Lobster Quality 2024-2025 Preseason & In-season Sampling Program

Southwest Nova Scotia LFA33 & LFA34

Final Report

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Submitted by:

Coldwater Lobster Association
368 Main Street, Suite 105 Lovitt Plaza
Yarmouth, Nova Scotia, B5A 1E9
Tel: (902) 742-5247

www.coldwaterlobster.ca

Naomi Martineau, Technician

Centre sur la qualité du homard (CQH)/Lobster Quality Centre (LQC)
Université Sainte-Anne, Centre de recherche marine/Marine Research Centre
Campus de Petit-de-Grat

3433 Route 206
Petit-de-Grat, Nova Scotia, B0E 2L0
Tel: (902) 295-8054

Daniel E. Lane, Professeur associé

CQH/LQC

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1 Background

Figure 1: Banded lobsters in a dry tote.

The 2024-2025 Lobster Quality Preseason Sampling Program continues the long-standing Atlantic Lobster Moult and Quality (ALMQ) project, a collaboration between lobster harvesters, buyers, dealers, and scientists. The ALMQ database originated in 2006 as an initiative of the Fishermen & Scientists Research Society (FSRS 2022). For 2024-25, the sampling program represents the largest continuous database of lobster sampling globally with 20 years of uninterrupted sampling. It is a credit to all collaborators to have the opportunity to produce this final report for the 2024-2025 commercial season. As in the past, this report summarizes all the results of the preseason and in-season sampling program data collection and provide information meant to be of direct use to the lobster sector in Nova Scotia. The lobster industry in Nova Scotia faces many challenges. The quality of lobsters captured at the beginning of the lobster fishing season in southwest Nova Scotia (LFAs 33& 34), the area of the world's largest *Homarus americanus* commercial harvests, remains a significant issue for improved product valuation.

Since the early 2000s, there have been noted fluctuations in the quality of lobster landed in southwest Nova Scotia with higher proportions of soft-shell and lower-meated lobsters landed, resulting in lower quality live lobster product shipped to clients around the world. This represents a serious economic challenge for the industry, especially in international markets where, in 2023, over 80% of Canadian lobsters (by weight) were shipped live to markets in the United States of America (52% by value), China (40% by value), and the European Union (8% by value) (Fisheries and Oceans Canada 2024). Results of past ALMQ sampling in southwest Nova have shown that lobster quality at harvest is directly related to the timing of lobsters' moulting processes. These processes are affected by factors including water temperature, available lobster diet, and other ecosystem factors. Understanding the incidences of those factors that control the proportion of soft-shelled lobsters and the annual variation in lobster quality at the beginning of the commercial season (last Monday in November, annually) is vital to the sustainability, health, and viability of the live lobster industry in Nova Scotia.

In 2017, the Province of Nova Scotia announced the creation of Université Sainte-Anne's Lobster Quality Research and Innovation Centre (LQRIC, Nova Scotia 2020). The LQRIC, renamed the Lobster Quality Centre (LQC) in 2024, has been established to aid in the research and development of live lobster product quality through ongoing sampling and modelling and analysis of the live lobster supply chain. The Lobster Quality Centre acknowledges the financing for this project as part of a Scientific Partnership Grant from the Atlantic Fisheries Fund (AFF) award for 2020-2024, the support of Fisheries and Oceans, Canada, and, in particular for 2024-25, the generous support of the Nova Scotia Department of Fisheries and Aquaculture, and our industry partners.

The purpose of this annual report is to present and analyse the data observed on lobster quality from extensive preseason and selected in-season lobster sampling, and to report on the status of lobster quality for the 2024-2025 commercial season in subareas of LFAs 33 & 34 that terminates at the end of May 2025. The report follows the directives of the Report of the Maritime Lobster Panel that sought changes to 'improve the quality of lobster being landed in the Maritime Provinces' including the development of 'industry grading standards' (Thériault et al 2013, pp.44-43).

This report provides the detailed observations of the 2024-25 preseason and in-season at-sea sampling conducted by Coldwater Lobster Association (Coldwater Lobster Association 2024) in 8 locations within LFA33 and LFA34 designated as the 'inside' and 'outside' areas of Lobster Bay, St. Mary's Bay, Yarmouth Bar in LFA34, and Port La Tour in LFA33. Preseason sampling commenced October 8, 2024 and continued until November 13, 2024. This report also presents selected in-season sampling carried out in 5 of 8 LFA33&34 subareas from January 11, 2025 through February 24, 2025. All sampling was conducted by Coldwater Lobster Association according to the ALMQ protocols established since 2006 (revised in 2024). Table 1 below describes the samples information gathered on individual lobsters. Figure 2 presents the survey sampling tools. After observations are taken from sampled legal-sized lobsters, all lobsters are released.

Table 1. 2024-25 Lobster Sampling Data Description

No.	***Individual Lobster Sampling Data Item***
1	Depth of string (F, fathoms); typically 4 strings are used for sampling with 10 pots per string, for a total of 40 pots per sample
2	Counts of legal and sub-legal lobster captured (only legal lobsters were used in subsequent sampling)
By the 2024 protocol, 100 legal-sized lobsters are sampled from the captured counts and the following items recorded for each lobster during preseason sampling:	
3	Lobster Carapace Length (CL, millimetres)
4	Lobster Sex (M-male '1'; F-female '2'; BF-berried female '3')
5	Lobster Shell hardness (Soft '2'; Medium '4'; Hard '5')
6	Lobster Blood protein level – measured via refractometer as the BRIX Index (units/ml, Figure 2)
7	Lobster Moult stage ('0' – no activity; '1' to '5') – from selected lobsters' (40 per sample) pleopod removal and post-at-sea sample examination under a microscope (Factor 1995, see also Figure 3 below)
8	Damage (coded descriptions for visual impacts, e.g., culls, as well as "blackened" shell disease)
9	Lobster vitality status through leg and tail reflex observed: "weak" or "not weak" status indicated.

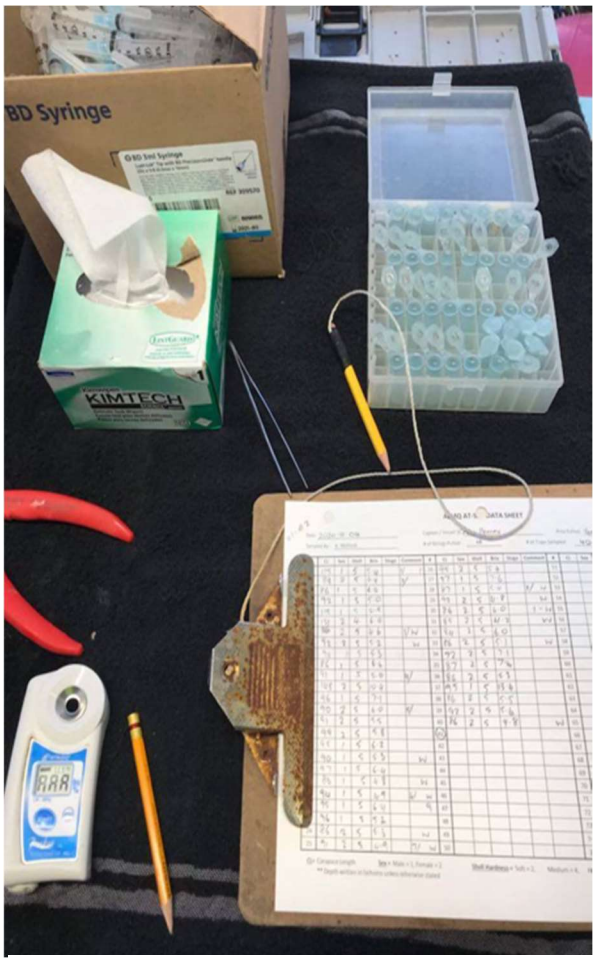


Figure 2: Survey sampling tools.

The collected data by the Coldwater Lobster Association technician are designed to proxy lobster quality – live lobster meat content and suitability for storage and shipping. Data analyses of the samples and collected data were carried out by the Centre de recherche marine/Marine Research Centre of the Université Sainte-Anne, Petit de Grat Campus and the LQC team. Results of the preseason component of the sampling program are provided in the 2024 preseason summary (Martineau, Mulock, and Lane 2024b and posted to the Coldwater website at: https://www.coldwaterlobster.ca/wp-content/uploads/2024/11/2024-25-DRAFT-ALMQ-Pre-Season-Sampling-Report-November-2024.pdf) as an indicator to the Nova Scotia lobster industry about the early season status of the post-moult lobster harvest in the 8 designated sampling areas of LFAs 33 & 34.

The results presented here also provide focus on: (i) sampling catch counts; and (ii) the distribution of the recorded BRIX levels for the 2024 preseason (October to November 2024) and the 2024-2025 in-season sampling (January 2025 to February 2025) compared to past years' samples from similar preseason and in-season times and sampling locations over the period 2012-2024. This information enables the industry to compare the 2024-2025 sample results to known past years of observed preseason and subsequent in-season lobster quality and status.

1.1 Lobster Quality Determinants

For the first time in 2021, consolidated data from each sample date by location are classified into lobster quality categories derived from the full ALMQ database (2006-2024). Lobster quality categories for each consolidated location sample and date are based on collective lobster sample characteristics of the sampled lobsters for each sampling date. The historical consolidated sample data were categorized into 5 'lobster quality' categories. The results of this analysis enable the numerical description of each category, and subsequently, the assignment of each of the 2024-25 sample dates into the most probable lobster quality category.

1.2 Blood Protein, BRIX Levels

In 2024, as per the protocol in the past, blood protein levels, represented by the BRIX index, are a key indicator of individual lobster quality. BRIX index values below 6.0 units/ml in the samples provide a probable indication of poor quality and less than fully-meated lobster that are less suitable for storage and shipping to international markets. These lobsters often appear weak, potentially soft shell, and would not be ideal for holding or shipping.

BRIX index values between 6.0–7.99 units/ml indicate that lobsters may still be recovering from their prior moult and may still be of some concern with respect to quality. BRIX levels at 8 or above are indicative of good quality, are more fully-meated lobsters, and are likely more suitable for storage and shipping.

It is noted that BRIX levels are an imperfect determinant of lobster quality and meat content (see also Thériault, David, Frame, Samson, Mdaini, and Lane 2024). Table 2 below summarizes the BRIX index categories by lobster quality determinants as interpreted in the full ALMQ database.

Table 2. BRIX Levels Lobster Quality Categories

BRIX Quality Category:	**"Poor"**	**"Medium"**	**"Good"**
Meat Content:	Most likely low	Not likely fully-meated	Likely fully-meated
Storage/Shipping:	Not ideal	Concerns	Likely suitable
Observed Lobster Quality Indicators:			
Blood Protein Level, BRIX index (units/ml)	**Less than 6.0**	**6.0 to 7.99**	**8.0 or greater**
Shell Hardness	Potentially "Soft" (2)	Potentially "Medium" (4), recovering from previous moult	Likely "Hard" (5)
Appearance	Pale colour, evidence of carapace abnormalities, and/or shell disease	Acceptable colour, little evidence of carapace abnormalities or shell disease	Spring black-bodied, few carapace abnormalities
Shape/size	Culls, misshapen claws, damage to carapace	Small size, misshapen claws, limited damage to carapace	Commercial size, good body shape

1.3 Lobster Shell Hardness

The manual assessment of shell hardness is a subjective indicator of lobster quality. Guidelines are in place for manual estimates of each sampled lobster's shell hardness using a subjective non-numeric scale of 2 ("Soft"), 4 ("Medium"), and 5 ("Hard"). In 2024-2025, shell hardness measures have increased significantly compared to previous years. This fact is the single most important take-away from this year's report. Although softer shells are correlated with lower BRIX values (as also have occurred in 2024-25 sampling), overall, shell hardness measures continue to be weakly correlated with continuously measured BRIX levels, and correlations (between lobster's BRIX and Hardness) are mostly not significantly different from zero for all sample location-dates. Consequently, shell hardness measures are not directly considered to be a lone determining factor in lobster quality prediction and are best used in conjunction with other measures, e.g., BRIX and appearance.

1.4 Lobster Appearance

Similarly, lobster appearance and lobster carapace shape and size are qualitative quality indicators based on simple accept-reject categories, i.e., if a lobster has carapace abnormalities such as evidence of culls, misshapen claws, missing swimmerets, or poor colour, then such lobsters may be rejected for storage or shipping. Like shell hardness measures, lobster appearance, shape and size cannot be singular determining factors in assessing lobster quality. Rather, the information is used as supplemental to determining lobster quality along with other measures, e.g., BRIX.

1.5 Lobster Moult Stage

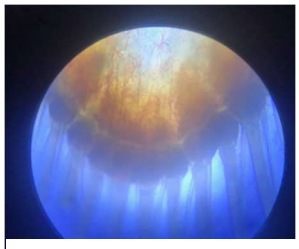


Figure 3. View of lobster pleopod under microscope.

Moult stage analyses are carried out by analysing selected lobsters. According to the ALMQ protocol in place since 2006 (revised in 2024), 40 lobsters from each sample of 100 lobsters per sampling location-date have their pleopods (swimmeret) removed. Each lobster's moult status is determined by microscopic analysis of the lobster pleopod as per the descriptions provided by Factor (1995) (Figure 3). Moult stage levels of zero indicate no moult activity is pending. Advanced moult stages (Stages 3+) indicate the moult is approaching. Pleopod analysis in female lobsters

may also indicate the onset of the egg-bearing cycle (Factor 1995). Lobsters with advanced moult stage are not considered for storage and shipping.

2 Sampling Survey Information and Summary Results in 2024-2025

The objective of the ALMQ project is to develop a lobster monitoring program, based on biological indicators of moult-timing, lobster quality measures, and environmental conditions, in order to predict the quality of lobsters at the start of the lobster commercial fishing season (end November annually) in LFAs 33&34. This program requires a combination of continuous at-sea quality monitoring (preseason and in-season confirmation of results) as well as the development of a prediction model incorporating historical data records for in-season quality. The following paragraphs describe the information obtained from the 2024 preseason sampling and the 2025 in-season sampling surveys.

Figure 4: Drawing blood for refractometer for BRIX

In 2024, a total of 2,400 preseason lobster samples were taken over the 6-week period from October 8 to November 13, 2024. For the in-season survey of January and February 2025, a total of 600 lobster samples were taken in 6 in-season trips over 5 dates for 5 of the 8 sample location subareas, not including St. Mary's Bay and Yarmouth Bar Inside areas and Lobster Bay Outside (Table 3).

In preseason sampling, over all location-areas sampled, BRIX levels observed at the beginning of the 2024 survey in October deemed to be 'average', generally dropped off as more berried females, soft shell, and "weak" lobsters started appearing more often in the traps (through to early November 2024). The BRIX decline was notable for Lobster Bay and sex specific there. Lobster Bay females were often soft-shelled, low BRIX lobsters, and often berried, while males were harder with higher BRIX.

During the in-season surveys of January and February 2025, average BRIX levels rose to 8-11 as lobsters hardened and berried females diminished. However, while the BRIX averages per sample reflected this, the BRIX data were much more spread out (higher variance) among the lobsters sampled than the pre-season samples, e.g., in-season samples often had many low BRIX lobsters and several high BRIX lobsters, while the pre-season samples were mostly intermediate level BRIX with lower BRIX variance among the lobsters sampled.

As the weeks went by in the preseason survey, a noticeable shift from higher to lower lobster counts for inside areas occurred, while lower to higher counts of lobster began appearing in corresponding outside locations along with increased BRIX levels and reductions in soft and weak lobsters. Lobster counts per trap continued to drop substantially into the in-season survey months of January and February. Fishermen often attributed catch declines to the lower temperatures, claiming the lobsters either retreat offshore or just don't crawl in response to sudden temperature drops (especially for the inside locations). This was a major reason for a decline in in-season sampling of inside areas since commercial fishermen were reluctant to fish in these locations during January and February 2025.

Inside areas over all 4 inside locations averaged 20.47 Fathoms in depth in 2024-25; outside areas over all 4 outside locations averaged 42.69 Fathoms in depth in 2024-25. These average depths are comparable to those of past years' surveys.

Preseason sampling in 2024 resulted in total catches of 10,851 sublegal and legal lobsters for an average of 11.30 lobsters per trap over the 24 preseason sampling dates (a decrease of -4% over the 2023 preseason catch of lobster per trap of 11.74). The average BRIX index for individual lobsters was 8.10 units/ml for the 24 preseason sample location-dates in 2024 (a decrease of -17% vs 2023 average BRIX of 9.78 units/ml).

In-season sampling in 2025 resulted in total catches of 1,183 lobster sublegal and legal lobsters for an average of 2.54 lobsters per trap over the 6 preseason sampling dates (a decrease of -61% over the 2023-24 in-season average catches of 6.58 lobsters per trap over 13 location-dates). The BRIX index for the 6 in-season sample location-dates (January through February 2025) was 10.06 units/ml or 24% higher on average than the preseason 2024 average of 8.10 units/ml, but -12% lower than the 11.44 units/ml average over the 13 in-season sampling dates in 2023-24.

Overall, for preseason and in-season samples combined, there were 32.53% "Soft" and 4.73% "Weak" lobsters observed in 2024-2025 sampling. This represents a large annual increase of over 10 times the "Soft"% in 2023-24 (of 2.78%) and, at the same time, a 58% decrease in "Weaks" versus 11.22% in the 2023-2024 report. These data are summarized below in Table 3 – "2024 Preseason and 2025 In-season Sampling Survey Information Summary".

2.1 Sampling Protocols

During the 2024-2025 lobster sampling program, the following project outcomes were achieved:

- At-sea quality monitoring – successful observations over 8 locations within LFA33 and LFA34 over a total of 30 sampling dates from October 8, 2024 to February 24, 2025;
- Development of pre-season prediction report for industry – as reported in Martineau, Mulock, and Lane (2024b) summary report released on November 24, 2024; see also: https://www.coldwaterlobster.ca/wp-content/uploads/2024/11/2024-25-DRAFT-ALMQ-Pre-Season-Sampling-Report-November-2024.pdf
- In-season quality sampling – successful completion of 6 sampling location-dates from January 11 through February 24, 2025 in 5 of 8 subareas of LFAs33 & 34;
- Temperature data collection for pre-season sampling only– incomplete (limited area sampling): no temperature data were analysed in the 2025 in-season samples;
- Lobster tagging program – not initiated in the 2024-2025 sampling program;
- Base line data on berried females – successful data collection across 30 preseason and in-season sampling location-dates; and
- Base line data on catch, including counts of sub-legal and legal, male and female lobsters in all 8 subareas of LFAs33&34 – successful observations of harvested lobsters in 8 locations in 24 preseason and 6 in-season sampling location-dates in 2024-2025.

Table 3. 2024 Preseason and 2025 In-season Sampling Survey Information Summary

Sampling Location	Sites Subarea	Sampling Dates 2024 & 2025	Harvested Counts	Total Samples	Sample Ave BRIX (units/ml)	Sample % Soft	Sample % Weak
Lobster Bay	Inside	October 18	658	100	9.46	37%	3%
		October 29	624	100	9.92	33%	3%
		November 13	376	100	10.02	40%	3%
		January 24	142	100	11.81	18%	2%
		February 24	171	100	11.33	3%	1%
	Outside	October 17	670	100	7.95	41%	14%
		October 28	552	100	8.74	38%	11%
		November 12	475	100	8.58	41%	4%
Port La Tour	Inside	October 16	492	100	7.30	39%	2%
		October 30	381	100	7.78	40%	1%
		November 13	415	100	8.09	36%	0%
		January 23	296	100	9.76	17%	5%
	Outside	October 15	251	100	6.93	47%	7%
		October 29	237	100	7.37	40%	3%
		November 12	310	100	7.84	49%	1%
		January 23	218	100	9.12	35%	3%
St. Mary's Bay	Inside	October 8	717	100	7.85	22%	21%
		October 24	548	100	8.04	45%	2%
		November 6	493	100	8.00	32%	3%
	Outside	October 7	311	100	7.81	25%	9%
		October 23	474	100	7.25	46%	3%
		November 5	637	100	8.14	24%	3%
		February 20	170	100	10.45	12%	2%
Yarmouth	Inside	October 9	601	100	8.25	16%	21%
		October 23	403	100	7.78	54%	4%
		November 5	258	100	8.78	17%	0%
	Outside	October 8	128	100	7.56	12%	6%
		October 22	352	100	7.22	44%	2%
		November 4	488	100	7.81	30%	3%
		January 11	186	100	7.87	43%	0%
PRESEASON TOTALS	**8 location-areas sampled**	**24 sample location-dates (2024)**	**10,851 lobsters landed**	**2,400 lobsters sampled**	**Preseason Ave BRIX 8.10mg/mL**	**Preseason% Soft 35.33%**	**Preseason % Weak 5.38%**
IN-SEASON TOTALS	**5 subareas sampled**	**6 sample location-dates (2025)**	**1,183 lobsters landed**	**600 lobsters sampled**	**In-season Ave BRIX 10.06mg/mL**	**In-season % Soft 21.33%**	**In-season % Weak 2.17%**
OVERALL TOTALS	**8 locations**	**30 sample location-dates**	**12,034 lobsters landed**	**3,000 lobsters sampled**	**Overall Ave BRIX 8.49mg/mL**	**Overall % Soft 32.53%**	**Overall % Weak 4.73%**

Note: In-season samples are shaded for selected sampling locations: Lobster Bay (2 Inside), Port La Tour (1 Inside, 1 Outside), St. Mary's Bay (1 Outside), and Yarmouth (1 Outside).

2.2 Sampling Sites and Schedule

The 2024-2025 sampling schedules, sampling dates, locations, and numbers of lobsters harvested, numbers of individual lobster samples made, proportion of soft/weak lobster status, and average location-date BRIX index are provided in Table 3 above. The map of Figure 5 below contains a single screen that illustrates the provided mapped tabulated information about the precise location of the sample harvests (latitude and longitude of first string), as well as time of haul statistics for: (i) sea state (in meters); (ii) surface temperature (where available); and (iii) weather description at time of set haul. Additional data includes total lobster harvest counts at site, the number of trap hauls, lobster counts per trap, average lobster BRIX from site samples, and the number of "weaks" in site sample.

This mapped information for 2024-25, including mapped sampling information for all 4 previous years of the sampling program: 2020-21, 2021-22, 2022-23 and 2023-24 are available for viewing on Google maps. A public link is available at the following site:
https://www.google.com/maps/d/edit?mid=14NsroLb5FWDSt9HQEn7h2J4zodkv7iAD&usp=sharing

(Please send any feedback or questions about the mapped sampling information to D. Lane at Daniel.Lane@usainteanne.ca.)

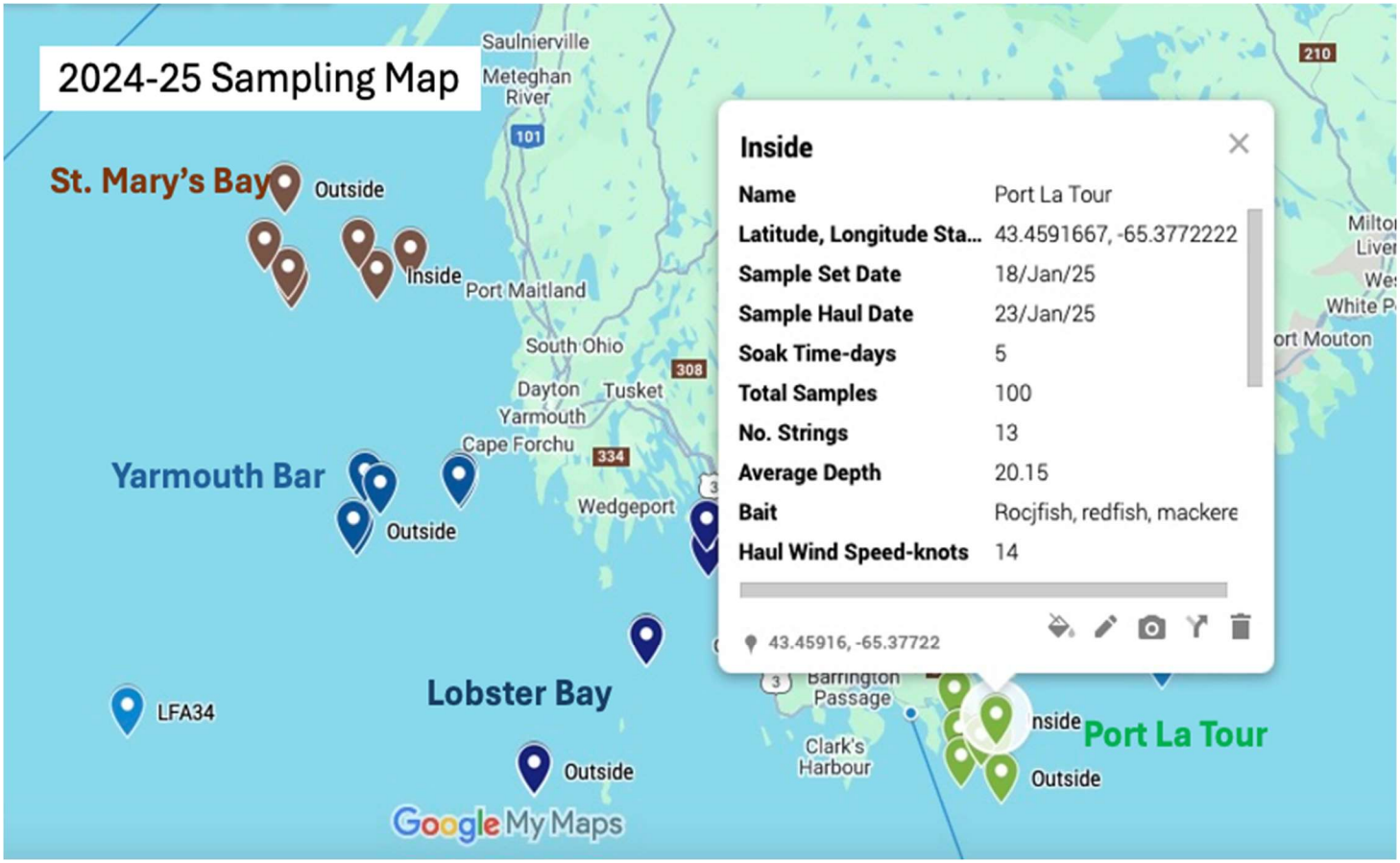


Figure 5. Google map of 2024-2025 At-sea survey area and related information.

2.3 2024-2025 Report on Conditions and Collections

As in past years, weather conditions during the 2024-25 sampling periods, described by strong winds and a blustery sea state, presented significant challenges for scheduling sampling days. Sampling during the months of October and November 2024 became more challenging as the weather windows closed. In-season sampling was very difficult to schedule sampling days as, more often than not, the sea state was of poor condition.

Weather conditions, especially in February 2025, were described as being "awful". Dropping temperatures, correlated with low catches, led commercial fishermen to soak their traps longer, and/or move their traps offshore. These decisions negatively impacted the possibilities to sample inside areas in the in-season sampling period of January and February 2025, as noted above.

The 2024-2025 commercial lobster fishery in LFAs 33&34 was scheduled to open on Monday, November 25, 2024. However, weather delayed dumping day by one day only, and the seasons started on Tuesday, November 26, 2024. (See also: https://www.seafoodnews.com/Story/1291140/Key-Nova-Scotia-Lobster-Fishing-Areas-to-Open-Tuesday-After-Delayed-Start.) In 2023, LFA33 area fishermen took advantage of a two-day flexibility window and started the season early on Sunday, November 26, 2023. However, LFA34 saw a 5-day delay before opening on December 2, 2023. In 2022, the LFA34 fishery opened on December 5, 2022, after a one-week delay to the season start due to weather. The LFA33 fishery opened on Nov. 29, 2022, after a one-day delay. In 2021, there was a two-day delay in dumping day, while in 2020, the delay was 8 days (among the longest in the history of the fishery).

Again in 2024-2025, captains have been strongly committed to the preseason lobster sampling survey which greatly simplifies the sampling schedule. It was nevertheless a challenge to book in-season sampling trips for reasons that included inclement weather, reduced frequency of haulable days, and difficulties in identifying available commercial fishermen for sampling. It is notable that fishermen were very helpful in attempting to identify available fishermen, but the forementioned issues and the restrictions of sampling on the sample sites made it difficult.

Preseason sampling provides a snapshot of lobster quality in selected locations of LFA 33 and LFA 34. In 2024-25 sampling was conducted from depths ranging from 9.6 Fathoms (Lobster Bay Inside) to 62 Fathoms (St. Mary's Bay Outside). It is noted that preseason and in-season samples do not provide an indication on the quality of lobsters caught outside the selected areas or outside the noted depth range. It is also noted that during the commercial lobster season in LFAs33 and 34 there is a significant percentage of vessels fishing in depths greater than 60 Fathoms.

2.4 Lobster Quality Category Classification

For the first time in 2021, consolidated data from each sample date by location were classified into lobster quality categories derived from the extended ALMQ database (2006-2021). Lobster quality categories for each consolidated location sample are based on collective lobster sample characteristics by sample date of – typically – 150 lobster samples for each location-date (100 samples per site in 2024-25). The consolidated sample date data include: the means, medians, ranges, and moments for the sampled lobster BRIX values, and the sampled lobster carapace lengths, as well as sample month and days prior to the

season opening. For example, the following graphic (Figure 6) displays the consolidated BRIX (only) data for the Lobster Bay (Inside) area for the 2006-2020 samples (n=158) in this location. The box-and-whisker plot shows the distribution of the summary average BRIX values across all samples in each year for Lobster Bay (Inside).

Of note in Figure 6 is the separation of the distributions of the consolidated annual average BRIX values into 2 notable groups: (1) 2006-2013; and (2) 2014-2022. The first group represents a relatively higher and consistent average BRIX regime. The second group illustrates an apparent shift in lobster average BRIX values to a consistently lower average BRIX regime. This time shift phenomenon occurs in each of the 8 lobster sampling locations and is the expected result of an environmental/ecosystem shift that persists into 2025. With this in mind, a subjective assignment of each year's consolidated annual BRIX values were assigned into one of 5 lobster quality categories. Preseason Lobster Quality categories are particular to the history of each of the 8 locations. These categories are described in Table 4 below.

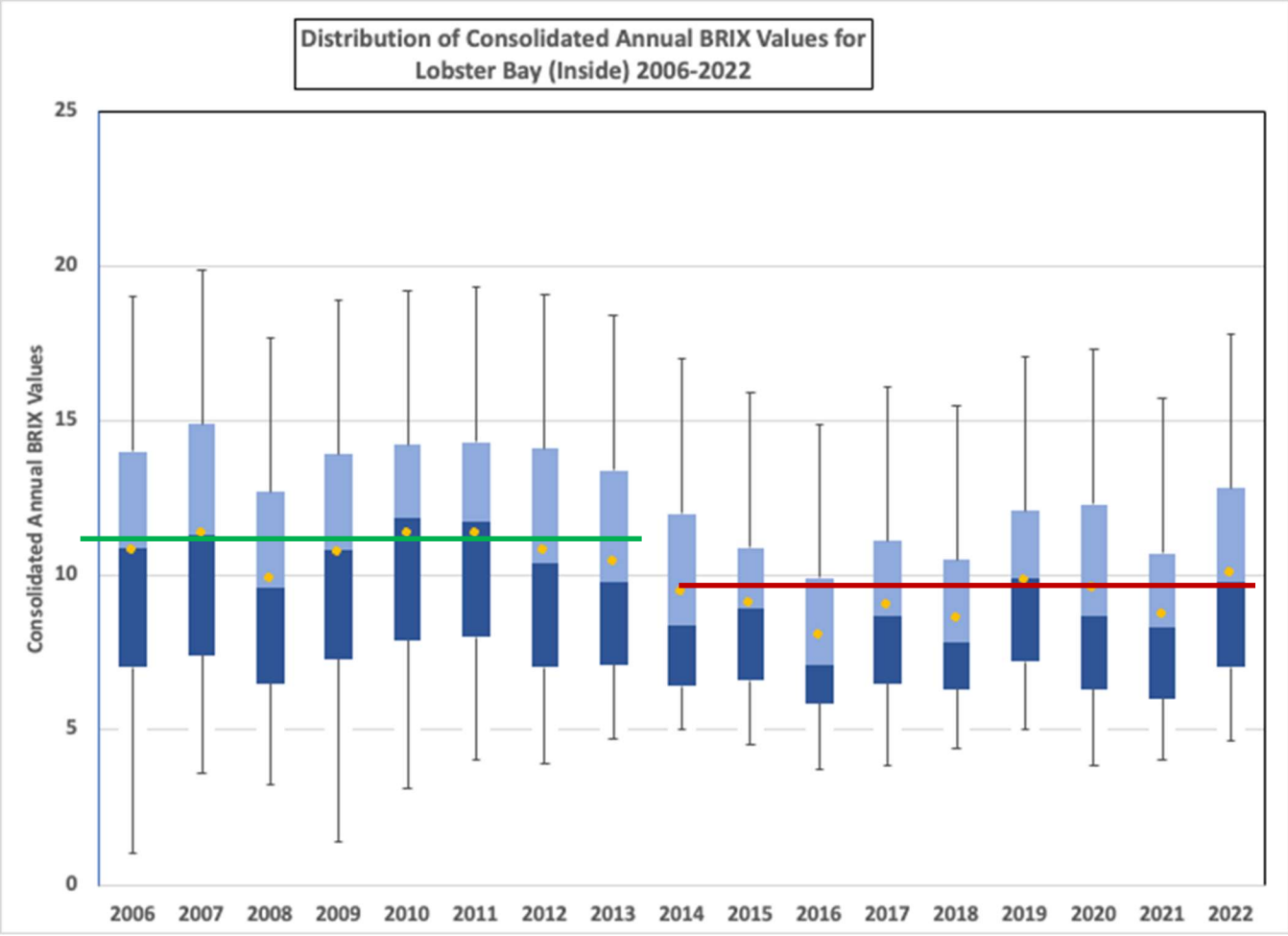


Figure 6. Box-and-Whisker plot of Consolidated Annual BRIX values for Lobster Bay (Inside). Annual mean BRIX values are denoted by yellow dots; rectangles are interquartile ranges; annual median BRIX are lines separating light and dark range; vertical lines (minimum to maximum BRIX) indicate annual consolidated BRIX values outside interquartile range.

Table 4. Lobster Quality Category Descriptions

Level	Lobster Quality Category	Description of Sample Location-Date Distribution
1	**High (H)**	This category is indicative of a consolidated sample date of lobsters with elevated average BRIX value specific to the location over the database period, e.g., exceeding 10 for most locations, and other positive distribution characteristics, e.g., high relative BRIX median and range
2	**Moderate–High (MH)**	This category is indicative of a consolidated sample date of lobsters with slightly above-average BRIX values specific to the location over the database period, e.g., approximately between 9.5 and 10 in most locations
3	**Moderate (M)**	This category is indicative of a consolidated sample date of lobsters with near average BRIX values specific to the location over the database period, e.g., approximately between 8.5 and 9.5 for most locations
4	**Moderate–Low (ML)**	This category is indicative of a consolidated sample date of lobsters with slightly below-average BRIX values specific to the location over the database period, e.g., approximately between 7.5 and 8.5 for most locations
5	**Low (L)**	This category is indicative of a consolidated sample date of lobsters with below average BRIX values specific to the location over the database period, e.g., less than 7.5 for most locations

Using linear discriminant analysis, the historical consolidated sample data were categorized into these 5 'lobster quality categories' for each location (MacLachlan 2004). The results of the analysis enabled the numerical description of each category, and subsequently, the assignment of each of the 2021, through 2024 preseason sample dates into its most probable lobster quality category.

Preseason sample results for 2024 by location are comparable to past preseason sampling years. If, for example, 2024 preseason sample results for Lobster Bay Inside compare favorably to past preseason survey years of Medium-Low (ML) Lobster Quality Category for Lobster Bay Inside (historically estimated from the data to have occurred in 2015 and 2017 and 2022 – see also Table 5 below), then the 2024 preseason data may predict that the 2024-2025 commercial season is comparable to the known commercial seasons of 2015, 2017 or 2022 that followed these same "Medium-Low" survey results.

Table 5 presents the annual time series of assigned Lobster Quality Category for each location from 2006 to 2023. The relative decline over time of lobster quality measured by average BRIX across all locations in LFAs 33&34 over the full period 2006 to 2023 is evident from Table 5 and the example of the annual box plots for Lobster Bay Inside (Figure 6 above). Lobster quality categories across all subareas from 2006-2013 exhibit the same relatively higher categories (moderate (M) or higher (MH, H)) throughout the period from 2006 to 2013 (Figure 6, green line).

Since 2014, however, assigned Lobster Quality Categories across all 8 locations are nearly all designated as moderate (M) levels or below (ML, and L) (Figure 6, red line). Although it is difficult to identify trends in the consolidated data (i.e., combined annual survey samples by location), it generally appeared that since 2018, there may be the beginning of a recovery of lobster quality indicators from L to ML to M going forward to 2023. However, in the 2024 preseason samples (Table 6 below) this trend has been reversed with the results of ML being reported for all subareas attributed to lower BRIX, lower legal catch counts, and higher soft lobster from the 24 preseason location-date samples.

