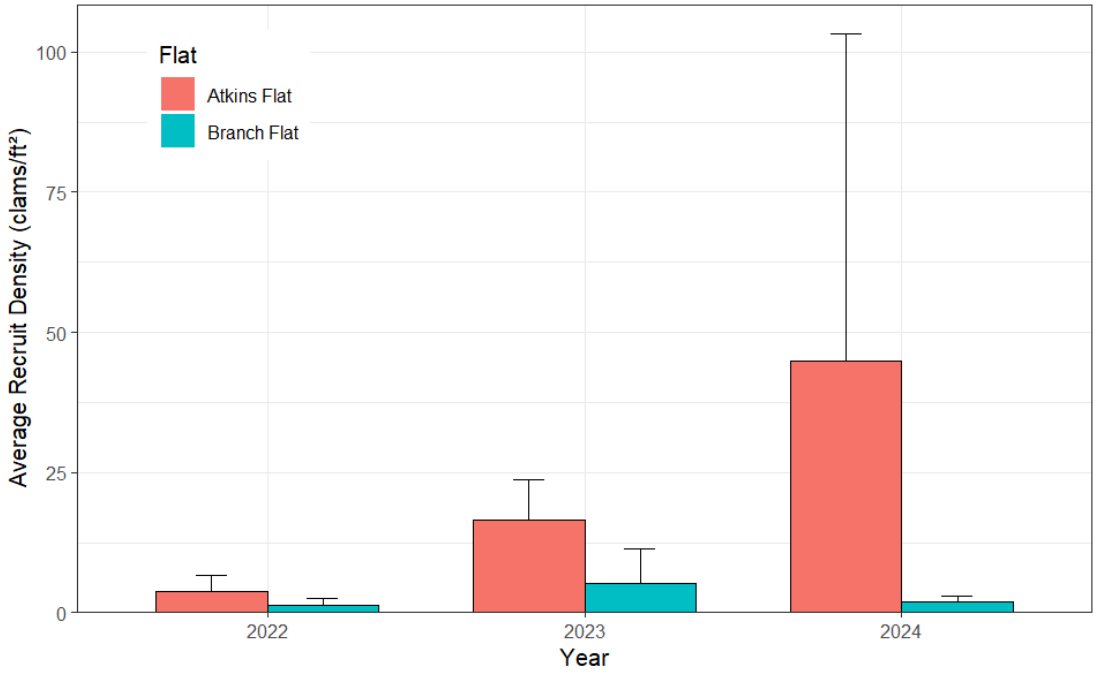
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Atkins Flat	44.9 (±58.4)	In 2024, on average there were 23x more clam recruits at Atkins Flat than Branch Flat. This difference was not statistically significant (p = 0.134). The average density for both flats combined was 23.4 ±29.68 clams/ft^2 (n = 24).
Branch Flat	1.9 (±0.96)	

*A detailed analysis of fall clam recruitment by flat can be found in Appendix F.

Clam recruit density at Atkins Flat increased from 2022 (6.46 clams/ft^2 in fabric-bottomed boxes) to 2023 (16.56 clams/ft^2) to 2024 (44.9 clams/ft^2). At Branch Flat, clam recruit density declined in 2024 (1.9 clams/ft^2) from 2022 (2.46 clams/ft^2 in fabric-bottomed boxes) and 2023 (5.23 clams/ft^2). Additional data on the density of soft-shell clam recruits across all years and sites can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Phippsburg (Spring to Fall 2022-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years of the project. In 2022 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Atkins Flat	220	1.3 mm [0.05 in]	46.02 mm [1.81 in]	25.63 (±1.12) mm [1.01 in]
Branch Flat	37	1.69 mm [0.07 in]	34.94 mm [1.38 in]	23.62 (±1.66) mm [0.93 in]

In 2024, clam recruits were on average slightly larger at Atkins Flat than Branch Flat ($p = 0.048$) which was also observed in 2023. In 2022, the average clam size was similar across both flats. Additional data on the size of clam recruits across all years and sites can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Atkins Flat	171	8.76 (±2.44) crabs/ft^2	2.75 mm [0.11 in]	22.41 mm [0.88 in]	9.97 (±0.64) mm [0.39 in]
Branch Flat	81	4.15 (±1.39) crabs/ft^2	3.51 mm [0.14 in]	30.84 mm [1.21 in]	15.28 (±1.45) mm [0.6 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average density of green crabs was significantly higher at Atkins Flat than Branch Flat ($p = 0.002$). In 2023, the average density of green crabs did not differ significantly between Atkins Flat and Branch Flat. The average size of green crabs in 2024 was larger at Branch Flat than Atkins Flat which contrasts what was observed in 2023.

Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

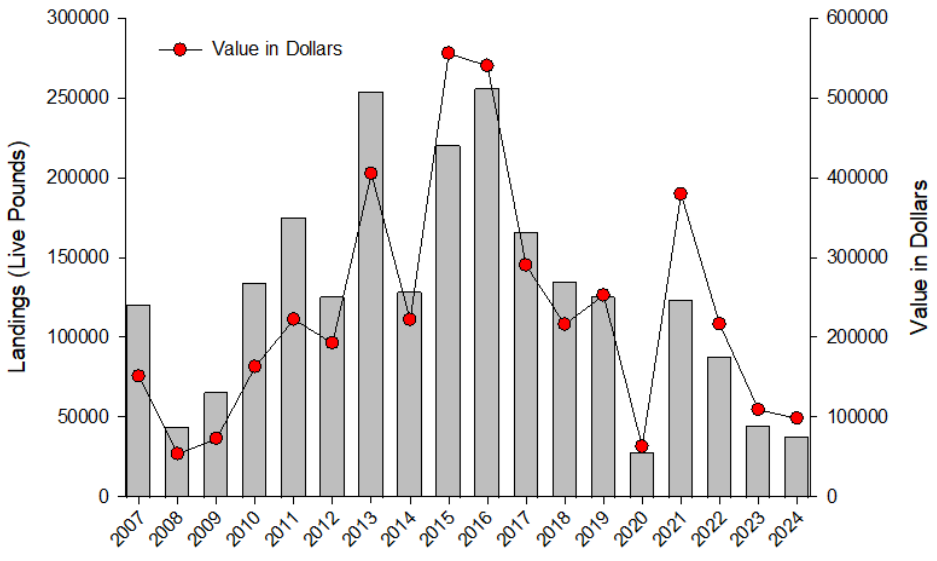
MIDCOAST

BREMEN

Site locations: Broad Cove and Sam's Cove

CLAMMING PROFILE:

- 1,078.76 intertidal acres (DMR Acreage by Town, 2016).
- 49 commercial and 55 recreational clamming licenses were allocated in 2024 (DMR General Town Shellfish Information, 2024).
- In 2024, 37,823 live pounds of soft-shell clams were landed in Bremen (ex-vessel value of $98,172) (DMR Landings, 2024). A graph of the live pounds and value of landings since 2007 is below.



Beginning (Deployment) Date: April 9, 2024
Ending (Fall Sampling) Date: October 18, 2024 (193 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2024 Seawater Temperatures
Sam's Cove	Max: 23.7°C (August 11) Min: 4.7°C (November 19)	Lost recorder	Max: 24.3°C (July 16) Min: 6.5°C (April 11/12)
Broad Cove	Max: 22.8°C (August 11) Min: 3.6°C (November 19)	Max: 21.8°C (August 27) Min: 8.4°C (November 5)	Max: 24.4°C (July 13) Min: 6.1°C (April 11/12)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

Temperature recorders were lost and not recovered from either study site in 2022 and 2023. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Bremen (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Sam's Cove	0.42 (±0.93) clams/ft^2	0.85 (±1.87) clams/ft^2	Gain of 0.43 clams/ft^2		4.0 mm* [0.16 in]	4.02 mm [0.16 in]
Broad Cove	1.69 (±1.59) clams/ft^2	13.16 (±5.25) clams/ft^2	Gain of 11.47 clams/ft^2		10.23 mm [0.4 in]	2.92 mm [0.11 in]

*Only 1 clam found in survey

In 2024, the average clam density was higher at Broad Cove in both the spring and fall which is the same as in previous years with the exception of the fall of 2023 when no clams were found at either site. Additional data on the densities of surveyed clams across all years and sites can be found in Appendix A.

There was an increase in clam density at both sites in 2024 from spring to fall. The average clam size at Broad Cove was larger in the spring and smaller in the fall than Sam's Cove. But only one clam was

found in surveys at Sam's Cove in the spring and only two in the fall. Additional data on the size-frequency distribution of surveyed clams can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

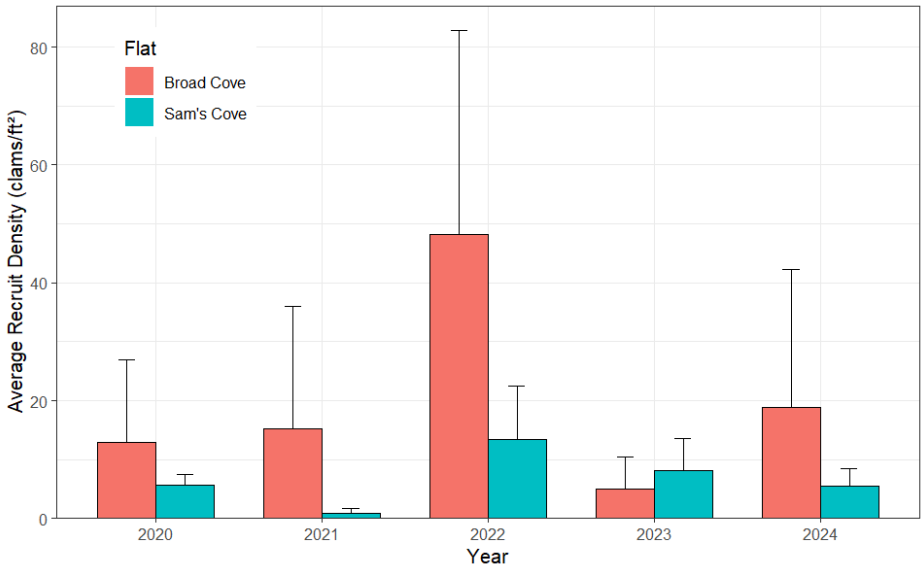
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses.

Site*	Avg. # per ft^2	Conclusion
Sam's Cove	5.43 (±3.12)	In 2024, there were approximately 3.5x more clam recruits at Broad Cove than Sam's Cove, but this difference was not statistically significant (p = 0.236). The average density for both flats was 12.17 ±13.26 clams/ft^2 (n = 24).
Broad Cove	18.91 (±23.39)	

*A detailed analysis of fall clam recruitment by flat can be found in Appendix F.

In 2024, the average clam recruit density at Broad Cove increased from 2020 (12.95 clams/ft^2), 2021 (15.3 clams/ft^2), and 2023 (4.97 clams/ft^2) to 18.91 clams/ft^2, but is still a lower average density than in 2022 (48.24 clams/ft^2). At Sam's Cove, average clam recruit density in 2024 (5.43 clams/ft^2) decreased slightly from 2020 (5.6 clams/ft^2 average). From 2021 (0.9 clams/ft^2) to 2022 (13.45 clams/ft^2) average density increased but then decreased again in 2023 (8.2 clams/ft^2). Additional data on the density of soft-shell clam recruits across all years and sites can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Bremen (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2021 and 2022 (n = 16), all bottoms were comprised of PetScreening®.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Sam's Cove	100	1.52 mm [0.06 in]	25.77 mm [1.01 in]	5.46 (±1.09) mm [0.21 in]
Broad Cove	114	1.58 mm [0.06 in]	26.34 mm [1.04 in]	8.77 (±1.42) mm [0.35 in]

In 2024, the average clam recruit size was significantly larger at Broad Cove than Sam's Cove ($p < 0.0001$) which is the opposite of what was observed in previous years. Additional data on the size of soft-shell clam recruits across all years and sites can be found in a table in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Sam's Cove	6	0.31 (±0.39) crabs/ft^2	6.76 mm [0.27 in]	17.71 mm [0.7 in]	11.69 (±3.82) mm [0.46 in]
Broad Cove	12	0.62 (±0.33) crabs/ft^2	6.98 mm [0.27 in]	33.68 mm [1.33 in]	16.94 (±5.41) mm [0.67 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

The average density of green crabs was not significantly different between Broad Cove and Sam's Cove ($p = 0.202$). The average green crab density was higher at Broad Cove than Sam's Cove in 2022 and the opposite in 2023. Similarly to in 2023, the average green crab size was larger at Broad Cove than Sam's Cove.

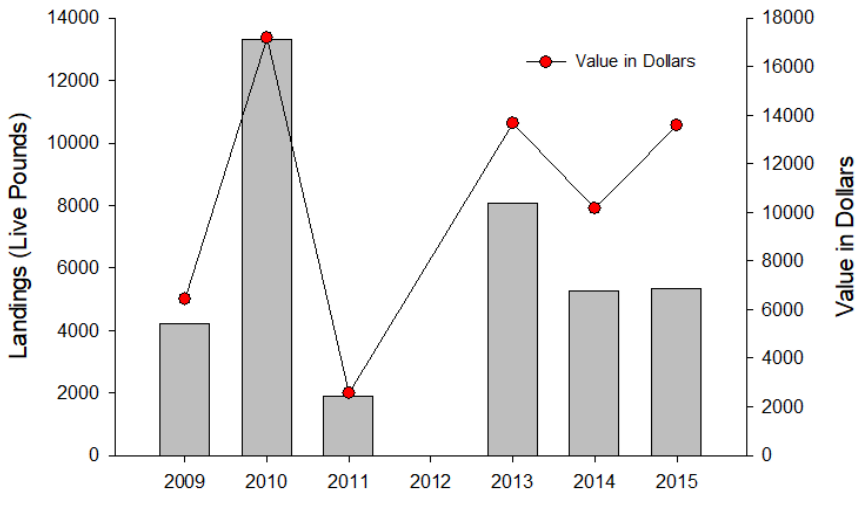
Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

ISLESBORO

Site locations: Ryder Cove and Little Broad Cove

CLAMMING PROFILE:

- 4,380.15 intertidal acres (DMR Acreage by Town, 2016).
- Islesboro had an unlimited number of commercial and recreational clamming licenses allocated for residents in 2024 (DMR General Town Shellfish Information, 2024).
- In 2015 (the most recent available data), 5,350 live pounds of soft-shell clams, valued at $13,586, were landed in Islesboro (DMR Landings, 2020). A graph of the live pounds and value of landings for the available data is below. While clams were commercially harvested in Islesboro after 2015, for the Department of Marine Resources to be able to make a town's landings public, landings must be reported at a minimum of three different dealers and from three different harvesters, which was the case prior to 2015, but not after.



Beginning (Deployment) Date: May 6, 2024
Ending (Fall Sampling) Date: November 13, 2024 (192 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2024 Seawater Temperatures
Little Broad Cove	Max: 21.2°C (August 13) Min: 6.1°C (May 17)	Max: 19.8°C (August 27) Min: 6.4°C (May 9)	Max: 20.5°C (August 8) Min: 5.8°C (May 3)	Max: 22.2°C (July 18) Min: 6.0°C (May 11)
Ryder Cove	Max: 21.8°C (August 11) Min: 6.3°C (May 17)	Max: 20.4°C (August 14) Min: 6.4°C (May 8)	Max: 21.4°C (August 6) Min: 6.0°C (May 3)	Max: 23.0°C (July 17) Min: 5.7°C (May 11)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

Temperature recorders were not recovered from either study site in 2023. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Islesboro (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Ryder Cove	4.67 (±4.46) clams/ft^2	2.55 (±2.18) clams/ft^2	Loss of 2.17 clams/ft^2		6.98 mm [0.27 in]	6.0 mm [0.24 in]
Little Broad Cove	0 clams/ft^2	0.43 (±0.94) clams/ft^2	Gain of 0.43 clams/ft^2		N/A	3.81 mm* [0.15 in]

*Only 1 clam found in survey

In 2024, clam density was higher at Ryder Cove than Little Broad Cove in both the spring and fall which is the same as in 2022. No live clams were present in cores from 2021. Additional data on the densities of surveyed clams across all years and sites can be found in Appendix A.

In contrast to 2023, there was a decrease in clam density from spring to fall at Ryder Cove and an increase in density at Little Broad Cove. The average clam size was larger at Ryder Cove than Little Broad Cove which is also in contrast to 2023 where the average clam size was larger at Little Broad

Cove in both the spring and fall. Additional data on the size-frequency distribution of surveyed clams across all years and sites can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

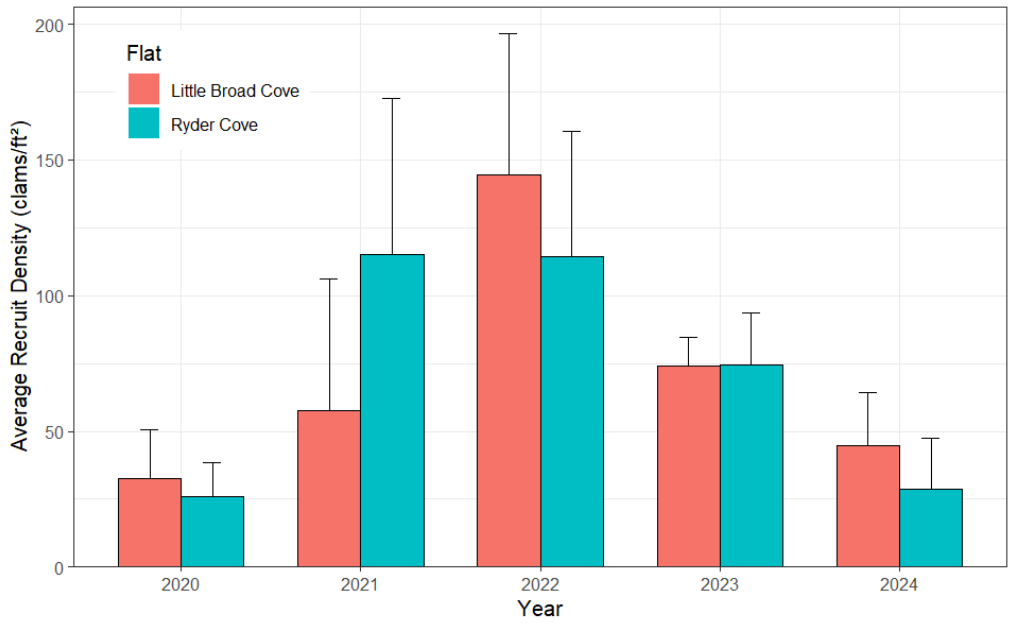
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Little Broad Cove	44.8 (±19.43)	In 2024, there were approximately 1.5x more clam recruits on average at Little Broad Cove than Ryder Cove. This difference was not statistically significant (P = 0.206). The average density for both flats combined was 36.8 ±19.07 clams/ft^2 (n = 24).
Ryder Cove	28.8 (±18.71)	

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Little Broad Cove, the average clam recruit density decreased in 2024 (44.8 clams/ft^2) from 2021 (57.5 clams/ft^2), 2022 (144.34 clams/ft^2), and 2023 (74.06 clams/ft^2), but remains slightly higher than the average density in 2020 (32.6 clams/ft^2). At Ryder Cove, the average clam density also decreased in 2024 (28.8 clams/ft^2), from 2021 (115.3 clams/ft^2), 2022 (114.36 clams/ft^2), and 2023 (74.52 clams/ft^2), but also remains slightly higher than the average density in 2020 (26.2 clams/ft^2). Additional data on the density of soft-shell clam recruits across all years and sites can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Islesboro (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2021 (n = 16), 2022 (n = 16), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Little Broad Cove	240	1.66 mm [0.07 in]	30.07 mm [1.18 in]	18.52 (±0.84) mm [0.73 in]
Ryder Cove	236	1.45 mm [0.06 in]	42.55 mm [1.68 in]	21.17 (±1.4) mm [0.83 in]

In 2024, the average clam recruit size was larger at Ryder Cove than Little Broad Cove and this difference was significant ($p = 0.001$). This was also seen in the previous four years. Additional data on the size of soft-shell clam recruits can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Little Broad Cove	108	5.54 (±1.34) crabs/ft^2	4.69 mm [0.18 in]	18.33 mm [0.72 in]	10.49 (±0.68) mm [0.41 in]
Ryder Cove	78	3.95 (±1.38) crabs/ft^2	4.67 mm [0.18 in]	25.01 mm [0.98 in]	12.43 (±0.91) mm [0.49 in]

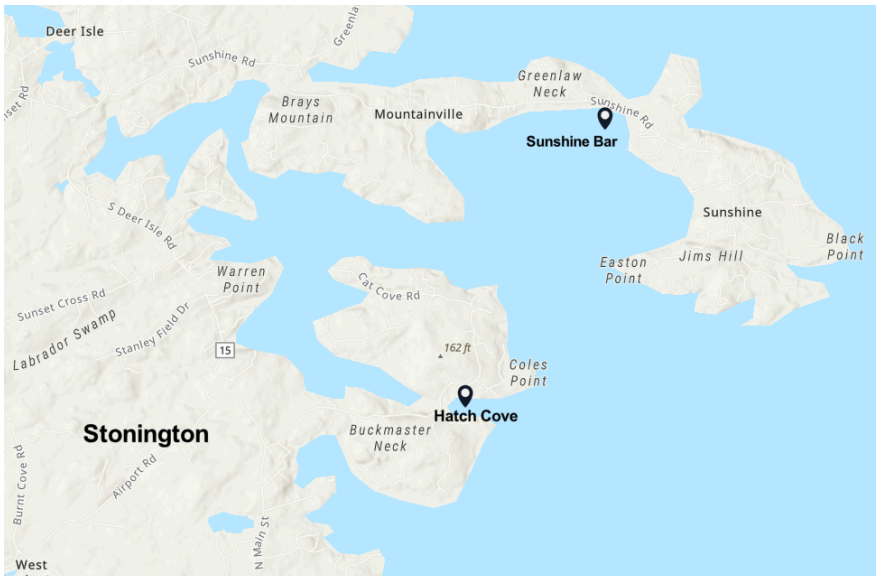
*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average density of green crabs was greater at Little Broad Cove than Ryder Cove, but was not significantly different ($p = 0.084$), which was the same pattern that was seen in 2023. The average green crab size was slightly larger at Ryder Cove than Little Broad Cove which was also seen in 2023.

Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

Stonington/Deer Isle

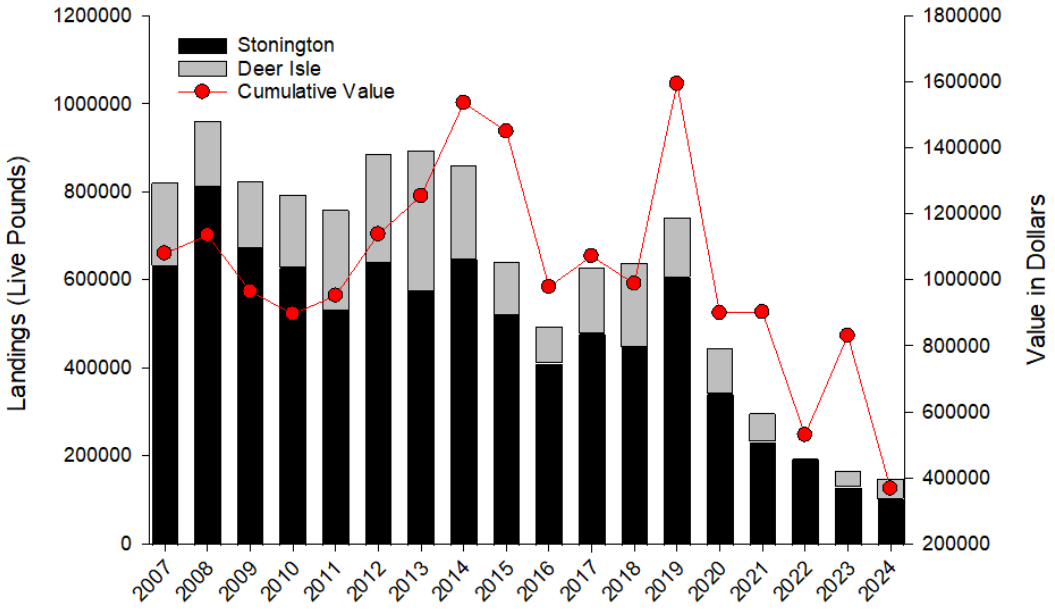


Site Locations: Hatch Cove (Stonington) and Sunshine Bar (Deer Isle)

CLAMMING PROFILE:

Stonington and Deer Isle have a combined shellfish program.

- Stonington has 1,624.39 intertidal acres and Deer Isle has 4,597.21 intertidal acres (DMR Acreage by Town, 2016).
- Stonington and Deer Isle had an unlimited number of commercial licenses allocated for residents and a 10% limit set for non-residents in 2024. There was no limit on recreational clamming licenses allocated for residents and non-residents (DMR General Town Shellfish Information, 2024).
- In 2024, 42,990 live pounds of soft-shell clams, valued at $102,723, were landed in Stonington and 103,507 live pounds of clams, valued at $264,811, were landed in Deer Isle (DMR Landings, 2024). A graph of the live pounds and the cumulative value of landings since 2007 is below.



Beginning (Deployment) Date: May 5, 2024
Ending (Fall Sampling) Date: November 14, 2024 (194 days total duration)

SEAWATER TEMPERATURE

Site	2023 Seawater Temperatures*	2024 Seawater Temperatures
Hatch Cove	Lost Recorder	Max: 18.1°C (August 14) Min: 8.1°C (May 6)
Sunshine Bar	Max: 22.0°C (July 28) Min: 4.8°C (November 25)	Max: 22.2°C (July 17) Min: 8.7°C (May 10)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

The temperature recorder was only recovered from Sunshine Bar in 2023 and they were not recovered from either site in 2022. In 2024, the Hatch Cove recorder only logged through September and the Sunshine Bar recorder only logged through July. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Stonington and Deer Isle (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Hatch Cove	0.85 (±1.26) clams/ft^2	0.43 (±0.94) clams/ft^2	Loss of 0.42 clams/ft^2		8.0 mm [0.31 in]	4.15 mm* [0.16 in]
Sunshine Bar	1.27 (±1.46) clams/ft^2	2.12 (±2.56) clams/ft^2	Gain of 0.85 clams/ft^2		14.67 mm [0.58 in]	3.89 mm [0.15 in]

*Only 1 clam found in survey

In 2024, the average clam density was higher at Sunshine Bar than Hatch Cove in both the spring and fall which is the opposite of what was found in 2023. Additional data on the densities of surveyed clams across all sites and years can be found in Appendix A.

The average number of clams decreased from spring to fall at Hatch Cove which was also seen in 2023. At Sunshine Bar, the average number of clams increased slightly from spring to fall which is the

opposite of what was recorded in 2023. Additional data on sizes of surveyed clams across all sites and years can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

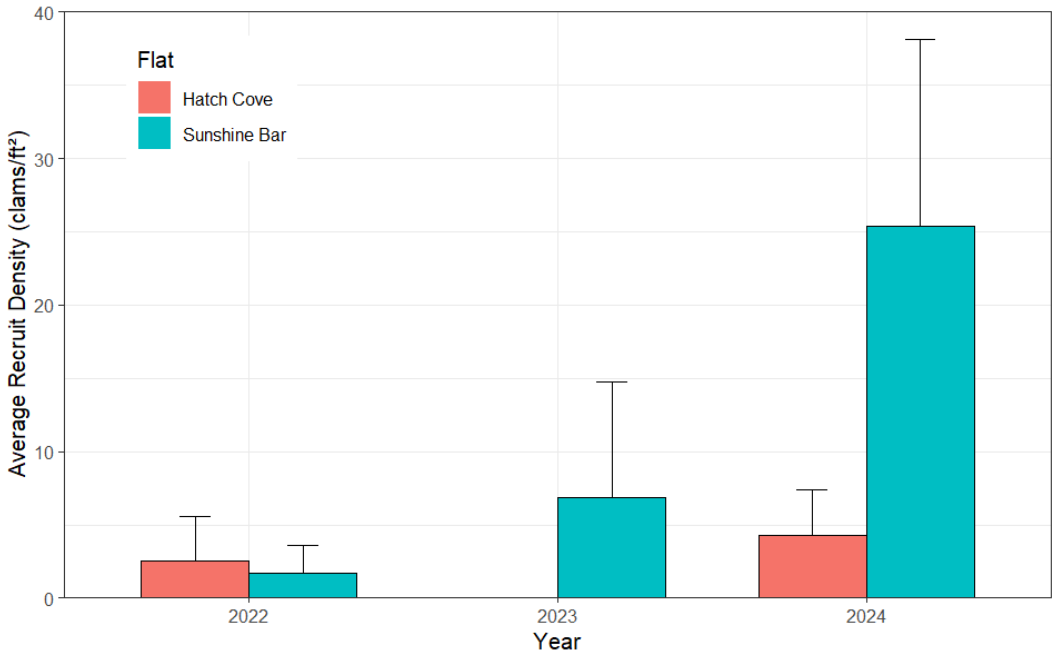
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Hatch Cove	4.25 (±3.12)	In 2024, there were ~6x more clam recruits on average at Sunshine Bar than Hatch Cove. This difference was statistically significant (p = 0.004). The average density for both flats combined was 14.81 ± 7.96 clams/ft^2 (n = 24).
Sunshine Bar	25.37 (±12.79)	

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Hatch Cove, the average soft-shell clam density increased from 2023 (0 clams/ft^2) and 2022 (2.5 clams/ft^2) to 2024 (4.25 clams/ft^2). At Sunshine Bar, the average clam recruit density continued to increase in 2024 (25.37 clams/ft^2) from 2023 (6.87 clams/ft^2) and 2022 (1.69 clams/ft^2). Additional data on the density of soft-shell clam recruits across all years and sites can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the towns of Stonington and Deer Isle (Spring to Fall 2022-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2022 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. No clams occurred in boxes at Hatch Cove in 2023.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Hatch Cove	75	2.01 mm [0.08 in]	25.51 mm [1.0 in]	10.45 (±1.75)mm [0.41 in]
Sunshine Bar	236	1.69 mm [0.07 in]	27.66 mm [1.09 in]	12.12 (±1.02)mm [0.48 in]

In 2024, the average clam recruit size was not significantly different between Sunshine Bar and Hatch Cove ($p = 0.104$). Across both sites, the average recruit size was smaller than in previous years. At Sunshine Bar, for example, the average recruit size was 12.12 mm in 2024 vs 19.79 mm in 2023 and 21.72 mm in 2022. Additional data on the size of soft-shell clam recruits from all years and sites can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Hatch Cove	36	1.85 (±1.21) crabs/ft^2	2.91 mm [0.22 in]	27.77 mm [1.27 in]	12.7 (±2.24) mm [0.68 in]
Sunshine Bar	14	0.72 (±0.44) crabs/ft^2	3.71 mm [0.19 in]	25.56 mm [1.38 in]	14.44 (±4.04) mm [0.64 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average green crab density was slightly greater at Hatch Cove than Sunshine Bar, but was not significantly different ($p = 0.076$). In 2022 and 2023, the average density was higher at Sunshine Bar. The average green crab size was greater at Sunshine Bar than Hatch Cove in 2024 which was also seen in 2022. In 2023, the average crab size was slightly larger at Hatch Cove.

Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

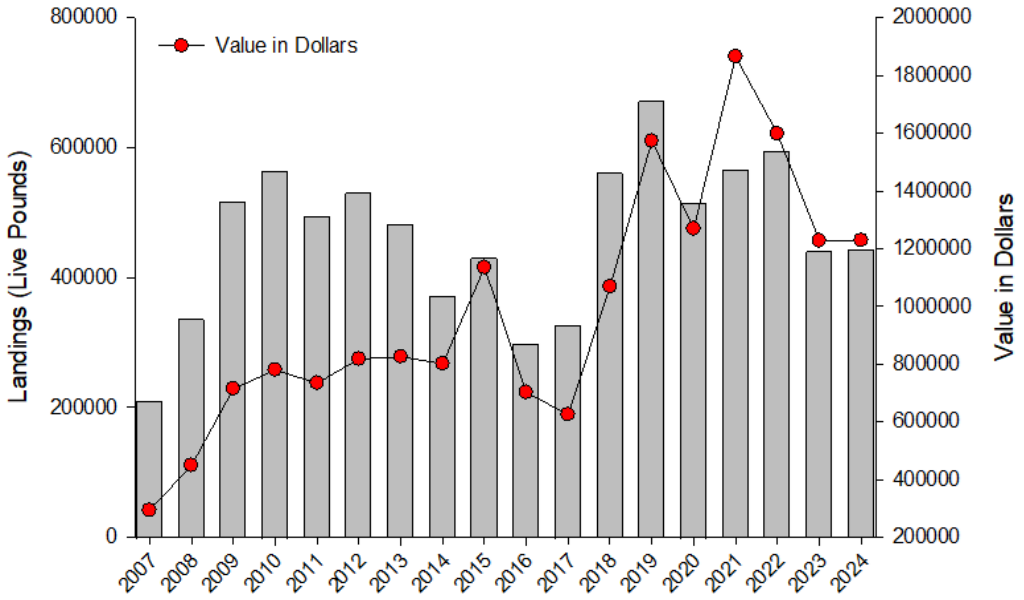
DOWNEAST
FRENCHMAN BAY

Site Locations: Hog Bay and Raccoon Cove

CLAMMING PROFILE:

The Frenchman Bay Regional Shellfish Program is governed by a regional ordinance, with agreements from seven towns in Hancock County: Ellsworth, Franklin, Hancock, Lamoine, Sorrento, Sullivan, and Trenton.

