PEI Mussel Monitoring Program

2024 Report

Technical Report # 283

By

Gary Smith
Mussel Monitoring Technician

&

Aaron Ramsay
Aquaculture Biologist

Prince Edward Island Department of Fisheries, Tourism, Sport & Culture
Aquaculture Division
Charlottetown, PEI

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TABLE OF CONTENTS

SUMMARY

The information collected from the Mussel Monitoring Program (MMP) is provided to mussel growers and processors to assist in the management of their mussel farms and mussel harvesting plans. Staff of the Department of Fisheries, Tourism, Sport, and Culture (DFTSC) collected information related to mussel spat-fall, mussel meat yield, water temperature, the presence of potentially toxic algal species, tunicate larvae, and the presence of predators and fouling on mussel seed and grows-out lines. The information was collected from 19 mussel spat collection and growing areas over a period of 32 weeks in 2024.

Information on mussel spat-fall prediction and productivity (meat yield and shell growth) was collected from May 1st to December 2nd and on potentially toxic phytoplankton from September 3rd to December 2nd. Monitoring for the presence of potentially toxic phytoplankton was conducted in cooperation with the Canadian Food Inspection Agency (CFIA). The cooperation between CFIA and DFTSC has increased program efficiency. Water samples from mussel grow-out areas were examined for the presence of mussel larvae from early May to early December. Growers often delay raising their crop and the socking of new mussel seed in the fall until the mussel spawning period is over and larvae can no longer be detected. This information assists the growers in avoiding a second mussel set on both new and old mussel crop.

Mussel landings in 2023 were 34.3 million lbs., which was a decrease by almost 4.2 million lbs. over the landings in 2022. The landings for 2024 were not available at the time when this report was being prepared. The meat yield values of mussels collected from the monitoring stations in 2024 varied greatly (8 – 42 % European meat yield values) from area to area. The variation in meat yield values is a result of the new methodology to measure mussel productivity; high meat yield values of between 17 – 42 % (European meat yield) were reported early in the monitoring season (May) because juvenile mussels (~30 mm) were being used. This contrasts with years prior to 2016, in which mussels greater than 50 mm were used for meat yields. At the end of the monitoring season (November) European meat yields ranged from 11 – 22 % between monitoring sites.

Anecdotal reports from industry indicate that there was a good set of mussel seed in most areas this year.

Temperature data collected at each of the sample sites were within normal ranges for mussel growth and performance. During late July and early August, water temperatures are routinely nearing 25 °C on an annual basis. This is considered an upper threshold for mussel performance and survival and should be closely monitored over the upcoming summer production seasons.

Low counts of *Pseudo-nitzschia sp.* were recorded for all mussel production areas from the water samples collected for the toxic phytoplankton monitoring portion of the program. There have been no elevated levels of domoic acid detected in shellfish since the fall of 2006 and, as a result, there were no closures of mussel harvesting areas due to presence of these toxins. However, in 2023, Covehead and Brackley Bays were placed in closed status for much of the summer/fall due to the presence of Diarrhetic Shellfish Poison (DSP; a marine biotoxin produced by the dinoflagellate *Dinophysis*) in shellfish tissue. In 2024, closures were issued for Boughton River (June 14 - July 19) and Covehead/Brackley Bays (June 21 - August 15; size reduction on August 9) due to elevated DSP results. Elevated DSP also resulted in a precautionary closure for Darnley Basin (April 22 - 25).

Tunicates continue to cause fouling problems for many mussel growers, with high densities of vase tunicates occurring in Montague River, Brudenell River, St. Mary's Bay, Murray River, Boughton River, Cardigan River, and more recently, St. Peter's Bay, Tracadie Bay, Savage Harbour, Rustico Bay, Covehead Bay, New London Bay and Lennox Channel. The vase tunicate was detected in the Alberton Harbour area in the fall of 2021 by DFO Aquatic Invasive Species (AIS) monitoring collectors. Follow-up surveys of the area confirmed the presence of the vase tunicate on the floating docks in the harbour, as well as the clubbed tunicate. The vase tunicate is now considered to be well established in the harbour area; however, it had remained undetected outside of the harbour area until 2024. The vase tunicate was reported to be present in the March Water area of Malpeque Bay and Percival River late in 2024; follow-up is planned for 2025. The density of the clubbed tunicate remains high in Malpeque Bay (Lennox Channel, March Water, Darnley Basin) and Rustico Bay. The clubbed tunicate was detected on DFO's aquatic invasive species collector plates in St. Peter's Bay on September 5th, 2024 and it was also reported to be present in Tracadie Bay on October 27th, 2024; follow-up is planned for 2025. Both the clubbed and vase tunicates are being managed through treatment activities. For information on the locations of the vase tunicate and the clubbed tunicate in PEI, see the invasive species locator maps in Appendix V.

Tunicate larvae numbers, listed by species, are shown in Appendix I. Vase tunicate larvae were present in water samples from June 3rd until November 5th. The peak vase tunicate larval count was observed in water samples collected from Murray River on September 11th, with 23 larvae being counted in a 150 L water sample. Clubbed tunicate larvae were present in water samples collected in Malpeque Bay (Lennox Channel, March Water and Darnley Basin), New London Bay and Rustico Bay from June 11th until October 10th, peaking in Lennox Channel on August 12th with 104 larvae detected.

In 2024, with the detection of MSX in Island waters, sampling frequencies were temporarily reduced to allow adequate time for cleaning and disinfection between sample sites to reduce the risk of transferring the oyster disease.

Information collected over the 2024 season was communicated to mussel growers via the use of the Mussel Monitoring website at https://www.princeedwardisland.ca/en/feature/view-mussel-monitoring-results.

INTRODUCTION

The Prince Edward Island Mussel Monitoring Program (MMP) is a technical service provided to cultured mussel growers and processors by the Department of Fisheries, Tourism, Sport, and Culture (DFTSC). The MMP has operated annually since 1982 during the ice-free season providing mussel growers and processors with a variety of information to assist them in the management of their operations (Figure 1).

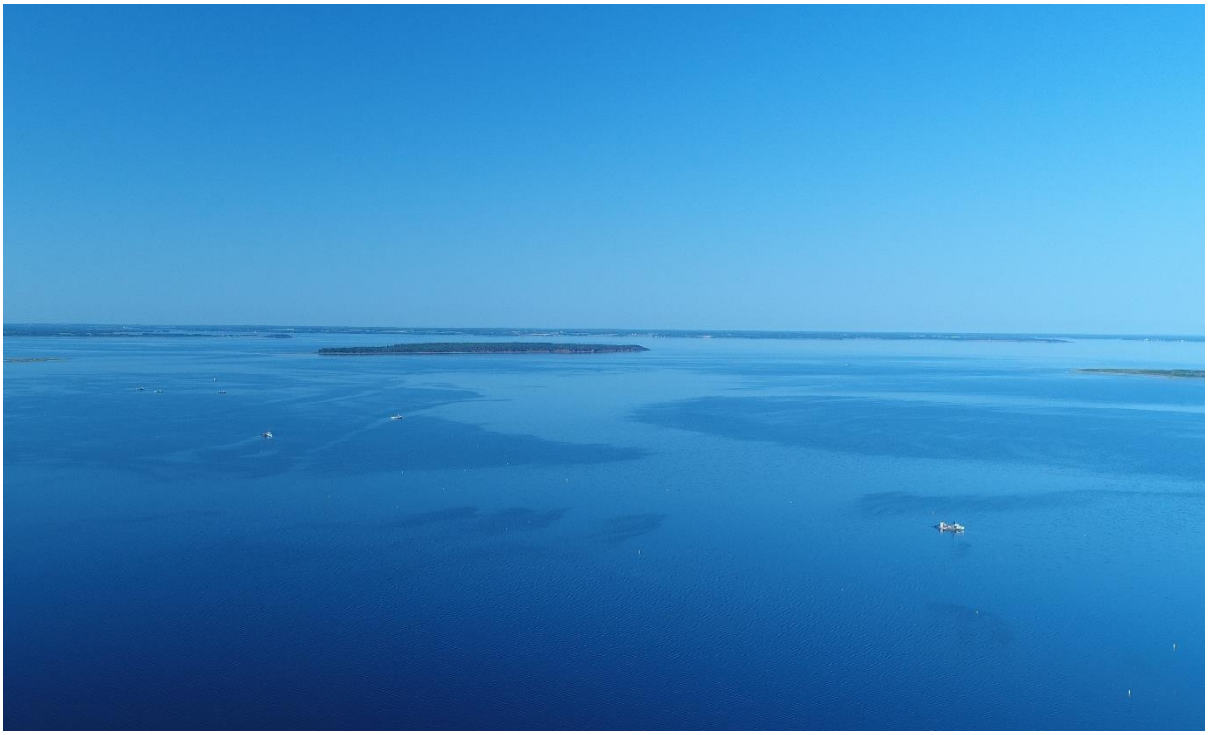


Figure 1. Several mussel boats working on their farms in the March Water area of Malpeque Bay (September 14, 2018).

Information is collected for the MMP on mussel spat-fall prediction, mussel meat yield analysis, water temperature, the detection and estimation of the numbers of potentially toxic algae species (such as the toxin producing diatom, *Pseudo-nitzschia sp.*, and dinoflagellates, *Alexandrium sp.* and *Dinophysis sp.*), the presence and number of tunicate larvae, and the presence and quantity of predators and fouling organisms.

The department has expanded the role of the MMP over time in response to requests for additional information from the mussel industry. Also, the information collected for this program is often utilized by other government and academic research agencies and additional

information has been collected for researchers when possible. The MMP has provided this assistance without substantially re-directing its resources from its mandate as a technical advisory service to the Prince Edward Island (PEI) mussel growers.

In 2023, the cultured mussel industry produced 34.3 million lbs. of product for market with a landed value of $29.1 million; a decrease in both landings (4.2 million lbs.) and value ($1.6 million), as compared to 2022 (Figure 2). The landings for 2024 were not available at the time when this report was being prepared. The mussel industry is an important contributor to the PEI economy and has resulted in the creation of an estimated 1,500 full-time jobs and numerous spin-off industries. The economic value of the industry to PEI is estimated at over $60 million dollars.

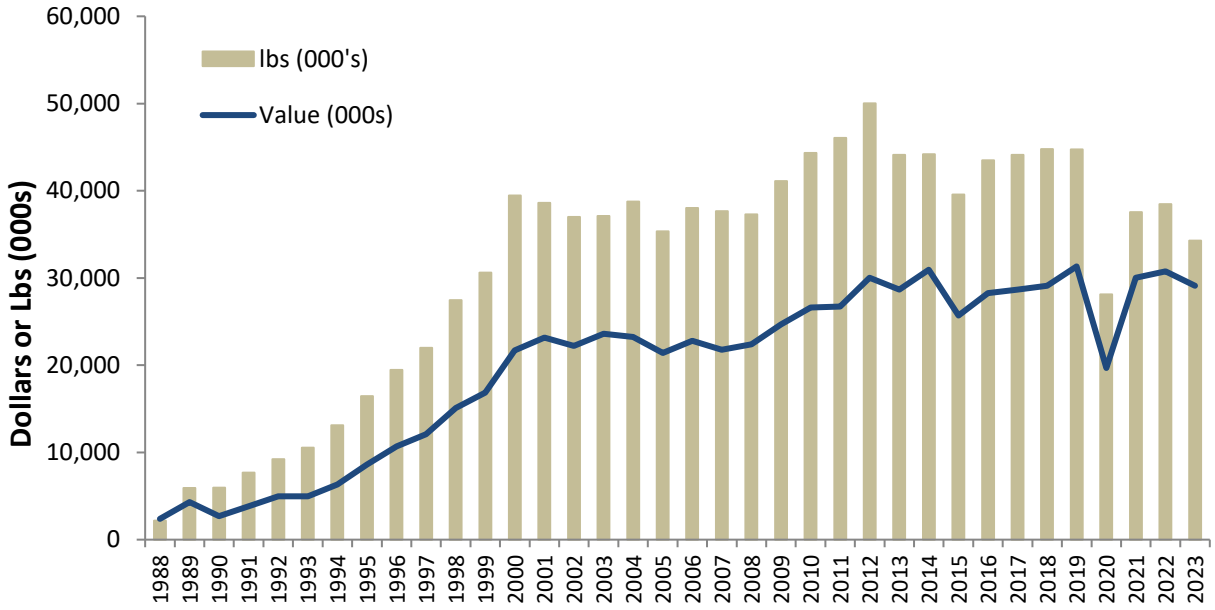


Figure 2. PEI mussel landings and values from 1988 to 2023.

The mussels grown in PEI waters are of high quality because the growing areas are abundant in food and have excellent water exchange. The rivers and bays on PEI are well sheltered from prevailing winds making them ideal for mussel aquaculture.

The objective of this report is to document the information that was communicated to mussel growers during the 2024 season through the MMP website. Early in 2021 the MMP website was updated https://www.princeedwardisland.ca/en/feature/view-mussel-monitoring-results.

MATERIALS AND METHODS

EQUIPMENT

- 17' Boston Whaler, 90 hp Yamaha outboard motor (Figure 3) and Shorelander boat trailer
- YSI temperature meter, HOBO automated temperature recorders, water pump (50L/minute capacity), 64 micron nitex screen for collecting mussel larvae, 20' clear plastic tubing (1.5" in diameter) and 2.5 gallon container
- Electronic weigh scale, calipers, and cooking equipment for meat yield analysis
- Microscope, slides and pipettes for mussel larvae and phytoplankton observation
- Vacuum pump and filtering apparatus for phytoplankton slide preparation
- Field books, sample bags and cooler
- Computer and printer to analyze and store data

Figure 3. MMP staff collecting samples in Brudenell River.

METHODS AND PROCEDURES

The data collected by the MMP is to provide information on six main areas related to mussel aquaculture:

1. Mussel spat-fall prediction
2. Mussel meat yield
3. Water temperature
4. Presence of potentially toxic phytoplankton
5. Tunicate larvae sampling
6. Predators and fouling organisms

Nineteen mussel growing/spat collection areas are sampled weekly for the MMP (Figure 4). Maps of the specific locations of each of the sample sites are displayed in Appendix II.

Figure 4. Sample collection sites for the Mussel Monitoring Program (blue = full monitoring site; orange = larval monitoring only; green = monitoring discontinued).

1. SPAT-FALL PREDICTION

The numbers and size range of mussel larvae were determined from water samples collected weekly at each sample location from early May until mid-July. This information was used to assist mussel growers in predicting the timing and abundance of mussel spat-fall. The growers use this information to determine when to either deploy, or to raise and clean their collectors to maximize spat collection. Mussel larvae information was also collected from July to late November at some grow-out sites to provide growers with information on mussel "second set". Some growers attempt to avoid or reduce the amount of second set from settling on market mussels by keeping the mussels submerged until mussel larvae are no longer detected in the water column. The growers also avoid the second set from settling on newly socked mussels by delaying the socking process until after the second set is complete.

To collect mussel larvae for this analysis, water samples are pumped from the top two to three meters of the water column through a 64 µm screen at the rate of 50 liters per minute for three minutes (Figure 5). The mussel larvae become trapped on the screen surface and are washed off with 10 mL of previously screened seawater into a sample bottle. A 1 mL subsample of the larval concentrate is examined utilizing a compound microscope to determine the abundance and average size of the mussel larvae. The quantity of mussel larvae present is quantified according to the following scale: Low = 1 – 5 Medium = 6 – 15 High = >15

Figure 5. Staff collecting "pump sample".

2. MUSSEL MEAT YIELD

Mussel socks with juvenile mussels (spat from previous fall, ~30mm in length) are collected at the beginning of the season in May and placed in wire cages at each monitoring station for meat yield analysis. In most cases, the monitoring cage was positioned near the mussel lease that is closest to the mouth of the bay or river and sits approximately 2 metres down from the surface of the water. The collection site of the mussel socks is recorded in the event that the monitoring cages need to be restocked; the same stock is used throughout the monitoring season to monitor productivity (meat yields and shell growth). The same stock of mussels (2023 spat collection) is

monitored for meat yield and shell growth through the monitoring season. Samples for meat yield analysis and shell growth were collected from each of the monitoring stations from early May to early December. The following procedure is used for the determination of mussel meat yields:

A. Thirty mussels are randomly selected and cleaned in fresh running water.

B. Mussels are steamed in the absence of water for five minutes, and then the meats are shucked from the shells.

C. The steamed meat yield, expressed as a percentage, is determined according to the formula: $$\% \text{ Meat Yield} = \frac{\text{Steamed Meat Weight}}{(\text{Steamed Shell} + \text{Steamed Meat Weight})} \times 100$$

D. The European meat yield, expressed as a percentage, is determined according to the formula: $$\% \text{ European Meat Yield} = \frac{\text{Steamed Meat Weight}}{\text{Raw Weight of Sample}} \times 100$$

Mussel meat yield information is beneficial to growers to assist in the determination of the mussel spawning condition in a river system. The information, when collected over a long-term basis, is of interest in the analysis of potential trends in mussel condition and productivity. This information is displayed graphically in Appendix IV.

3. WATER TEMPERATURE

Water temperatures were recorded from 1 to 2 metres below the surface at each site, at the time of each site visit, throughout the season. In addition, automatic temperature recording devices, set to record hourly temperature readings, were placed approximately 2 metres below the surface (attached to the monitoring cage) in several of the mussel growing areas. The hourly collected temperature data provided additional information on water temperature profiles throughout the ice-free season. This information assists growers in comparing temperature conditions with the development of mussel spawning condition over the season in various river systems. Also, if a shellfish mortality event occurs, it is beneficial to have information on temperatures over the season to assist in the investigation of the cause of the mortality. Temperature profiles taken from each of the mussel monitoring stations can be found in Appendix III and in Appendix I for specific sampling days.

4. PHYTOPLANKTON MONITORING

The monitoring for the presence of potentially toxic phytoplankton began on September 3rd and continued until December 2nd in 2024. It is during this time that toxic algae blooms have most frequently occurred in PEI waters. This portion of the program was conducted in conjunction with the Canadian Food Inspection Agency (CFIA) who shares in the collection of samples with staff of the MMP. The procedure utilized to collect, identify, and quantify potentially toxic algae is documented in the DFO procedures manual "*A field and laboratory manual for the collection, identification and enumeration of toxic marine phytoplankton*" by John C. Smith and Kevin Pauley.

Department staff collected water samples weekly from sites in Boughton River, Brudenell River, Cardigan River, Murray River, Nine Mile Creek, Orwell Bay, Savage Harbour, St. Mary's Bay, St. Peter's Bay and Tracadie Bay. Mussel samples were also collected by department staff from these sites for the CFIA toxin monitoring program. CFIA staff collected water and mussel samples from Darnley Basin, Lennox Channel, March Water, New London Bay, and Rustico Bay for both programs.

Information on the identification and quantity of potentially toxic phytoplankton species observed in the water samples was reported to CFIA and was made available to growers on the MMP website. The numbers of algal cells observed were reported according to the following scale: Trace = 1 - 1000 cells/L; Low = 1000 - 50,000 cells/L; Medium = 50,000 - 350,000 cells/L; High = greater than 350,000 cells /L.

The results of the phytoplankton analysis for 2024 are reported in the results section of this report (Appendix I). The information collected from this portion of the program is beneficial to provide both industry and CFIA with an early warning of the possibility of a bloom of potentially toxic algae occurring in an area. The presence of toxins in mussel tissue is monitored by CFIA, and closures are based upon these levels; however, the information on the types and quantity of phytoplankton present in the water column is invaluable as early warning that an event might occur. If the samples show that numbers of a potentially toxic algae species are present and increasing in a river system CFIA may increase their sampling of mussels from the area and industry can plan future mussel harvests avoiding the algae bloom and ensuring that a safe product is sold to the marketplace.

5. TUNICATE LARVAE

The numbers of tunicate larvae were counted in water samples collected from tunicate infested areas (see Appendix I for numbers of tunicate larvae). The purpose of obtaining the larvae numbers was to inform growers when the tunicates start and stop spawning, the species of tunicate larvae present, and to provide an indication of the number of larvae that were present over the season. Research results have shown that there may not be a direct correlation between the timing and density of tunicate recruitment and the observation of tunicate larvae and larvae densities in the water samples collected for MMP. However, the mussel industry has requested that this information be collected by the program. The information may show changing trends in tunicate populations over time. Tunicate counts were conducted weekly from mid May to late November. Water samples were collected by pumping water through a 64 µm sieve using a water pump at the rate of 50 L per minute for 3 minutes (a total of 150 L per sample). Tunicate larvae were identified and counted in the entire water sample. The larvae counts were made available for the growers on the MMP website.

6. PREDATOR AND FOULING MONITORING

Spat lines were periodically examined for the general appearance of the crop and for the presence of predators (such as starfish and sea ducks), fouling organisms such as algae, hydroids, tunicates or sea anemones and for the presence of silt. Mussel growers are notified of any potential problems that are noted by technical staff. If growers observe any unusual fouling organisms or aquatic invasive species that are outside of their known range, they are asked to either contact this department or Fisheries and Oceans Canada (DFO). Staff of either department will be available to identify the organisms and provide more information on the species. Information and maps showing the current known ranges of all aquatic invasive tunicates in PEI waters is available on the MMP website, in Appendix V of this report, or may be obtained by contacting staff of either our department or DFO.

REPORTING

The information collected from the MMP is made available throughout the field season through the mussel monitoring website. Mussel growers can access this information at any time. The web address is https://www.princeedwardisland.ca/en/feature/view-mussel-monitoring-results.

RESULTS AND DISCUSSION

Information collected on quantity and size ranges of mussel larvae, meat yields, water temperature, numbers of potentially toxic algae and tunicate larvae from each monitoring location are presented in the tables in Appendix I.

High numbers of setting size mussel larvae were observed in water samples at most locations from mid-June until early July (Figure 6). Anecdotal reports from industry indicate that there was a good set of mussel seed in many areas this year.

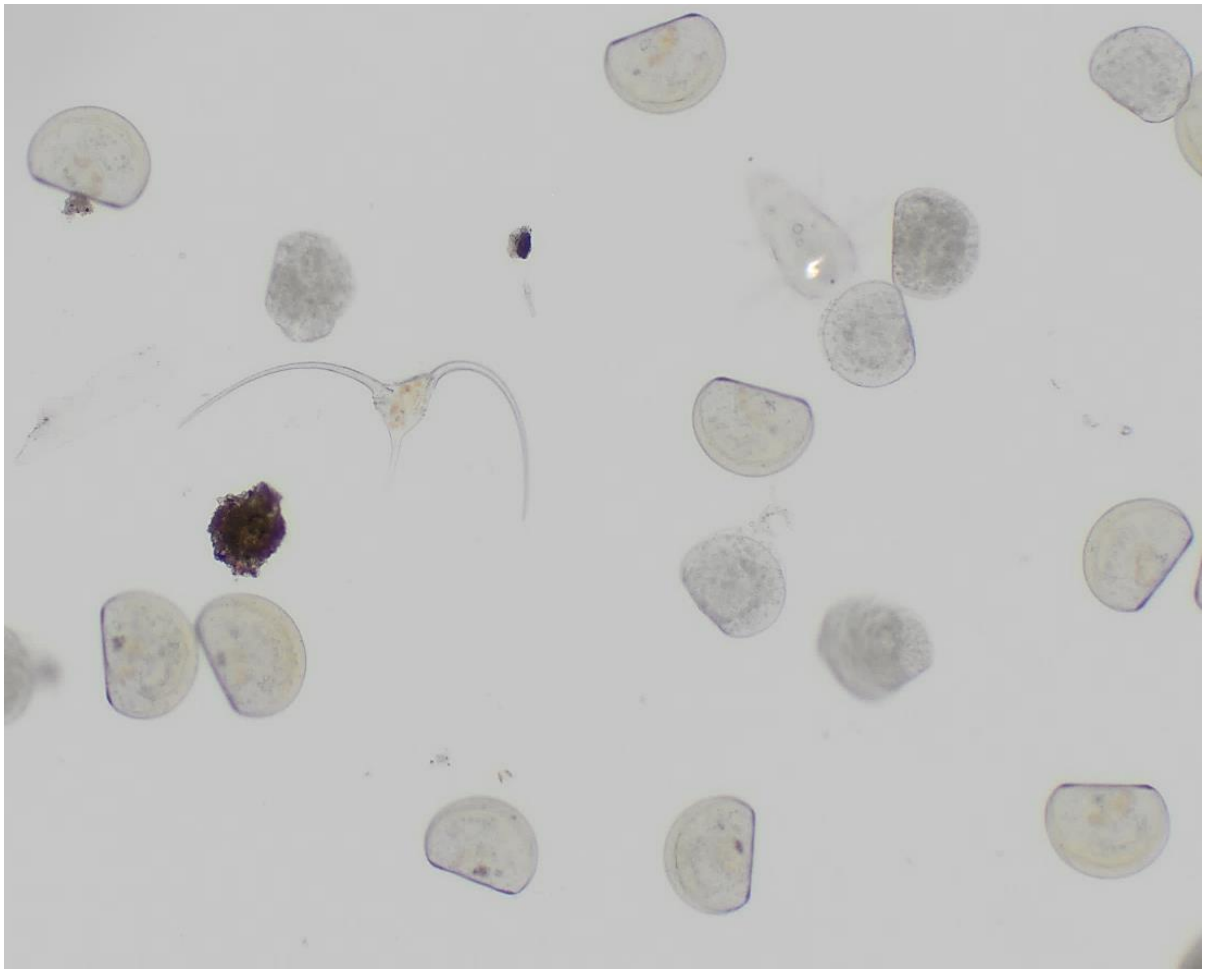


Figure 6. Mussel larvae (pre-set size) in Brudenell River on June 5th, 2023.

In 2024, low numbers (less than 50,000 cells/L) of *Pseudo-nitzschia sp.* cells were observed at all locations. The highest number of cells/L were observed in Cardigan River on October 22nd (24,500 cells/L). In past years, there were frequent fall blooms of *Pseudo-nitzschia sp.*, which provided a significant food source for cultured mussels prior to the winter period. However,

there have been no closures to mussel harvesting due to domoic acid toxicity since 2006. For example, in Cardigan River the numbers of *Pseudo-nitzschia sp.*, (a non-toxin producing form), peaked in the late fall of 2001 at 5.6 million cells/L of seawater and in 2002 at 9.3 million cells/L. In 2013, the peak numbers of *Pseudo-nitzschia sp.* cells was 3.2 million cells/L (Lennox Channel).

Tunicates continue to cause fouling problems for many mussel growers, with high densities of vase tunicates occurring in Montague River, Brudenell River, St. Mary's Bay, Murray River, Boughton River, Cardigan River, and more recently, St. Peter's Bay, Tracadie Bay, Savage Harbour, Rustico Bay, Covehead Bay, New London Bay and Lennox Channel. See below for follow-up on recent reports on the vase and clubbed tunicates in areas where its presence has not been confirmed.