Table 5. 2006-2023 Lobster Quality Category Assignments*

Location:	Yarmouth Inside	Yarmouth Outside	Lobster Bay Inside	Lobster Bay Outside	Port La Tour Inside	Port La Tour Outside	St. Mary's Bay Inside	St. Mary's Bay Outside	Total Annual Sample Dates
2006	MH	H	H	MH	MH	H	H	MH	68
2007	H	H	H	MH	M	-	H	H	61
2008	H	MH	MH	MH	MH	-	MH	MH	60
2009	MH	H	H	MH	MH	MH	M	M	67
2010	H	MH	H	H	H	MH	MH	H	73
2011	MH	M	H	MH	MH	H	MH	-	65
2012	MH	MH	MH	H	M	M	MH	-	63
2013	M	M	MH	H	M	M	M	-	52
2014	ML	ML	M	M	L	ML	-	-	34
2015	ML	ML	ML	M	L	L	-	-	32
2016	L	L	L	L	L	M	ML	ML	52
2017	ML	ML	ML	L	L	L	ML	ML	52
2018	L	ML	L	ML	MH	L	L	L	46
2019	ML	L	M	ML	ML	ML	-	L	12
2020	ML	L	M	ML	ML	ML	ML	M	56
2021	ML	M	M	M	M	M	M	M	51
2022	ML	ML	ML	ML	ML	ML	MH	M	62
2023	M	M	M	M	M	M	M	M	57
Total Sample Dates	145	143	171	128	155	56	62	47	907

*2006-2013 (Green)–Historical period of higher average BRIX; 2014-2023 (Red)–Current period of lower average BRIX.

Table 6 below presents the summary lobster quality category classification for the 2024 preseason sample subarea locations. These results average the lobster quality categories over the preseason sampling dates by subarea locations and as reported in the November report (Martineau, Mulock and Lane 2024b). Information on average BRIX, average counts of legal-sized lobster per trap, percentage of weak lobsters in samples, and percentage of lobsters in samples, as well as most comparable historical years compared to 2024 are included in Table 6. A detailed description of the statistical analyses of the consolidated annual data by location is provided in the LQC Working Paper "Statistical Analyses for Lobster Quality Determinants and Predictions" (in progress) (Lane et al 2025a) (in progress).

Table 6. 2024-25 Preseason Lobster Quality Category Assignments by Subarea

Locations : 2024 Preseason	Yarmouth Inside	Yarmouth Outside	Lobster Bay Inside	Lobster Bay Outside	Port La Tour Inside	Port La Tour Outside	St. Mary's Bay Inside	St. Mary's Bay Outside	Overall Locations
Average BRIX (units/ml)	8.27	7.53	9.80	8.42	7.72	7.38	7.96	7.73	**8.10**
Ave Legal Counts Per Trap	7.36	6.94	8.19	10.25	7.76	**5.42**	**10.15**	**9.98**	8.26
%Soft	29.00%	28.67%	36.67%	40.00%	38.33%	**49.33%**	33.00%	31.67%	**35.33%**
%Weaks	**8.33%**	3.67%	3.00%	**9.67%**	1.00%	3.67%	**8.67%**	5.00%	5.38%
Estimated Overall Lobster Quality Category	ML	ML	ML	ML	ML	ML	ML	ML	ML
No. of Sample Location- dates	3	3	3	3	3	3	3	3	24
Comparable Years	2018	2017, 2018	2016, 2017	2015	2019	2019	2018	2019	2015-2019

Average BRIX by location overall preseason sampling is relatively constant. All locations have average BRIX values near 8 or "Good" (Table 2) with average BRIX over all locations of 8.10 units/ml. Similarly, estimated overall lobster quality category across the board is "Medium-Low" which places 2024 in the ongoing current regime of 'lower BRIX' experienced since 2014 and similar to the years of noted "low quality" from 2014 to 2019. In 2023, overall average BRIX was 10.07 units/ml or almost 25% higher than in 2024.

Average legal counts per sampling trap are an indicator of commercial catch counts. As in the past, Port La Tour, LFA33 shows the lowest sample legal catch counts compared to the other locations with average legal-sized counts per sample trap of only 5.42 (an increase from the value of 3.5 lobsters per sampling trap (Inside) in 2023 preseason samples. Sampling trap catches counts in 2024 in St. Mary's Bay (Inside and Outside) exceed all other areas (at 10.15 and 9.98, respectively). This represents a marked improvement in St. Mary's Bay catch counts in comparison to 2023 (Inside – 6.71, Outside – 7.06). Lobster Bay catch counts are normally the highest among all subareas. However, in 2024, they attained lower catch counts of 8.19 (Inside) and 10.15 (Outside).

In 2024, the estimation of the hardness of lobster carapaces in samples changed substantially across all areas. The percentages of "Soft" lobsters in the preseason samples increased overall from 5.09% in 2023 to 35.33% in 2024, as increase of nearly 7 times over the previous year. These increases were observed in all 8 subareas reaching a maximum average of over 49.33% "Soft" in Port La Tour Outside area samples (Table 6).

The percentage of weak lobsters per sample are highest in Lobster Bay (Outside) among all subareas at an average of 9.37% followed by weeks in the Inside areas of Yarmouth Bar (8.33%) and St. Mary's Bay (8.67%).

2.5 2024-2025 By-catch and Other Observations

There was not much notable bycatch in the lobster sampling traps, with the exception of Jonah Crab through the start of the sampling period beginning in early October. Generally large, male Jonah Crab (carapace lengths between 110-140mm) were observed in all outside locations with the Outside location of Lobster Bay seeing crab in significant numbers. It is a general belief among fishermen that the presence of Jonah crabs generally correlates with lower lobster catch rates. Based on what was observed in 2024, there was a concerning amount of crab during the sampling this year. Apart from Jonah crabs, cod were also observed in all locations with a few sampling trips in Port La Tour having the most cod of all 8 locations. As in 2023, there were a few spiny dogfish that appeared in the traps in October.

Figure 7. Lobster with evidence of shell disease. Source: Naomi Martineau (2024 Preseason survey).

As in past years, the recorded database assigns codes in the event of observations of lobster shell disease observations also known as epizootic shell disease (ESD). In 2024, a single observation of shell disease was observed during on-vessel preseason sampling (October). Figure 7 illustrates the lobster showing evidence of epizootic shell disease. A second lobster with ESD was observed during the in-season period in late March 2025. The Spring period (March-May) has been reported by the Maine lobster fisheries as the period when most ESD is found in their waters.

3 Preseason Sampling Data Results

Since 2006, preseason and in-season data have been collected annually on lobsters in selected harvest areas of LFA33 and 34. Previously, these data have been used in each year, independently, to estimate average moult times over all subareas and to predict lobster quality based on overall moult conditions at the start of each season. In hindsight, the estimate of a general moult time was subject to considerable uncertainty and spatial and temporal variation such that a generalized prediction about lobsters' average moult time was difficult to determine.

The longitudinal database from the 2006 season onward permits direct comparison of pre-season and corresponding in-season samples over multiple years. Knowing the precise history of quality results in the subsequent commercial fishery over past years enables comparison of current results to actual quality of the past, e.g., the 2011-12 commercial season was a "high quality" season whereas the 2015-16 commercial season was a very poor-quality year throughout LFAs33&34. Preseason sampling results that compare well with the 2011-12 preseason sampling data should therefore be an indicator of good quality to follow into the commercial season. Similarly, preseason sampling that compares more closely to the 2015-16 preseason sampling data would suggest a prediction for poor quality to follow in the comparable commercial fishery. To this end, we evaluate historical annual quality status and compare recent results to the history. This analysis begins with a view of the distribution of the lobster data collected for 2024-25.

3.1 Lobster Counts Sampling for 2024-2025

The at-sea preseason sampling data were compiled into the '*Preseason Summary Report*' and distributed by Coldwater Lobster Association to the lobster industry and government funders on November 24, 2024 (Martineau, Mulock, and Lane 2024b). This report contains summary information on the lobster counts harvested and sampled during the 2024 preseason and the 2025 in-season sampling program with comparison to the 4 previous year's 2020-21, 2021-22, 2022-23 and 2023-24 lobster counts sampling results. Specific information on survey lobster counts includes: (1) section 3.1.1: lobster count location graphics per trap by sex, average BRIX indicator value, moult stage analysis, and manual hardness measures; and (2) section 3.1.2: comparative location results of catch per trap, and average BRIX indicator value. Complete graphics information on lobster counts sampling for each location is presented in Appendix A of this report for 2024-2025.

3.1.1 Location graphics (4 pages) - lobster counts (harvested and sampled) information (complete graphics are presented in Appendix A.1)

Location graphics results of lobster count from the sampling program are as follows:

(a) Counts of lobsters harvested per trap by sex for Inside & Outside areas
(b) Counts of lobsters harvested per trap and BRIX for Inside & Outside areas
(c) Counts of lobsters sampled by Moult Stage - Outside areas
(d) Counts of lobsters sampled by Hardness and BRIX for Inside & Outside areas

Appendix A.1 – "Harvested and Sampled Lobster Count Location Graphics" contains the complete graphic record of this information for all locations, inside and outside areas by preseason and in-season sampling dates. Selected graphics are presented in this report below.

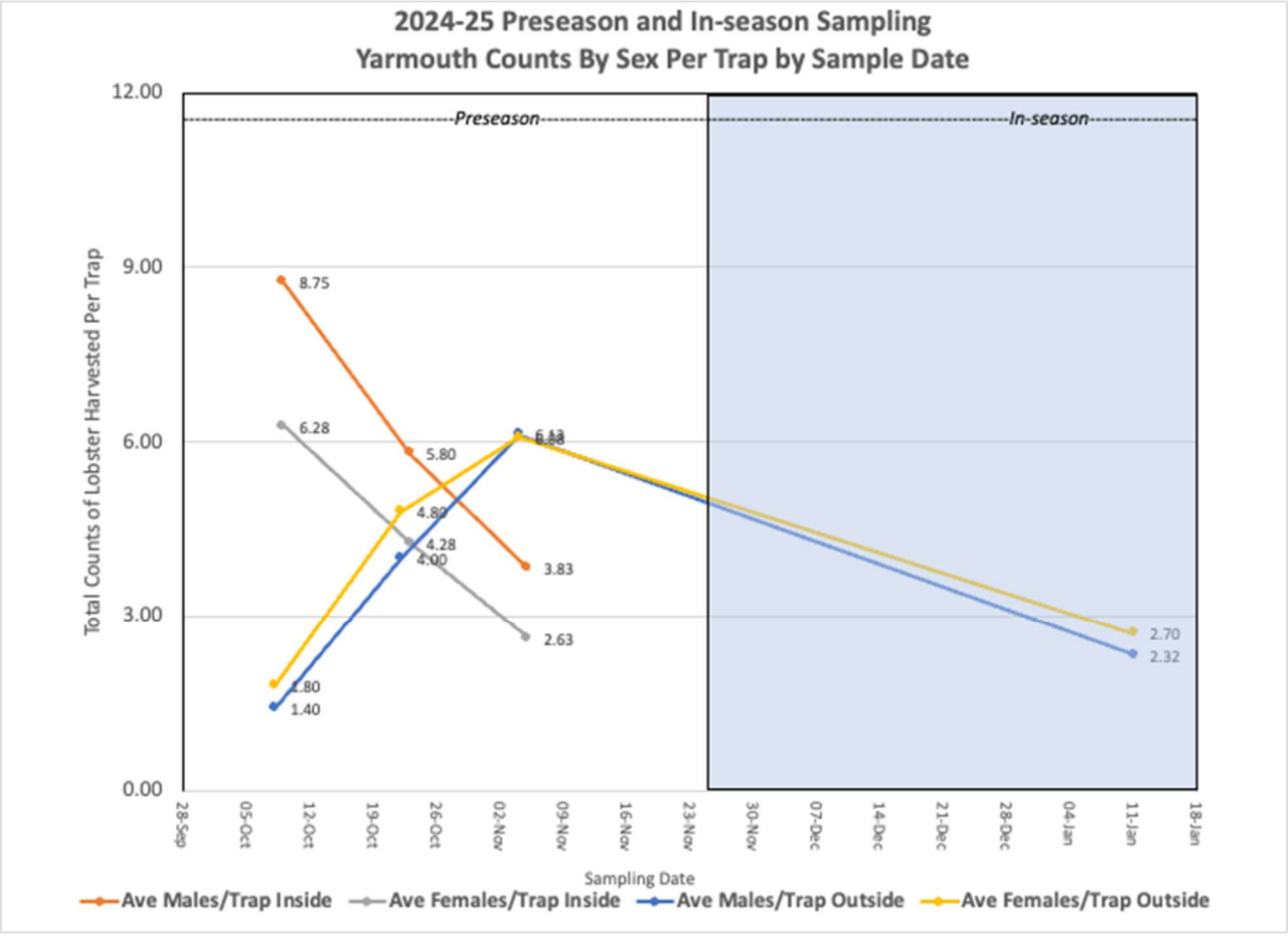
(a) Counts of lobsters harvested by Location per Trap by Sex for Inside and Outside Areas

The counts per unit trap (CPUT) fishing effort measure provides general information about the propensity of available lobster to enter the trap during preseason sampling. As noted by the example of Yarmouth (Inside and Outside areas) in Figure 8 below, CPUT measures (legal and sublegal males and females) for 2024-25 (8a), 2023-24(8b), 2022-23(8c), 2021-22(8d), and 2021-20(8e) for inside areas are generally flat or declining over the course of each preseason sampling dates (Figure 8abcde). CPUT measures are steady (2023-24, Figure 8b) or declining (2024-25, Figure 8a and 2020-21, Figure 8e) during the commercial season. Comparison of annual CPUT for Yarmouth Inside and Outside areas shows that 2024 preseason catch rates were comparable to 2023 but below those of the 3 previous years 2022, 2021, and 2020. These results would suggest that Yarmouth Inside and Outside catch rates at the start of the commercial fishery in 2024 would be comparable to those of 2023. For the single in-season sampling point of January 11, 2025 there was a marked decrease in both males and females catches per trap in both Inside and Outside areas. These numbers are comparable to the lower catch rates experienced by the commercial fishery at this time in Yarmouth Inside and Outside areas.

For outside areas, preseason CPUT tends to rise over the preseason suggesting a movement of lobster from inside to outside areas over the preseason period October-November and a potential shift of the

commercial fishery on outside areas as the season progresses. High CPUT for males and females in the outside areas during the later preseason sample dates are indicative of good catch rates at the start of the commercial season in these areas.

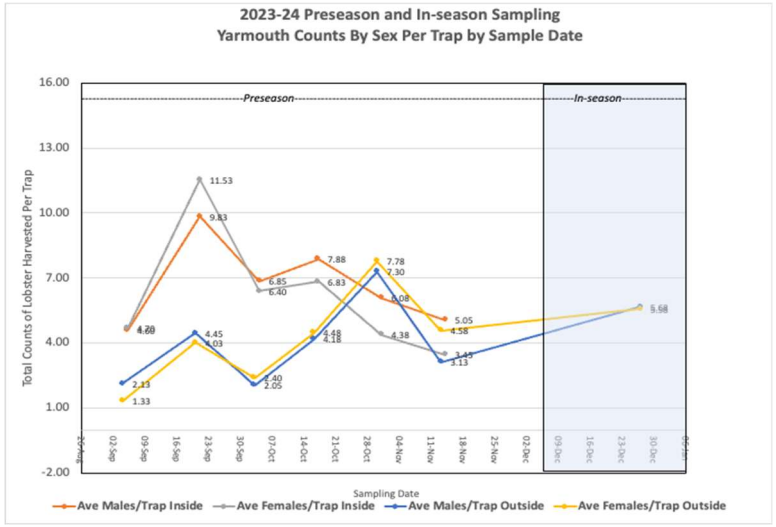
Conversely, in 2024–like 2023 (Figure 8b), Yarmouth Outside saw relatively lower catch rates throughout the preseason and in-season periods (2024, Figure 8a) unlike the increases in Yarmouth Outside catch counts of the 3 previous years 2022-2020 (Figure 8cde). These lower relative outside catch counts were also experienced in Lobster Bay, St. Mary's Bay, and Port La Tour in 2024-25, as they were in 2023-24. These observations lead to lowering predicted estimates of outside area catches in all Outside areas at the start of the commercial fishery in LFAs33 and 34 for 2024-25.



(a)

Figure 8. Preseason and In-season Yarmouth Count by Sex per Trap for Inside/Outside locations:

(a) 2024-25 Sample Dates



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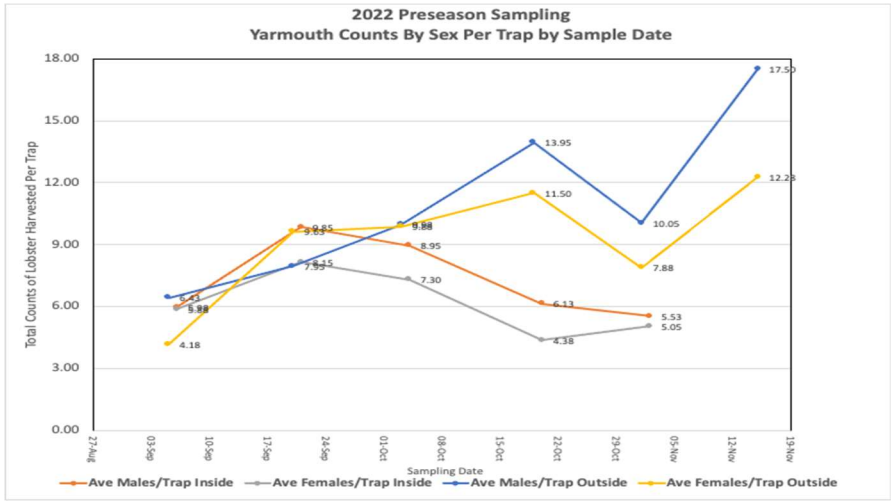
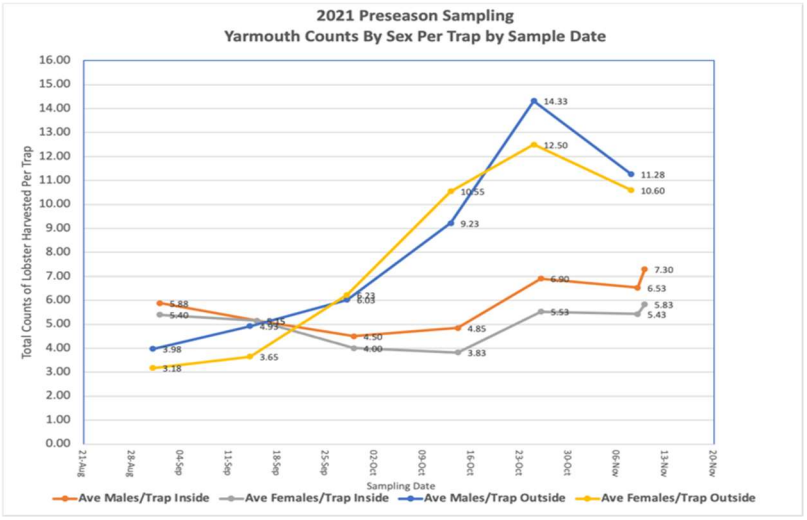


(c)



(d) (e)

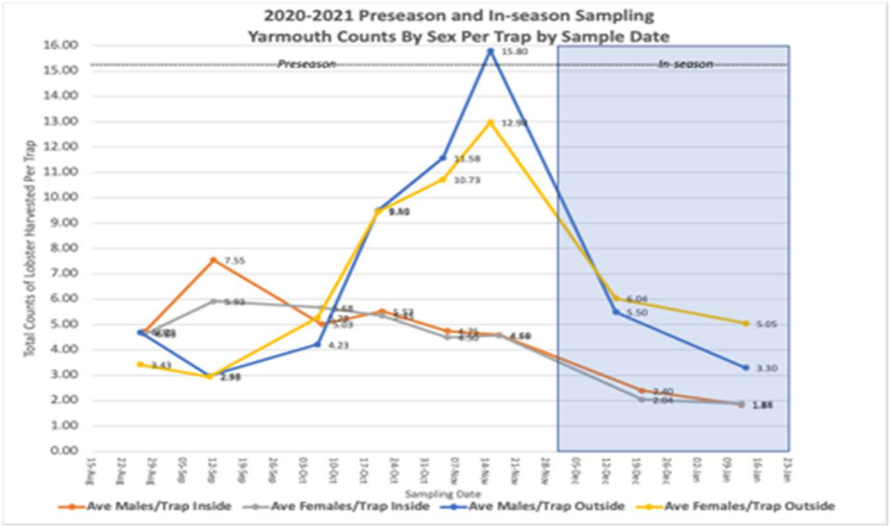


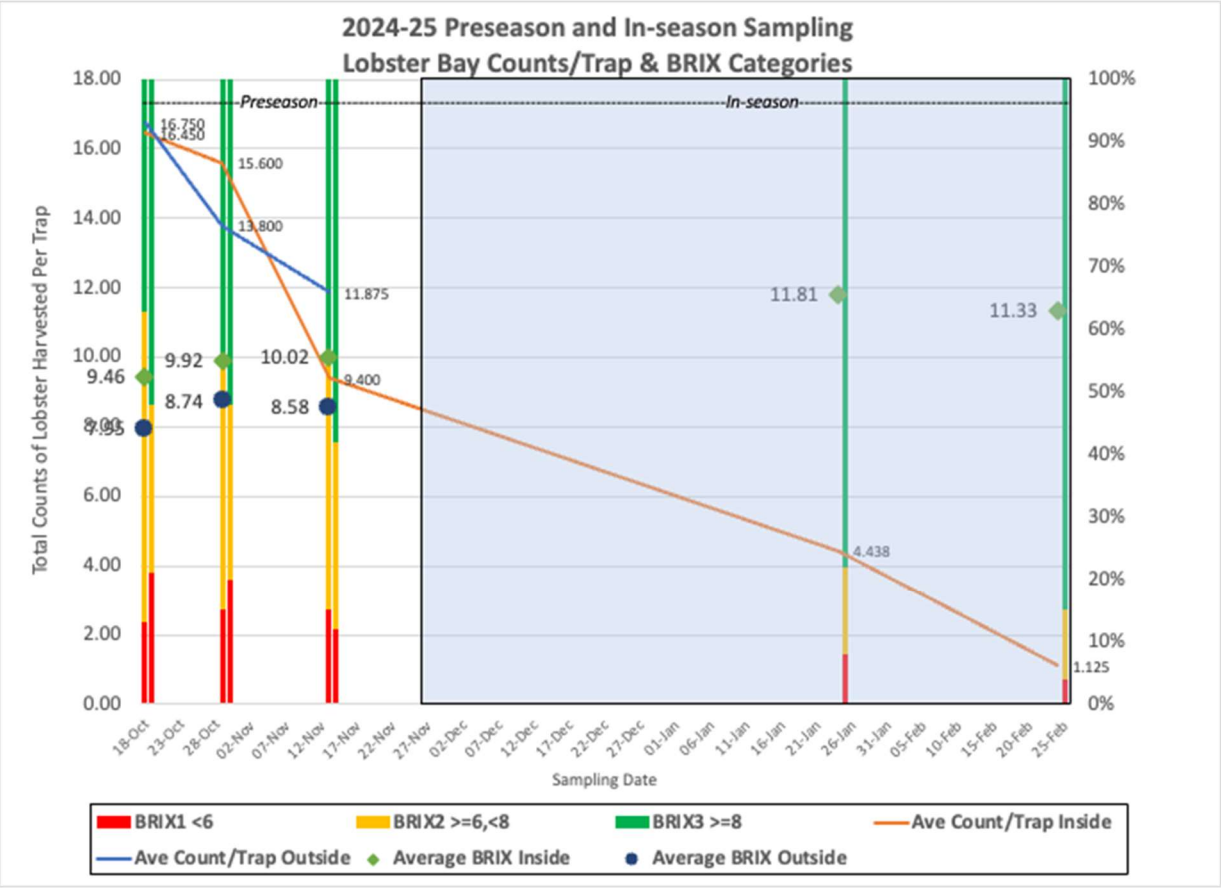
Figure 8. Preseason and In-season Yarmouth Count by Sex per Trap for Inside/Outside locations: (b) 2023 Sample Dates; (c) 2022 Sample Dates; (d) 2021 Sample Dates; (e) 2020-21 Sample Dates.

(b) Counts of lobsters harvested per trap for Inside & Outside areas with BRIX averages

Since 2020, preseason BRIX levels shift slightly over the course of sampling in all areas. Figure 9 indicates the BRIX category levels for Lobster Bay. BRIX values tend to be flat initially in both Inside and Outside areas from the early preseason sampling dates (September) followed by a slight decline in value through October, then followed by a rise into early and mid-November at the end of the preseason sampling period and into the commercial season (2024-25, Figure 9a). Inside area BRIX averages tend to be marginally higher than Outside areas early in the sampling period. This trend reverses later in the year when average BRIX values in the Inside areas tend to fall, and Outside areas' BRIX tend to rise. This behaviour of marginal differences within years BRIX was observed in all years 2024-2020 and relatively for all areas.

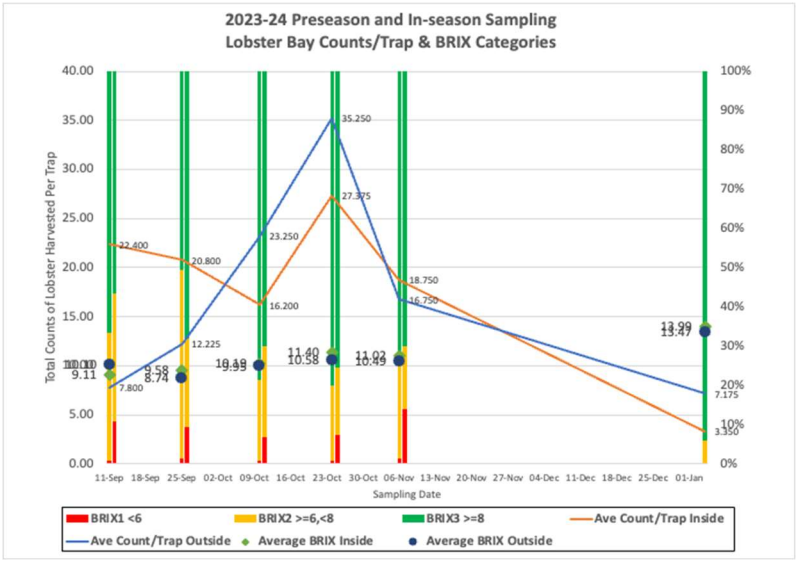
In Lobster Bay, average BRIX values, both Inside and Outside, have generally risen from 2020 to 2023 as this area begins to move back to the higher BRIX level regime of the pre-2014 period. In 2024, however, BRIX levels declined somewhat to 2022 levels.

Overall, average counts were initially higher in Inside samples. Outside counts rose in later sampling dates in all years. (See also Appendix A, pp.A.2 through A.5 for 2024-25 sampling dates and locations.)



(a)

Figure 9. Preseason and In-season Lobster Bay Counts per Trap by Inside and Outside Locations and BRIX Indicators: (a) 2024-25 Sample Dates;



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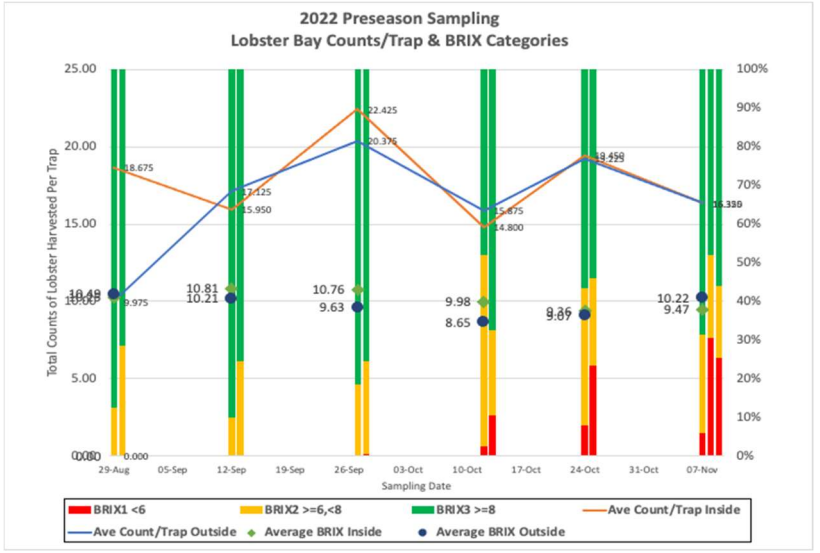

(c)

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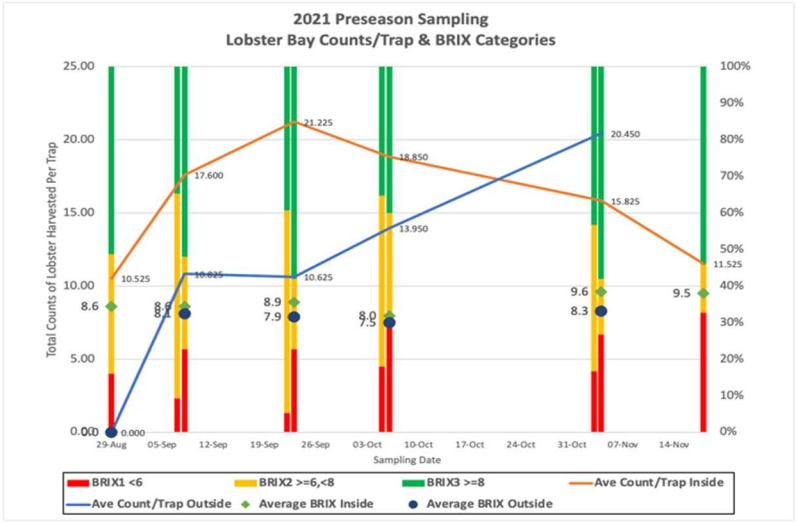

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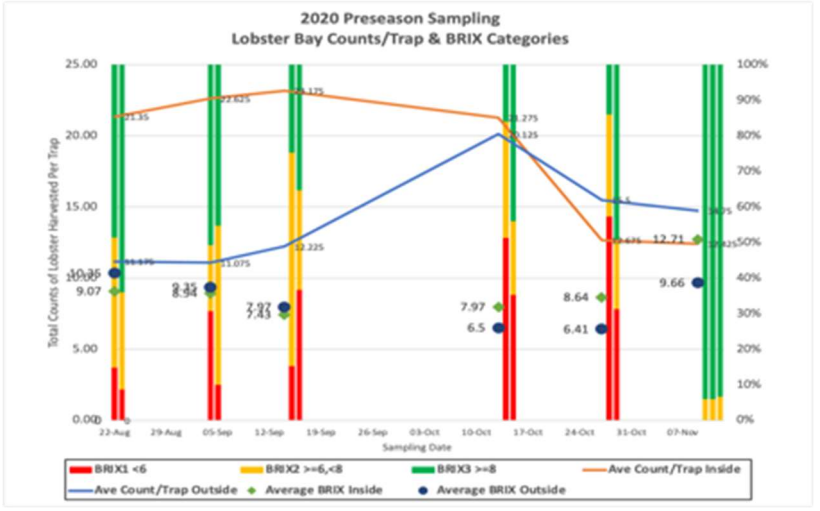


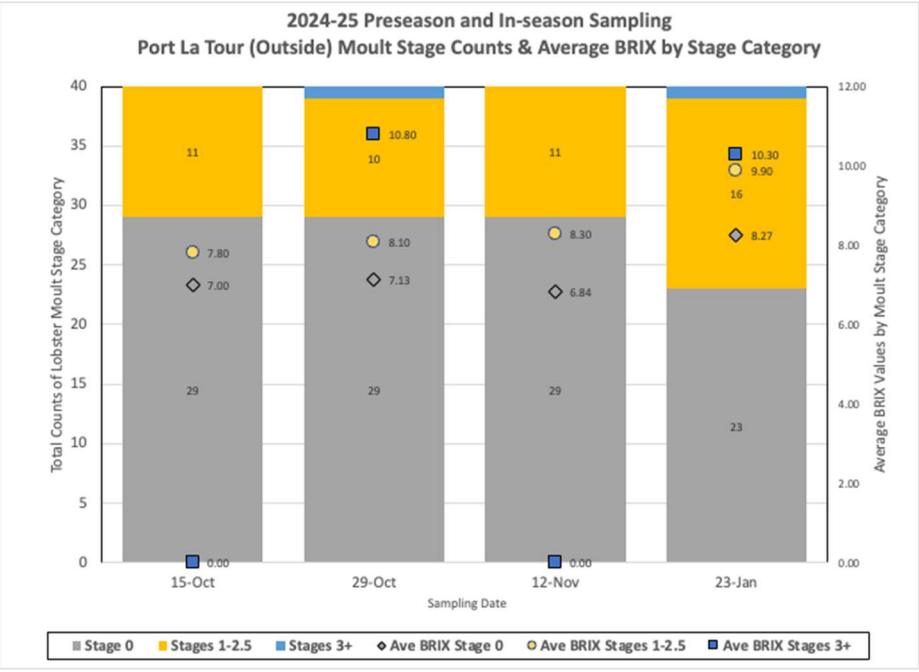
Figure 9. Preseason and In-season Lobster Bay Counts per Trap by Inside and Outside Locations and BRIX Indicators: (b) 2023-24 Sample Dates; (c) 2022 Sample Dates; (d) 2021 Sample Dates; (e) 2020 Sample Dates.

(c) Counts of lobster sampled by Moult Stage – Pleopod Data

As for 2020 to 2023, the 2024 preseason sampling program examined selected lobster's mount staging through the analysis of lobster pleopod (swimmeret) data under the microscope (Figure 3). As per Factor (1995, p.223), lobster moult categories are defined as: (1) Stage 0 (C4); (2) Stage 1-2.5 (D0); (3) Stages 3+ (D1). In 2024, moult stage information was increased in 40 vials (from 30 vials, as available) for each of the 8 sampling areas and for each preseason and in-season sampling date.

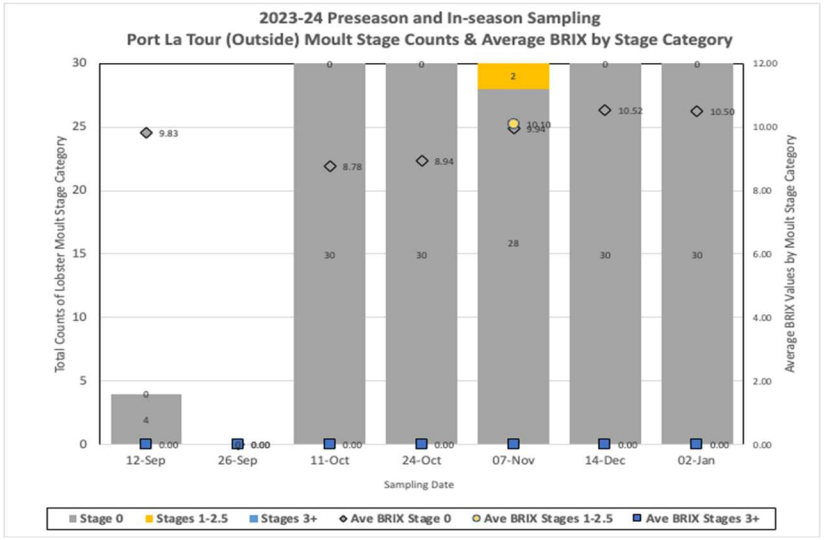
Figure 10abcde below shows the moult stage counts data by stage for Port La Tour Outside area preseason sampling. Excluding 2024-25 (Figure 10a), Figure 10bcde illustrates that the Port La Tour (Outside) samples in the preseason and into the in-season sampling period for all 5 years result in a clear majority (90% or greater) of Stage 0 (no moult activity) samples. There are very few (less than 5 samples) of Stage 1-2.5 lobsters and very limited Stage 3+ observations (2) across all sample dates over all 4 historical years. In this year's sampling, 2024-25, there were 10 or more Stage 1-2.5 lobster observed in each of the Port La Tour Outside area samples. There were also Stage 3+ observations in the October 23, 2024 preseason sample, and in the January 23, 2025 in-season sample. No Stage 3+ observations had been seen in the pleopod data since the 2021-22 samples (2).

Among the 40 pleopod samples per location-date, roughly 1-2 vials recorded evidence of cement glands in female lobster ("CS", Factor's D2 and D3). Otherwise, zero overall moult activity stage is observed in Port La Tour (Outside) for the fifth successive year of preseason and in-season sampling there. (See also Appendix A, pp.A.2 through A.5 for moult stage information for all sampled locations in 2024-25.)