- Frenchman Bay Regional Shellfish Program is composed of 8,054.81 intertidal acres (IA) (DMR Acreage by Town, 2016). Franklin (the location of Hog Bay) has 1,725.09 intertidal acres and Lamoine (the location of Raccoon Cove) has 1,907.55 intertidal acres. Ellsworth has 280.72 IA, Hancock: 1,589.71 IA, Sorrento: 770.92 IA, Sullivan: 306.65 IA, and Trenton: 1,473.80 IA.
- There was no limit on the number of commercial and recreational licenses allocated for residents in 2024 and a 10% limit on non-resident commercial licenses (DMR General Town Shellfish Information, 2024).
- In 2024, 217,151 live pounds of soft-shell clams (valued at $579,986) were landed in Franklin. 42,128 pounds (valued at $113,657) were landed in Lamoine. 49,173 pounds (valued at $135,328) were landed in Hancock. 8,033 pounds (valued at $23,013) were landed in Sorrento. 107,136 pounds (valued at $324,782) were landed in Sullivan. And 19,830 pounds (valued at $51,766) were landed in Trenton (DMR Landings, 2024). A graph of the cumulative live pounds and value of landings in Frenchman Bay since 2007 is below.



Beginning (Deployment) Date: May 4, 2024

Ending (Fall Sampling) Date: November 15, 2024 (Raccoon Cove) (196 days total duration)
November 19, 2024 (Hog Bay) (200 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2023 Seawater Temperatures	2024 Seawater Temperatures
Raccoon Cove	Max: 17.2°C (August 6) Min: 7.3°C (May 14)	Max: 18.4°C (August 15) Min: 7.4°C (April 29/May 2)	Lost Recorder	Max: 16.4°C (Sept. 15) Min: 6.9°C (April 25)	Max: 18.1°C (Aug 12+13) Min: 7.5°C (May 4)
Hog Bay	Max: 25.1°C (June 19) Min: 8.4°C (October 9)	Max: 24.8°C (June 29/30) Min: 9.5°C (May 9)	Max: 26.6°C (July 24) Min: 6.6°C (April 20)	Max: 23.5°C (Aug. 2) Min: 8.5°C (April 27)	Max: 25.8°C (July 14) Min: 10.06°C (May 10)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

Both the Raccoon Cove and Hog Bay recorders stopped logging on September 11, 2024. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Frenchman's Bay (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Raccoon Cove	0.42 (±0.93) clams/ft²	0.85 (±1.26) clams/ft²	Gain of 0.43 clams/ft²		5.5 mm* [0.22 in]	4.5 mm [0.18 in]
Hog Bay	1.69 (±1.59) clams/ft²	0 clams/ft²	Loss of 1.69 clams/ft²		44.25 mm [1.74 in]	N/A

*only 1 clam found in survey

In 2024, average clam density was higher at Hog Bay than Raccoon Cove in the spring, but lower than Raccoon Cove in the fall which was the same pattern as seen in 2023. In both 2022 and 2021, the average clam density was higher at Hog Bay than Raccoon Cove in the fall. Additional data on the densities of surveyed clams across all sites and years can be found in Appendix A.

Clam density increased from spring to fall at Raccoon Cove, but decreased at Hog Bay as no clams were found during sampling in the fall. In 2023, there was also an increase in clam density from spring to fall at Raccoon Cove and no change at Hog Bay. In 2020-2022, the flats experienced net losses in density from spring to fall. The average clam size was larger at Hog Bay than Raccoon Cove in 2024, which was the same as seen in previous years. Additional data on sizes of surveyed clams across all years and sites can be found in the table in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

Clam recruit density is presented as the average number of clams per square foot (ft²) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

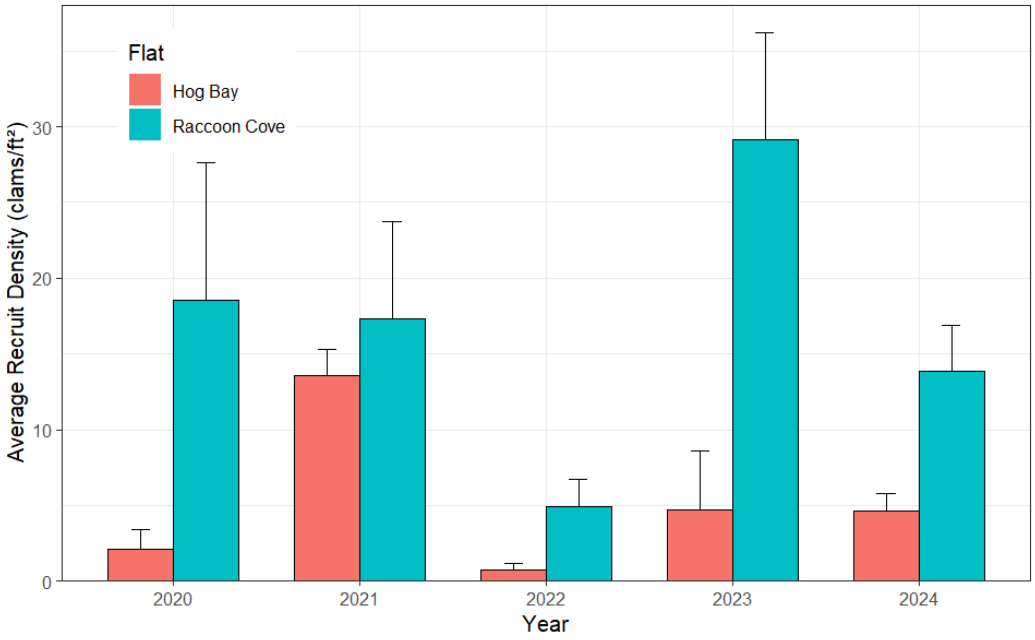
Site*	Avg. # per ft²	Conclusion
Raccoon Cove	13.84 (±3.07)	In 2024, the average number of clam recruits was approximately 3x higher at Raccoon Cove than Hog Bay. This difference was statistically significant (P < 0.0001).
Hog Bay	4.66 (±1.15)	The average density for both flats combined was 9.25 ±2.11 clams/ft² (n = 24)

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Raccoon Cove, the clam recruit density decreased from 2023 (29.11 clams/ft²) to 2024 (13.84 clams/ft²). In previous years, the average recruit density at Raccoon Cove decreased from 2021 (17.3 clams/ft²) to 2022 (4.92 clams/ft²). At Hog Bay, the recruit density decreased slightly from 2023 (4.72

clams/ft²) to 2024 (4.66 clams/ft²). This density is greater than in 2022 (0.73 clams/ft²), but still less than in 2021 (13.6 clams/ft²). Data on the density of soft-shell clam recruits can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in Frenchman's Bay (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2021 and 2022 (n = 16), boxes at Raccoon Cove had mesh bottoms while boxes at Hog Bay had fabric bottoms.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Raccoon Cove	215	1.66 mm [0.07 in]	21.76 mm [0.86 in]	7.4 (±0.63) mm [0.29 in]
Hog Bay	92	2.72 mm [0.11 in]	24.56 mm [0.97 in]	6.97 (±0.76) mm [0.27 in]

The average clam recruit size was not significantly different between Raccoon Cove and Hog Bay. In previous years, the average recruit size has been higher at Hog Bay than Raccoon Cove. Additional data on the size of soft-shell clam recruits can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Raccoon Cove	0	0 crabs/ft^2	N/A	N/A	N/A
Hog Bay	0	0 crabs/ft^2	N/A	N/A	N/A

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the average size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, no green crabs were found in any box either at Raccoon Cove or Hog Bay. In previous years, low densities (e.g. 0.31 crabs/ft^2) of green crabs have been recorded at at least one of the study sites.

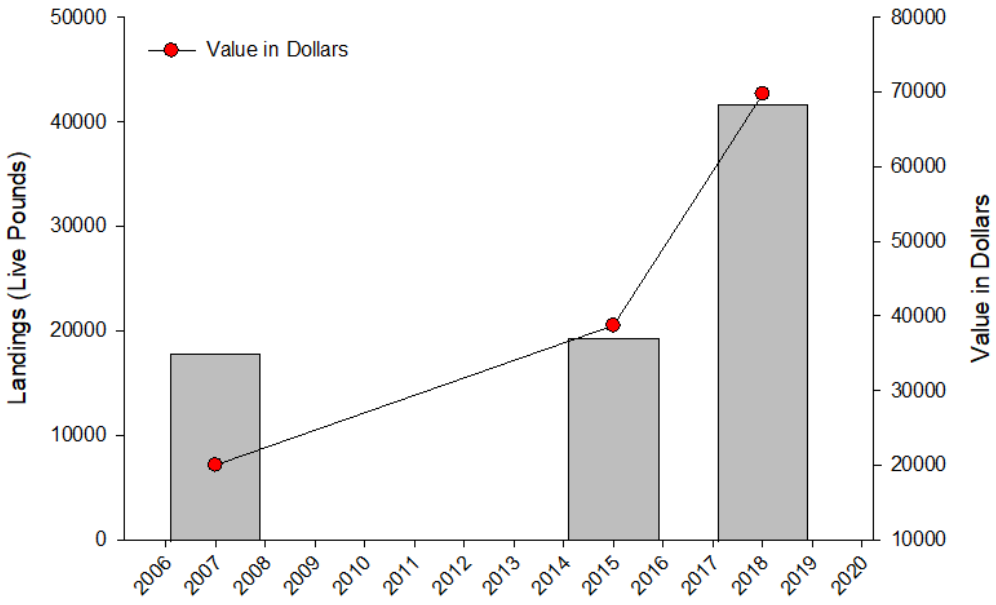
Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

BEALS

Site Locations: Perio Point and Dobbins' Island

CLAMMING PROFILE:

- 1,741.22 intertidal acres (DMR Acreage by Town, 2016).
- There was no limit on the number of commercial and recreational licenses allocated for residents in 2024 and a 10% limit on non-resident commercial licenses (DMR General Town Shellfish Information, 2024).
- In 2018 (the most recent available data), 41,711 live pounds of soft-shell clams (valued at $69,767) were landed in Beals (DMR Landings, 2020). A graph of the live pounds and value of landings in 2007, 2015, and 2018 is below. Commercial landings post-2018 are not made public for confidentiality reasons.



Beginning (Deployment) Date: April 9, 2024
Ending (Fall Sampling) Date: October 19, 2024 (194 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2023 Seawater Temperatures	2024 Seawater Temperatures
Dobbins' Island	Max: 20.2°C (August 12) Min: 7.0°C (May 16)	Max: 20.2°C (August 14) Min: 6.4°C (May 1)	Max: 20.0°C (August 7) Min: 5.3°C (April 19)	Lost Recorder	Max: 19.4°C (July 17) Min: 5.5°C (April 12)
Perio Point	Max: 15.6°C (Aug. 6/14/15) Min: 6.5°C (May 13)	Max: 16.2°C (August 27) Min: 7.1°C (May 1)	Max: 16.3°C (August 22) Min: 7.1°C (May 5)	Max: 15.9°C (Sept. 6) Min: 4.5°C (April 6)	Max: 15.5°C (August 13) Min: 4.9°C (April 11/12)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

The Dobbins' Island recorder stopped logging on July 22, 2024 and the Perio Point recorder stopped logging on August 17, 2024. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Beals (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Dobbins' Island	3.39 (±3.74) clams/ft^2	0 clams/ft^2	Loss of 3.39 clams/ft^2		3.76 mm [0.15 in]	N/A
Perio Point	0.42 (±0.93) clams/ft^2	2.55 (±2.18) clams/ft^2	Gain of 2.13 clams/ft^2		3.8 mm* [0.15 in]	4.53 mm [0.18 in]

*only 1 clam found in survey

In 2024, the average clam density was higher at Dobbins' Island than Perio Point in the spring and higher at Perio Point in the fall. In 2020, 2021, and 2023, the average clam density was higher at Perio Point in both the spring and fall. Additional data on the densities of surveyed clams across all years and sites can be found in Appendix A.

There was a decrease in clam density at Dobbins' Island from spring to fall as zero clams were found in the fall surveys, but an increase at Perio Point. In 2020, 2022, and 2023, clam density declined at both sites from spring to fall. The average clam size was slightly larger at Perio Point, but only based on a

sample size of one in the spring. Additional data on the size-frequency distribution of clams from spring core samples can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

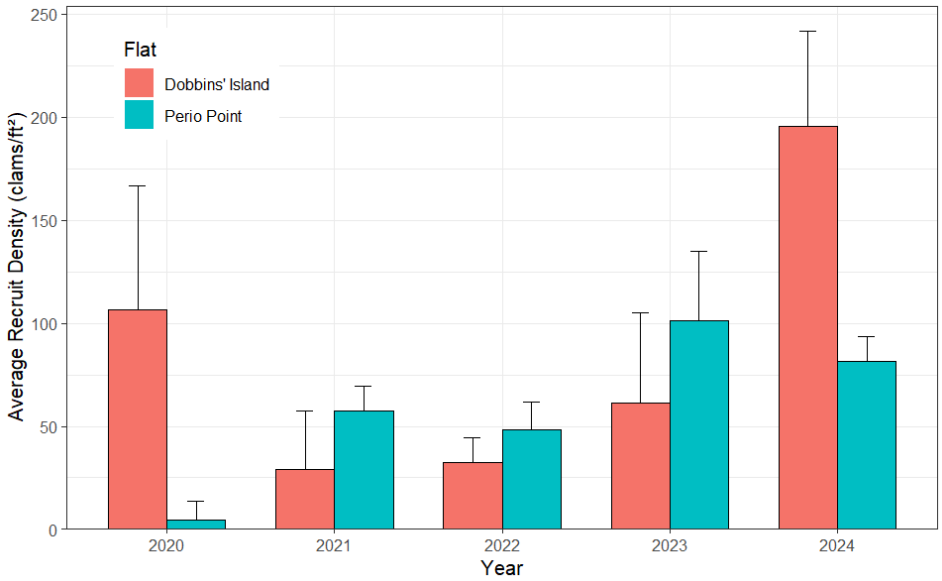
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Dobbins' Island	195.48 (±46.48)	In 2024, there were approximately 2.4x more clam recruits at Dobbins' Island than Perio Point. This difference was statistically significant ($p < 0.0001$).
Perio Point	81.49 (±12.04)	The average density for both flats combined was 138.49 ±29.26 clams/ft^2 (n = 24).

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Dobbins' Island, the average soft-shell clam recruit density increased from 2023 (61.25 clams/ft^2) to 2024 (195.48 clams/ft^2). The 2024 average recruit density was also greater than in 2021 (28.9 clams/ft^2) and 2022 (32.59 clams/ft^2). At Perio Point, the average recruit density decreased from 2023 (101.23 clams/ft^2) to 2024 (81.49 clams/ft^2), but this density was still greater than in 2021 (57.7 clams/ft^2) and 2022 (48.47 clams/ft^2). Additional data on the density of soft-shell clam recruits can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Beals (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2022 (n = 16), all bottoms were comprised of PetScreening® while in 2021, the flats were split. Boxes at Dobbins' Island had PetScreen® bottoms and boxes at Perio Point had fabric bottoms.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Dobbins' Island	240	1.01 mm [0.04 in]	28.76 mm [1.13 in]	2.94 (±0.39) mm [0.12 in]
Perio Point	240	1.48 mm [0.06 in]	22.1 mm [0.87 in]	4.19 (±0.31) mm [0.16 in]

In 2024, the average clam recruit size was larger at Perio Point than Dobbins' Island and this difference was significant ($p < 0.0001$). In previous years, the average recruit size was larger at Dobbins' Island than Perio Point. Additional data on the size of soft-shell clam recruits can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Dobbins' Island	10	0.51 (±0.47) crabs/ft^2	3.0 mm [0.12 in]	11.14 mm [0.44 in]	8.21 (±1.67) mm [0.32 in]
Perio Point	1	0.05 (±0.11) crabs/ft^2	N/A	N/A	11.96 (-) mm [0.47 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average density of green crabs was higher at Dobbins' Island than Perio Point which was also observed in the previous four years, but was not significantly higher ($p = 0.056$). In 2023, the average density of green crabs was significantly different between Dobbins' Island and Perio Point ($p = 0.0385$).

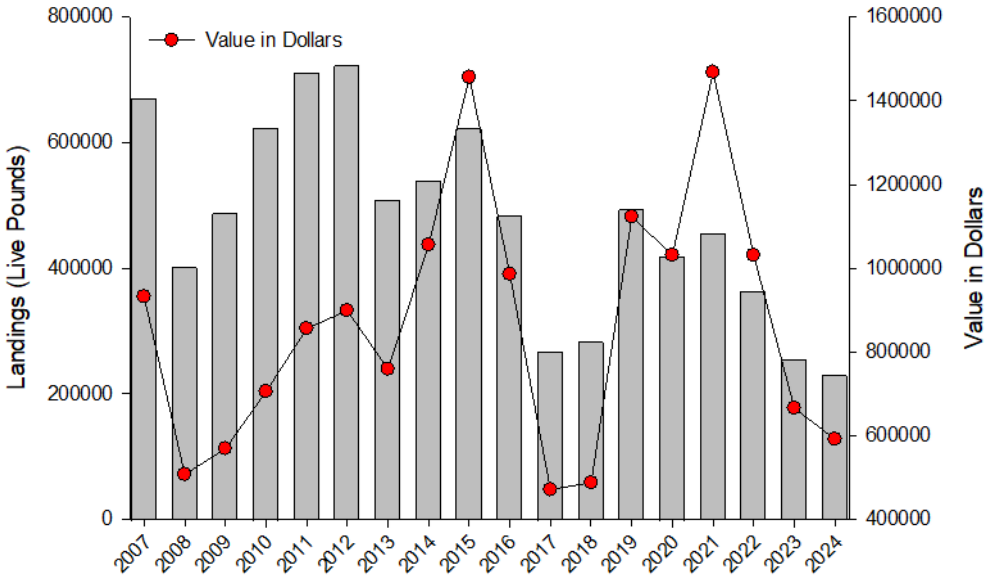
Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

MACHIASPORT

Site Locations: Sanborn Cove and Randall Point Flat

CLAMMING PROFILE:

- 3,696.06 intertidal acres (DMR Acreage by Town, 2016).
- There was an unlimited number of commercial and recreational clamming licenses allocated for residents in 2024 and a 10% limit on non-resident commercial licenses (DMR General Town Shellfish Information, 2024).
- In 2024, 229,975 live pounds of soft-shell clams were landed in Machiasport (ex-vessel value of $591,409) (DMR Landings, 2024). A graph of the live pounds and value of landings since 2007 is below.



Beginning (Deployment) Date: April 10, 2024
Ending (Fall Sampling) Date: October 21, 2024 (195 days total duration)

SEAWATER TEMPERATURE

Site	2022 Seawater Temperatures*
Sanborn Cove	Max: 16.5°C (August 23) Min: 5.6°C (April 30)
Randall Point Flat	Lost Recorder

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

Both temperature loggers were lost in Machiasport in 2023 and 2024.

2024 SITE CORE SURVEY RESULTs - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Machiasport (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities		Average size of clams sampled	
	Spring	Fall			Spring	Fall
Sanborn Cove	0.85 (±1.26) clams/ft^2	2.12 (±2.57) clams/ft^2	Gain of 1.27 clams/ft^2		4.95 mm [0.19 in]	8.23 mm [0.32 in]
Randall Point Flat	2.12 (±0.53) clams/ft^2	7.64 (±5.26) clams/ft^2	Gain of 5.52 clams/ft^2		6.88 mm [0.27 in]	6.89 mm [0.27 in]

In 2024, the average clam density was higher at Randall Point Flat than Sanborn Cove in both the spring and fall. This is the same as what was seen in previous years. Additional data on the densities of surveyed clams across all sites and years can be found in Appendix A.

Both Sanborn Cove and Randall Point Flat experienced an increase in clam density from spring to fall. Both sites also experienced gains in 2022, but in 2023, there was no change in clam density at Sanborn Cove and a decrease in density at Randall Point Flat. The average clam size was larger at Randall Point Flat in the spring and Sanborn cove in the fall. In previous years, the average clam size has been larger at Randall Point Flat in both the spring and fall. Additional data on the clam size-frequency distribution from core samples can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

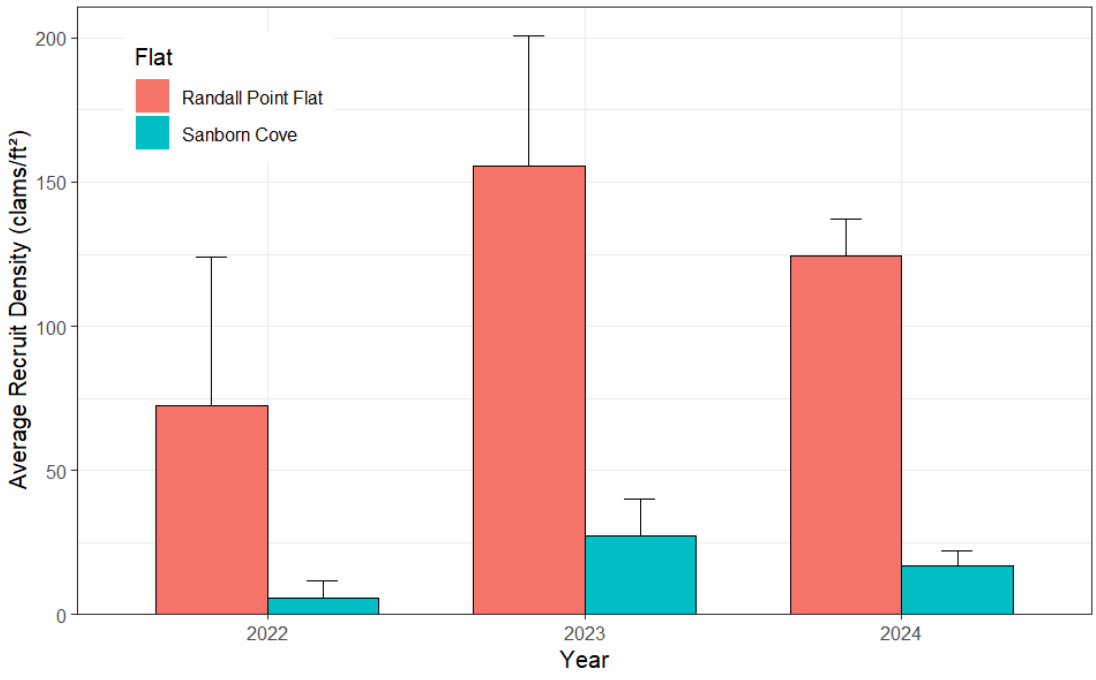
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Sanborn Cove	16.86 (±5.22)	In 2024, there were approximately 7x more clam recruits at Randall Point than Sanborn Cove and this difference was statistically significant ($p < 0.0001$). The average density for both flats combined was 70.68 ± 8.91 clams/ft^2 (n = 24).
Randall Point	124.5 (±12.6)	

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Sanborn Cove, the average clam recruit density decreased from 2023 (27.42 clams/ft^2) to 2024 (16.86 clams/ft^2), but is greater than the average density in 2022 (5.61 clams/ft^2). At Randall Point, the average clam recruit density also decreased from 2023 (155.5 clams/ft^2) to 2024 (124.5 clams/ft^2), but is an increase from the average density in 2022 (72.35 clams/ft^2). Additional data on the density of soft-shell clam recruits can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Machiasport (Spring to Fall 2022-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2022 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Sanborn Cove	209	1.28 mm [0.05 in]	28.35 mm [0.12 in]	6.05 (±0.41) mm [0.24 in]
Randall Point	240	1.44 mm [0.06 in]	17.92 mm [0.71 in]	4.71 (±0.31) mm [0.19 in]

In 2024, the average clam recruit size was slightly larger at Sanborn Cove than Randall Point Flat, which was also seen in 2023 and 2022. The average size was significantly different between flats ($p < 0.0001$). The average recruit size at both sites was greater than in 2023. Additional data on recruit size is in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Sanborn Cove	0	0 crabs/ft^2	N/A	N/A	N/A
Randall Point	1	0.05 (±0.11) crabs/ft^2	N/A	N/A	4.41 (-) mm [0.17 in]

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, the average green crab density continued to decline from previous years. Only one green crab was found at Randall Point Flat and zero were found at Sanborn Cove.

Graphs showing the relationship between the largest crab in each recruitment box and the number of clam recruits in each box is in Appendix I.

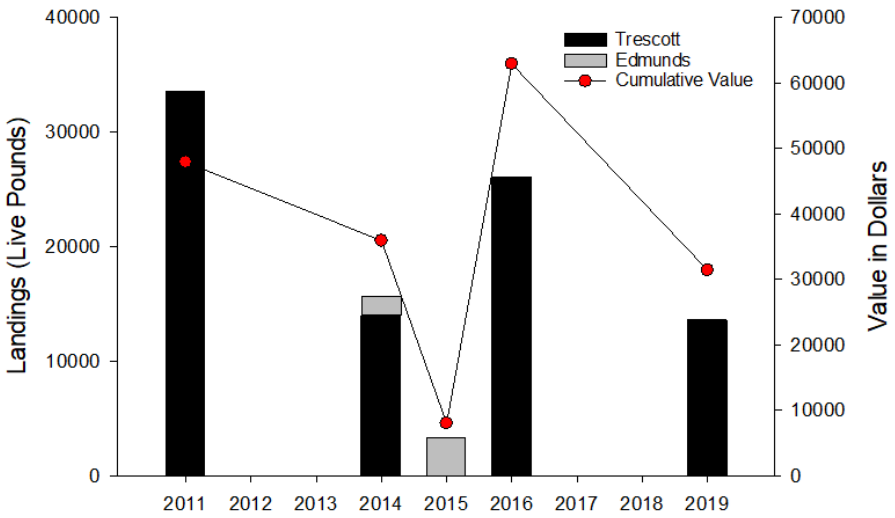
EDMUNDS/TRESCOTT

Site Locations: Williams/Hallowell Island, Marion Cove, and Burnt Cove

Edmunds (Hallowell Island and Burnt Cove) and Trescott (Marion Cove) are unorganized territories in Washington County, and have been part of the recruitment monitoring network since 2021. Twelve boxes were deployed at each site in 2024 (N = 36).

CLAMMING PROFILE:

- 1103.35 intertidal acres in Edmunds Township and 1632.96 intertidal acres in Trescott Township (DMR Acreage by Town, 2016).
- Edmunds and Trescott had an unlimited number of commercial and recreational clamming licenses allocated for residents in 2024 and nonresident licenses were set at 10% of resident licenses (DMR General Town Shellfish Information, 2024).
- In 2019 (the most recent available data due to confidentiality matters that are similar to those described for the Town of Beals), 13,596 live pounds of soft-shell clams were landed in Trescott (ex-vessel value of $31,371) and in 2015 (the most recent available data), 3,381 pounds of clams were landed in Edmunds (ex-vessel value of $7,977) (DMR Landings, 2024). A graph of the live pounds and value of landings for the available data is below. Commercial landings post-2019 are not made public for confidentiality reasons.



Beginning (Deployment) Date: April 12, 2024
Ending (Fall Sampling) Date: October 20, 2024 (192 days total duration)

SEAWATER TEMPERATURE

Site	2021 Seawater Temperatures*	2022 Seawater Temperatures	2023 Seawater Temperatures	2024 Seawater Temperatures
Williams/ Hallowell Island	Max: 22.5°C (May 27) Min: 3.6°C (May 30)	Max: 17.2°C (August 7) Min: 7.7°C (May 17/18/19)	Lost Recorder	Max: 14.9°C (July 17) Min: 4.6°C (April 12)
Marion Cove	Max: 16.5°C (Aug 27) Min: 8.4°C (June 1)	Max: 16.1°C (August 8/22/30) Min: 8.1°C (May 22)	Max: 16.1°C (September 9) Min: 6.4°C (April 21)	Max: 15.8°C (July 17) Min: 5.0°C (April 12)
Burnt Cove	N/A	Lost Recorder	Max: 18.4°C (July 28) Min: 7.0°C (April 21)	Max: 16.2°C (June 20/21) Min: 5.5°C (April 12)

*Seawater temperature was calculated from five temperature recordings taken around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

The Hallowell Island recorder stopped logging on August 3, 2024, the Marion Cove recorder stopped logging on August 19, 2024, and the Burnt Cove recorder stopped logging on June 26, 2024. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Edmunds/Trescott (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities	Average size of clams sampled	
	Spring	Fall		Spring	Fall
Williams/ Hallowell Island	0 clams/ft²	0.43 (±0.94) clams/ft²	Gain of 0.43 clam/ft²	N/A	3.11 mm* [0.12 in]
Marion Cove	2.97 (±2.16) clams/ft²	0.42 (±0.94) clams/ft²	Loss of 2.55 clam/ft²	6.8 mm [0.23 in]	7.93 mm* [0.31 in]
Burnt Cove	1.69 (±2.11) clams/ft²	0.85 (±1.26) clams/ft²	Loss of 0.84 clams/ft²	5.6 mm [0.22 in]	4.06 mm [0.16 in]

*only 1 clam found in survey

In 2024, the highest density of clams was found at Marion Cove in the spring and Burnt Cove in the fall. No clams were found in core samples at Williams/Hallowell Island in the spring and only one clam was found at Williams/Hallowell Island and Marion Cove in the fall. Additional data on the densities of surveyed clams across all sites and years can be found in Appendix A.

Additional data on the size-frequency distribution of surveyed clams across all years and sites can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

Clam recruit density is presented as the average number of clams per square foot (ft²) and is accompanied by its 95% confidence interval (CI)* in parentheses (n = 12).

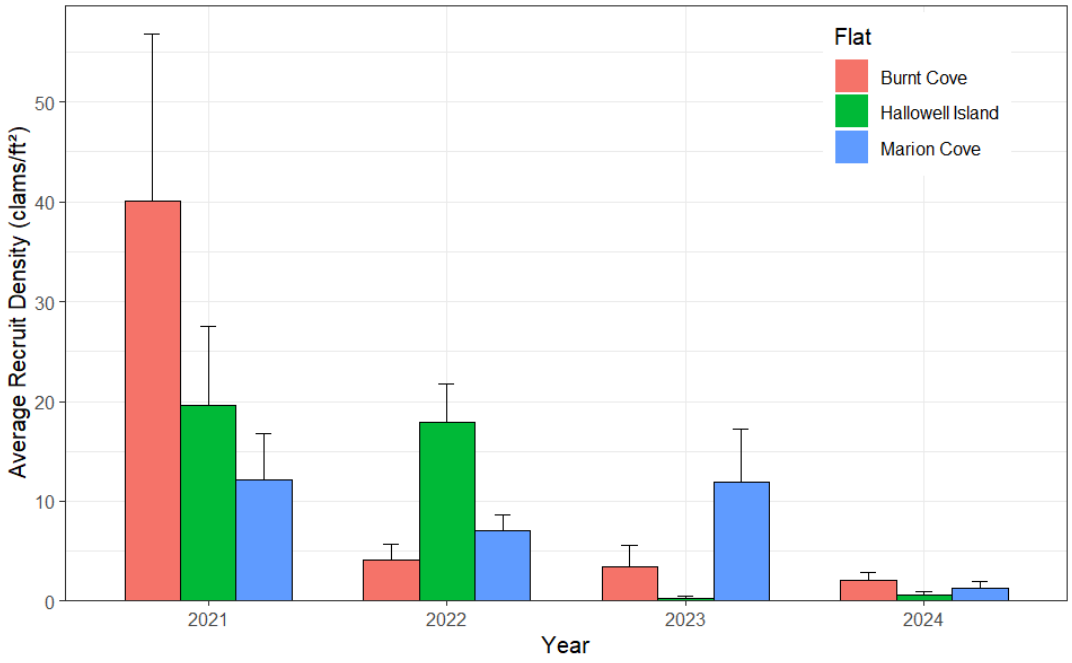
Site*	Avg. # per ft²	Conclusion
Burnt Cove	2.1 (±0.75)	The average clam recruit density at Burnt Cove was significantly higher than the density at Hallowell Island (p = 0.001), but not Marion Cove (p = 0.101). The combined average density for all three sites was 1.31 ±0.64 clams/ft² (n = 36).
Hallowell Island	0.56 (±0.42)	
Marion Cove	1.28 (±0.74)	

*A detailed graphical analysis of fall clam recruitment by flat can be found in Appendix F.