On October 19th, 2021, DFO Science notified the department that a vase tunicate had been identified on their collectors in the Alberton Harbour area. Follow-up surveys (October 21, 2021; August 24, 2022; August 29, 2023, and again on June 3, 2024 – See Figure 7) of the area confirmed the presence of the vase tunicate on the floating docks in the harbour, as well as the clubbed tunicate, but it was not detected outside of the harbour area. However, the vase tunicate was confirmed outside of the harbour area (by DFO) in November, 2024. There have also been industry reports of its presence in the Dock River and Foxley areas.

Figure 7. Map of area surveyed (grey dots) in the Foxley area for the vase tunicate on June 3rd, 2024 (*left*) and staff checking an oyster cage for aquatic invasive species (*right*).

Industry reported the presence of a single vase tunicate on their aquaculture gear in Lennox Channel on December 27th, 2023. A follow-up survey was completed on June 6&11th, 2024 (see Figure 8); the vase tunicate was not detected. However, it was confirmed on oyster gear in early June. There have been unconfirmed reports of its presence in the March Water area.

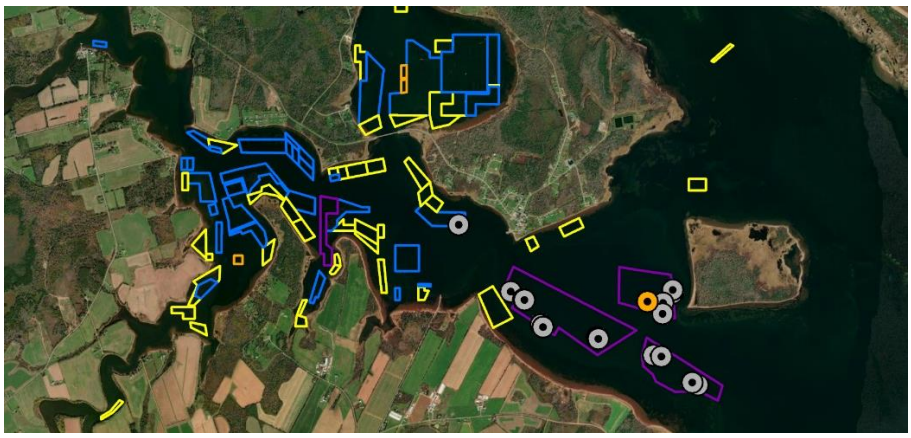


Figure 8. Map of area surveyed in the Lennox Channel area for the vase tunicate on June 6&11th, 2024 (orange dot = initial report; grey dots = areas checked on June 6&11th)

The density of the clubbed tunicate remains high in Malpeque Bay (Lennox Channel, March Water and Darnley Basin) and Rustico Bay. New detections of the clubbed tunicate in 2024 include (1) St. Peter's Bay – confirmed on DFO collectors on September 5, 2024, and (2) unconfirmed report of its presence in Tracadie Bay on October 27, 2024 (Figure 9).

Figure 9. Clubbed tunicate on collectors in St. Peter's Bay on September 5th (*left*) and on mussel culture gear in Tracadie Bay on October 27th (*right*).

Both the clubbed and vase tunicates are being managed through treatment activities. For information on the locations of the vase tunicate and the clubbed tunicate in PEI, see the invasive species locator maps in Appendix V.

Tunicate larvae numbers, listed by species, are shown in Appendix I. Vase tunicate larvae (Figure 10) were present in water samples from June 3rd until November 5th. The peak vase tunicate larval count was observed in water samples collected in Murray River on September 11th, with 23 larvae being counted in a 150 L water sample. Clubbed tunicate larvae were present in water samples collected in Malpeque Bay (Lennox Channel, March Water and Darnley Basin), New London Bay and Rustico Bay from June 11th until October 10th, peaking in Lennox Channel on August 12th with 104 larvae detected.

Figure 10. Microscopic view of a vase tunicate larvae that was in a water sample collected in St. Peter's Bay on June 5th, 2023.

The department continues to be involved in a project to gather more water quality information in several mussel producing areas. Water quality meters collect information on water temperature, salinity, dissolved oxygen, chlorophyll (indicator of phytoplankton), fDOM (indicator of other organic material that could be a food source), pH and turbidity. This will give a baseline to compare to future years, possibly enabling the prediction of shellfish growth rates. On a longer-term basis, this information could be used to determine best bay management practices to optimize growth/production within a bay/river. Ultimately, that is the end goal in the collection of this data, but it will take more time to determine trends within growing areas. This is especially important with the issue of climate change, as our weather patterns become more unpredictable. More recently, the department has been investigating the use of a FlowCam (Figure 11) to potentially enhance (i.e. quantify multiple species of plankton in a single water sample) the information that is currently collected in water samples. This is being conducted through a collaboration with DFO's Marine Spatial Planning and Marine Environmental Quality group.

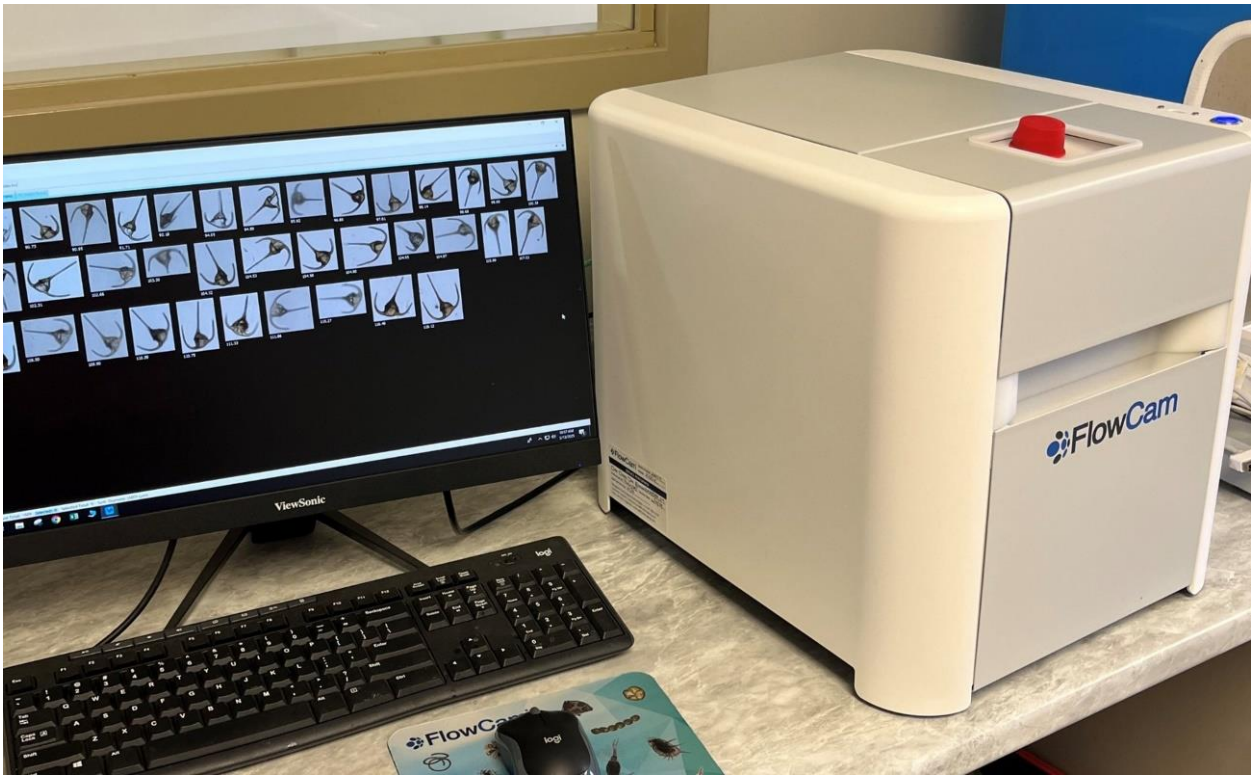


Figure 11. FlowCam being used to quantify phytoplankton in water samples.

The mussel industry has grown significantly from its small beginnings in the 1980s. Throughout the development of the industry there have been numerous challenges to overcome. Through perseverance, hard work and ingenuity, the mussel industry continues to overcome challenges and continues to produce a high-quality product (Figure 12).

Figure 12. Mussel socks in Tracadie Bay on May 12th, 2023.

APPENDIX I MUSSEL MONITORING DATA BY AREA

Bentick Cove									
Date	**Water Temp**	**Mussel larvae**	**Size (microns)**	**% Pre-set**	**% Set-size**	**Steamed Meat Yield**	**European Meat Yield**	***#Pseudo-nitzschia* (cells/L)**	**Tunicate Larvae**
Jun 04	14.2	High	90-190	100	0	- - - -	- - - -	- - - -	- - - -
Jun 12	18.2	High	90-240	100	0	- - - -	- - - -	- - - -	- - - -
Jun 20	21.7	High	90-290	98	2	- - - -	- - - -	- - - -	- - - -
The setting of mussel larvae occurs when they reach a size of at least 250 microns. Setting started in this area approximately June 20, 2024.									

Boughton River

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 01	5.0	0	- - - -	0	0	37	23	- - - -	0
May 08	7.6	0	- - - -	0	0	39	23	- - - -	0
May 15	9.4	0	- - - -	0	0	39	24	- - - -	0
May 23	13.8	Med	90-110	100	0	N/A	N/A	- - - -	0
May 29	11.9	Med	90-120	100	0	36	19	- - - -	0
Jun 04	13.2	High	90-190	100	0	31	15	- - - -	0
Jun 13	15.7	High	90-210	100	0	31	15	- - - -	0
Jun 19	17.3	High	90-240	100	0	27	12	- - - -	0
Jun 26	16.9	High	90-280	98	2	29	14	- - - -	1C
Jul 04	18.5	High	90-320	90	10	32	16	- - - -	1C
Jul 17	22.2	High	90-360	75	25	31	15	- - - -	1C
Jul 29	21.8	Low	110-310	50	50	29	13	- - - -	9C 1S
Aug 09	21.3	Low	110-290	50	50	26	12	- - - -	1C
Aug 23	21.9	Med	110-390	20	80	25	12	- - - -	2C
Sep 05	18.8	Low	110-140	100	0	24	13	0	4C
Sep 10	18.5	Low	110-290	50	50	24	12	600	4C
Sep 18	19.0	Low	120-200	100	0	26	14	0	2C
Oct 01	16.2	Med	140-360	50	50	24	12	1000	2C
Oct 07	15.7	Low	260	0	100	27	14	0	1C
Oct 15	11.4	Med	250-320	0	100	28	14	0	2C
Oct 22	11.6	Low	350	0	100	29	14	3200	7C
Oct 30	8.4	0	- - - -	0	0	25	14	700	0
Nov 05	7.9	0	- - - -	0	0	25	15	200	0
Nov 18	7.4	0	- - - -	0	0	24	15	0	0
Nov 26	6.7	0	- - - -	0	0	24	12	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 26, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Brudenell River

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 02	4.8	0	- - - -	0	0	52	32	- - - -	0
May 14	7.3	0	- - - -	0	0	50	29	- - - -	0
May 23	11.1	High	90-110	100	0	45	24	- - - -	0
May 30	12.0	Med	90-140	100	0	44	22	- - - -	0
Jun 06	11.2	High	90-190	100	0	44	23	- - - -	0
Jun 12	14.1	High	90-250	98	2	44	23	- - - -	1C
Jun 18	11.4	High	90-270	95	5	43	22	- - - -	0
Jun 26	16.0	High	90-300	95	5	43	23	- - - -	0
Jul 04	17.8	High	90-350	85	15	45	26	- - - -	3C
Jul 16	18.6	High	90-330	75	25	38	19	- - - -	1S
Jul 25	19.0	Med	110-300	50	50	35	17	- - - -	1C 1S
Aug 07	19.8	Med	110-360	30	70	33	16	- - - -	5C 4S
Aug 20	21.6	High	110-380	29	14	29	14	- - - -	4C
Sep 04	18.7	Low	120-180	100	0	32	18	700	2C
Sep 11	18.2	Low	110-120	100	0	30	15	0	3C 3S
Sep 17	17.9	Low	120-260	50	50	30	14	0	3C 1S
Sep 25	17.0	0	- - - -	0	0	29	14	0	2C
Oct 07	15.7	0	- - - -	0	0	28	15	300	3C
Oct 17	9.5	0	- - - -	0	0	28	15	1000	2C
Oct 22	10.7	Low	250-330	0	100	31	18	0	1C
Oct 30	8.7	0	- - - -	0	0	33	19	0	0
Nov 05	8.7	0	- - - -	0	0	26	15	0	0
Nov 14	7.0	0	- - - -	0	0	N/A	N/A	0	0
Nov 18	7.1	0	- - - -	0	0	28	15	0	0
Nov 28	6.8	0	- - - -	0	0	27	13	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 12, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Cardigan River

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	*#Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 01	3.7	0	- - - -	0	0	N/A	N/A	- - - -	0
May 08	5.5	0	- - - -	0	0	N/A	N/A	- - - -	0
May 15	9.3	0	- - - -	0	0	N/A	N/A	- - - -	0
May 23	9.5	High	90-120	100	0	N/A	N/A	- - - -	0
May 29	10.8	Med	90-120	100	0	N/A	N/A	- - - -	0
Jun 04	10.5	High	90-180	100	0	53	32	- - - -	0
Jun 13	14.5	High	90-210	100	0	43	23	- - - -	0
Jun 19	12.2	High	90-240	100	0	41	20	- - - -	0
Jun 26	16.4	High	90-290	98	2	40	21	- - - -	0
Jul 04	18.8	High	90-300	90	10	37	17	- - - -	1C 4S
Jul 16	21.2	High	90-350	80	20	31	14	- - - -	0
Jul 25	20.1	Med	90-350	60	40	40	21	- - - -	2S
Aug 07	19.9	Med	110-380	30	70	37	20	- - - -	1C
Aug 22	22.2	High	110-380	10	90	33	17	- - - -	1C
Sep 05	18.5	Low	110-130	100	0	27	13	2300	2C
Sep 10	18.3	Low	120-300	20	80	29	15	400	5C
Sep 18	18.1	Low	140-310	30	70	26	13	0	1C 1S
Sep 25	17.1	Low	290-320	0	100	28	15	0	12C
Oct 01	16.2	Low	280-310	0	100	25	12	1400	0
Oct 07	15.9	0	- - - -	0	0	27	14	0	6C
Oct 15	11.4	Med	260-350	0	100	26	12	7900	2C
Oct 22	10.7	Low	300-350	0	100	28	15	24500	1C
Oct 30	9.3	Low	250-350	0	100	27	13	1300	0
Nov 05	8.4	0	- - - -	0	0	28	15	200	0
Nov 14	7.3	0	- - - -	0	0	N/A	N/A	0	0
Nov 18	7.6	0	- - - -	0	0	37	22	0	0
Nov 26	7.2	0	- - - -	0	0	36	19	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 26, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Darnley Basin

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 10	6.6	0	- - - -	0	0	N/A	N/A	- - - -	0
May 13	9.4	0	- - - -	0	0	N/A	N/A	- - - -	0
May 22	13.7	Low	90-110	100	0	46	26	- - - -	0
May 27	12.8	Low	90-120	100	0	44	26	- - - -	0
Jun 11	14.1	High	90-240	100	0	38	21	- - - -	0
Jun 21	18.6	High	90-280	98	2	36	18	- - - -	1S
Jun 27	18.5	High	90-300	95	5	36	18	- - - -	3S
Jul 02	19.8	Med	90-290	85	15	33	19	- - - -	0
Jul 08	19.8	High	90-290	80	20	38	19	- - - -	1S
Jul 17	22.7	High	90-310	70	30	35	17	- - - -	3S
Jul 23	22.4	Med	90-350	60	40	35	17	- - - -	27S
Jul 30	22.8	Med	90-280	60	40	33	16	- - - -	3S
Aug 08	21.4	Low	110-310	20	80	32	16	- - - -	8S
Aug 30	18.8	Low	120-320	50	50	28	14	- - - -	2S
Sep 04	17.7	Low	120-160	100	0	27	14	0	2S
Sep 12	17.5	Low	110-140	100	0	28	15	0	1S
Sep 18	19.2	Low	120-200	100	0	31	17	0	1S
Sep 23	16.3	Low	120-150	100	0	N/A	N/A	0	2S
Oct 02	14.7	0	- - - -	0	0	28	16	0	0
Oct 10	13.2	0	- - - -	0	0	28	15	0	0
Oct 24	11.5	0	- - - -	0	0	27	16	0	0
Nov 12	5.7	0	- - - -	0	0	27	17	0	0
Nov 27	5.6	0	- - - -	0	0	27	16	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately Jun 21, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Grand River									
Date	**Water Temp**	**Mussel larvae**	**Size (microns)**	**% Pre-set**	**% Set-size**	**Steamed Meat Yield**	**European Meat Yield**	***#Pseudo-nitzschia* (cells/L)**	**Tunicate Larvae**
Jun 04	14.8	High	90-180	100	0	- - - -	- - - -	- - - -	- - - -
Jun 12	17.7	High	90-230	100	0	- - - -	- - - -	- - - -	- - - -
Jun 20	21.7	High	90-270	98	2	- - - -	- - - -	- - - -	- - - -
Jun 25	19.3	High	90-280	95	5	- - - -	- - - -	- - - -	- - - -
The setting of mussel larvae occurs when they reach a size of at least 250 microns. Setting started in this area approximately June 20, 2024.									

Lennox Channel

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 13	9.1	0	- - - -	0	0	N/A	N/A	- - - -	0
May 22	14.8	Med	90-110	100	0	41	25	- - - -	0
May 27	14.2	Med	90-120	100	0	41	26	- - - -	0
Jun 11	16.5	High	90-240	100	0	31	18	- - - -	1S
Jun 24	19.1	High	90-290	98	2	27	15	- - - -	1S
Jul 02	19.4	High	90-320	90	10	26	15	- - - -	1S
Jul 09	21.1	High	90-320	80	20	25	12	- - - -	0
Jul 16	23.0	High	90-310	75	25	24	11	- - - -	1S
Aug 01	23.8	Low	120-320	50	50	22	10	- - - -	11S
Aug 08	22.6	Low	120-330	50	50	22	10	- - - -	7S
Aug 12	22.6	Low	110-210	100	0	21	10	- - - -	104S
Aug 28	22.1	Low	110-140	100	0	19	9	- - - -	19S
Sep 04	18.3	Low	110-140	100	0	23	12	0	1S
Sep 12	17.6	Low	260-320	0	100	21	10	400	2S
Sep 18	18.7	Low	140-300	50	50	23	12	0	2S
Sep 23	16.9	Low	280	0	100	22	13	0	1S
Oct 02	15.0	0	- - - -	0	0	23	14	0	0
Oct 10	11.0	0	- - - -	0	0	N/A	N/A	800	13S
Oct 24	11.2	0	- - - -	0	0	22	12	900	0
Nov 12	6.1	0	- - - -	0	0	26	15	0	0
Nov 27	5.5	0	- - - -	0	0	24	15	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 24, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

March Water

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 10	7.4	0	- - - -	0	0	N/A	N/A	- - - -	0
May 13	8.7	0	- - - -	0	0	N/A	N/A	- - - -	0
May 22	14.1	Med	90-110	100	0	47	29	- - - -	0
May 27	14.0	Med	90-130	100	0	46	28	- - - -	0
Jun 07	14.6	High	90-190	100	0	34	17	- - - -	0
Jun 11	15.8	High	90-260	98	2	33	17	- - - -	0
Jun 21	20.7	High	90-290	95	5	29	14	- - - -	3S
Jun 27	18.9	High	90-320	95	5	27	13	- - - -	0
Jul 02	19.5	Med	90-300	85	15	26	14	- - - -	1S
Jul 08	19.5	High	90-300	80	20	27	13	- - - -	1S
Jul 23	22.5	Low	110-330	50	50	24	11	- - - -	1S
Aug 08	22.5	Low	120-280	50	50	22	10	- - - -	5S
Aug 30	20.0	Low	110-160	100	0	22	10	- - - -	26S
Sep 04	18.0	Low	260	0	100	21	11	0	2S
Sep 12	17.5	Low	120-200	100	0	20	10	0	1S
Sep 18	18.5	Low	130-220	100	0	22	12	0	1S
Sep 22	16.6	0	- - - -	0	0	18	9	0	1S
Oct 02	14.8	0	- - - -	0	0	N/A	N/A	0	0
Oct 10	13.6	0	- - - -	0	0	15	8	0	1S
Oct 24	11.0	0	- - - -	0	0	24	13	0	0
Nov 12	5.4	0	- - - -	0	0	25	15	0	0
Nov 27	5.5	0	- - - -	0	0	26	15	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 11, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Murray River

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 02	5.9	0	- - - -	0	0	48	29	- - - -	0
May 08	6.2	0	- - - -	0	0	42	20	- - - -	0
May 14	8.8	0	- - - -	0	0	46	24	- - - -	0
May 23	12.1	0	- - - -	0	0	38	17	- - - -	0
May 30	12.5	Low	90-129	100	0	37	17	- - - -	4C
Jun 05	14.0	Med	90-190	100	0	38	18	- - - -	0
Jun 12	14.6	High	90-240	100	0	37	17	- - - -	0
Jun 18	15.6	High	90-270	98	2	32	15	- - - -	3C
Jul 04	16.9	High	90-320	90	10	32	15	- - - -	1C
Jul 15	21.4	High	90-300	80	20	28	12	- - - -	1C 1S
Jul 26	20.7	Med	110-330	50	50	30	15	- - - -	9C 5S
Aug 06	21.9	Med	90-380	20	80	24	11	- - - -	3C
Aug 19	21.3	High	110-390	20	80	21	9	- - - -	6C
Sep 04	18.3	Low	120-220	100	0	21	10	0	9C
Sep 11	18.8	Low	110-130	100	0	20	9	0	23C
Sep 17	18.6	Low	130-150	100	0	23	10	700	14C 2S
Oct 01	15.9	Med	120-350	10	90	22	10	400	12C 2S
Oct 07	15.7	0	- - - -	0	0	23	11	0	14C
Oct 27	11.7	0	- - - -	0	0	27	14	3300	2C
Nov 05	7.8	0	- - - -	0	0	23	11	500	4C
Nov 18	7.4	0	- - - -	0	0	25	12	0	0
Nov 28	6.2	0	- - - -	0	0	25	12	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately Jun 18, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

New London Bay

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 06	7.4	0	- - - -	0	0	48	32	- - - -	0
May 16	11.3	0	- - - -	0	0	48	30	- - - -	0
May 24	14.1	Med	90-110	100	0	49	31	- - - -	0
May 31	13.9	Med	90-130	100	0	48	31	- - - -	0
Jun 07	13.9	Med	90-180	100	0	47	29	- - - -	0
Jun 11	14.8	High	90-230	100	0	46	28	- - - -	0
Jun 20	19.4	High	90-280	98	2	34	18	- - - -	3S
Jun 28	18.1	High	90-300	85	15	33	18	- - - -	0
Jul 05	18.0	High	90-350	85	15	31	15	- - - -	4S
Jul 12	21.1	High	90-310	75	25	32	18	- - - -	1S
Jul 23	21.4	High	90-340	60	40	31	16	- - - -	2S
Aug 02	23.3	Low	110-330	50	50	30	15	- - - -	22S
Aug 14	22.2	Low	120-220	100	0	30	16	- - - -	0
Aug 27	22.0	Low	120-220	100	0	27	13	- - - -	4S
Sep 04	18.1	Low	120-200	100	0	26	14	- - - -	0
Sep 12	17.8	Low	250-280	0	100	26	14	0	2S
Sep 18	18.7	Low	260-330	0	100	25	13	1000	2S
Sep 23	16.7	Low	120-130	100	0	27	15	2700	0
Oct 02	14.2	0	- - - -	0	0	27	17	13400	0
Oct 10	13.8	0	- - - -	0	0	25	14	500	1S
Oct 24	11.7	0	- - - -	0	0	27	16	0	0
Nov 12	6.0	0	- - - -	0	0	28	16	0	0
Nov 22	5.6	0	- - - -	0	0	29	15	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 20, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Nine Mile Creek

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	*#Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 01	5.4	0	- - - -	0	0	57	42	- - - -	- - - -
May 08	7.7	0	- - - -	0	0	55	40	- - - -	- - - -
May 15	8.5	0	- - - -	0	0	55	41	- - - -	- - - -
May 22	12.8	High	90-110	100	0	44	28	- - - -	- - - -
May 31	13.4	High	90-140	100	0	44	27	- - - -	- - - -
Jun 06	11.3	High	90-180	100	0	44	26	- - - -	- - - -
Jun 13	13.8	High	90-260	98	2	44	27	- - - -	- - - -
Jun 17	15.8	High	90-270	98	2	43	27	- - - -	- - - -
Jun 26	15.1	High	90-290	98	2	33	18	- - - -	- - - -
Jul 05	17.5	High	90-290	90	10	30	16	- - - -	- - - -
Jul 10	18.1	Med	90-320	80	20	33	18	- - - -	- - - -
Jul 17	21.0	Med	90-320	75	25	31	16	- - - -	- - - -
Jul 30	20.8	Low	110-290	50	50	28	15	- - - -	- - - -
Aug 06	21.0	Low	110-180	100	0	27	14	- - - -	- - - -
Aug 13	20.5	Low	110-190	100	0	27	13	- - - -	- - - -
Aug 26	21.3	Low	110-130	100	0	25	12	- - - -	- - - -
Sep 03	18.5	Med	120-340	50	50	27	14	1600	- - - -
Sep 10	18.5	Low	110-380	50	50	26	14	200	- - - -
Sep 19	18.0	Med	250-340	0	100	31	18	1900	- - - -
Sep 26	17.0	Low	310	0	100	30	16	0	- - - -
Oct 01	N/A	Low	250	0	100	30	17	400	- - - -
Oct 09	15.2	0	- - - -	0	0	31	18	0	- - - -
Oct 21	12.6	0	- - - -	0	0	32	20	0	- - - -
Oct 29	10.2	0	- - - -	0	0	33	20	0	- - - -
Nov 04	8.0	0	- - - -	0	0	33	20	600	- - - -
Nov 12	7.8	0	- - - -	0	0	32	18	0	- - - -
Nov 27	N/A	0	- - - -	0	0	33	21	0	- - - -

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 13, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

North Lake									
Date	**Water Temp**	**Mussel larvae**	**Size (microns)**	**% Pre-set**	**% Set-size**	**Steamed Meat Yield**	**European Meat Yield**	***#Pseudo-nitzschia* (cells/L)**	**Tunicate Larvae**
Jun 03	9.8	Low	90-140	100	0	- - - -	- - - -	- - - -	- - - -
Jun 10	11.0	Low	110-160	100	0	- - - -	- - - -	- - - -	- - - -
Jun 17	15.4	High	90-190	100	0	- - - -	- - - -	- - - -	- - - -
Jun 24	18.4	High	90-220	100	0	- - - -	- - - -	- - - -	- - - -
The setting of mussel larvae occurs when they reach a size of at least 250 microns. Set-size larvae were not observed.									