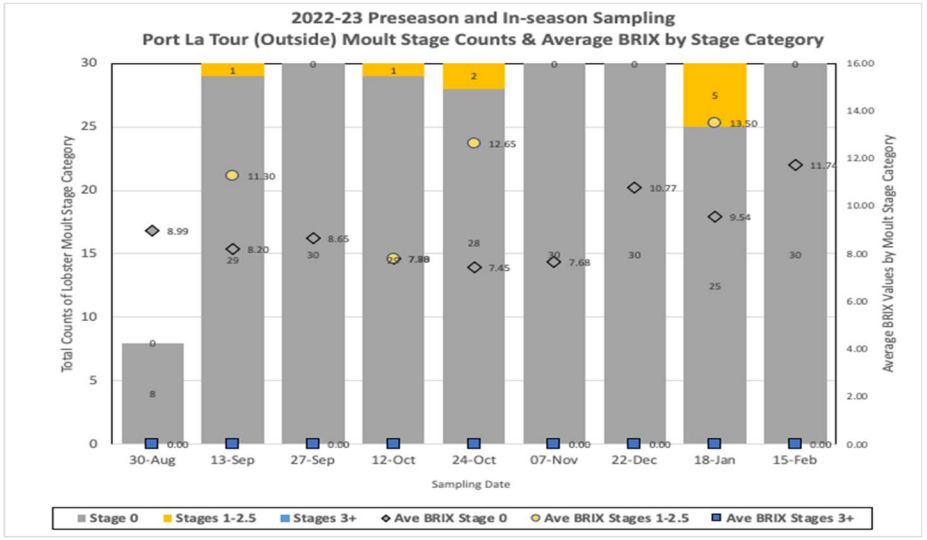


(a)

Figure 10. Preseason and In-season Port La Tour (Outside) Moult Stage Counts & Average BRIX by Stage Categories: (a) 2024-2025 Sample Dates;



(b)



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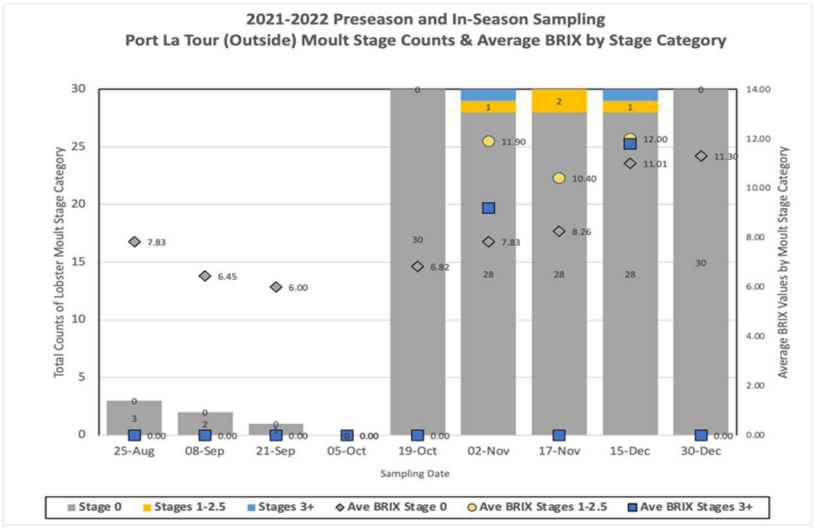

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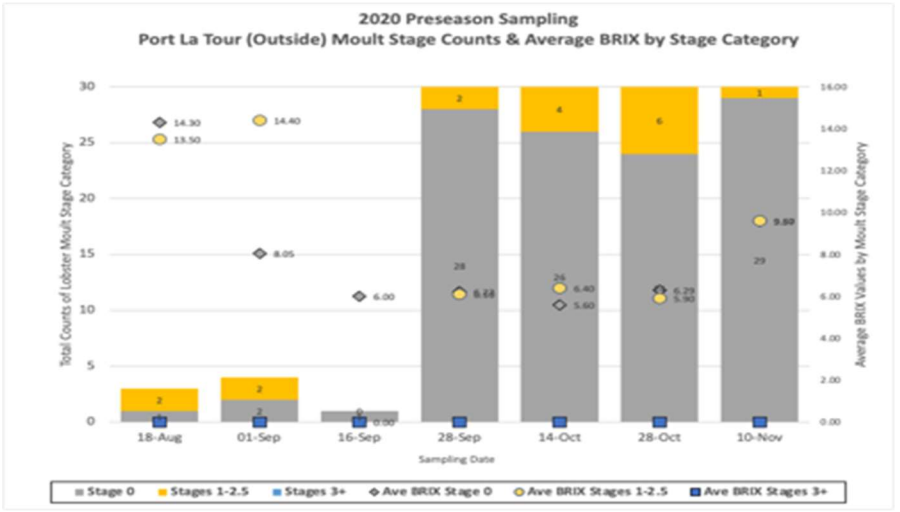


Figure 10. Preseason and In-season Port La Tour (Outside) Moult Stage Counts & Average BRIX by Stage Categories: (b) 2023-2024 Sample Dates; (b) 2022-23 Sample dates(c) 2021-22 Sample Dates; (d) 2020 Sample Dates.

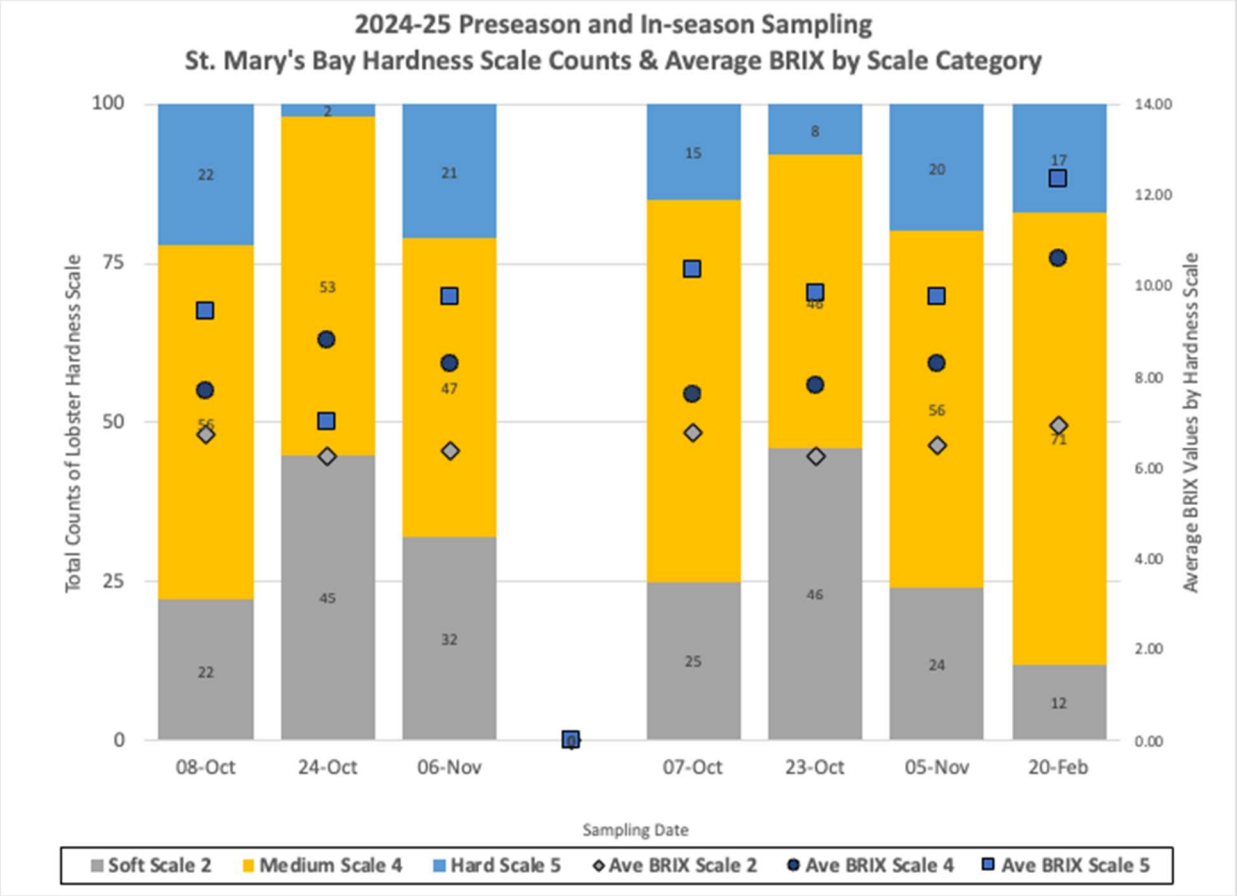
(d) Counts of lobsters sampled by Hardness and BRIX for Inside & Outside areas

In 2024-25, lobster sampling included recording the manual hardness scale found by gently squeezing the lobster's carapace at harvest. In the 2020 sampling program, the evidence was that more than 90% of all sampled lobsters in all areas were recorded as "Hard" (scale "5"). This measure is not well-correlated with the much wider variation in lobsters' corresponding BRIX index values. However, over the recent 5-year sampling period 2020-2024 over all locations, new statistics reveal that significantly more lobsters are being recorded with "Soft" status than ever before in the data series.

Figure 11 below provides the hardness measure results for St. Mary's Bay Inside and Outside preseason and in-season sampling dates. In 2020-21 (Figure 11e), less than 1% of all sampled lobsters were assigned a "Soft" or "Medium" hardness level, i.e., almost all (98%+) lobster were assigned a "Hard" level. In 2021-22 sampling (Figure 11d), more "Medium" lobsters were assigned in the St. Mary's Bay samples and approximately 5% of all lobsters (Inside and Outside areas combined) were recorded as "Soft" plus "Medium" hardness. In 2022-23 (Figure 11c), the percentage of "Soft" lobsters remained relatively stable at approximately 1.5%. However, the numbers of "Soft" plus "Medium" lobster in 2022-23 (Figure 11c) increased markedly in this location – and across all other locations in this year – to the highest levels seen in the database since 2006 with totals Soft plus Medium lobsters reaching 15-16% for both Inside and Outside subareas of St. Mary's Bay. This trend has continued into the 2023-24 sampling period where the highest level of "Soft" plus "Medium" have been recorded exceeding 20% in both Inside (20.37%) and Outside (20.96%) subareas. In 2023-24, "Soft" lobster accounted for less than 2% in St. Mary's Bay.

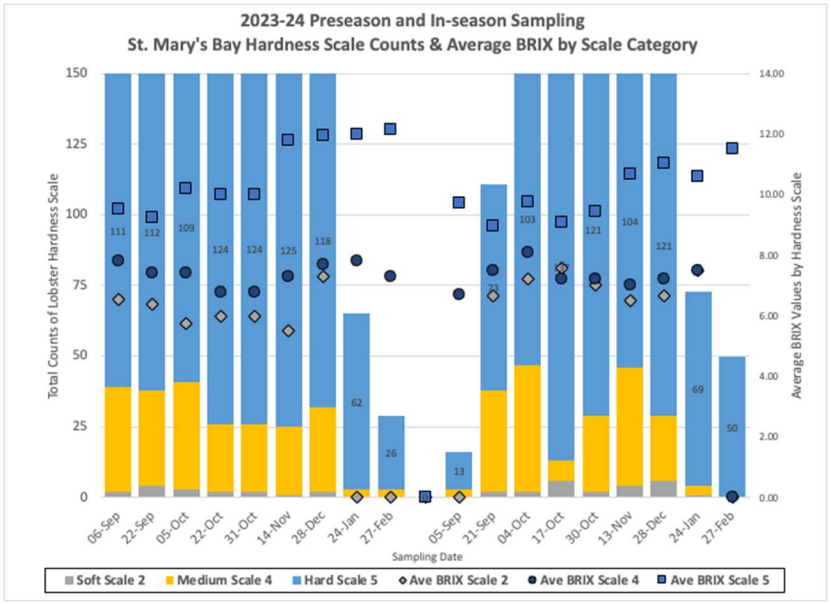
The shift to softer lobster is most acute in the latest 2024-25 samples. For St. Mary's Bay (Figure 11a), "Soft" lobsters make up an average of over 30% of lobsters sampled in Inside and Outside areas, an increase of over 10 times that of the previous year. "Hard" lobsters make up only 20% of lobsters sampled in most Inside and Outside samples in 2024-25. This dramatic shift is evident across all 8 subareas and is indicative of the presence of lower quality lobster in LFAs33&34.

It is noted also that subjectively measured "Soft" lobster have lower average BRIX values. However, the lack of variability in the hardness scale measure makes it difficult to obtain additional information about lobster quality from this subjective measure. As such, this determinant of lobster quality may be used to eliminate a proportion of lobster as unacceptable quality for storage and shipment. Appendix A.1, pp.A.2 through A.5, also contains hardness information for all sampled locations in 2024-25 sampling.

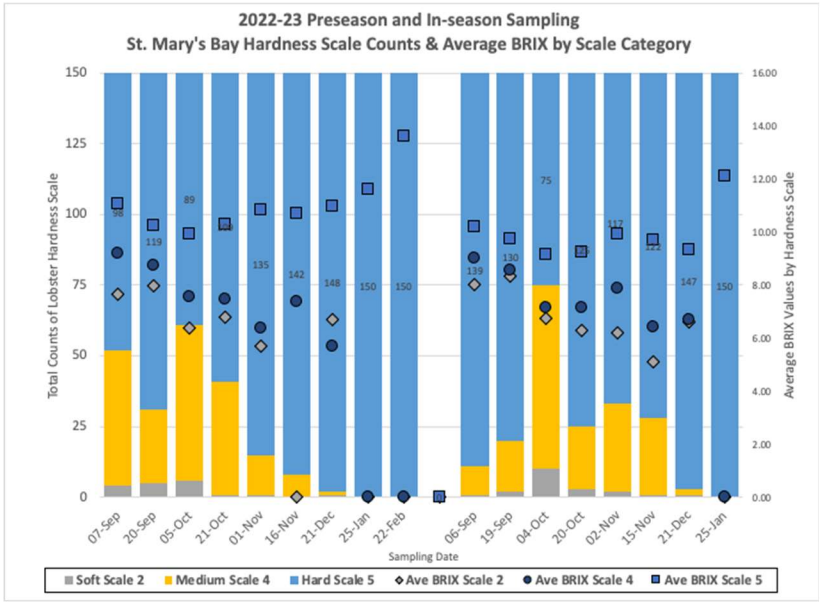


(a)

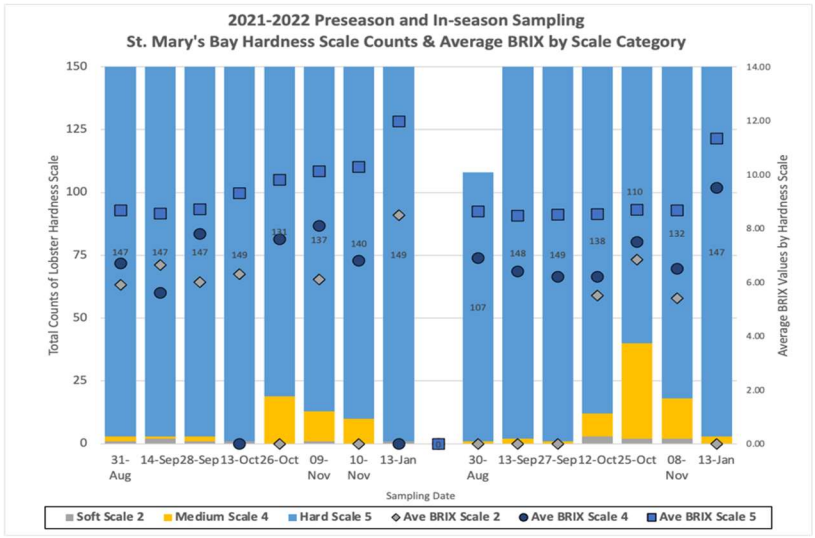
Figure 11. Preseason and In-season St. Mary's Bay (Inside and Outside) Hardness Counts per Trap & Average BRIX by Category: (a) 2024-2025 Sample Dates;



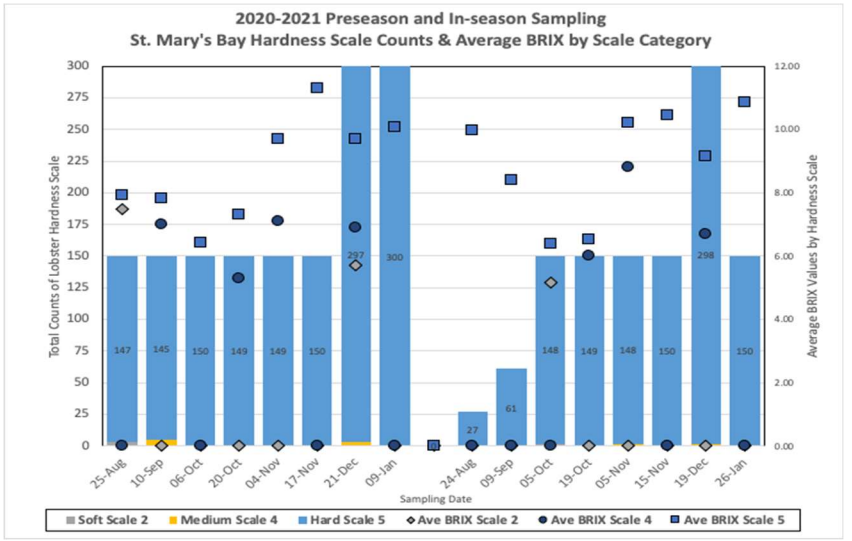
(b)



(c)



(d)



(e)

Figure 11. Preseason and In-season St. Mary's Bay (Inside and Outside) Hardness Counts per Trap & Average BRIX by Category: (b) 2023-2024 Sample Dates; (c) 2022-2024 Sample Dates; (d) 2021-2022 Sample Dates; (e) 2020-2021 Sample Dates.

3.1.2 Comparative Location graphics - lobster (harvested and sampled) counts information

Comparative location graphics from the sampling program are as follows:

(a) Counts of lobster harvested per trap by location for Inside areas
(b) Counts of lobster harvested per trap by location for Outside areas
(c) Average BRIX per sample by location of Inside areas
(d) Average BRIX per sample by location of Outside area

Appendix A.2 – "Comparative Location Graphics" contains the complete graphic record of this information. Selected graphics are presented in this report below and in Appendix A.2.

(a) Counts of lobster harvested per trap by location for Inside areas

As noted above in Section 3.1.1(a), the lobster counts per unit trap (CPUT) fishing effort measure provides general information about the propensity of available lobster to enter the sampling trap. As for all years, the trend across all inside locations is for CPUT to rise in the early months of the preseason (October 2024) and then fall by the end of the preseason sampling period in November 2024. In-season CPUT during January-February 2025 period declines from commercial effort. Differences do exist among the different inside locations. Notably, Lobster Bay Inside has nearly twice the CPUT than the other inside locations over the preseason sampling periods (although this difference was reduced in 2024). See also Appendix A.2, p.A.6(a) for the Inside area graphic by location.

(b) Counts of lobster harvested per trap by location for Outside areas

The trend across all Outside locations is for CPUT to rise as lobster move into their associated Outside areas over the preseason as is indicative of a movement of lobster from inside to outside areas over the sampling period September to November. This is illustrated by the trends seen in all 5 years of the 2020 to 2024 preseason periods in Figure 12abcde. Notably, in 2024-25, Outside areas show a markedly lower catch count per trap over the sampling period. As anticipated, once the commercial season begins, CPUT falls appreciably in the Outside areas as lobsters are fished down through more extensive commercial fishing effort. Appendix A.2, p.A.6 contains more details.

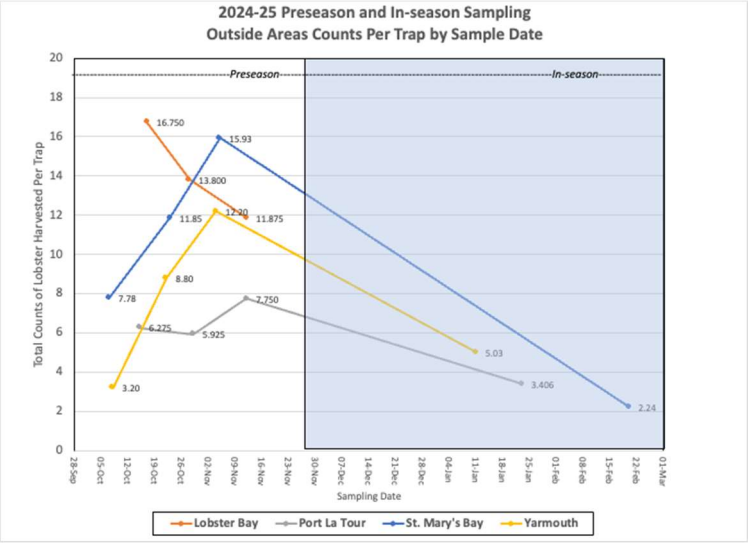
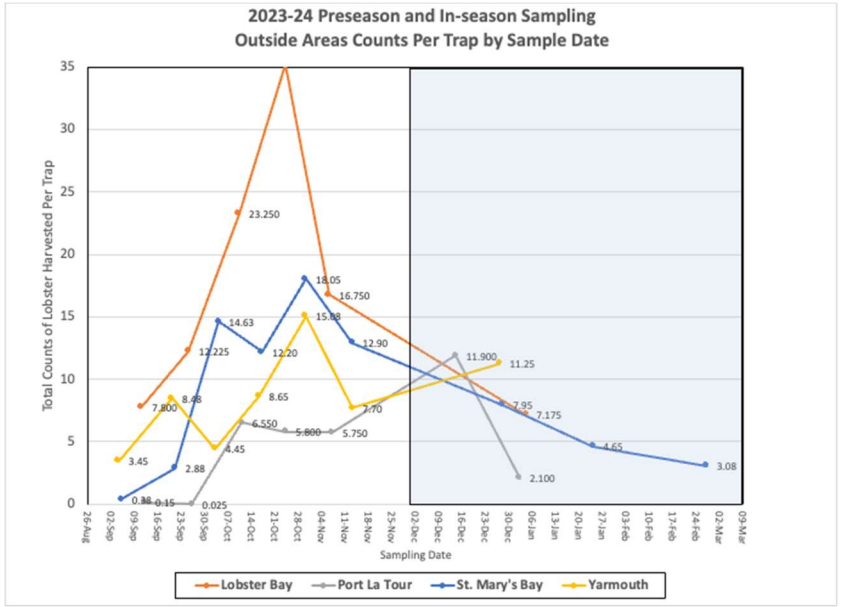
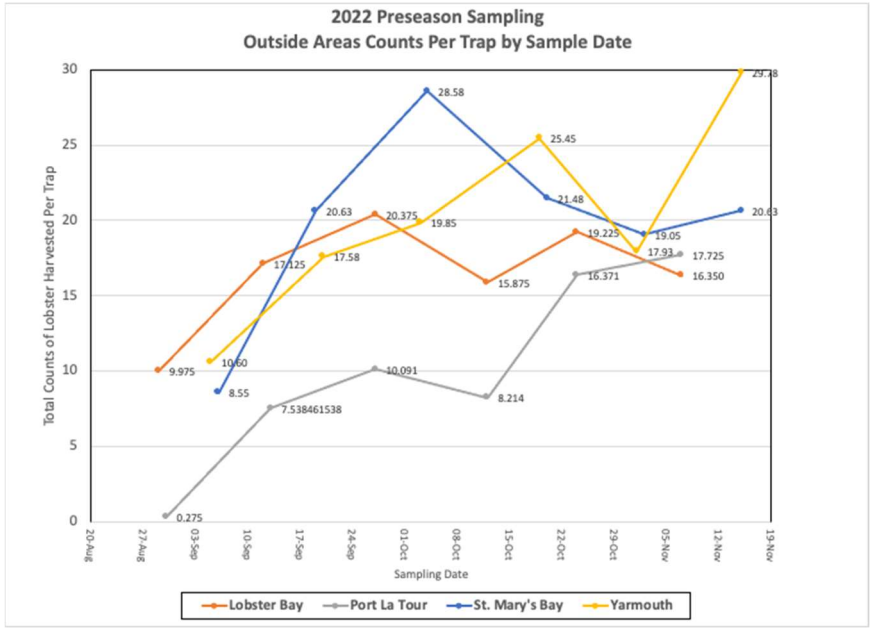
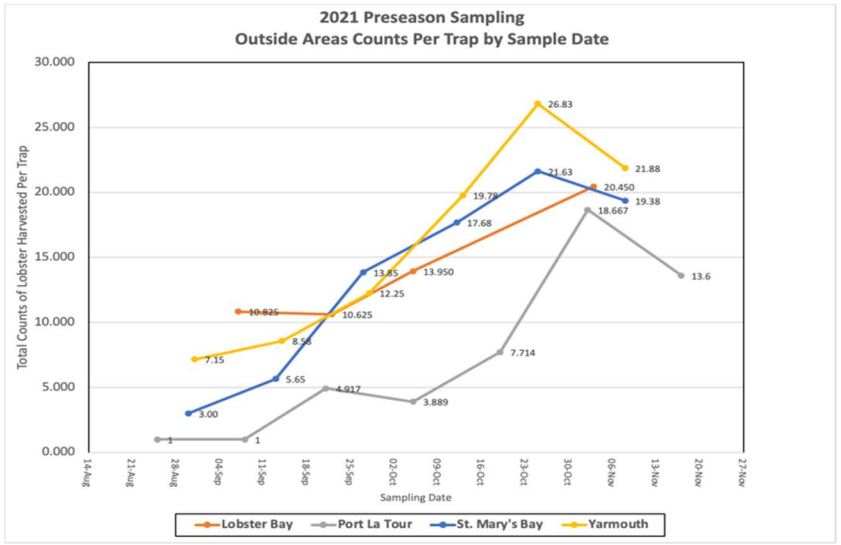


Figure 12. Preseason and In-season Outside Areas Counts per Trap: (a) 2024-25 Sample Dates;



(b) (c)
(d) (e)





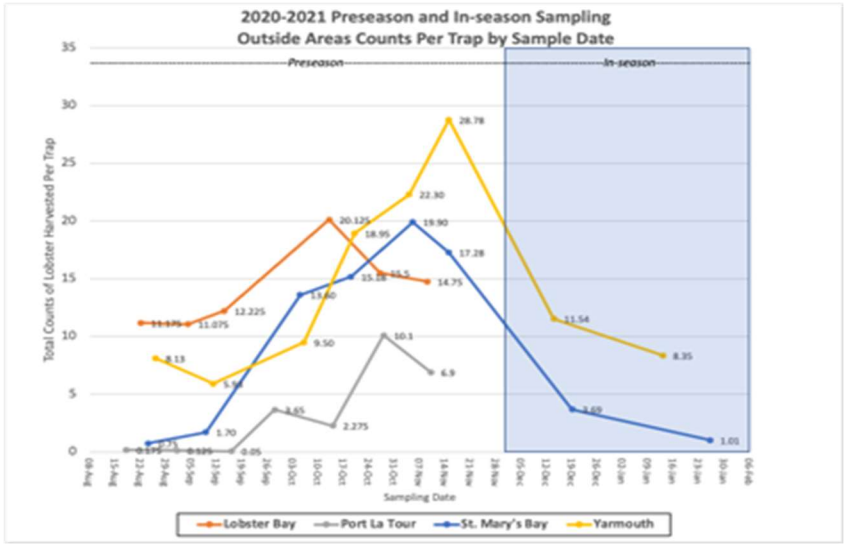


Figure 12. Preseason and In-season Outside Areas Counts per Trap: (b) 2023-24 Sample Dates; (c) 2022-23 Sample Dates; (d) 2021-22 Sample Dates; (e) 2020-21 Sample Dates.

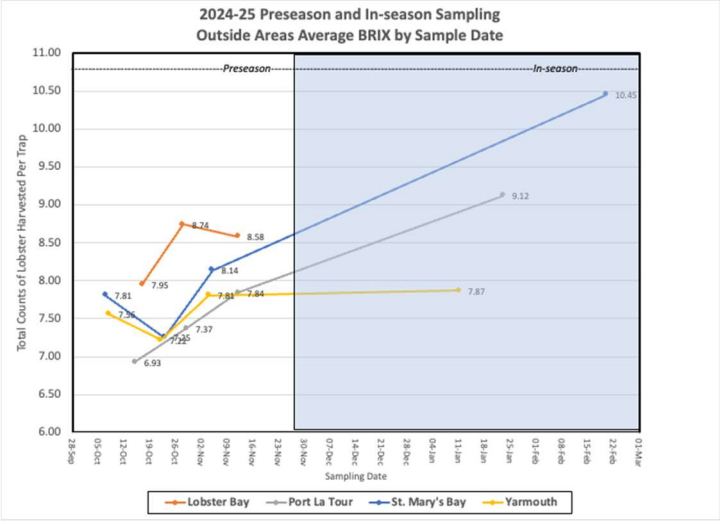
In 2024, average BRIX levels observed throughout the preseason sampling period (October to November) declined compared to past years (2020-2023) for both Inside and Outside areas across all locations. Lobster total counts (legals plus sublegals) in each location over the preseason period typically fall in Inside samples, and rise in Outside samples. This is consistent with the expected Inside to Outside movement of lobsters to deeper waters in LFAs 33&34 as the commercial season and winter nears. Lobster counts in Port La Tour samples were stable compared to past years (2020-2023). However, comparable counts were lower in Lobster Bay including a pattern of falling counts in Lobster Bay Outside. 2024 counts in St. Mary's Bay Inside were higher than in 2023 (at 2022 levels) but decreasing into November, whereas counts in Yarmouth Inside were lower than in past years (contrasting the increasing trend from 2021 to 2023) and continuing to decrease into November. Counts in Outside areas of St. Mary's Bay and Yarmouth were low (at 2023 levels) but increasing into November.

(c) Average BRIX per sample by location of Inside areas

Comparison of average BRIX levels in the inside location samples are also provided in Appendix A.2, p.A.6(c) for the inside areas. Generally, in 2024-2025, as in the past years, Inside BRIX values are flat and/or in decline in the preseason sampling period (September and October) as lobster may be recovering from a spring-summer moult. This is expected to be followed by a significant rise thereafter (November) to the start of the commercial season at end November and into the commercial in-season sampling periods. See also Appendix A.2, p.A.6(c).

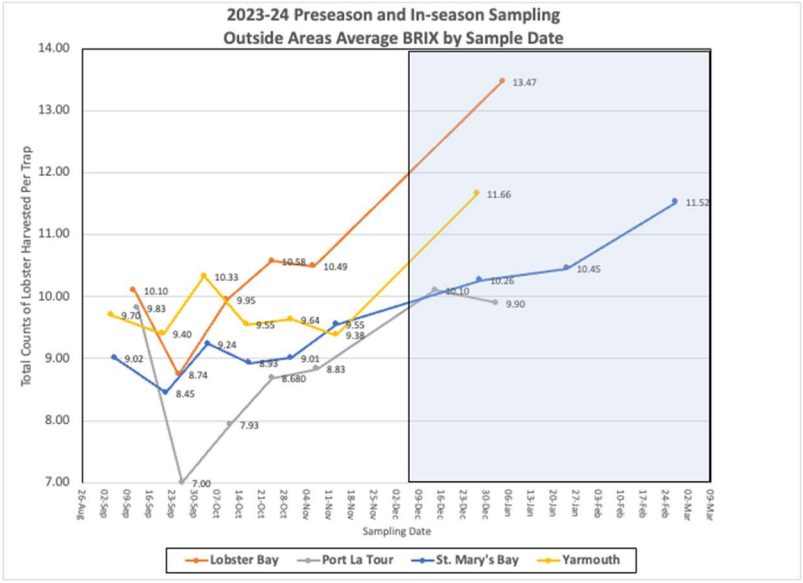
(d) Average BRIX per sample by location of Outside areas

Outside areas average BRIX values per sample tend to fall initially (September through October) as lobsters may be recovering from spring-summer moults. Thereafter, average BRIX levels remain flat through October (at levels of 7-8 units/ml) before rising by as much as 50% (to levels of 11-13 units/ml) into November across all areas and continuing into the In-season sampling periods. This dynamic behavior over all 5 years 2020 to 2024 with respect to BRIX is illustrated in Figure 13abcde below for all locations. Average BRIX levels increased in 2023-24 (Figure 13b) going into the commercial fishery season to higher levels relative to past years, but have since decreased overall in 2024-25 (Figure 13a) to 2021-22 (Figure 13d) levels. (See also Appendix A.2, p.A.6(d).)

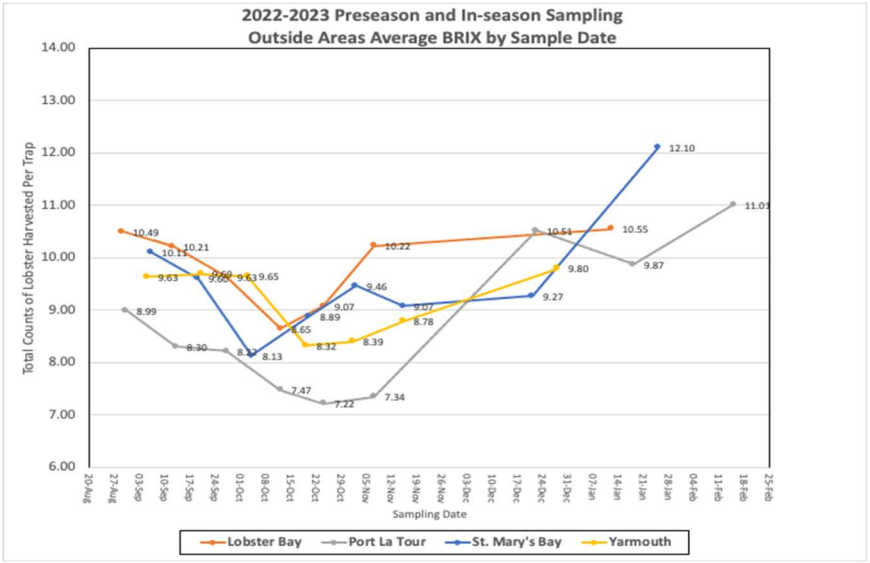


(a)

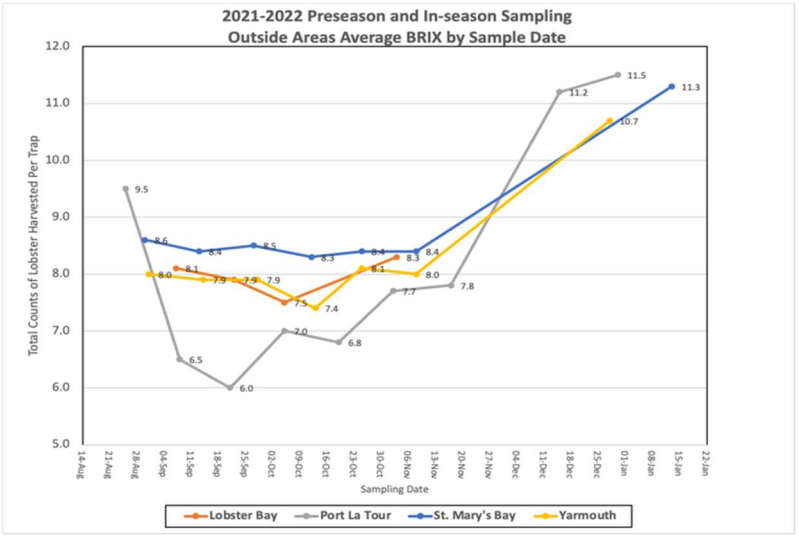
Figure 13. Preseason and In-season Outside Areas Average BRIX; (a) 2024-25 Sample Dates;



(b)



(c)



(d)

(e)

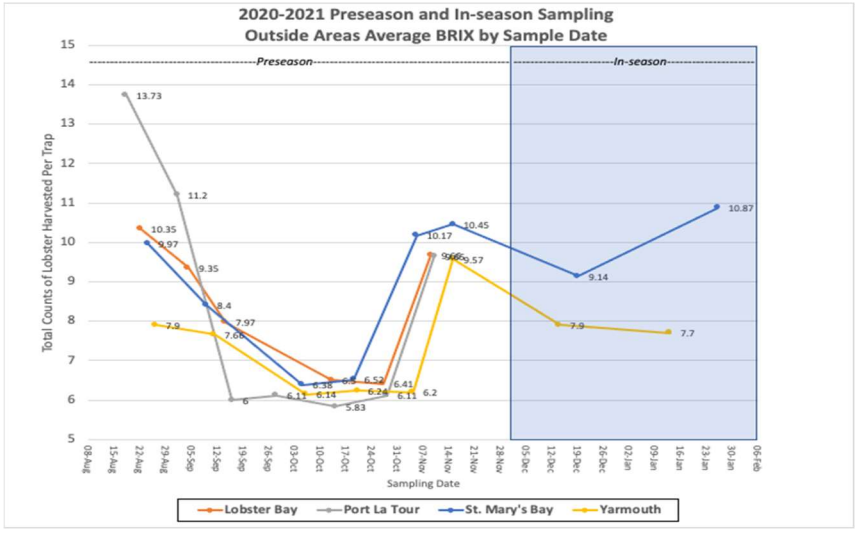


Figure 13. Preseason and In-season Outside Areas Average BRIX; (b) 2023-24 Sample Dates; (c) 2022-23 Sample Dates; (d) 2021-22 Sample Dates; (e) 2020-21 Sample Dates

3.2 Berried Females Sampling for 2024-2025

Berried (egg-bearing) females were examined again in the 2024-25 preseason and in-season surveys. Each of the 30 preseason and in-season location-dates captured an average of 13.6 berried females in all moult stages or 7.9% (408) of all female lobsters captured (5,166) during the preseason and in-season sampling dates. This represents a 130% increase in the percentage of berried females observed (3.44%) over 2023-24. In total, Outside areas accounted for only 14% of total berried females collected. Lobster Bay Inside saw 312 berried females or 76% of the total in 2024-25 sampling. Only between 15-22 berried females samples were found in each of the other areas (Port La Tour, St. Mary's Bay, and Yarmouth) Inside and Outside areas combined during 2024-25 sampling. Berried female analyses recorded carapace size, clutch fullness, egg stage and condition for each berried female lobster.