At Burnt Cove, the average clam recruit density decreased from 2022 (4.07 clams/ft²) and 2023 (3.43 clams/ft²) to 2024 (2.1 clams/ft²). At Hallowell Island, the average clam density increased slightly from 2023 (0.26 clams/ft²) to 2024 (0.56 clams/ft²), but is still significantly lower than the average density

in 2022 (17.91 clams/ft²). At Marion Cove, the average clam density decreased from 2022 (7.03 clams/ft²) and 2023 (11.94 clams/ft²) to 2024 (1.28 clams/ft²). Additional data on the density of soft-shell clam recruits can be found in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the township of Edmunds and one site in the township of Trescott (Marion Cove) (Spring to Fall 2021-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2021 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2022 (n = 16), all bottoms were comprised of PetScreening®.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Burnt Cove	41	2.4 mm [0.09 in]	18.63 mm [0.73 in]	9.49 (±1.4) mm [0.37 in]
Hallowell Island	11	2.82 mm [0.11 in]	12.37 mm [0.49 in]	8.46 (±1.78) mm [0.33 in]
Marion Cove	25	1.36 mm [0.05 in]	25.6 mm [1.01 in]	7.92 (±2.47) mm [0.31 in]

Across all sites, the average recruit size increased from 2023 to 2024. The average sizes were similar to what was seen in 2021 and 2022. There was no significant difference in the average size between sites. Additional data on the size of soft-shell clam recruits can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

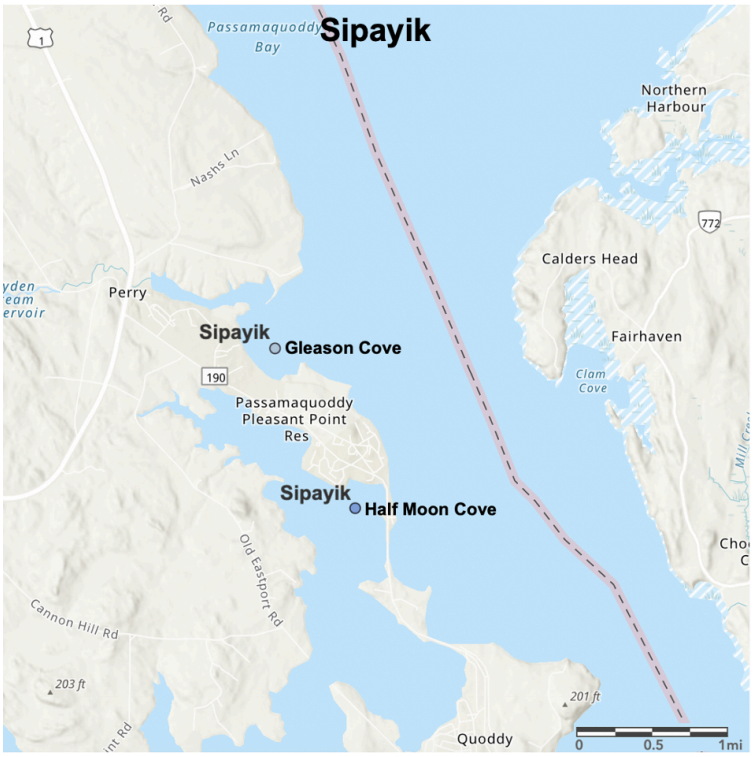
Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Overall Avg. Size
Burnt Cove	0	0 crabs/ft^2	N/A	N/A	N/A
Hallowell Island	0	0 crabs/ft^2	N/A	N/A	N/A
Marion Cove	0	0 crabs/ft^2	N/A	N/A	N/A

*An analysis of green crab size-frequency distribution by flat and box type can be found in Appendix H.
**Data on the size and density of green crabs found in recruitment boxes can be found in a table in Appendix D.

In 2024, no green crabs were found at any of the three sites. In 2023, green crabs were only found in recruitment boxes at Marion Cove while in both 2021 and 2022, green crabs were found at all sites in low densities.

Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

SIPAYIK



Site Locations: Gleason Cove and Half Moon Cove

CLAMMING PROFILE:

- 1.02 intertidal acres (DMR Acreage by Town, 2016).

Beginning (Deployment) Date: April 11, 2024

Ending (Fall Sampling) Date: October 19, 2024 (192 days total duration)

SEAWATER TEMPERATURE

Site	2020 Seawater Temperatures*	2021 Seawater Temperatures	2022 Seawater Temperatures	2024 Seawater Temperatures
Gleason Cove	Max: 16.7°C (August 14) Min: 6.5°C (May 16/17)	Max: 17.3°C (August 28) Min: 6.6°C (May 6)	Max: 16.9°C (August 28) Min: 5.1°C (April 16/17)	Max: 16.9°C (August 13) Min: 4.3°C (April 12)
Half Moon Cove	Max: 15.6°C (August 15) Min: 6.8°C (May 16)	Max: 16.1°C (September 1) Min: 6.9°C (May 6/8)	Max: 16.1°C (August 21/25) Min: 5.6°C (April 17/19/20)	Max: 15.2°C (August 13/15) Min: 4.8°C (April 11/12)

*Seawater temperature was calculated from five temperature recordings around both high tides each day: 60 minutes and 30 minutes prior to and after high tide, as well as at high tide.

The Gleason Cove recorder stopped logging on August 18, 2024 and the Half Moon Cove recorder stopped logging on August 16, 2024. Analysis of how seawater temperatures changed through the season can be found in Appendix E.

2024 SITE CORE SURVEY RESULTS - Fall and Spring

Below is a summary of the spring vs. fall site survey results for Sipayik (n=12 core samples for each flat and season). Clam densities are reported in the average number of clams per square foot (ft^2) and accompanied by the 95% confidence interval (CI) in parentheses.

Site	Density of clams found in surveys		Difference between Spring and Fall densities	Average size of clams sampled	
	Spring	Fall		Spring	Fall
Gleason Cove	3.82 (±2.8) clams/ft^2	1.69 (±2.1) clams/ft^2	Loss of 2.12 clams/ft^2	4.4 mm [0.17 in]	4.14 mm [0.16 in]
Half Moon Cove	0.85 (±1.26) clams/ft^2	0.85 (±1.87) clams/ft^2	No change in clams/ft^2	3.85 mm [0.15 in]	2.18 mm [0.09 in]

In 2024, the average clam density was higher at Gleason Cove than Half Moon Cove in both the spring and fall. This was also seen in 2023 and 2022, but in 2020 and 2021, the clam density was higher at Half Moon Cove. Additional data on the densities of surveyed clams across all sites and years can be found in Appendix A.

There was a decrease in clam density at Gleason Cove in 2024 and there was no change in density at Half Moon Cove. In 2020, 2021, and 2023, there was also a decrease in clam density at Gleason Cove. The average clam size was larger at Gleason Cove than Half Moon Cove in both the spring and fall. This is consistent with previous years other than spring 2021 and fall 2023. Additional data on the clam size-frequency distribution from core samples can be found in Appendix B.

2024 RECRUITMENT BOX RESULTS

Summary of Average Soft-shell Clam Recruit Density

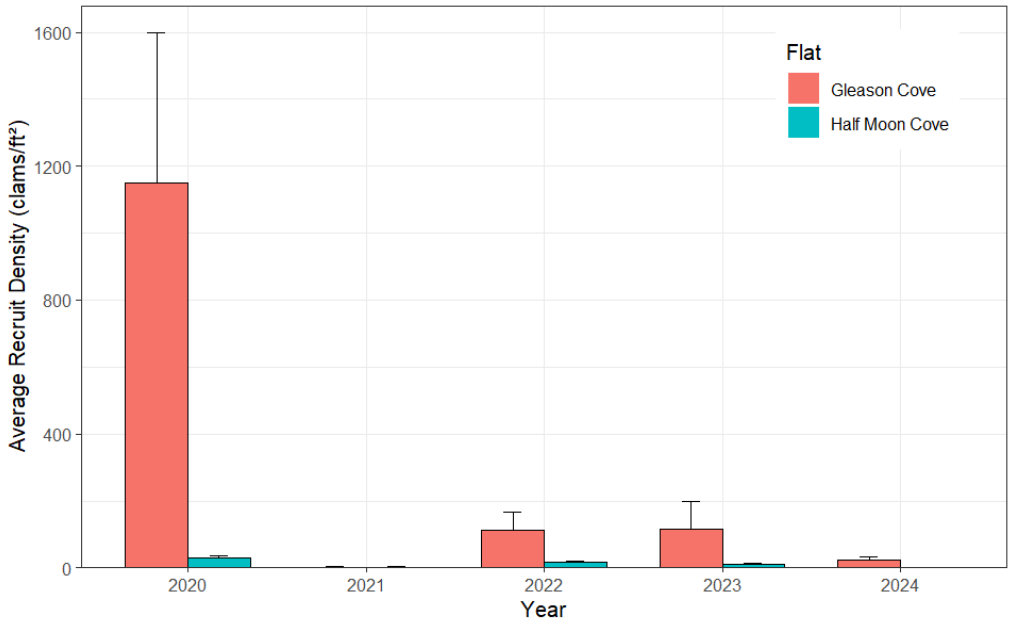
Clam recruit density is presented as the average number of clams per square foot (ft^2) and is accompanied by its 95% confidence interval (CI) in parentheses (n = 12).

Site*	Avg. # per ft^2	Conclusion
Gleason Cove	24.6 (±7.88)	In 2024, there were ~40x more clam recruits at Gleason Cove than Half Moon Cove. This difference was statistically significant ($p < 0.0001$).
Half Moon Cove	0.62 (±0.37)	The average density for both flats combined was 12.61 ± 4.13 clams/ft^2 (n = 24).

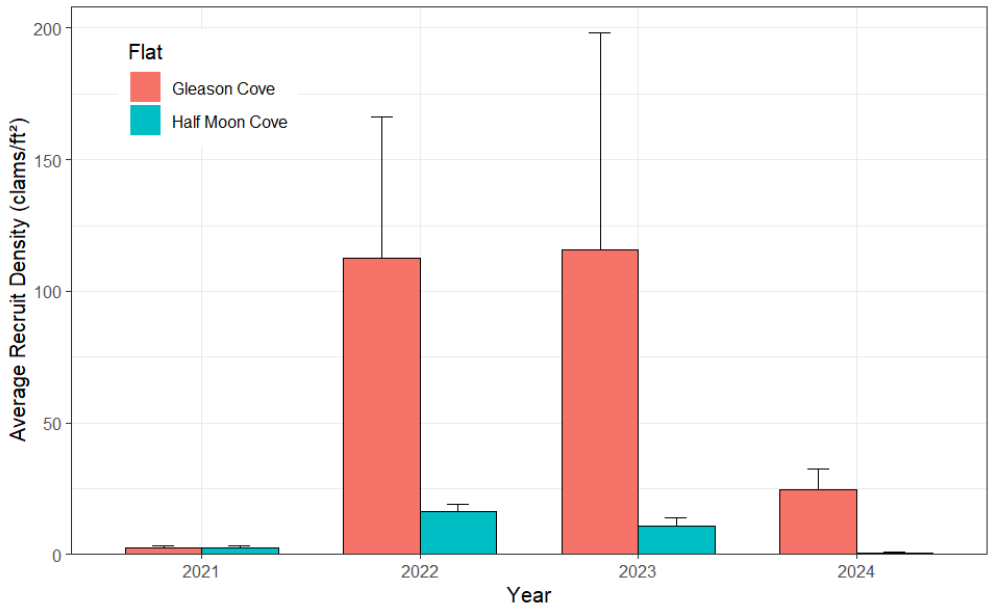
*A detailed analysis of fall clam recruitment by flat can be found in Appendix F.

At Gleason Cove, the average clam density decreased from 2022 (112.48 clams/ft²) and 2023 (115.91 clams/ft²) to 2024 (24.6 clams/ft²). At Half Moon Cove, the average clam density also decreased from 2020 (28.5 clams/ft²), 2021 (2.6 clams/ft²), 2022 (16.49 clams/ft²), and 2023 (10.81 clams/ft²) to 2024 (0.62 clams/ft²). Additional data on the density of soft-shell clam recruits can be found in a table in Appendix C.

The graph below shows the average number of young-of-the-year soft-shell clams in recruitment boxes from two study sites in the town of Sipayik (Spring to Fall 2020-2024). All boxes had a mesh top (PetScreen®; 1.7mm x 0.9mm aperture) across all years. In 2020 (n = 8), 2023 (n = 12), and 2024 (n = 12), boxes had a ground cover (fabric) bottom. In 2021 and 2022 (n = 16), all bottoms were comprised of PetScreening®.



Given the high average density at Gleason Cove in 2020, the graph below excludes 2020 data.



Summary of Clam Recruit Size

Size summary of soft-shell clam recruits is presented in both mm and inches. Average size is accompanied by its 95% confidence interval (CI).

Site	# Recruits Measured (N)	Min. Size of Recruit	Max. Size of Recruit	Average Recruit Size
Gleason Cove	198	1.66 mm [0.07 in]	21.16 mm [0.83 in]	8.41 (±0.65) mm [0.33 in]
Half Moon Cove	12	2.09 mm [0.08 in]	13.74 mm [0.54 in]	8.53 (±2.25) mm [0.34 in]

In 2024, the average clam recruit size was very slightly larger at Half Moon Cove than Gleason Cove, but this difference was not significant ($p = 0.917$). In 2023 and 2022, the average recruit size was larger at Gleason Cove than Half Moon Cove. Additional data on the size of soft-shell clam recruits can be found in Appendix C and G.

Summary of Green Crab Density and Size

Total number of green crabs in n = 12 recruitment boxes per site, along with average number of green crabs per square foot ± 95% CI and size information.*

Site	Total # of Green Crabs	Density**	Min. Size	Max. Size	Average Size
Gleason Cove	0	0 crabs/ft^2	N/A	N/A	N/A
Half Moon Cove	0	0 crabs/ft^2	N/A	N/A	N/A

*An analysis of green crab size-frequency distribution by flat can be found in Appendix H.

**Data on the size and density of green crabs found in recruitment boxes can be found in Appendix D.

In 2024, no green crabs were found at either flat. The density of green crabs in recruitment boxes at both Gleason Cove and Half Moon Cove decreased from 2022 to 2023, but the average size of crabs at both sites was greater in 2023 than 2022. In 2023, the density of green crabs was significantly higher at Gleason Cove than Half Moon Cove ($p = 0.0011$).

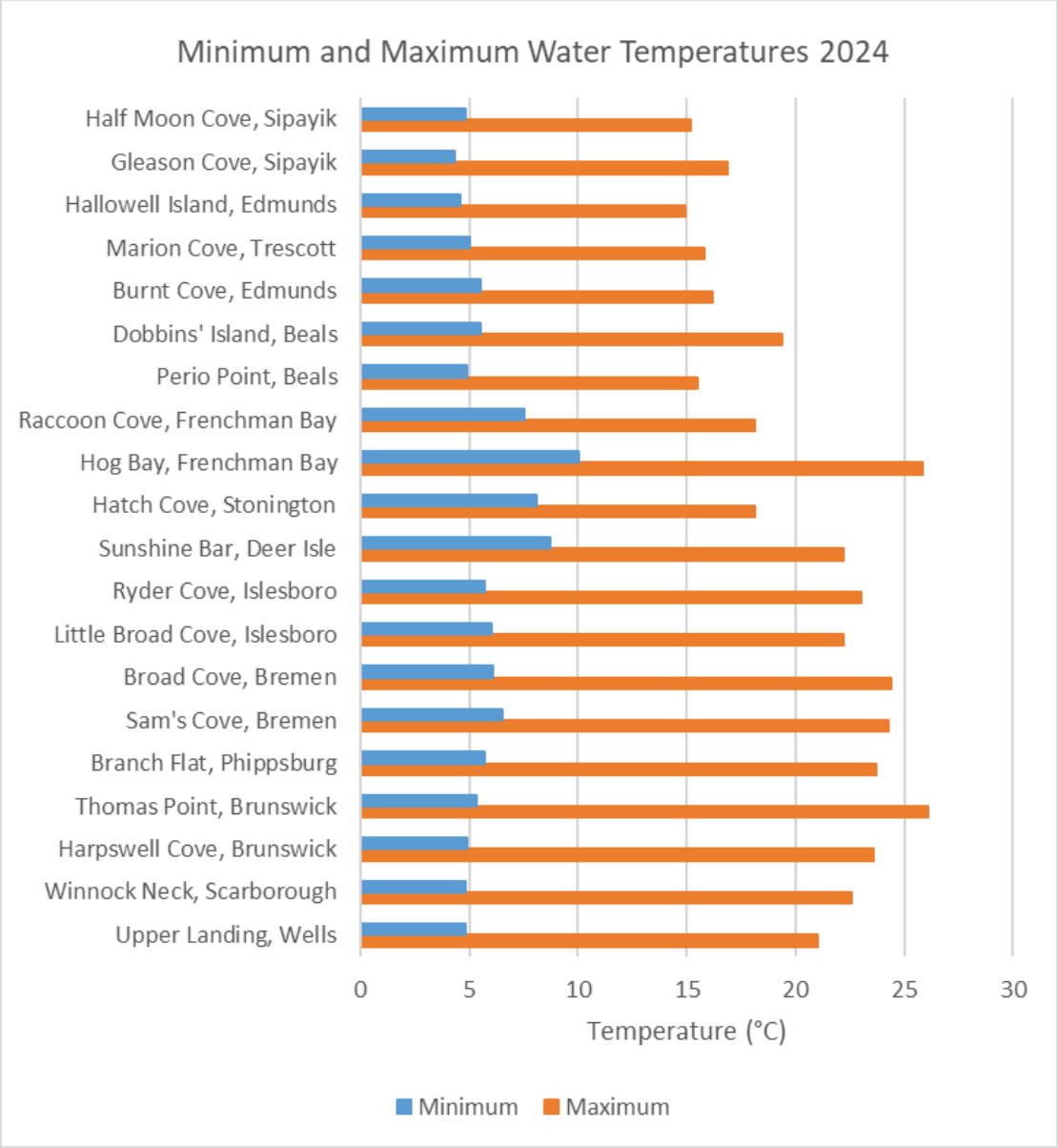
Graphs showing the relationship between the largest green crab in each recruitment box and the number of clam recruits recovered can be found in Appendix I.

OVERALL RESULTS

Temperature

Seawater temperature is the most important driver influencing the biological and ecological processes that govern the health of the clam fishery. Temperature is the key prompt for clams to begin spawning, and may drive the duration of the spawning season (see: How Many Eggs Does a Clam Produce?). Temperature also affects how fast clams grow as well as the rates of predation by green crabs and other clam consumers. Warm temperatures allow certain predators, such as invasive green crabs, to proliferate, and increase predation intensity (rates) by speeding up their metabolism. In addition, warm seawater temperatures extend the period that predators feed at high intensity.

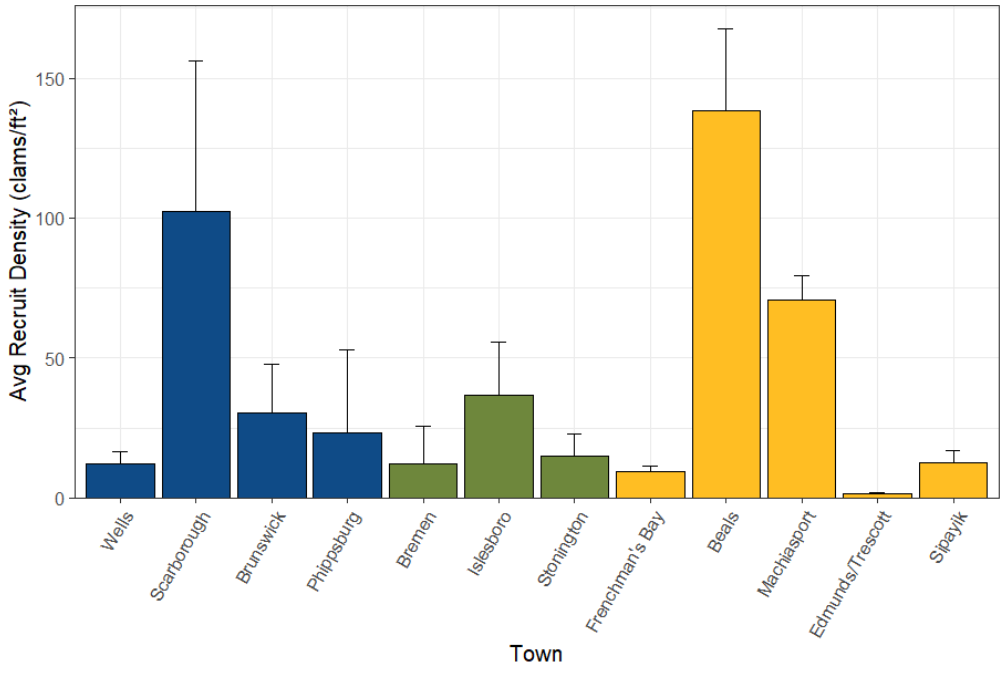
The graph below shows the maximum and minimum water temperatures at each site over the 2024 Clam Recruitment Monitoring season. For information about seawater temperatures, see Appendix E.



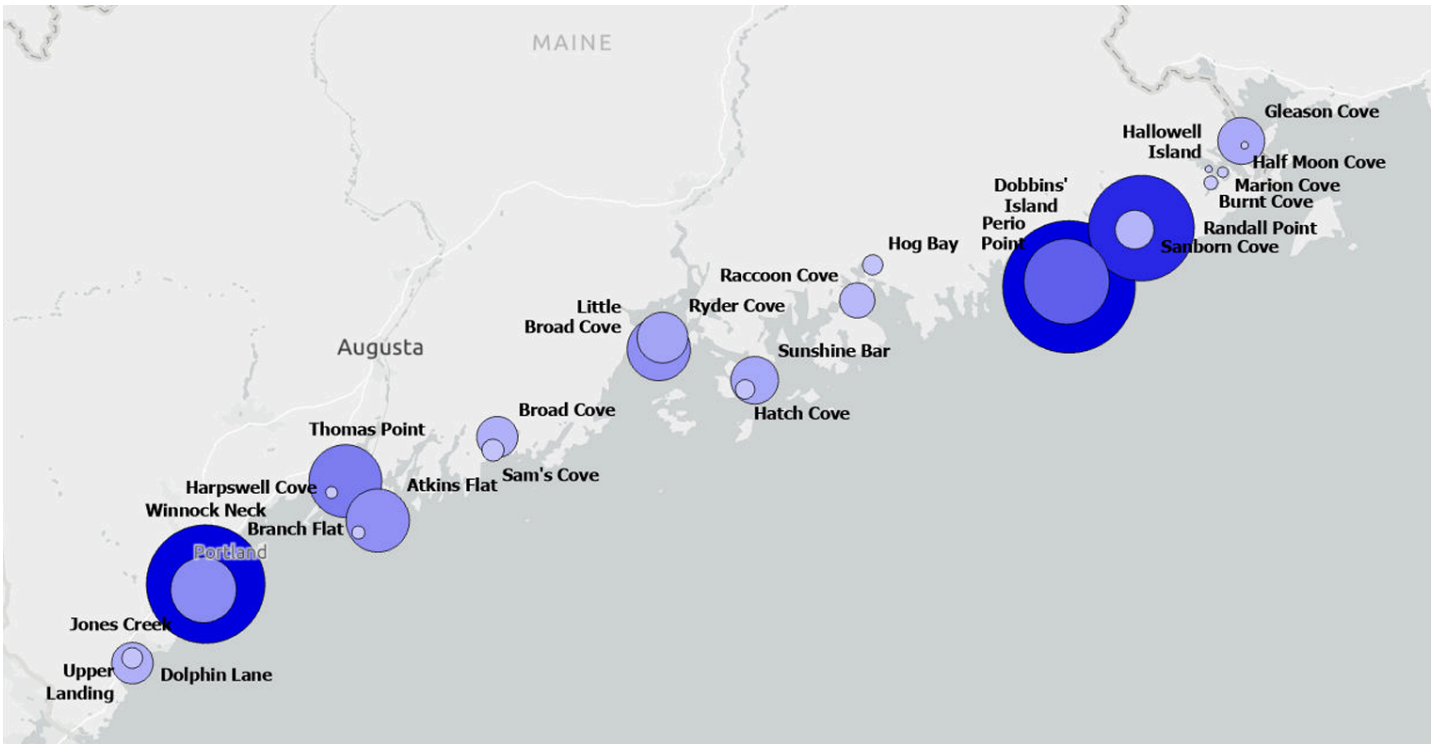
Site-Specific Clam Recruitment Densities

In 2024, 10 of the 25 sites (40%) had average soft-shell clam recruit densities less than 10 recruits/ft^2. And 20 of the 25 sites (80%) had densities less than 50 recruits/ft^2. Three sites - Dobbins' Island in Beals, Winnock Neck in Scarborough, and Randall Point Flat in Machiasport - averaged more than 100 recruits/ft^2. In 2024, only three of the top ten sites with the highest clam densities were located in the Downeast region compared to five in 2023 and seven in 2022.

	Location	Average # Recruits/ft^2
1	Dobbins' Island, Beals	195.48 (±46.48)
2	Winnock Neck, Scarborough	156.53 (±67.53)
3	Randall Point Flat, Machiasport	124.5 (±12.6)
4	Perio Point, Beals	81.49 (±12.04)
5	Thomas Point, Brunswick	59.4 (±32.7)
6	Jones Creek, Scarborough	48.37 (±39.57)
7	Atkins Flat, Phippsburg	44.9 (±58.4)
8	Little Broad Cove, Islesboro	44.8 (±19.43)
9	Ryder Cove, Islesboro	28.8 (±18.71)
10	Sunshine Bar, Deer Isle	25.37 (±12.79)
11	Gleason Cove, Sipayik	24.6 (±7.88)
12	Dolphin Lane, Wells	19.27 (±4.71)
13	Broad Cove, Bremen	18.91 (±23.39)
14	Sanborn Cove, Machiasport	16.86 (±5.22)
15	Raccoon Cove, Steuben	13.84 (±3.07)
16	Sam's Cove, Bremen	5.43 (±3.12)
17	Upper Landing, Wells	4.87 (±4.34)
18	Hog Bay, Hancock	4.66 (±1.15)
19	Hatch Cove, Stonington	4.25 (±3.12)
20	Burnt Cove, Edmunds	2.1 (±0.74)
21	Branch Flat, Phippsburg	1.9 (±0.96)
22	Harpswell Cove, Brunswick	1.59 (±2.21)
23	Marion Cove, Trescott	1.28 (±0.74)
24	Half Moon Cove, Sipayik	0.62 (±0.37)
25	Hallowell Island, Edmunds	0.56 (±0.42)



The map below shows the average clam recruit density across all sites for the 2024 season. Larger and darker circles indicate higher densities (with a maximum of 195 recruits/ft^2).

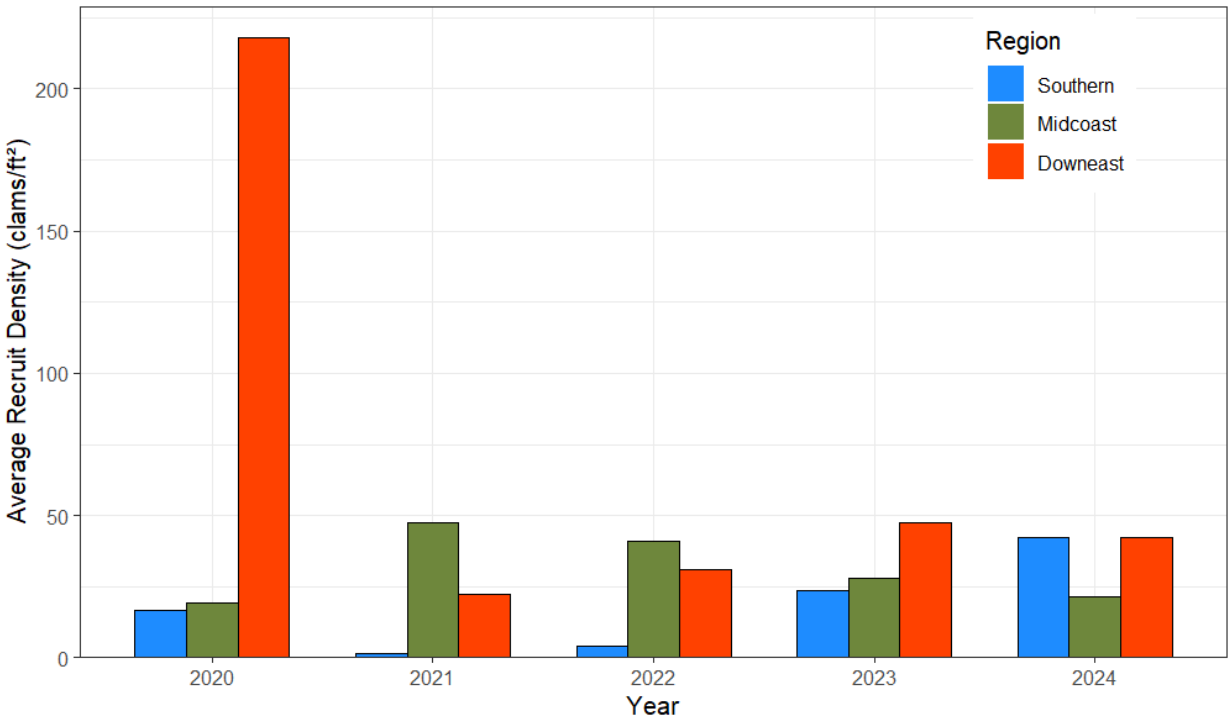


Regional Trends

Overall, densities of clam recruits were highest in the downeast region (colored orange/red in the table above), with an average density of 42.36 (±36.39) recruits/ft^2 and were lowest in the midcoast region (colored green above) with an average of 21.26 (±11.19) recruits/ft^2. The average clam recruit density in southern Maine (colored blue above) was very close to the downeast density with an average of 42.1 (±33.41) recruits/ft^2.

In comparison, in 2023 and 2020, clam recruit densities were highest downeast (47.42 and 218 recruits/ft^2, respectively). In 2022 and 2021, clam recruit densities were highest in the midcoast region (41.1 and 31.7 recruits/ft^2, respectively), but in 2024, the midcoast region had the lowest densities of soft-shell clam recruits (21.26 recruits/ft^2) in contrast to all previous years where the southern region has had the lowest number of recruits. More information about clam recruitment levels can be found in Appendix F.

Graph of the average clam recruit density for each region since 2020 is on the next page.