Orwell Bay

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 01	6.8	0	- - - -	0	0	57	39	- - - -	- - - -
May 07	7.6	0	- - - -	0	0	57	39	- - - -	- - - -
May 15	10.0	0	- - - -	0	0	54	37	- - - -	- - - -
May 22	12.5	Med	90-110	100	0	56	38	- - - -	- - - -
May 31	14.2	High	90-140	100	0	46	26	- - - -	- - - -
Jun 06	12.1	High	90-200	100	0	47	27	- - - -	- - - -
Jun 13	16.1	Med	90-260	98	2	46	25	- - - -	- - - -
Jun 19	18.3	Med	90-270	98	2	38	20	- - - -	- - - -
Jul 04	18.1	Med	90-300	90	10	38	21	- - - -	- - - -
Jul 09	20.4	High	90-350	80	20	37	19	- - - -	- - - -
Jul 25	20.8	Low	110-340	50	50	33	17	- - - -	- - - -
Jul 29	21.7	Low	110-380	50	50	32	16	- - - -	- - - -
Aug 09	22.5	Low	110-300	50	50	29	13	- - - -	- - - -
Aug 12	22.4	Low	110-220	100	0	27	13	- - - -	- - - -
Aug 26	22.4	Low	120-320	50	50	31	15	- - - -	- - - -
Sep 05	18.8	Low	120-200	100	0	28	14	3400	- - - -
Sep 11	17.7	Low	120-160	100	0	33	18	0	- - - -
Sep 18	19.2	Low	120-140	100	0	30	17	0	- - - -
Sep 26	17.0	0	- - - -	100	0	30	14	400	- - - -
Oct 03	16.0	0	- - - -	0	0	29	16	0	- - - -
Oct 08	N/A	0	- - - -	0	0	27	15	600	- - - -
Oct 17	10.9	0	- - - -	0	0	28	16	0	- - - -
Oct 22	N/A	0	- - - -	0	0	28	16	0	- - - -
Oct 30	7.2	0	- - - -	0	0	29	17	0	- - - -
Nov 04	7.0	0	- - - -	0	0	29	15	200	- - - -
Nov 12	7.0	0	- - - -	0	0	30	17	0	- - - -
Nov 27	N/A	0	- - - -	0	0	30	17	0	- - - -

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 13, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Rustico Bay

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 06	8.3	0	- - - -	0	0	- - - -	- - - -	- - - -	0
May 16	11.0	0	- - - -	0	0	- - - -	- - - -	- - - -	0
May 24	15.4	High	90-120	100	0	- - - -	- - - -	- - - -	0
May 31	13.4	High	90-150	100	0	- - - -	- - - -	- - - -	0
Jun 07	13.9	Med	90-180	100	0	- - - -	- - - -	- - - -	0
Jun 14	17.5	High	90-270	98	2	- - - -	- - - -	- - - -	0
Jun 20	21.5	High	90-280	95	5	- - - -	- - - -	- - - -	0
Jun 28	18.6	High	90-290	85	15	- - - -	- - - -	- - - -	1S
Jul 09	20.6	Med	110-300	80	20	- - - -	- - - -	- - - -	1S
Jul 24	N/A	Med	110-310	60	40	- - - -	- - - -	- - - -	0
Aug 02	23.8	Low	90-160	100	0	- - - -	- - - -	- - - -	1S
Aug 05	N/A	Med	110-360	40	60	- - - -	- - - -	- - - -	0
Aug 15	22.2	Low	120-210	100	0	- - - -	- - - -	- - - -	2S
Aug 27	22.4	Low	110-180	100	0	- - - -	- - - -	- - - -	2S
Sep 04	17.9	Low	140-200	100	0	- - - -	- - - -	0	0
Sep 12	17.3	Low	110-150	100	0	- - - -	- - - -	0	0
Sep 18	18.0	Low	120-160	100	0	- - - -	- - - -	0	0
Sep 23	N/A	0	- - - -	0	0	- - - -	- - - -	0	0
Oct 02	14.5	0	- - - -	0	0	- - - -	- - - -	0	0
Oct 10	13.2	0	- - - -	0	0	- - - -	- - - -	0	0
Oct 24	11.5	0	- - - -	0	0	- - - -	- - - -	0	0
Nov 12	5.6	0	- - - -	0	0	- - - -	- - - -	0	0
Dec 02	2.7	0	- - - -	0	0	- - - -	- - - -	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 14, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Savage Harbour

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 03	5.5	0	- - - -	0	0	- - - -	- - - -	- - - -	0
May 07	8.4	0	- - - -	0	0	- - - -	- - - -	- - - -	0
May 13	5.0	0	- - - -	0	0	- - - -	- - - -	- - - -	0
May 21	12.1	Low	90-110	100	0	- - - -	- - - -	- - - -	0
May 27	11.4	Low	90-120	100	0	- - - -	- - - -	- - - -	0
Jun 03	11.3	Low	90-180	100	0	- - - -	- - - -	- - - -	0
Jun 10	12.4	High	90-260	98	2	- - - -	- - - -	- - - -	0
Jun 17	17.2	High	90-220	100	0	- - - -	- - - -	- - - -	0
Jul 03	17.8	High	90-300	95	5	- - - -	- - - -	- - - -	0
Jul 10	19.5	High	90-300	85	15	- - - -	- - - -	- - - -	0
Jul 24	21.4	Med	110-300	50	50	- - - -	- - - -	- - - -	0
Aug 05	23.0	Low	120-350	50	50	- - - -	- - - -	- - - -	0
Aug 26	22.9	Low	11-170	100	0	- - - -	- - - -	- - - -	0
Sep 03	19.2	Low	110-320	50	50	- - - -	- - - -	0	0
Sep 09	18.2	Low	160-340	50	50	- - - -	- - - -	0	7C
Sep 16	18.0	Low	280	0	100	- - - -	- - - -	0	2C
Sep 23	16.3	0	- - - -	0	0	- - - -	- - - -	0	0
Oct 03	14.6	0	- - - -	0	0	- - - -	- - - -	0	3C
Oct 10	13.8	0	- - - -	0	0	- - - -	- - - -	0	0
Oct 16	11.0	0	- - - -	0	0	- - - -	- - - -	0	0
Oct 21	12.1	0	- - - -	0	0	- - - -	- - - -	400	0
Oct 29	6.6	0	- - - -	0	0	- - - -	- - - -	0	0
Nov 04	6.3	0	- - - -	0	0	- - - -	- - - -	0	0
Nov 26	5.9	0	- - - -	0	0	- - - -	- - - -	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately Jun 10, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

St. Mary's Bay

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	*#Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 02	6.6	0	- - - -	0	0	52	31	- - - -	0
May 09	7.7	0	- - - -	0	0	53	30	- - - -	0
May 14	8.6	0	- - - -	0	0	49	26	- - - -	0
May 23	12.7	High	90-120	100	0	42	21	- - - -	0
May 30	12.6	High	90-150	100	0	39	20	- - - -	0
Jun 06	14.0	High	90-190	100	0	42	21	- - - -	0
Jun 12	14.2	High	90-260	98	2	42	21	- - - -	2S
Jun 18	14.1	High	90-260	95	5	39	20	- - - -	0
Jul 04	18.3	High	90-300	85	15	32	15	- - - -	13S
Jul 16	21.4	High	90-350	70	30	32	14	- - - -	1C 8S
Jul 25	19.8	Med	110-320	50	50	31	15	- - - -	2C
Aug 07	21.3	Low	110 340	20	80	28	13	- - - -	1C
Aug 20	21.7	High	110-400	20	80	26	12	- - - -	2C
Sep 04	18.5	Low	120-140	100	0	25	12	300	0
Sep 11	18.3	Low	120-140	100	0	24	11	0	6C 1S
Sep 17	18.3	Low	120-310	50	50	24	10	400	2C
Sep 25	16.8	Low	250	0	100	25	12	0	5C
Oct 07	15.5	0	- - - -	0	0	26	12	300	8C
Oct 17	9.6	Low	350	0	100	25	12	0	0
Oct 22	10.7	0	- - - -	0	0	24	12	2000	1C
Oct 30	7.6	0	- - - -	0	0	27	15	0	0
Nov 05	7.4	0	- - - -	0	0	23	12	0	0
Nov 14	4.0	0	- - - -	0	0	N/A	N/A	0	0
Nov 18	6.2	0	- - - -	0	0	27	13	0	0
Nov 28	5.9	0	- - - -	0	0	24	11	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 12, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

St. Peter's Bay

Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	*#Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 03	6.1	0	- - - -	0	0	N/A	N/A	- - - -	0
May 07	7.1	0	- - - -	0	0	N/A	N/A	- - - -	0
May 13	5.6	0	- - - -	0	0	N/A	N/A	- - - -	0
May 21	10.8	High	90-120	100	0	N/A	N/A	- - - -	0
May 27	11.5	High	90-120	100	0	N/A	N/A	- - - -	0
Jun 03	11.7	High	90-220	100	0	43	24	- - - -	1C
Jun 10	12.3	High	90-260	98	2	40	23	- - - -	0
Jun 17	17.0	High	90-280	98	2	43	24	- - - -	0
Jun 25	17.8	High	90-290	95	5	30	15	- - - -	0
Jul 03	20.3	High	90-330	85	15	30	14	- - - -	0
Jul 11	21.3	High	90-340	75	25	31	16	- - - -	0
Jul 22	22.0	Med	110-300	50	50	32	16	- - - -	0
Jul 31	22.3	Med	110-280	50	50	26	12	- - - -	0
Aug 13	22.6	Low	110-200	100	0	26	12	- - - -	0
Aug 26	22.7	Low	110-140	100	0	25	12	- - - -	0
Sep 03	19.3	Low	120-160	100	0	26	12	400	0
Sep 09	18.5	Low	280-320	0	100	25	12	0	14C
Sep 10	18.5	Low	120-140	100	0	25	12	0	3C
Sep 23	17.4	Low	250-400	0	100	27	13	0	3C
Oct 03	14.9	0	- - - -	0	0	25	12	0	3C
Oct 10	14.5	0	- - - -	0	0	26	13	0	6C
Oct 16	11.4	0	- - - -	0	0	23	11	0	0
Oct 26	11.6	0	- - - -	0	0	24	11	0	2C
Oct 29	7.9	0	- - - -	0	0	22	10	0	0
Nov 04	6.8	0	- - - -	0	0	30	16	300	0
Nov 21	5.8	0	- - - -	0	0	24	12	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 10, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

Tracadie Bay

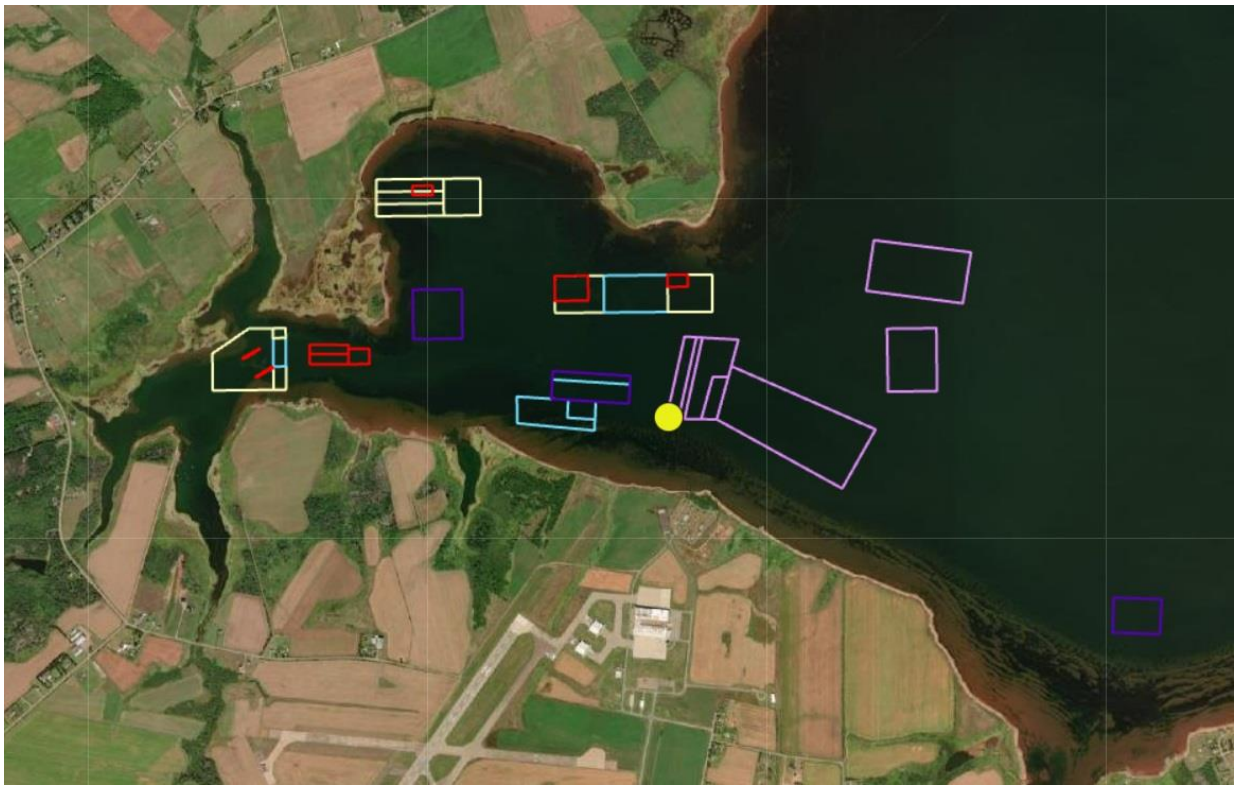
Date	Water Temp	Mussel larvae	Size (microns)	% Pre-set	% Set-size	Steamed Meat Yield	European Meat Yield	#*Pseudo-nitzschia* (cells/L)	Tunicate Larvae
May 02	5.2	0	- - - -	0	0	53	36	- - - -	0
May 07	7.2	0	- - - -	0	0	52	36	- - - -	0
May 13	5.3	0	- - - -	0	0	50	33	- - - -	0
May 21	11.4	High	90-110	100	0	47	31	- - - -	0
May 27	11.1	High	90-130	100	0	47	30	- - - -	0
Jun 03	11.4	High	90-200	100	0	N/A	N/A	- - - -	0
Jun 10	13.1	High	90-240	100	0	44	28	- - - -	0
Jun 17	16.4	High	90-260	98	2	31	17	- - - -	0
Jul 03	19.2	High	90-290	90	10	30	15	- - - -	0
Jul 09	21.9	High	90-310	80	20	28	14	- - - -	0
Jul 18	23.3	High	90-330	70	30	28	15	- - - -	0
Aug 01	22.6	Med	110-300	50	50	N/A	N/A	- - - -	0
Aug 12	22.1	Low	110-180	100	0	26	12	- - - -	0
Aug 26	22.7	Low	110-190	100	0	25	12	- - - -	0
Sep 03	19.6	Low	110-160	100	0	22	11	0	3C
Sep 09	18.0	Med	120-350	40	60	21	10	0	13C
Sep 16	18.1	Low	120-200	100	0	22	10	0	6C
Oct 03	15.0	0	- - - -	0	0	22	11	0	2C
Oct 10	14.2	0	- - - -	0	0	22	11	0	7C
Oct 16	11.3	0	- - - -	0	0	21	10	900	0
Oct 26	12.0	Low	120	100	0	23	11	0	0
Oct 29	7.9	0	- - - -	0	0	25	12	0	0
Nov 04	6.9	0	- - - -	0	0	24	12	0	0
Nov 21	5.9	0	- - - -	0	0	25	13	0	0

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately Jun 17, 2024.
C= Ciona S=Styela GS=Goldenstar V=Violet

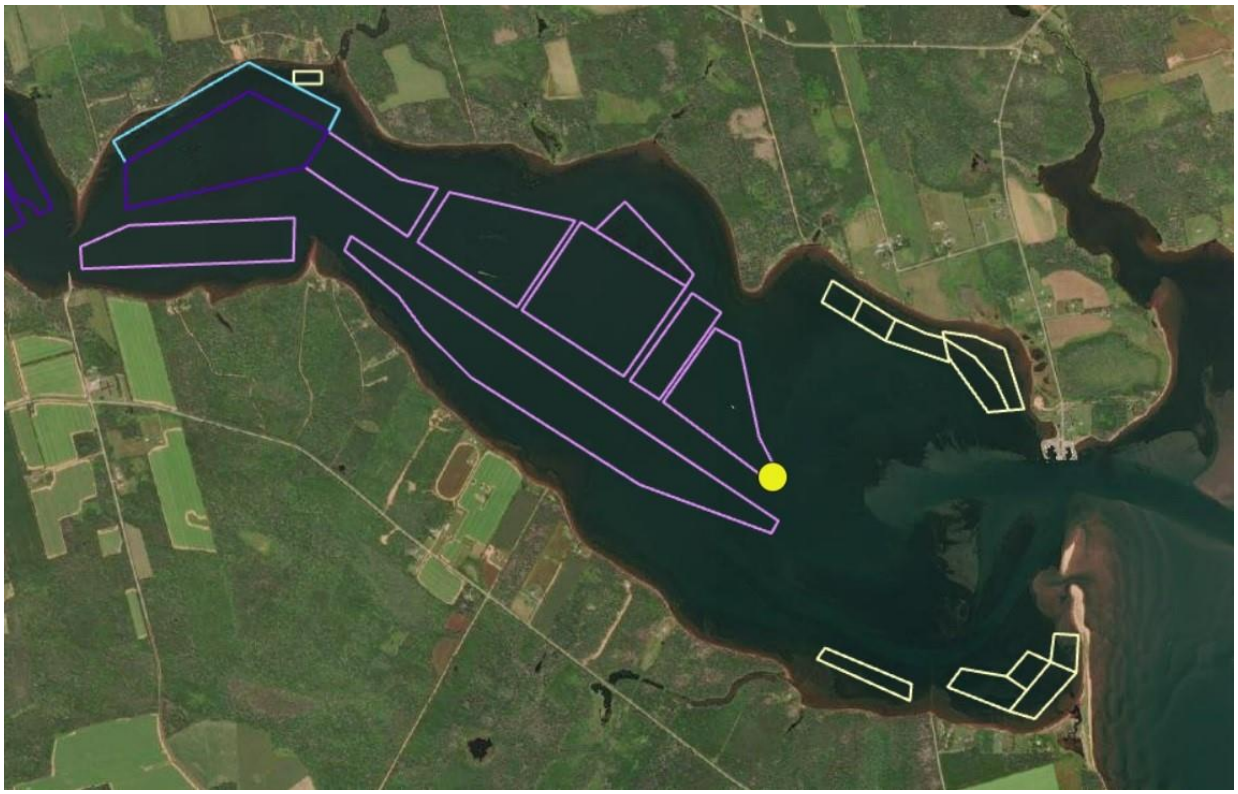
Winter Bay									
Date	**Water Temp**	**Mussel larvae**	**Size (microns)**	**% Pre-set**	**% Set-size**	**Steamed Meat Yield**	**European Meat Yield**	***#Pseudo-nitzschia* (cells/L)**	**Tunicate Larvae**
May 27	13.6	High	90-140	100	0	- - - -	- - - -	- - - -	- - - -
Jun 03	12.3	High	90-210	100	0	- - - -	- - - -	- - - -	- - - -
Jun 10	15.1	High	90-250	98	2	- - - -	- - - -	- - - -	- - - -
Jun 17	17.2	High	90-280	98	2	- - - -	- - - -	- - - -	- - - -
Jun 25	18.9	High	90-300	95	5	- - - -	- - - -	- - - -	- - - -
Jul 03	20.6	High	90-320	90	10	- - - -	- - - -	- - - -	- - - -
Jul 09	19.9	High	90-310	80	20	- - - -	- - - -	- - - -	- - - -
Jul 18	23.5	High	90-330	70	30	- - - -	- - - -	- - - -	- - - -
Aug 01	23.6	Low	110-330	50	50	- - - -	- - - -	- - - -	- - - -
Aug 12	22.4	Low	110-190	100	0	- - - -	- - - -	- - - -	- - - -
Aug 26	22.9	Low	110-180	100	0	- - - -	- - - -	- - - -	- - - -

The setting of mussel larvae occurs when they reach a size of at least 250 microns.
Setting started in this area approximately June 10, 2024.

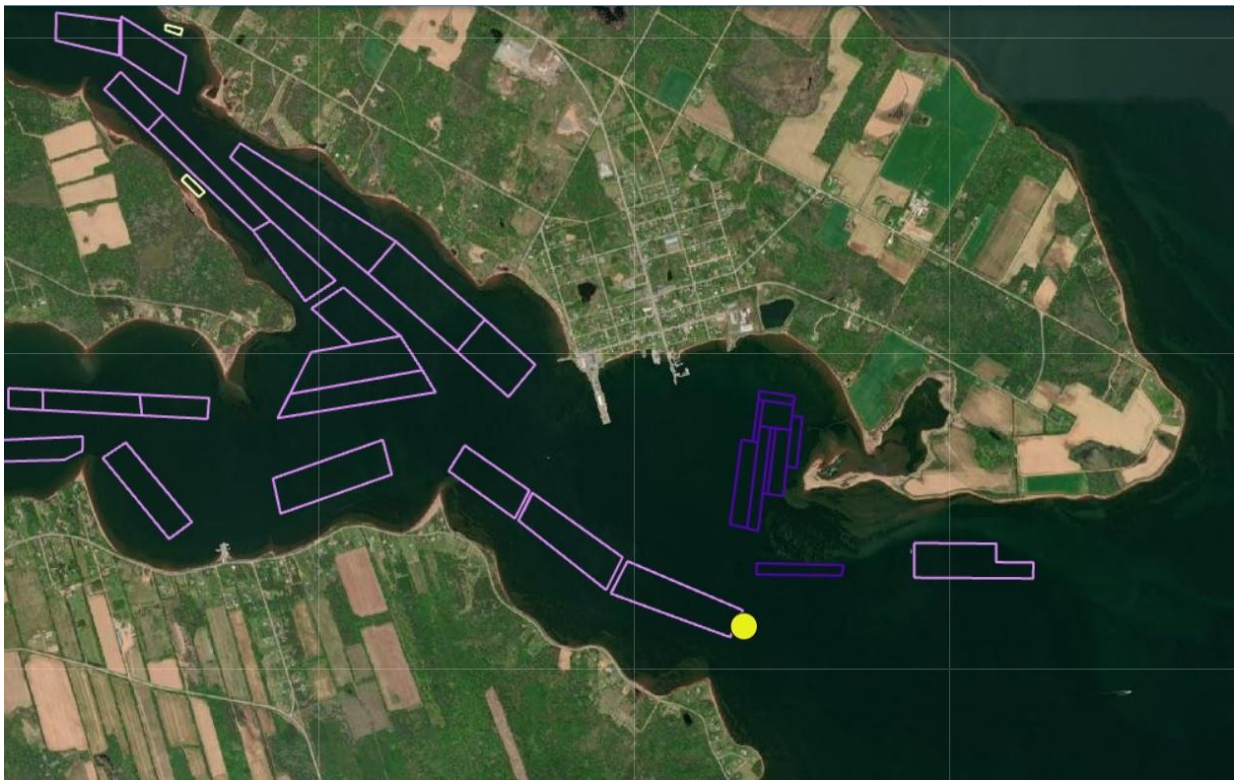
APPENDIX II MAPS OF SAMPLE SITES



Bentick Cove Mussel Monitoring Site



Boughton River Mussel Monitoring Site

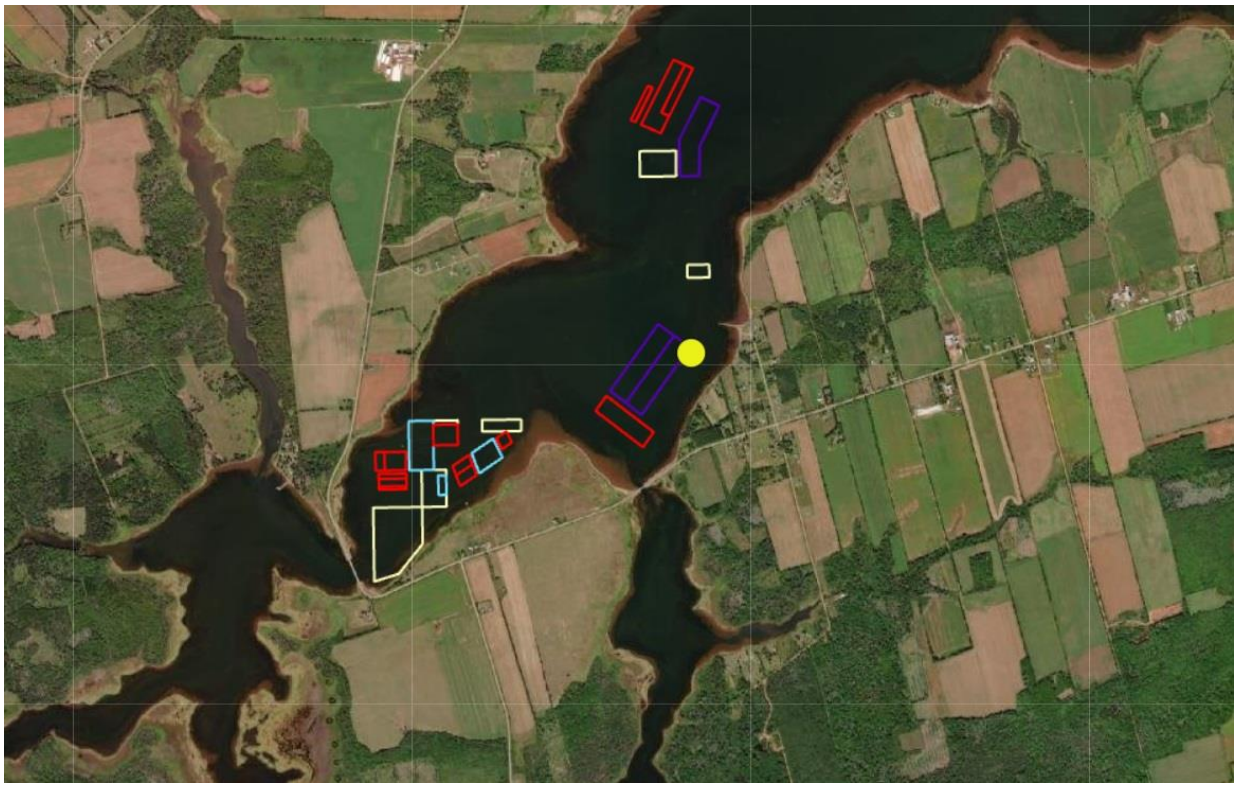


Brudenell River Mussel Monitoring Site

Cardigan River Mussel Monitoring Site

Covehead Bay Mussel Monitoring Site (temperature monitoring only)