Data on berried females were compiled as part of the preseason and in-season sampling program in 2024-2025. This report contains summaries of the berried females information on selected harvested lobster counts. This information below includes: (1) Section 3.2.1 – berried females sampled counts information; and (2) Section 3.2.2 – berried females sampled stage counts information.

Appendix B.1 – "Location graphics – berried females sampled counts information Graphics" contains the complete graphic record of this information for all locations, inside and outside areas by preseason sampling dates (no berried female counts data were collected for the 2024-2025 in-season sampling dates). Selected graphics are presented in this report below.

3.2.1 Berried females sampled counts information (Appendix B.1)

1) Berried females sampled in 2024 and percent of harvest for Yarmouth Inside & Outside areas

The sample of berried females in Yarmouth – as for most areas – is variable with respect to counts of lobsters in stages. Most observations are Stage 1(21 of 22 total berried females observations or 5.4% of all 408 sampling dates) with observations between 0 and 7 berried female lobsters in a single sample. In 2024, there were zero Stage 2 and Stage 4 observations and only 1 Stage 3 observation (Yarmouth Outside, in-season sample of January 11, 2025). In 2024, the percentage of Yarmouth berried females observations to total females (sublegal and legal – 1134 lobsters) was 1.9%. These proportions are comparable to the 2021 overall berried female results for Yarmouth (although the 2021 data included substantial Stages 2 through 4 observations in Yarmouth).

2) Berried females sampled in 2024 and percent of harvest for Lobster Bay Inside & Outside areas

As noted above, berried female counts in Lobster Bay accounted for 76% (312 on 408 observations) of all berried females observations across all locations (Figure 14). In 2023, Lobster Bay recorded 198 berried females on a total of 387 observations across all areas or 51%. In 2022, Lobster Bay accounted for 32% berried females on 295 total observations. Thus, the appearance of berried females in Lobster Bay has been increasing appreciably in the year-over-year observations.

In 2024-25, as in past years, Stage 1 counts in the Inside area increase (to a maximum of over 100 berried females in the October 29, 2024 samples) and then declines through mid-November (to 55 berried

females in the November 13, 2024 samples). This decline in Inside area berried females continues into the commercial season samples of January 24, 2025 (52 observations) and February 24, 2025 (8 observations). Figure 14 illustrates the berried females report for Lobster Bay for 2024-25. Lobster Bay berried females in all Inside and Outside samples counts are dominated by Stage 1 observations accounting for all but one of the 351 total berried female observations. There is one Stage 2 observation in the Inside area, November 13, 2024 samples. There were zero observations of either Stage 3 or 4berried females in Lobster Bay sampling.

3) Berried females sampled and percent of harvest for Port La Tour Inside & Outside areas

Again in 2024, berried female counts in Port La Tour are the smallest of all areas with total counts of 15 (3.7% of 408 total berried females observations) with an average of less than 2 berried females in any one of the 8 samples in Port La Tour Inside (4) and Outside (4). Unlike past years, Port La Tour berried female observations are all estimated to be at Stage 1 only with zero observations in Stage 2 through 4.

4) Berried females sampled and percent of harvest for St. Mary's Bay Inside & Outside areas

The counts of berried females in St. Mary's Bay Inside and Outside locations in 2024 record 20 berried females or 4.9% (versus 110 observations or 28% of all observations in 2023-24). 60% of berried females (12 observations) are observed in the Inside sampling areas and later in the preseason sampling periods (October 23, 2024 – 2 observations, November 5, 2024 – 10 observations). Only 3 berried females were observed in the single in-season sample in St. Mary's Bay Outside on February 20, 2025.

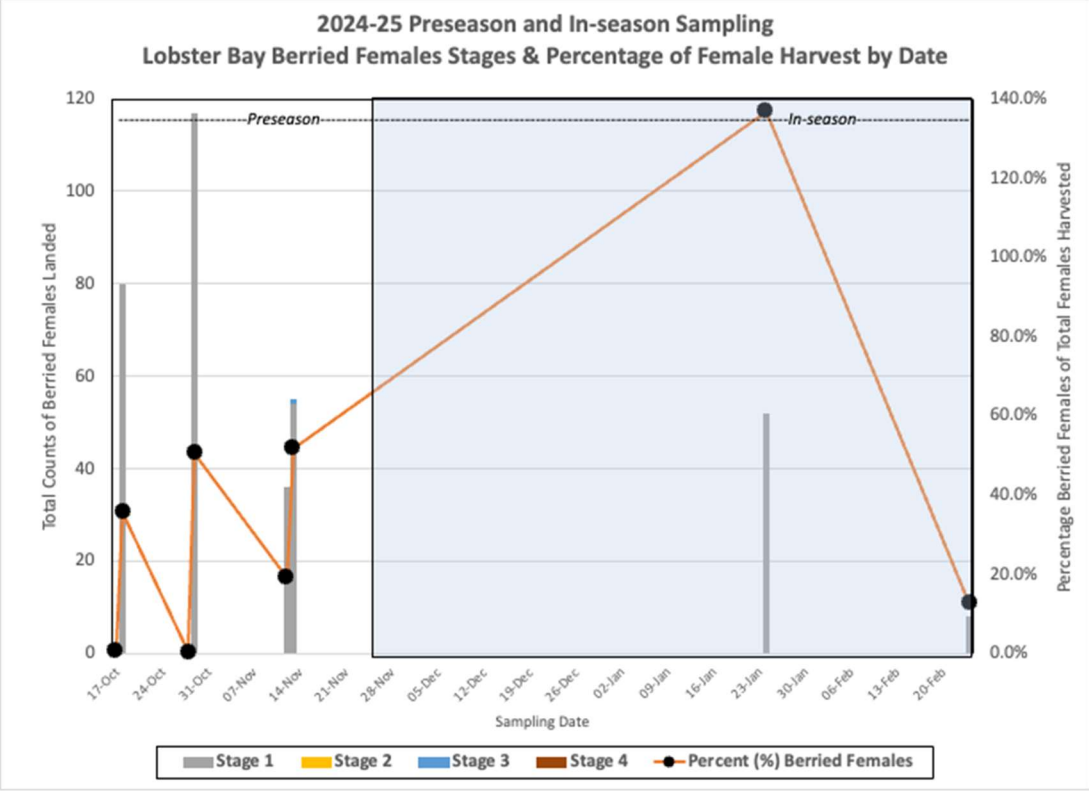


Figure 14. Preseason and In-season Lobster Bay Berried Females Stages and Percent of Female Harvest: 2024-25 Sample Dates;

3.2.2 Comparative Location Graphics – berried female sampled stage counts information (Appendix B.2)

a) Berried females Stage 1 counts for Inside areas

Stage 1 berried females represent the largest counts of all stages for the inside areas. In 2024, Stage 1 inside area counts (Figure 14) fluctuate by location with Lobster Bay Inside having the dominant highest counts of Stage 1 berried females by far (totals of 312) and St. Mary's Bay Inside having the lowest counts (12). It is not possible to determine a trend over the 4 years of data in Stage 1 counts for any location. Inside counts for past years vary from a low of 163 (2021-22) to a high of 408 (2024-25). Figure 14 illustrate the distribution of berried females counts for the past years 2023 to 2020 for the Lobster Bay Inside and Outside areas.

b) Berried females Stage 1 counts for Outside areas

As for Stage 1 Inside counts, there is no evident trend in Outside counts for any or all areas over the 2024 preseason and in-season sampling periods. In 2024, Lobster Bay Outside has largest counts for the Outside areas (38), while Port La Tour once again has berried female counts in the Outside area that are negligible over all samples (1). Lobster Bay Outside also dominated berried females counts in 2023-24, 2021-22, and 2020-21 sampling.

In general, the counts of berried females over all locations and areas are expected to be low for the higher Stages 3 and 4 during the preseason and the in-season sampling period. Appreciable counts of higher moult stages climb significantly and are expected to be seen before the sampling period (in the Spring of the year, March-May) and after the end of the commercial season in LFAs33 and 34 when lobster eggs are released during the months of June and July and before the September-October sampling dates. Low counts of Stage 3 and 4 berried females are more of a concern after the end of the commercial season (i.e., in June and July). They are not a concern for the start of the commercial season (November-December). These data are recorded here for potential use with in-season observations aligned with the lobster moulting cycle during Spring and Summer months.

Table 7 summarizes the berried females observations over all 8 subareas of the 2024-25 and the 2023-24 sampling programs. The percentage of berried females per sample increased from 6,79 berried female lobsters in 2023-24 to 13.6 lobsters in 2024-25. As a percentage of overall total lobster counts (males and females, sublegals and legals), there were 3.39% berried females observed in 2024-25 versus 1.61% berried females in 2023-24 – a doubling of observed berried females observed over one year.

Table 7. Berried Females in 2024-25 and 2023-24 by Subarea

			2024-25			2023-24		
Sampling Subarea of LFA	Site#	Locations	Sampling Dates	Total Counts	Berried Females	Sampling Dates	Total Counts	Berried Females
Lobster Bay	1	Inside	18-Oct	658	80	12-Sep	896	12
LFA 34			29-Oct	624	117	26-Sep	832	14
			13-Nov	376	55	11-Oct	648	44
			24-Jan	142	52	25-Oct	1095	54
			24-Feb	171	8	07-Nov	750	43
						04-Jan	134	3
				1971	312		4355	170
	2	Outside	17-Oct	670	2	11-Sep	312	8
			28-Oct	552	1	25-Sep	489	4
			12-Nov	475	36	10-Oct	930	10
						24-Oct	1410	0
						06-Nov	670	5
						04-Jan	287	1
				1697	39		4098	28
Port La Tour	3	Inside	16-Oct	492	0	13-Sep	252	1
LFA 33			30-Oct	381	10	27-Sep	503	0
			13-Nov	415	3	12-Oct	452	1
			23-Jan	296	1	25-Oct	386	1
						08-Nov	301	3
						14-Dec	543	2
						02-Jan	137	1
				1584	14		2574	9
	4	Outside	15-Oct	251	0	12-Sep	6	0
			29-Oct	237	0	26-Sep	1	0
			12-Nov	310	0	11-Oct	262	1
			23-Jan	218	1	24-Oct	232	0
						07-Nov	230	0
						14-Dec	476	5
						02-Jan	84	0
				1016	1		1291	6
St. Mary's Bay	5	Inside	08-Oct	717	0	06-Sep	272	3
LFA 34			24-Oct	548	2	22-Sep	481	7
			06-Nov	493	10	05-Oct	512	7
						22-Oct	618	17
						31-Oct	431	18
						14-Nov	229	39
						28-Dec	437	7
						24-Jan	168	0
						27-Feb	40	0
				1758	12		3188	98
	6	Outside	07-Oct	311	0	05-Sep	15	1
			23-Oct	474	0	21-Sep	115	1
			05-Nov	637	5	04-Oct	585	2
			20-Feb	170	3	17-Oct	488	0
						30-Oct	722	1
						13-Nov	516	6
						28-Dec	318	1
						24-Jan	186	0
						27-Feb	123	0
				1592	8		3068	12
Yarmouth	7	Inside	09-Oct	601	4	05-Sep	372	1
LFA 34			23-Oct	403	5	21-Sep	854	3
			05-Nov	258	4	04-Oct	530	4
						17-Oct	588	7
						31-Oct	418	10
						14-Nov	340	6
				1262	13		3102	31
	8	Outside	08-Oct	128	0	04-Sep	138	0
			22-Oct	352	1	20-Sep	339	5
			04-Nov	488	3	03-Oct	178	2
			11-Jan	186	5	16-Oct	346	6
						30-Oct	603	1
						13-Nov	308	1
						27-Dec	450	18
				1154	9		2362	33
			2024-25			2023-24		
	#Sites		Sampling Dates	Total Cts	BF Counts	Sampling Dates	Total Cts	BF Counts
TOTALS	8		**30**	**12034**	**408**	**57**	**24038**	**387**

3.3 Temperature Data

It is recognized that collecting continuous data on bottom temperatures on the lobster fishing areas would provide valuable information and assist in making prediction models for the lobster moult cycle as a key determinant of lobster behaviour including as a trigger for moulting, and/or for epizootic shell disease conducive conditions. For the first time in the 2024 preseason surveys, this report includes feedback on the available temperature information at sampling site locations. This information includes set and haul water surface temperatures compiled by captains and the data collection technician, as well as detailed soak times and soak time bottom temperature data downloaded from attached HOBO temperature loggers on sampling traps. Bottom temperature data recorded at regular intervals are downloaded and summarized as average, maximum, and minimum temperatures during sampling soak time periods as reported in the Table 8 below.

Due to initial issues with the HOBO temperature logger attached to traps, not all sample locations-dates bottom temperature data were retrievable. Future years will be expected to streamline temperature information access and retrieval including comparative annual preseason analyses. In this first year, bottom temperature data are presented for observational input and reader feedback. Bottom temperature data have long been considered to be important to understanding lobster dynamics, the moult process, and lobster catchability, i.e., the likelihood of lobster coming out to traps. Compilation of these data marks a key starting point for future lobster analyses and research. (Special thanks to the staff of the Marine Research Centre in Petit de Grat, notably, Victoria Tobin and Aleasha David, for their considerable time and effort in preparing these data for this report.)

Table 8 and Figure 15 illustrate bottom temperature information available for the 2024 preseason sampling program. The observational data provide a snapshot of the status of the bottom ecosystem that undoubtedly impact lobster status and catchability. It is recognized that the date and location of sampling, and the depth of sample traps impact our observations of temperature data. For example, it is noted in Table 8 that for all sampling locations, bottom temperatures for Inside areas generally exceed those for Outside areas (see also Figure 15 for Lobster Bay). This is attributable to shallower Inside and deeper Outside bottom depths for similar dates.

Further, average temperatures are impacted by sample trap string depth. It is noted that the column “String Depth (F)” in Table 8 refer to the recorded depths of String #1 from the dataset.

Table 8. 2024 Preseason Sampling Temperature Data Summary

LFA Subarea 2024	Site Location	Set Date/ Time*	Set Surface Temp (˚C)	String Depth (F)	Soak Time (Hrs:Mins)	Soak Time Ave Bottom Temp (˚C	Soak Time Max Bottom Temp (˚C)	Soak Time Min Bottom Temp (˚C)
Lobster Bay	Inside	10-17 12:35	14.4	19.38	19:05	13.5	13.8	13.2
LFA 34		10-28 12:45	12.1	17.25	18:55	11.2	11.4	10.9
		11-12 9:10	10.4	19.50	21:25	9.7	9.9	9.5
		01-12 7:00	-	10.67	5:00	N/A	N/A	N/A
		01-12 7:00	-	9.68	293:00	N/A	N/A	N/A
	Outside	10-15 9:00	13.2	31.35	48:10	11.8	12.5	11.3
		10-27 1:50	11.2	30.38	31:25	10.6	10.8	10.1
		11-10 8:55	9.9	30.20	45:10	9.2	9.3	9.1
Port La Tour	Inside	10-15 10:00	12.8	10.23	20:50	N/A	N/A	N/A
LFA 33		10-29 15:10	9.2	10.65	15:20	8.4	9.4	8.1
		11-12 15:00	9.6	12.63	19:30	N/A	N/A	N/A
		01-18 7:00	-	20.15	125:00	N/A	N/A	N/A
	Outside	10-14 8:30	13.6	35.65	25:00	N/A	N/A	N/A
		10-28 20:20	11.3	36.13	16:33	4.5	4.8	4.3
		11-11 8:15	10.1	35.50	29:00	4.3	4.8	4.159^
		01-18 7:00	-	34.94	125:00	N/A	N/A	N/A
St. Mary's Bay	Inside	10-07 11:30	-	31.95	19:18	N/A	N/A	N/A
LFA 34		10-23 16:40	-	36.75	17:11	11.0	13.2	10.7
		11-05 15:30	-	38.00	17:51	10.1	10.2	10.0
	Outside	10-06 9:29	-	49.75	23:31	N/A	N/A	N/A
		10-22 8:15	-	50.75	30:55	N/A	N/A	N/A
		11-04 8:55	-	49.25	27:21	9.8	10.0	6.6
		01-29 7:00	-	61.53	533:00	N/A	N/A	N/A
Yarmouth	Inside	10-08 16:00	-	22.75	18:08	15.2	15.9	15.0
LFA 34		10-22 11:00	-	23.75	21:11	12.1	12.2	12.0
		11-04 13:10	10.0	23.75	18:50	10.6	10.7	10.5
	Outside	10-07 8:45	-	49.75	28:15	N/A	N/A	N/A
		10-21 7:30	-	40.25	24:00	10.4	12.1	10.2
		11-03 9:45	-	52.75	23:30	9.7	9.9	9.6
		12-30 7:00	-	52.25	287:45	N/A	N/A	N/A

N/A - Temperature logger data not available/not recorded.

*Times, as available, for set, soak time and string depth refer to String 1.

^NB: Minimum Bottom Temperature for this location were at actual depths of greater that 50F.

In the case of the observed lowest average bottom temperatures recorded over all locations at under 5 degrees Celsius for Port La Tour Outside, actual bottom depth of logger was noted at being on a string in water depth greater than 50 Fathoms which differs from the depth of String #1 in this case. The resulting low temperatures, as expected, record very few lobster counts for sampling.

Bottom temperature analyses in future sampling will be defined using protocols to associate variables, such as depth, with specific information about where loggers may be placed to record bottom temperatures. Ongoing analyses of temperature data will compare year-over-year differences to examine the impacts on sample catch counts and lobster biological data.

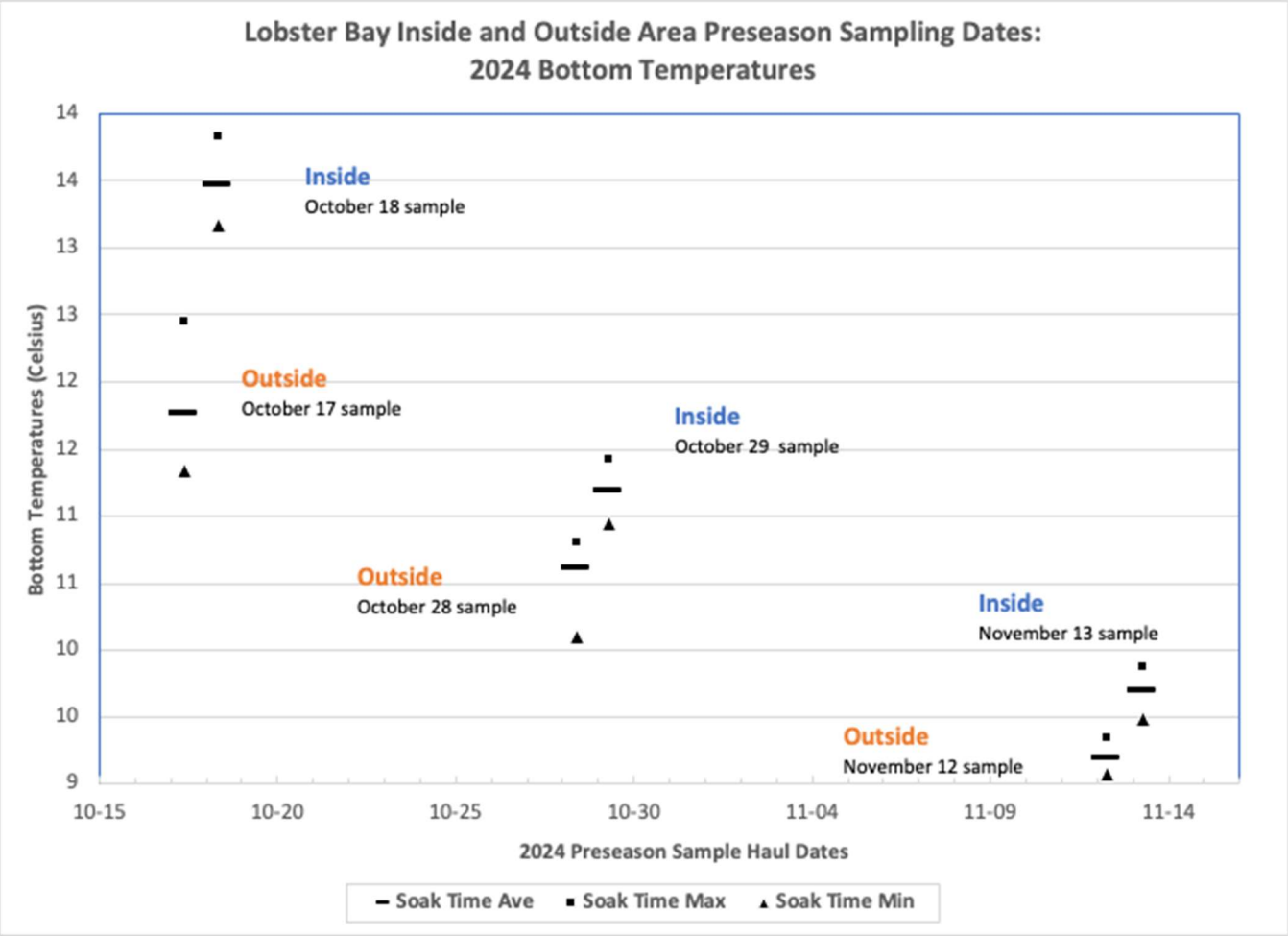


Figure 15. Lobster Bay 2024 Preseason Samples Bottom Temperature Information

4 2024 Preseason Highlights and Predictors

In the summary report presented prior to the start of the 2024-25 commercial season (Martineau, Mulock, and Lane 2024b), the 2024 Preseason Summary highlights were summarized for: (1) BRIX level values; (2) lobster counts per trap; (3) lobster carapace hardness 'soft' and 'medium' values; and (4) percent weak lobsters in the samples.

Table 6 presented the 2024 preseason lobster quality category assignments by subarea. These included the average BRIX results, average landed lobster counts per trap by subarea, as well as the percentage of weak lobsters, and the percentage of soft lobsters in the preseason samples. Table 8 (Section 4.5) below presents the predictor values for the summary lobster quality indicators for the start of the 2024-2025 commercial season as presented in the November 2024 preseason report (Martineau, Mulock, and Lane 2024b). In this report, the Table 8 predictions are corroborated with the historical preseason indicators and the 2025 in-season sampling observations presented in Section 6 below.

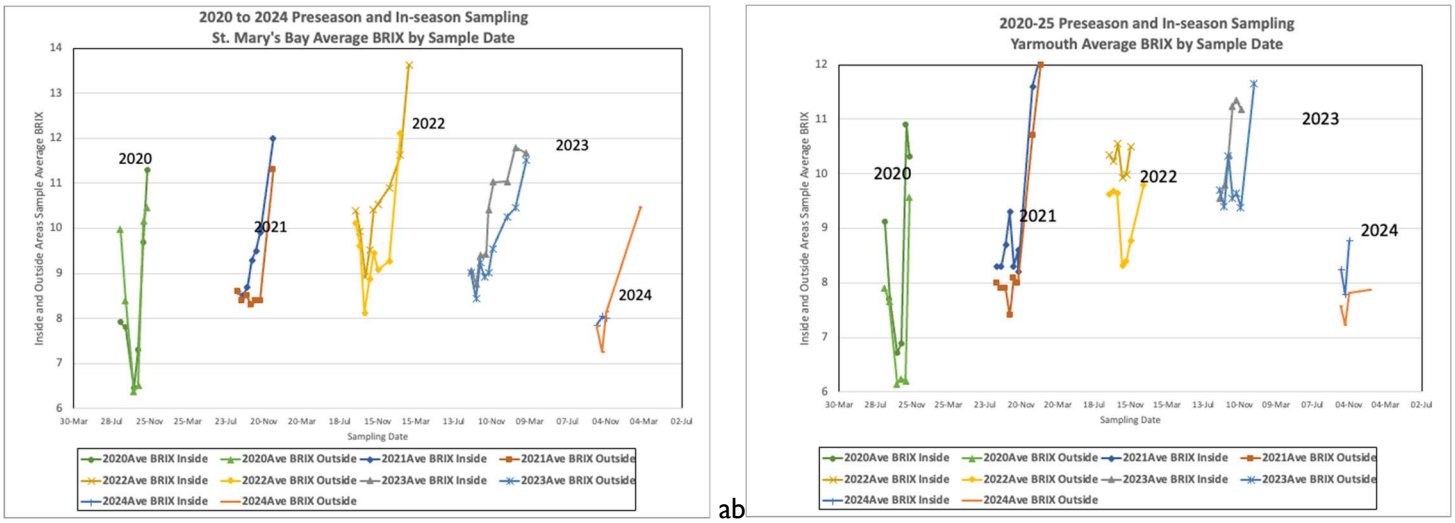
The following subsections compares the 2024 preseason lobster quality indicators with those of the four previous reports, 2020 to 2023.

4.1 BRIX Level Values

In 2024, Inside area average BRIX levels per sample tended to fall initially until end October and then rise over the remaining preseason sampling dates to the end of sampling period in mid-November and continuing into the in-season sampling of January and February. Average levels vary by location from a low of 6.78 mg/mL (St. Mary's Bay in 25 October samples) to a high of 11.81 mg/ml (Lobster Bay in 24 January, 2025 samples). Average BRIX are indicative of marginally "Good" BRIX (≥ 8 mg/ml) across all Inside locations and sampling dates in 2024-25. Similarly to Inside BRIX averages, across all areas, Outside BRIX levels fall in mid-October and then rise from end October into the in-season sampling of January and February 2025. In Outside areas, average BRIX vary between low levels of 6.93 mg/mL (Port La Tour in 15 October samples) to a high of 10.45 mg/ml (St. Mary's Bay in 24 February, 2025 samples).

In Figure 16, average BRIX values are shown for St. Mary's Bay and Yarmouth and include samples for both Inside and Outside areas and for each of the indicated years 2020 to 2024. In the case of St. Mary's Bay (Figure 16a), overall average BRIX values are generally rising from 2020 to 2022. However, in 2023 and 2024, St. Mary's Bay average BRIX values decline. Overall average BRIX fall from a high of approximately 10 in 2022-23, to 9.5 in 2023-24 to below 8 in recent survey sampling in 2024-25 (Table 6). For St. Mary's Bay, the average BRIX values observed in 2024-25 are arguably the lowest averages in the time series (2020-2025) for a smaller set of samples (i.e., 7 samples in 2024-25 versus 16-18 samples in all other years 2020 to 2023).

For Yarmouth (Figure 16b), overall average BRIX values rise annually from 2020 through to 2023. However, in 2024, Yarmouth overall average BRIX values are near 8 (Inside and Outside) (Table 6). The fall in average BRIX in 2024-25 in Yarmouth is pronounced (from overall mean of 10 in 2023 and 2022, to under 8 for 2024 at or below 2021 and 2020 levels, Figure 16b and Table 6) and reverses the apparent increasing trend in average BRIX per sample from 2020 to 2023.



ab

Figure 16. Preseason and In-season Sampling Average BRIX values by Sample Dates 2020-2024 for: (a) St. Mary's Bay inside and Outside Areas; and (b) Yarmouth Inside and Outside Areas

2024 preseason sampling results in LFAs 33 and 34 across all areas indicated that lobsters landed at the start of the 2024-2025 season in southwest Nova Scotia, appear to be of overall moderate-low (ML) quality by comparison with the entire 2006 to 2023 preseason database (Table 6). This is a downgrading level from the Moderate (M) of BRIX in 2023. 2024 preseason samples average overall BRIX (Table 3 and 6) at the moderate-low level of marginally "Good" of only 8.10 mg/mL, a -17% decline in the overall BRIX average for 2023 of 9.78 mg/mL.

4.2 Lobster Counts Per Trap

In 2024, total preseason and in-season landings (legal and sublegal, and male and female lobsters) over 30 sample dates were 12,034 lobsters or 401.1 counts per sample – the second lowest counts per sample in the time series. This represents a decrease of almost 5% in counts per sample versus last year's 2023-24 samples landings of 24,038 lobsters over 57 sample dates or 421.7 counts per sample. The 2022-23 survey caught 29,446 lobsters over 62 sample dates or 474.9 counts per sample; the 2021-22 preseason and in-season survey landings totaled 23,715 lobsters for 63 sample dates or 376.4 counts per sample; and the 2020-21 preseason and in-season survey landings were 28,276 lobsters for 60 sample dates or 471.3 counts per sample. (Survey samples, 2020 to present, use 40 traps in 4 strings with 10 pots/string.)

Previous surveys carried out different numbers of preseason sampling locations-dates. In 2024, there were only 24 location-dates sampled compared to 44 (2023), 50 (2022), 51 (2021), and 52 (2020). Differences in the preseason sampling location-dates explain, in part, differences in total annual preseason survey lobster landings. To examine comparable differences in sampling counts of lobster, the measure of total (legal and sublegal) lobsters landed per trap are determined for each year 2020 to 2024. The results are summarized for selected locations in the figures below. Table 6 above also presents the average legal-sized landings of lobster counts per preseason trap in the 2024 samples for each location. Legal landings of lobster counts per trap are also shown for each location and compared to historical years 2020-2023 in each of the 2024 preseason locations below (Section 5 - Analysis of Preseason Sampling Data in 2024).

In the Figure 17, Inside and Outside total (legal and sublegal) counts are illustrated for Lobster Bay annually for each preseason sample (only) over the years 2020 to 2024. Lobster Bay is unique in that there is annually a clear separation of males and females in the preseason samples' landings in the Inside area. With respect to legal lobster counts per trap (Table 6), Lobster Bay counts per trap for 2024 are comparable in the Inside area (8.19 lobsters/trap) and the Outside area (10.25 lobsters/trap). These counts per trap statistics for Lobster Bay have been higher than the other areas in each year since 2020. However, in 2024, legal-sized counts per trap in Lobster Bay Inside were 41% lower than in 2023 (13.92 lobsters/trap) and in Lobster Bay Outside were 30% lower than in 2023 (14.68 lobsters/trap). Further, overall legal-sized lobster counts per trap in St. Mary's Bay exceeded Lobster Bay counts for the first time since 2020.

Based in the significant lower catch counts per trap in Lobster Bay in 2024 samples, it is expected that catches in the commercial fishery in 2024 will be significantly lower (on the order of 30-40% decline) than past commercial catches in Lobster Bay, both in Inside and Outside areas based on total (Figure 17) and legal counts per trap (Table 6) over time.

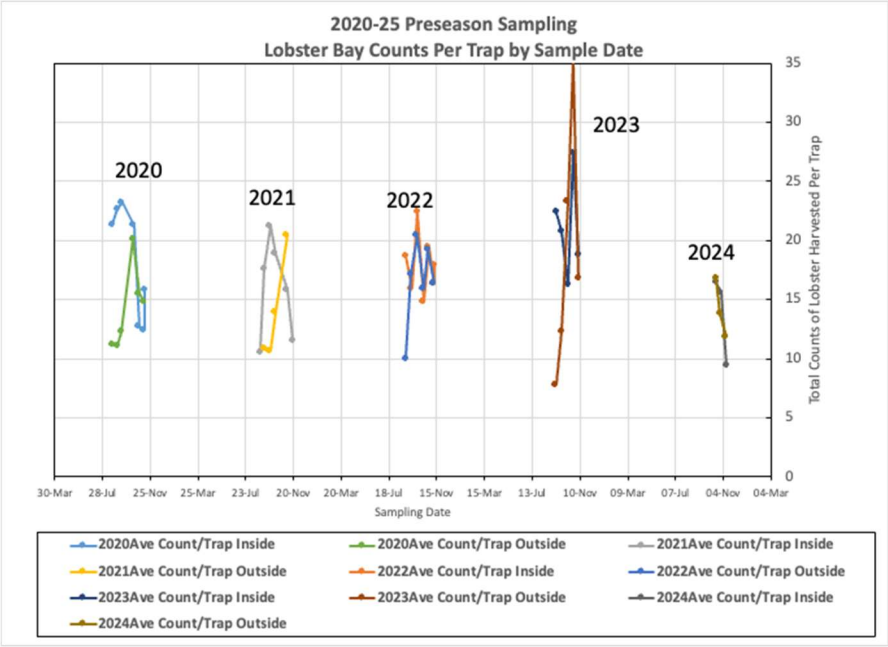
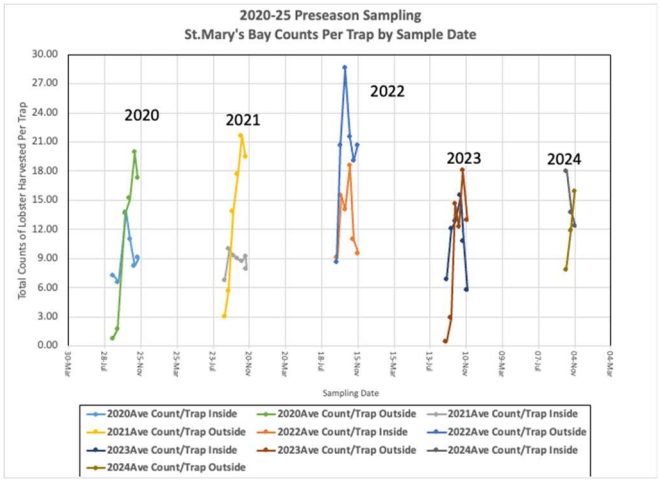


Figure 17. Lobster Bay Catch Counts per Trap 2020 to 2024 for Inside Sample Dates and Outside Sample Dates

Figure 18 below provides total counts per trap by sample for the Inside and Outside areas of St. Mary's Bay (18a) and Yarmouth (18b) for 2020 to 2024. These figures illustrate differences between the 2023 and 2024 areas total counts pre trap and the comparable past years' results (2020-2022) for these two areas. Notably, both St. Mary's Bay and Yarmouth Inside counts per trap are relatively stable over the period 2020 to 2024. However, both St. Mary's Bay and Yarmouth Outside counts per trap show slight increases in counts per trap date over the period 2020 to 2022 followed by a sharp decline in the 2023 and 2024 total counts per trap of -40% (approximately 5-15 counts per trap) compared to 2022 total counts per trap (approximately 10-28 counts per trap) as illustrated below in Figures 18ab.

As was the case for 2023, these sharp year-over-year declines in average landings per trap, lead to the expectation that catches in the commercial fishery in 2024-25 will be significantly lower in the Outside areas of St. Mary's Bay and Yarmouth based on the total counts (Figure 18) over the past years 2020-2022. Over all 8 sampling locations, average legal-sized counts per trap in 2024 (Table 6) is 8.26 legal-sized counts per trap, down by -7% compared to 2023-24 average counts per trap of 8.85) and down 29% compared to 2022 values (11.69 legal-sized counts per trap).



(a b)

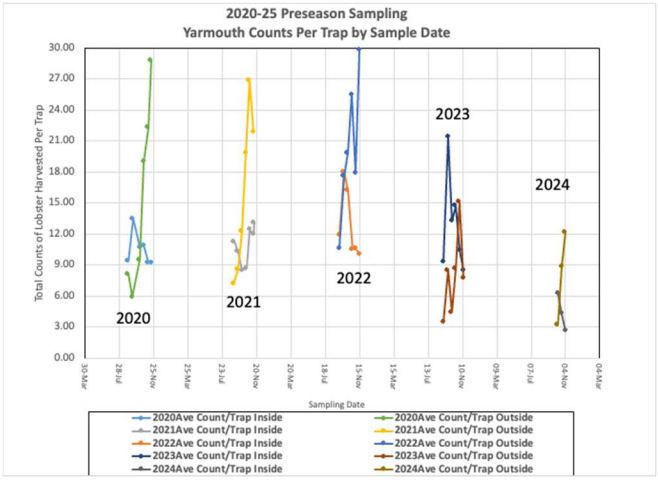


Figure 18. Total Catch Counts Per Trap 2020 to 2024 (a) St. Mary's Bay; (b) Yarmouth Inside and Outside

4.3 Lobster Carapace Hardness in Samples

Lobster hardness measurements shifted significantly in the 2024-25 preseason and in-season samples in comparison to all previous results of 2020 to 2023 in the database. Figures 19abcd below for all areas, both Inside and Outside, show lobster counts for "Soft" (Hardness scale=2) for the preseason and in-season survey dates over the 5-year reporting period, 2020-21 to 2024-25. Counts of soft lobster increased from negligible amounts (0.8%) in 2020 to over 32% in 2024-25 – a more than 40-fold average increase in Soft lobster percent of samples since 2020.