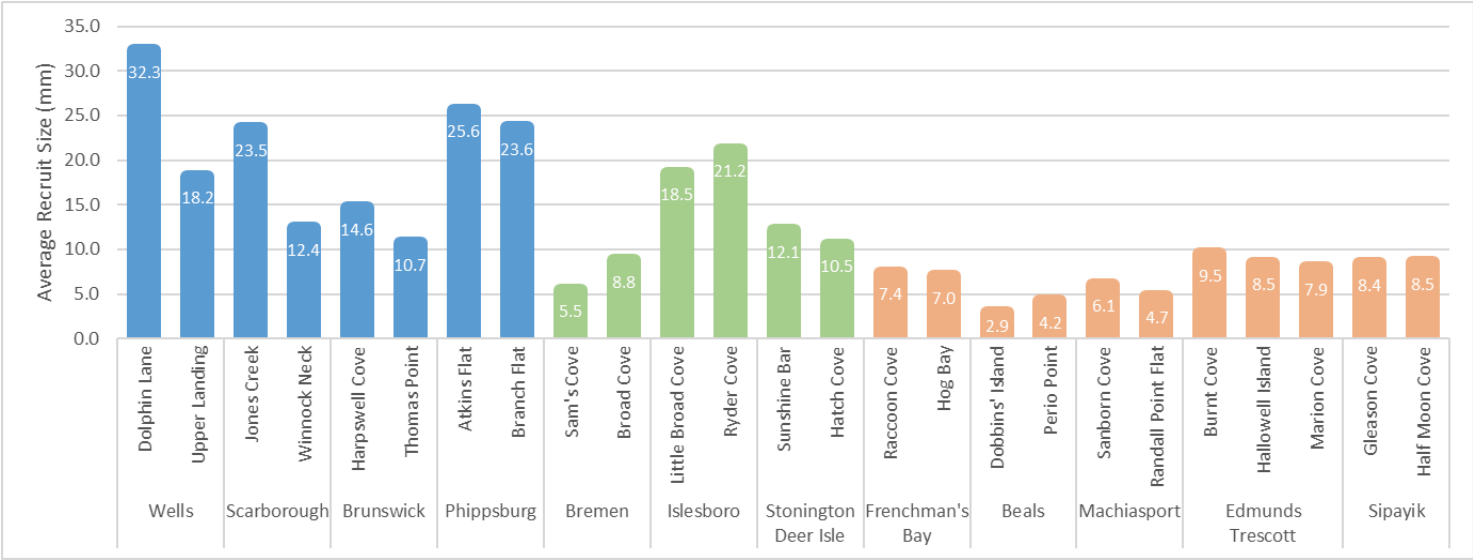


Size of Clam Recruits

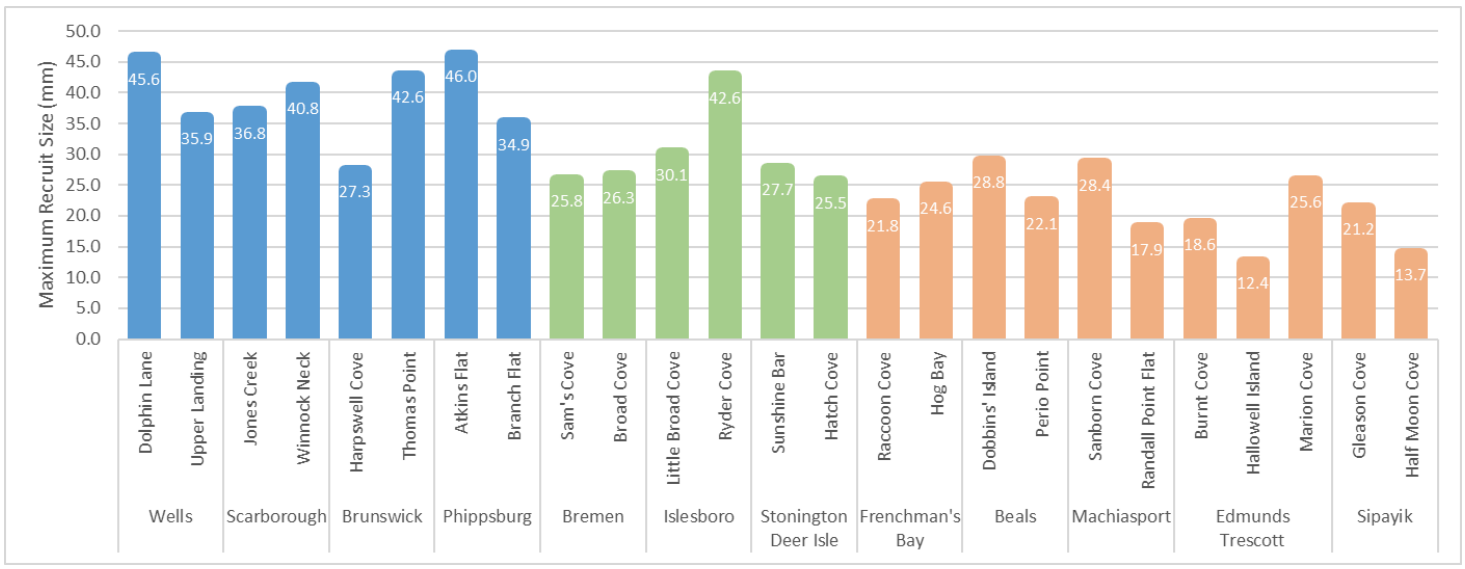
Approximately three to four weeks after adults spawn by releasing their gametes into the water column, clam larvae settle to the benthos (bottom) at about ¼ - ⅕ of a mm. This process does not occur on a single day or even over a week or two. Rather, we found that clams have a major settlement event (during the first weeks of June in the Freeport area) followed by a protracted (2-3 month) period when small numbers of settlers reach the flats. Size of recruits is driven by seawater temperatures, food availability, genetics, and how early in the season settlement occurs. Because Beal boxes are on the mudflats during the entirety of the clam settling and growing season, a variety of recruit sizes are found in the boxes.

Knowing how fast clams grow is crucial to understand when a clam will reach harvestable size. In places where clams are not protected from predators, it is the clams that recruit later in the year, when summer predation rates are beginning to decline, that have the best chance of surviving their first year of life and making it to harvestable size in the following years (Beal et al. 2018). That means the bulk of clams that settle to flats during June and July become food for predators ranging from green crabs and hermit crabs to killifish, milky ribbon worms, and moon snails.

The chart below shows the average size of recruits found in the recruitment boxes on each flat in the fall of 2024. Southern sites are colored blue, midcoast sites are in green, and downeast sites are in orange/red. The site with the largest average recruits in 2024 was Dolphin Lane in Wells with an average size of 32.3 mm.



The chart below shows the size of the LARGEST recruit found in the recruitment boxes on each flat in 2024. This chart is helpful to understand what size clam is possible to grow in each town in this timeframe. The flat with the largest clam recruit in 2024 was Atkins Flat in Phippsburg with a 46 mm clam.



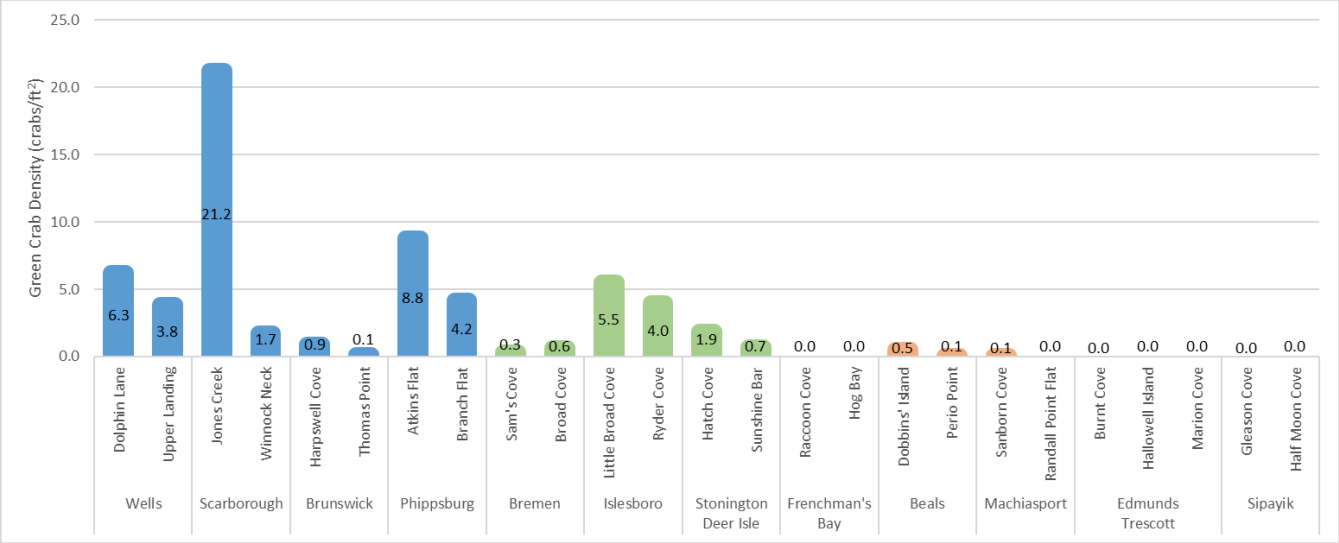
For more information about the sizes of recruits see Appendix G.

Density and Size of Green Crabs

There are at least two ways, and times, for crabs to enter the boxes. Crabs may settle into a recruitment box from the plankton (as do clams and other species with planktotrophic larvae). The other way is for them to crawl into the boxes after settlement. Crabs with carapace widths as large as 2.02 mm that settled either during the monitoring period or that settled the previous fall and

overwintered at small sizes could presumably have crawled into the box through the aperture of the screening.

The chart below shows the density of green crabs found in the recruitment boxes in each town in 2024. Southern sites are in blue, midcoast sites are in green, and downeast sites are in orange/red. The flat with the highest green crab density in 2024 was Jones Creek in Scarborough with a density of 21.2 green crabs/ft^2.



The number and size of green crabs in the boxes is important to understanding their biomass level. For more information about green crab sizes and densities, see Appendix D.

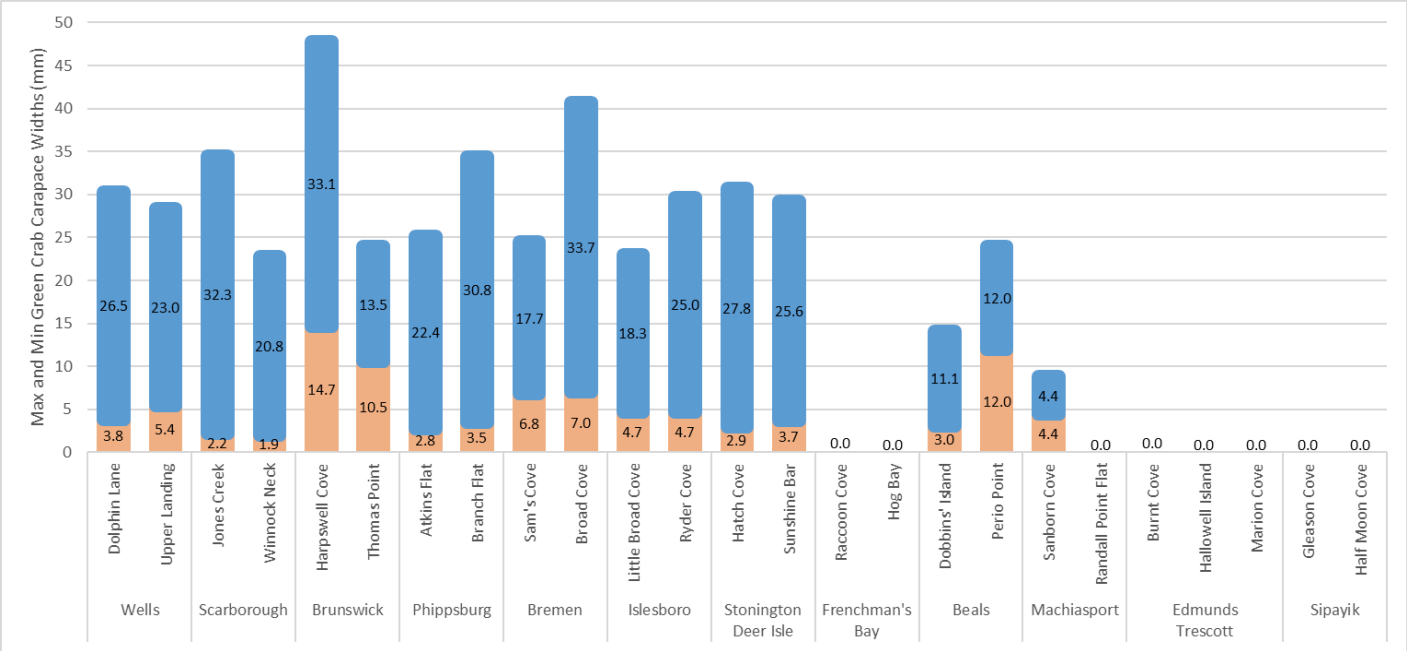
Green crabs settle out of the water column at ~1 mm, giving them a distinct size advantage over their prey of soft-shell clams (at 1 mm, green crabs are about 5x larger than settling soft-shell clams). Crab settlement occurs during the summer (Berrill 1982) typically after the bulk of soft-shell clams settle out of the water column. How fast green crabs grow is controlled by the same factors that control clam growth.

It is not possible to discern the length of time a particular crab was in a box, but based on its size, one may assume that a crab with a carapace width greater than 15 mm resided in boxes longer and consumed more clam recruits than those with a carapace width less than 10 mm.

The smallest green crab found in 2024 was 1.9 mm or 0.07 inches at Winnock Neck in Scarborough, and the largest was 33.7 mm or 1.3 inches at Broad Cove in Bremen.

The graph below shows the size of the smallest (in orange) and largest (in blue) green crabs found in recruitment boxes at each site. There were no green crabs found in recruitment boxes at Raccoon Cove

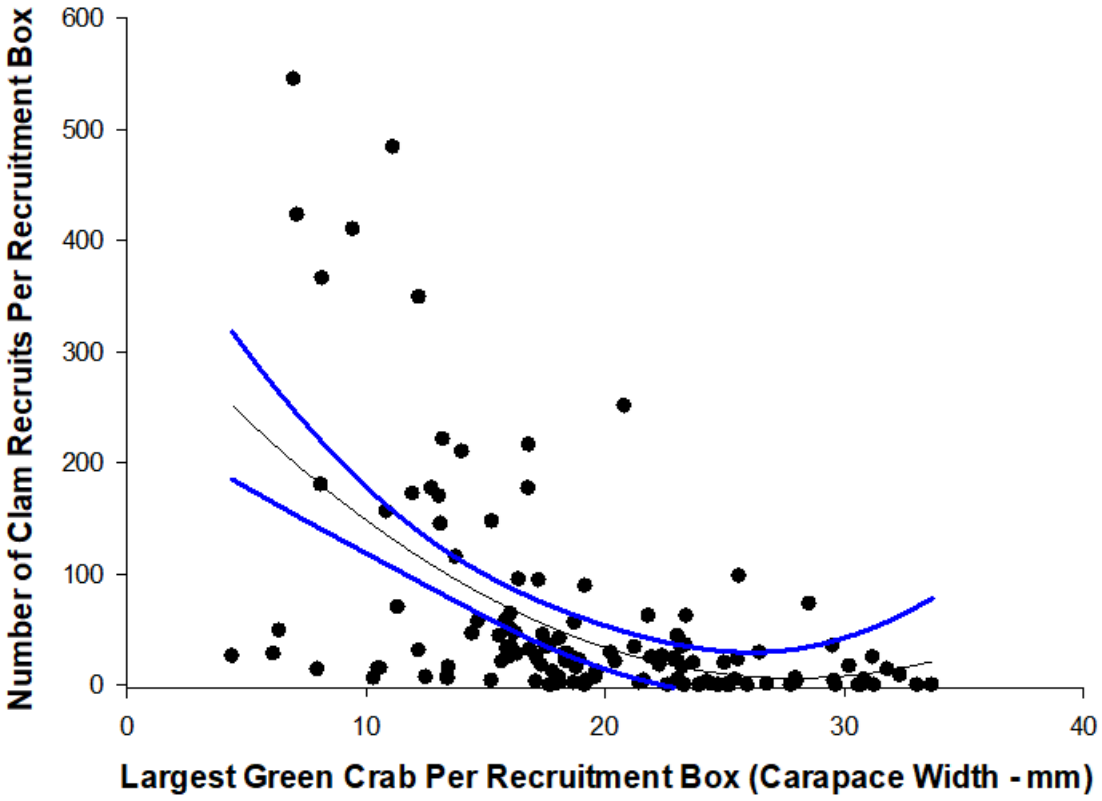
and Hog Bay in Frenchman's Bay, Randall Point Flat in Machiasport, Burnt Cove, Hallowell Island, and Marion Cove in the Edmunds and Trescott Townships, and Gleason Cove and Half Moon Cove in Sipayik. For more information about the size distribution of green crabs found at the study sites, see Appendix H.



Relationship Between Crab Size and Clams Per Box

Our analysis of results from all 25 monitoring sites determined an inverse relationship between the number of clam recruits per box and size of the largest green crab per box. This relationship was similar to that found in previous years (i.e., when crabs exceed 10 mm (~ ½-inch) in carapace width, few soft-shell clam juveniles occur in recruitment boxes). The graph shows that there is an impressive decrease in clam recruits with increasing green crab size.

The figure below shows the relationship between the number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.283$; $P < 0.0001$). A lack-of-fit test determined that there was a significant departure from a linear model ($F = 4.81$, $df = 2, 122$, $P = 0.0097$); however, the line-of-best-fit was a quadratic model as there was no significant improvement in the fit with more complicated models ($F = 0.269$, $df = 1, 122$, $P = 0.605$). The quadratic equation is as follows $\hat{Y} = 352.2 - 24.81X + 0.4448X^2$ where $\hat{Y}$ =number of clam recruits per recruitment box,and X equals the size of the largest green crab per recruitment box). The blue lines represent the 95% confidence interval around $\hat{Y}$, the line-of-best fit.



In addition to the community partners listed on the first page, thank you to the following community volunteers for their assistance in this project:

Wells: Mike Yorke, Michelle Andre, Lee McGlashan and the Wells High School Environmental Club students
Scarborough: Noah Nygren
Brunswick: Dan Devereaux, Dan Sylvain, and Emily Stone
Bremen: Kristen Roberts, Morganne Price, and Suzanne Rourke
Islesboro: Ken Smith, Rachel Rolerson-Smith, and Janis Petzel
Frenchman's Bay: Mark Whiting
Edmunds: Brian Smith

REFERENCES

Appledoorn, R. S. 1983. Variation in the growth rate of Mya arenaria and its relationship to the environment as analyzed through principal components analysis and the ω parameter of the von Bertalanffy equation. Fishery Bulletin 81(1):75-84).

Beal, B.F. 2006a. Relative importance of predation and intraspecific competition in regulating growth and survival of juveniles of the soft-shell clam, *Mya arenaria* L., at several spatial scales. *Journal of Experimental Marine Biology & Ecology* 336:1-17.

Beal, B.F. 2006b. Biotic and abiotic factors influencing growth and survival of wild and cultured individuals of the softshell clam (*Mya arenaria* L.) in eastern Maine. *Journal of Shellfish Research* 25(2):461-474.

Beal, B.F. 2023. Predators and Competitors of the Soft-Shell Clam *Mya arenaria*. In V.S. Kennedy and B.F. Beal (Eds.), *The Soft- Shell Clam* Mya arenaria: *Biology, Fisheries, and Mariculture* (pp. 193-270). American Fisheries Society, Bethesda, Maryland.

Beal, B.F., Coffin, C.R., Randall, S.F., Goodenow, C.A., Jr., Pepperman, K.E., Ellis B.W. 2020a. Interactive effects of shell hash and predator exclusion of 0-year class recruits of two infaunal intertidal bivalve species in Maine, USA. *Journal of Experimental Marine Biology & Ecology* 530-531:151441. https://doi.org/10.1016/j.jembe.2020.151441.

Beal, B.F., Coffin, C.R., Randall, S.F., Goodenow, C.A., Jr., Pepperman, K.E., Ellis, B.W., Jourdet, C.B., Protopopescu, G.C. 2018. Spatial variability in recruitment of an infaunal bivalve: experimental effects of predator exclusion on the soft-shell clam (*Mya arenaria* L.) along three tidal estuaries in southern Maine, USA. *Journal of Shellfish Research* 37(1):1–27.

Beal, B.F., Kraus, M.G. 2002. Interactive effects of initial size, stocking density, and type of predator deterrent netting on survival and growth of cultured juveniles of the soft-shell clam, *Mya arenaria* L. in eastern Maine. *Aquaculture* 208:81-111.

Beal, B. F., Nault, D.- M., Annis, H., Thayer, P., Leighton, H., Ellis, B. 2016. Comparative, large-scale field trials along the Maine coast to assess management options to enhance populations of the commercially important soft-shell clam, *Mya arenaria* L. *Journal of Shellfish Research* 35(4):7 11–727.

Beal, B.F., Parker, M.R., Vencile, K.W. 2001. Seasonal effects of intraspecific density and predator exclusion along a shore-level gradient on survival and growth of juveniles of the soft-shell clam, *Mya arenaria* L., in Maine, USA. *Journal of Experiential Marine Biology & Ecology* 264:133-169.

Beal, B.F., Randall, S.F. 2020. Soft-shell clam recruitment monitoring network Technical Report 1: 2020 Spring baseline clam survey results. Downeast Institute, Beals. https://downeastinstitute.org/research/soft-shell-clams/soft-shell-clam-recruitment-monitoring-network/.

Beal, B.F., Randall, S.R., Duval, A., Chase A., Dibattista, L., Hinckley, K. 2020. Learning about clam reproduction: When do clams spawn and how big are their eggs? Downeast Institute, Beals. https://downeastinstitute.org/research/soft-shell-clams/how-many-eggs-does-a-clam-produce/.

Beal, B.F., Randall, S.F, Greene, H. 2021. Soft-shell clam recruitment monitoring network Technical Report 2: 2020 clam recruitment monitoring network. Downeast Institute, Beals. https://downeastinstitute.org/wp-content/uploads/2021/05/2020clamrecruitmentmonitoringnetwork technicalreportmay212021.pdf

Beal, B.F., Randall, S.F., Pepperman, K.E. 2020b. Comparative field trials to examine the efficacy of a traditional management tool – brushing – to enhance local densities of 0-y class recruits in the soft-shell clam *Mya arenaria* L. fishery in Maine, USA. *Journal of Shellfish Research*. 39(3):1-15.

Berrill, M. 1982. The life cycle of the green crab *Carcinus maenas* at the northern end of its range. *Journal of Crustacean Biology* 2:31–39.

Downeast Institute (2022, August 2). *Downeast Discussions: How Acidic are Maine Mudflats? Results from Monitoring Beals Mudflat Chemistry* [Video]. Youtube. https://www.youtube.com/watch?v=uxZnpXJGZGM.

Huey, R. B., Kingsolver, J. G., 1989. Evolution of thermal sensitivity of ectotherm performance. *Trends in Ecology & Evolution*, 4, 131–135. 10.1016/0169-5347(89)90211-5.

ME DMR. 2016. Total acreage and intertidal acreage for NSSP classification types by town. Compiled by William Devoe. Acreage by town - Google Docs.

ME DMR. 2025. 2007-2024 Maine Soft Clam Landings by Port. SoftClamByPort_1.pdf.

Papastamatiou, Y.P., Watanbe, Y.Y., Bradley, D., Dee, L.E., Weng, K., Lowe, C.G., Caselle, J.E. 2015. Drivers of daily routines in an ectothermic marine predator: hunt warm, rest warmer? *PloS ONE* 10. e0127807. 10.1371/journal.pone.0127807.

Pershing, A. J., Alexander, M. A., Hernandez, C. M., Kerr, L. A., Le Bris, A ., Mills K. E., Nye J. A., Record N.R., Scannell, H. A., Scott, J.D., Sherwood, G.D. & Thomas, A. C. 2015. Slow adaptation in the face of rapid warming leads to collapse of the Gulf of Maine cod fishery. *Science* 350:809–812.

Appendix A: 2020-2024 Fall & Spring Soft-Shell Clam Density Survey Data.

Average density in number of clams/ft² and parentheses after the average refer to a 95% confidence interval.

Town	Flat	2020 Spring Avg. Density	2020 Fall Avg. Density	Density + or - ?	2021 Spring Avg. Density	2021 Fall Avg. Density	Density + or - ?	2022 Spring Avg. Density	2022 Fall Avg. Density	Density + or - ?	2023 Spring Avg. Density	2023 Fall Avg. Density	Density + or - ?	2024 Spring Avg. Density	2024 Fall Avg. Density	Density + or - ?
Wells	Dolphin Lane	3.2(2.2)	1.9(1.7)	-	2.7(1.7)	0.6(0.9)	-	5.41(2.88)	0.32(0.68)	-	4.67(3.77)	1.7(2.11)	-	7.64(5.26)	7.64(8.67)	=
	Upper Landing	3.5(2.2)	0.0(0)	-	6.4(3.9)	0.3(0.7)	-	9.23(4.67)	0.32(0.68)	-	4.67(2.57)	0.85(1.26)	-	6.38(3.42)	0.0(0)	-
Scarborough	Jones Creek	1.9(1.7)	0.0(0)	-	1.9(2.2)	0.0(0)	-	0.0(0)	0.0(0)	=	25.9(16.07)	1.7(2.87)	-	1.69(2.11)	61.56(20.68)	+
	Winnock Neck	29.6(9.4)	9.6(4.4)	-	6.4(6.3)	3.1(3.9)	-	0.0(0)	0.32(0.68)	+	3.82(3.42)	0.0(0)	-	2.12(2.91)	17.83(11.42)	+
Brunswick	Harpswell Cove	0.0(0)	0.3(0.7)	+	0.3(0.7)	0.0(0)	-	0.64(1.36)	1.59(1.63)	+	5.09(3.38)	0.0(0)	-	4.25(2.7)	0.0(0)	-
	Thomas Point	1.3(1.2)	0.0(0)	-	0.0(0)	0.3(0.7)	+	0.0(0)	0.0(0)	=	4.67(4.01)	0.0(0)	-	0.42(0.93)	1.69(2.11)	+
Phippsburg	Atkins Flat	N/A	N/A	N/A	N/A	N/A	N/A	0.59(1.63)	1.91(1.95)	+	6.79(5.04)	6.37(9.38)	-	24.19(9.06)	46.7(12.18)	+
	Branch Flat	N/A	N/A	N/A	N/A	N/A	N/A	0.0(0)	0.96(1.09)	+	6.79(3.18)	1.27(1.46)	-	2.12(2.16)	4.67(2.91)	+
Bremen	Sam's Cove	0.0(0)	0.0(0)	=	0.0(0)	0.0(0)	=	0.0(0)	0.32(0.68)	+	0.0(0)	0.0(0)	=	0.42(0.93)	0.85(1.87)	+
	Broad Cove	0.6(9.1)	0.6(0.9)	=	6.0(2.5)	2.5(2.4)	-	0.32(0.36)	0.64(0.93)	+	2.12(2.16)	0.0(0)	-	1.69(1.59)	13.16(5.25)	+
Islesboro	Little Broad Cove	0.9(1.1)	0.0(0)	-	0.0(0)	0.0(0)	=	0.0(0)	0.32(0.68)	+	1.27(1.46)	0.43(0.93)	-	0.0(0)	0.43(0.94)	+
	Ryder Cove	3.2(1.9)	0.0(0)	-	0.0(0)	0.0(0)	=	1.27(1.51)	3.18(2.19)	+	0.43(0.94)	2.12(2.16)	+	4.67(4.46)	2.55(2.18)	-
Stonington	Hatch Cove	N/A	N/A	N/A	N/A	N/A	N/A	0.0(0)	0.0(0)	=	2.55(1.69)	1.69(1.59)	-	0.85(1.26)	0.43(0.94)	-
	Sunshine Bar	N/A	N/A	N/A	N/A	N/A	N/A	0.0(0)	0.32(0.68)	+	1.27(1.46)	0.0(0)	-	1.27(1.46)	2.12(2.56)	+
Frenchman's Bay	Raccoon Cove	28.0(26.4)	1.6(1.3)	-	4.5(3.9)	0.9(1.5)	-	0.32(0.68)	0.0(0)	-	0(0)	0.85(1.26)	+	0.42(0.93)	0.85(1.26)	+
	Hog Bay	2.2(1.9)	0.0(0)	-	2.5(2.2)	3.2(2.8)	+	4.14(2.84)	1.59(1.63)	-	0.43(2.84)	0.43(0.93)	=	1.69(1.59)	0.0(0)	-
Beals	Dobbins' Island	2.2(1.7)	0.0(0)	-	0.0(0)	0.3(0.7)	+	1.91(1.68)	0.0(0)	-	1.27(2.01)	0.0(0)	-	3.39(3.74)	0.0(0)	-
	Perio Point	8.3(3.6)	0.0(0)	-	0.6(0.9)	0.6(0.9)	=	1.59(1.29)	0.0(0)	-	6.37(6.49)	0.43(0.93)	-	0.42(0.93)	2.55(2.18)	+
Machiasport	Sanborn Cove	N/A	N/A	N/A	N/A	N/A	N/A	0.0(0)	1.69(2.3)	+	0.43(0.94)	0.43(0.93)	=	0.85(1.26)	2.12(2.57)	+
	Randall Point Flat	N/A	N/A	N/A	N/A	N/A	N/A	2.87(2.42)	22.29(7.48)	+	8.49(4.44)	0.85(1.26)	-	2.12(0.53)	7.64(5.26)	+
Edmunds	Burnt Cove	N/A	N/A	N/A	0.0(0)	4.1(5.1)	+	0.32(0.68)	0.64(0.93)	+	0.0(0)	0.0(0)	=	1.69(2.11)	0.85(1.26)	-
	Hallowell Island	N/A	N/A	N/A	4.1(5.3)	3.1(5.7)	-	2.55(2.8)	1.59(2.15)	-	0.0(0)	0.0(0)	=	0.0(0)	0.43(0.94)	+
	Marion Cove	N/A	N/A	N/A	0.0(0)	1.0(2.8)	+	1.27(1.21)	0.64(0.93)	-	0.0(0)	0.85(1.26)	+	2.97(2.16)	0.42(0.94)	-
Sipayik	Gleason Cove	1.9(1.4)	1.3(1.2)	-	0.6(0.9)	0.0(0)	-	5.09(2.62)	6.05(5.08)	+	7.64(5.25)	1.7(2.87)	-	3.82(2.8)	1.69(2.1)	-
	Half Moon Cove	4.8(2.5)	1.6(1.6)	-	1.3(1.2)	1.3(1.6)	=	1.59(2.15)	0.0(0)	-	0.0(0)	0.43(0.93)	+	0.85(1.26)	0.85(1.87)	=

Key for Appendices A, B, C, and D:

Blue shaded cells = southern region sites

Green shaded cells = midcoast region sites

Orange shaded cells = downeast region sites

Appendix B: 2020-2024 Fall & Spring Soft-Shell Clam Size Ranges from Spring and Fall Survey Data. The parentheses after the average size refer to the 95% confidence interval. A (-) indicates no confidence interval as n = 1. N = the number of clams sampled.