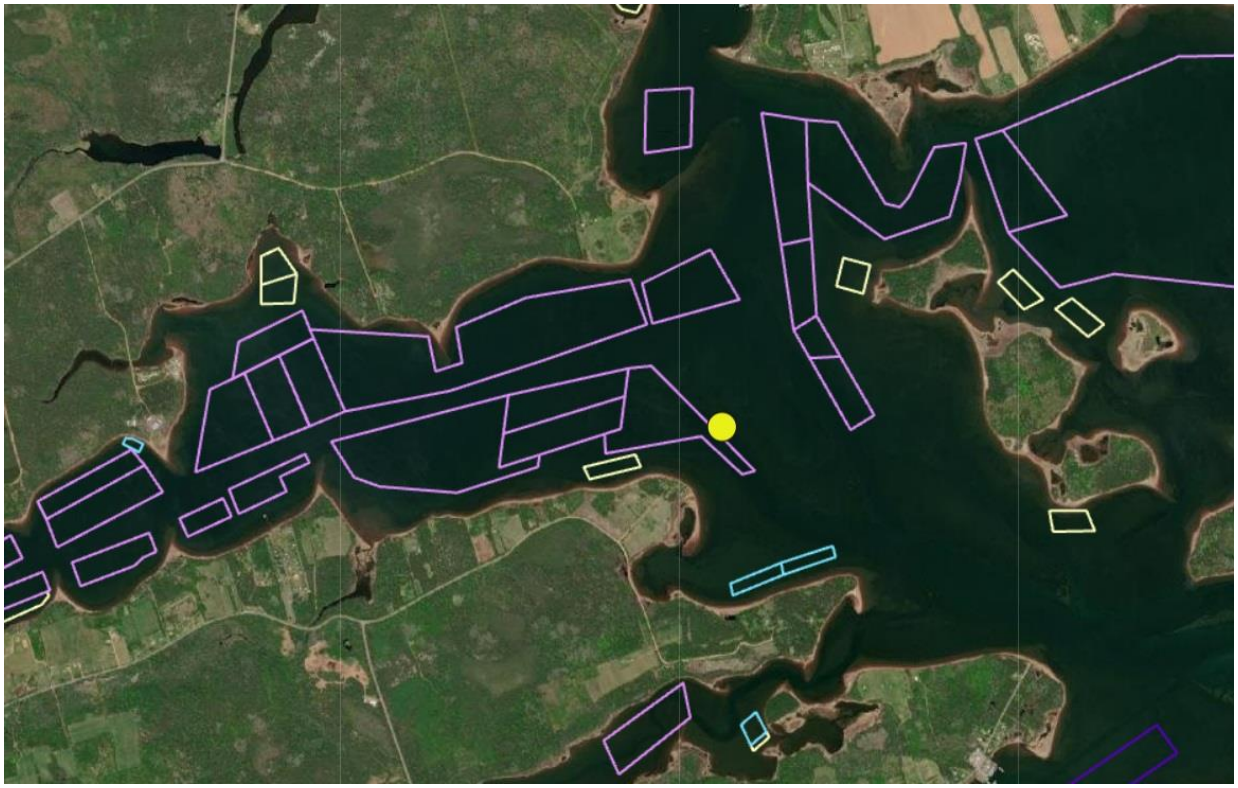
Darnley Basin Mussel Monitoring Site



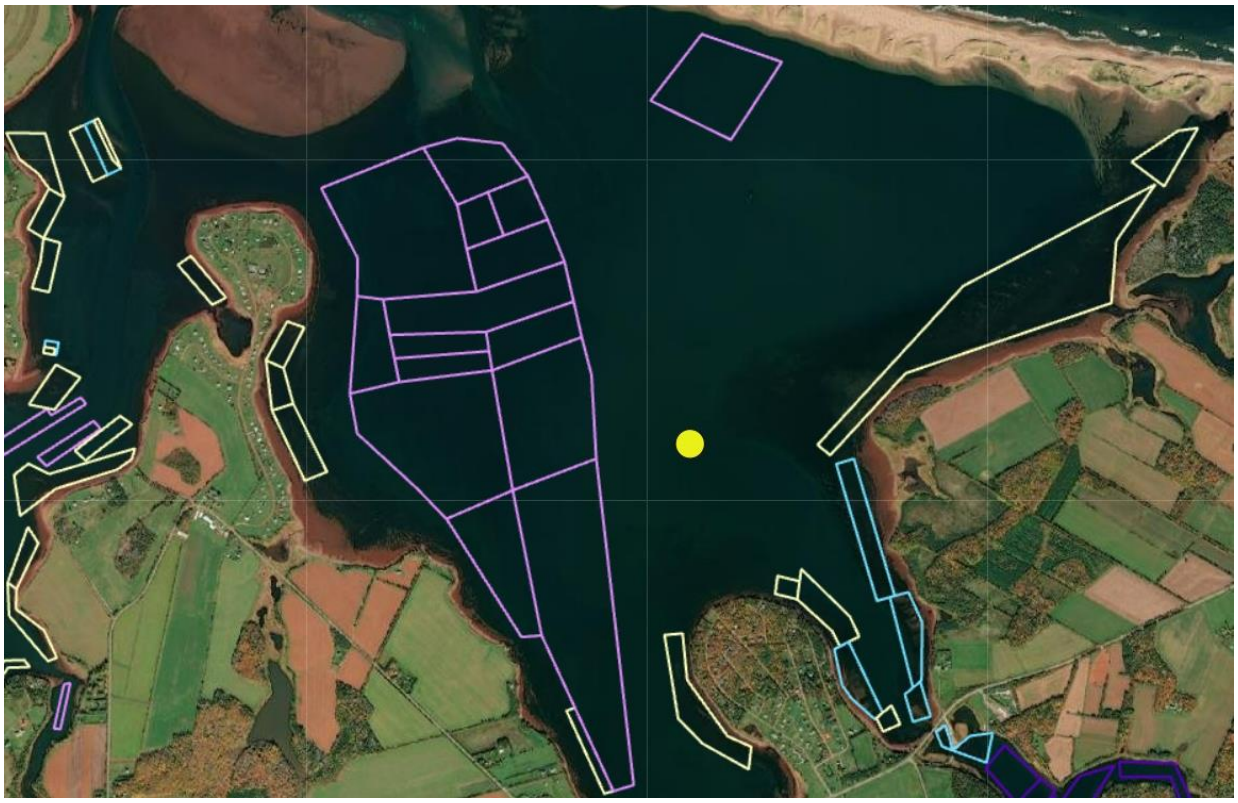
Grand River Mussel Monitoring Site

Lennox Channel Mussel Monitoring Site

March Water Mussel Monitoring Site

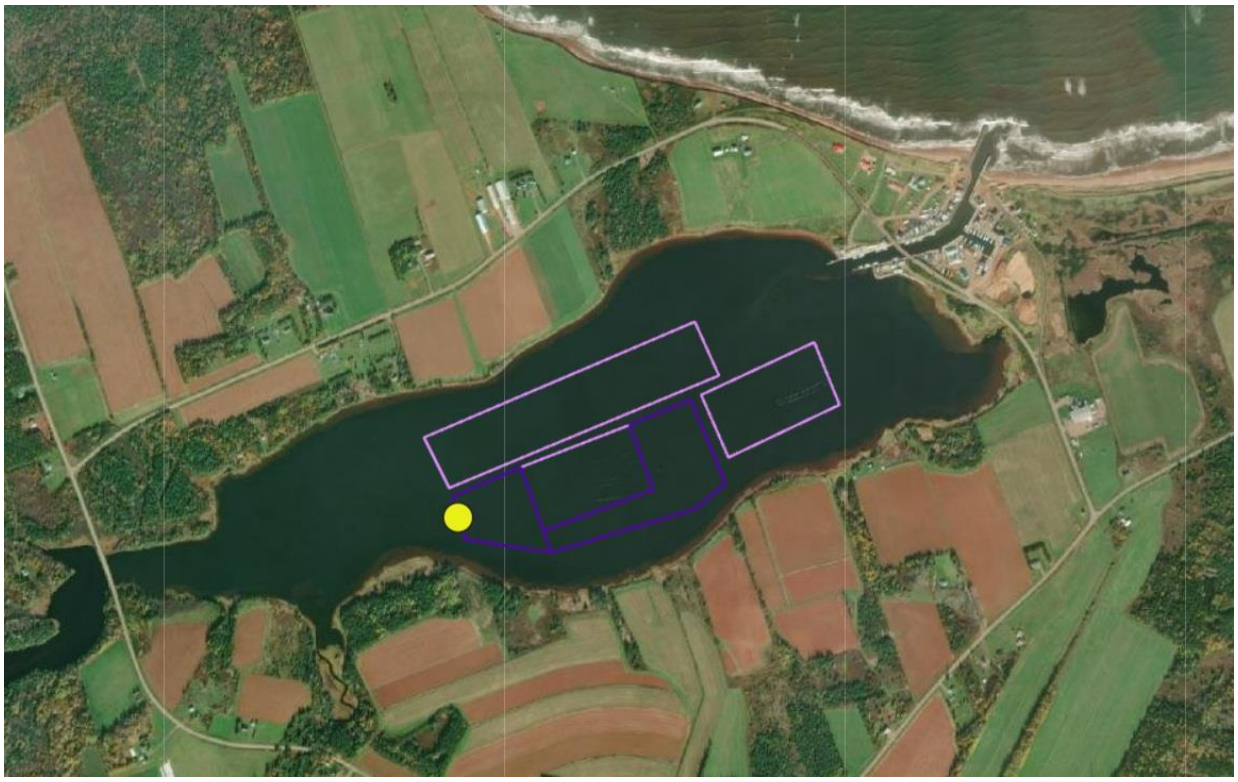


Murray River Mussel Monitoring Site



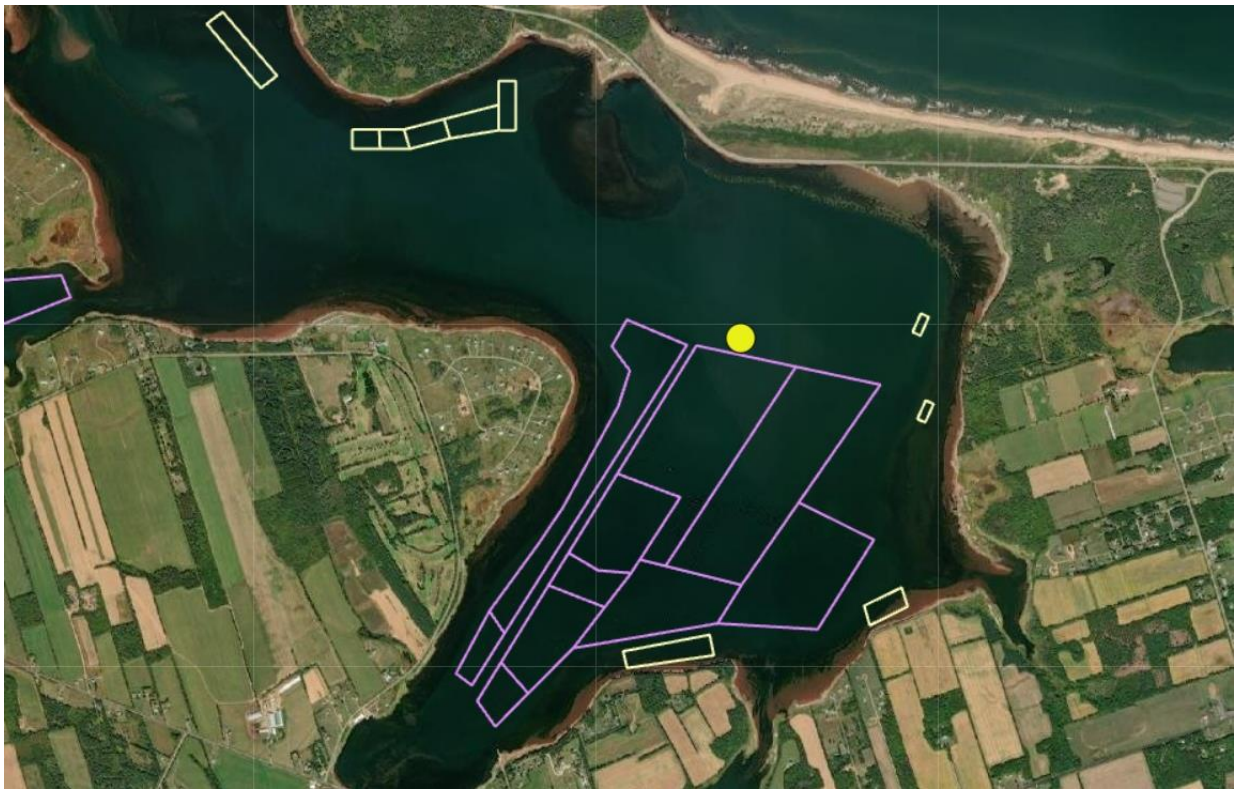
New London Mussel Monitoring Site

Nine Mile Creek Mussel Monitoring Site

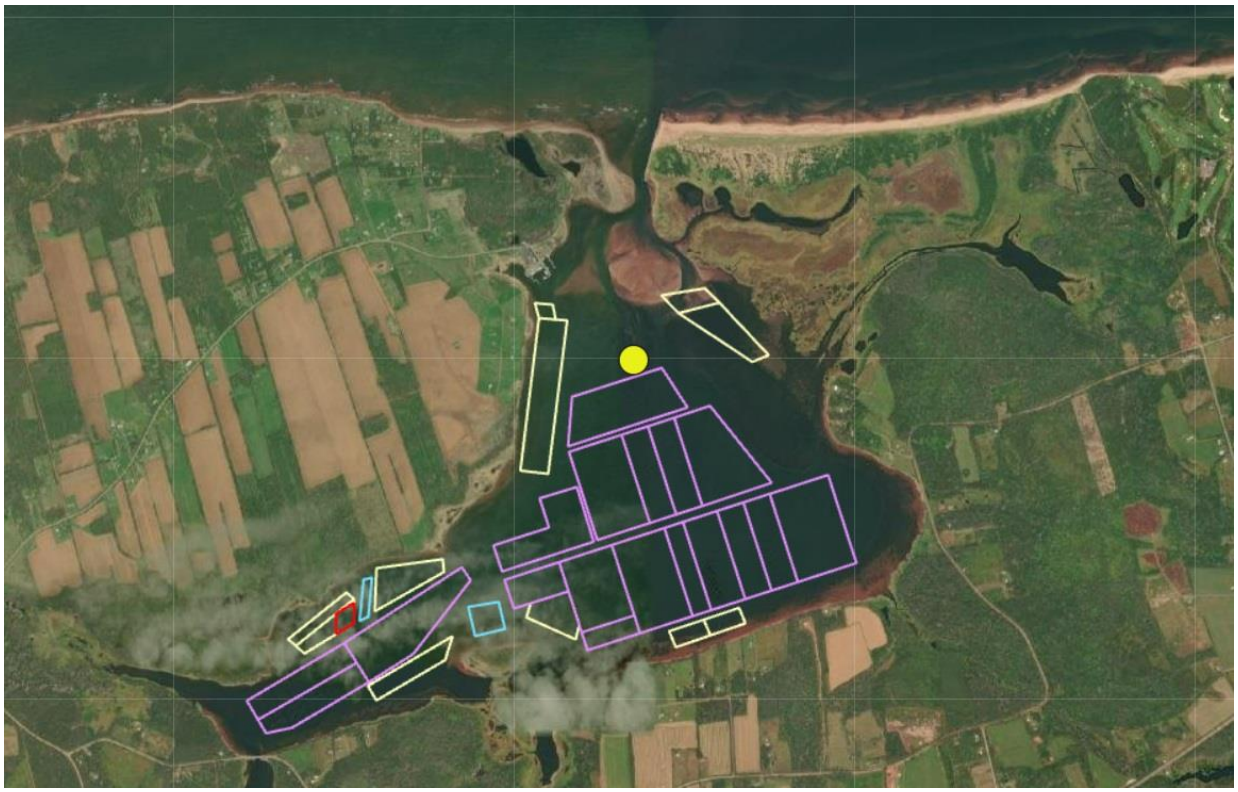


North Lake Mussel Monitoring Site

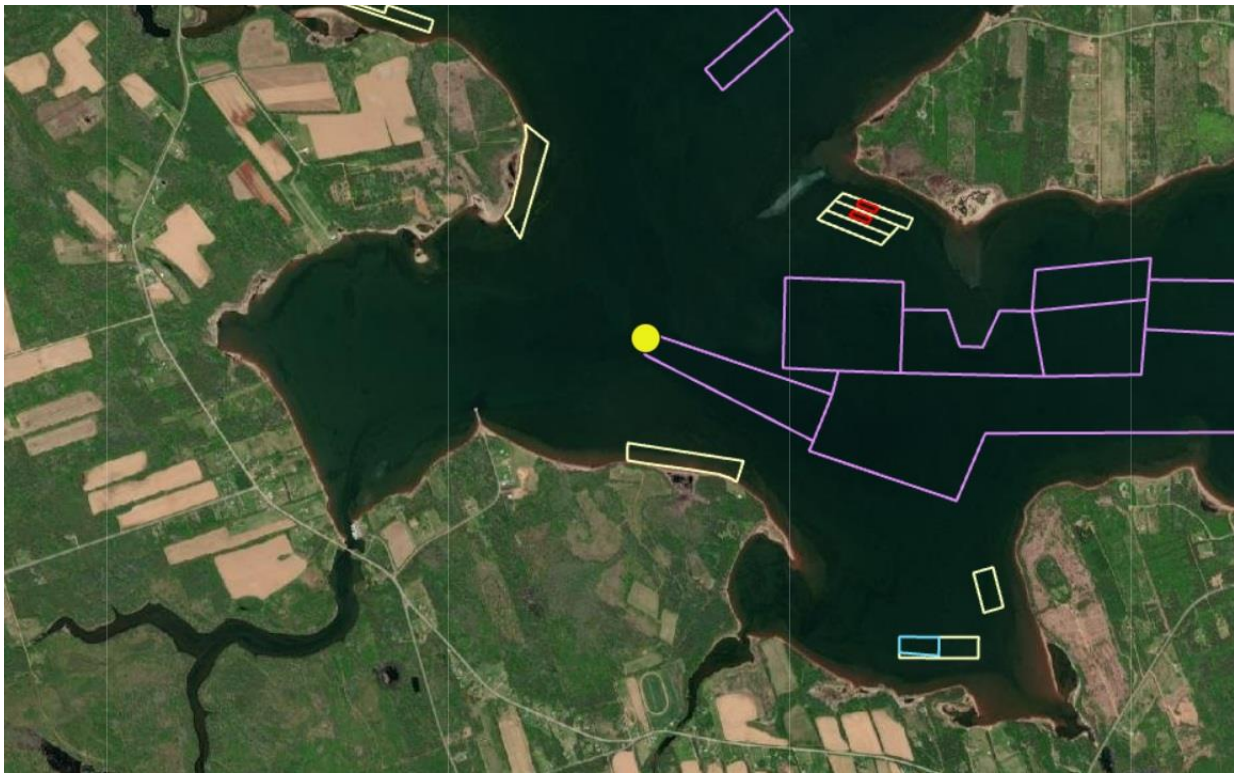
Orwell Bay Mussel Monitoring Site



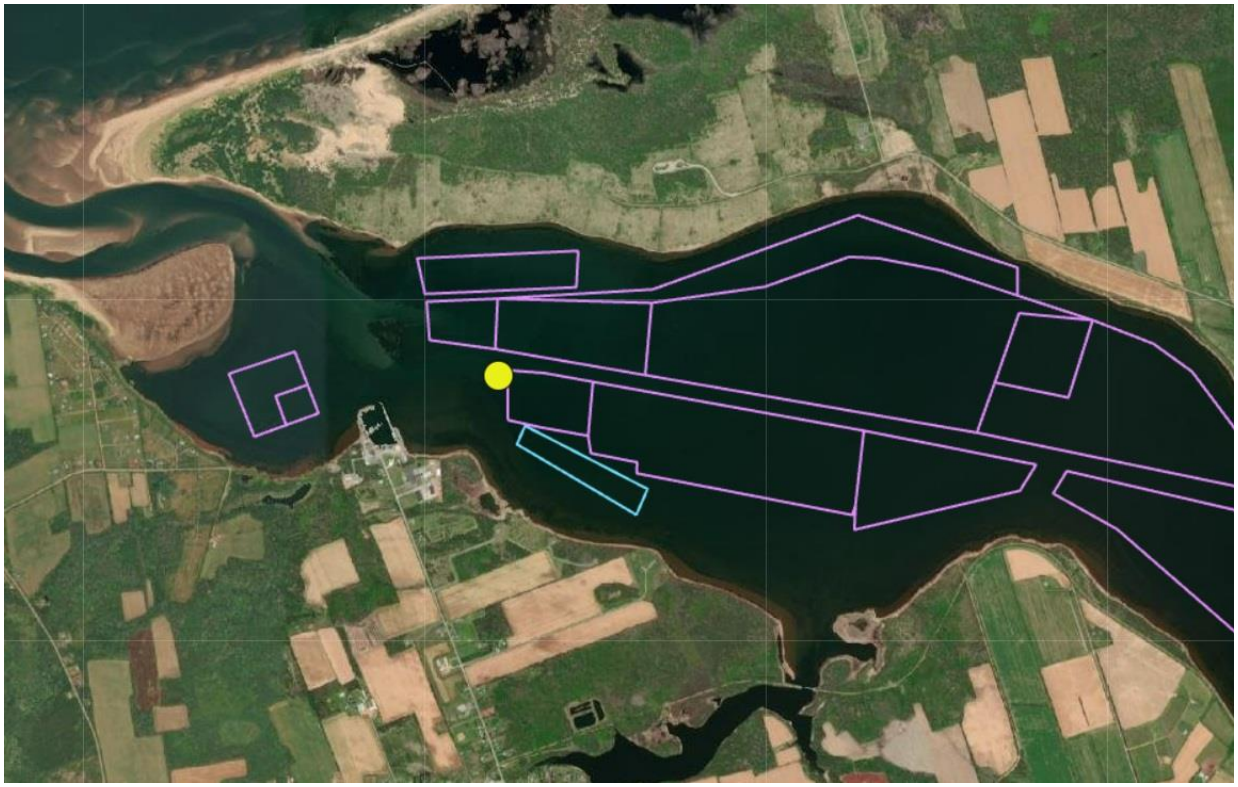
Rustico Bay Mussel Monitoring Site



Savage Harbour Mussel Monitoring Site



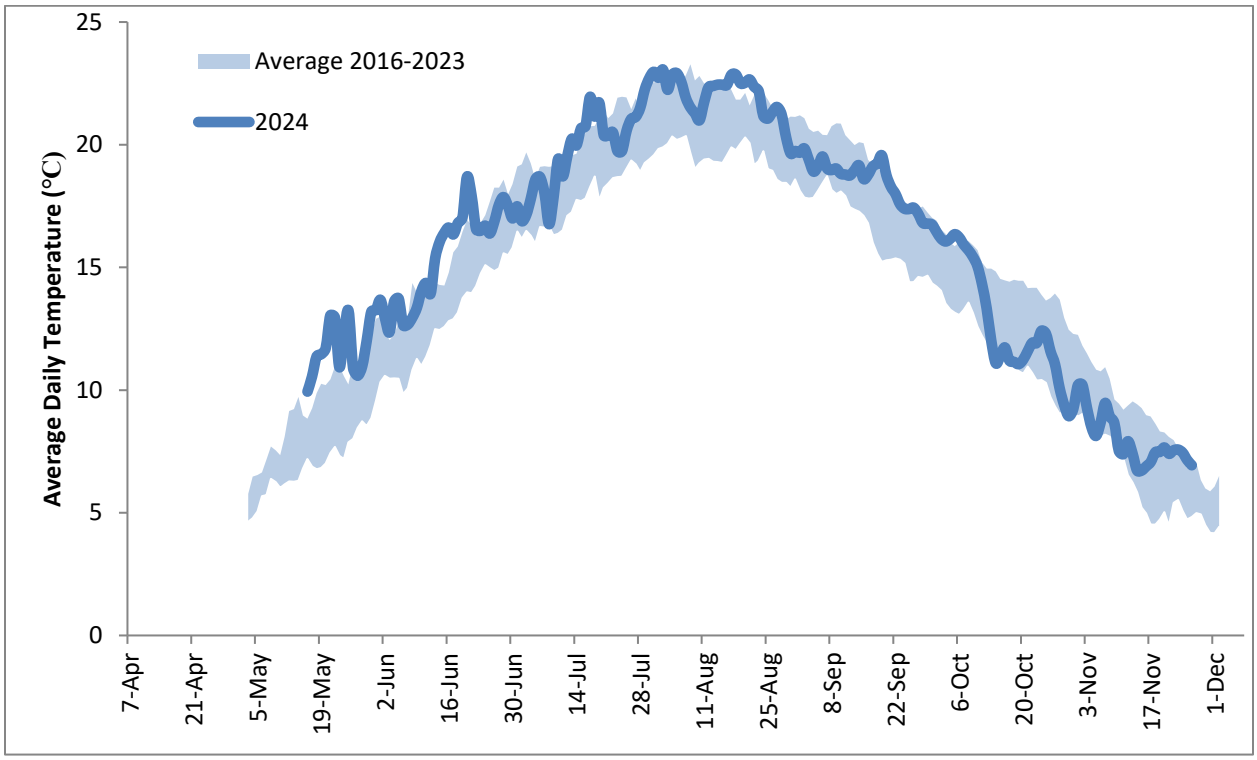
St. Mary's Bay Mussel Monitoring Site



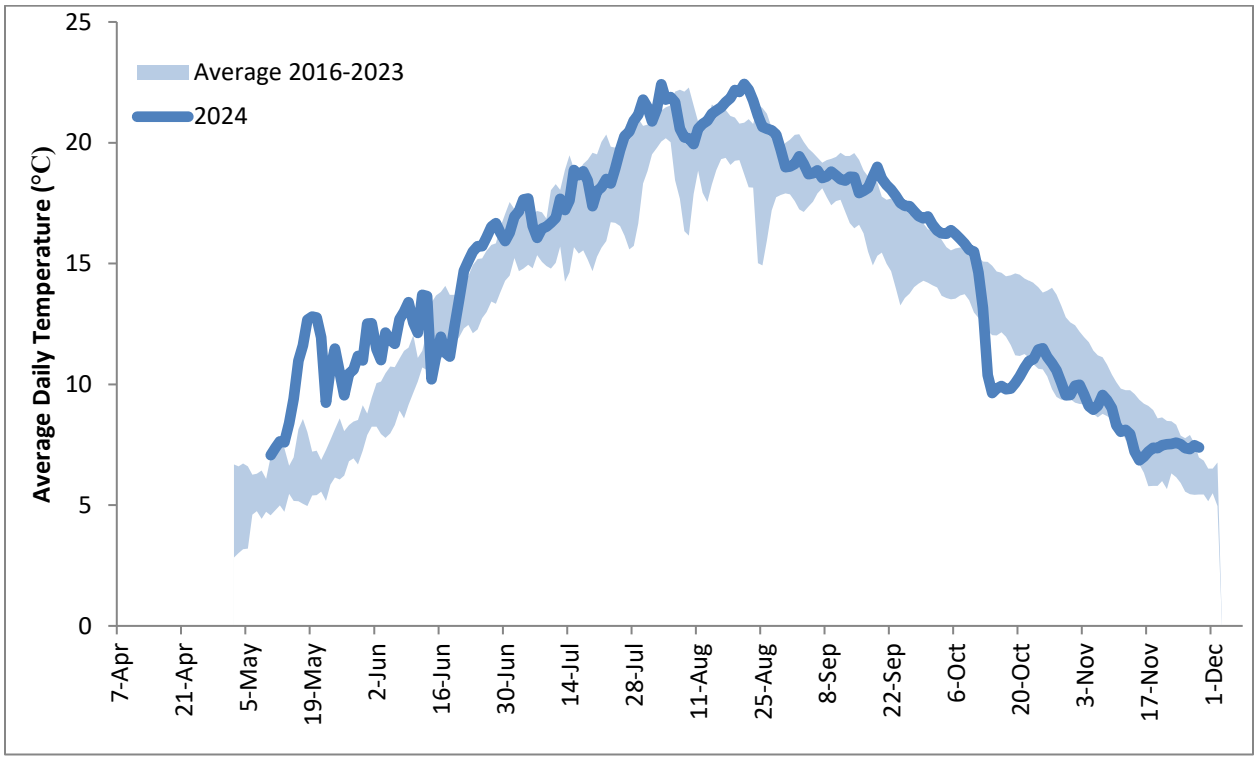
St. Peter's Bay Mussel Monitoring Site

Tracadie Bay and Winter Bay Mussel Monitoring Sites

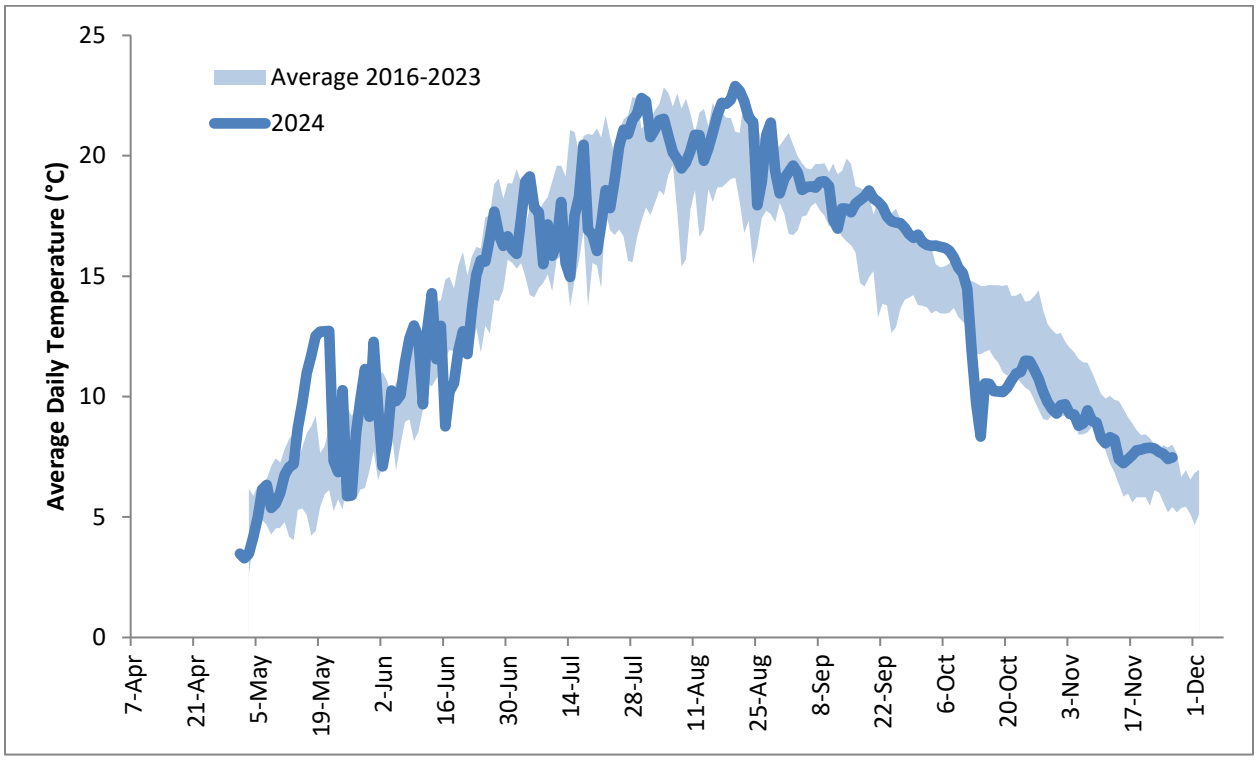
APPENDIX III WATER TEMPERATURE GRAPHS FOR SAMPLE SITES