As illustrated in Figure 19abcd, these significant shifts in reduced lobster carapace hardness status applies to all areas. With the exception of Port La Tour (Figure 19b, where sample counts of available lobster were very low), from 2020-21 through to 2023-24, "Soft" lobster made up 10% or less of all sample in all locations (Figure 19acd). That changed dramatically in 2024-25 where observations of "Soft" lobsters jumped by 4 to 5 times to percentages in samples of 40%-50% in many samples during this period.

These results, as reported in the preseason summary report (Martineau, Mulock, and Lane 2024b) are consistent with ongoing anecdotal information from sector members that the 2024-25 commercial lobster fishery had been yielding poor grade ("soft") lobsters in catches. This has potentially significant impacts on the ability to store and ship live lobsters to international markets.

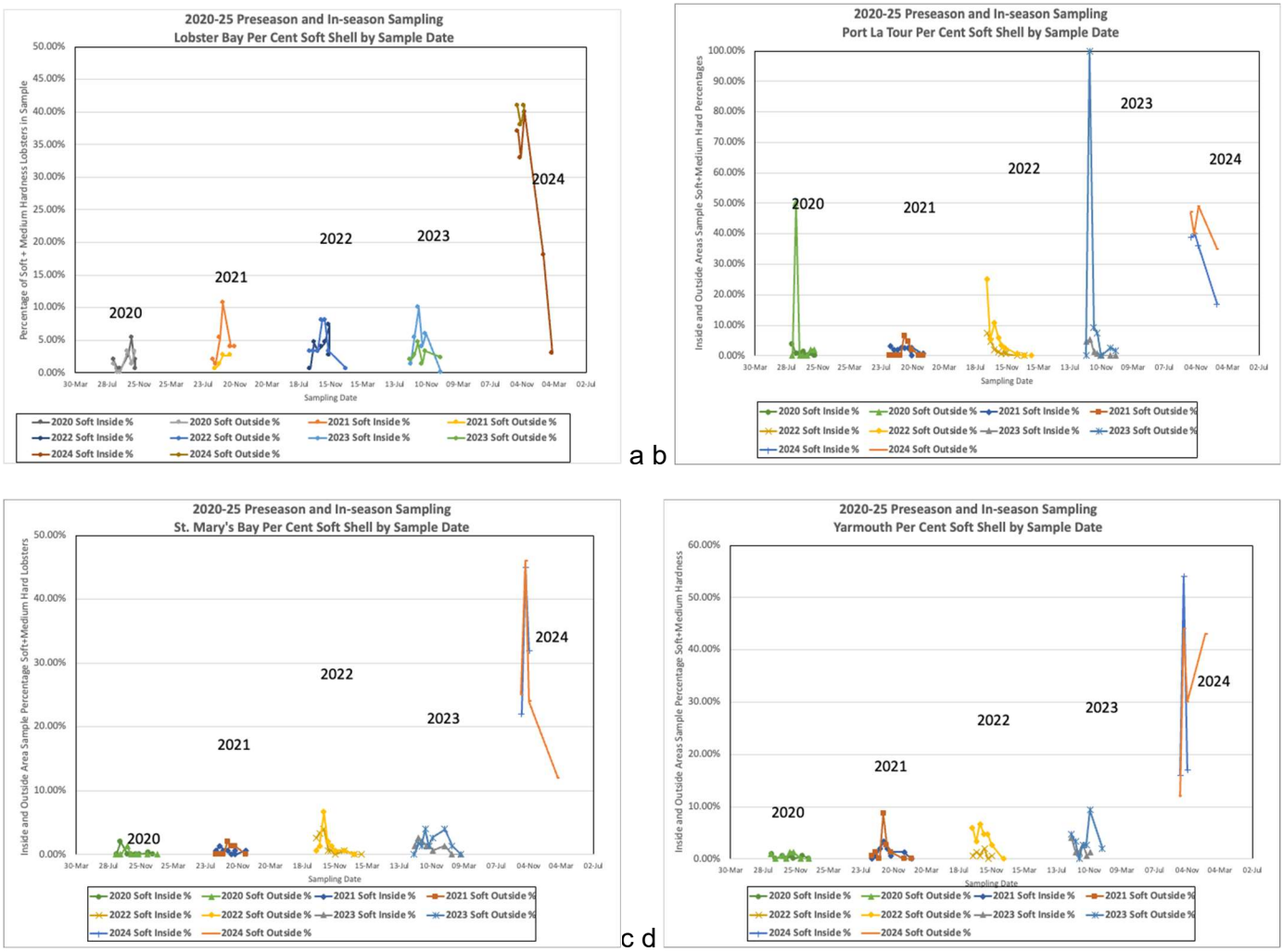
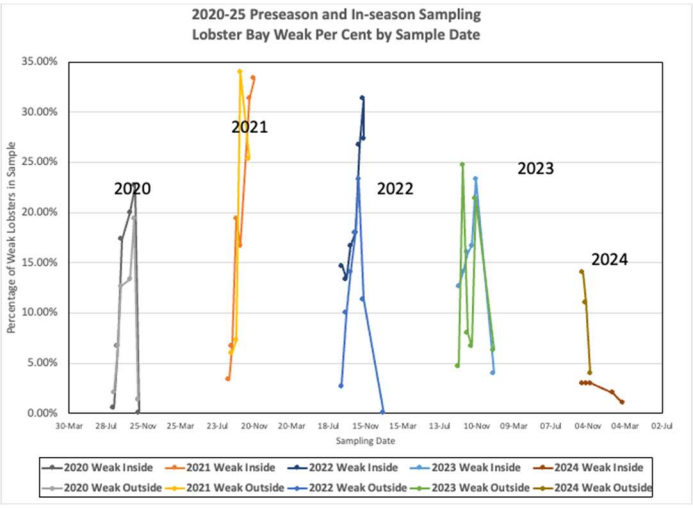


Figure 19. 2024-25 Inside and Outside Per Cent Soft Lobsters: (a) Lobster Bay; (b) Port La Tour; (c) St. Mary's Bay; and (d) Yarmouth Bar by Sample Dates

4.4 Percent Weak Lobsters in Samples

The percentage "weak" lobsters observed in 2024-25 preseason and in-season sampling was 4.73% weaks over all samples (Table 3) – the lowest overall weak percentage in the 2020-2025 period. These observations are an improvement in the weaks statistics relative to the 2023 results (11.22%) and they approach the 2020 overall level of weak lobsters in the preseason and in-season samples (5.39%). In 2024, weaks in both the Inside and the Outside locations averaged 71 counts or 4.73% per sample (on 15 samples Inside and Outside) – a significant improvement over the 2023 value of 10% (Inside) and 12.5% (Outside). Lobster Bay and St. Mary's Bay (Figure 20ab below) incurred weaks in 2024-25 of 2.4% and 8.67% respectively in Inside areas, and 9.67% and 5.0% in Outside areas, respectively. These higher weak counts are compared to the overall average of weaks in all areas of 4.73% in 2024 (Table 3). Yarmouth weaks were slightly lower overall with Inside and Outside areas with averages of 8.33% and 3.67% respectively (Table 6). Weaks in Port La Tour (2% Inside and 3.67% Outside) were lower than the overall average of 4.73%.

The illustration for Lobster Bay and St. Mary's Bay (Inside and Outside) in Figure 20ab below depicts the dynamics of weaks from 2020 to 2024 for these areas. It is typical of all areas that weaks percentages of samples tend to become more varied, i.e., wider, over time with gradual increases from lower 2020 values trending to higher percentage values by 2023 with an apparent dip in weak percentage in 2024-25 as noted especially in Lobster Bay (Figure 20a).



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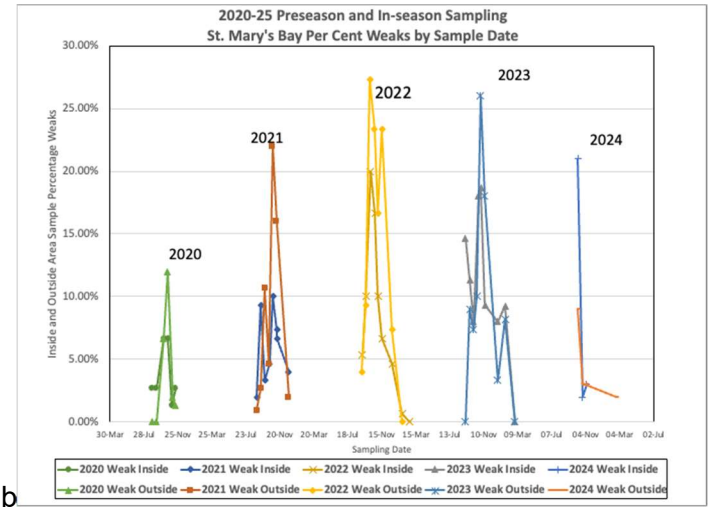


Figure 20. (a) 2023-24 Lobster Bay; and (b) 2023-24 St. Mary's Bay Per Cent Weaks by Sample Dates

The assignment of lower weak percentages in 2024-25 may not be consistent with the large increase in soft carapace lobsters discussed in Section 4.3 above. However, it must be noted that "weak" lobsters are not the same as "soft" lobsters – a key characteristic described by harvesters of catches in 2024-25. Review of the interpretation of what constitutes a "weak" versus a "soft" lobster may be at issue.

4.5 Summary of 2024-25 Predictors

For the start of the commercial season (end-November to mid-December 2024) predictors were provided for preseason samples for all 8 locations for the indicators of interest as follows:

(1) average BRIX level values;
(2) average lobster counts (legal sized) per trap; and
(3) average percent weak lobsters.

The logic for establishing the list of predictors is based on the extension of the observed 2024 preseason samples' results into the start of the commercial season for 2024-2025. From the start of the commercial season, lobsters prepare to move from the post-moult stage to the pre-moult stage over the winter of 2024-2025. The pre-moult stage is characterized by hardening of lobster shells and lower incidence of lobsters with soft and medium carapaces, and lower incidences of otherwise weak lobsters into the Spring months (March, April and May) of the commercial season in LFAs33 and 34. Estimates of the predictors into December 2024 anticipate the rate of improvement of lobster quality status overall. The estimate of counts per trap takes into account the change in catchability of lobsters as well as the draw down in catchable

lobster abundance in each location following the initial start of season fishing effort intensity. The predictions for average weight per trap of legal lobsters are based on estimated lobster weight by carapace length using the survey carapace length data from sampling. These predictions are calculated so that industry members may make direct comparison of these predictions with actual observations in the commercial fishery.

As evidenced from the data, the participation of the commercial fleet immediately after the season opens results in fishing effort that leads to a precipitous decline in catch counts of lobster per trap in all locations into the New Year (January 2025) period. Table 9 below presents the estimated predictor values through December 2024 based on the above assumptions as were presented in the November 24, 2024 preseason report to industry (Martineau, Mulock, and Lane 2024b).

Table 9. 2024 Preseason Sampling Predictors to December 2024

Locations: / Predictors	Yarmouth Inside	Yarmouth Outside	Lobster Bay Inside	Lobster Bay Outside	Port La Tour Inside	Port La Tour Outside	St.Mary's Bay Inside	St.Mary's Bay Outside
Average BRIX (mg/mL)	9	9	11	10	9	8	9	9
Ave Legal Counts Per Trap	4	8	6	8	6	5	6	7
Ave Legal Wt (kg) Per Trap	2	4	4	4.5	3	2.5	4	4.5
Ave % Weaks	3%	3%	3%	5%	2%	2%	3%	3%

The predictor values in Table 9 were presented here to test the ability of the 2024 preseason summary report to estimate the results at the start of the commercial fishery. It is anticipated that feedback from industry about the viability of these predictors will assist in improving these predictor results based on the preseason sampling program.

Overall in 2024, BRIX levels across all locations are expected to improve slightly and remain in the “Good” range (≥ 8 mg/l of blood protein) as lobster proceed from post-moult to pre-moult status with highest BRIX predictions in Lobster Bay Inside and Outside areas.

There remains concern – especially in the Outside areas of Yarmouth, St. Mary’s Bay and Port La Tour – for a decline in commercial catch rates over 2024-25 comparable to the declines of the 2023-24 commercial season. In 2023-24, catches were indeed lower at the start of the year (November-December 2023) by approximately -30% overall. Into March 2024 however, catches rebounded in a compensatory manner after which warming water led to livelier lobster and increased catches nearing +30% above anticipated levels over the end of the 2023-24 commercial season by the end May of 2024.

As of the writing of this report (end April 2025), waters remained cold in deeper areas and catches have yet to rebound as in the Spring of 2024. In the meantime, harvesters are declaring that the status of lobsters

caught in LFA33 and 34 continue to be in poor condition with more "soft" lobsters than usual. Thus, the fall in counts per trap over the preseason sampling period, especially in St. Mary's Bay and Yarmouth Bar (for the second year in a row) predicts a drop in overall catches in these areas by as much as 50% relative to the previous seasons 2020-21 through 2022-23.

It should be noted that the observation of a significant shift in Soft carapace lobsters was not predicted for the start of the 2024 season in the preseason summary report (Martineau, Mulock, and Lane 2024b). However, the extent of the decline in Hard carapace lobsters observed in the preseason surveys were nevertheless an area of particular concern going into the commercial season of 2024-25. Moreover, soft shell lobsters, as experienced in 2024-25, are consistent with lower BRIX. Together, these lower quality lobsters indicators are not preferred lobsters to carry in storage facilities (to hold during periods of lower export prices) as the risk of longer-term (weeks) of storage may be detrimental to lobster survival. In the Spring, softer shell, and lower BRIX are nevertheless anticipated to improve their condition and move to harder shells and rising BRIX as lobster move into pre-moult Spring status. Further analysis of the Table 8 start of season predictors is provided below in this report in Section 6 – In-season Sampling Data in 2024-2025, subsection 6.2.5 – Preseason Predictions versus In-season Results.

5 Analysis of Preseason Sampling Data in 2024

The at-sea preseason sampling summary report for 2024 was compiled as the 'Lobster Quality Preseason Sampling Program–Southwest Nova Scotia LFA33 & LFA34, Preseason Summary Report' (Mattock, Mulock, and Lane 2024b) and distributed by Coldwater Lobster Association to the lobster industry and government funders on November 24, 2024. That initial report released at the start of the 2024-25 commercial season contains information on the proportion of soft shell as well as the proportion of low blood protein lobsters for each of the identified sampling areas in the survey.

The 2024 preseason sampling results in LFAs 33 and 34 indicated that lobsters landed at the start of the 2024-2025 season in southwest Nova Scotia, were of overall of Moderate-Low (ML) quality (see also Table 6, Section 2.4–Lobster Quality Category Classification above). 2024 preseason samples mean overall BRIX is lower than the past 4 years and has been adjusted downward to a 'Moderate-Low' (ML) overall level of 8.10 units/ml (versus 10.07 (2023), 9.46 (2022), 8.4 (2021) and 8.37 (2020)). Preseason results vary by location. Other summary observations from the preseason summary report include:

During the early preseason sampling periods (October), sample results, especially Outside subareas, show that average BRIX values then tended to decline/dip throughout October and then increase moderately toward the end of the sampling period in mid-November.

In 2024, weaks in the Inside and Outside locations averaged about 5% overall per sample. Lobster Bay Outside (9.67%) and St. Mary's Bay Inside (8.67%) dominated the incidence of weaks. Overall, levels of weaks across all locations were below the 2023 percentages of weaks.

Overall lobster hardness measurements shifted markedly in the 2024 preseason in comparison to the past 2020 to 2023 preseason survey results. Counts of Soft lobsters in samples increased from negligible amounts of 0.8% (in 2020-21) to 1.7% (in 2021-22) to 2.7% (in 2022-23) to 2.8% (in 2023-24) and finally to a record high of 32.5% in 2024-25 – an increase factor of almost 12 times compared to the previous year. These shifts are evident in all areas in 2024 where lobster samples in the Inside areas are 30% Soft, and Outside areas are larger at 35% Soft lobsters (see also Figure 19abcd above.)

Sample results by BRIX category are shown for each of the 8 sampling locations in Section 5.2 below. These results present:

(A) BRIX category series trend for the 2024 preseason and 2024-25 in-season samples;

(B) comparable BRIX category preseason sampling 3-4 weeks before the start of the commercial season for years 2012 to 2024; and

(C) lobster (legal-sized) counts per trap for each preseason and in-season sample in 2024-25 compared to comparable results in 2020 to 2023.

The trends are described and predictions for the 2024 start-of-season are presented. It is acknowledged that years when preseason BRIX has been observed to be high, e.g., 2012 and 2013, catch per trap was relatively lower. Conversely, seasons of relatively lower preseason BRIX (2015, 2017) have resulted in relatively higher catches per trap. In 2024-25, however, lower BRIX and lower catch rates were observed together for the first time since reporting of these indicators began in 2020.

5.1 Blood Protein (BRIX) Categories

The BRIX analyses compare sample annual data of past years with the preseason and in-season sample data of the current year and looks for observations of the best match of a past year with the current year's sampling observations. The most closely matched historical year then becomes the basis for predicting the status and quality of lobster at the start of the current commercial fishery. For example, consider Figure 21 for Yarmouth Outside 2012-2018, from sampled data 3-4 weeks before the start of the respective season. The indication from these results is that 2016 is a low-quality year in a series of declining quality beginning in 2012. Since 2012, the poor BRIX values (Red category) are seen to be increasing from a low of 2.4% (2012) to a high of 31.4% (2016). Similarly, the extent of the high-quality BRIX values (Green category) decreases from a high of 75% (2012) to a low of 22% (2016).

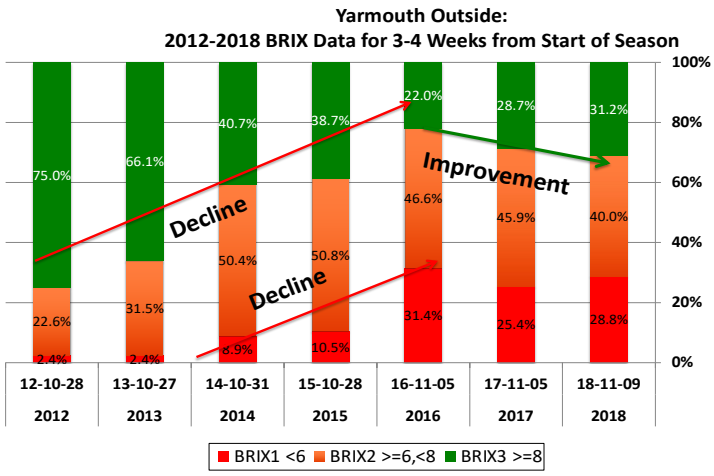


Figure 21. Example: Yarmouth Outside BRIX Categories for 3-4 weeks prior to season start 2012-2018

From Figure 21 and since 2016, preseason quality indicators show improvement. The 2016 low of BRIX values in the high category (Green) of 22% rises again from 28.7% (2017) to 31.2% (2018). Similarly, but less dramatically, the poor BRIX category (Red) falls from 31.4% in 2016 to 25.4% in 2017 with a similar value in 2018 of 28.8%. Based on this graphic, there may be expectation – assuming the annual trend since 2016 continues for Yarmouth Outside – that the upcoming 2019-2020 preseason season will mark improved quality over the lows of 2016 with marginal improvement over 2017 and 2018. (In fact, the 2019 preseason samples yielded high BRIX values (Green) of only 18%, and low BRIX values (Red) of 7.3% for an overall average BRIX of 7.2–a decline of -11% versus the 2018-2019 average BRIX of 8.1. This result may indicate that in Yarmouth in 2019, the quality improvement had stalled.)

5.2 Site Results and Predictions

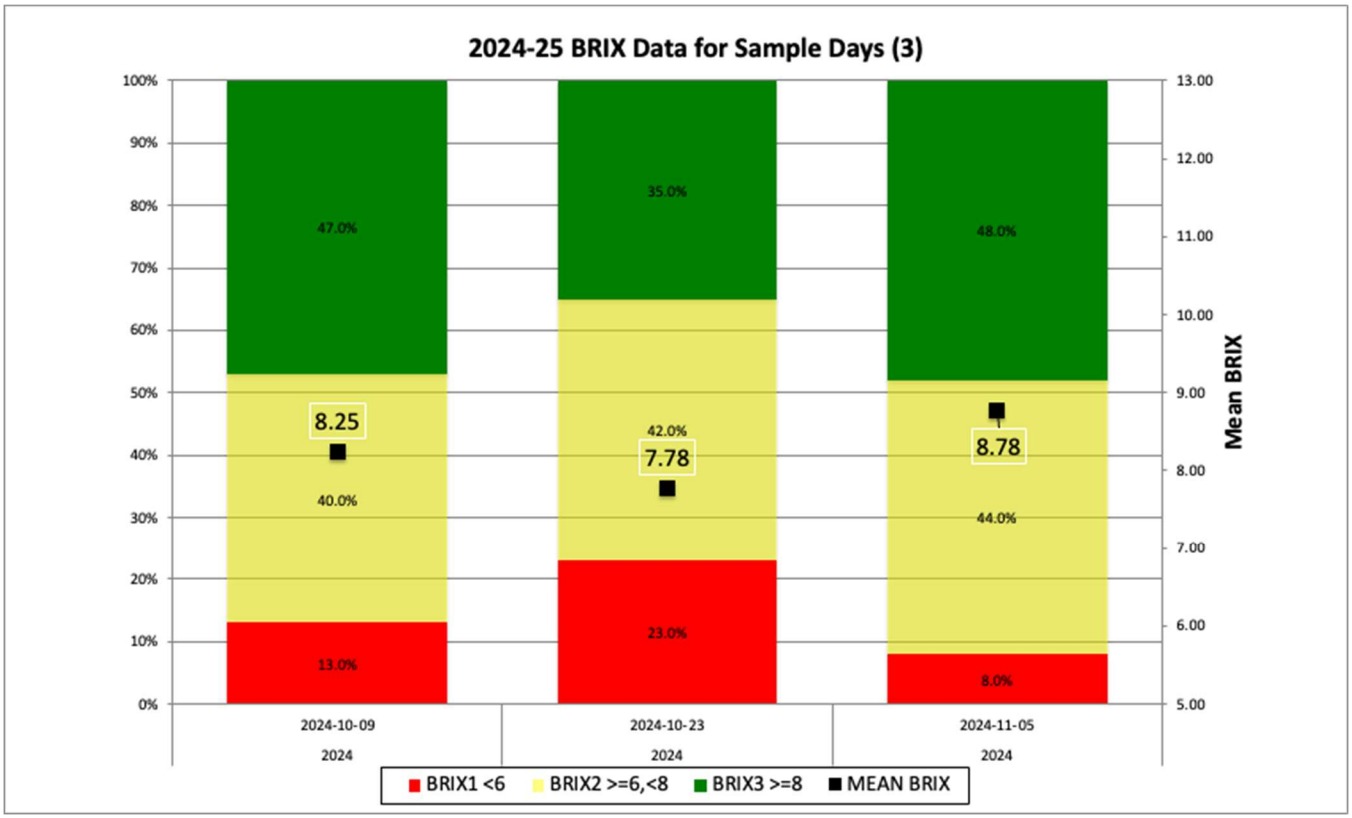
Start of season lobster quality predictions are based on the analyses described in Section 5.1 above and presented by location in this section. Appendix C - Preseason Sampling Summaries presents the summary (recommendations text) for each of the 8 location-areas as previously provided in the 'Lobster Quality 2022 Preseason Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Preseason Summary Report' (Mattock, Mulock, and Lane 2024b). The following pages present the breakdown of the 2024-25 preseason by location and include the additional results from the in-season sampling surveys. The preseason results were provided to industry collaborators on November 24, 2024 prior to the start of the 2024-2025 commercial season.

5.2.1 YARMOUTH INSIDE

2024 SUMMARY OF RESULTS

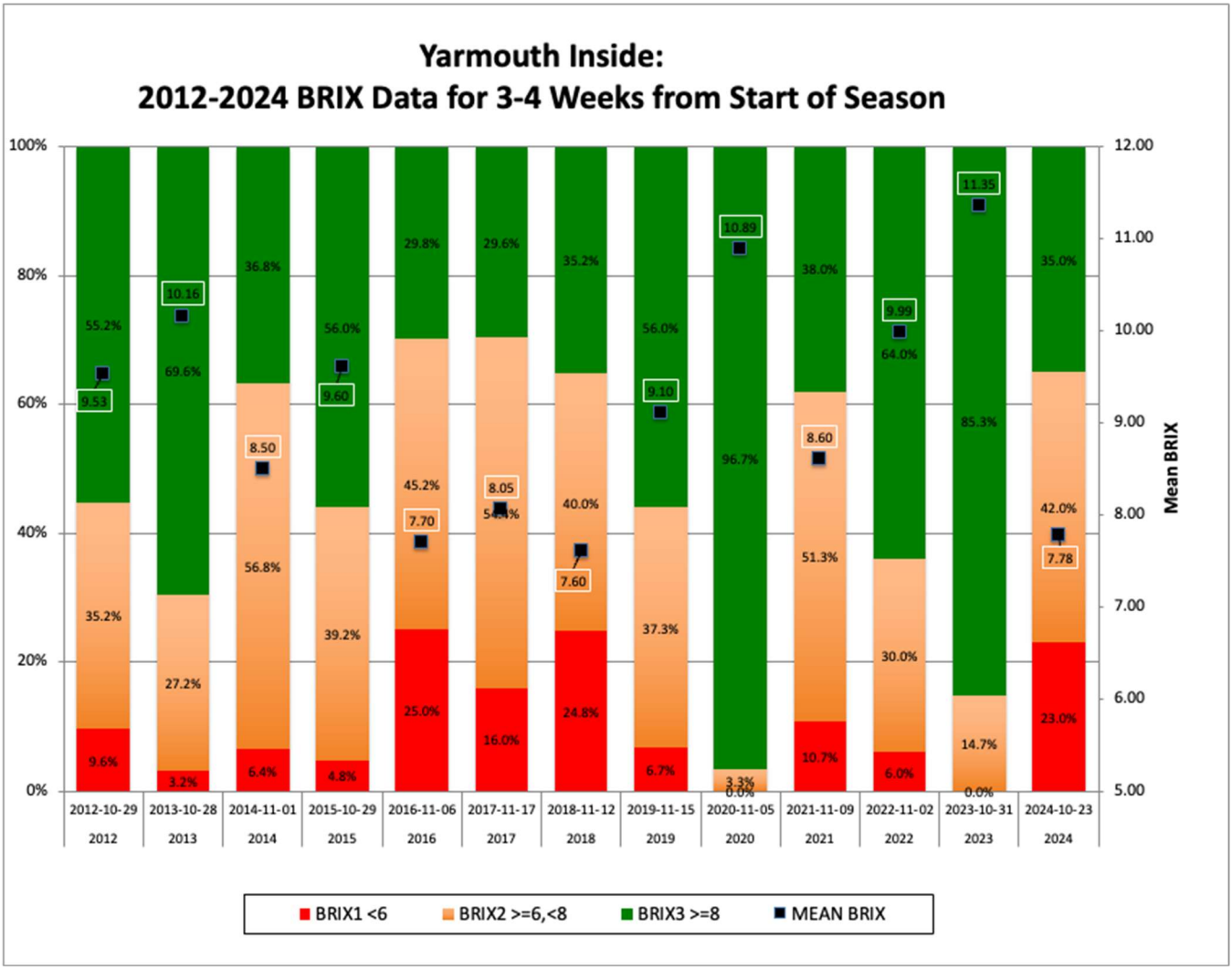
(A) BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

In the figure below, 2024 preseason survey results for 3 sample sites in Yarmouth Inside show relatively stable average BRIX from early-October to early-November samples. 35% to 48% of each sample attained “Good” levels of BRIX (≥8 mg/mL). The proportion of “Poor” lobsters (BRIX<6 mg/mL) sampled in Yarmouth Inside ranged between 8% and 23% of samples in 2024 (there were no in-season sample for this subarea). Average BRIX level values for samples in 2024 hovered around the “Good” threshold of 8 and were in the tight range of the low of 7.78 mg/ml (in the end of October sample) and the high of 8.78 mg/ml in the early November sample. Overall average BRIX for the 2024 Yarmouth Inside samples of 8.1 were well below the 2023 preseason average BRIX of 10.6 mg/ml, a decline of almost -25%.



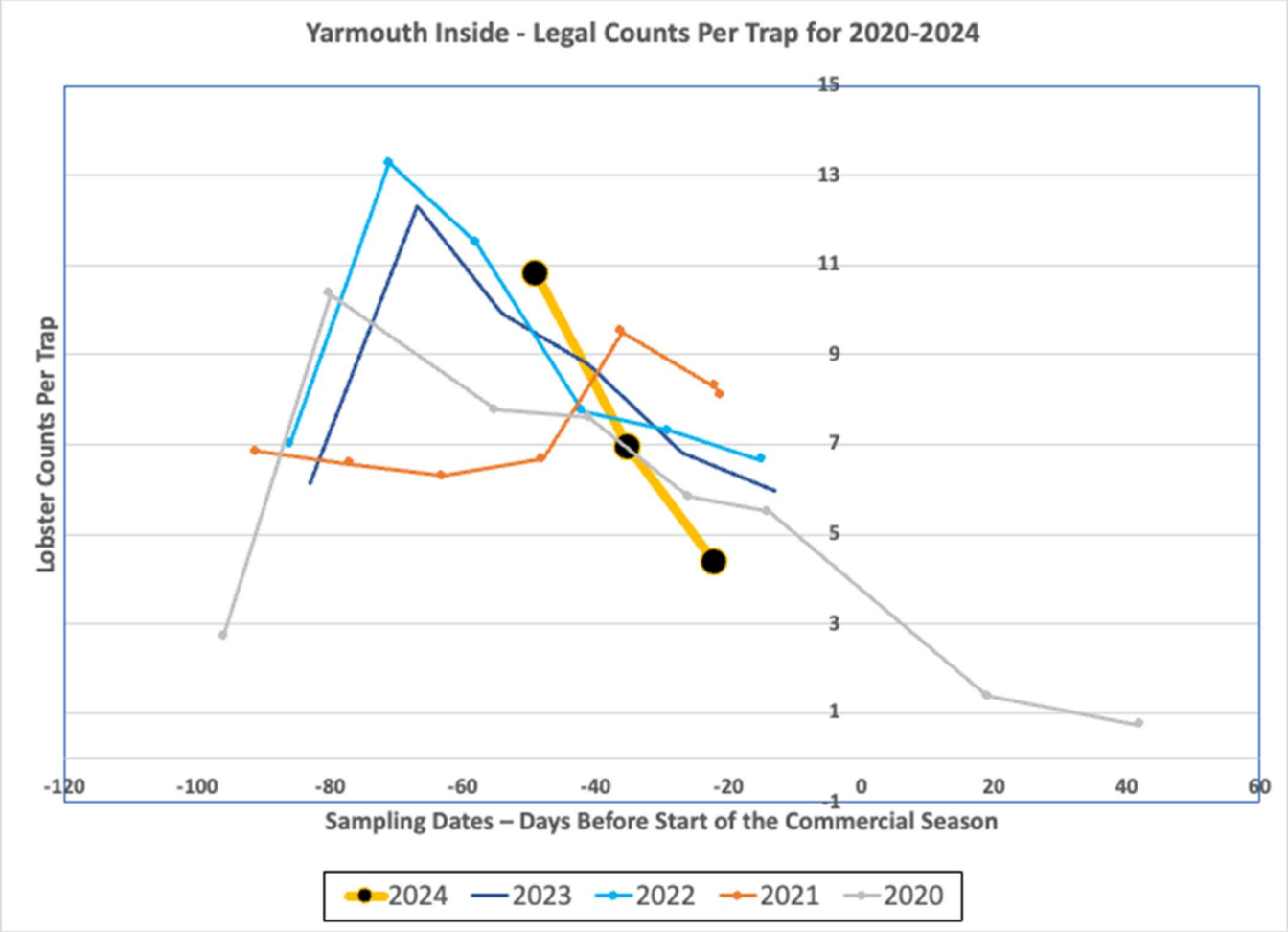
(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are variable across the series from 2012 to 2024 for Yarmouth Inside. The 2024 sample (October 31) has the highest BRIX average (11.35 mg/mL) in the series. The October 23, 2024 sample is comparable to the mid-November samples of 2016-2018, years designated as low-BRIX years. 2024 BRIX levels imply that Yarmouth Inside remains in the lower BRIX regime in LFAs33&34 that have been observed since 2014.



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) lobsters that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023). The counts for Yarmouth Inside are comparable to past years' counts over the reduced 3-sample period between October and November 2024. The counts per trap of the first sample of 2024 are the highest of all previous samples around early to mid-October. However, subsequent 2024 samples are below those of past years at similar dates. In particular, the last sample if 2024 in Yarmouth Inside on November 5, 2024 is well below all other years' sampling around this date. As the last sample of the preseason period, this survey is a key indicator of lobster status at the start of the commercial fishery at end November. As evidenced by the 2020 in-season sampling in the figure below, commercial catch rates are expected to fall precipitously after the beginning of the commercial season as legal sized lobster abundance is extracted. Moreover, lower catch rates and lower catches (relative to past years) are anticipated for 2024-25.



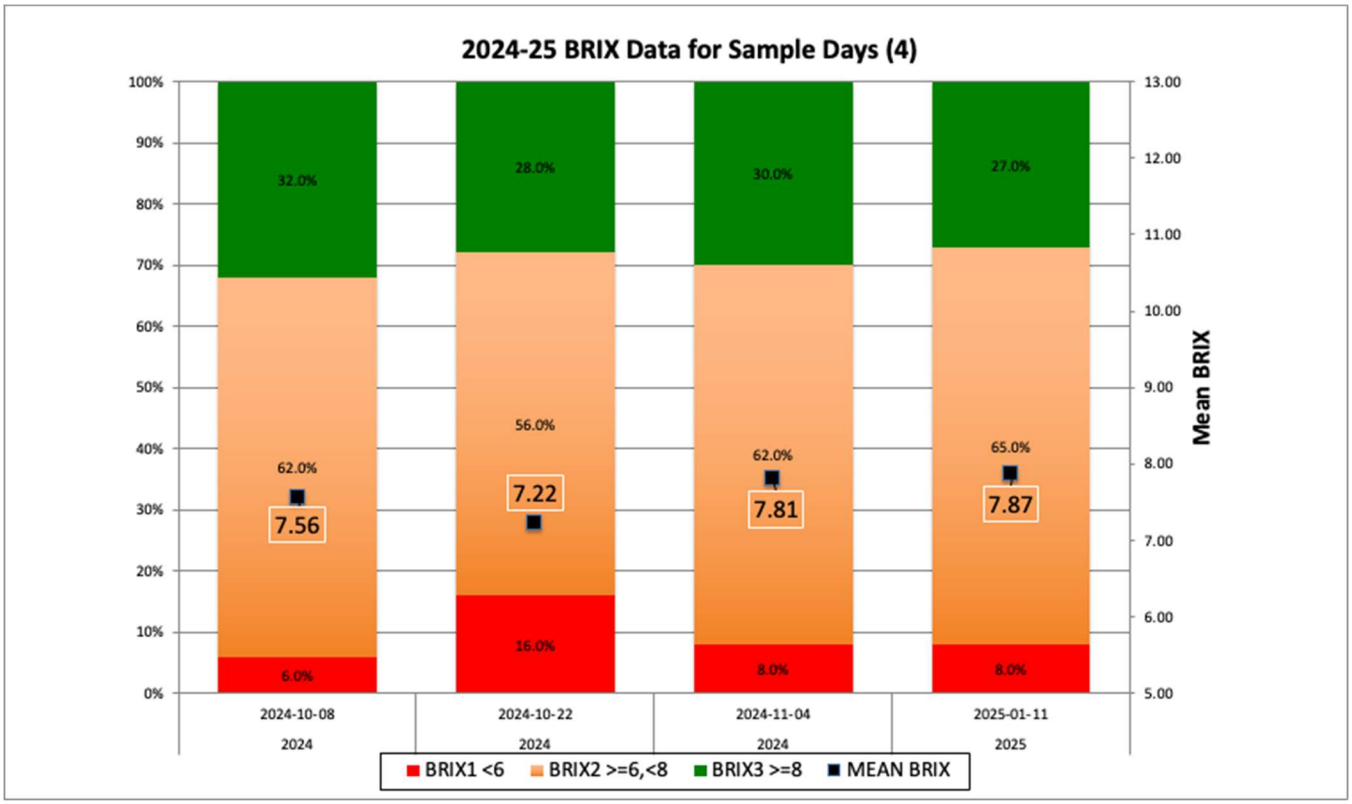
Counts of weak lobsters in the 2024 Yarmouth Inside samples declined from the highest level (across all areas in 2024) of 21% in the early-October sample to zero weaks in the early-November sample. Overall weaks of 8.33% (Table 6) were above last year's weaks averaging 7% (2023) per sample versus 11% in 2022.