Town	Flat	2020 Spring Avg. Size (mm)	n	Size range (mm)	2020 Fall Avg. Size (mm)	n	Size range (mm)	2021 Spring Avg. Size (mm)	n	Size range (mm)	2021 Fall Avg. Size (mm)	n	Size range (mm)	2022 Spring Avg. Size (mm)	n	Size range (mm)	2022 Fall Avg. Size (mm)	n	Size range (mm)	2023 Spring Avg. Size (mm)	n	Size range (mm)	2023 Fall Avg. Size (mm)	n	Size range (mm)	2024 Spring Avg. Size (mm)	n	Size range (mm)	2024 Fall Avg. Size (mm)	n	Size range (mm)
Wells	Dolphin Lane	4.5(1.2)	10	2.7-7.5	3.6(0.9)	6	2.8-4.7	4.8(1.8)	9	2.7-8.8	2.1(1.8)	2	1.9-2.2	6.05(0.83)	17	2.93-8.69	4.29(-)	1	-	4.27(0.83)	11	3.13-6.96	2.46(0.47)	4	2.02-2.67	4.71(0.89)	18	2.6-7.6	2.77(0.27)	18	2.12-3.82
	Upper Landing	4.6(1.5)	11	2.7-8.9	-	0	-	9.5(6.4)	20	2.7-67.1	2.0(-)	1	-	8.12(4.62)	29	2.94-70.1	16.15(-)	1	-	5.35(0.86)	11	3.95-6.96	2.52(5.34)	2	2.1-2.94	4.01(0.91)	15	2.3-7.9	-	0	-
Scarborough	Jones Creek	8.6(3.6)	6	6.0-13.7	-	0	-	8.6(3.6)	6	4.9-13.7	-	0	-	-	0	-	-	0	-	10.08(7.57)	4	3.9-14.2	4.73(2.14)	4	3.52-6.65	5.34(0.48)	60	2.2-10.3	2.62(0.11)	141	1.54-6.36
	Winnock Neck	40.8(2.9)	16	5.4-60.3	53.9(4.9)	30	4.9-68.7	40.8(2.9)	93	5.4-60.3	60.4(16.1)	8	20.8-76.3	-	0	-	29.63(-)	1	-	3.74(0.77)	5	3.2-4.8	-	0	-	5.68(0.86)	9	4.0-7.23	2.77(0.46)	42	1.85-11.45
Brunswick	Harpswell Cove	-	0	-	7.9(-)	1	-	19.4(-)	1	-	-	0	-	8.77(3.88)	2	8.46-9.07	6.44(2.63)	5	3.52-9.17	11.34(2.86)	12	4.9-20.7	-	0	-	9.43(1.86)	10	3.9-12.1	-	0	-
	Thomas Point	5.8(2.2)	4	4.6-7.4	-	0	-	-	0	-	14.7(-)	1	-	-	0	-	-	0	-	8.92(2.47)	11	4.1-16.32	-	0	-	8.2(-)	1	-	4.19(1.49)	4	2.81-4.91
Phippsburg	Atkins Flat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.22(3.35)	5	5.11-11.77	3.79(1.26)	6	2.59-5.78	6.73(0.72)	16	4.5-8.61	3.03(0.39)	15	2.3-4.98	3.34(0.3)	57	1.6-7	2.38(0.11)	110	1.58-4.41
	Branch Flat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	0	-	4.85(1.27)	3	4.44-5.42	6.14(1.19)	16	3.2-10.53	3.96(1.27)	3	2.87-5.49	8.44(5.27)	5	3.7-13.73	3.3(0.59)	11	2.14-5.04
Bremen	Sam's Cove	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	6.15(-)	1	-	-	0	-	-	0	-	4.0(-)	1	-	4.02(13.72)	2	2.94-5.1
	Broad Cove	11.3(18.8)	2	9.8-12.7	8.1(11.4)	2	7.2-9.0	15.7(7.4)	19	4.0-50.4	48.8(17.0)	8	7.2-68.1	6.05(-)	1	-	4.37(14.74)	2	3.21-5.53	6.14(2.48)	7	3.15-10.9	-	0	-	10.23(4.15)	4	7.7-13.8	2.92(0.33)	31	1.66-5.44
Islesboro	Little Broad Cove	4.5(4.8)	3	3.1-6.7	-	0	-	-	0	-	-	0	-	-	0	-	2.47(-)	1	-	5.93(5.17)	3	3.64-7.63	3.6(-)	1	-	-	0	-	3.81(-)	1	-
	Ryder Cove	7.2(2.1)	9	3.9-12.6	-	0	-	-	0	-	-	0	-	9.3(2.3)	4	7.78-11.11	2.78(0.53)	10	1.84-4.46	4.11(-)	1	-	3.27(0.63)	5	2.49-3.82	6.98(1.93)	11	3.6-13.3	6.0(3.15)	6	3.05-11.35
Stonington	Hatch Cove	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	0	-	-	0	-	6.05(1.73)	6	4.3-8.6	4.55(2.26)	4	3.05-6.12	8.0(13.98)	2	6.9-9.1	4.15(-)	1	-
	Sunshine Bar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	0	-	40.81(-)	1	-	8.87(12.52)	3	3.56-13.58	-	0	-	14.67(10.7)	3	9.7-17.4	3.89(0.72)	5	3.17-4.61
Frenchman's Bay	Raccoon Cove	10.0(1.8)	47	3.2-37.2	11.5(9.2)	8	2.5-30.3	20.5(7.6)	14	7.1-44.0	22.7(41.8)	3	3.8-36.2	30.4(-)	1	-	-	0	-	-	0	-	3.57(9.59	2	2.81-4.32	5.50(-)	1	-	4.5(1.65)	2	4.37-4.63
	Hog Bay	39.3(25.5)	7	4.3-74.3	-	0	-	41.5(11.9)	8	20-62.1	46.4(7.9)	10	21.2-62.4	44.89(6.01)	13	26.16-66.93	22.27(19.98)	5	6.95-52.5	5.41(-)	1	-	36.64(-)	1	-	44.25(35.04)	4	13.1-62.6	-	0	-
Beals	Dobbins' Island	3.7(1.0)	7	2.5-5.8	-	0	-	-	0	-	9.9(-)	1	-	4.22(0.7)	6	3.44-5.43	-	0	-	4.43(2.49)	3	3.3-5.24	-	0	-	3.76(0.92)	8	2.9-5.9	-	0	-
	Perio Point	7.5(0.9)	26	2.6-11.7	-	0	-	6.2(9.5)	2	5.4-6.9	6.2(36.5)	2	3.3-9.1	7.55(2.73)	5	4.09-9.86	-	0	-	3.91(0.72)	15	2.09-7.4	4.82(-)	1	-	3.8(-)	1	-	4.53(1.66)	6	2.91-7.02
Machiasport	Sanborn Cove	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	0	-	3.34(0.71)	5	2.88-4.31	4.67(-)	1	-	3.59(-)	1	-	4.95(0.64)	2	4.9-5.0	8.23(10.15)	5	3.63-22.8
	Randall Point Flat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	47.92(12.02)	9	12.3-62.41	5.84(2.11)	70	2.04-71.32	7.65(2.74)	20	3.43-30.0	6.73(49.74)	2	2.81-10.64	6.88(2.74)	20	3.5-9.2	6.89(4.1)	18	2.32-36.33
Edmunds	Burnt Cove	N/A	N/A	N/A	N/A	N/A	N/A	-	0	-	3.5(1.5)	4	2.9-4.9	9.80(-)	1	-	3.54(1.14)	2	3.45-3.63	-	0	-	-	0	-	5.6(3.43)	4	3.3-8.3	4.06(2.92)	2	3.83-4.29
	Hallowell Island	N/A	N/A	N/A	N/A	N/A	N/A	5.6(2.3)	4	3.7-7.2	3.3(1.5)	3	2.6-3.8	6.78(2.01)	8	3.9-10.3	3.02(0.62)	5	2.48-3.74	-	0	-	-	0	-	-	0	-	3.11(-)	1	-
	Marion Cove	N/A	N/A	N/A	N/A	N/A	N/A	-	0	-	3.5(-)	1	-	7.73(2.07)	4	6.6-8.9	4.8(11.94)	2	3.86-5.74	-	0	-	4.96(14.05)	2	3.85-6.06	6.8(2.03)	7	3.5-10.2	7.93(-)	1	-
Sipayik	Gleason Cove	14.5(25.9)	6	3.0-64.9	13.3(17.0)	4	3.5-24.6	6.2(10.2)	2	5.4-7.0	11.9(15.1)	3	4.89-15.9	11.02(10.03)	16	2.8-65.45	2.61(0.33)	19	1.72-4.21	4.73(0.63)	18	2.4-7.45	2.87(0.98)	4	2.16-3.62	4.4(1.05)	9	3.1-6.6	4.14(1.48)	4	3.47-5.45
	Half Moon Cove	5.1(1.0)	15	2.8-8.3	4.8(1.3)	5	3.1-5.8	8.4(1.9)	4	7.1-10.0	-	0	-	6.53(3.74)	5	4.08-10.85	-	0	-	-	0	-	7.28(-)	1	-	3.85(16.69)	2	2.5-5.2	2.18(3.69)	2	1.89-2.47

Appendix C: 2020-2024 Soft-Shell Clam Recruitment Density Data and Recruit Size. The parentheses after the average density refer to the 95% confidence interval. A (-) indicates no confidence interval as n = 1.

Town	Flat	Treatment	2020 Avg. Density	2020 Mean Shell Length (mm)	2020 Size Range (mm)	2021 Avg. Density	2021 Mean Shell Length (mm)	2021 Size Range (mm)	2022 Avg. Density	2022 Mean Shell Length (mm)	2022 Size Range (mm)	2023 Avg. Density	Shell Length (mm)	2023 Size Range (mm)	2024 Avg. Density	2024 Mean Shell Length (mm)	2024 Size Range (mm)
Wells	Dolphin Lane	Mesh	7.8(6.4)	26.3(0.6)	16.2-33.1	N/A	N/A	N/A	1.72(1.38)	25.79(1.37)	18.78-34.25	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.8(0.8)	31.6(2.3)	16.6-34.9	0.2(0.2)	22.7(7.8)	8.6-28.6	N/A	N/A	N/A	54.99(18.31)	26.44(0.86)	13.68-42.79	19.27(4.71)	32.3(0.72)	14.2-45.57
	Upper Landing	Mesh	1.7(1.9)	16.2(1.7)	5.9-21.8	4.2(1.8)	5.2(0.5)	1.8-23.9	0.73(0.61)	19.83(2.69)	1.64-26.36	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1.5(2.0)	12.9(2.2)	7.6-29.2	N/A	N/A	N/A	N/A	N/A	N/A	0.97(1.03)	26.71(3.24)	15.9-38.01	4.87(4.34)	18.18(1.85)	1.56-35.92
Scarborough	Jones Creek	Mesh	1.3(2.2)	8.8(1.3)	2.1-14.3	0.8(0.4)	18.7(3.1)	3.6-29.3	8.80(6.89)	8.67(1.32)	1.94-33.32	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.4(0.6)	6.1(1.7)	4.5-9.1	N/A	N/A	N/A	N/A	N/A	N/A	44.44(36.7)	16.88(0.83)	2.0-31.21	48.37(39.57)	23.5(0.91)	1.64-36.83
	Winnock Neck	Mesh	105.5(102.9)	8.3(0.7)	1.5-16.2	0.4(0.4)	17.8(3.6)	6.1-25.4	5.61(6.39)	18.34(0.62)	11.01-24.83	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	72.3(72.9)	8.8(0.6)	2.5-20.9	N/A	N/A	N/A	N/A	N/A	N/A	4.66(3.54)	10.32(1.31)	2.23-26.34	156.53(67.53)	12.35(0.97)	1.35-40.78
Brunswick	Harpswell Cove	Mesh	5.1(4.1)	12.1(1.4)	2.7-28.4	1(0.8)	13.3(2.2)	5.5-24.4	0.65(0.37)	17.56(3.79)	2.21-26.82	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	2.6(1.4)	18.5(2.1)	3.7-28.1	N/A	N/A	N/A	N/A	N/A	N/A	0.67(1.35)	12.04(4.12)	1.46-19.45	1.59(2.21)	14.62(2.75)	2.16-27.3
	Thomas Point	Mesh	1.2(1.3)	15.7(4.4)	4.7-33.1	1.5(0.8)	17.3(3.0)	2.2-35.8	14.95(3.55)	15.49(0.98)	2.41-43.56	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1.5(1.6)	23.2(3.7)	2.1-34.8	N/A	N/A	N/A	N/A	N/A	N/A	62.94(33.69)	7.79(0.84)	1.53-27.59	59.4(32.7)	10.69(1.16)	1.67-42.62
Phippsburg	Atkins Flat	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	0.99(1.03)	13.87(4.8)	3.61-30.83	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	6.46(4.76)	22.59(0.84)	5.41-28.42	16.56(7.16)	25.25(0.79)	14.45-38.14	44.9(58.4)	25.63(1.12)	1.3-46.02
	Branch Flat	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	0.0(-)	0.0(-)	-	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	2.46(2.71)	17.01(3.22)	2.75-33.59	5.23(6.13)	13.09(1.58)	1.02-28.05	1.9(0.96)	23.62(1.66)	1.69-34.94
Bremen	Sam's Cove	Mesh	6.8(1.5)	14.9(1.6)	1.9-39.9	0.9(0.8)	17(3.4)	5.3-29.5	13.45(9.1)	10.85(1.02)	1.68-34.36	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	4.4(2.4)	22.1(2.6)	2.3-41.5	N/A	N/A	N/A	N/A	N/A	N/A	8.2(5.31)	15.48(1.57)	1.81-42.43	5.43(3.12)	5.46(1.09)	1.52-25.77
	Broad Cove	Mesh	13.7(12.4)	11.7(0.9)	3.2-21.4	15.3(20.7)	9.9(1.4)	2.5-21.2	48.24(34.62)	7.6(0.79)	1.68-25.38	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	12.2(15.5)	15.6(2.1)	1.8-29.5	N/A	N/A	N/A	N/A	N/A	N/A	4.97(5.47)	11.85(2.14)	1.54-30.07	18.91(23.39)	8.77(1.42)	1.58-26.34
Islesboro	Little Broad Cove	Mesh	0.5(0.4)	9.6(2.9)	3.4-13.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	64.7(35.9)	16.2(0.7)	4.0-25.0	57.5(48.5)	14.2(0.4)	3.3-21.4	144.34(52.27)	16.64(0.31)	13.53-25.55	74.06(10.61)	20.11(0.45)	7.74-31.47	44.8(19.43)	18.52(0.84)	1.66-30.07
	Ryder Cove	Mesh	4.8(4.8)	15.9(1.2)	2.3-25.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	47.5(19.9)	21.5(0.8)	2.3-33.9	115.3(57.5)	17.6(0.5)	6.3-26.3	114.36(46.18)	16.64(0.31)	9.75-25.34	74.52(19.07)	21.99(0.85)	4.93-35.21	28.8(18.71)	21.17(1.4)	1.45-42.55
Stonington	Hatch Cove	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	0.46(1.09)	17.99(2.09)	15.4-20.73	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	4.54(5.07)	17.83(1.84)	2.1-26.18	0.0(-)	0.0(-)	-	4.25(3.12)	10.45(1.75)	2.01-25.51
	Sunshine Bar	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	0.0(-)	0.0(-)	-	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	3.38(3.81)	21.72(1.37)	2.44-28.87	6.87(7.88)	19.79(1.06)	4.83-29.78	25.37(12.79)	12.12(1.02)	1.69-27.66
Frenchman's Bay	Raccoon Cove	Mesh	32.2(15.2)	5.3(0.3)	2.2-10.3	17.3(6.4)	7.8(0.3)	2.8-18.4	4.92(1.84)	7.61(0.75)	1.51-17.53	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	4.9(2.9)	6.7(0.8)	2.8-11	N/A	N/A	N/A	N/A	N/A	N/A	29.11(7.11)	8.78(0.45)	1.64-18.46	13.84(3.07)	7.4(0.63)	1.66-21.76
	Hog Bay	Mesh	0.0(-)	0.0(-)	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	4.2(2.7)	9.1(0.7)	2.6-15.9	13.6(1.7)	8.9(0.3)	3.2-19.1	0.73(0.47)	9.91(1.69)	3.14-16.99	4.72(3.86)	8.89(1.01)	1.8-16.9	4.66(1.15)	6.97(0.76)	2.72-24.56
Beals	Dobbins' Island	Mesh	137(86.9)	10.5(0.6)	3.5-21.5	28.9(28.7)	14.6(0.8)	2.1-25.9	32.59(12.03)	12.65(0.29)	12.45-30.39	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	75.9(33.6)	13.3(0.6)	2.9-20.5	N/A	N/A	N/A	N/A	N/A	N/A	61.25(43.67)	11.62(1.0)	1.37-31.78	195.48(46.48)	2.94(0.39)	1.01-28.76
	Perio Point	Mesh	4.4(15.2)	5.5(0.6)	1.8-10.6	N/A	N/A	N/A	48.47(13.18)	7.67(0.62)	1.62-22.99	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	4.9(2.6)	6.9(0.5)	1.3-16.9	57.7(11.8)	7.1(0.3)	1.7-22.9	N/A	N/A	N/A	101.23(33.82)	6.53(0.66)	1.52-22.61	81.49(12.04)	4.19(0.31)	1.48-22.1
Machiasport	Sanborn Cove	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	3.92(2.19)	9.9(1.47)	2.08-20.68	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	7.3(9.84)	13.45(1.48)	2.4-21.33	27.42(12.81)	5.86(0.51)	1.59-20.72	16.86(5.22)	6.05(0.41)	1.28-28.35
	Randall Point Flat	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	28.52(15.79)	5.79(0.55)	1.79-14.97	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	116.17(87.36)	6.12(0.69)	1.78-16.32	155.5(45.35)	2.97(0.19)	1.17-9.97	124.5(12.6)	4.71(0.31)	1.44-17.92
Edmunds	Burnt Cove	Mesh	N/A	N/A	N/A	58.4(21.1)	7.7(0.6)	1.8-18.2	4.07(1.58)	8.32(0.74)	2.32-20.59	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	21.8(12.4)	7.4(0.8)	1.5-20.9	N/A	N/A	N/A	3.43(2.16)	4.11(0.44)	1.83-11.59	2.1(0.75)	9.49(1.4)	2.4-18.63
	Hallowell Island	Mesh	N/A	N/A	N/A	15.1(5.7)	7.3(0.7)	1.1-17.6	17.91(3.81)	7.29(0.49)	2.01-19.4	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	24.1(10.1)	8.9(0.7)	1.6-19.8	N/A	N/A	N/A	0.26(0.26)	4.66(1.11)	3.55-5.9	0.56(0.42)	8.46(1.78)	2.82-12.37
	Marion Cove	Mesh	N/A	N/A	N/A	10.1(4.3)	6.2(0.6)	1.5-15.4	7.03(1.65)	5.89(0.48)	1.82-14.74	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	14.3(4.9)	5.8(0.5)	1.7-15.1	N/A	N/A	N/A	11.94(5.3)	4.04(0.41)	1.61-22.16	1.28(0.74)	7.92(2.47)	1.36-25.6
Sipayik	Gleason Cove	Mesh	1187.5(212.1)	5.8(0.3)	1.8-15.4	2.6(0.7)	7.4(0.8)	2.1-17.7	112.48(53.62)	7.42(0.49)	1.58-21.11	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1109.6(690.3)	5.3(0.4)	1.5-13.3	N/A	N/A	N/A	N/A	N/A	N/A	115.91(82.42)	7.62(0.49)	1.57-22.19	24.6(7.88)	8.41(0.65)	1.66-21.16
	Half Moon Cove	Mesh	34.9(10.2)	7.7(0.4)	2.5-14.6	2.6(0.7)	7.4(0.8)	2.1-17.7	16.49(2.63)	5.72(0.44)	1.35-23.75	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	22.1(4.9)	8.9(0.4)	2.9-15.7	N/A	N/A	N/A	N/A	N/A	N/A	10.81(2.97)	3.74(0.28)	1.66-11.06	0.62(0.37)	8.53(2.25)	2.09-13.74

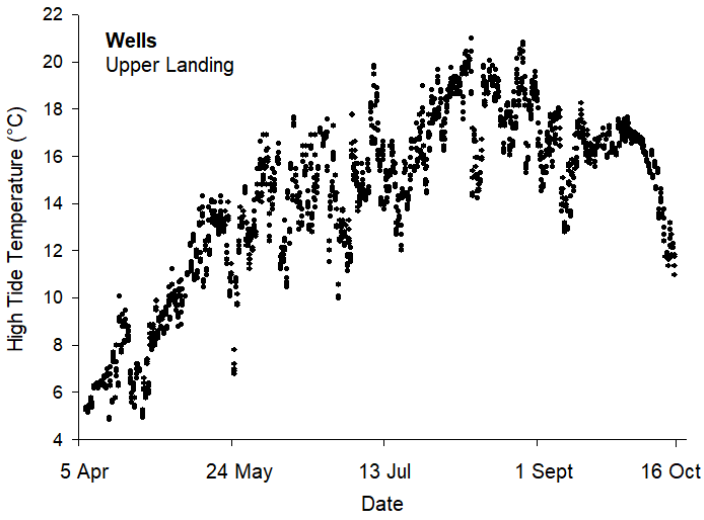
Appendix D: 2020-2024 Green Crab Size and Density Data. The parentheses after the average density refer to the 95% confidence interval. A (-) indicates no confidence interval as n = 1.

Town	Flat	Treatment	2020 Green Crab Avg. Density	2020 Mean Carapace Width (mm)	2020 Size Range (mm)	2021 Green Crab Avg. Density	Carapace Width (mm)	2021 Size Range (mm)	2022 Green Crab Avg. Density	2022 Mean Carapace Width (mm)	2022 Size Range (mm)	2023 Green Crab Avg. Density	2023 Mean Carapace Width (mm)	2023 Size Range (mm)	2024 Green Crab Avg. Density	2024 Mean Carapace Width (mm)	2024 Size Range (mm)
Wells	Dolphin Lane	Mesh	7.7(1.7)	14.7(1.0)	2.1-31.1	N/A	N/A	N/A	6.77(1.95)	13.9(0.65)	1.97-31.98	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	3.9(2.7)	14.1(1.7)	3.9-32.9	4.4(0.6)	15.1(0.8)	4.4-31.7	N/A	N/A	N/A	12.61(3.36)	10.84(0.49)	5.58-26.9	6.25(0.83)	13.81(0.78)	3.82-26.47
	Upper Landing	Mesh	1.7(1.9)	16.2(1.7)	5.9-21.8	4.2(1.8)	5.2(0.5)	1.8-23.9	3.42(0.99)	11.57(0.74)	5.73-27.88	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1.5(2.0)	12.9(2.2)	7.6-29.2	N/A	N/A	N/A	N/A	N/A	N/A	2.41(0.75)	15.68(1.99)	7.3-32.11	3.84(0.65)	12.14(0.94)	5.36-22.98
Scarborough	Jones Creek	Mesh	0.0(-)	0.0(-)	-	8.8(1.8)	10.3(0.7)	2.6-39.3	1.11(1.33)	8.06(0.96)	2.03-16.04	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.4(0.6)	6.1(1.7)	4.5-9.1	N/A	N/A	N/A	N/A	N/A	N/A	13.27(6.75)	9.56(0.7)	1.92-31.52	21.2(5.75)	12.25(0.63)	2.18-32.34
	Winnock Neck	Mesh	7.2(4.4)	8.3(0.7)	1.5-16.2	4.3(0.9)	13.6(1.1)	3.3-33.5	9.38(6.21)	11.58(0.9)	2.6-33.92	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1.6(0.9)	8.8(0.6)	2.5-20.9	N/A	N/A	N/A	N/A	N/A	N/A	0.36(0.31)	6.99(2.46)	1.98-9.3	1.74(1.21)	9.62(1.49)	1.94-20.83
Brunswick	Harpswell Cove	Mesh	1.7(0.7)	15.1(3.1)	6.5-40.8	3.4(1.0)	13.8(1.7)	3.5-35.8	2.23(0.53)	19.16(2.21)	5.68-41.64	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1.2(1.1)	12.8(3.1)	6.5-30.7	N/A	N/A	N/A	N/A	N/A	N/A	1.33(0.33)	22.54(3.84)	5.27-40.14	0.87(0.31)	22.48(2.77)	14.68-33.06
	Thomas Point	Mesh	0.0(-)	0.0(-)	-	1.2(0.8)	8.3(1.5)	4.4-22.2	0.12(0.18)	26.98(10.58)	22.59-31.09	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.0(-)	0.0(-)	-	N/A	N/A	N/A	N/A	N/A	N/A	0.56(0.39)	13.3(4.99)	3.29-28.77	0.1(0.15)	11.99(18.74)	10.51-13.46
Phippsburg	Atkins Flat	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	17.38(14.49)	10.71(0.59)	2.79-23.47	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	11.76(2.61)	12.01(0.63)	5.24-25.78	5.28(1.79)	13.06(0.88)	3.58-34.46	8.76(2.44)	9.97(0.64)	2.75-22.41
	Branch Flat	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	6.99(3.12)	20.8(1.48)	3.24-36.12	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	5.92(2.93)	10.67(1.57)	2.7-34.79	5.43(2.7)	11.01(0.84)	3.02-25.92	4.15(1.39)	15.28(1.45)	3.51-30.84
Bremen	Sam's Cove	Mesh	0.8(0.7)	11.9(3.8)	3.7-27.1	3.8(1.0)	18.0(2.2)	5.2-44.6	0.78(0.44)	16.24(4.0)	6.56-33.08	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.4(0.4)	21.4(9.0)	10.2-31.5	N/A	N/A	N/A	N/A	N/A	N/A	1.38(0.63)	15.75(4.12)	3.27-48.26	0.31(0.39)	11.69(3.82)	6.76-17.71
	Broad Cove	Mesh	0.5(0.2)	23.9(9.2)	6.0-34.9	1.2(0.3)	20.8(4.2)	4.4-36.1	1.69(0.58)	10.3(2.02)	1.76-31.02	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.5(0.3)	28.2(10.1)	6.4-41.0	N/A	N/A	N/A	N/A	N/A	N/A	0.77(0.58)	21.01(5.42)	4.09-35	0.62(0.33)	16.94(5.41)	6.98-33.68
Islesboro	Little Broad	Mesh	0.0(-)	0.0(-)	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	2.5(3.2)	10.0(1.3)	5.1-20.0	20.1(3.8)	10.9(0.4)	2.9-29.9	11.69(2.58)	10.94(0.61)	1.94-32.49	11.07(3.59)	9.17(0.68)	4.57-41.26	5.54(1.34)	10.49(0.68)	4.69-18.33
	Ryder Cove	Mesh	0.2(0.2)	12.5(28.1)	8.0-16.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	2.2(0.9)	11.2(1.7)	4.8-28.7	11.3(3.6)	13.9(0.8)	1.8-29.6	9.73(1.49)	14.53(0.79)	2.79-38.64	8.66(4.21)	7.95(2.49)	3.17-22.47	3.95(1.38)	12.43(0.91)	4.67-25.01
Stonington	Hatch Cove	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	3.23(2.02)	16.36(1.43)	7.75-25.77	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	5.61(2.22)	10.72(1.32)	2.44-23.75	2.15(0.66)	17.17(1.73)	5.55-32.17	1.85(1.21)	12.7(2.24)	2.91-27.77
	Sunshine Bar	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	5.23(1.55)	21.89(1.54)	8.41-34.52	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	6.91(0.89)	17.83(1.73)	3.97-39.84	3.89(1.51)	16.19(1.86)	4.73-34.94	0.72(0.44)	14.44(4.04)	3.71-25.56
Frenchman's Bay	Raccoon Cove	Mesh	0.0(-)	0.0(-)	-	0.4(0.3)	8.9(2.4)	5.1-16.6	0.31(0.21)	12.05(3.15)	5.65-17.73	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.0(-)	0.0(-)	-	N/A	N/A	N/A	N/A	N/A	N/A	0.31(0.26)	11.21(3.73)	8.26-17.5	0.0(-)	0.0(-)	-
	Hog Bay	Mesh	0.2(0.2)	29.9(4.1)	29.3-30.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	4.2(2.7)	9.1(0.7)	2.6-15.9	0.0(-)	0.0(-)	-	0.0(-)	0.0(-)	-	0.26(0.2)	24.75(11.04)	14.84-32.53	0.0(-)	0.0(-)	-
Beals	Dobbins' Island	Mesh	5.9(2.2)	6.4(0.7)	2.3-20.5	14.5(4.1)	9.4(0.2)	1.4-22.4	15.76(1.4)	10.44(0.39)	2.87-20.03	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	2.2(1.4)	8.8(1.9)	2.5-27.5	N/A	N/A	N/A	N/A	N/A	N/A	9.94(5.56)	7.45(0.34)	1.47-21.83	0.51(0.47)	8.21(1.67)	3-11.14
	Perio Point	Mesh	0.0(-)	0.0(-)	-	N/A	N/A	N/A	2.34(1.57)	6.95(0.59)	2.86-12.41	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.0(-)	0.0(-)	-	0.1(0.1)	6.9(-)	-	N/A	N/A	N/A	3.38(3.48)	4.94(0.32)	2.65-8.73	0.05(0.11)	11.96(-)	-
Machiasport	Sanborn Cove	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	6.15(3.39)	6.32(0.46)	3.5-14.53	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	9.84(2.56)	8.38(0.45)	2.94-15.04	1.38(1.59)	7.21(0.9)	3.87-12.23	0.05(0.11)	4.41(-)	-
	Randall Point Flat	Mesh	N/A	N/A	N/A	N/A	N/A	N/A	4.68(2.78)	6.04(0.41)	3.66-9.76	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	N/A	N/A	N/A	6.76(4.29)	7.14(0.54)	2.29-14.35	0.67(0.42)	3.58(0.27)	2.98-4.43	0.0(-)	0.0(-)	-
Edmunds	Burnt Cove	Mesh	N/A	N/A	N/A	0.8(0.6)	6.2(0.9)	3.8-8.6	0.64(0.93)	13.1(-)	9.36-16.84	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	1.2(0.8)	6.5(1.1)	2.8-10.9	N/A	N/A	N/A	0.0(-)	0.0(-)	-	0.0(-)	0.0(-)	-
	Hallowell Island	Mesh	N/A	N/A	N/A	0.6(0.4)	5.9(1.6)	2.9-10.5	0.23(0.16)	5.87(1.59)	3.71-7.66	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	0.3(0.3)	7.2(2.1)	4.8-8.7	N/A	N/A	N/A	0.0(-)	0.0(-)	-	0.0(-)	0.0(-)	-
	Marion Cove	Mesh	N/A	N/A	N/A	0.2(0.2)	7.7(7.0)	4.1-12.3	0.04(0.08)	5.21(-)	-	N/A	N/A	-	N/A	N/A	N/A
		Fabric	N/A	N/A	N/A	0.8(0.5)	7.1(1.6)	2.6-12.1	N/A	N/A	N/A	0.82(0.65)	6.65(1.79)	2.74-13.44	0.0(-)	0.0(-)	-
Sipayik	Gleason Cove	Mesh	2.5(1.7)	4.2(0.5)	2.2-9.8	11.2(2.6)	5.1(0.2)	1.6-13.0	8.34(3.37)	4.15(0.32)	1.07-17.85	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	1.7(1.5)	8.5(2.9)	2.8-24.6	N/A	N/A	N/A	N/A	N/A	N/A	6.09(3.69)	7.21(0.47)	2.63-12.82	0.0(-)	0.0(-)	-
	Half Moon Cove	Mesh	0.0(-)	0.0(-)	-	0.8(0.2)	4.9(0.8)	1.9-11.6	1.23(0.57)	5.15(1.46)	2.04-25.16	N/A	N/A	N/A	N/A	N/A	N/A
		Fabric	0.2(0.2)	5.5(16.9)	2.8-8.2	N/A	N/A	N/A	N/A	N/A	N/A	0.1(0.15)	5.99(25.48)	3.98-7.99	0.0(-)	0.0(-)	-

Appendix E: Seawater Temperatures

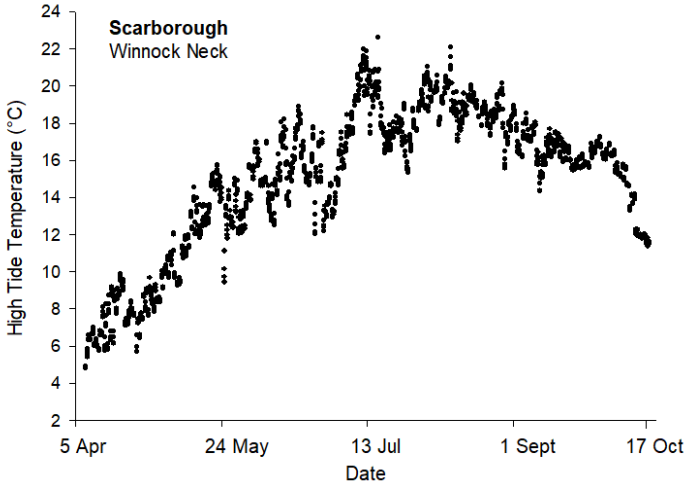
Southwest Region

Wells:



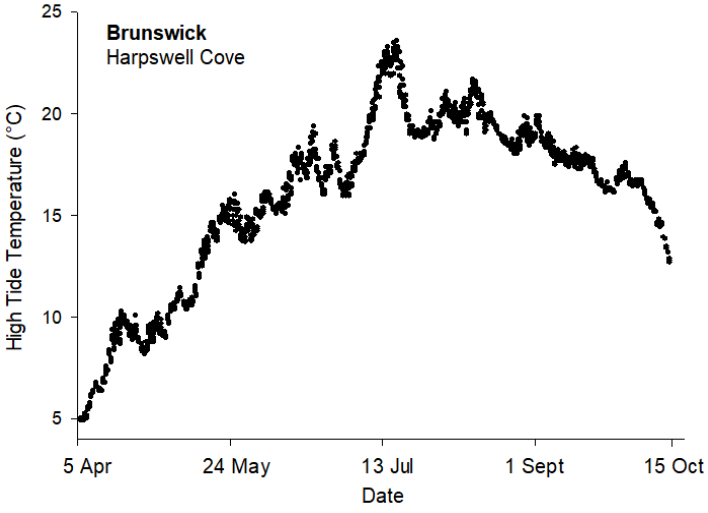
The temperature recorder at Dolphin Lane stopped recording after seven days.