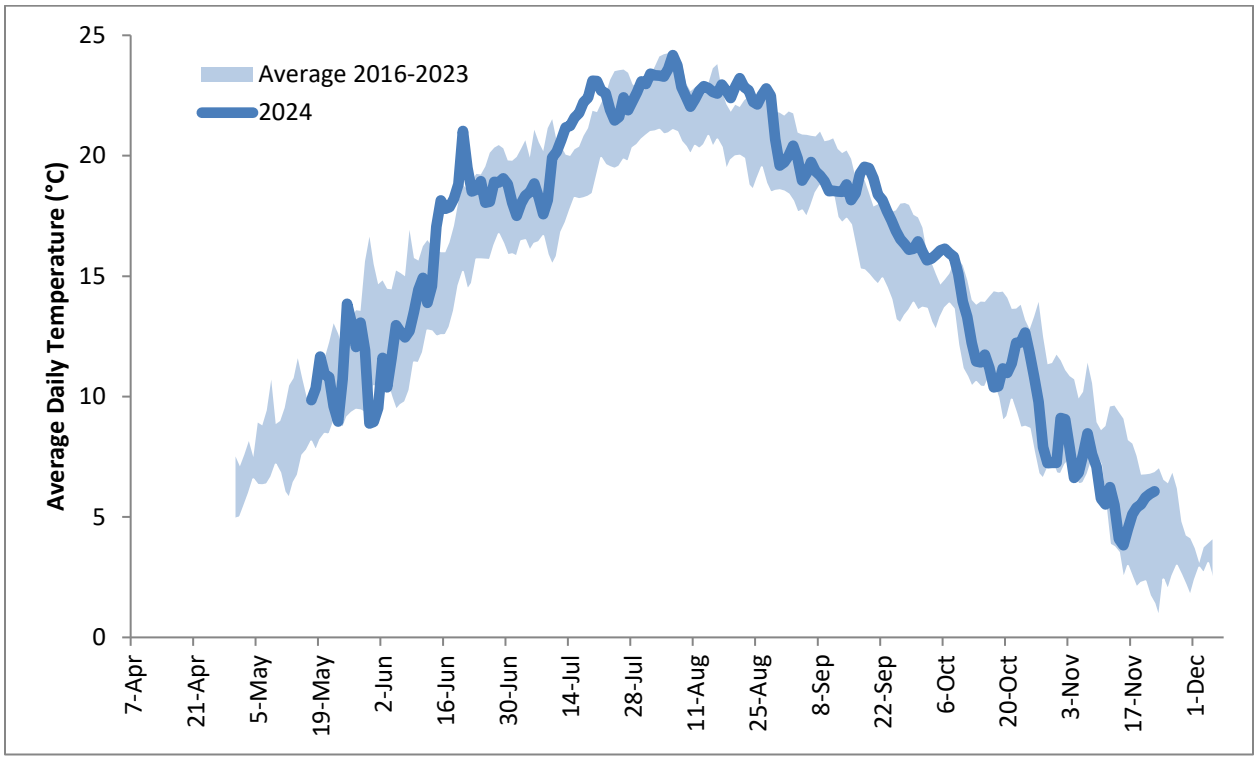
Average daily water temperature measured at Boughton River Mussel Monitoring Station in 2016 – 2024.



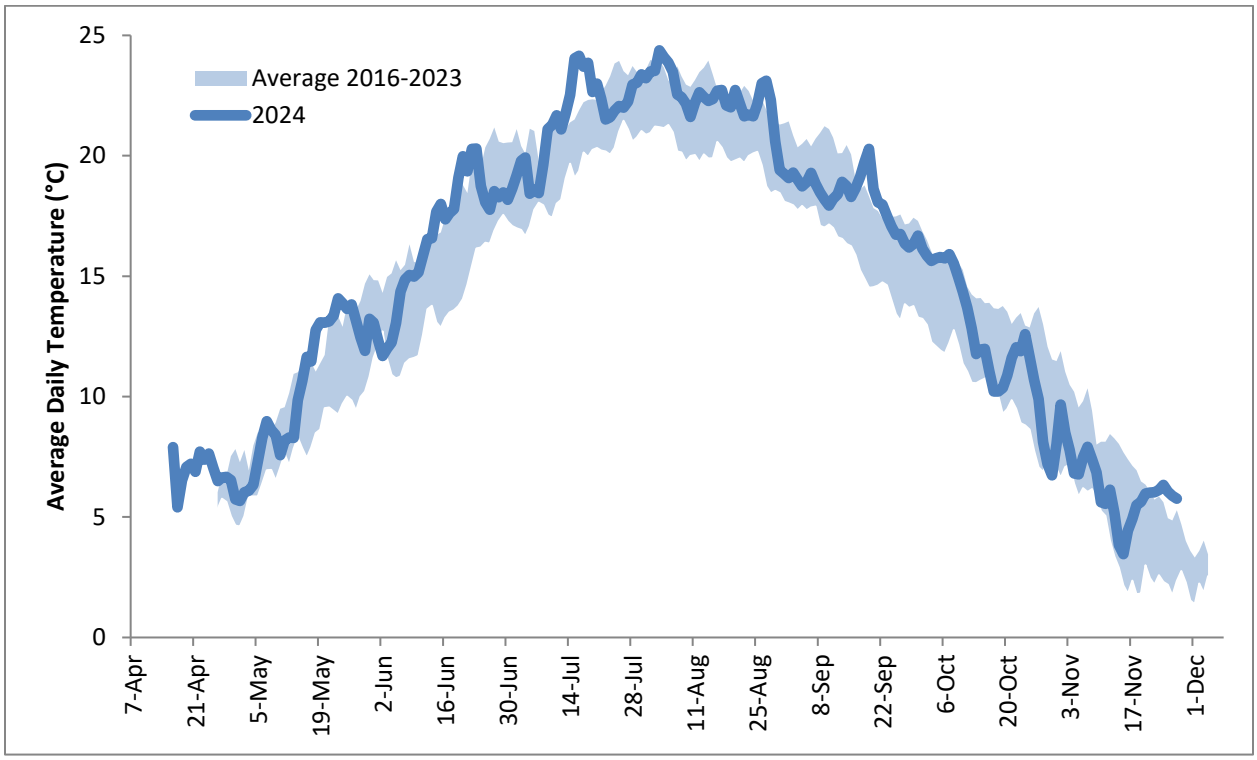
Average daily water temperature measured at Brudenell River Mussel Monitoring Station in 2016 – 2024.



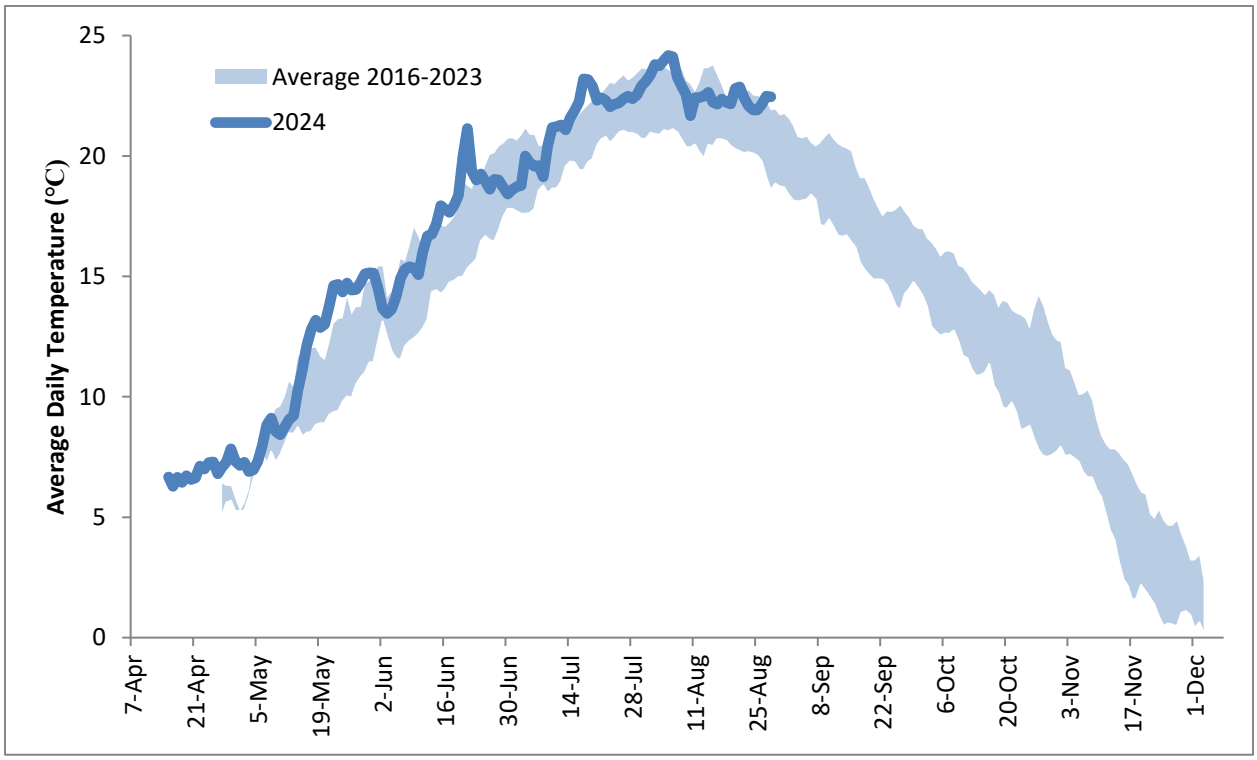
Average daily water temperature measured at Cardigan River Mussel Monitoring Station in 2016 – 2024.



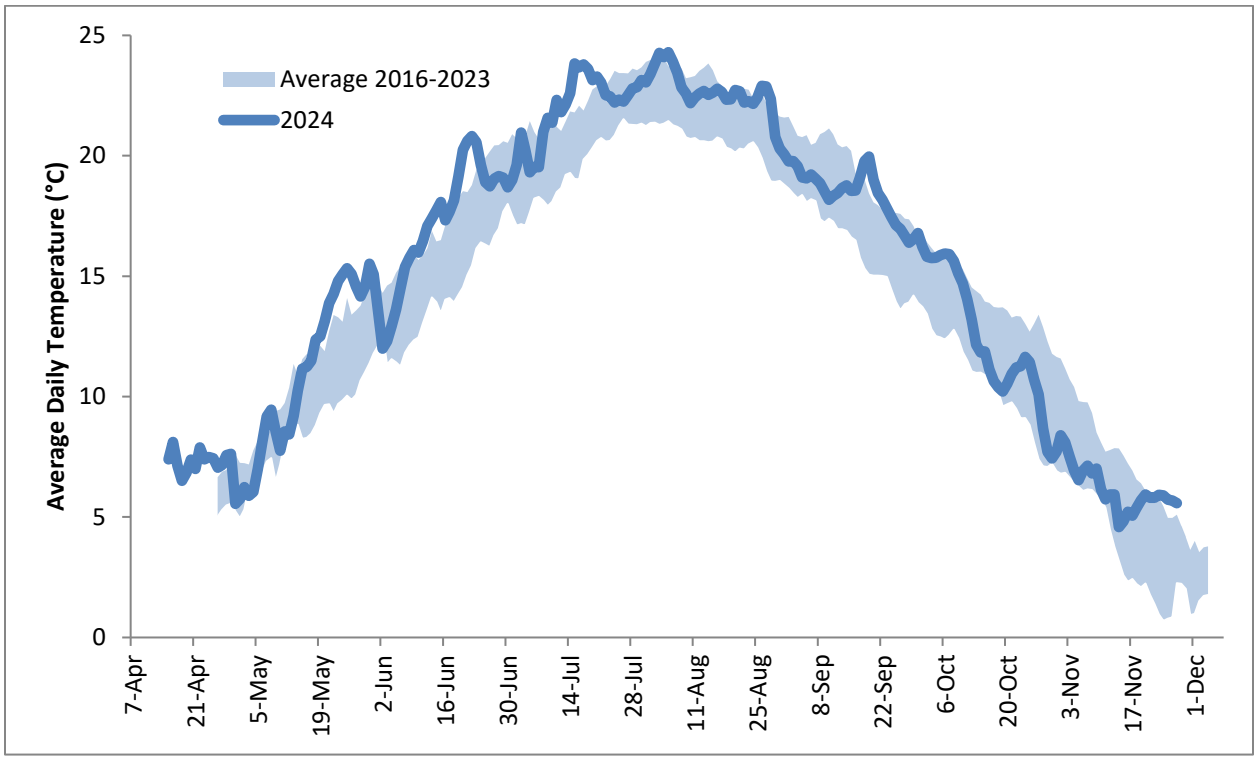
Average daily water temperature measured at Covehead Bay Mussel Monitoring Station in 2016 – 2024.



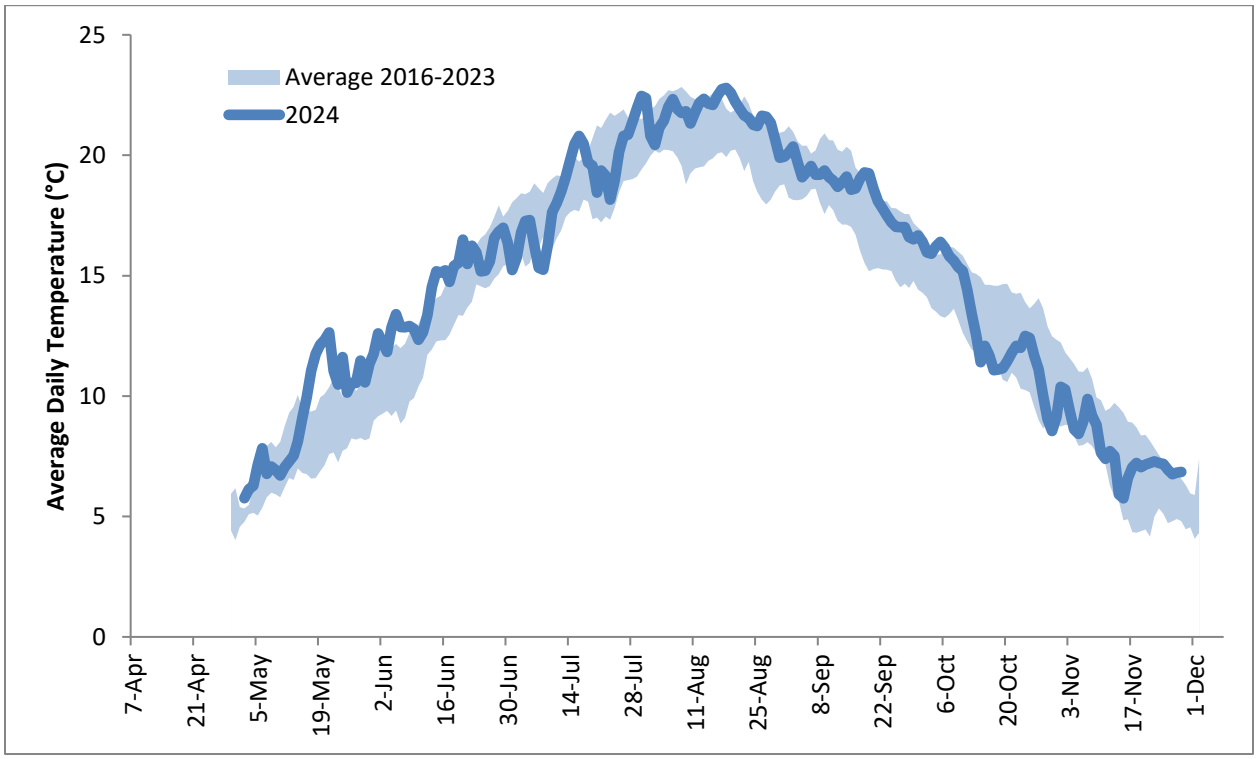
Average daily water temperature measured at Darnley Basin Mussel Monitoring Station in 2016 – 2024.



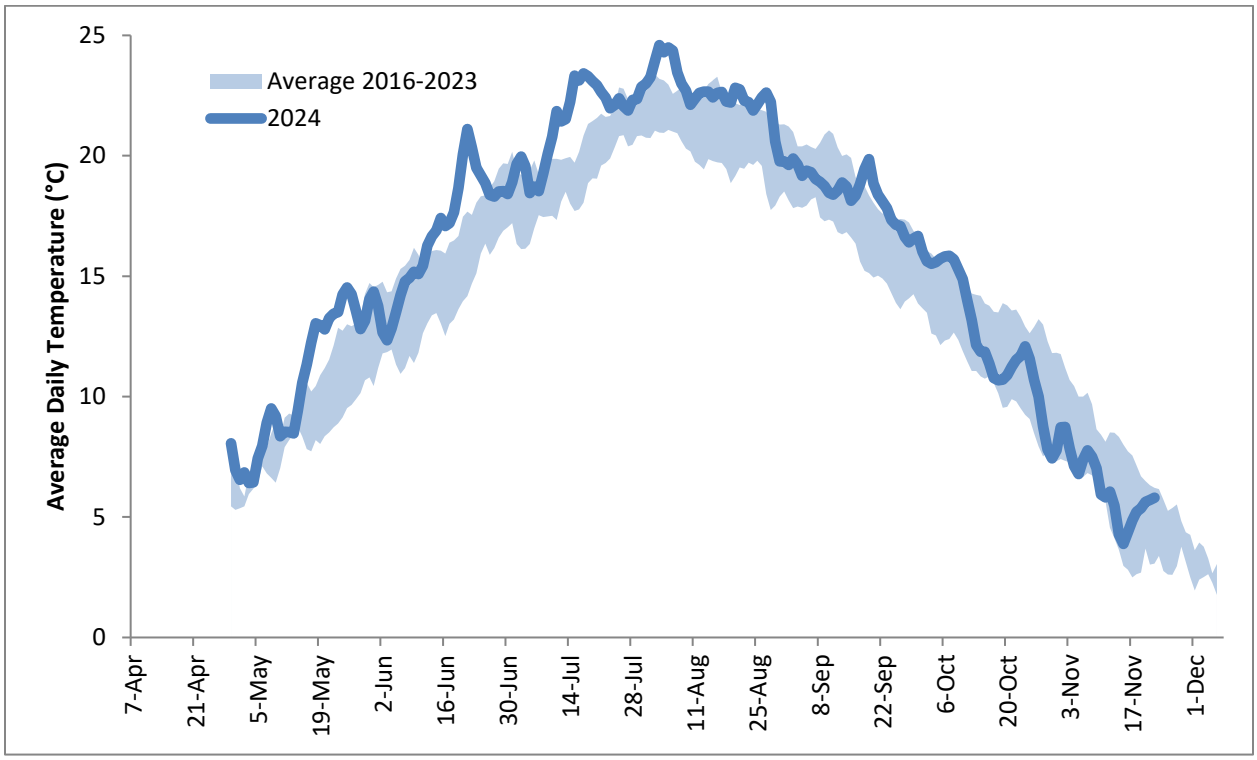
Average daily water temperature measured at Lennox Channel Mussel Monitoring Station in 2016 – 2024.



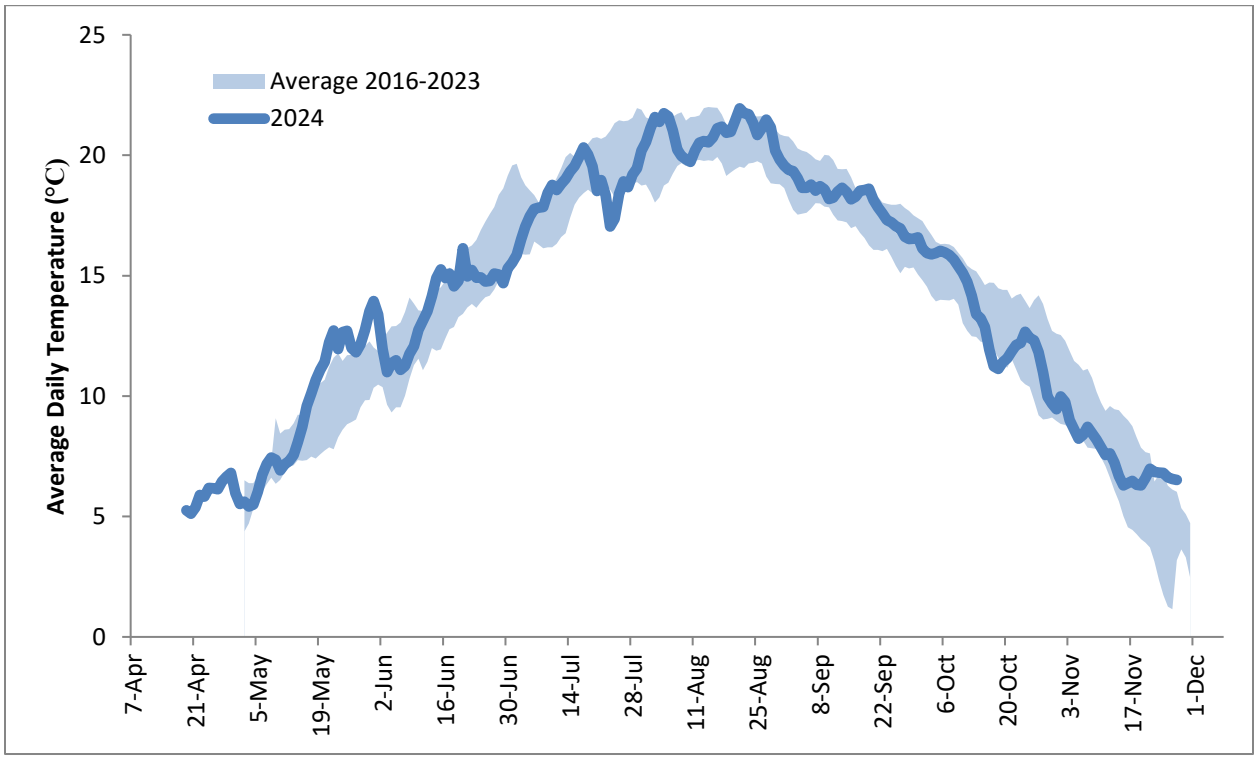
Average daily water temperature measured at March Water Mussel Monitoring Station in 2016 – 2024.