The average percentage of Soft lobsters per sample in 2024-25 reached a maximum for the time series of 29% with only 22% Hard lobster. This is 15 times that of 2023 "Soft" of 1.9% for Yarmouth Inside.

5.2.2 YARMOUTH OUTSIDE

2024 SUMMARY OF RESULTS

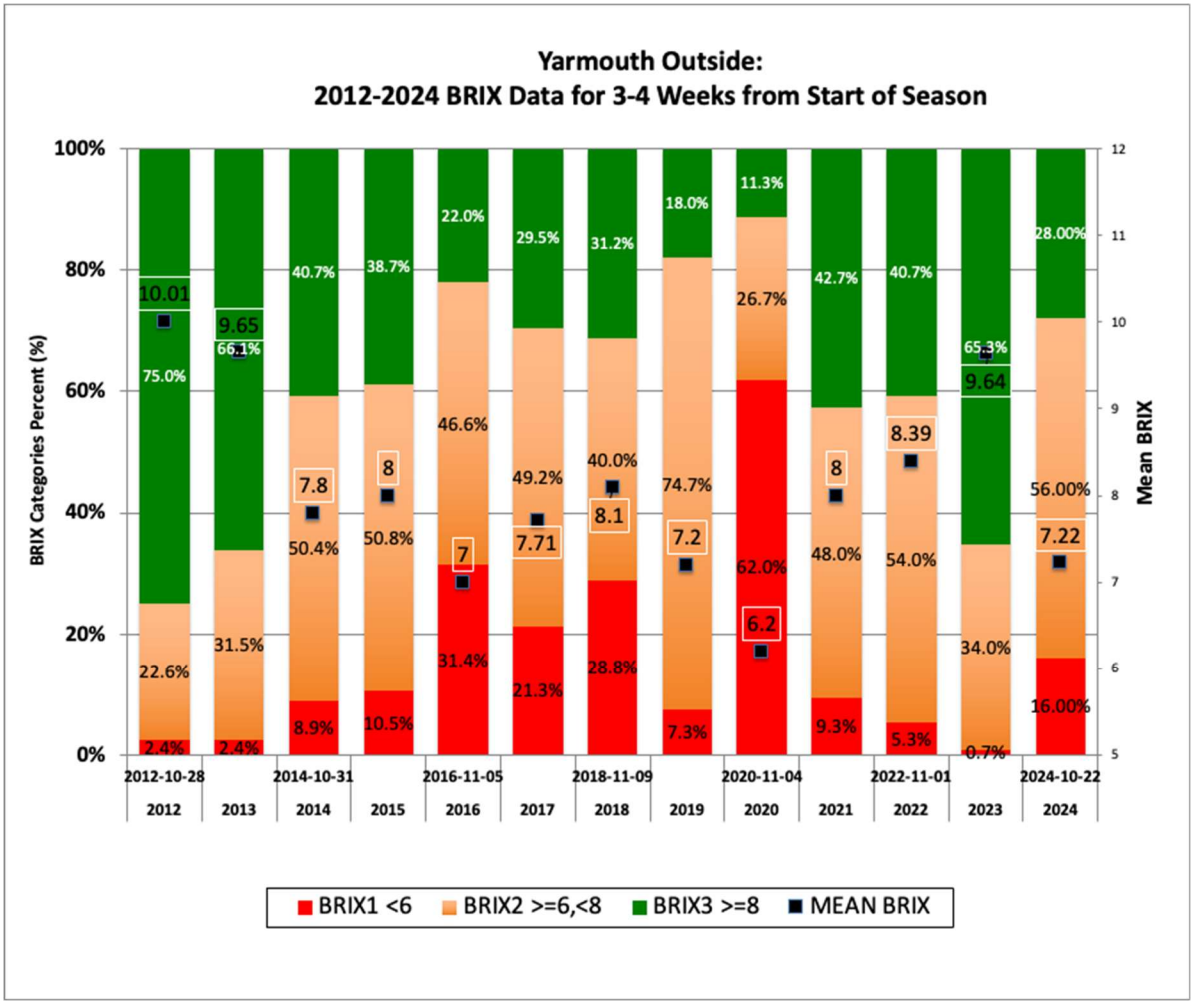
(A) Blood Protein (BRIX) Categories–2024 Samples



The 3 preseason samples plus 1 in-season sample of 2024 for Yarmouth Outside show a relatively constant average BRIX between values of 7.22 mg/ml (October 22 sample) and 7.87 mg/ml in the in-season sample of January 11, 2025. These values contrast with the range of average BRIX in the 6 2023 samples of 9.38 (min) to 11.66 mg/mL (max) a year-over-year decline in overall average BRIX of -23% for Yarmouth Outside. Throughout sampling in 2024, the distribution of "Good" (27-32%), "Medium" (56-65%), and "Poor" (6-16%) category lobsters (BRIX≥8) was relatively unchanged.

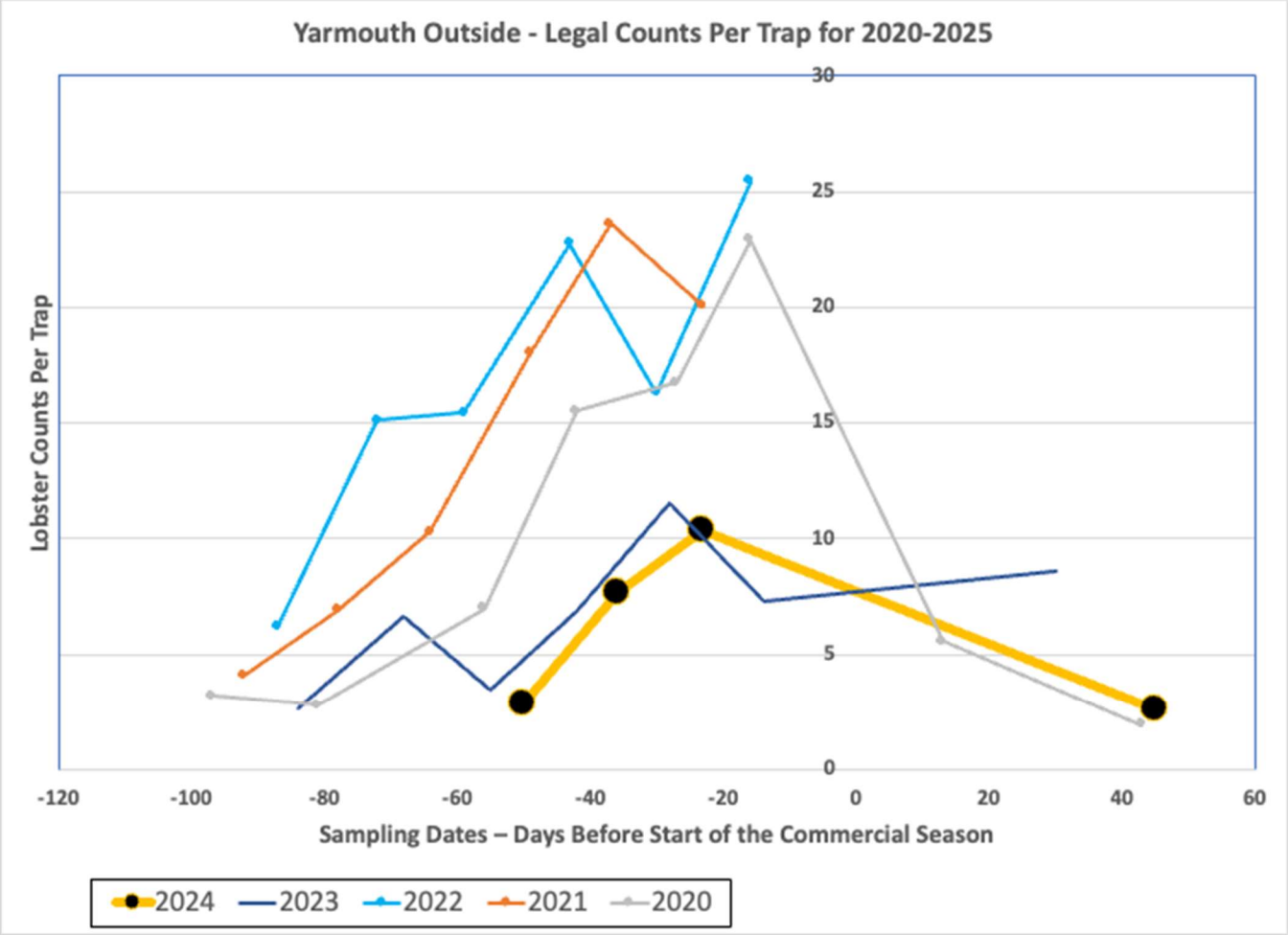
(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are variable across the series from 2012 to 2024 for Yarmouth Outside. The average BRIX for the 2024 sample of October 22 (7.22 mg/ml) is the fourth smallest in the series and its BRIX categories are directly comparable to 2017.



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the Yarmouth Outside survey samples dates in 2024 are compared to past years' samples (2020-2023). The 2024 counts for Yarmouth Outside (thick yellow line with black sample date points) are all on the lower side relative to past years' counts 2020-2023 for comparable sample date timing and are best compared with the sampling catches per trap in 2023 that were deemed to be below over averages for catches per trap in this subarea. As for the Yarmouth Inside counts per trap, the time series of counts per trap over the preseason in Yarmouth Outside exhibit a rise from the early-October sample until the early-November sample after which counts per trap begin the characteristic decline at the end of the preseason sampling period (mid-November) into the in-season period. As evidenced again by the 2020 in-season sampling in the figure below and the single 2025 in-season sample, commercial catch rates fall off after the beginning of the commercial season as legal sized lobster abundance is extracted from this subarea.



Counts of weak lobsters in the 2024 Yarmouth Outside samples were well below past values averaging only 3.67% per sample (Table 6) versus 9.54% per sample in 2023 and 16-18% (in 2022 and 2021, respectively).

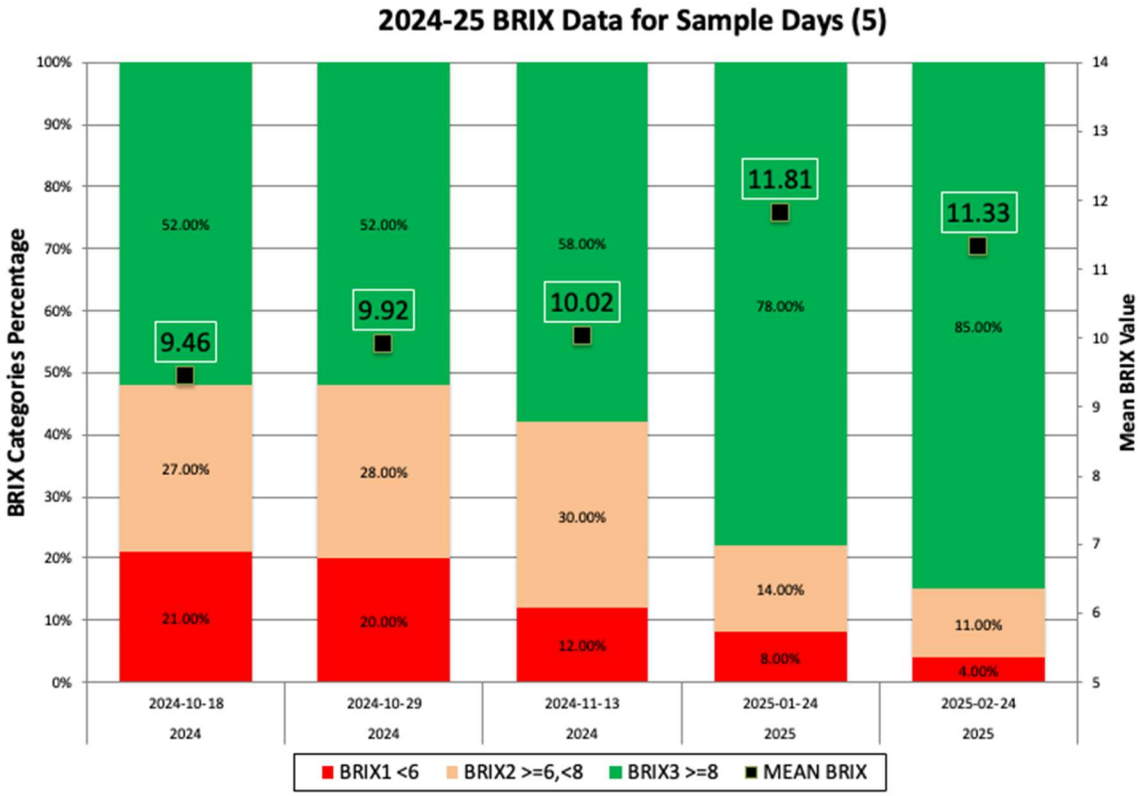
In 2024, Yarmouth Outside average percentage of Soft lobsters per sample rose to an overall high in the time series of 28.67%. This is compared to the 3.54% of 2023-24. The 2024 increase in Soft lobster per sample represents more than a 8-fold increase compared to the past year in this quality indicator and is similar to the trend observed in Yarmouth Inside.

5.2.3 LOBSTER BAY INSIDE

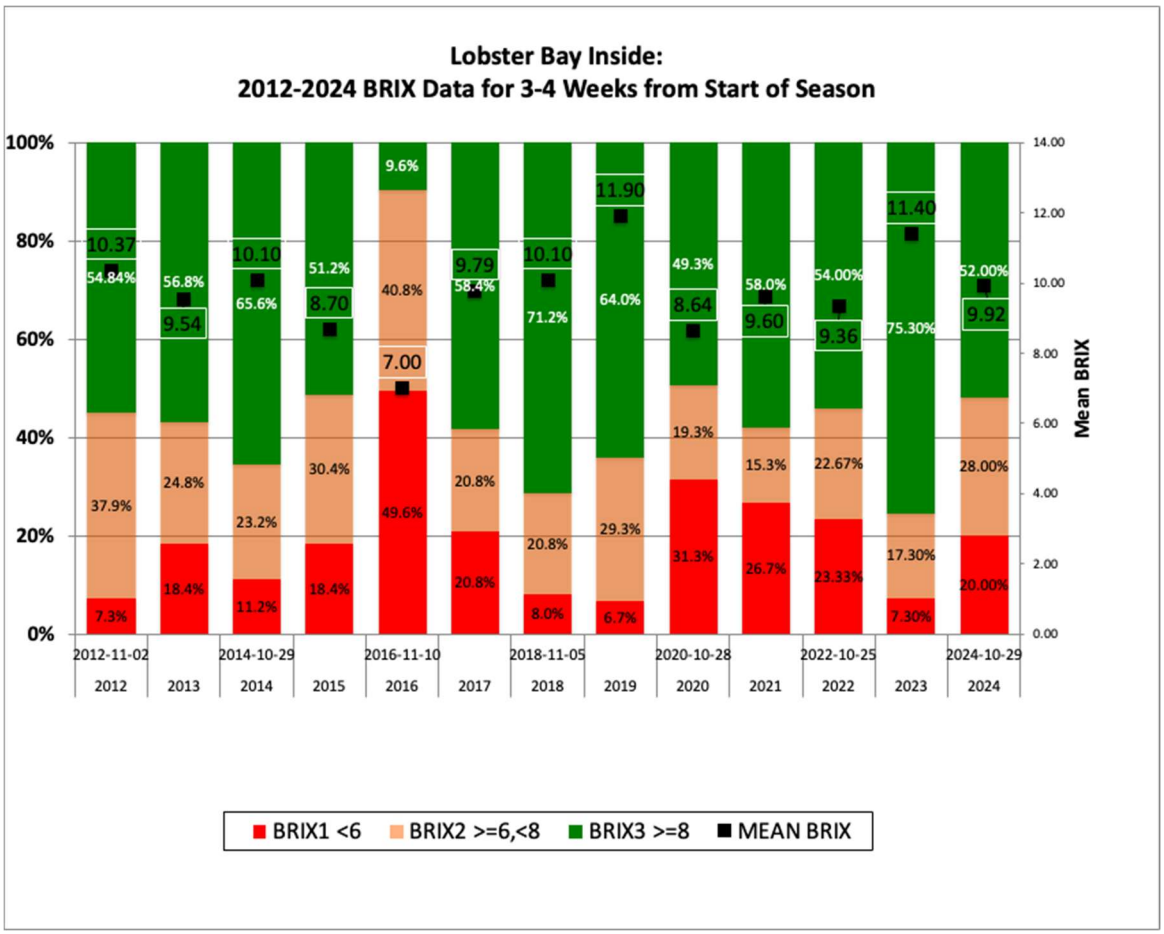
2024 SUMMARY OF RESULTS

(A)BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

In the figure below, 2024 preseason survey results for 3 preseason sample sites and 2 in-season (2025) sample dates in Lobster Bay Inside show a steady rise in average BRIX from 9.46 mg/mL in the early-October sample to over 11 mg/mL in the January and February 2025 in-season samples. Over 50% of preseason samples attained “Good” levels of BRIX (≥8 mg/mL) rising to over 80% in the in-season samples. Simultaneously, “Medium” and “Poor” levels of BRIX fell over the sample period from approximately 30% (Medium) and 20% (Poor) in mid-October to less than 15% and 10%, respectively by end-February.



Average BRIX level values for the preseason and in-season samples in 2024 of 10.52 mg/ml were similar to past years’ average BRIX values for 2023 (10.3) 2022 (10), 2021 (8.9) and 2020 (9.6).

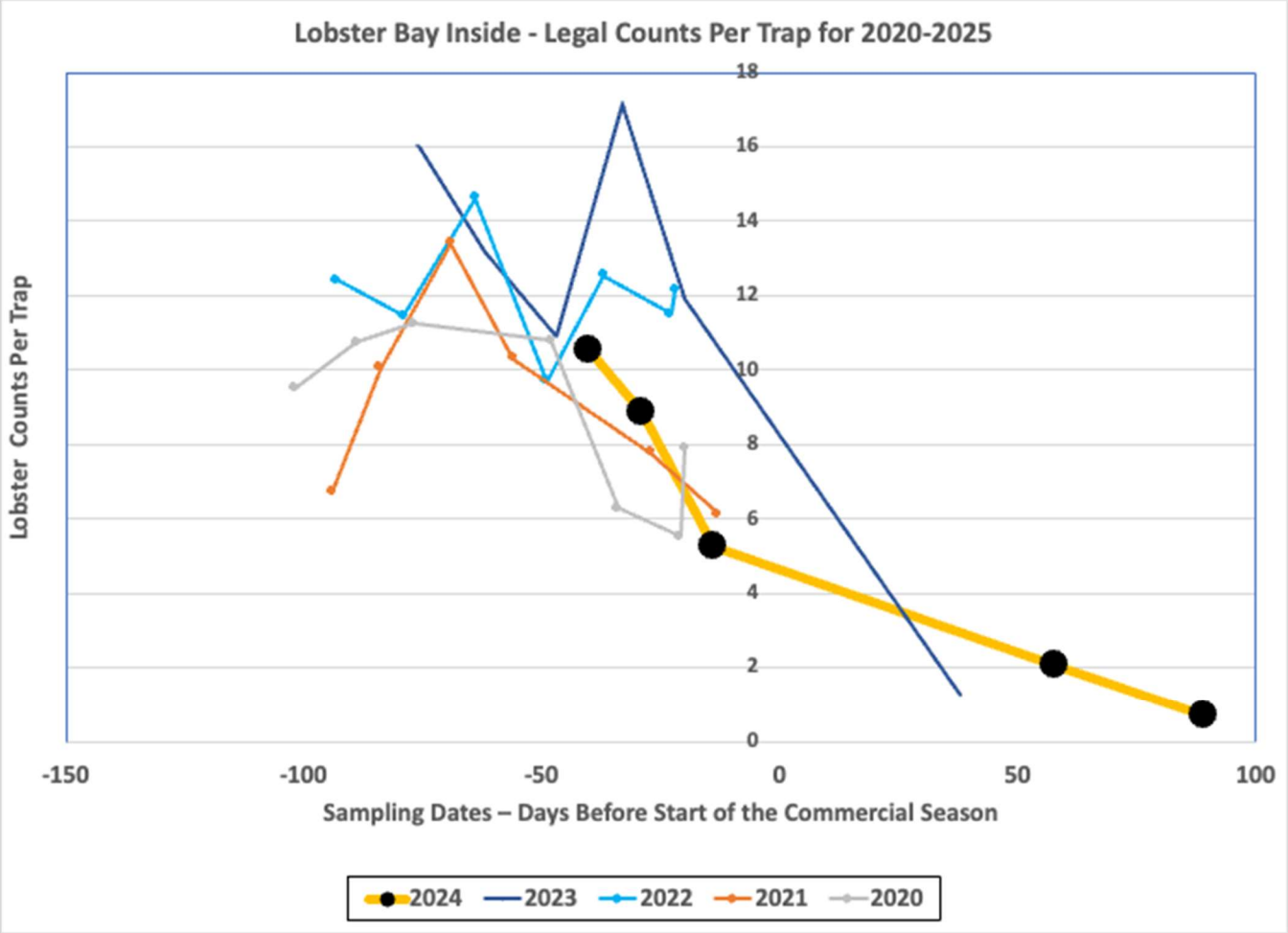


(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure above, annual samples 3-4 weeks from the start of each commercial harvest season opening are somewhat variable across the series from 2012 to 2024 for Lobster Bay Inside. The 2024 sample (October 29) has an average BRIX average (9.92 mg/mL) in the series behind the 2023 average BRIX of 11.4 mg/mL and the 2019 maximum average BRIX in the series of 11.9 mg/ml. The October 29, 2024 sample is directly comparable to the 2017 sample and with similar average BRIX value (9.79 mg/mL).

(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023). The counts for Lobster Bay Inside sampling are generally highest among the 4 Inside locations surveyed in LFAs33 and 34. In 2024, Lobster Bay Inside counts are below those of the past 2 years (2023 and 2022) counts pre trap at similar sampling dates but above those of the earlier years 2021 and 2020. For Lobster Bay Inside, the time series of counts per trap over the 2024 preseason remain relatively stable from October through November with average counts varying between 11 and 5 lobsters per trap. The evidence from the figure below is that commercial catch rates fall precipitously in Lobster Bay Inside after the beginning of the commercial season as legal sized lobster abundance is extracted, e.g., the January and February in-season samples fall to 2 lobsters per trap or less.



Counts of weak lobsters in the 2024 Lobster Bay Inside samples were well below past years (2022-2023) values averaging only 3% versus 16.5% per sample (2023) and 21% (2022).

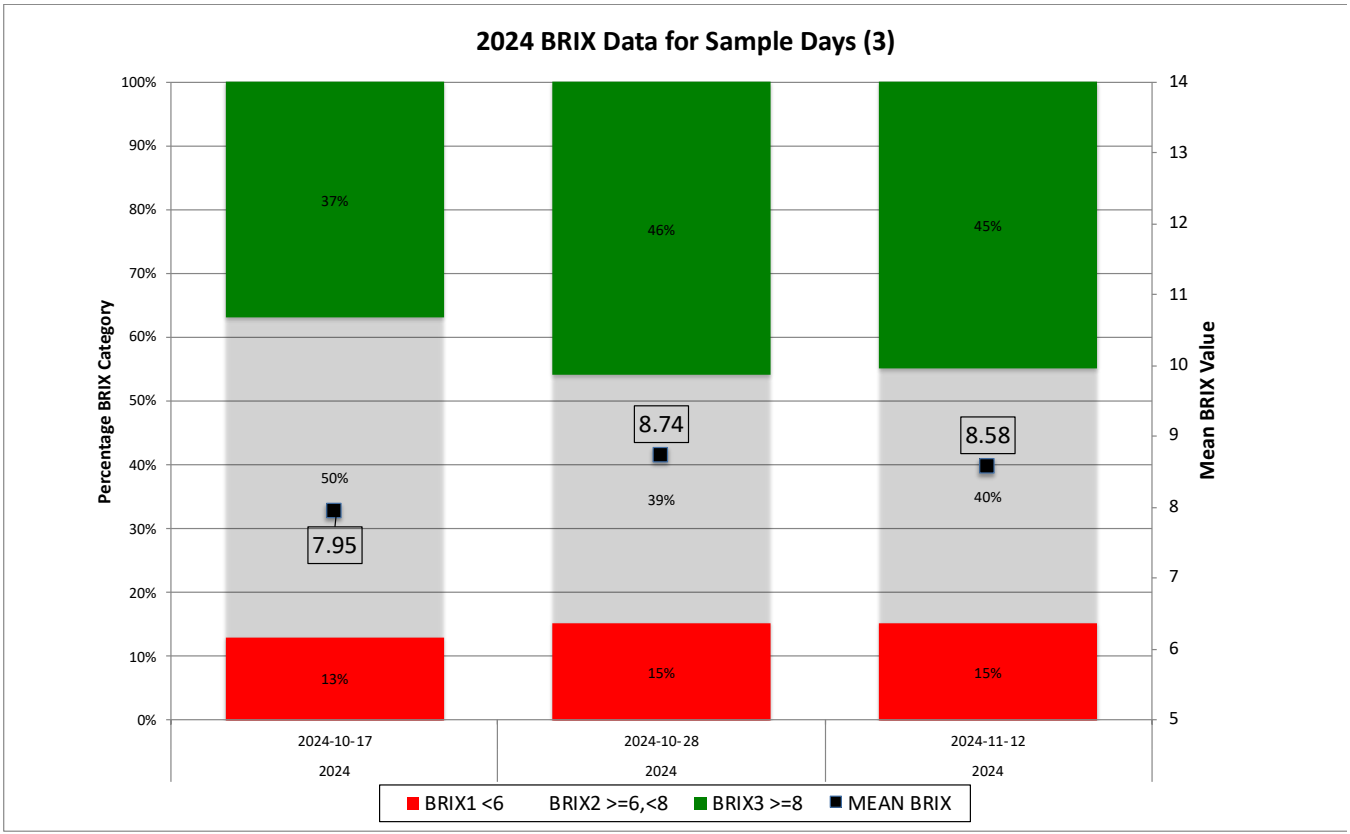
The average percentage of Soft lobsters per sample in Lobster Bay Inside reached a maximum in 2024 with preseason samples reporting a record 36.67% Soft lobsters. This compares to Soft percentage per sample of 4.4% in 2023. The year-over-year increase in 2024 versus 2023 Soft lobster is a factor of 8 times for Lobster Bay Inside.

5.2.4 LOBSTER BAY OUTSIDE

2024 SUMMARY OF RESULTS

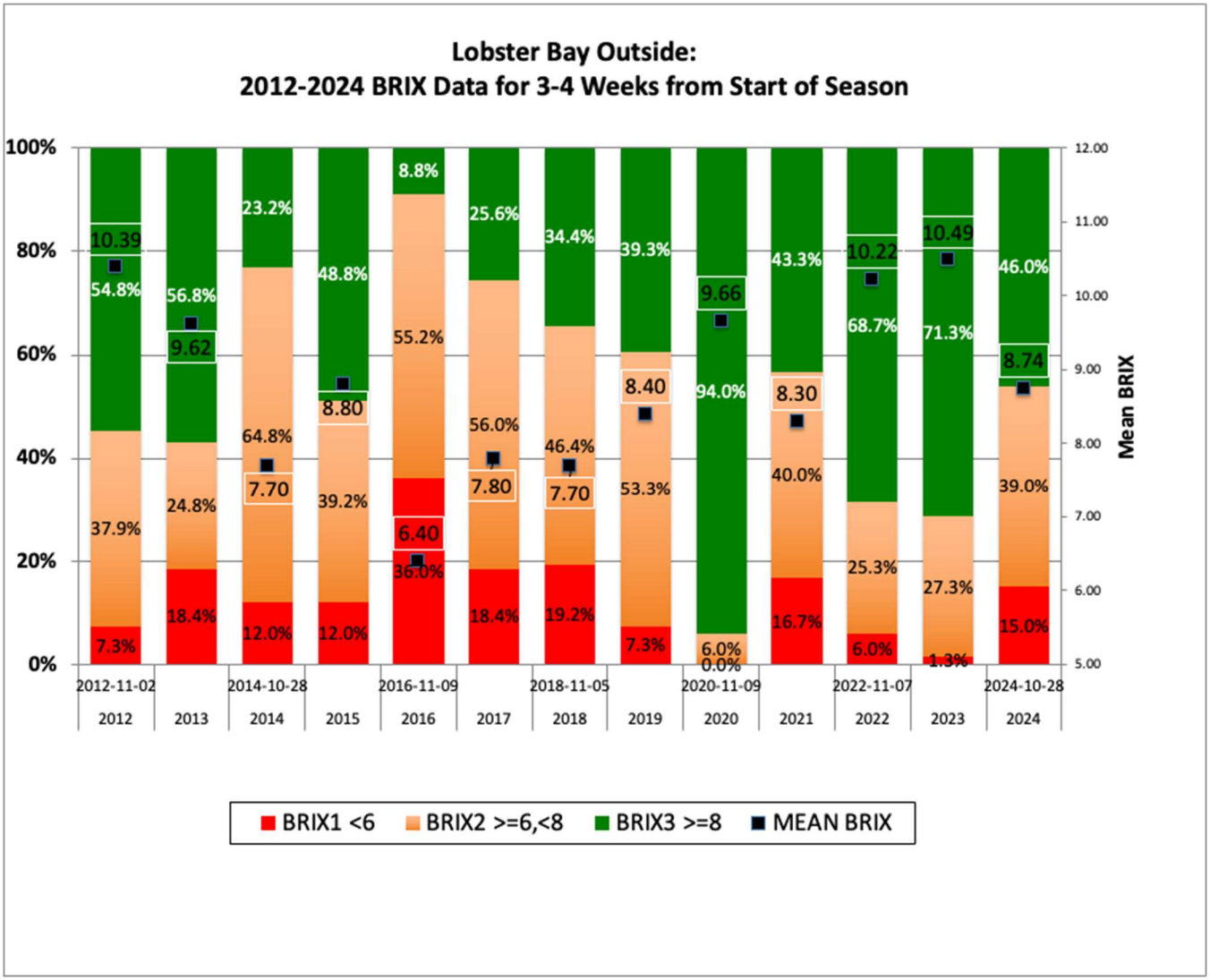
(A)BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

In the figure below, 2024 preseason survey results for 3 sample sites in Lobster Bay Outside show a relatively constant average BRIX varying from 7.95 mg/ml in the mid-October sample to the maximum of 8.74 mg/ml at end-October, and 8.58 mg/ml in the last preseason mid-November. These values contrast with average BRIX per preseason sample of sample at 9.97 mg/mL in 2023. This represents a decrease in average preseason BRIX of -1.55 mg/ml or -15% year-over-year. Approximately 45% of samples attained “Good” levels of BRIX (≥8 mg/mL) and only 15% of samples had incidences of “Poor” lobsters.



(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

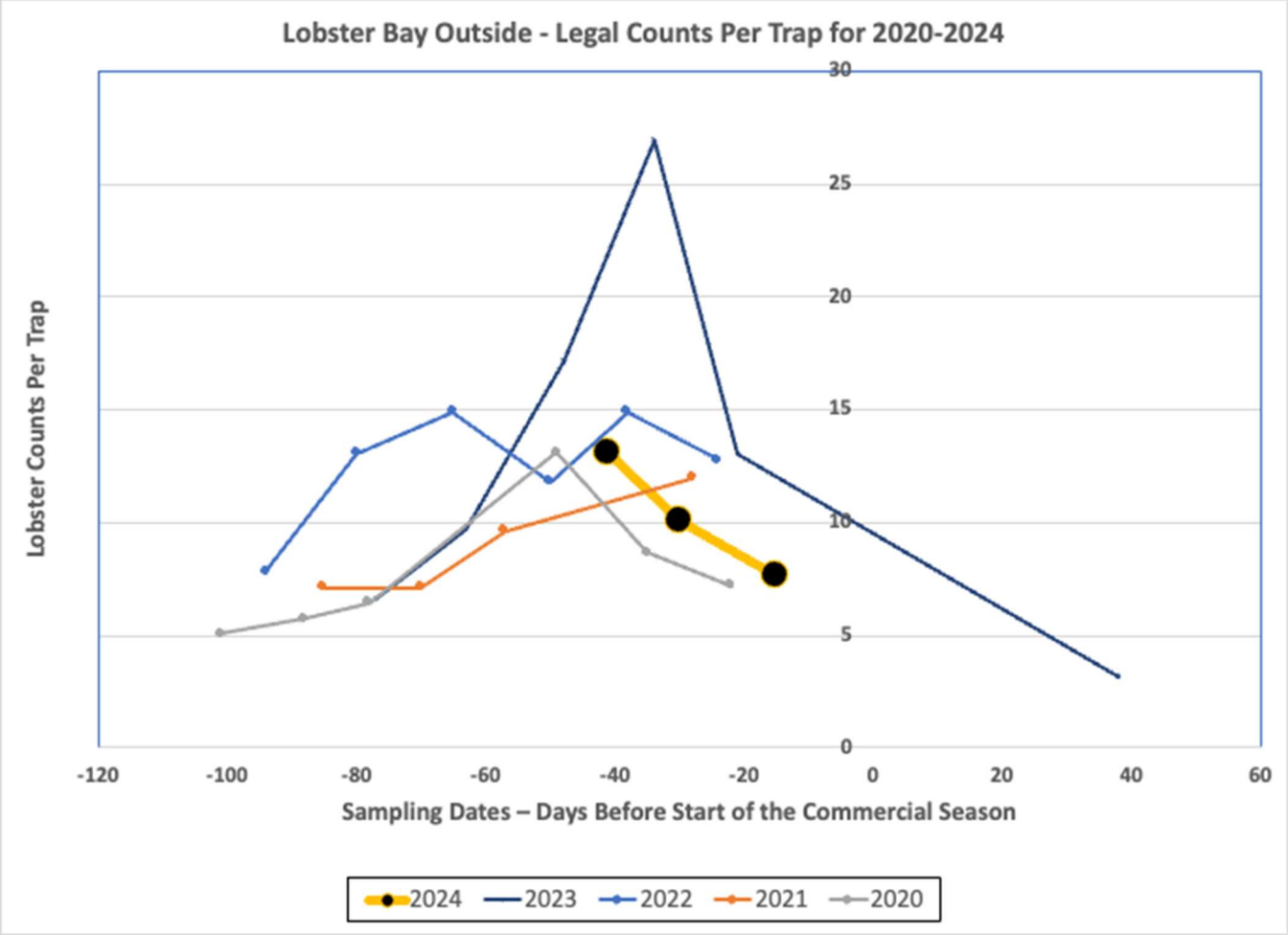
From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are variable across the series from 2012 to 2024 for Lobster Bay Outside. The 2024 sample (October 28) has a mid-range BRIX average of 8.74 mg/ml in the series. The October 28, 2024 sample is comparable to the 2015 sample with similar average BRIX value and like BRIX category levels. The 2015-16 commercial season experienced low quality lobsters in catches combined with high catch rates.



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023). The counts per trap for Lobster Bay Outside sampling are generally highest among the 4 Outside area sampling locations in LFAs33 and 34. In 2024, Lobster Bay Outside counts in 2024 (10.25 lobster per trap) are comparable to past years' counts at similar sampling dates with the exception of the spike in counts for the October 2024 sample (27 lobsters per trap).

The evidence from the figure below is that Lobster Bay Outside counts per trap fall prior to the start of the commercial fishery and then fall precipitously in Lobster Bay Outside after the beginning of the commercial season as legal sized lobster abundance is extracted – as evidenced by the single in-season sample of January 4, 2024 (<5 lobster per trap) in Lobster Bay Outside. It is anticipated that the in-season counts per trap for Lobster Bay Outside will be among the lower catch rates based on past data and that commercial catches will decline in this subarea relative to past years.



Counts of weak lobsters in the 2024 Lobster Bay Outside samples are almost 10%. This is a decline from weaks in 2023 (13%) and the similar values for 2022 and 2021 values (13% and 18% respectively). Like 2024, the percent of weak lobsters in Lobster Bay Outside in 2020 was also 10%.