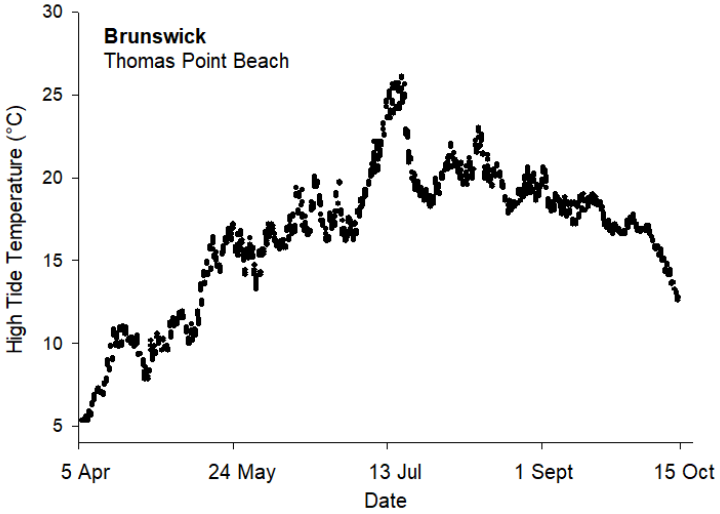
Scarborough:



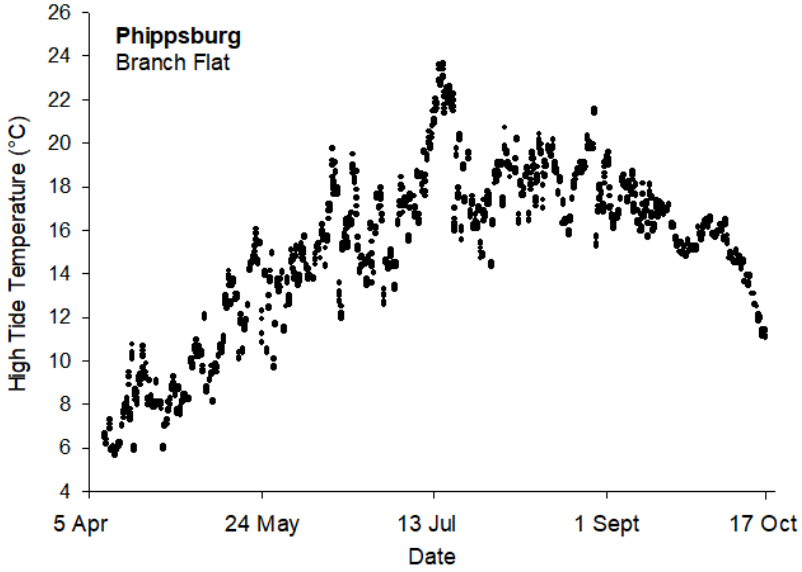
The temperature recorder at Jones Creek was not recovered.

Brunswick:





Phippsburg:

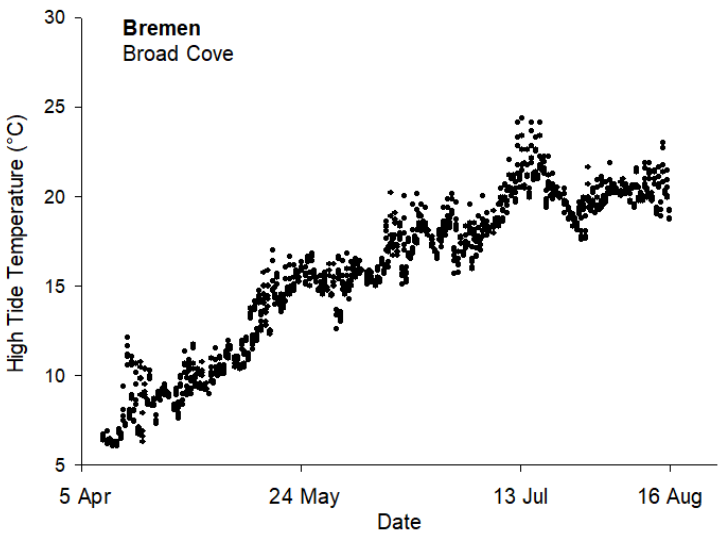


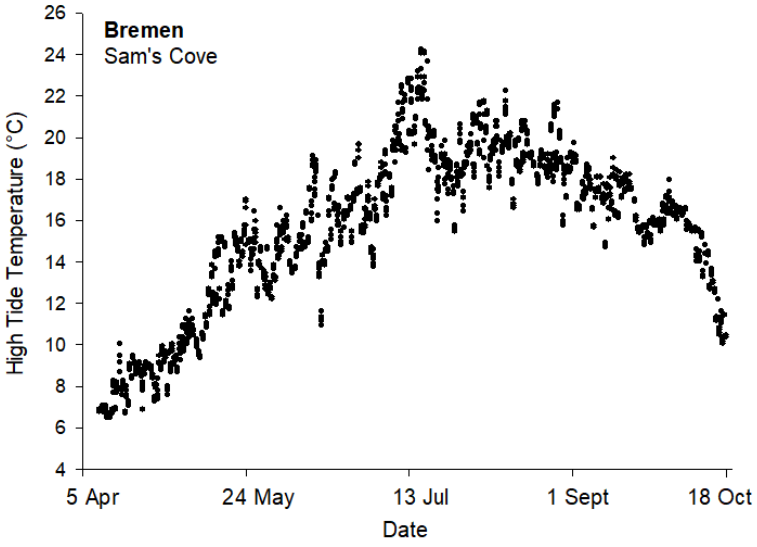
The temperature recorder at Atkins Flat was not recovered.

Appendix E: Seawater Temperatures

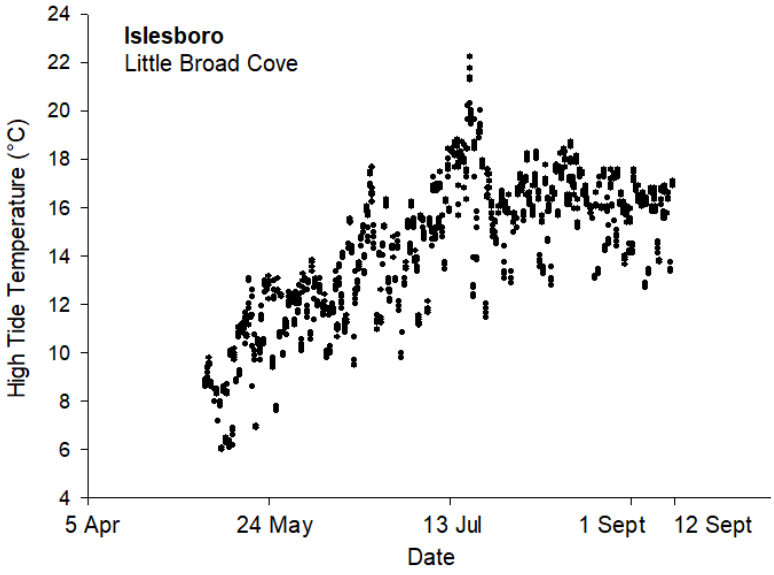
Midcoast Region

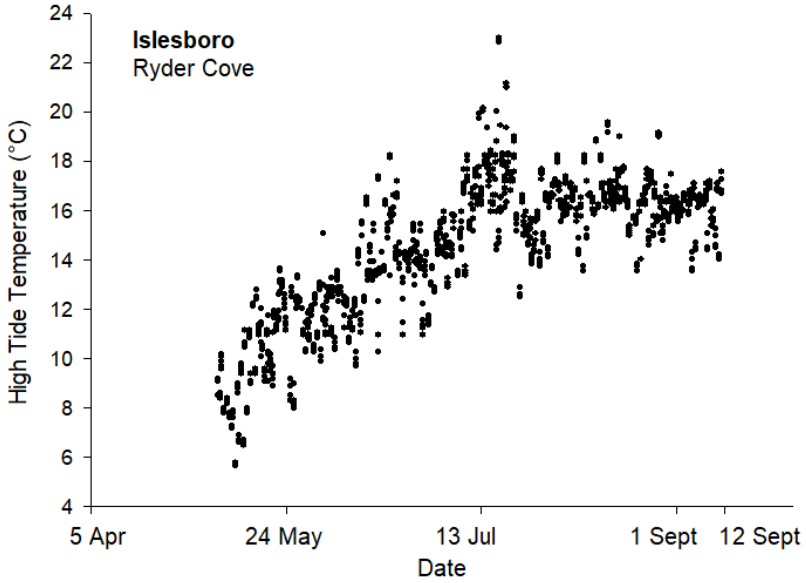
Bremen:



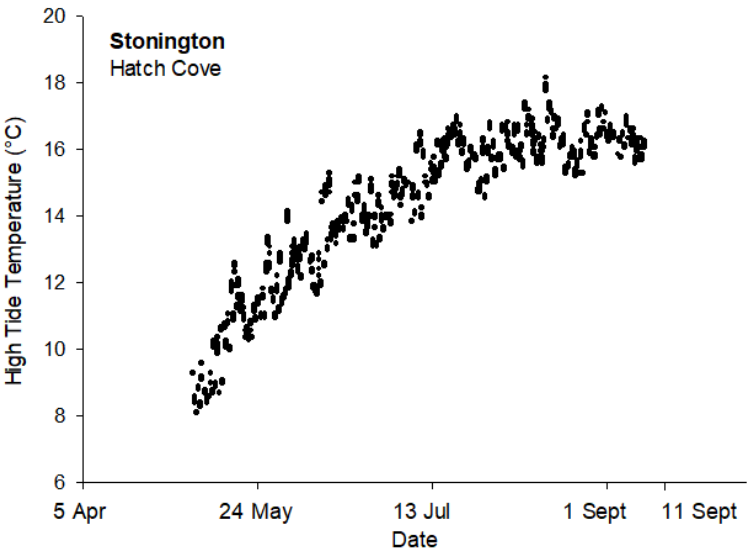


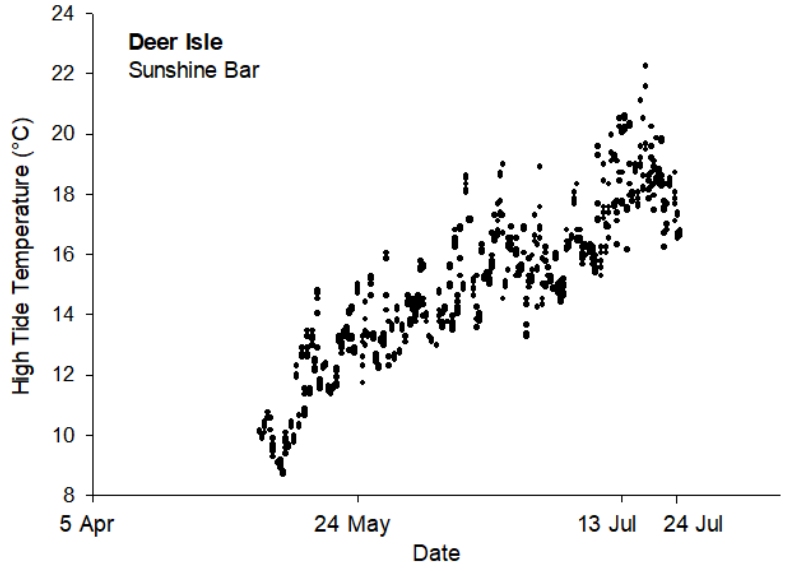
Islesboro:





Stonington/Deer Isle:

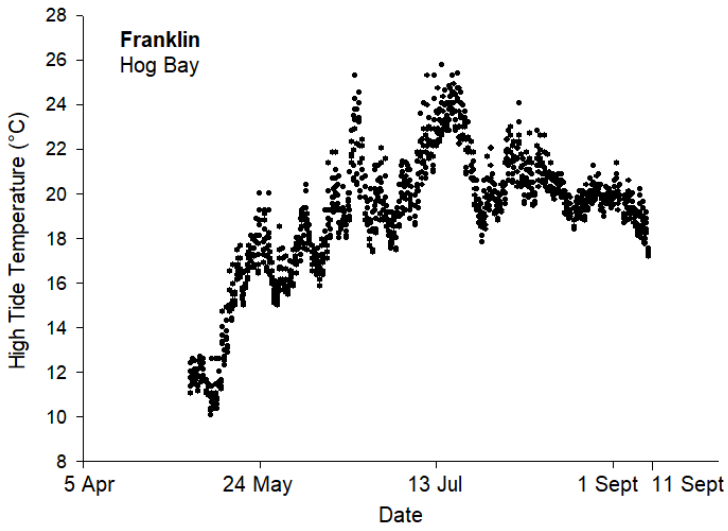


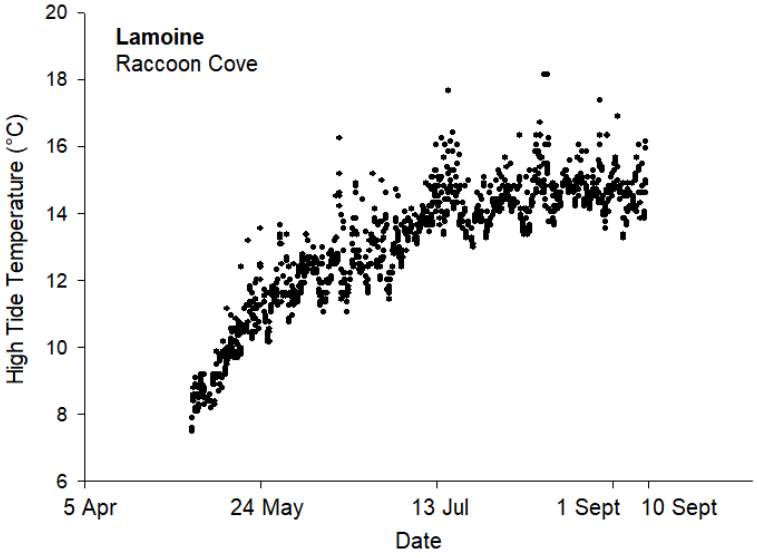


Appendix E: Seawater Temperatures

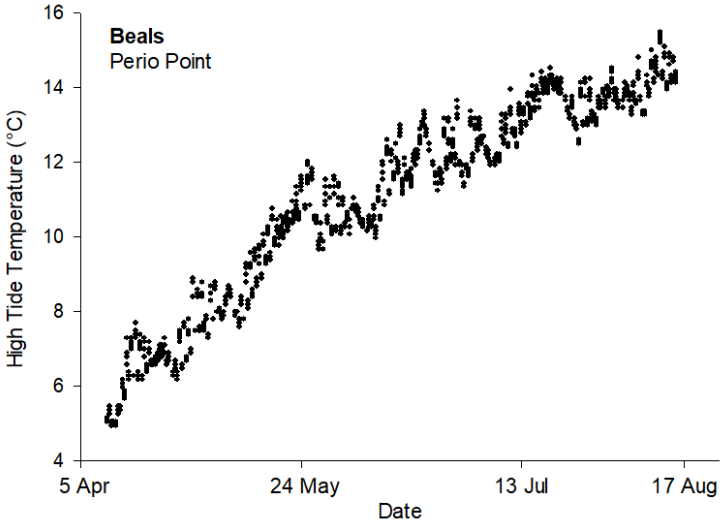
Downeast Region

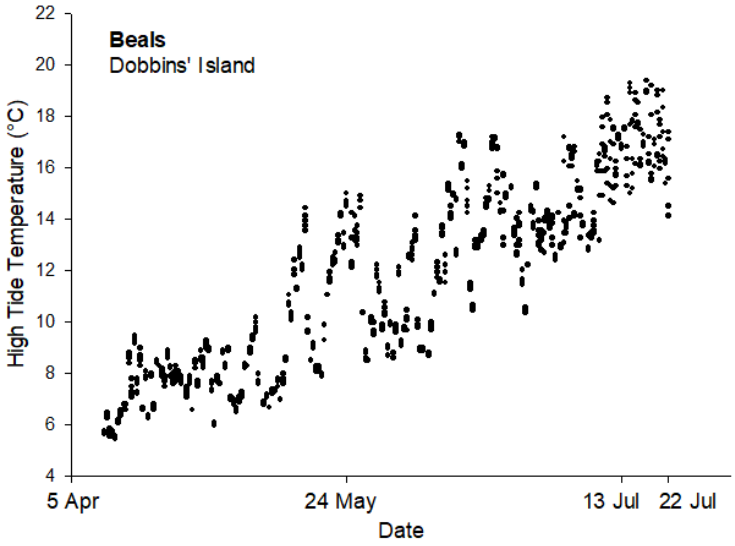
Frenchman Bay:





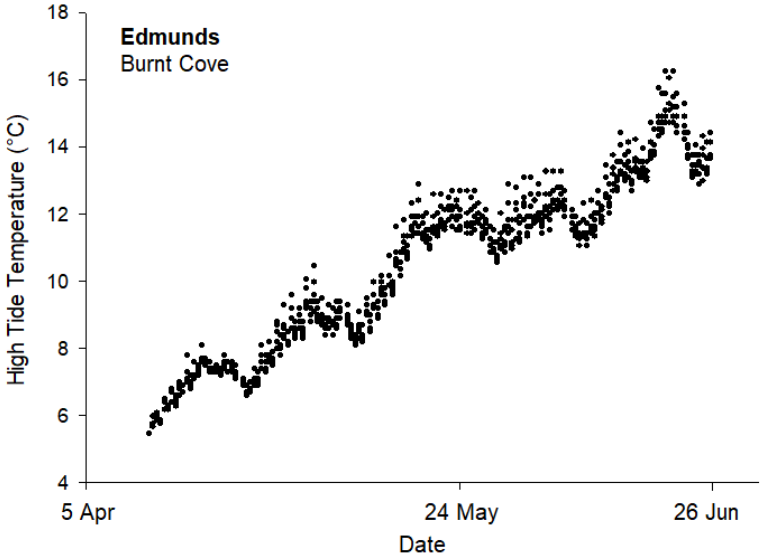
Beals:

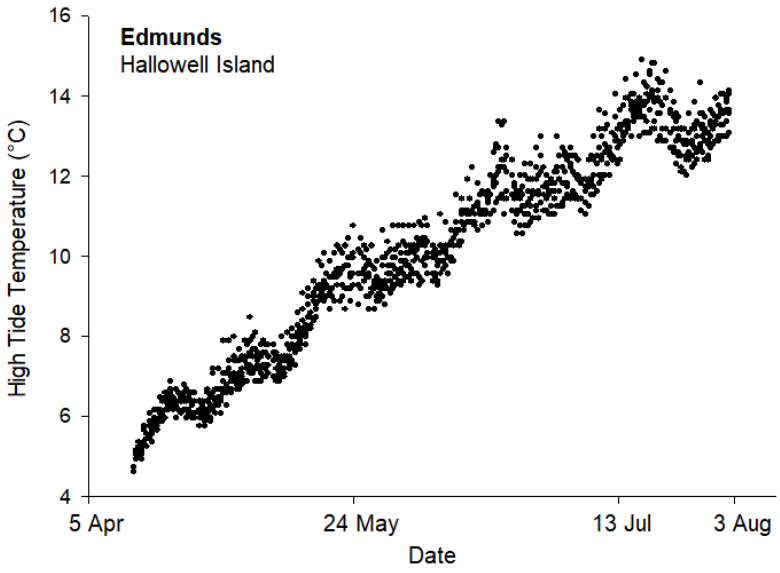


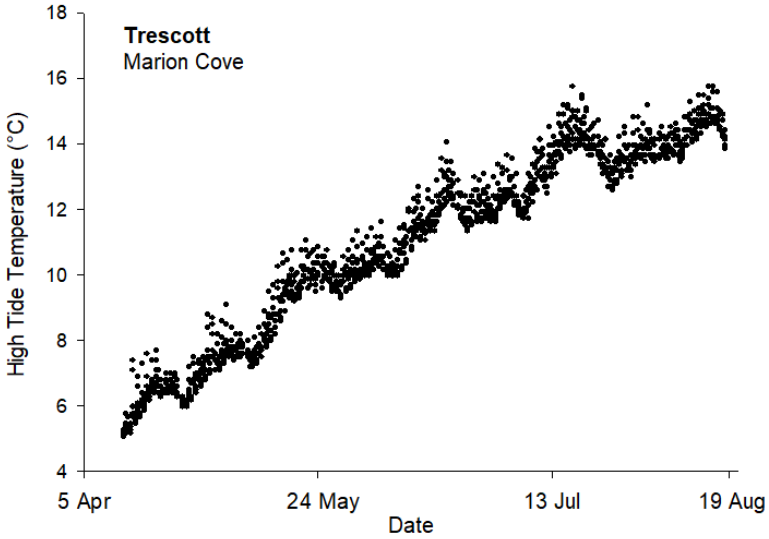


Temperature recorders were not recovered from either of the **Machiasport** sites.

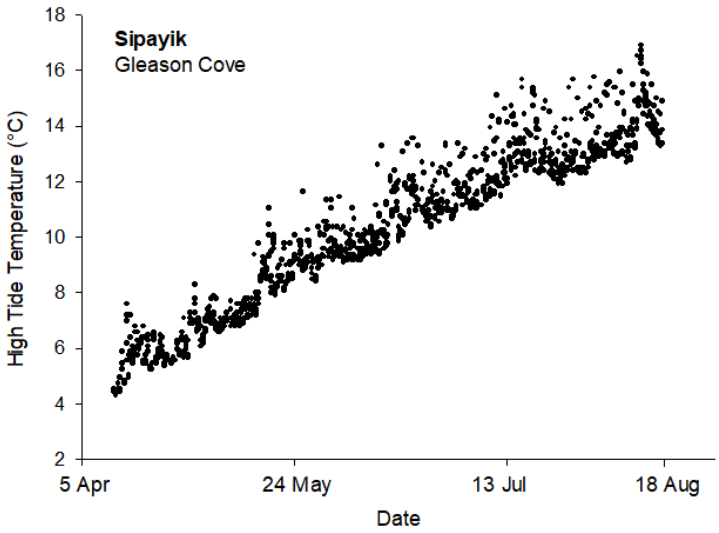
Edmunds/Trescott:

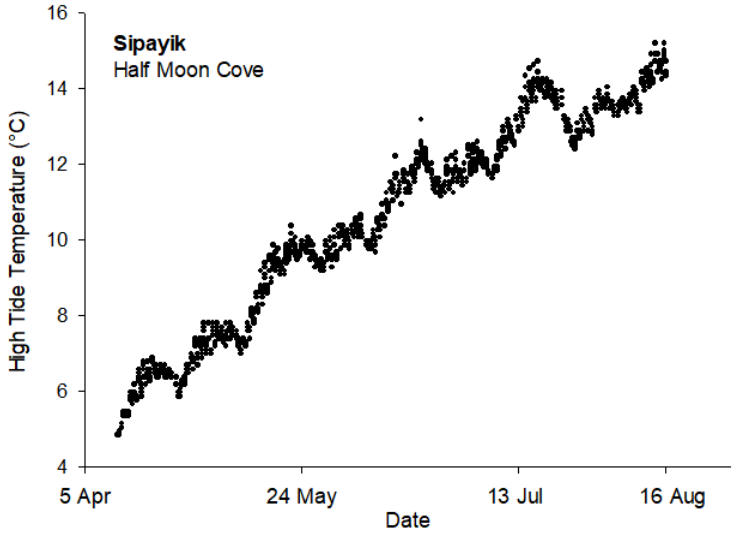






Sipayik:

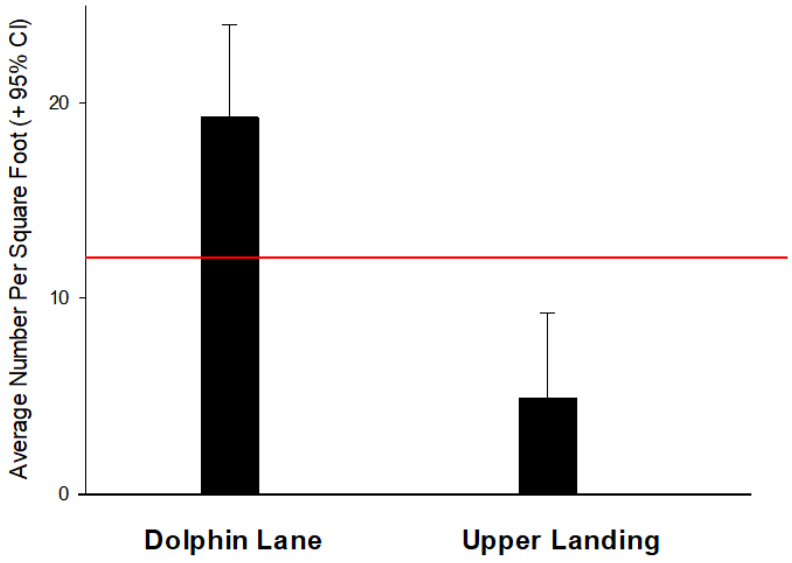




Appendix F: Clam Recruitment Density Results

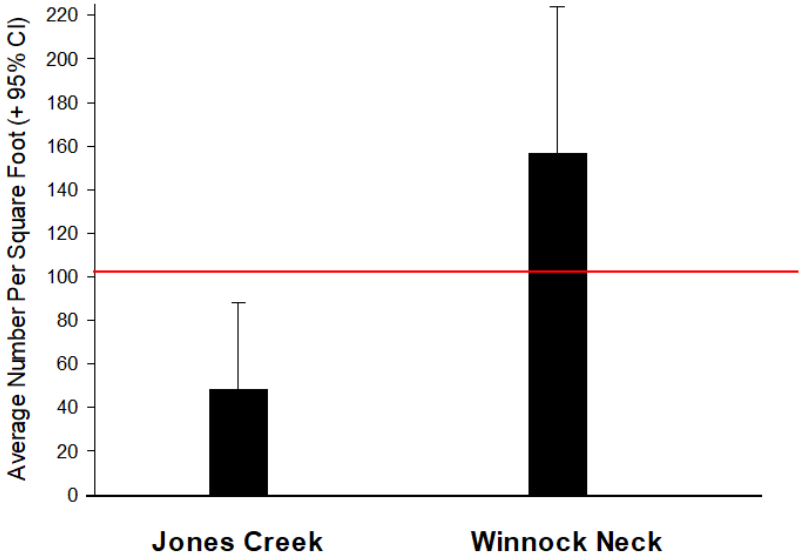
Southwest Region

Wells:



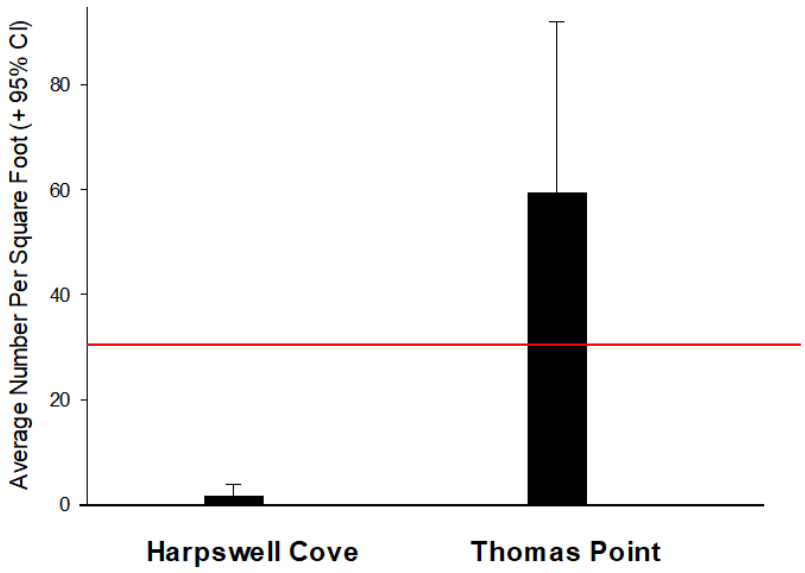
The average density of soft-shell clam recruits per square foot was 19.27 at Dolphin Lane and 4.87 at Upper Landing. The red line represents the combined average number of recruits across both sites (12.08/ft^2).

Scarborough:



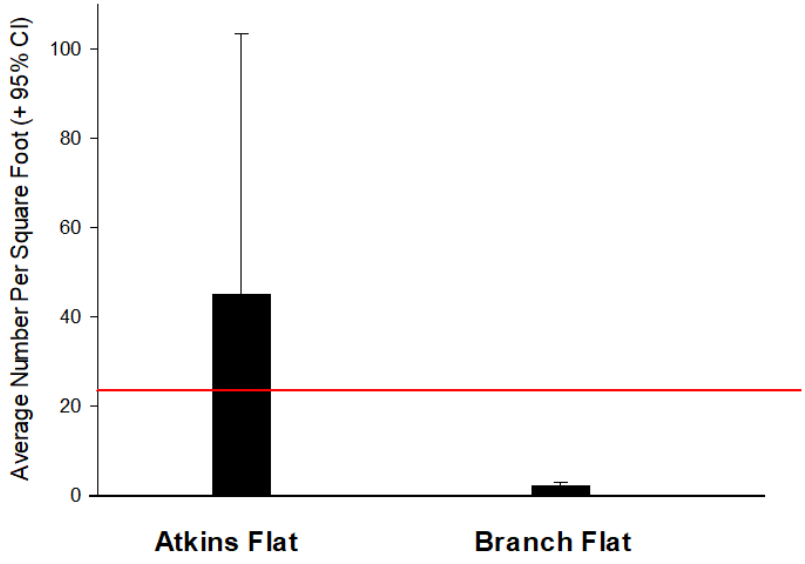
The average density of soft-shell clam recruits per square foot was 48.37 at Jones Creek and 156.53 at Winnock Neck. The red line represents the combined average number of recruits across both sites (102.45/ft^2).

Brunswick:



The average density of soft-shell clam recruits per square foot was 1.59 at Harpswell Cove and 59.40 at Thomas Point. The red line represents the combined average number of recruits across both sites (30.50/ft^2).

Phippsburg:

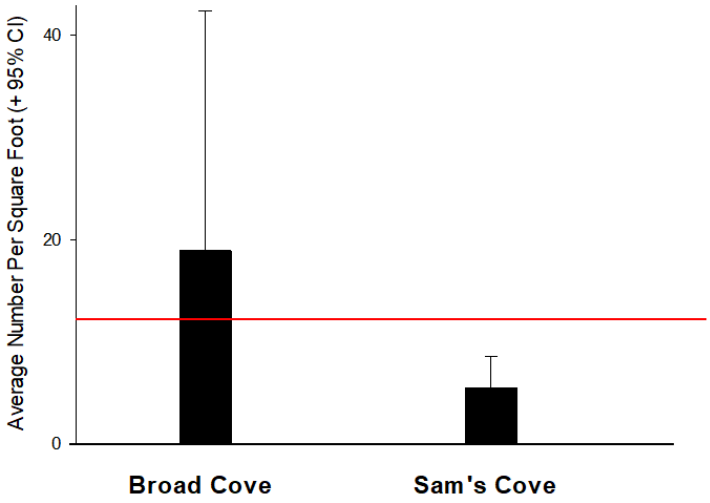


The average density of soft-shell clam recruits per square foot was 44.90 at Atkins Flat and 1.90 at Branch Flat. The red line represents the combined average number of recruits across both sites (23.40/ft^2).

Appendix F: Clam Recruitment Density Results

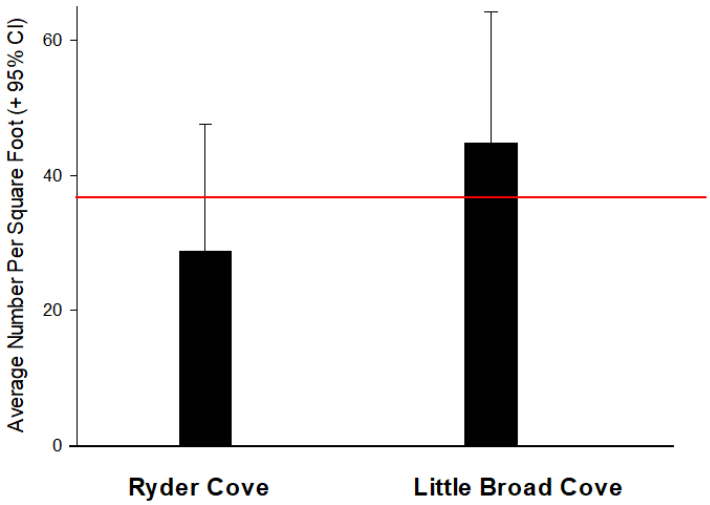
Midcoast Region

Bremen:



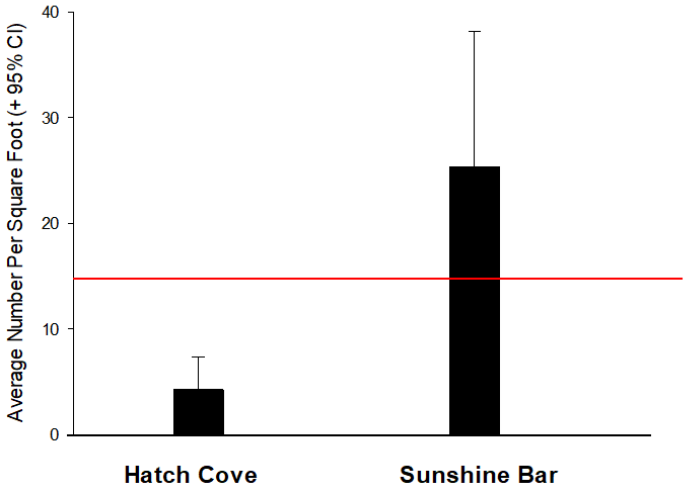
The average density of soft-shell clam recruits per square foot was 18.90 at Broad Cove and 5.43 at Sam's Cove. The red line represents the combined average number of recruits across both sites (12.17/ft^2).