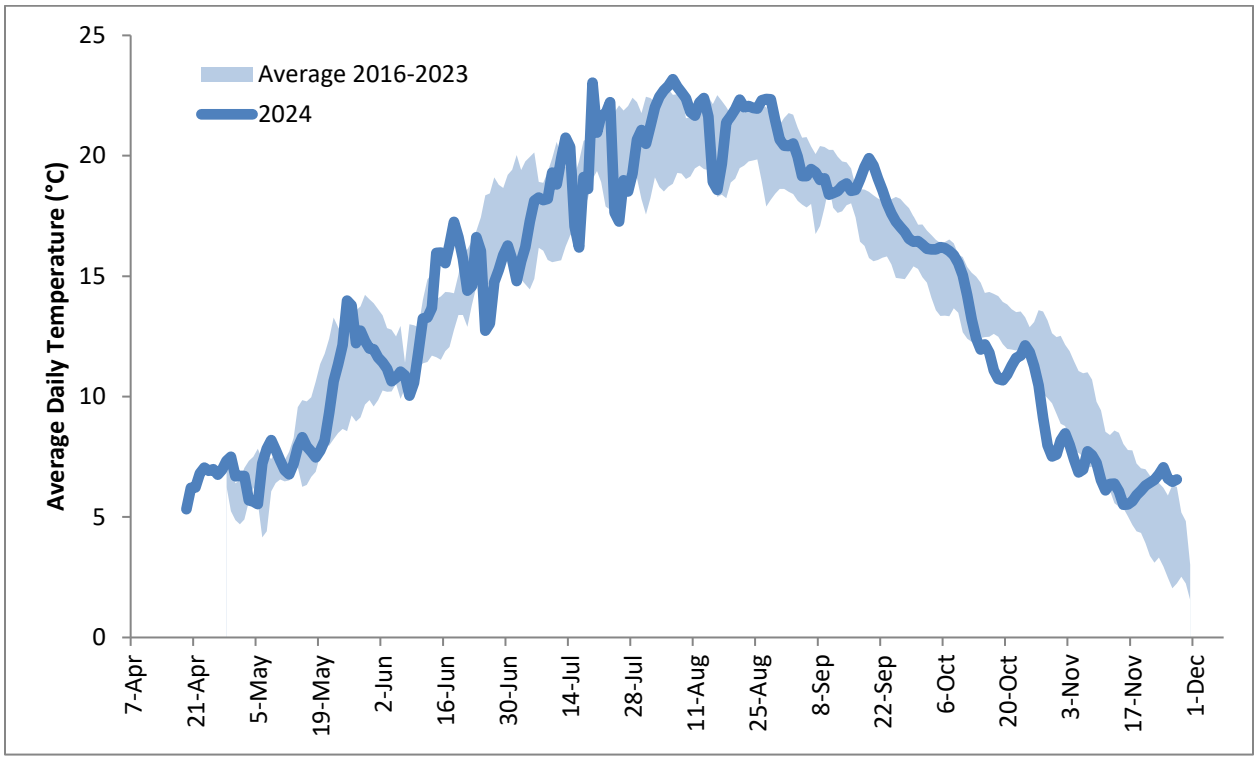
Average daily water temperature measured at Murray River Mussel Monitoring Station in 2016 – 2024.



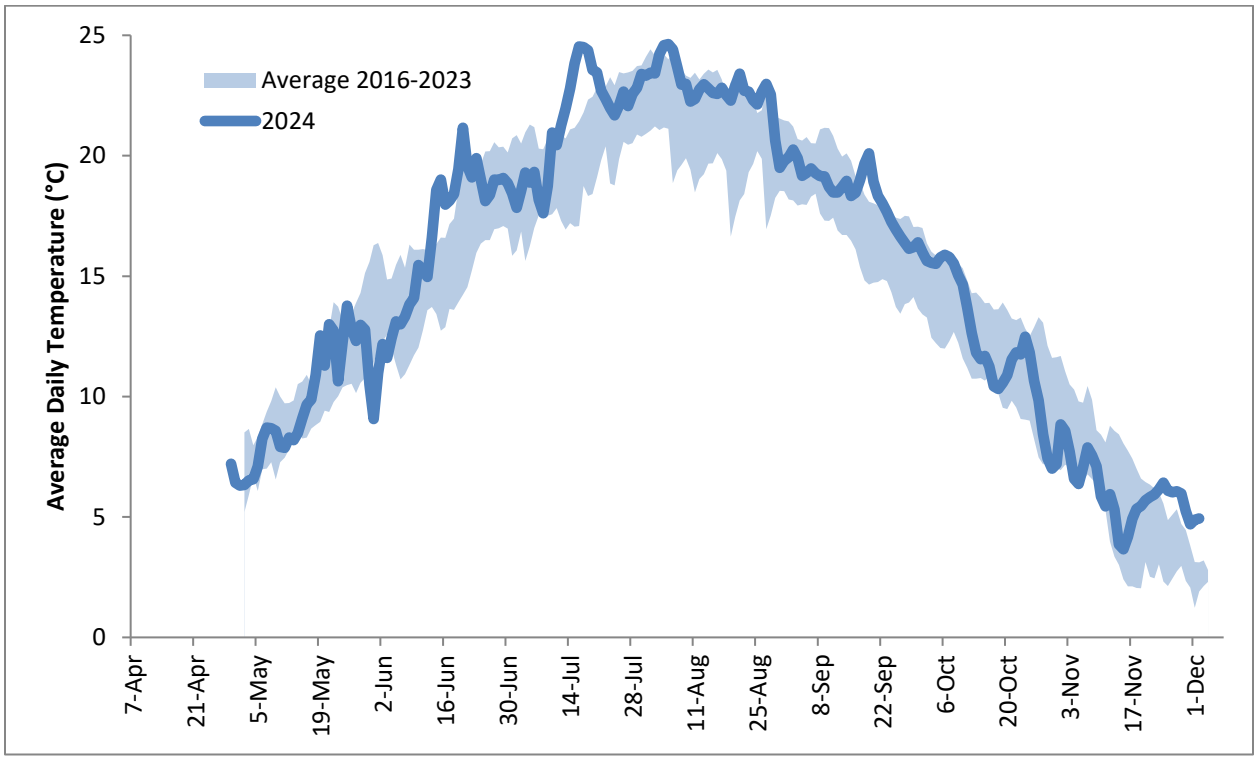
Average daily water temperature measured at New London Bay Mussel Monitoring Station in 2016 – 2024.



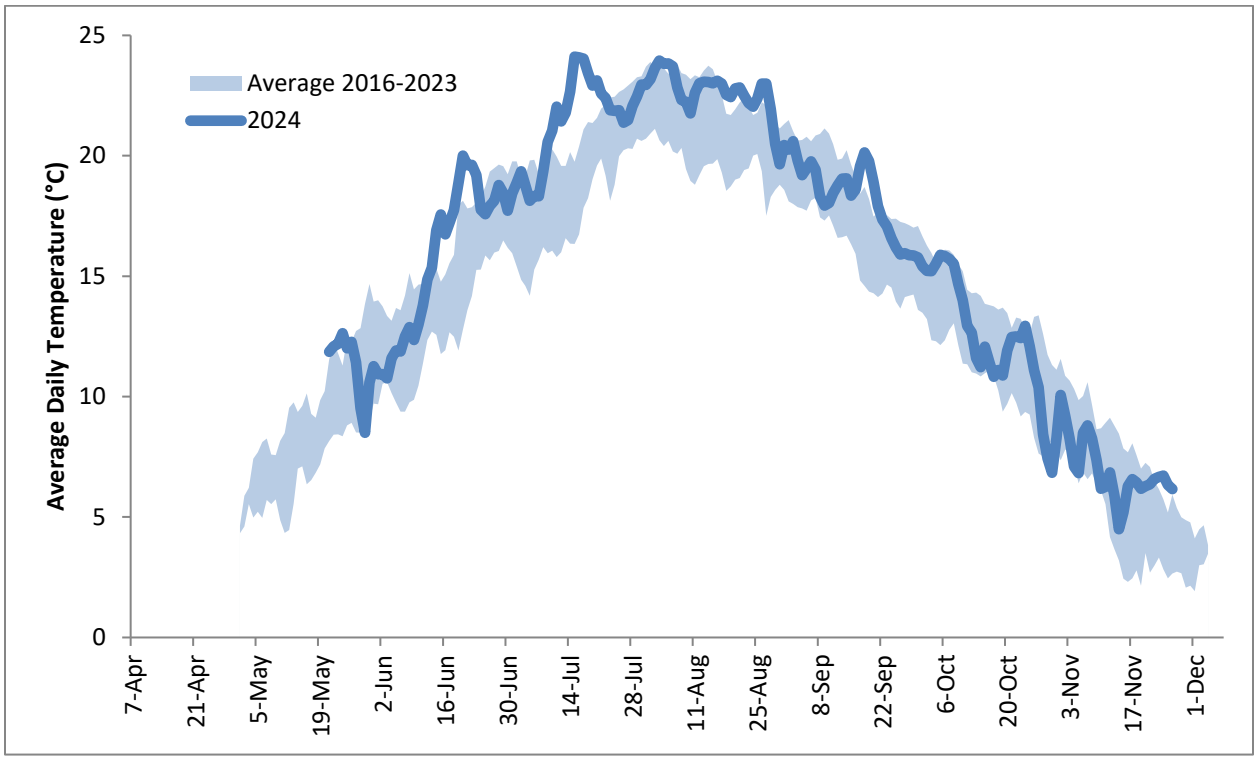
Average daily water temperature measured at Nine Mile Creek Mussel Monitoring Station in 2016 – 2024.



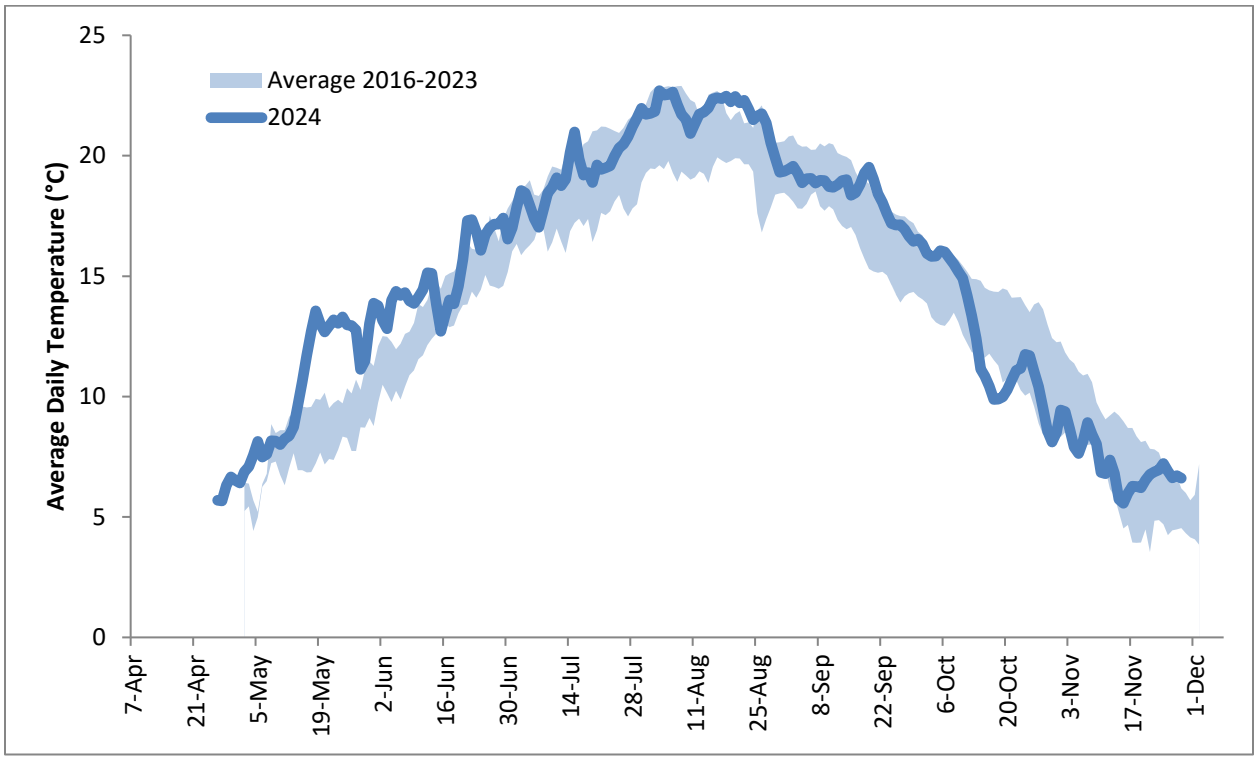
Average daily water temperature measured at Orwell Bay Mussel Monitoring Station in 2016 – 2024.



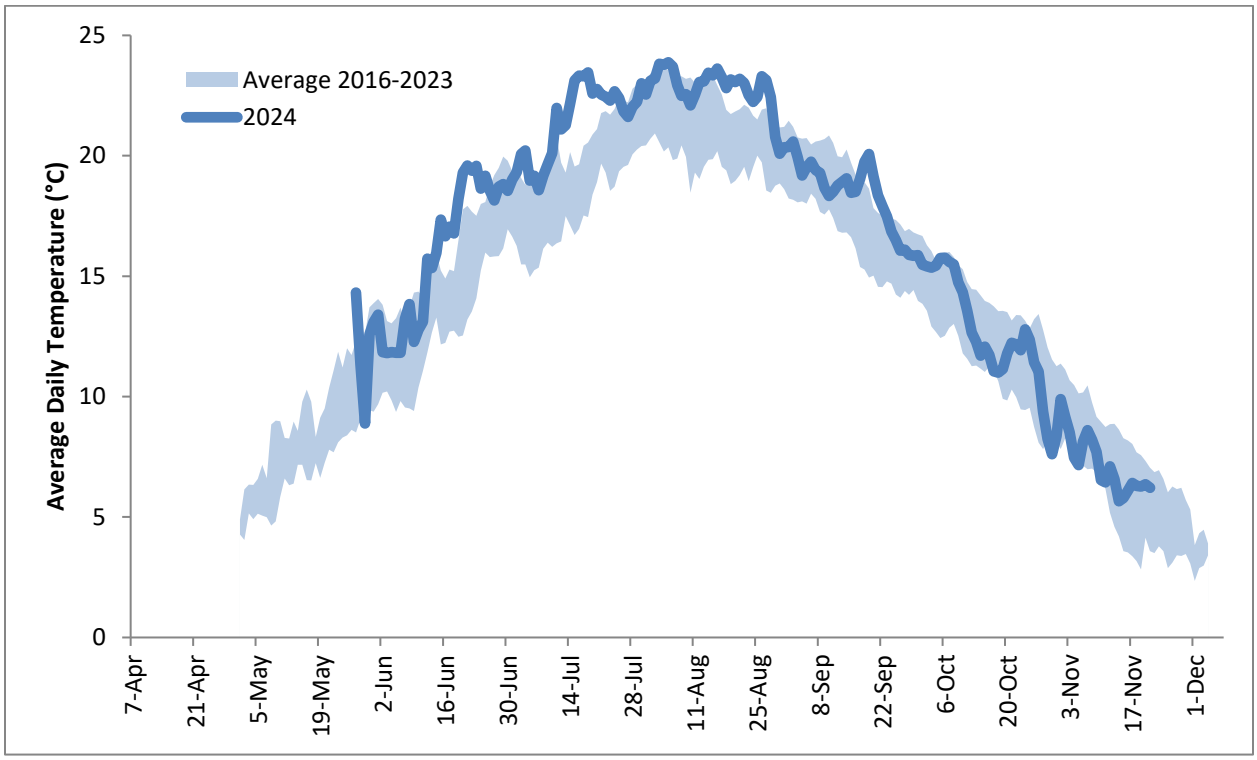
Average daily water temperature measured at Rustico Bay Mussel Monitoring Station in 2016 – 2024.



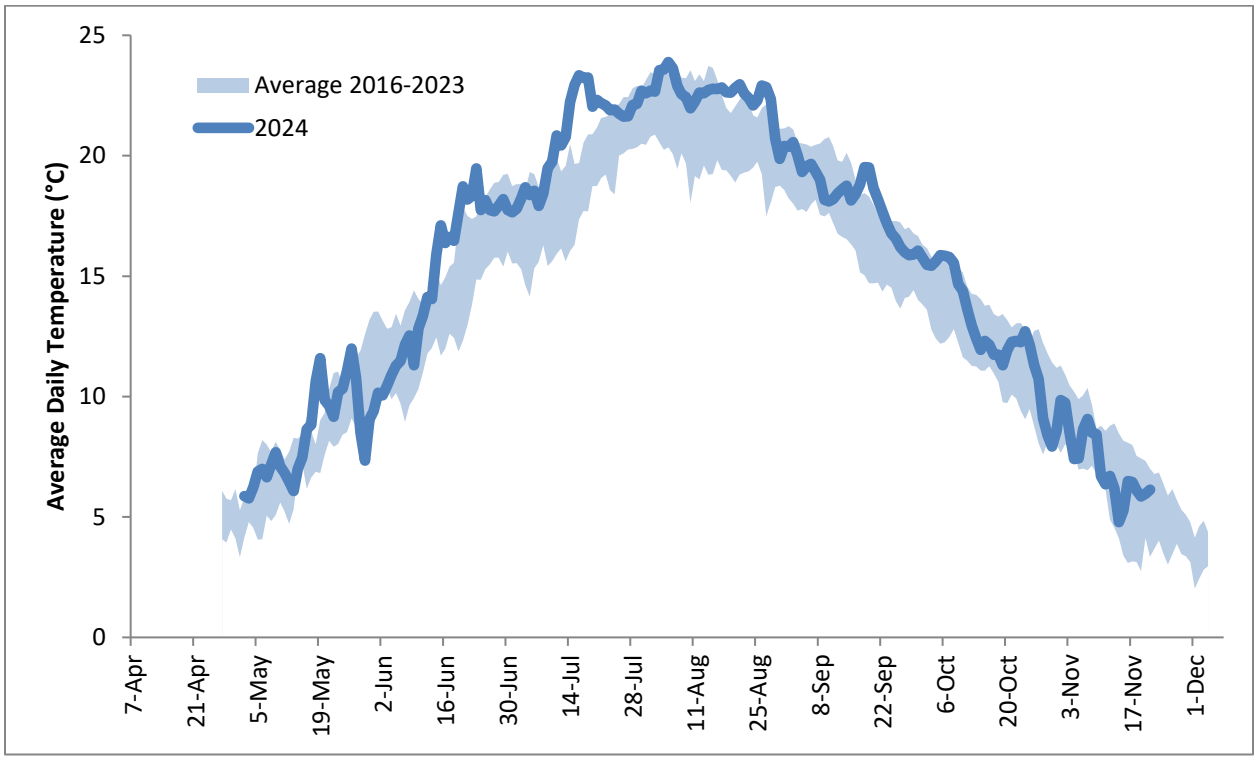
Average daily water temperature measured at Savage Harbour Mussel Monitoring Station in 2016 – 2024.



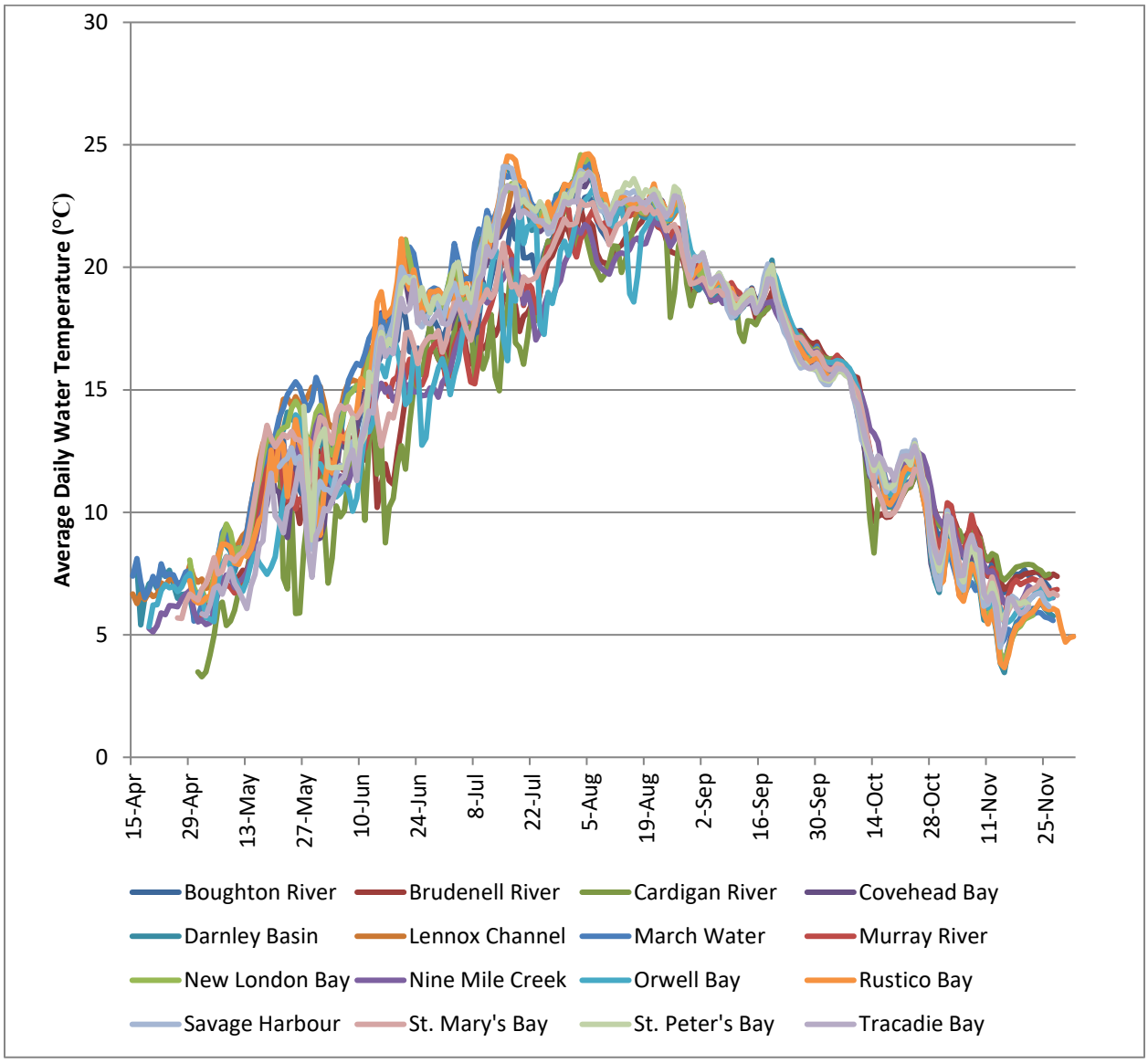
Average daily water temperature measured at St. Mary's Bay Mussel Monitoring Station in 2016 – 2024.



Average daily water temperature measured at St. Peter's Bay Mussel Monitoring Station in 2016 – 2024.



Average daily water temperature measured at Tracadie Bay Mussel Monitoring Station in 2016 – 2024.



Average daily water temperature measured at all Mussel Monitoring Sites in 2024.

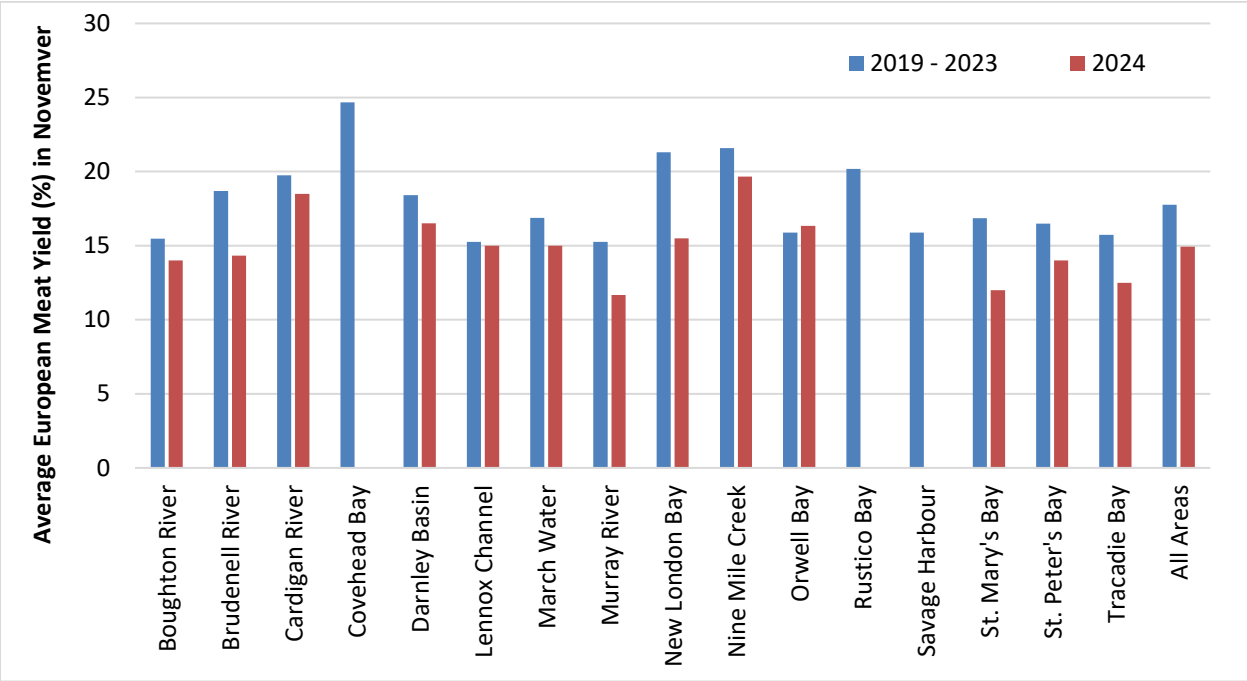
APPENDIX IV MUSSEL STEAMED MEAT YIELD INFORMATION

Comparison of average steamed meat yields from mussels collected from 16 Mussel Monitoring sites in 2020, 2021, 2022, 2023 and 2024.