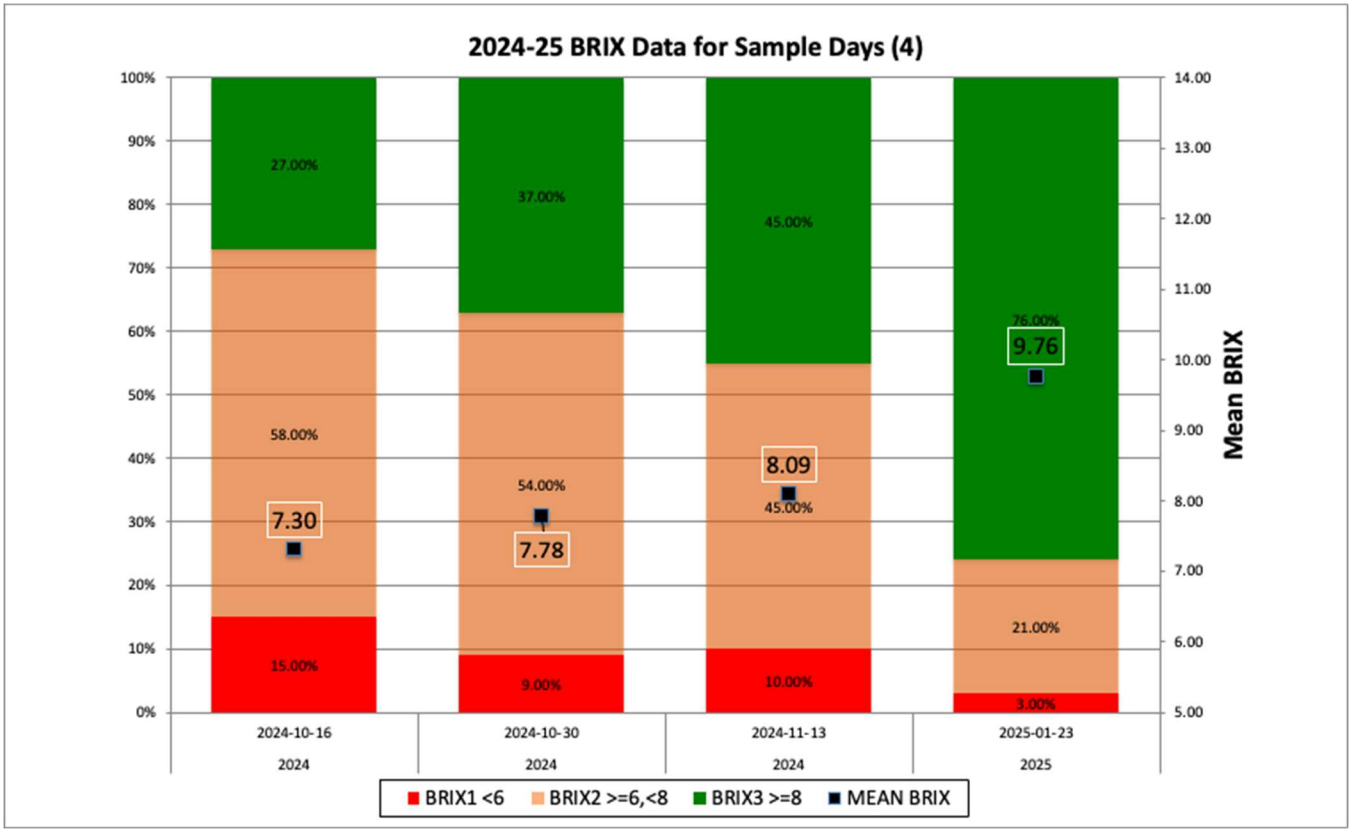
The average percentage of Soft lobsters per sample in Lobster Bay Outside increased significantly in the 2024 samples to reach a series maximum of 40% (Table 6). Once again, the previous year's value of 2.7% in 2023 represents a significant change of a factor of almost 15 times the 2023 percentage.

5.2.5 PORT LA TOUR INSIDE

2024 SUMMARY OF RESULTS

(A)BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

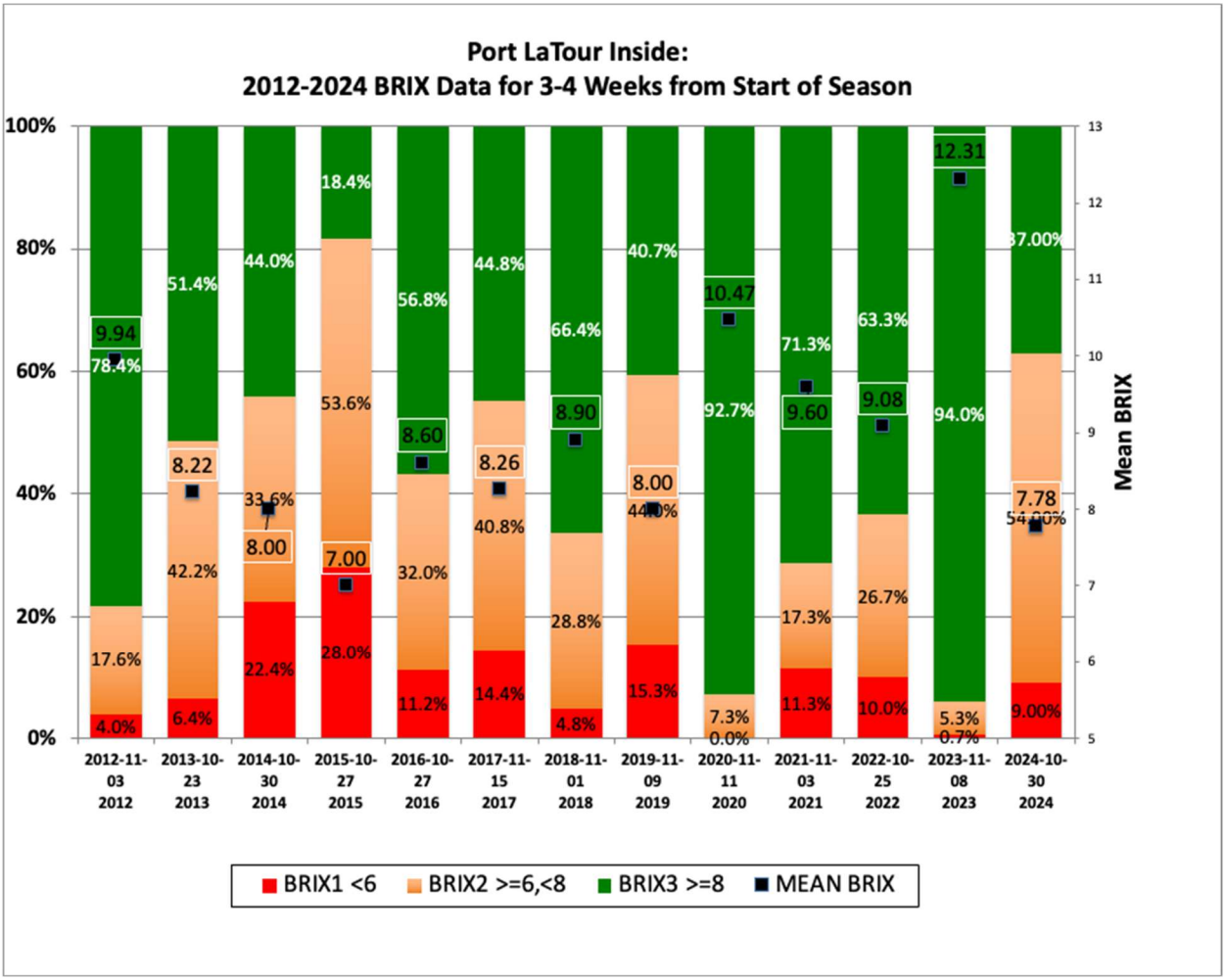
In the figure below, 2024-25 survey results for 3 preseason and 1 in-season sample sites in Port La Tour Inside show a steady rise in average BRIX from the mid-October sample (7.3 mg/ml) to the high of end-January 2025 samples (9.76 mg/mL). As the same time as the rise in average BRIX, the proportions of "Good" levels of BRIX (≥8 mg/mL) increase from less than 30% at the start of sampling in October to almost 80% by the January 2025 sample. Similarly, the proportion of "Medium" and "Poor" lobsters fall from almost 60% and 15% to almost 20% and 5% from the start of sampling until the end of sampling.



Average BRIX level values for Port La Tour Inside during the 3 preseason samples in 2024 (7.72 mg/mL, Table 6) were the lowest subarea averages. The in-season sample of January 23, 2025 continues the series with higher relative average BRIX value.

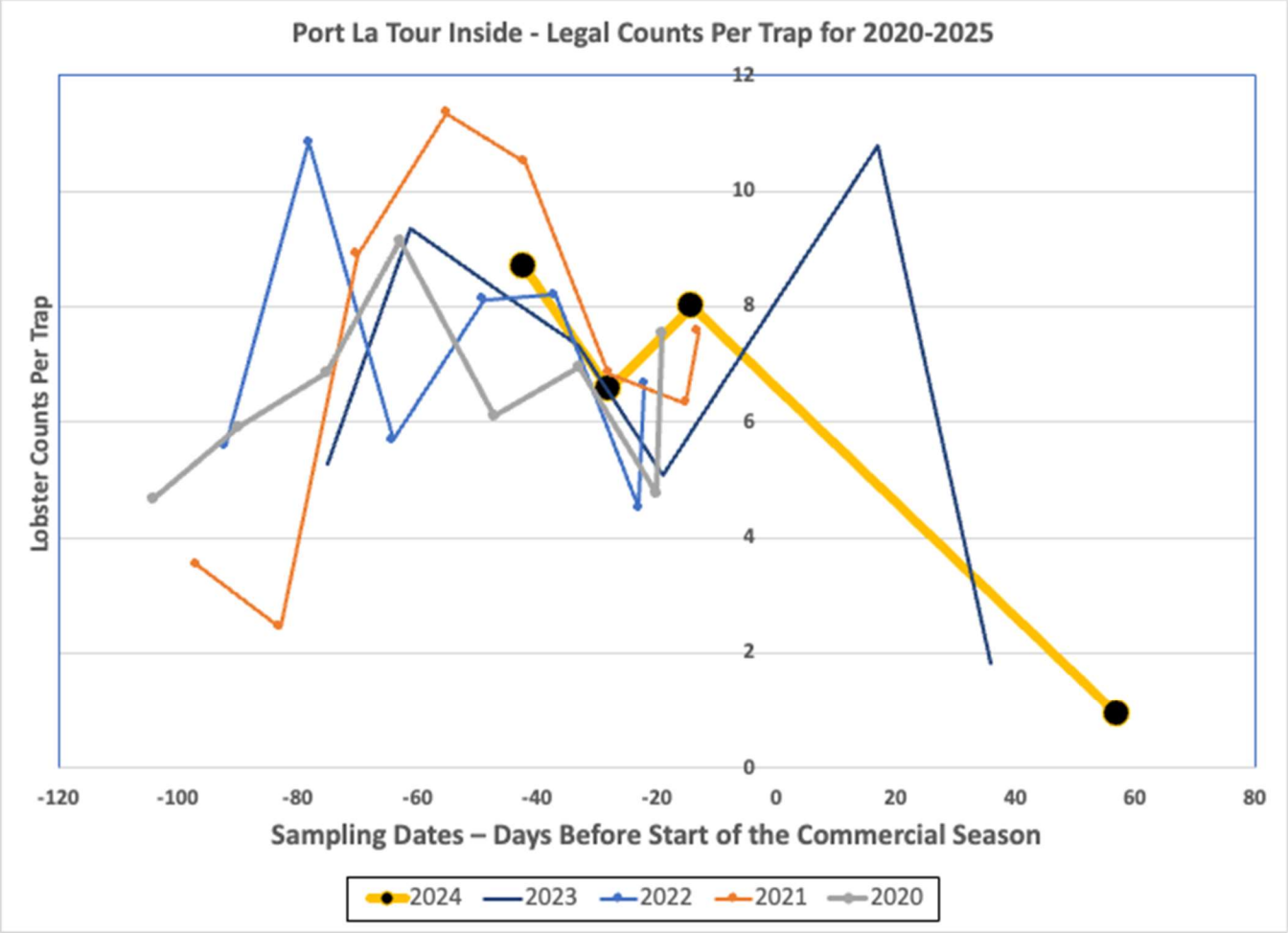
(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are variable across the series from 2012 to 2024 for Port La Tour Inside. The 2024 sample (October 30) has the 2nd lowest BRIX average (7.78 mg/ml on 2015 minimum of 7) in the series 2012-2024. The October 30, 2024 sample is directly comparable to the November 9, 2019 sample in terms of average BRIX (7.78 versus 8) and the Good, Medium and Poor category distribution.



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023) for Port La Tour Inside. The 2024 Port La Tour Inside counts per trap are directly comparable to past years' counts at similar sampling dates. The time series of counts per trap over the preseason in Port La Tour Inside, for all years, exhibit a fall in rates from mid- to end-October, followed by a rise to mid-November before the start of the commercial season, and then finally a precipitous fall (to legal counts of less than 2 lobster per trap) into the commercial season as lobster abundance is extracted.



Counts of weak lobsters in the 2024 Port La Tour Inside preseason samples (1%) were low in comparison with past years. In 2023, weaks were 6.27% on 5 samples, and in 2022, weaks were 13.52% on 6 samples for Port La Tour Inside.

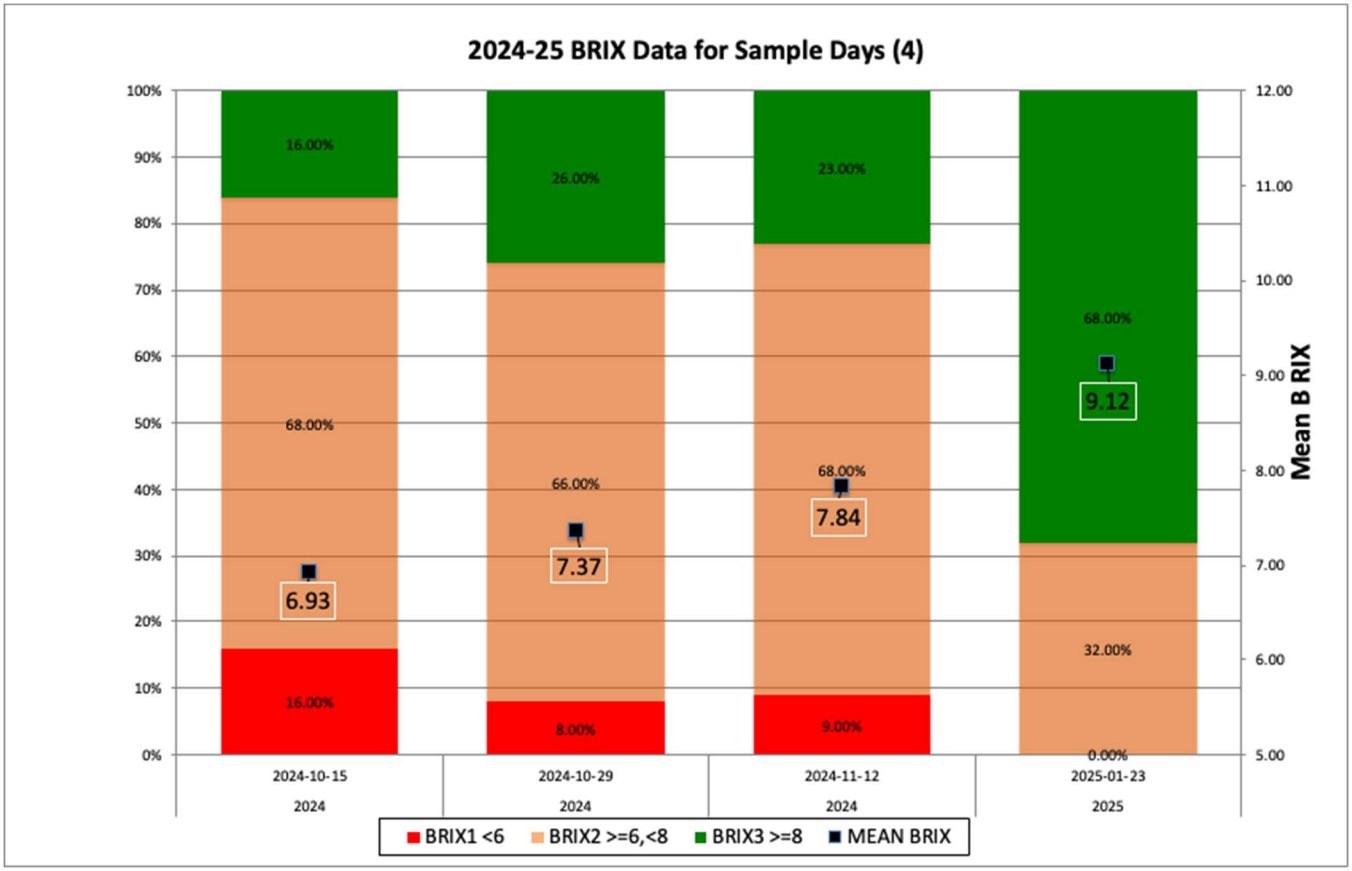
The average percentage of Soft lobsters per sample in 2024 were at record highs at 38.33%. This value was nearly 32 times higher than the 2023 Soft percent per sample of 1.2% and represents a significant change in this indicator over the series.

5.2.6 PORT LA TOUR OUTSIDE

2024 SUMMARY OF RESULTS

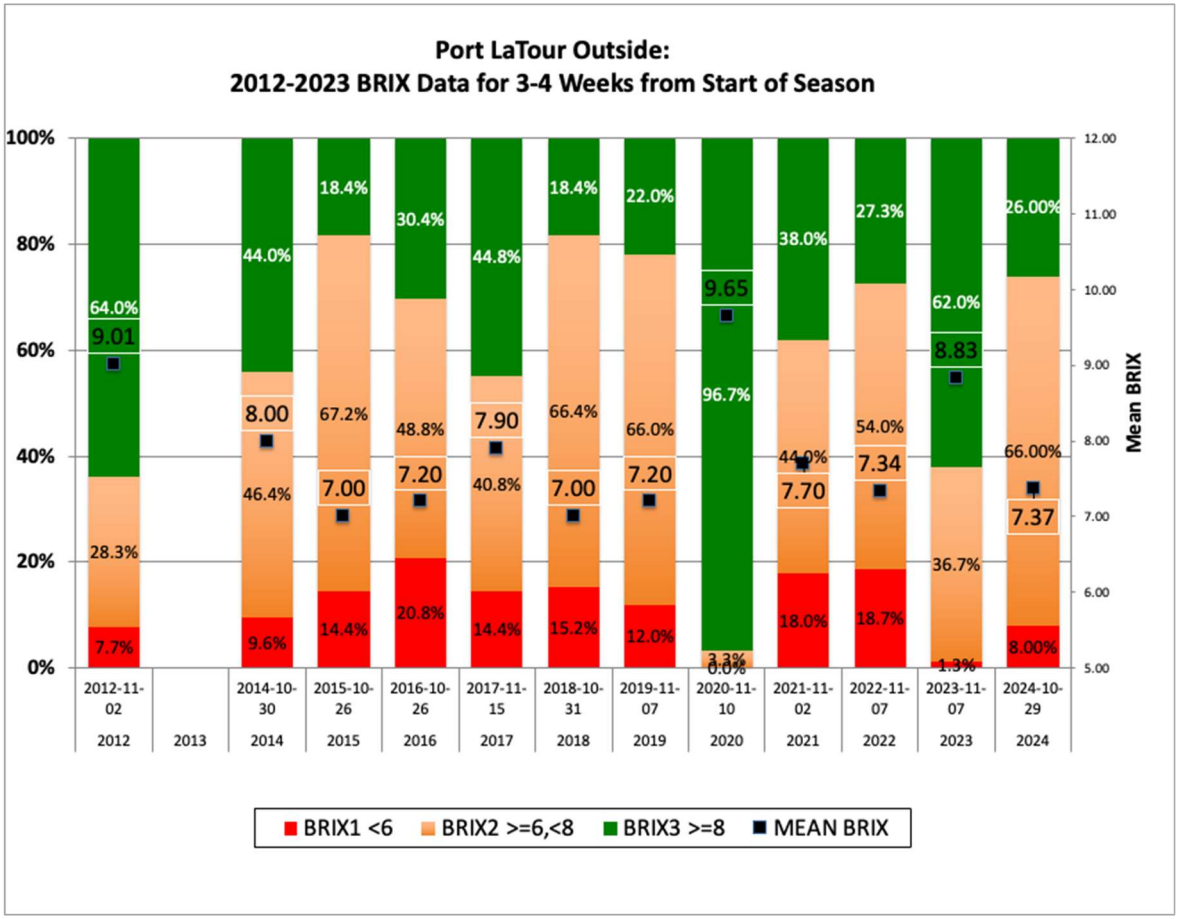
(A)BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

In the figure below, 2024 preseason survey results for 3 sample sites and 1 sample for the in-season period in Port La Tour Outside show a variable average BRIX on a steady rise from the start of sampling in mid-October to the end of sampling at end January 2025. This indicator ranges from a low of 6.93 mg/mL in mid-October to a high of 9.12 mg/mL in the in-season sample of January 23, 2025. Generally, the shift in average BRIX over time is consistent with a rise in the proportion of "Good" (≥8 mg/mL) lobsters (from 16% to 68%) and a fall in the proportions "Medium" and "Poor" lobsters in Port La Tour Outside. "Medium" lobsters proportions fall from a high of 68% to a low 32% by the end of sampling, while "Poor" lobster proportions fall from 16% to 0% in the in-season sample. The average BRIX level maximum (9.12 mg/ml) for the in-season sample are elevated relative to the earlier samples, as expected, as lobster move into pre-moult status in Port La Tour Outside.



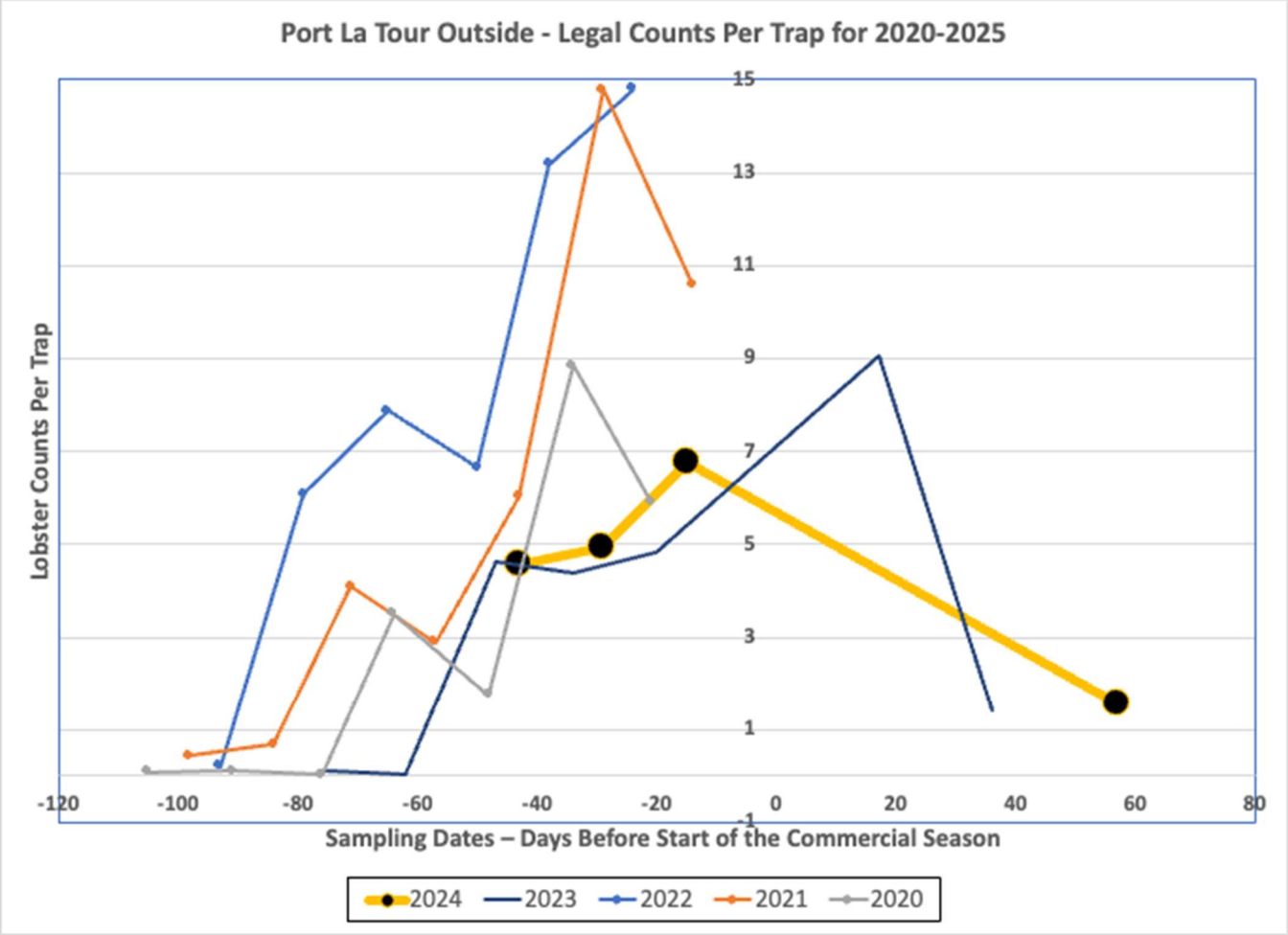
(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are highly variable across the series from 2012 to 2024 for Port La Tour Outside. The 2024 sample (October 29) is among the lower average BRIX values (7.37 mg/mL) in this series. The October 29, 2024 sample is comparable to the November 7, 2019 sample with similar average BRIX value (7.2 mg/mL) and similar BRIX category levels distribution. 2019-20 was generally considered a year of lower BRIX with good catches overall areas.



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023) for Port La Tour Outside. In 2024, Port La Tour Outside counts per trap pattern is similar to that of 2023 and are among the lowest counts per trap in comparison to past years' counts per trap at similar sampling dates. As in 2023, the time series of counts per trap over the preseason in Port La Tour Outside exhibit a rise from mid-October sampling to mid-November sampling. In 2024 (and 2023), counts per trap that are approximately 50% below those of 2020-2022. As evidenced the figure below, and as noted for the 2024 in-season data, commercial catch rates fall precipitously after the beginning of the commercial season as legal sized lobster abundance is extracted. In 2025, the in-season sample in January has less than 2 legal counts per trap.



Counts of weak lobsters in the 2024 Port La Tour Inside samples (3.67%) were well below the 2023 values averaging 15.2% in 2023 per sample and 23.4% in 2022. Percent weaks this subarea in 2021 and 2020 were 10% and 5% respectively.

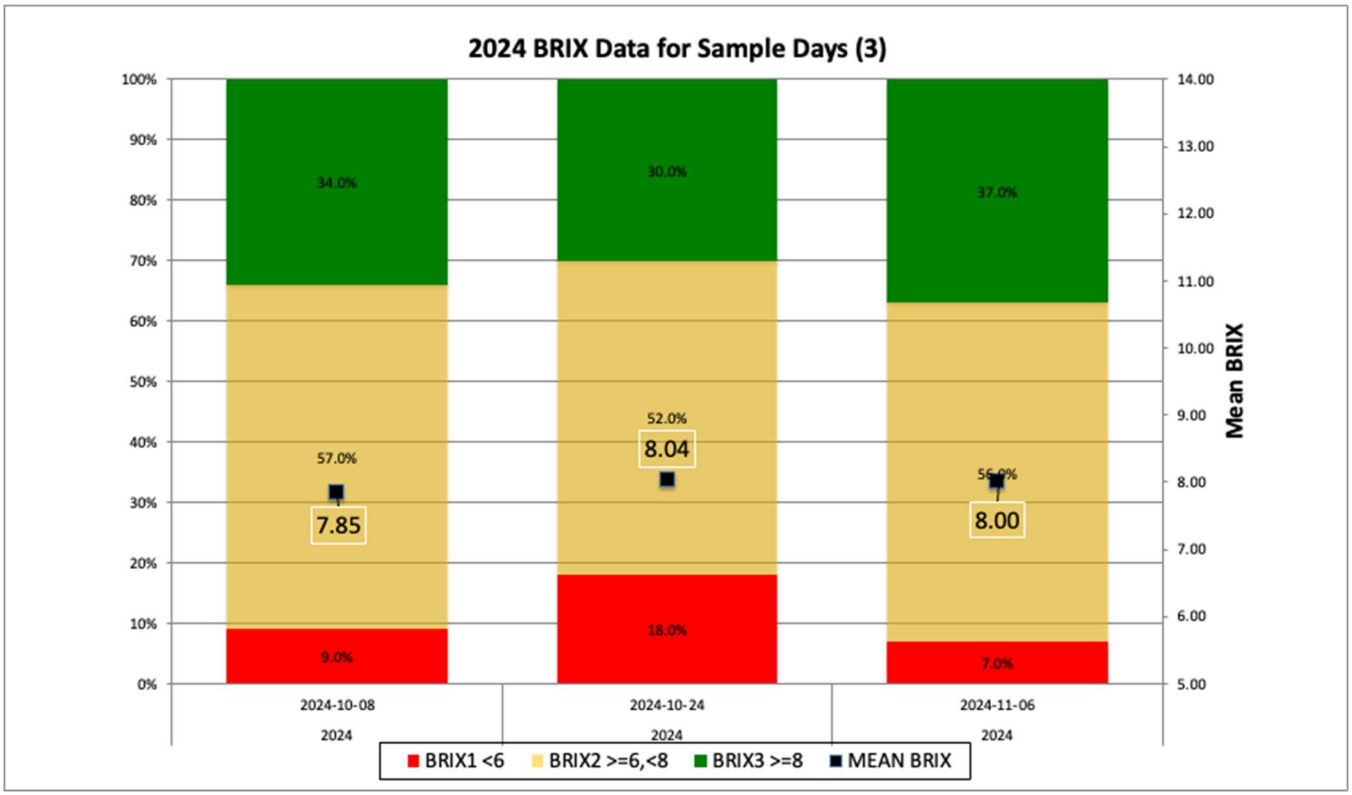
The average percentage of Soft lobsters per preseason sample reached global maximum values in Port La Tour Outside in 2024 at a rate of 49.33%. Essentially, it is observed in 2024 that nearly one out of every two preseason sampled lobsters in this area do not have carapaces with preferred hardness levels for storage and transport. In the past, this subarea also had elevated Soft percentages – relative to the other areas. However, the 2024 percentage surpassed past values by almost 3 times that compared to 17% in 2023.

5.2.7 ST. MARY'S BAY INSIDE

2024 SUMMARY OF RESULTS

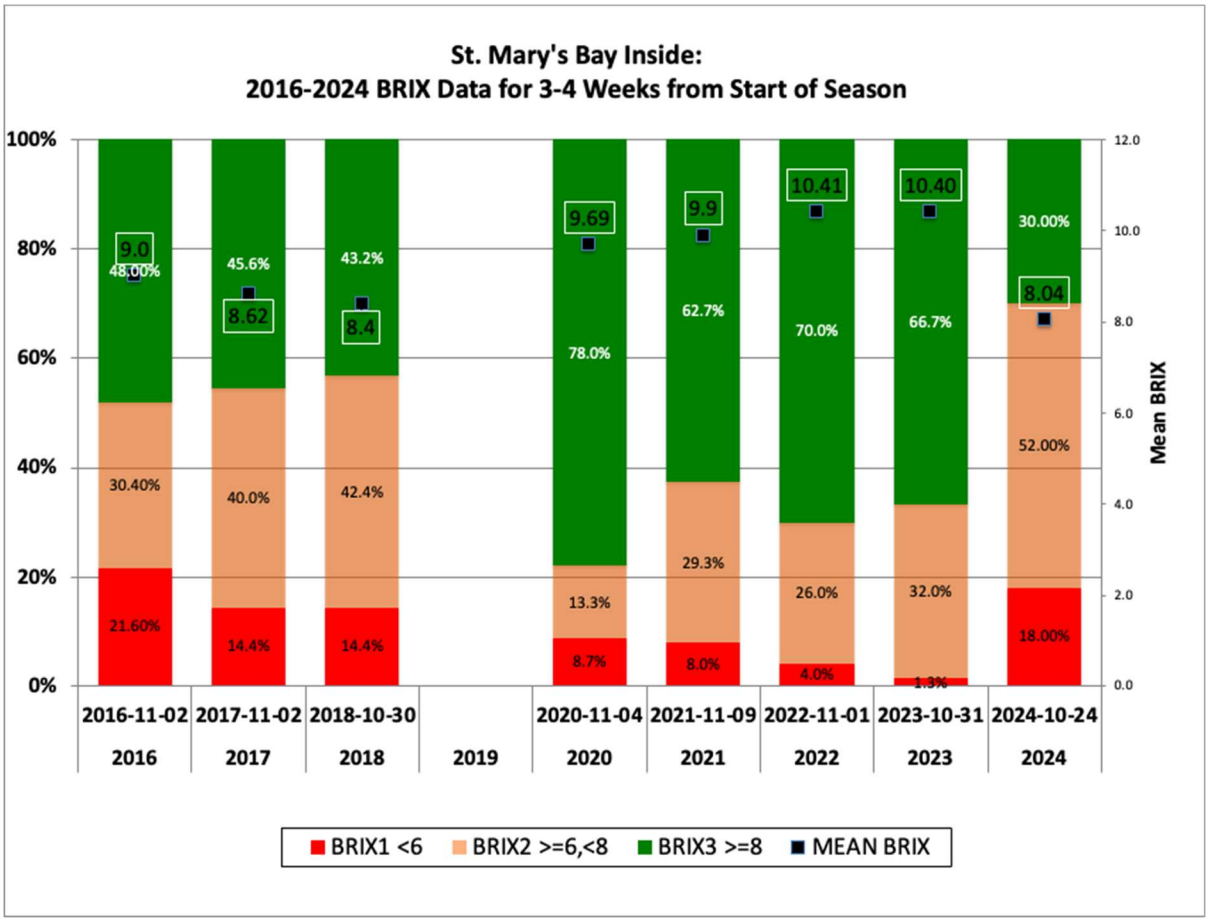
(A)BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

In the figure below, 2024 preseason survey results for 6 sample sites in St. Mary's Bay Inside show stability in average BRIX from the early-October sample (7.85 mg/mL) to the early-November sample (8.0 mg/mL). BRIX category level distributions also remained relatively constant with samples attaining 30-37% "Good" levels for BRIX (≥8 mg/mL) and 52-57% "Medium" levels. The proportion of "Poor" lobsters (BRIX<6 mg/mL) sampled in St. Mary's Bay Inside varied between 7% and 18% over the 3 samples. Average BRIX level values for samples in 2024 (7.96 mg/ml) were the lowest in the time series for St. Mary's Bay Inside. They were also below the 2023 and 2022 values (9.7 and 9.95 mg/mL, respectively) by -18%.



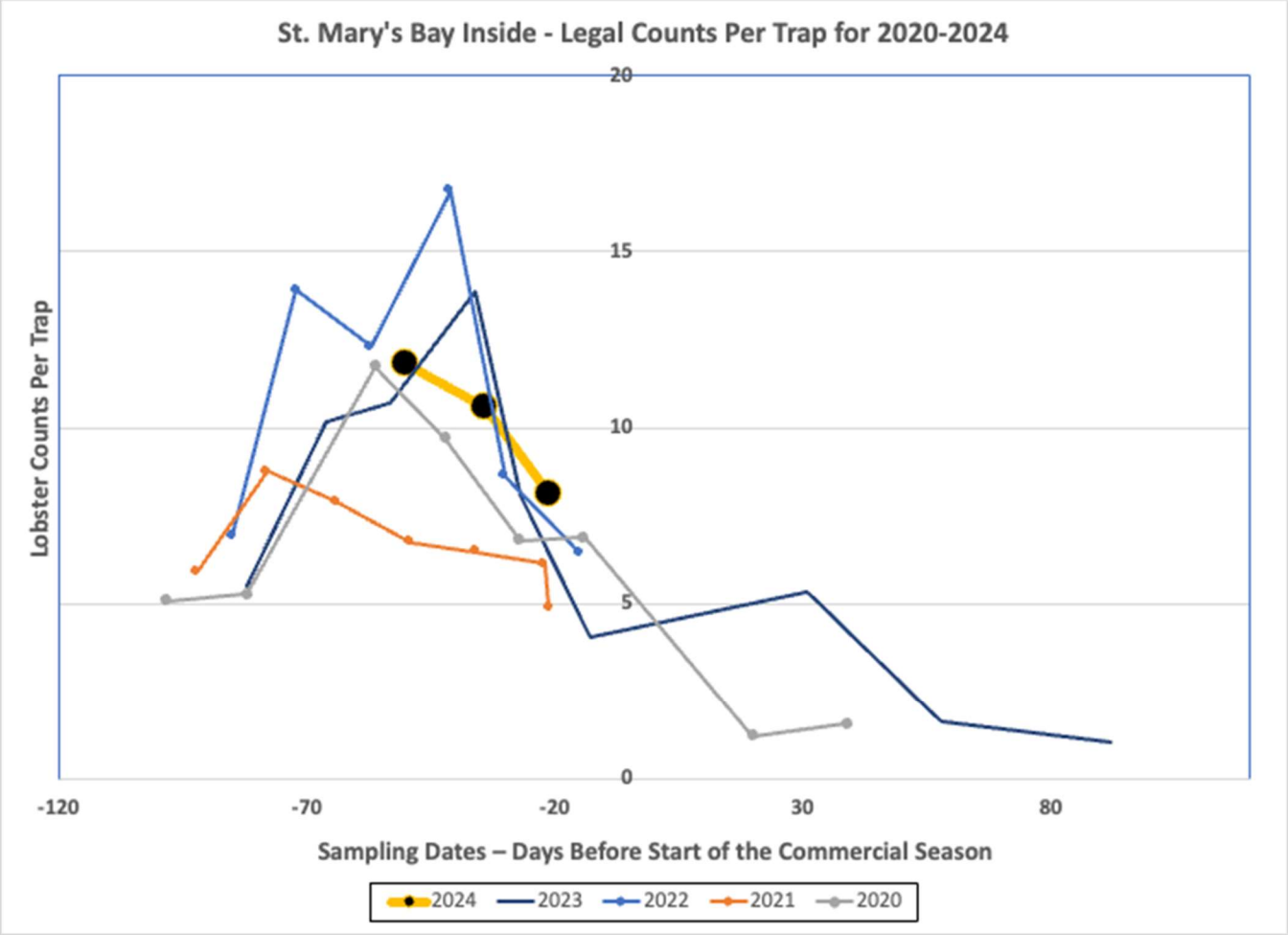
(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are somewhat variable across the series from 2016 to 2024 for Yarmouth Inside. The 2024 sample (October 24) is the lowest BRIX average (8.04 mg/mL) in the series. The October 24, 2024 sample is most closely comparable to the October 20, 2018 sample with lower average BRIX (8.04 versus 8.4) and lower "Good" lobster proportions (30% versus 43.2%).