Islesboro:



The average density of soft-shell clam recruits per square foot was 28.80 at Ryder Cove and 44.80 at Little Broad Cove. The red line represents the combined average number of recruits across both sites (36.80/ft^2).

Stonington & Deer Isle:

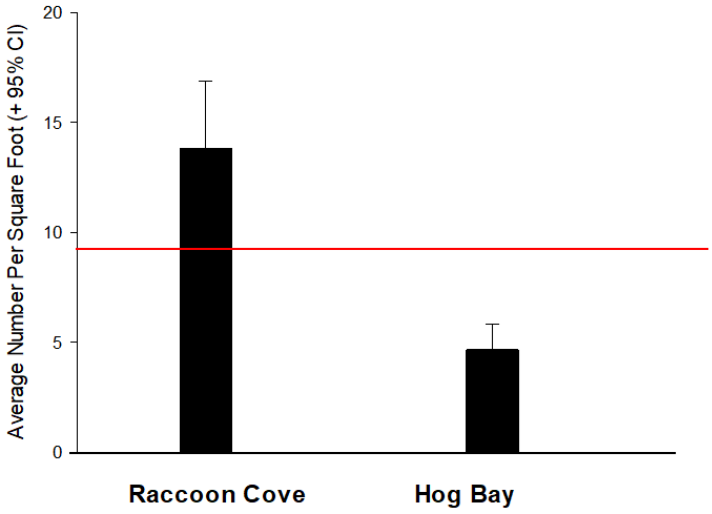


The average density of soft-shell clam recruits per square foot was 4.25 at Hatch Cove and 25.37 at Sunshine Bar. The red line represents the combined average number of recruits across both sites (14.81/ft^2).

Appendix F: Clam Recruitment Density Results

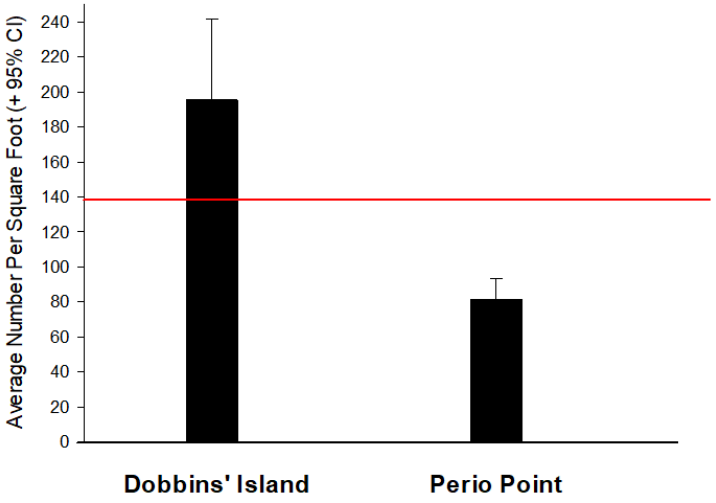
Downeast Region

Frenchman Bay:



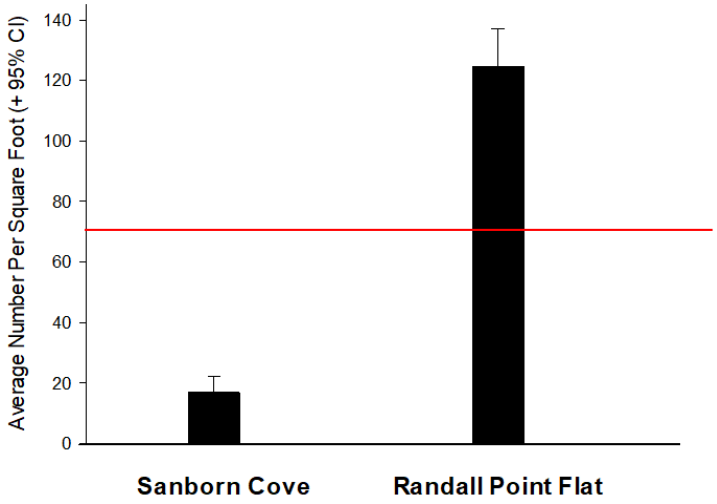
The average density of soft-shell clam recruits per square foot was 13.84 at Raccoon Cove and 4.66 at Hog Bay. The red line represents the combined average number of recruits across both sites (9.25/ft^2).

Beals:



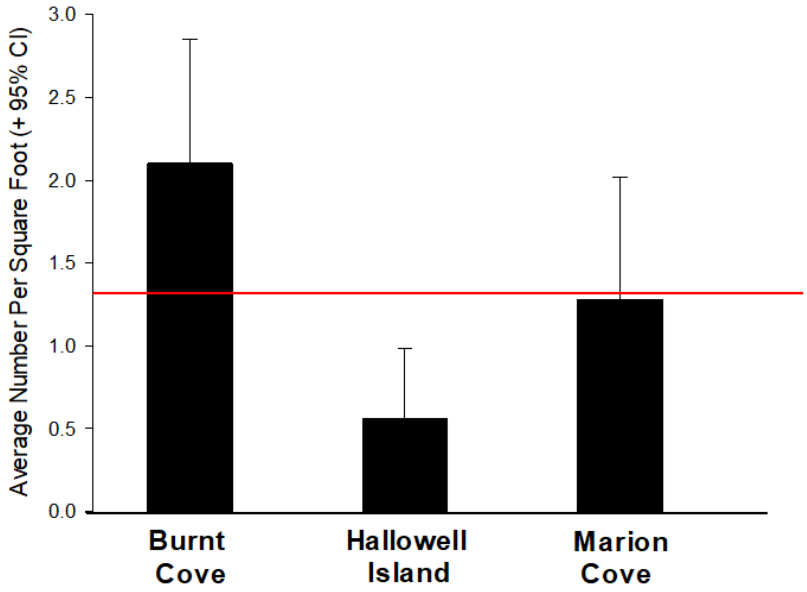
The average density of soft-shell clam recruits per square foot was 195.48 at Dobbins' Island and 81.49 at Perio Point. The red line represents the combined average number of recruits across both sites (138.49/ft^2).

Machiasport:



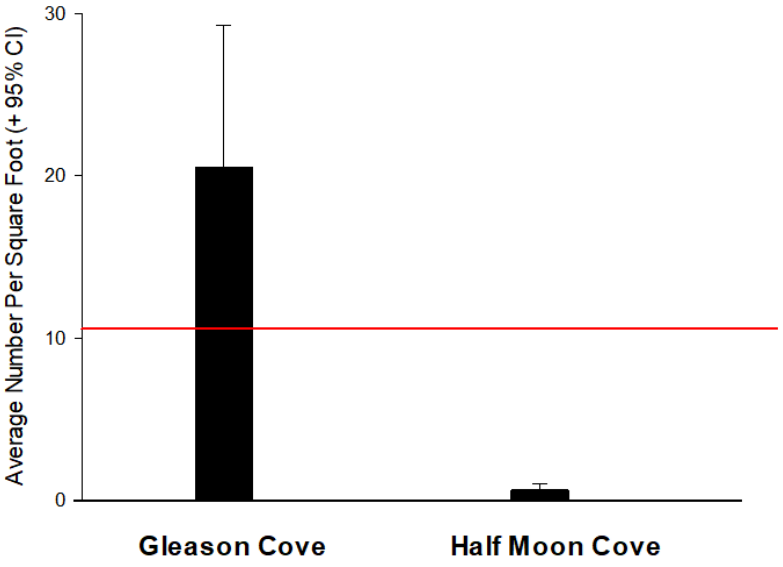
The average density of soft-shell clam recruits per square foot was 16.86 at Sanborn Cove and 124.49 at Randall Point Flat. The red line represents the combined average number of recruits across both sites (70.68/ft^2).

Edmunds/Trescott:



The average density of soft-shell clam recruits per square foot was 2.10 at Burnt Cove, 0.56 at Hallowell Island, and 1.28 at Marion Cove. The red line represents the combined average number of recruits across both sites (1.32/ft^2).

Sipayik:

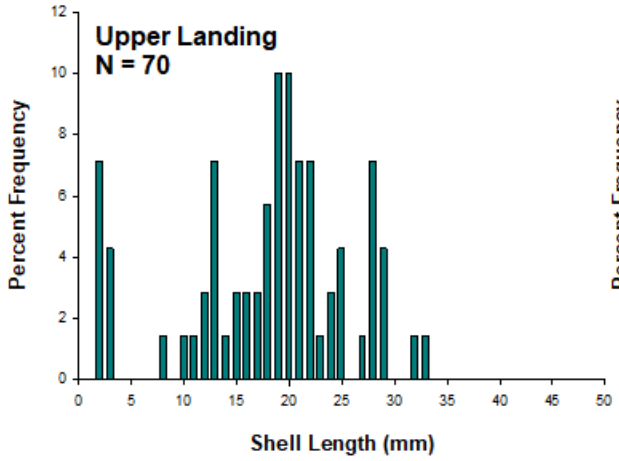


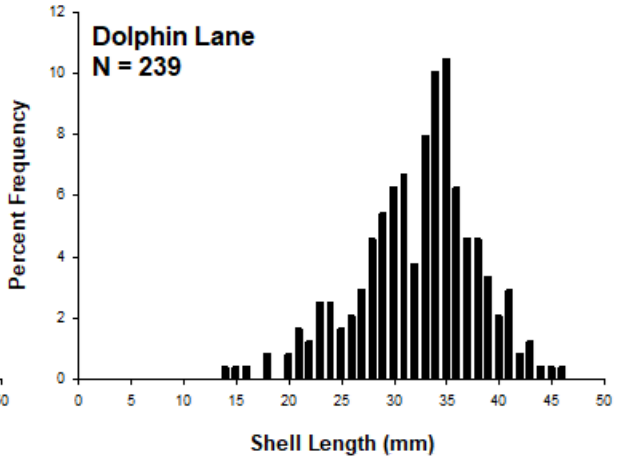
The average density of soft-shell clam recruits per square foot was 2.10 at Burnt Cove, 0.56 at Hallowell Island, and 1.28 at Marion Cove. The red line represents the combined average number of recruits across both sites (1.32/ft^2).

Appendix G: Clam Recruitment Size-Frequency Distributions

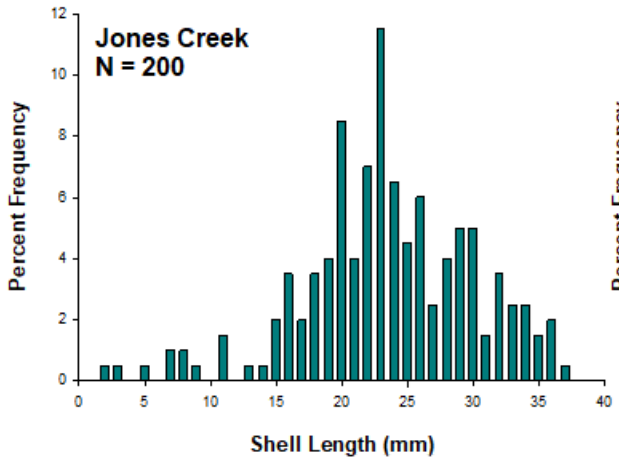
Southwest Region

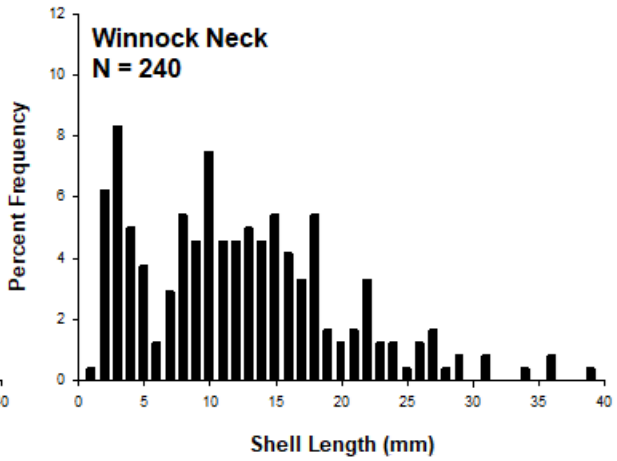
Wells:



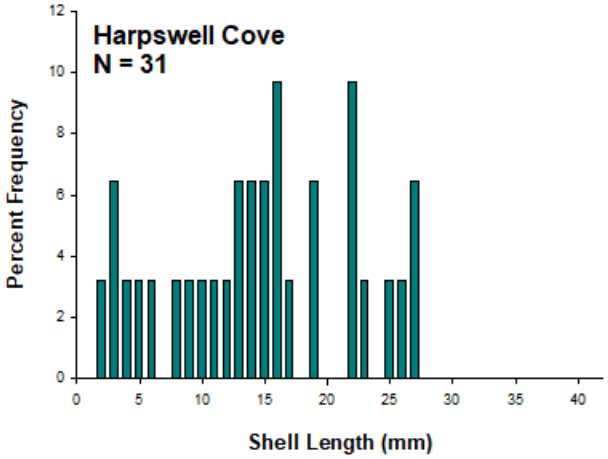


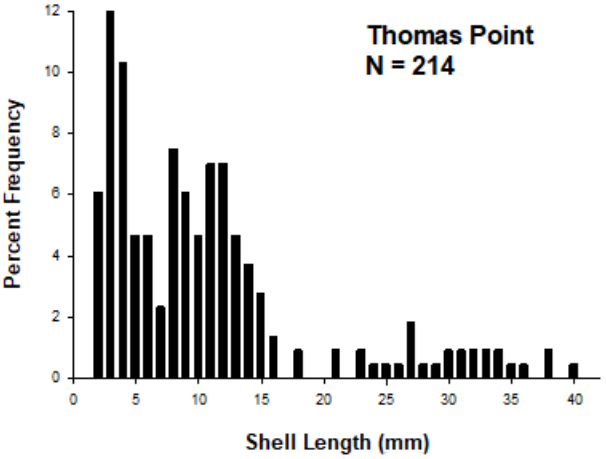
Scarborough:



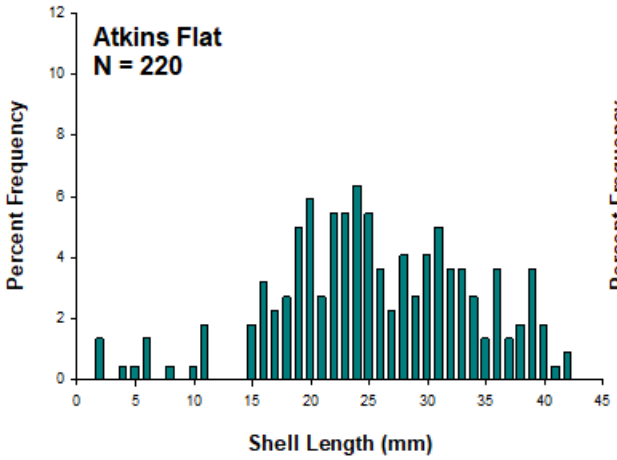


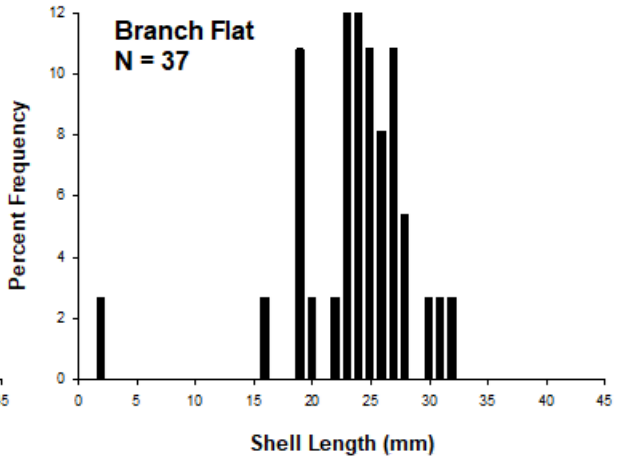
Brunswick:





Phippsburg:

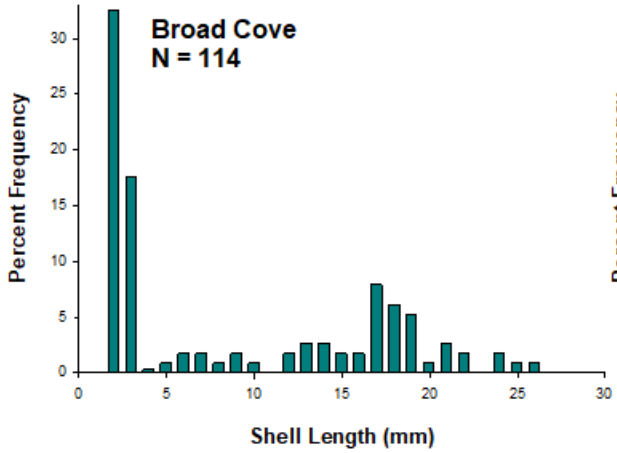


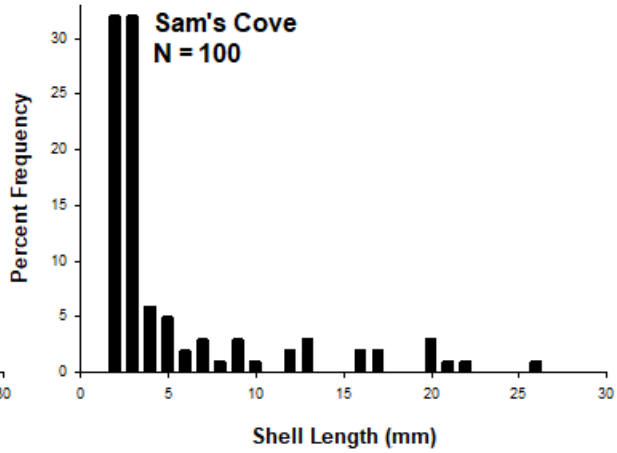


Appendix G: Clam Recruitment Size-Frequency Distributions

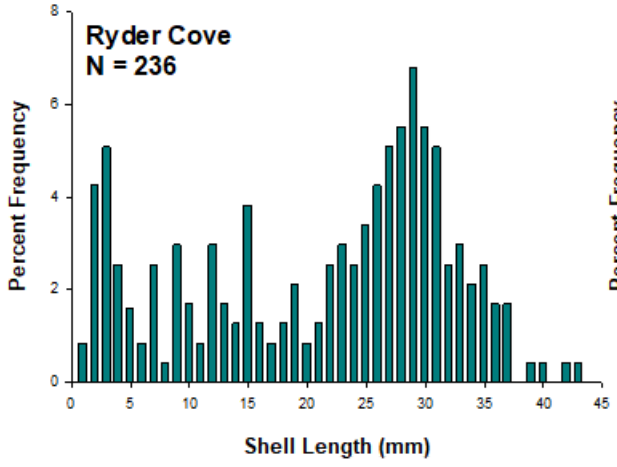
Midcoast Region

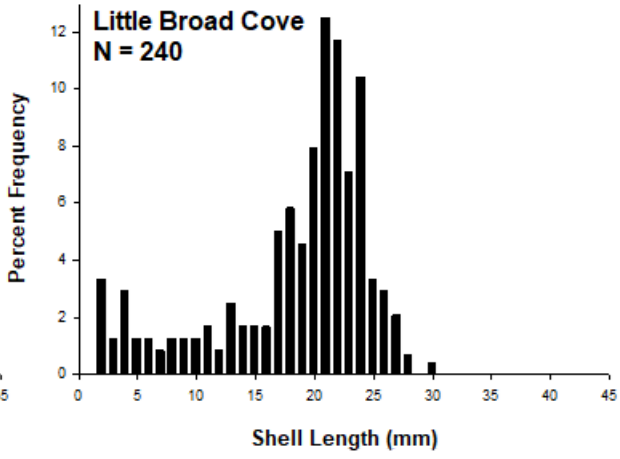
Bremen:



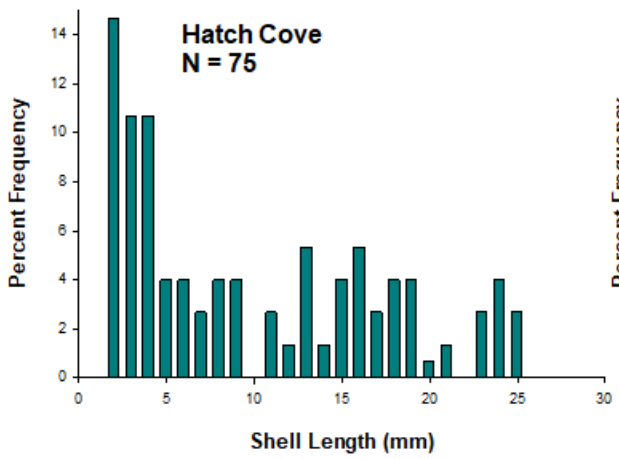


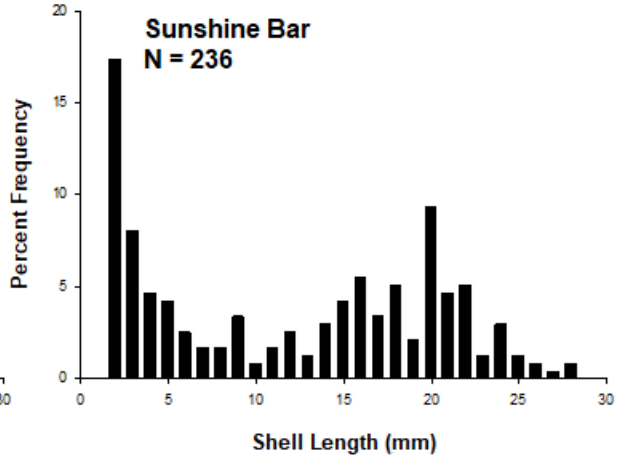
Islesboro:





Stonington/Deer Isle:

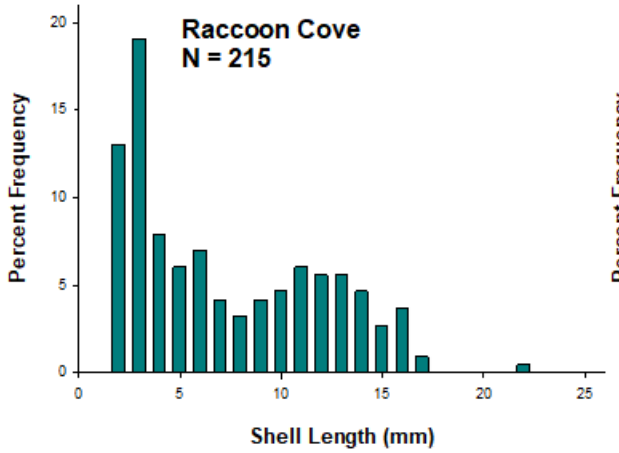


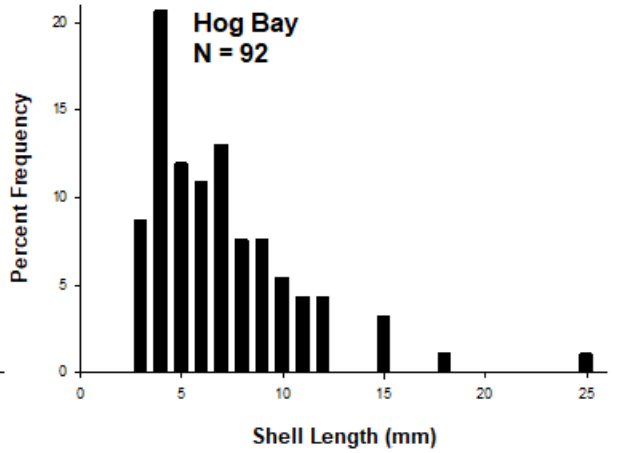


Appendix G: Clam Recruitment Size-Frequency Distributions

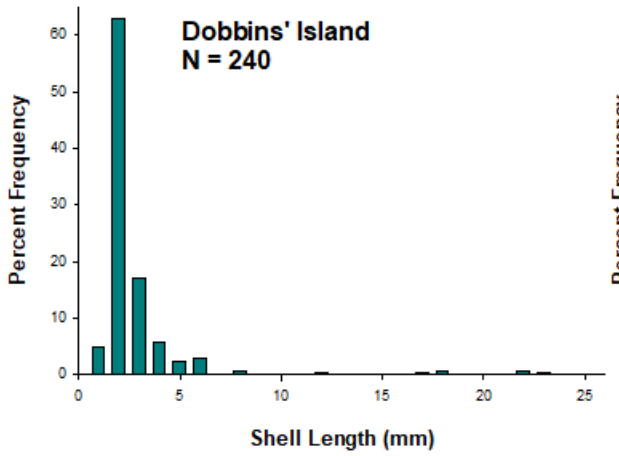
Downeast Region

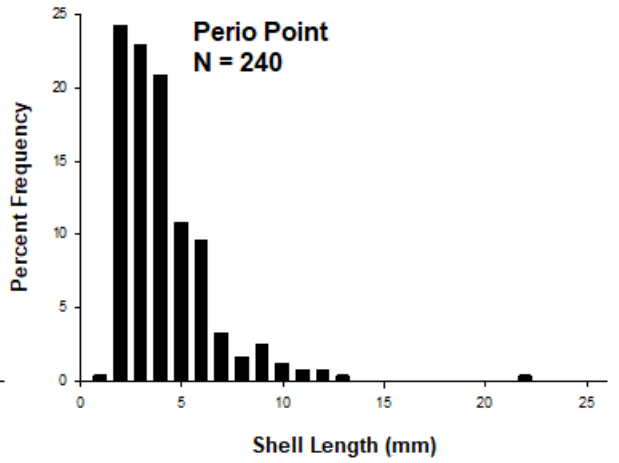
Frenchman Bay:



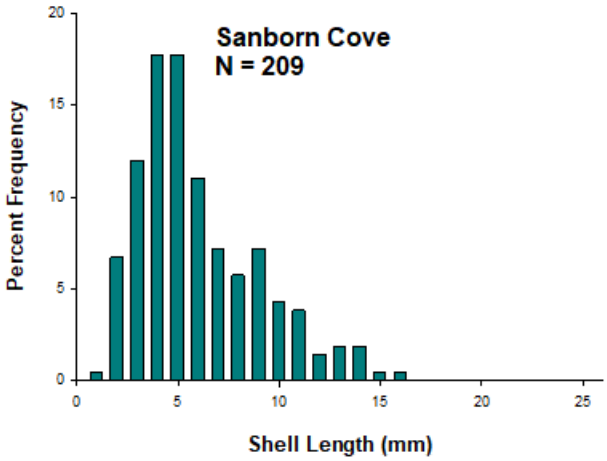


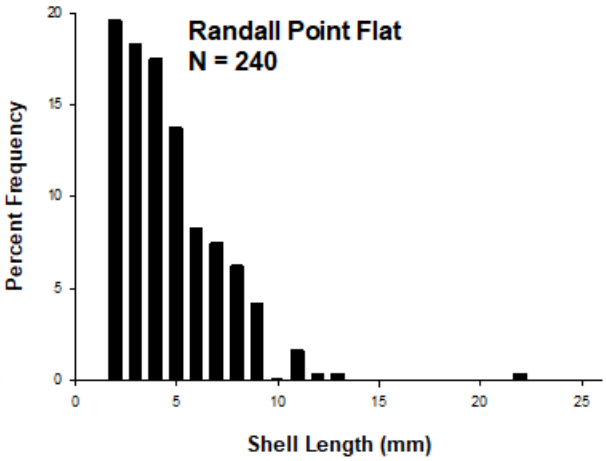
Beals:



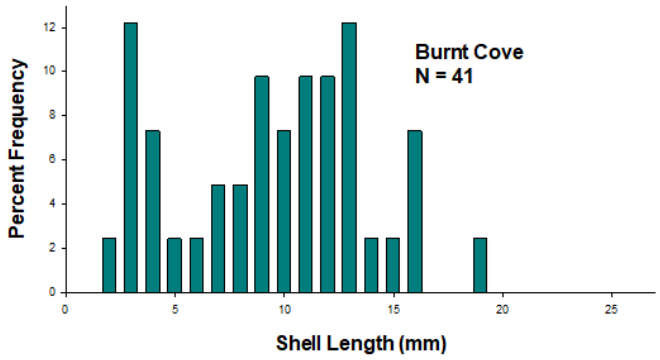


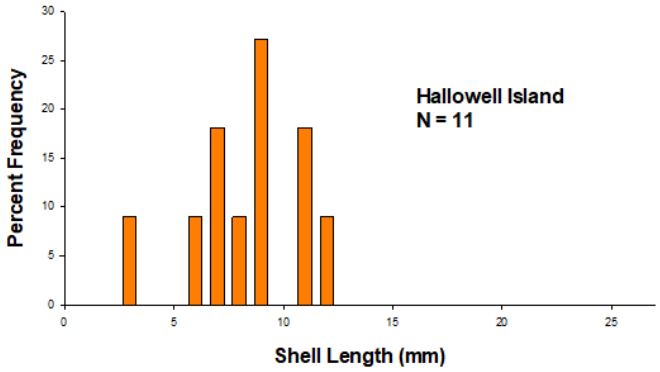
Machiasport:

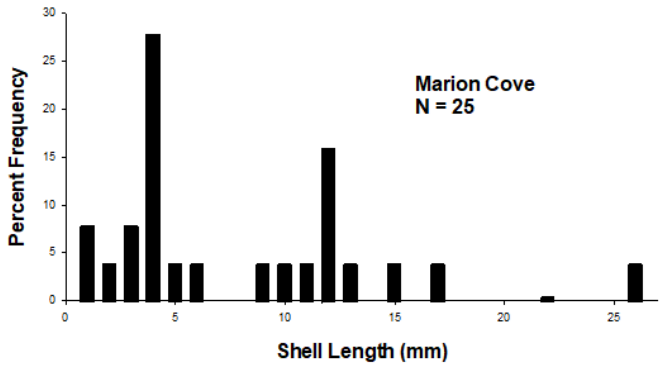




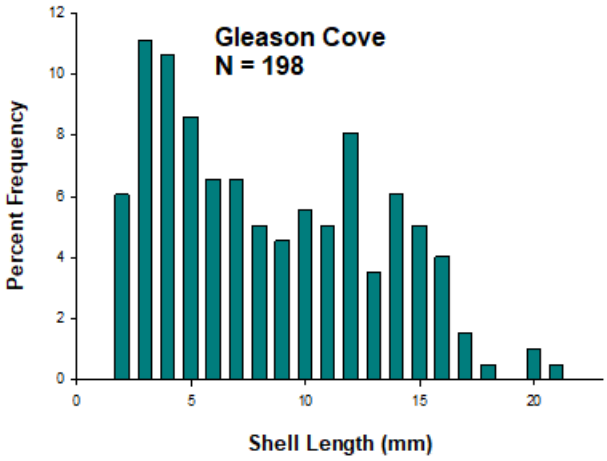
Edmunds/Trescott:

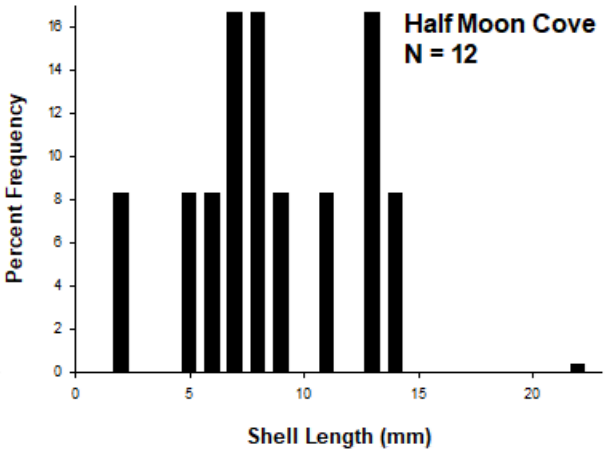






Sipayik:

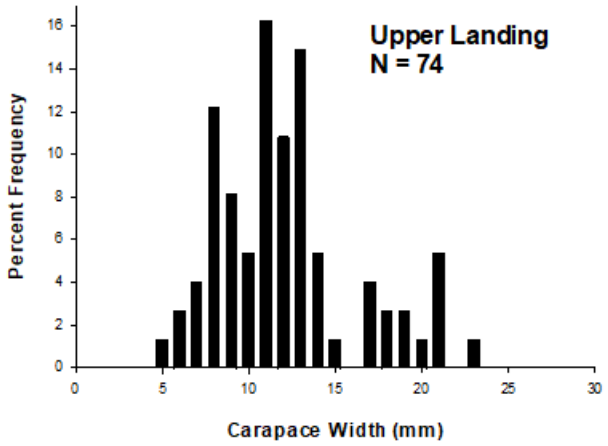

Gleason Cove
N = 198
Percent Frequency
Shell Length (mm)
0
2
4
6
8
10
12
0
5
10
15
20

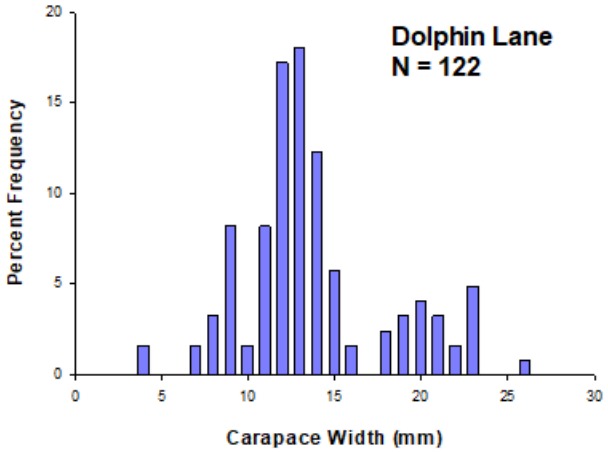

Half Moon Cove
N = 12
Percent Frequency
Shell Length (mm)
0
2
4
6
8
10
12
14
16
0
5
10
15
20

Appendix H: Green Crab Size Distribution

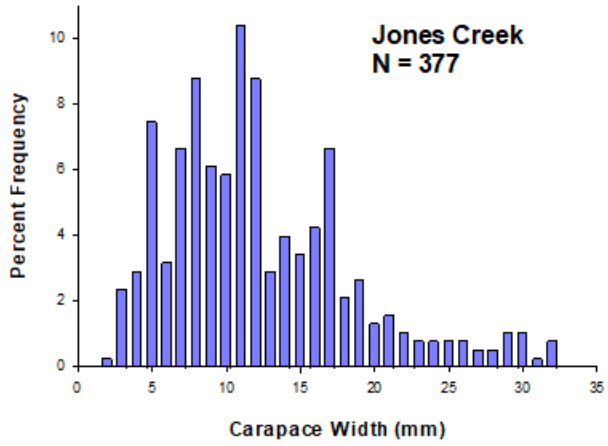
Southwest Region

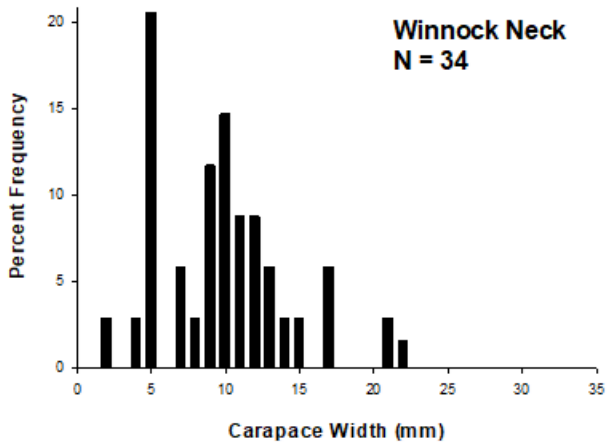
Wells:



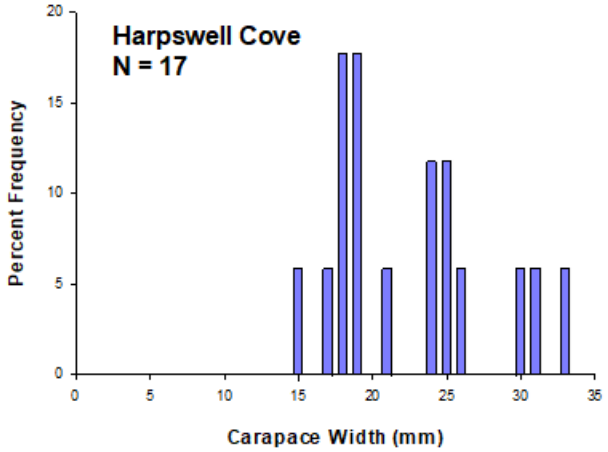


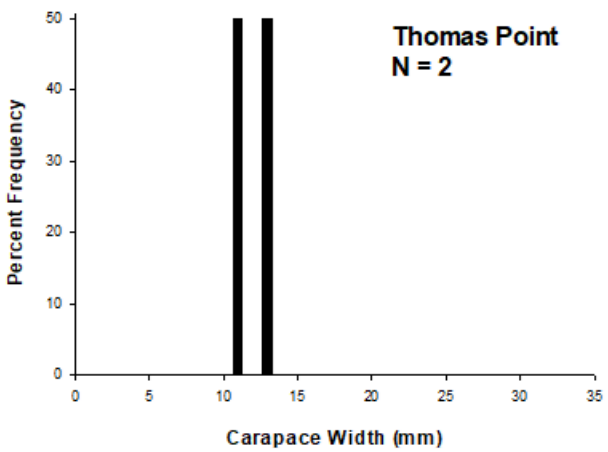
Scarborough:



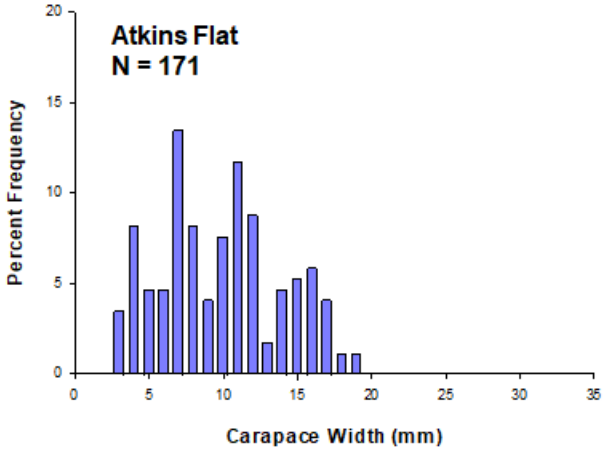


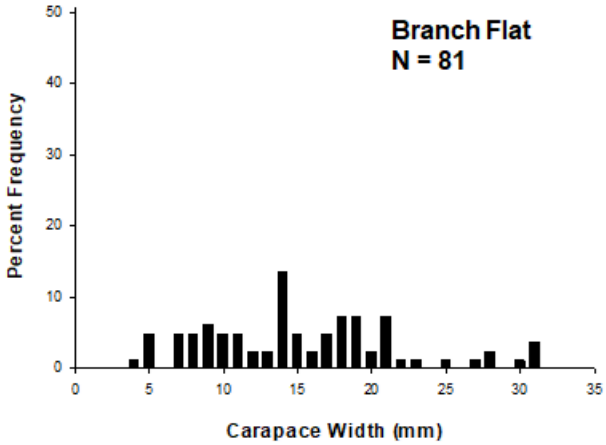
Brunswick:





Phippsburg:

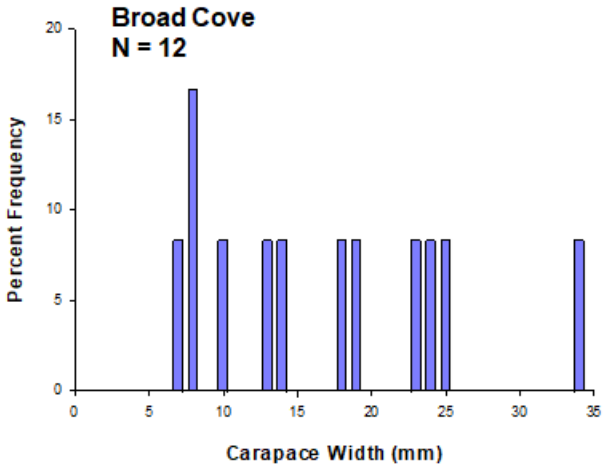


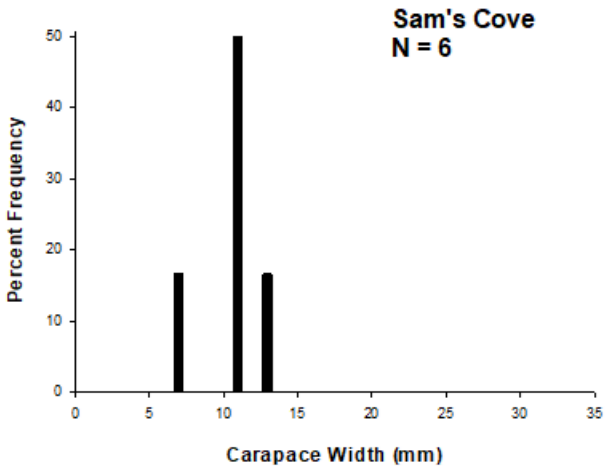


Appendix H: Green Crab Size Distribution

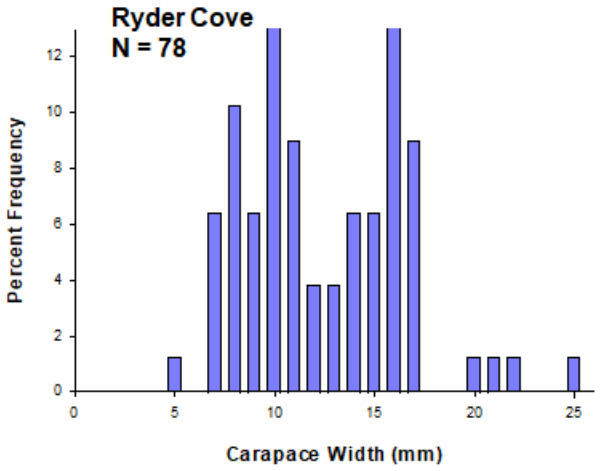
Midcoast Region

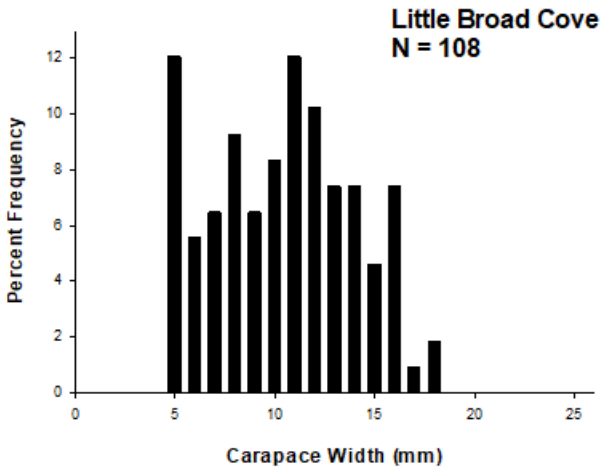
Bremen:



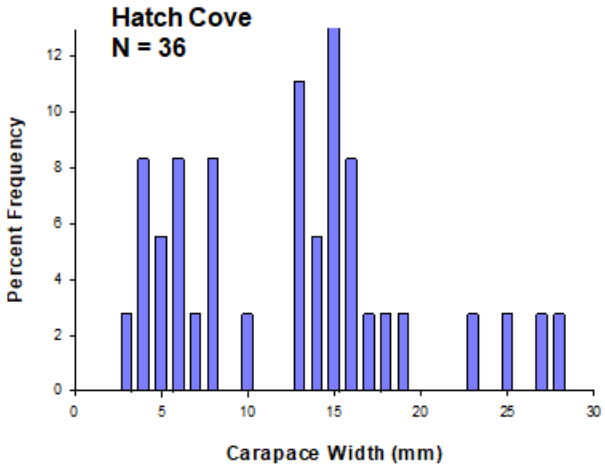


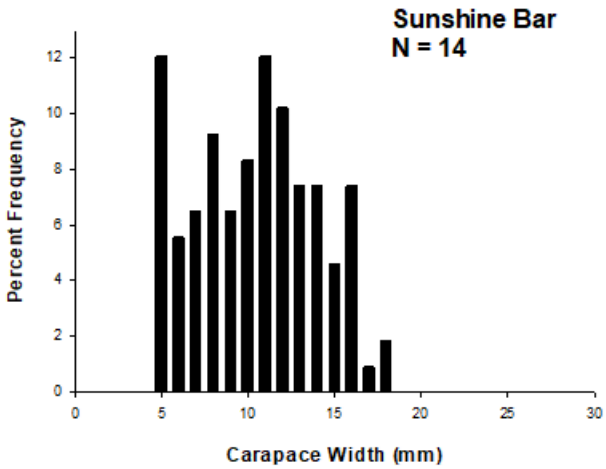
Islesboro:





Stonington:



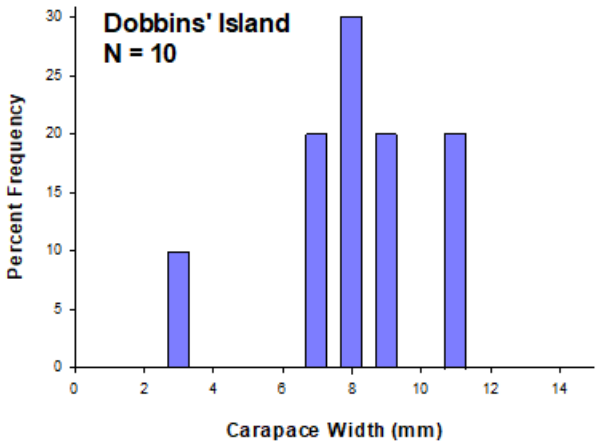


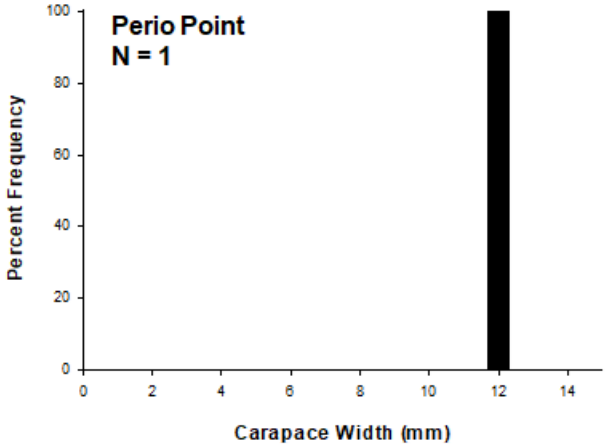
Appendix H: Green Crab Size Distribution

Downeast Region

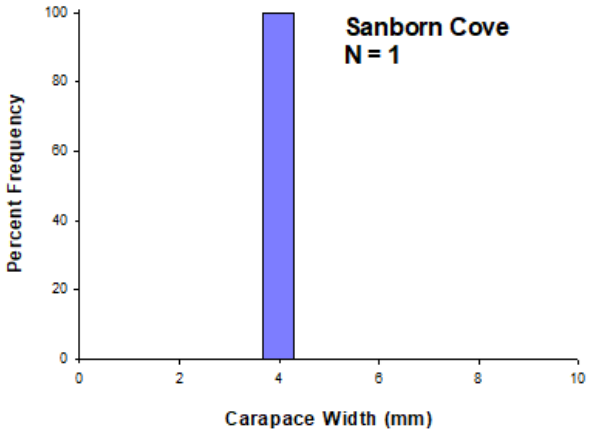
Frenchman Bay: No green crabs were sampled from boxes at either site.

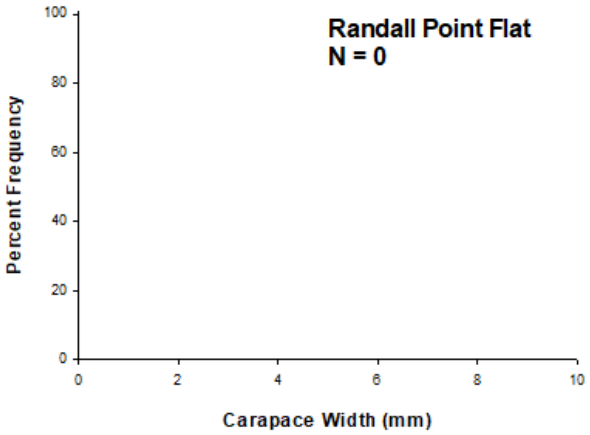
Beals:





Machiasport:





Edmunds/Trescott: No green crabs were sampled from boxes at all sites.

Sipayik: No green crabs were sampled from boxes at either site.

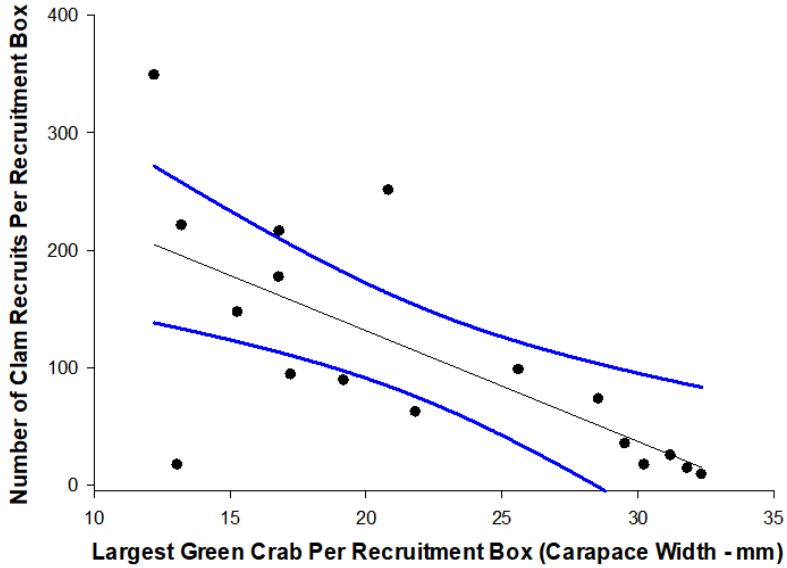
Appendix I: Relationship Between Largest Crab and Number of Clam Recruits

Southwest Region

Wells:

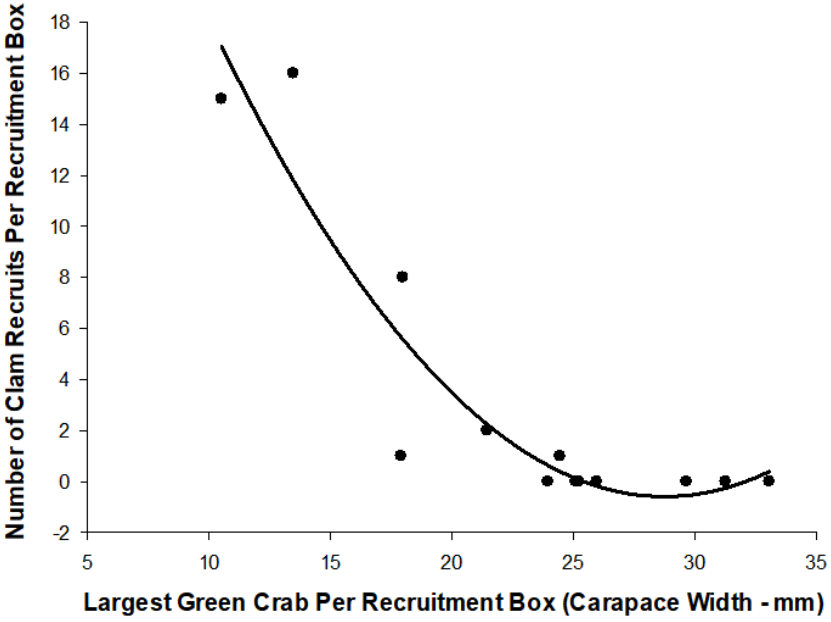
Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.167$; $P = 0.0475$). The linear equation is: $Y = -29.2 + 2.37X$. where Y = number of clam recruits and X = largest green crab/box. The blue line represents the 95% confidence interval associated with the line of best fit (regression line). There was no significant departure from a straight line ($F = 0.25$, $df = 2, 20$; $P = 0.780$).

Scarborough:



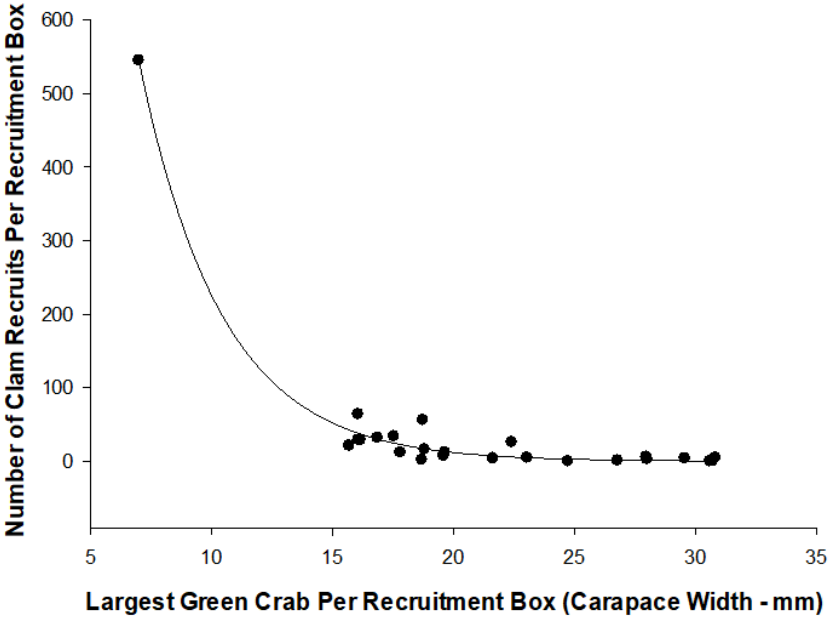
Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.678$; $P < 0.0001$). The linear equation is: $Y = 364.89 - 11.06X$. where Y = number of clam recruits and X = largest green crab/box. The blue line represents the 95% confidence interval associated with the line of best fit (regression line). There was no significant departure from a straight line ($F = 0.94$, $df = 2, 13$; $P = 0.417$).

Brunswick:



Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.876$; $P < 0.0001$). A lack-of-fit test determined that the data deviated significantly from a linear model ($F = 6.65$, $df = 2, 9$, $P = 0.0017$). A quadratic model fit the data best, and the equation is: $Y = 43.29 - 3.053X + 0.0531X^2$, where Y = number of clam recruits and X = largest green crab/box.

Phippsburg:

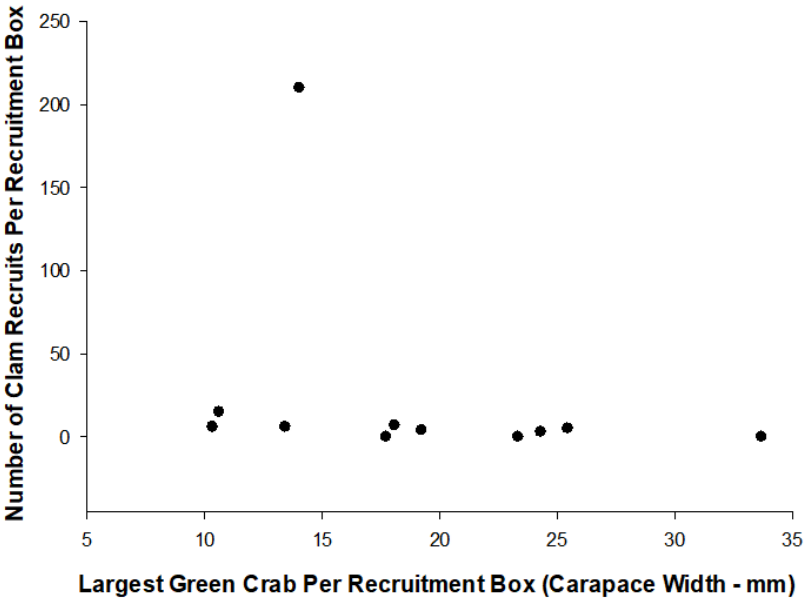


Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.986$; $P < 0.0001$). A lack-of-fit test determined that the data deviated significantly from a linear model ($F = 326.3$, $df = 2, 20$, $P < 0.0001$). A quadratic model was also not appropriate as a lack of fit from a quadratic model resulted in an $F = 88.6$, $df = 1, 20$, $P < 0.0001$). An exponential decay function with an equation: $Y = (a)(e^{-bx})$ best fit the data ($r^2 = 0.986$). Values for $a = 4.225 \times 10^3$, and $b = 0.2931$. Y = number of clam recruits and X = largest green crab/box.

Appendix I: Relationship Between Largest Crab and Number of Clam Recruits

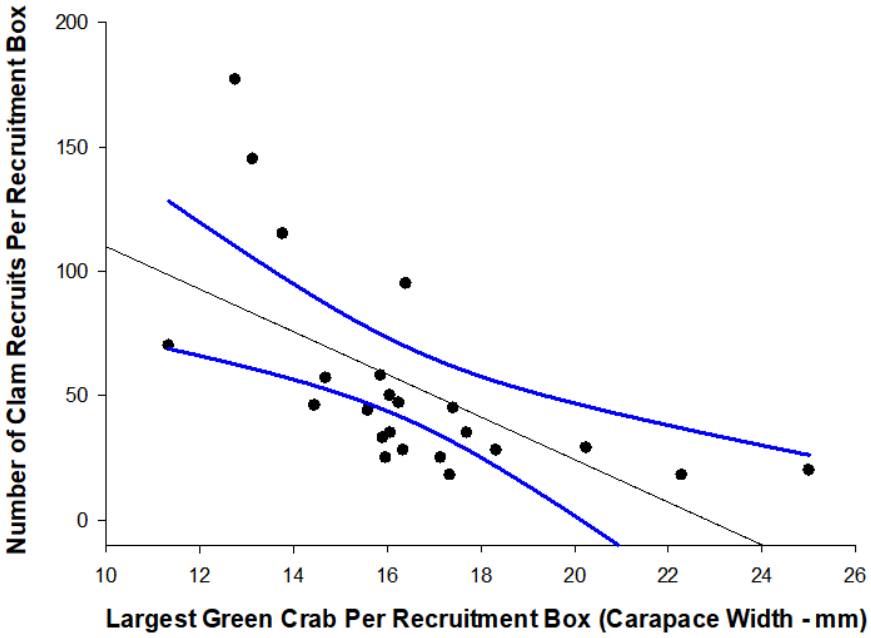
Midcoast Region

Bremen:



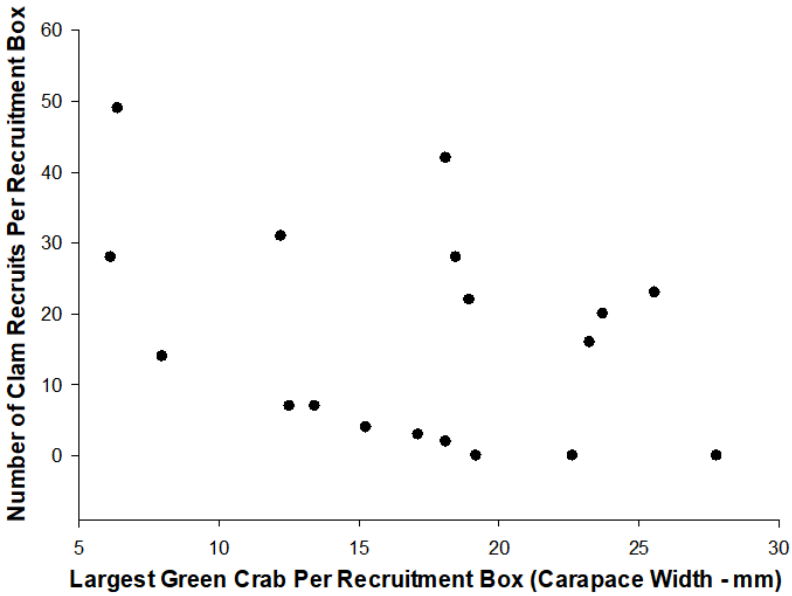
Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box (r^2 = 0.079; P = 0.403). There is no significant linear relationship, and a lack-of-fit test determined that a quadratic model was also not appropriate as a lack of fit from a quadratic model resulted in an F = 0.39, df = 1, 7, P < 0.552).

Islesboro:



Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box (r2 = 0.378; P = 0.002). A lack-of-fit test determined that there was no significant deviation from a linear model, which was appropriate for explaining the relationship (F = 2.69, df = 1, 19, P = 0.118; $\hat{Y}$ = 195.5-8.56X, where $\hat{Y}$ = number of clam recruits per recruitment box,and X=size of the largest green crab per recruitment box). The blue lines represent the 95% confidence interval around $\hat{Y}$, the line-of-best fit.

Stonington:



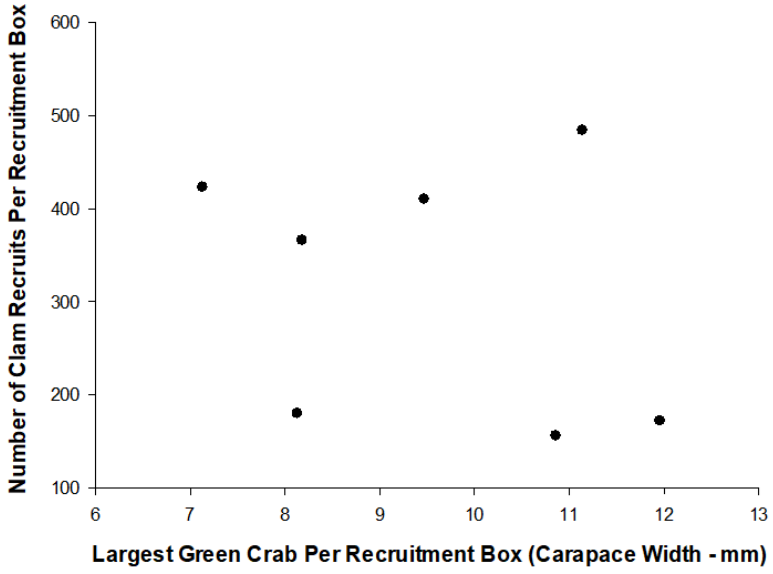
Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.142$; $P = 0.1235$). Neither a linear nor quadratic relationship was statistically significant.

Appendix I: Relationship Between Largest Crab and Number of Clam Recruits

Downeast Region

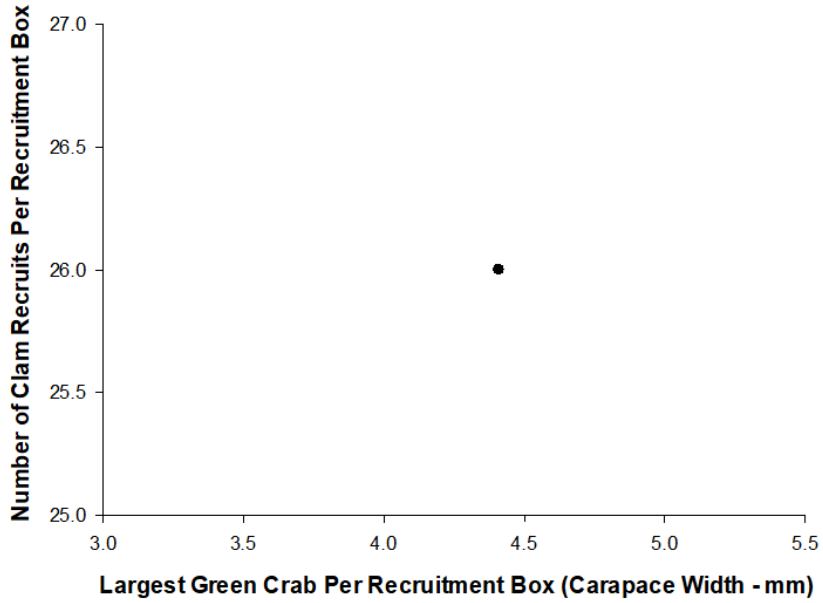
Frenchman Bay: No green crabs were sampled from either site.

Beals:



Relationship between number of soft-shell clam recruits per box vs. the largest crab in the same box ($r^2 = 0.081$; $P = 0.5359$). Neither a linear nor quadratic relationship was statistically significant.

Machiasport:



There is no relationship because there is only a single observation.

Edmunds/Trescott: No green crabs were sampled from boxes at all sites.

Sipayik: No green crabs were sampled from boxes at either site.