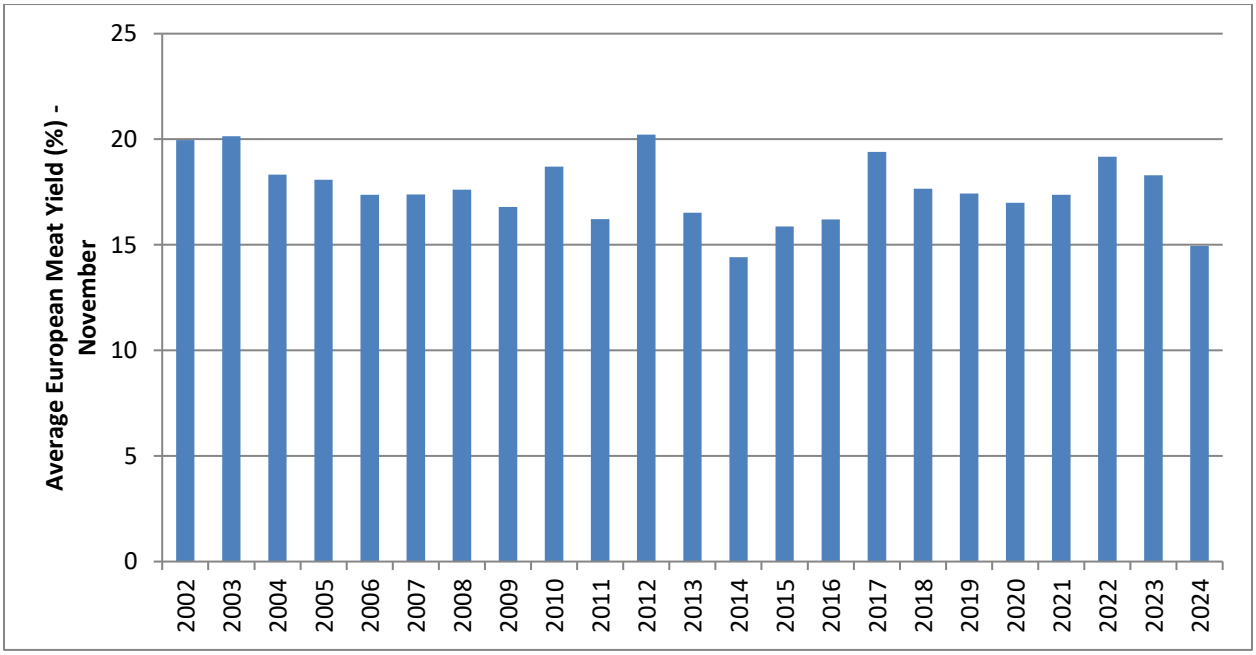
Area	2020	2021	2022	2023	2024
Boughton River	30.0	32.3	35.7	33.3	28.8
Brudenell River	36.9	35.2	37.4	39.7	36.1
Cardigan River	32.6	40.1	35.7	36.5	33.3
Covehead Bay	40.7	40.8			
Darnley Basin	32.3	36.0	31.7	32.4	32.9
Lennox Channel	30.7	30.0	30.0	29.4	25.4
March Water	30.5	29.3	33.2	27.4	26.7
Murray River	28.9	29.8	31.2	30.7	30.1
New London Bay	32.7	38.1	34.5	34.1	33.7
Nine Mile Creek	33.7	38.0	34.2	37.4	35.5
Orwell Bay	33.4	29.4	33.1	35.6	36.3
Rustico Bay	36.1	39.8	38.8		
Savage Harbour	28.6	28.4	32.4		
St. Mary's Bay	33.7	32.2	35.3	32.6	32.5
St. Peter's Bay	30.1	33.9	34.5	31.9	28.7
Tracadie Bay	28.0	32.4	34.3	29.7	30.7

Comparison of average meat weight from mussels collected from 13 Mussel Monitoring Sites in 2024.

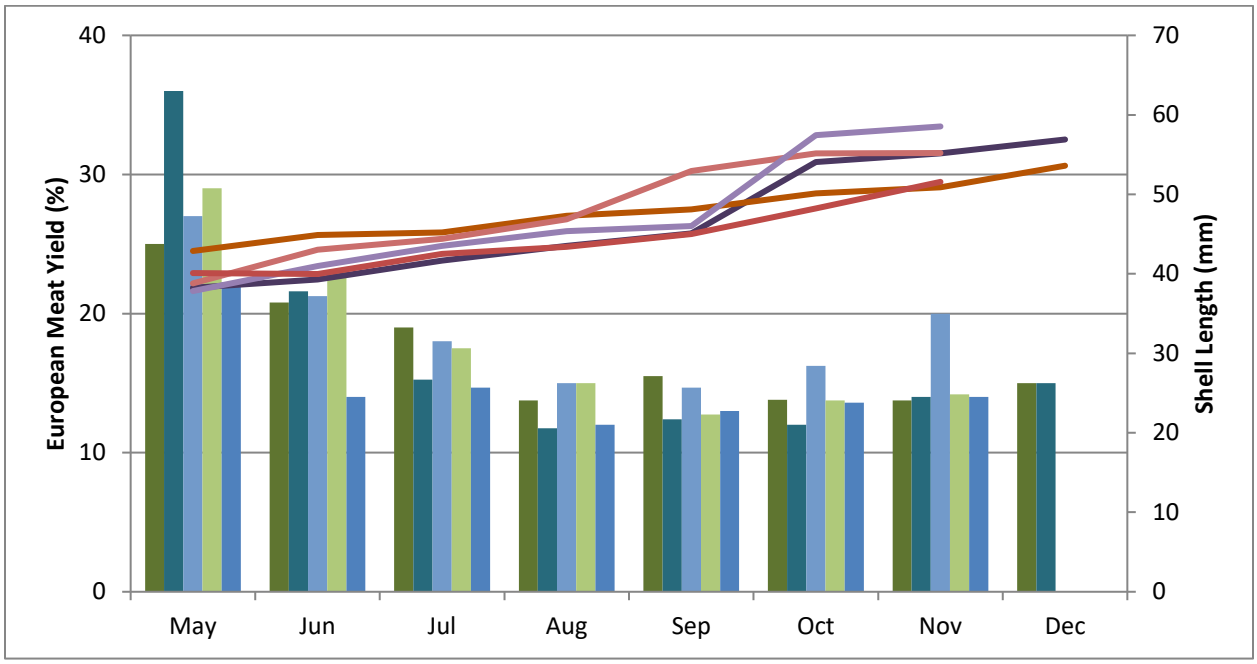
Area	Maximum (g)	Minimum (g)	Average (g)
Boughton River	1.9	0.8	1.3
Brudenell River	2.0	1.0	1.4
Cardigan River	3.7	0.7	1.3
Darnley Basin	1.8	1.2	1.4
Lennox Channel	2.0	0.7	1.1
March Water	2.0	0.6	1.1
Murray River	1.7	0.6	1.0
New London Bay	1.8	0.9	1.4
Nine Mile Creek	3.9	0.9	2.0
Orwell Bay	2.4	0.9	1.4
St. Mary's Bay	1.8	0.7	1.1
St. Peter's Bay	1.8	0.7	0.9
Tracadie Bay	1.9	0.6	1.1



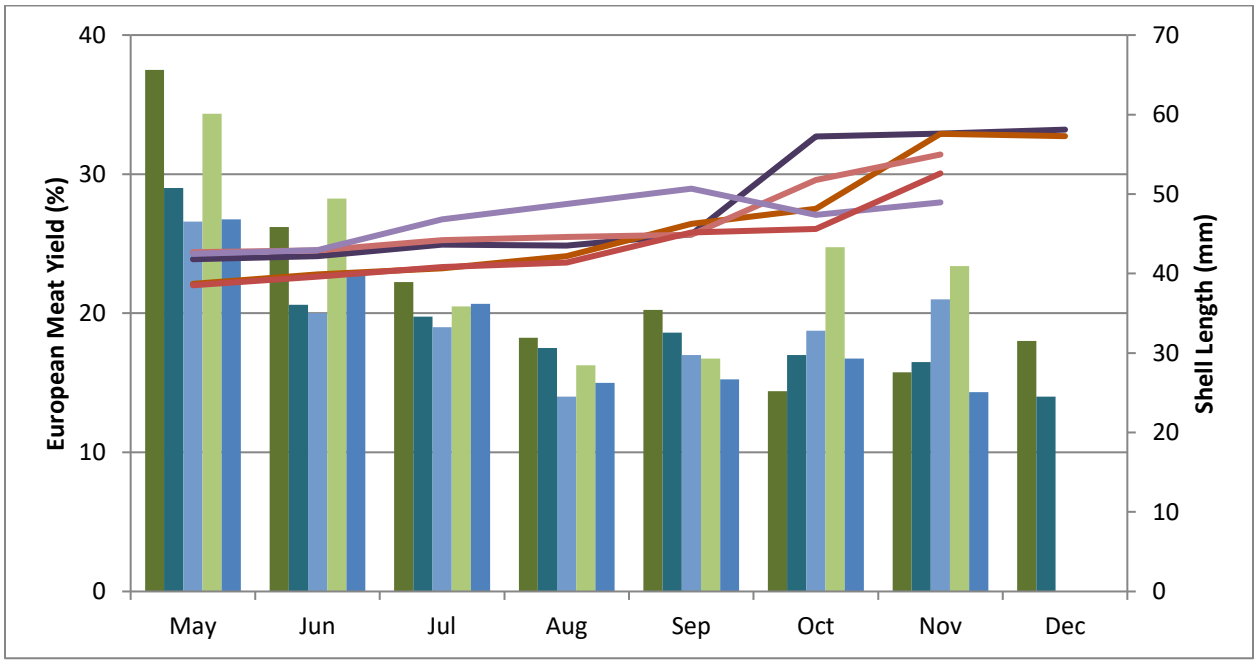
Average European meat yield (%) in November compared between a 5-year average (2019-2023) and 2024 for each of the MMP sites.



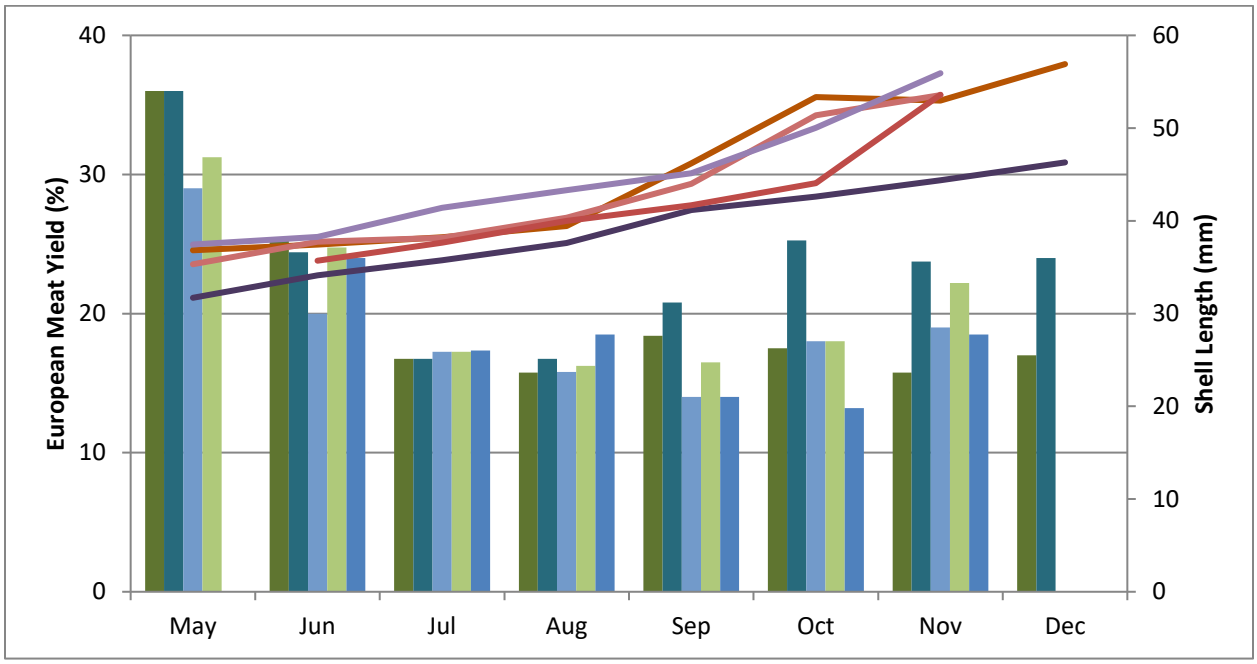
Annual Average European meat yield (%) in November for all MMP sites from 2002-2024.



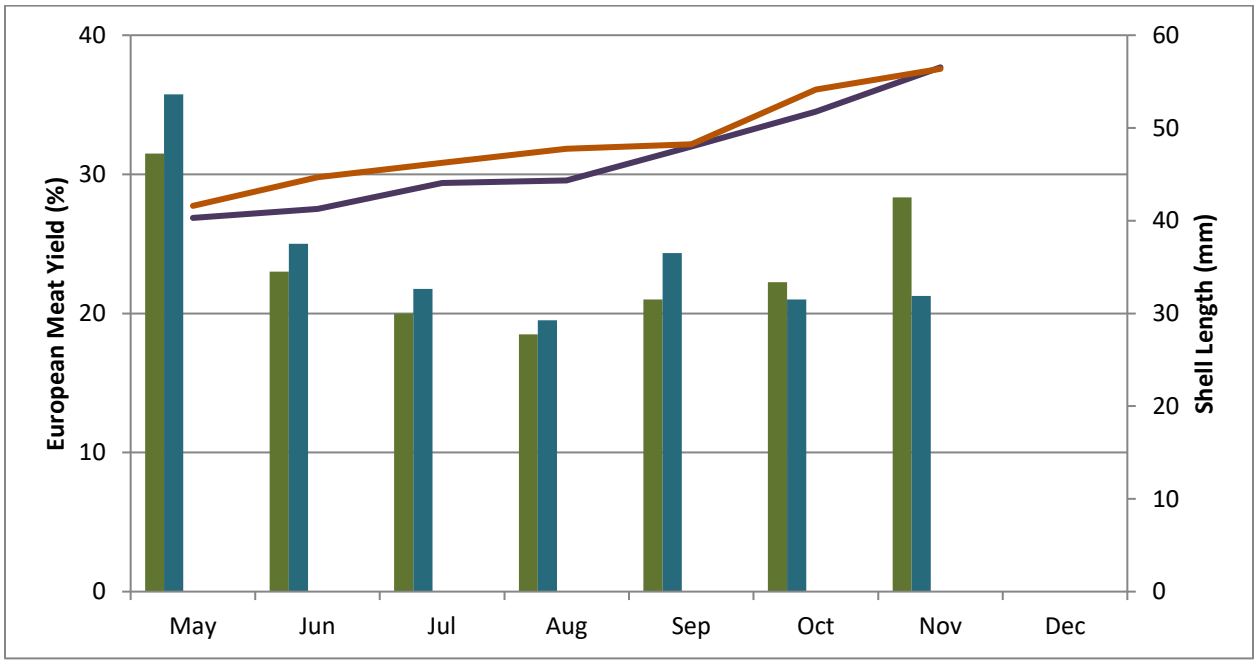
Boughton River European Meat Yield and Shell Length, 2020-2024.



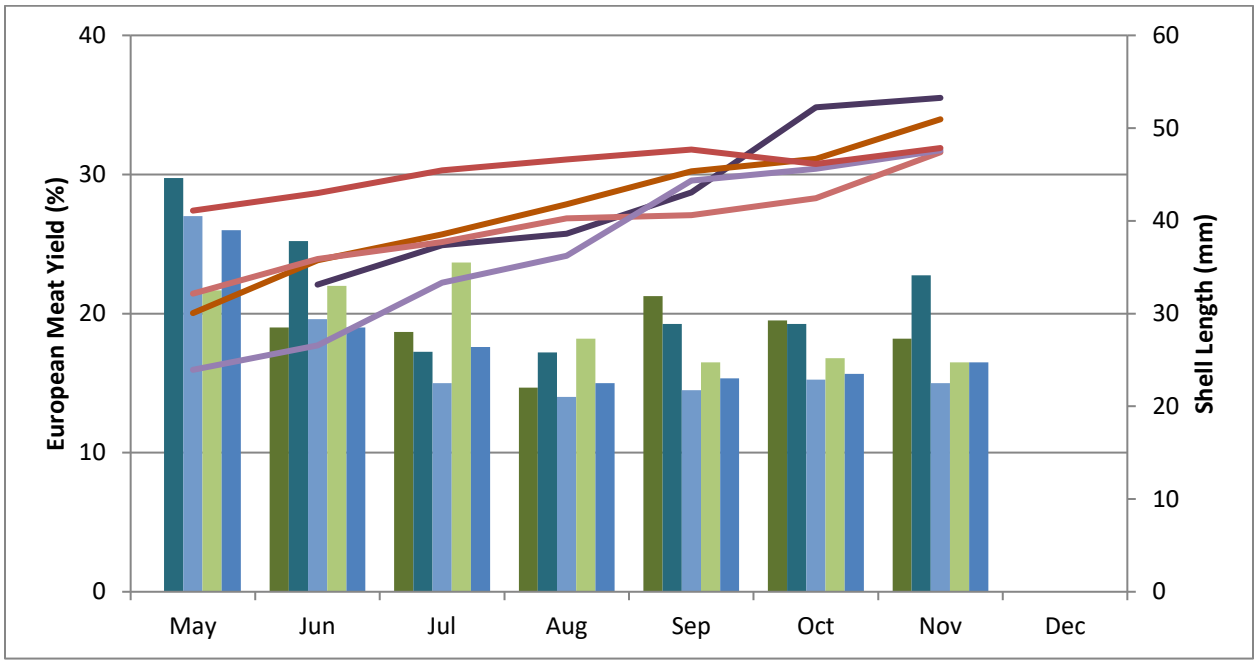
Brudenell River European Meat Yield and Shell Length, 2020-2024.



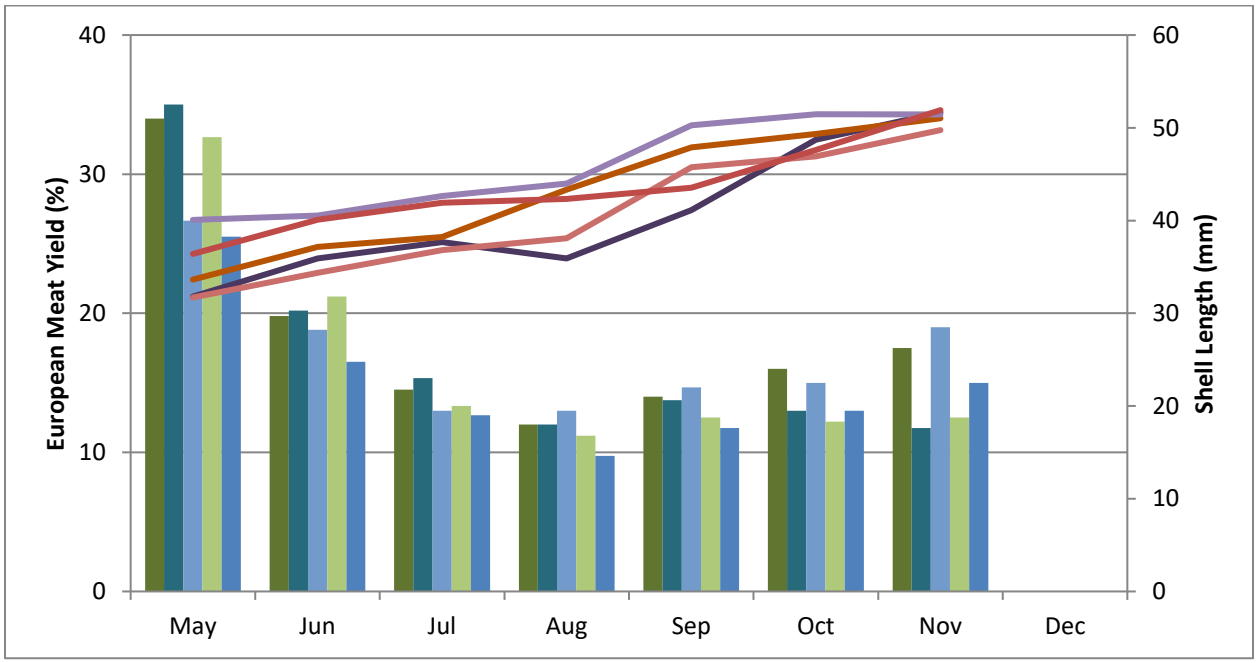
Cardigan River European Meat Yield and Shell Length, 2020-2024.



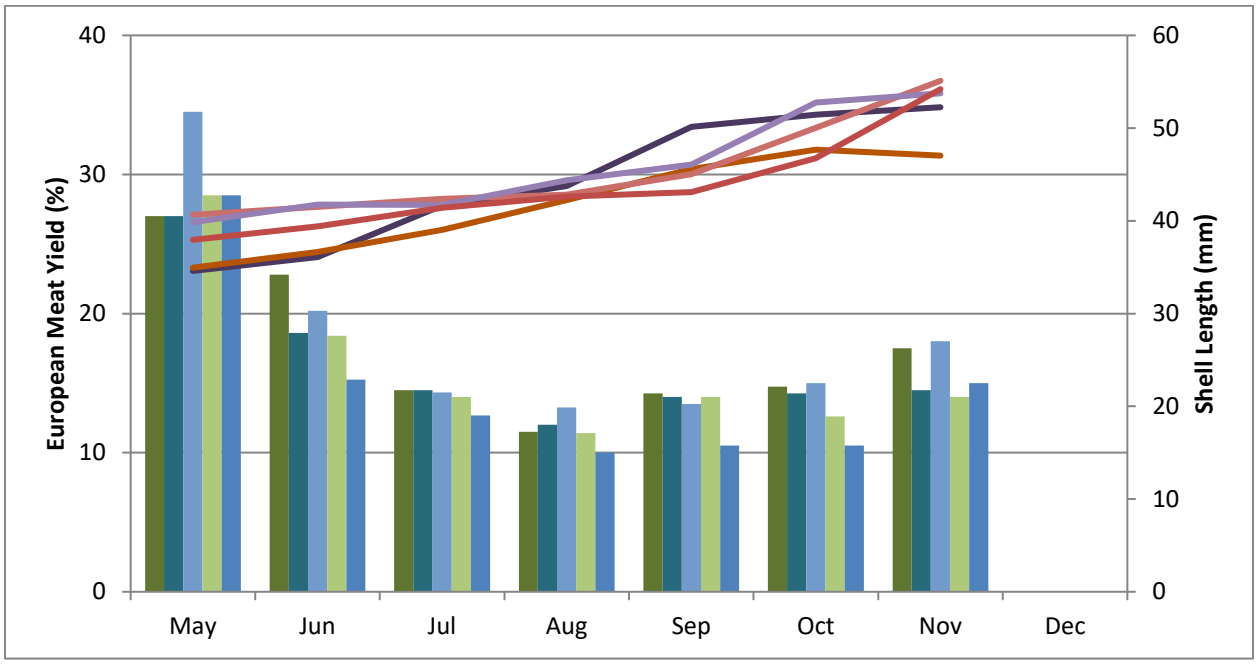
Covehead Bay European Meat Yield and Shell Length, 2020-2024.



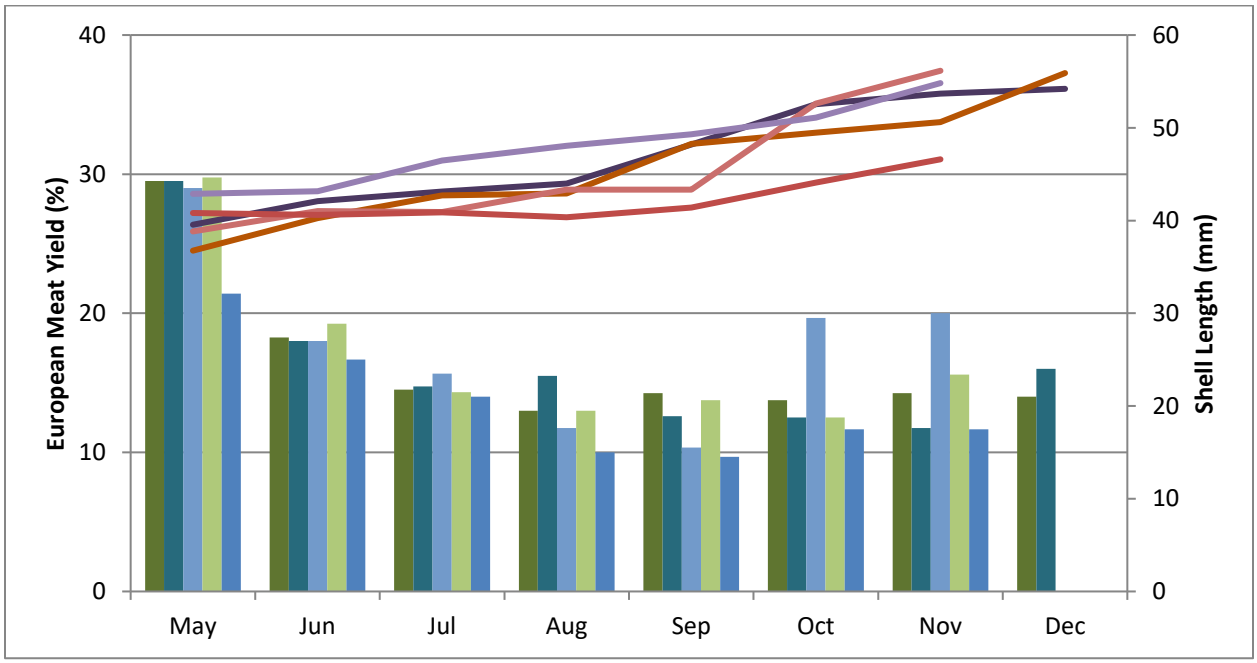
Darnley Basin European Meat Yield and Shell Length, 2020-2024.



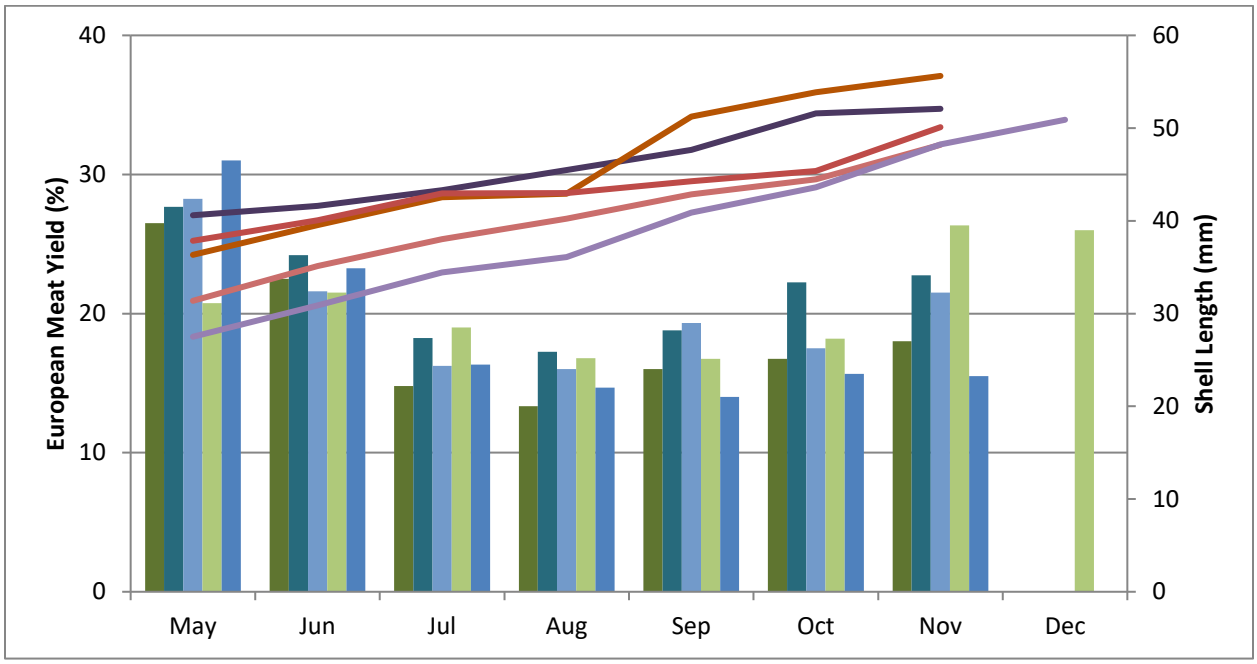
Lennox Channel European Meat Yield and Shell Length, 2020-2024.



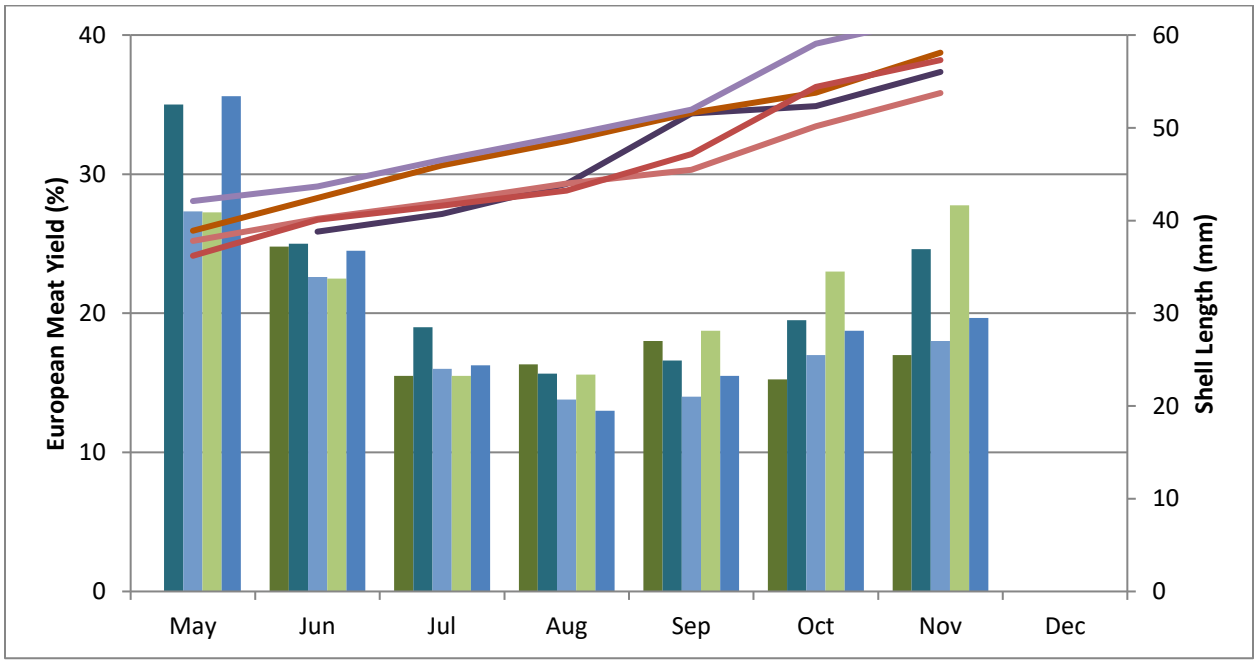
March Water European Meat Yield and Shell Length, 2020-2024.



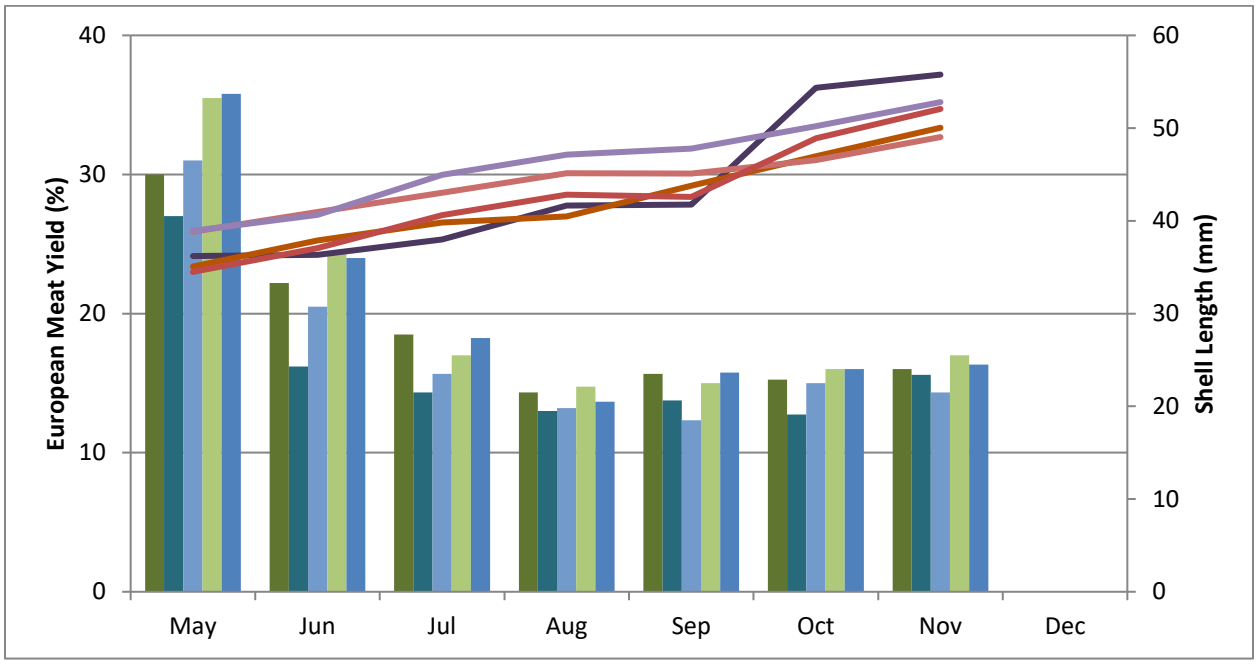
Murray River European Meat Yield and Shell Length, 2020-2024.



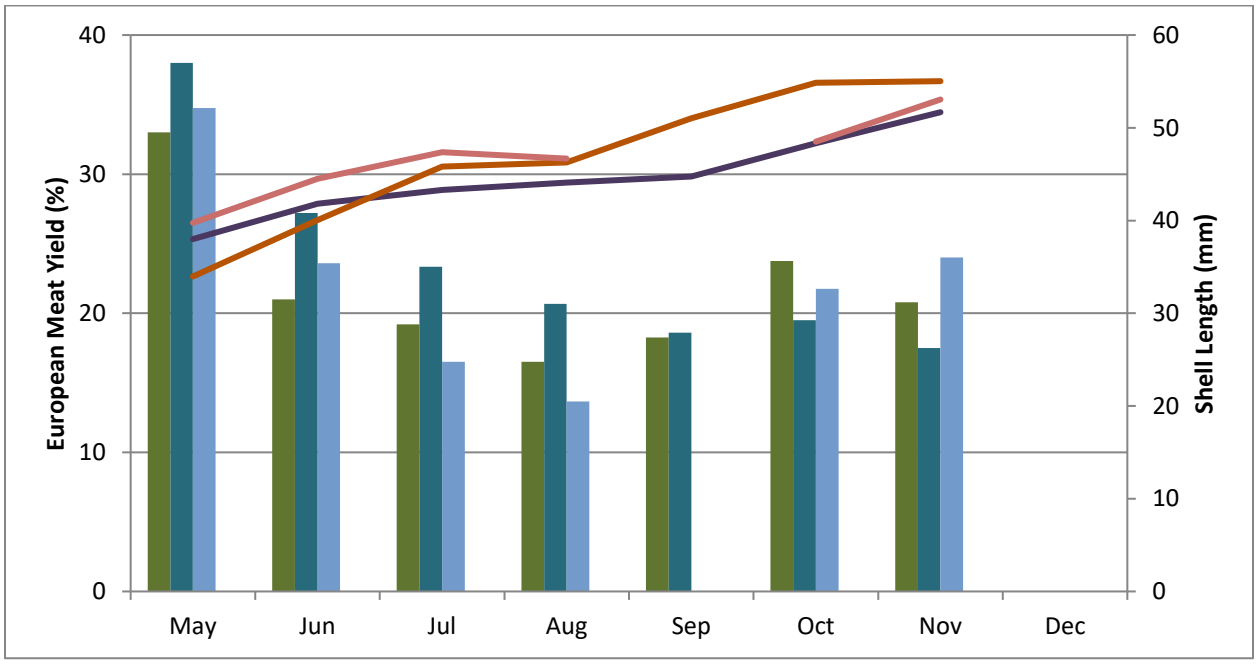
New London Bay European Meat Yield and Shell Length, 2020-2024.



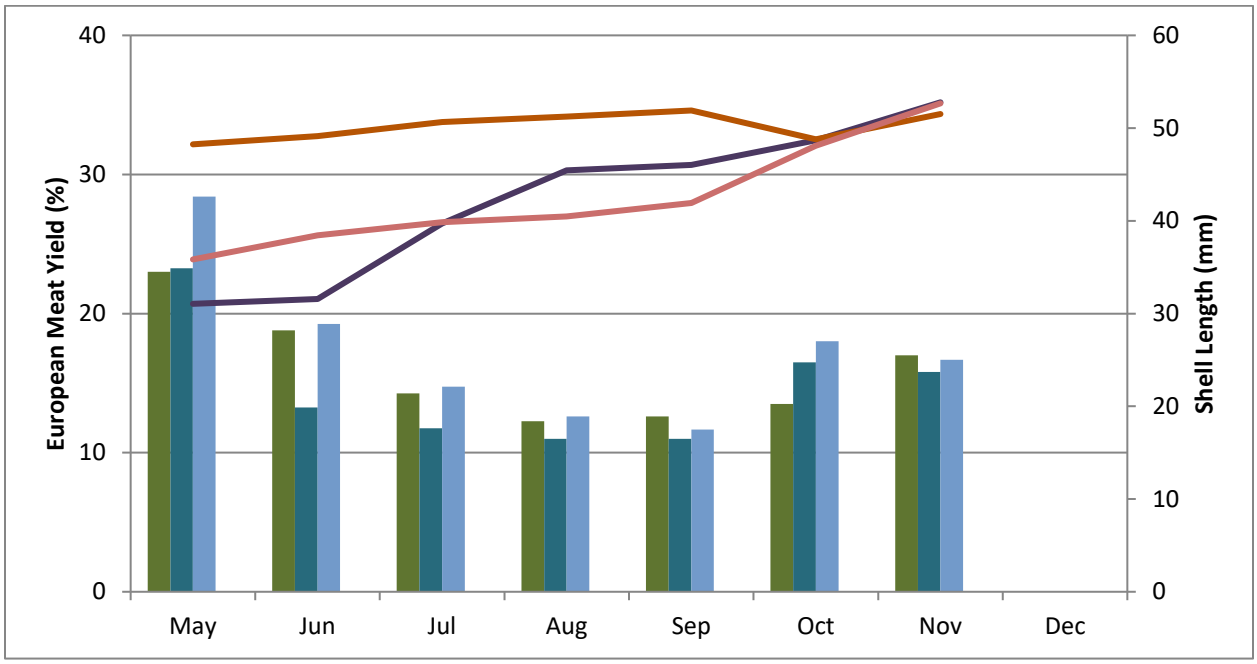
Nine Mile Creek European Meat Yield and Shell Length, 2020-2024.



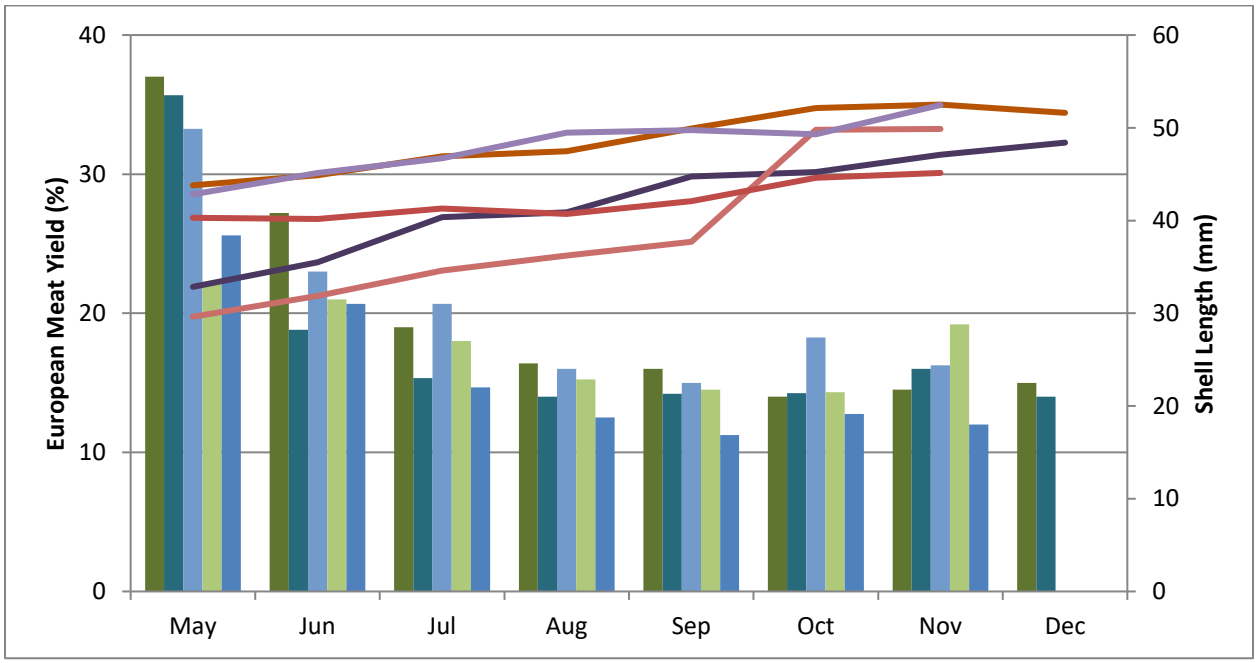
Orwell Bay European Meat Yield and Shell Length, 2020-2024.



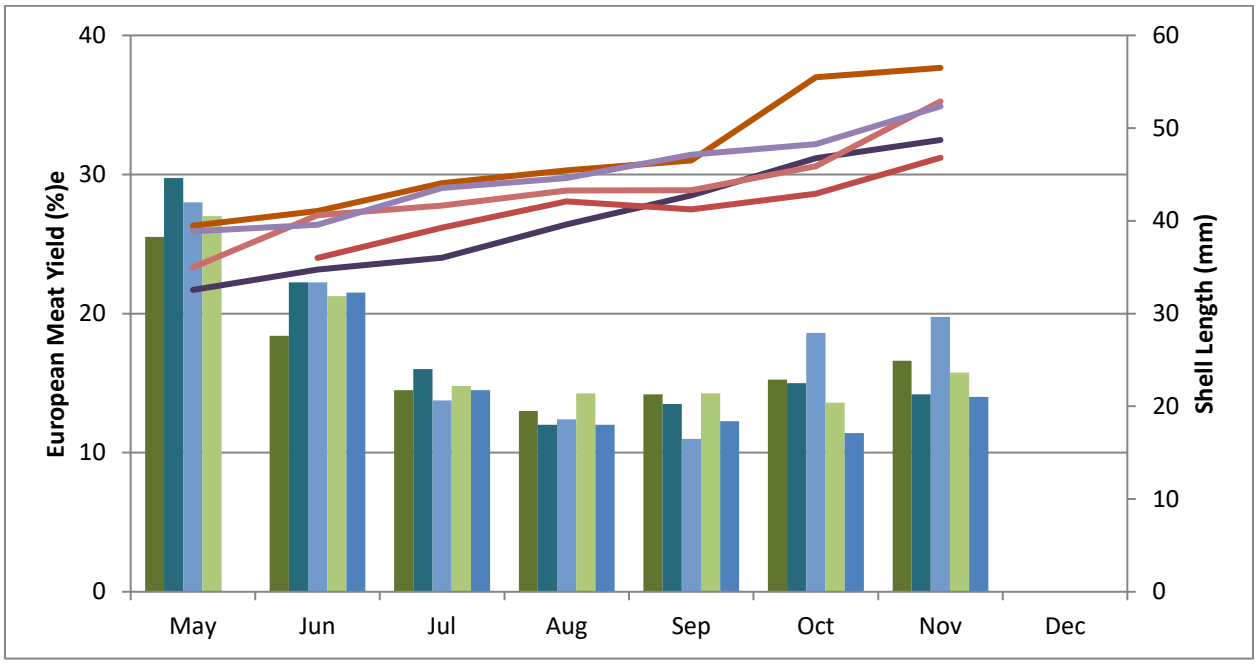
Rustico Bay European Meat Yield and Shell Length, 2020-2024.



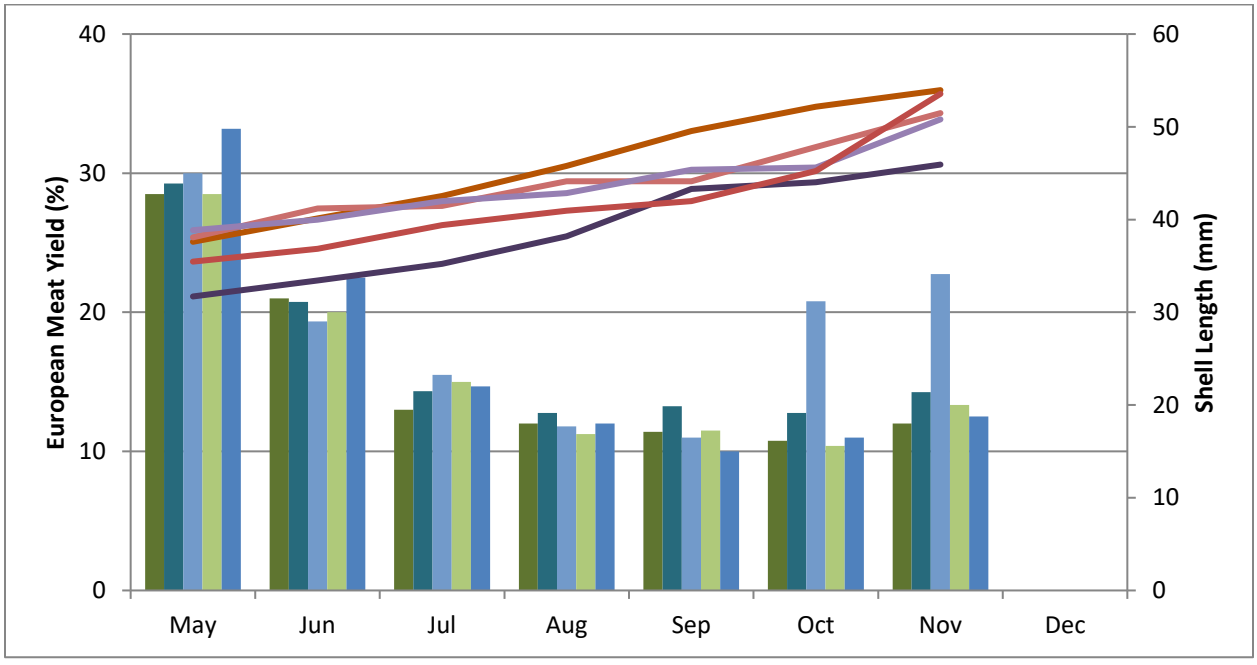
Savage Harbour European Meat Yield and Shell Length, 2020-2024.



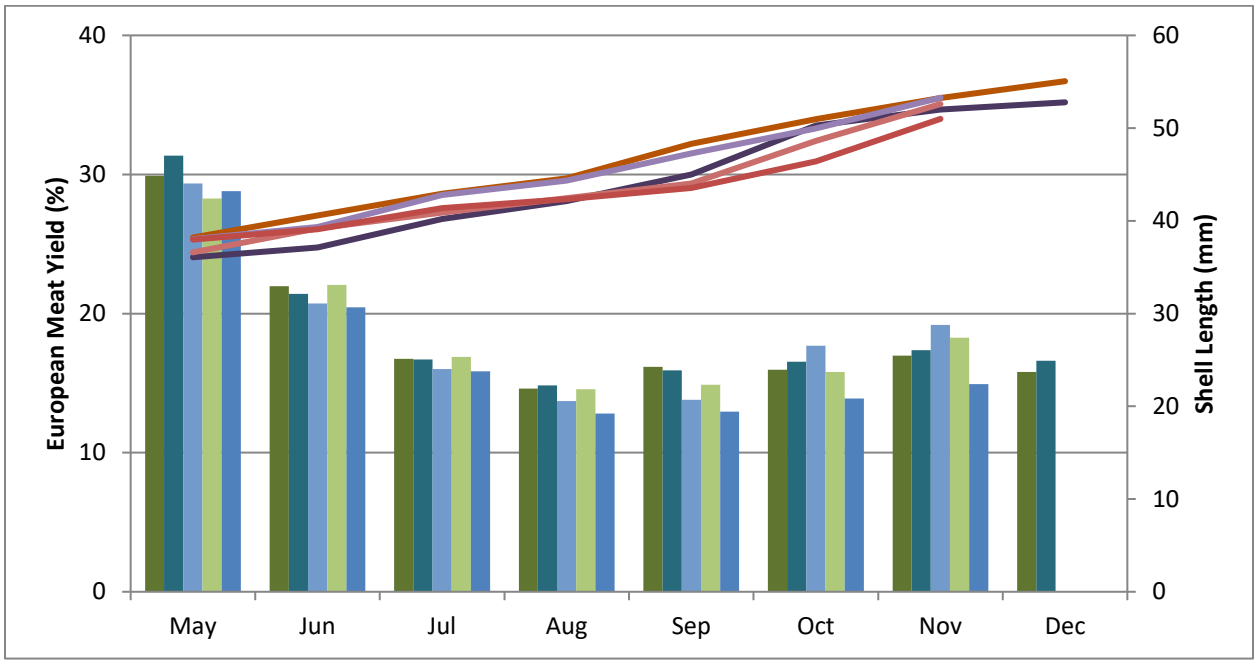
St. Mary's Bay European Meat Yield and Shell Length, 2020-2024.



St. Peter's Bay European Meat Yield and Shell Length, 2020-2024.



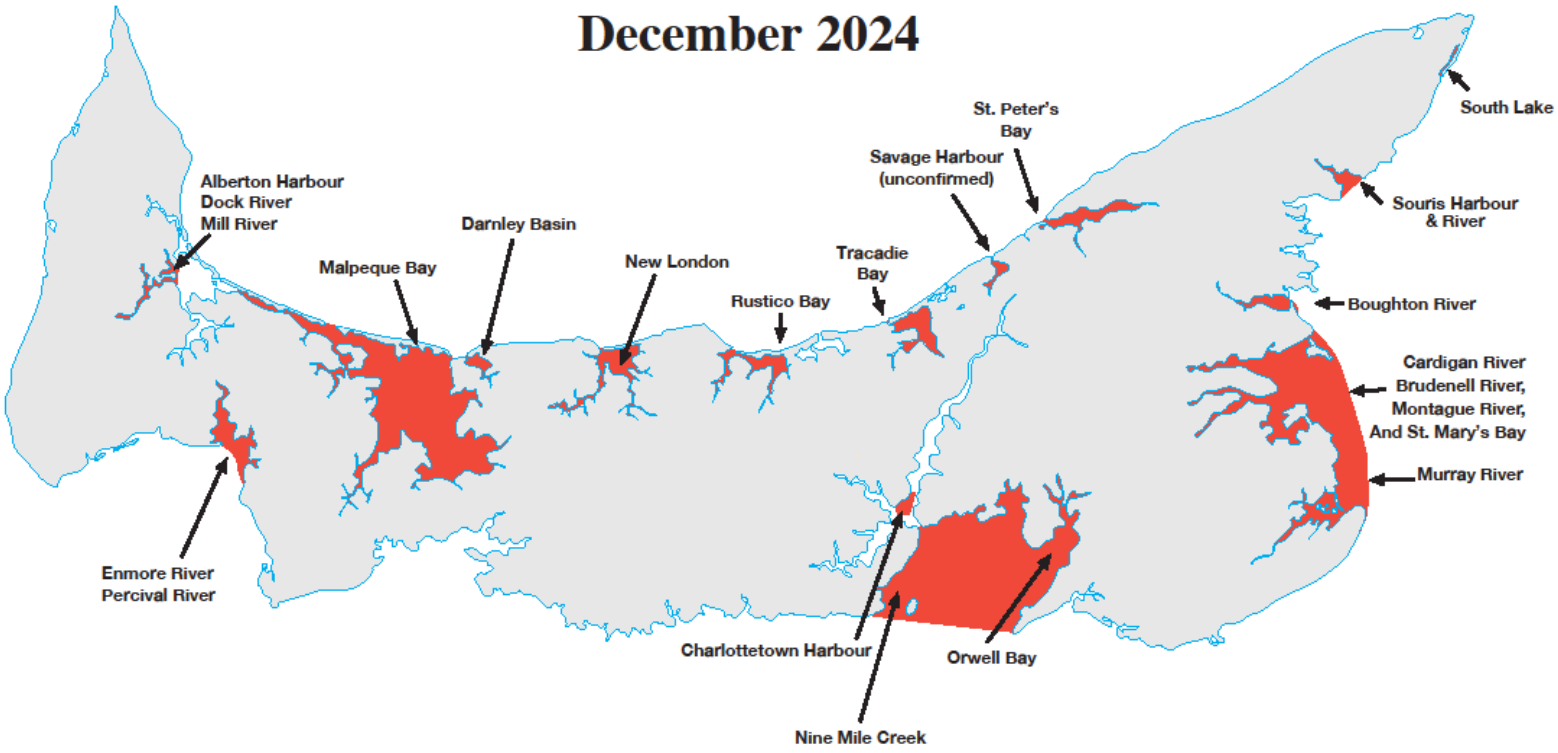
Tracadie Bay European Meat Yield and Shell Length, 2020-2024.



European Meat Yield and Shell Length – 2020-2024 – All Areas Combined.

APPENDIX V MAPS DISPLAYING CURRENT KNOWN RANGE OF INVASIVE TUNICATES IN PEI

Known Range of Clubbed Tunicate December 2024



Known Range of Vase Tunicate December 2024