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023). The counts per trap for St. Mary's Bay Inside are comparable to past years' counts per trap and exceed the values for the earlier years of sampling in 2020 and 2021. However, counts per trap in 2022 and 2023 generally exceed the 2024 values for samples from the comparable time frame (mid-October to mid-November). The characteristic time series of counts per trap over the preseason in St. Mary's Bay Inside exhibit a rise toward end-October and then a fall into the beginning of the commercial season at end-November. As evidenced by the 2023 and the 2020 in-season samples in the figure below, commercial catch rates also fall precipitously after the beginning of the commercial season as legal sized lobster abundance is extracted.



Counts of weak lobsters in the 2024 St. Mary's Bay Inside samples are 8.67%. These values are below but comparable to recent years. In 2023 there were 13.3% weaks and, in 2022, weak values were 11.4%. However, the 2024-2022 weaks were substantially greater than the previous years (2020-2021) values for weak percent in samples of 6% and 4% respectively for the St. Mary's Bay Inside subarea.

The average percentage of Soft and Medium lobsters per sample in reached record highs in 2024 at 33% of all sampled lobsters (Table 6). In 2023, the rate was only 1.2%. The large 2024 increase in Soft lobster in this subarea represents an increase of a factor of over 25 times the 2023 Soft percentage.

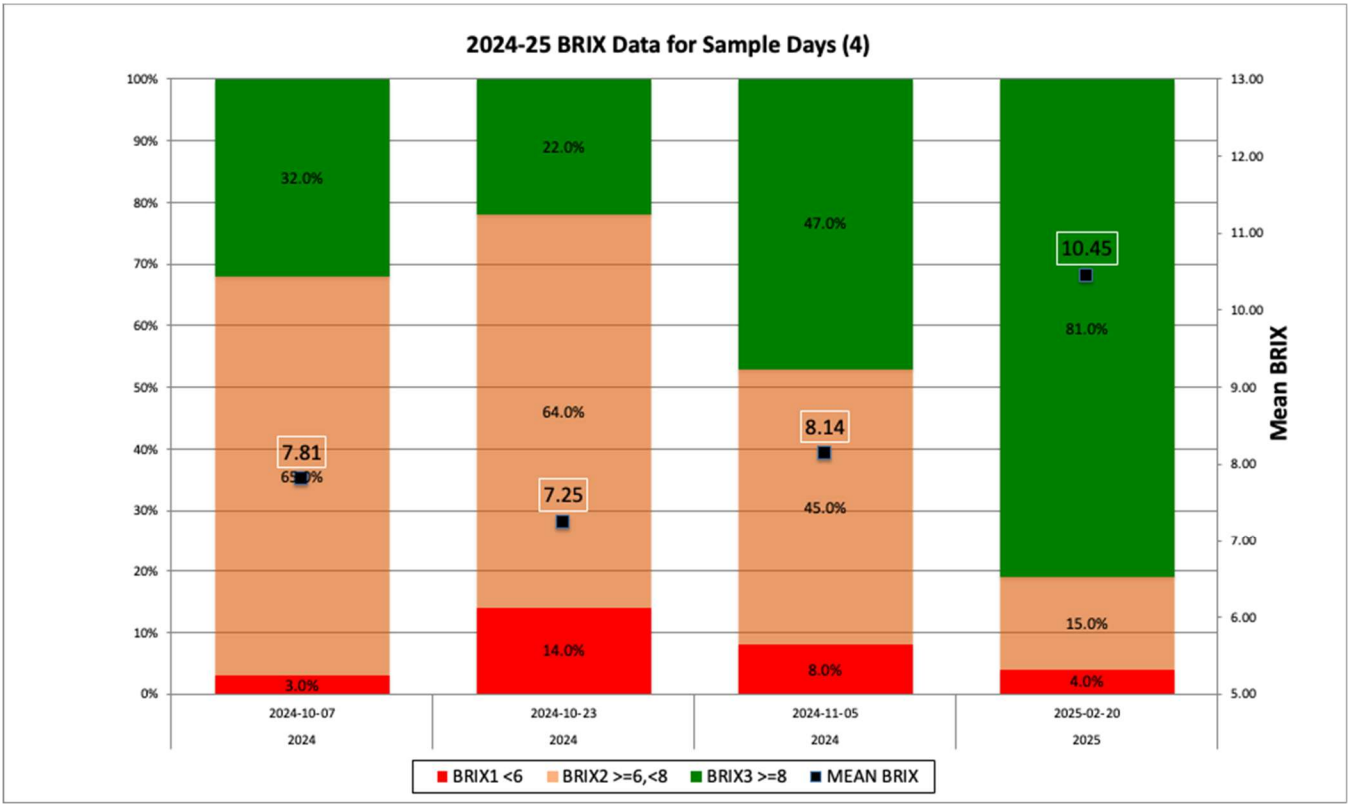
5.2.8 ST. MARY'S BAY OUTSIDE

2024 SUMMARY OF RESULTS

(A)BLOOD PROTEIN (BRIX) CATEGORIES–2024 SAMPLES

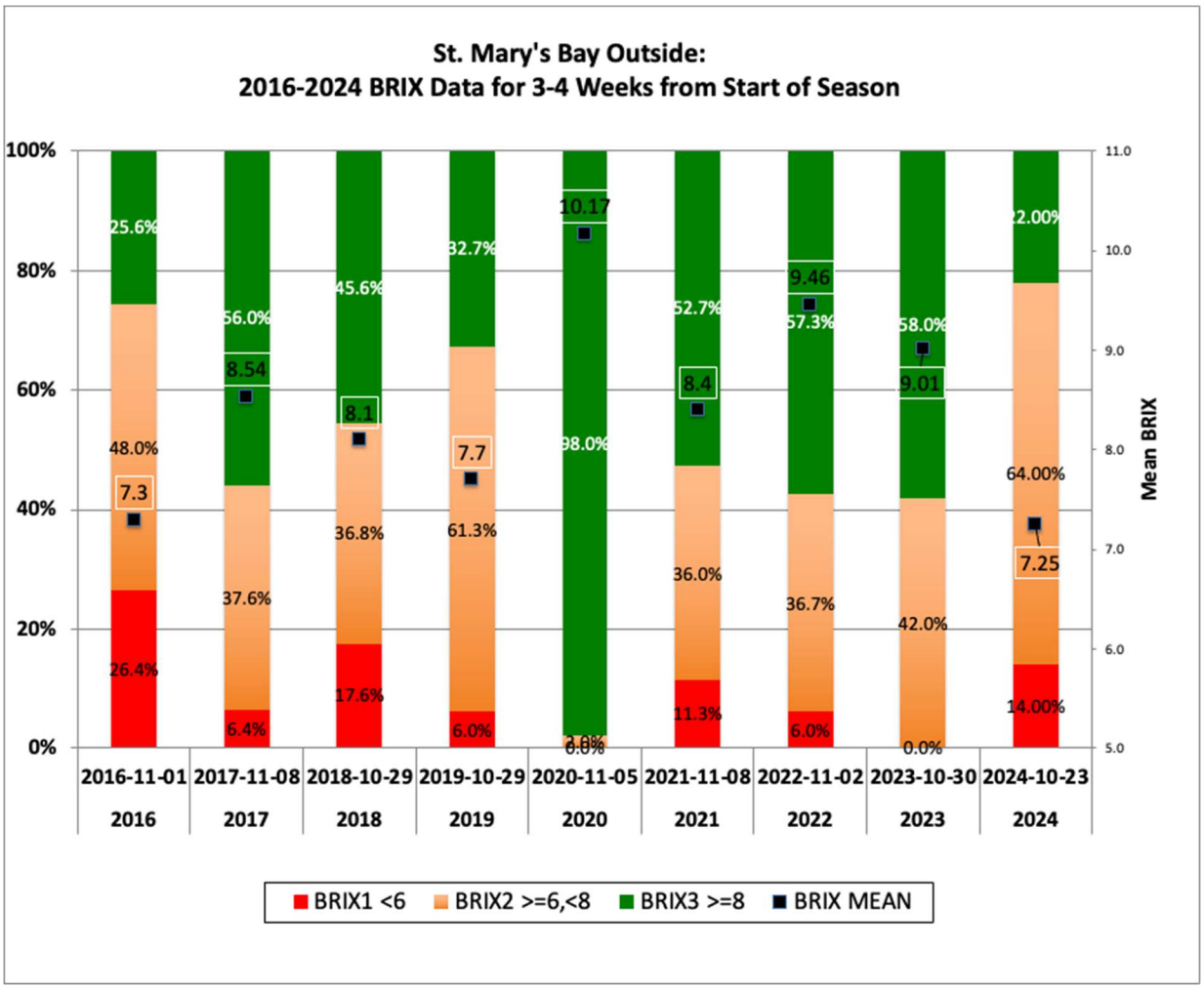
In the figure below, 2024 survey results for 3 preseason sample sites and 1 in-season sample in St. Mary's Bay Outside are presented. The figure shows a relatively constant average BRIX in preseason sampling from early-October to early-November ranging from a low of 7.25 mg/ml to a high of 8.14 mg/ml.

BRIX category levels in the preseason samples varied with samples attaining 22-47% "Good" levels for BRIX (≥8 mg/mL) throughout the sampling period. The proportion of "Poor" lobsters (BRIX<6 mg/mL) sampled in St. Mary's Bay Outside did not exceed 14% for all samples. The preseason samples results are followed by a substantial rise in average BRIX in the February 20, 2025 in-season sample of 10.45 mg/ml. Average BRIX level values for preseason samples in 2024 were 7.73 mg/ml, whereas in 2023 they were 9.03 mg/mL, comparable to 2022 values of 9.21. This represents a decline of approximately 15% in average BRIX for preseason samples. As for all subareas, the in-season sample exhibits substantially rising average BRIX values and high proportions of "Good" category lobsters per sample and lower proportions of "Medium" and "Poor" lobsters.



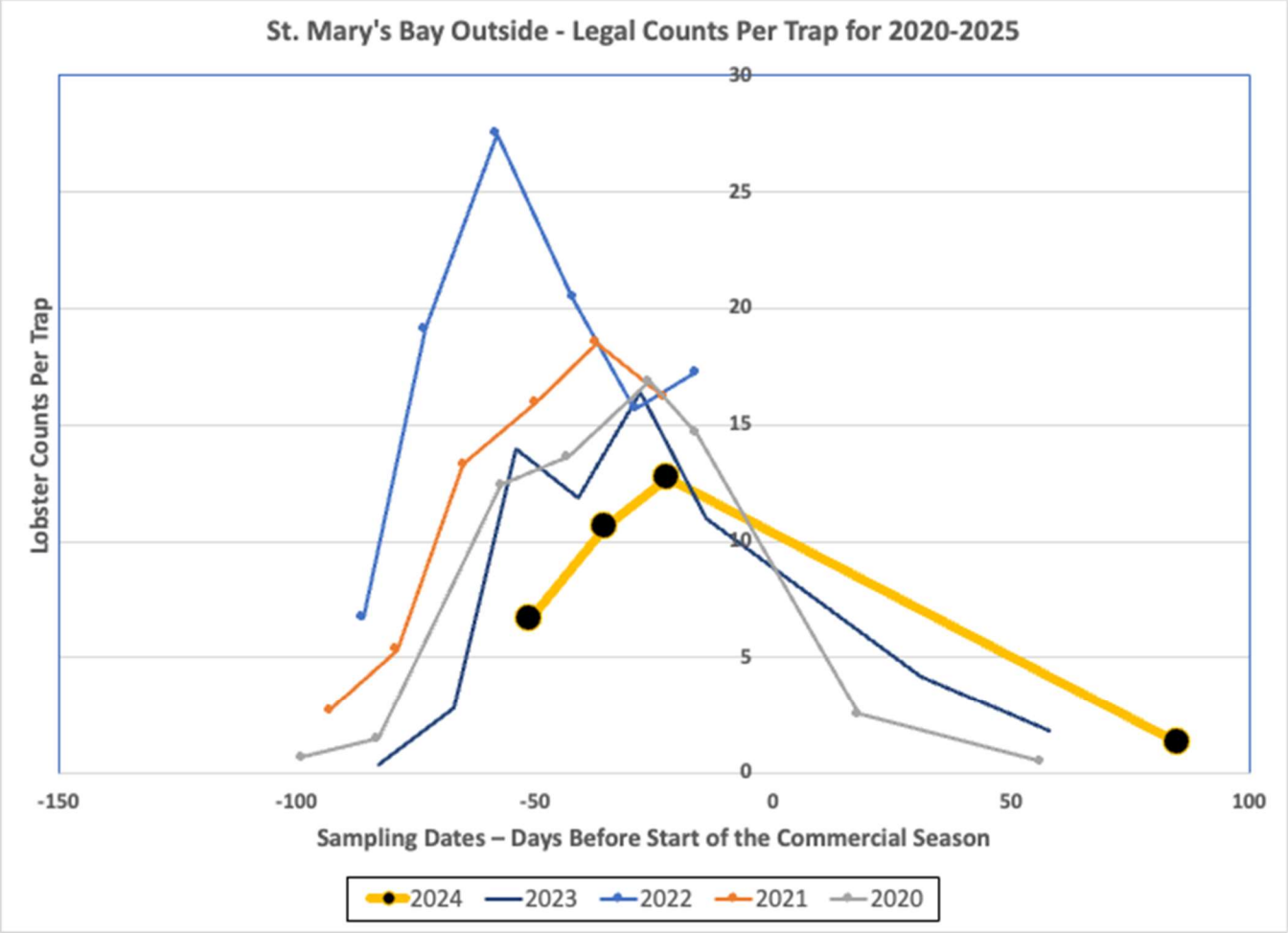
(B) BLOOD PROTEIN (BRIX) CATEGORIES – ANNUAL SAMPLES 3-4 WEEKS BEFORE SEASON START

From the figure below, annual samples 3-4 weeks from the start of each commercial harvest season opening are somewhat variable across the series from 2016 to 2024 for St. Mary's Bay Outside. The 2024 sample (October 23) is the lowest BRIX average (7.25 mg/mL) in the series. The October 23, 2024 sample is also directly comparable to the November 1, 2016 sample with similar average BRIX (7.25 versus 7.3) but different "Medium" and "Poor" category levels in the 2016 sample.



(C) Counts (legal-sized) per trap for 2024 samples

In the figure below, the counts per trap of lobsters (male and female) of legal-sized (82.5 mm or greater) that occurred in the survey samples dates in 2024 (thick yellow line with black sample date points) are compared to past years' samples (2020-2023). In 2024, the counts for St. Mary's Bay Outside are the lowest among all previous years' counts per trap. The 2024 counts do exhibit the characteristic time series of counts over the preseason showing the rise from early-October to early-November. As evidenced by the 2024, 2023 and the 2020 in-season sampling for St. Mary's Bay Outside in the figure below, commercial catch rates all precipitously after the beginning of the commercial season as legal sized lobster abundance is extracted.



Counts of weak lobsters in the 2024 St. Mary's Bay Outside samples of 5% were below the values of weaks in samples of past years. In 2023, weaks were 11.7% of those samples and 2022 weaks values were 17.3%. These higher values of 2023 and 2022 were also greater than the past years (2020-2021) values for weak percent in samples of 9.5% and 3.7%, respectively which are more comparable to the 2024 value of 5%.

The average percentage of Soft and Medium lobsters per sample in St. Mary's Bay Outside were elevated to a record high in 2024 of 31.67%. This high was more than 17 times that of the 2023 Soft percentage observation per sample of less than 2% (1.8%).

6 In-season Sampling Data in 2024-2025

The 2024-2025 sampling program included 6 sampling location-dates that took place after the beginning of the commercial lobster fishing season (January 11, 2025 in Yarmouth Outside to February 24, 2025 in Lobster Bay, Inside). These 6 samples were carried out during 5 days of sampling trips on January 11th, 23rd, and 24th, and February 20th and 24th, 2025.

6.1 In-season Sampling Data

In-season samples took place in the Inside and Outside subareas of Port La Tour, the Outside areas of St. Mary's Bay and Yarmouth, and the Inside area of Lobster Bay, as summarized in Table 10. As per the 2024 sampling protocol (Table 1), in-season samples were comprised of 100 legal-sized lobsters per location-date, as available.

Table 10. Summary of 2024-25 In-season Sampling Data

Sampling Location	Samples Subarea	Sampling Dates	Counts# Harvested	Total Samples	Sample Ave BRIX	% Change Ave BRIX*	Sample %Soft	Sample %Weak
Lobster	Inside	24-Jan	142	100	11.81	+20.51%	18.0%	2.00%
Bay		24-Feb	171	100	11.33	+15.61%	3.0%	1.00%
LFA 34	Outside	-	-	-	-	-	-	-
Port La Tour	Inside	23-Jan	296	100	9.76	+26.37%	17.0%	5.00%
LFA 33	Outside	23-Jan	218	100	9.12	+23.58%	35.0%	3.00%
St. Mary's Bay	Inside	-	-	-	-	-	-	-
LFA 34	Outside	20-Feb	170	100	10.45	+35.13%	12.0%	2.00%
Yarmouth	Inside	-	-	-	-	-	-	-
LFA 34	Outside	11-Jan	186	100	7.87	+4.52%	43.0%	0.00%
				Lobsters Sampled	**Average BRIX**	**Ave BRIX %Change**	**Overall %Soft**	**Overall% Weak**
		IN-SEASON TOTALS	1,183	600	10.06	+20.95%	21.33%	2.17%

^Zero In-season samples were taken in Lobster Bay (Outside), St. Mary's Bay (Inside), and Yarmouth (Inside) in 2024-2025.
*Average BRIX % change compares average preseason BRIX means by location with average in-season BRIX means.
#Counts Harvested totals include legal and sublegal lobsters in 4 strings of 10 traps per string.

In-season samples consistently show improved overall BRIX indicators over all areas across all in-season sampling dates. Overall in-season 2024-25 BRIX has a mean of 10.06 (Table 9) versus the overall areas preseason BRIX mean of 8.1 mg/ml (Table 3), a +21% change. In-season samples also showed lower %Soft and %Weak values respectively of 21.33% and 2.17% on 600 total in-season samples (Table 10) versus preseason rates of %Soft and %Weak values of 35.33% and 5.38% respectively on 2,400 preseason samples (Table 3). This is a decrease of -40% in %Soft and -60% in %Weak values from overall preseason to in-season samples. These changes from preseason to in-season results for weaks and soft lobsters for all sampled areas are typical of past history and can be seen in the historical data (2020 to 2023).

However, the results of the incidence of Soft lobsters in samples are concerning. The results for Soft show that the in-season totals are significantly higher than expected and many times (in general, by a factor of 10+) higher than past years values, as was also reported in the preseason report (Martineau, Mulock, and Lane 2024b) and in Sections 4.3 and 5.2 of this report. The large percentage of "Soft" lobster throughout all areas in 2024-25 also imply a large reduction in preferred "Hard" lobsters across the locations. This is a reversal of the state of lobster hardness since the beginning of the time series in 2020.

6.2 Preseason and In-season Comparison

The preseason and in-season sample results for the BRIX indicators for each location-area compare the corresponding 2024 preseason samples for a given location with the 2025 in-season samples. An examination of the performance results of the preseason prediction indicators of Table 9 compared to the in-season results of Table 9 is provided in Table 11 below.

6.2.1 Lobster Bay (Inside only) In-season Results

There were 5 total sampling periods for Lobster Bay Inside including 2 in-season sample dates (January 24 and February 24, 2024), 6 weeks after the start of the commercial season (November 26, 2024 in LFAs33&34). The average BRIX per sample for Lobster Bay Inside (Section 5.2.3) increases from the October 2024 sample date (9.46 mg/ml) into November (10.02 mg/ml). The in-season samples of January 24, 2025 and February 24, 2025 saw further increases 11.81 and 11.33 respectively. Average BRIX levels, as expected, improve as the winter season progresses and lobsters become fully-meated while moving from post-moult into the pre-moult period over the winter (December-February) and into the Spring (March and April). Thus, for Lobster Bay Inside by end February 2025, lobsters are predominantly (85%) of high quality (BRIX ≥8 mg/ml) and are considered acceptable for long-term storage and transport to international markets.

6.2.2 Port La Tour (Inside and Outside) In-season Results

There were 8 total sampling periods for Port La Tour Inside and Outside including two in-season samples both taken on January 23, 2025 in each subarea Inside and Outside, 8 weeks after the season opening. For the Inside area, the average BRIX per sample increased over the preseason period from a low of 7.3 mg/ml (mid-October) to a high of 8.09 mg/ml (mid-November). Similarly, for the Outside area, the average BRIX per sample increased over the preseason period from a low of 6.93 mg/ml (mid-October) to a high of 7.84 mg/ml (mid-November) – below the "Good" BRIX category.

The two in-season samples in Port La Tour continued the typical rise in average BRIX values with values of 9.76 (Inside) and 9.12 mg/ml (Outside). Average BRIX levels improve as the winter season progresses and lobsters become fully-meated while moving from post-moult into the pre-moult period. For Port La Tour Inside by end January 2025, lobsters are 75%+ considered to be of high quality and acceptable for long-term storage and transport to international markets (Section 5.2.5). For Port La Tour Outside, average BRIX levels are slightly below those of the Inside areas but follow a similar pattern. By end January 2025 Outside area lobsters are almost 70% considered to be of high quality and acceptable for long-term storage and transport to international markets (Section 5.2.6).

6.2.3 St. Mary's Bay (Outside only) In-season Results

There are 4 total sampling periods for St. Mary's Bay Outside including 1 in-season sampling date on February 20, 2025, 12 weeks after the start of the commercial season. Average BRIX per sample over the preseason period from end-October to early-November followed a gradual improvement in average BRIX values from 7.25 mg/ml to 8.14 mg/ml by the end of the preseason sampling. These values are barely within the "Good" category of BRIX (≥8mg/ml). It is understood that BRIX levels are expected to improve moving into the in-season period as lobster become more fully-meated and move from post-moult into the pre-moult period of the Spring of the coming year (2025). Thus, for St. Mary's Bay Inside and Outside, by end-February 2025, the average BRIX in the in-season sample rises to 10.45 mg/ml and these lobsters are estimated to be 80%+ of high quality and considered acceptable for long-term storage and transport to international markets (Section 5.2.8).

6.2.4 Yarmouth (Outside only) In-season Results

There are a total of 4 sampling periods for Yarmouth Outside including a single in-season sample date in the Outside subarea on January 11, 2025. The mean BRIX time series patterns were relatively stable over preseason sampling from early-October (7.56 mg/ml) to early-November (7.81 mg/ml). These samples showed average BRIX below 8 mg/ml and therefore lower than acceptable for storage and transport.

The single in-season sample in the Outside subarea had highest average BRIX in the 2024-25 time series with a value of only 7.8 mg/ml – below acceptable BRIX. Yarmouth Outside average BRIX levels would be expected to improve into the season as lobsters become more fully-meated while they move from post-moult into the pre-moult period of the coming calendar year, 2025. However, this appears not to be the case in Spring 2025 for this area. By the New Year 2025, lobsters are only approximately 30% likely to be of acceptable quality (i.e., ≥8mg/ml) in this location (Section 5.2.2).

6.2.5 Preseason Predictions versus In-season Results

The total of 6 in-season sampling periods provide a check on the preseason lobster quality indicators and predictors (Table 9) as presented in the Lobster Quality 2024 Preseason Sampling Program: Preseason Summary Report (Mattock, Mulock and Lane 2024b). Table 11 provides the Table 9 lobster quality predictors by location compared to the observations of the in-season sampling results of Table 10.

The 2024-25 results for average BRIX per sample values indicate that the preseason predictors are variable relative to the in-season observations. In Table 11, average BRIX predictors are below for Yarmouth Outside and above in-season values for Port La Tour and St. Mary's Bay Outside. Predictors for Lobster Bay and Port La Tour Inside were more precise to the resulting in-season observations.

The average counts per trap predictors all overestimated the actual in-season observations. Thus, actual catches were overestimated by the predictors based on the preseason sampling for all areas. This may be evidence of a deteriorating trend into the winter 2025 in lobster status and/or availability and/or poor weather conditions inhibiting trap hauls. The average overestimation of average counts per trap of

upwards of 50% per area is of concern with regard to overall actual catches in 2024-25. In the 2023-24 commercial season, catches rebounded significantly in the Spring of 2024 to mitigate the poor start of that season. However, in the Spring of 2025, cold waters into April and poor status of lobster in catches continued to be reported as the commercial season in LFAs33&34 winds down toward end-May 2025.

Predictors for average percentage Soft hardness levels in samples are reported in Table 11. These predictor values are the preseason average "Soft" percentages by location (as reported in Table 6, but not reported in Table 9) generally overestimate "Soft" percentage lobsters in samples by area since they are not corrected for the winter season and the expected lobster status improvements. Overall actual observations are indicative of lobsters of reduced quality for shipping and storage.

Table 11. 2024 Preseason Sampling Predictors Performance vs In-season Sampling

Locations: / Predictors:	Yarmouth Inside	Yarmouth Outside	Lobster Bay Inside	Lobster Bay Outside	Port La Tour Inside	Port La Tour Outside	St.Mary's Bay Inside	St.Mary's Bay Outside
In-Season Samples (Dates)	X	100(1)	200(2)	X	100(1)	100(1)	X	100(1)
Average BRIX (mg/mL)	**9**	**9**	**11**	**10**	**9**	**8**	**9**	**9**
In-season Obs Average BRIX	X	7.87	11.57	X	9.76	9.12	X	10.45
Ave Legal Counts Per Trap	**4**	**8**	**6**	**8**	**6**	**5**	**6**	**7**
In-season Obs Ave Leg Cts/trap	X	5.03	2.78	X	2.85	3.41	X	5.03
Ave % Soft*	**29%**	**29%**	**37%**	**40%**	**38%**	**45%**	**33%**	**31%**
In-season Obs Ave % Soft	X	43%	11%	X	17%	35%	X	12%
Ave % Weaks	**3%**	**3%**	**3%**	**5%**	**2%**	**2%**	**3%**	**3%**
In-season Obs Ave % Weaks	X	0.0%	1.5%	X	2.85%	3.41%	X	5.03%

*Average Soft indicators are taken from Table 6 and the November 2024 preseason sampling report (Martineau, Mulock and Lane 2024b).

Notes: Table 8 predictor values are denoted in **red text**; green cells denote in-season observations that exceed the corresponding predictor value; blue cells denote in-season observations that are less than the corresponding predictor value.

Finally, predictors for the percentage of weak lobsters in the in-season samples vary. For Yarmouth Outside and Lobster Bay Inside, weaks are overestimated by the predictors and actual weaks are less than expected there. However, in the Inside and Outside areas of Port La Tour and St. Mary's Bay Outside, actual weak percentages exceed the predicted values. Overall, it appears that the weaks predictors may be considered as reasonable estimates of early commercial season observations of lobster status indicators by subarea.

7 Discussion

The objective of this report is to present all information from the 2024-25 preseason and in-season sampling program–in a concise a manner as possible–for the benefit of the lobster sector in Nova Scotia. The extent of the expansive sampling program dataset and the variety of the rich information therein makes this a challenging task. This challenge is met by following strictly the sampling protocol (described in Table 1 above) each year of the sampling program so that observations are substantiated, validated and, where necessary, verified so that they are comparable across years as well as by sampled location. Following the protocol is at once a requirement for good data collection (leading to validated data analyses) as well as a goodwill protector against biased observations. We are confident that the 2024-25 dataset contributes unbiased observations of sampled lobsters in LFAs33 and 34 as per the full 2006-2024 dataset.

It is also important to note what this dataset does not do. The lobster data collected are samples taken from 8 defined subareas of LFAs 33 and 34. As such, these data provide representative information about lobster quality indicators in these different and specific subareas. The data do not represent the entire LFA as a whole neither do they pretend to provide information on live lobster status for other LFAs. This is the reason why designated subareas are established – they represent a variety of integrated parts of the whole of the LFA that permit repeated observation and longitudinal analyses that characterize good data. For example, the single representative data for the subarea of Port La Tour in LFA33 cannot be expected to be representative of actual results of lobster quality across the entire expanse of LFA33 since it is well-known that key components of LFA33 (such as around the Halifax area) are not included in the Port La Tour dataset. Rather, Port La Tour provides an integrated location in a separate jurisdiction that enables comparison with the other areas of the database that happen to be in LFA34 – St. Mary's Bay, Lobster Bay, and Yarmouth Bar. Similarly, these LFA34 subareas sampled in the dataset may not be considered representative of the entire LFA34.

Given the rich – and variable – observations of the sampling dataset from this report, we may anticipate that other lobster quality observations from these same LFAs may nevertheless differ from the results observed and presented here. In such a case, we caution the need to substantiate all observations and adhere to the same protocols as the dataset presented here so that the observations may be directly comparable. In situations where observations follow a different protocol or adopt different approaches to collecting data, then we understand that effort needs to be made to align the different data collection protocols so that the results may be justly comparative.

Since 2006, there have been some years of excellent quality (2012, 2013) and others of poorer and deteriorating quality (2015, 2016) as measured by the distribution of BRIX values from the preseason samples (e.g., Figure 6). Our ability to discriminate each year's sample using the same protocol standards improves as we collect and consider more years of historical data. The objective of the preseason and in-season sampling program by location is to carry out a structured, statistical analysis of year-over-year comparisons to gauge the early season prediction of lobster quality by fishing areas. This information, we believe, is of benefit to Nova Scotia harvesters, processors, and decision makers looking to prepare inventories for live and processed markets that yield most value to the lobster sector. The following discussion considers the outlook for the preseason and in-season lobster sampling program in LFAs33&34 and presents issues for continuous improvement of this report for the benefit of the lobster industry looking strategically toward the coming commercial seasons.

7.1 Annual Lobster Quality and Landings Comparison

In the 2020-2021 final report (Mattock, Mulock, and Lane 2021a), it was reported that there was a negative correlation between LFA34 seasonal landings and Overall Average BRIX for all 8 sampling areas. It was conjectured that as overall quality (measured by BRIX levels) degrades, total seasonal catches appear to increase (e.g., 2015-16 – year of highest catches and low quality) and vice versa (as lobster quality (BRIX levels) increases, catches fall – e.g., 2012-13 – year of low relative catches but high-quality lobster measures by BRIX values.

In the current commercial season, 2024-25, for the first time since 2020 and the development of the annual Final Reports, it is noted that BOTH lobster BRIX values AND catches per trap are low relative to the historical values of the database since 2020. In past years, when sampling catches per trap had decreased, there was typically a signal of rising lobster BRIX values. Vice versa, when catches per trap were up, then typically BRIX values were relatively lower. However, as noted in 2024-25, a fall in BOTH sampling catches per trap (Section 4.2, Figure 17) AND BRIX values (Section 4.1, Figure 16) have occurred (Table 10). This concurrence raises questions about other broader possibilities that may present themselves in the LFAs33&34, e.g., state of the lobster ecosystem, lobster abundance and survival issues.

It was also reported in the 2021-2022 final report (Mattock, Mulock, and Lane 2022a) that overall predictions of lobster quality and lobster landings in LFAs 33 and 34 can be seen as an independent time series that moves annually according to detectible and comparable trends. We caution that a strict time series analysis approach may ignore exogenous factors that clearly affect lobster fishing effort (i.e., numbers of trap hauls) and subsequent landings independent of lobster quality, e.g., fishing effort, weather conditions, access and allocation disputes, shore prices, lobster inventory and catchability, international markets, as well as global socioeconomic conditions (i.e., global public health issues in a pandemic, or economic fluctuations).

Again this year, this final report does not report on estimates of commercial landings compared to the preseason and in-season lobster sampling program. Further research on the dynamic determinants of lobster effort and catches by LFA – including predicted and perceived quality – is ongoing toward preparing sufficient analyses of the potential impacts of perceived quality on catch and effort for lobster. Future final reports of the preseason and in-season sampling program will seek to define quality rankings and grading definitions in further detail based on the historical and the current BRIX observations (Lane et al 2025a).

7.2 Decision Opportunities

The ability to compare historical data by selected sites may allow industry to consider options about when and where to harvest higher quality lobster. For example, industry may consider setting harvesting openings, e.g., if the prediction on quality expects harvests with low BRIX (and corresponding lower meat percentage levels), and high offloading losses, or lower lobster catchability, then it may be preferable to shift harvesting to alternative locations (e.g., Inside areas being preferred temporarily to Outside areas) that may have better than expected BRIX performance and catch rates to enable storage and shipment of higher valued quality product. Alternatively, lower BRIX levels may trigger industry decisions to move product from storage and shipment for live markets into processed product until BRIX levels improve.

These options can be evaluated in advance and based on modelling of the historical annual lobster BRIX observations into the commercial season combined with price trends and dynamic behaviour, e.g., based on inventory levels, in order to help lobster harvesters and the industry to make decisions on where and when to fish to improve harvest quality and overall value to the lobster sector over the course of the commercial seasons. Future full reports will endeavor to model the value implications of alternative decisions that may be a consequence of the observed BRIX profiles of the preseason sampling program. On-going research is underway toward decision modelling in the lobster sector (Lane et al 2025b).

7.3 Lobster Abundance Considerations

Recent US lobster fishery regulations considerations have raised attention to the status of lobsters recruiting to the commercial fishery along the New England shore and into the Gulf of Maine. The cancelled implications of the originally proposed January 2025 revised minimum size from 82.5mm to 84mm carapace measure would have undoubtedly had serious repercussions on Canadian lobster fisheries and, in particular, lobster commercial fishing in LFAs33 and 34 – the focus of this report. Estimates of up to 25% shipments of Canadian lobster to the United States could have faced rejection from US markets if the proposed regulations had in fact been implemented by US authorities. Several reasons regarding the proposed regulations ought to be of some concern regarding the status of LFA33&34 lobsters. Original American concerns were that lobster egg production may be declining, e.g., due to migration, or other impacts, and/or lobster recruitment may be hindered, e.g., by increased juvenile lobster predation (e.g., the burgeoning seals populations). These factors could affect the availability of catchable market lobster available for the fisheries. In LFAs33&34, the year-over-year decline in commercial catches since the 2015-16 season is sufficient to trigger further research on lobster resource concerns.

The Lobster Quality Centre is in the process of reviewing these data toward framing research on determining lobster abundance estimates based on observed lobster catch per unit effort, i.e., catch per trap or CPT. The idea consists of using (1) preseason sampling data on lobster counts per trap by location (as reported in this report) and (2) commercial (logbook) data on catch weight and trap hauls (Fisheries and Oceans Canada 2022) to develop an estimate of commercial catchable biomass and expected catch per trap over the season in LFA34 subareas. That analysis applies our knowledge of lobster moult dynamics (Factor 1995) to determine expected moult and lobster catchability. Data observations from the sampling program (dataset for this report) are matched with counts per sampling trap with data by subareas. Together, the moult schedule, lobster catchability, and observed catch data enable an annual estimate of lobster Catch Per Trap (CPT) over the year by subarea. Assuming catchability coefficients by area (based on sampling data protocols results), an estimate of an index of catchable biomass may be determined. A Lobster Quality Centre Working Paper is currently in progress to explore these concepts. Additionally, the Lobster Quality Centre is currently exploring potential impacts on lobster of egg production, recruitment, warming temperatures and the incidence and impacts of culls in the commercial fishery. This extensive work involves consideration of the impact of predation (e.g., including grey seals) on juvenile lobster stocks.

7.3 Lobster Conditions

The 2024-25 season has been remarkable for many of the wrong reasons. Since the beginning of the season in December 2024 and continuing into April 2025, anecdotal reports from industry observers and participants have noted the poor status of "soft" lobster in commercial catches and the higher than expected incidences of lobster mortalities in some storage facilities in 2024-25.

"Soft" lobster are most often characterized as having lower than acceptable BRIX (not "Good", with BRIX values NOT ≥8mg/ml) and may be still recovering from previous moult, may have evidence of carapace abnormalities or shell disease, and may have smaller carapace sizes with some damage to the carapace (Table 2). Moreover, "Soft" lobsters are at a higher risk of mortality both in the wild and, particularly, in contained storage facilities where they may be held in long term storage (i.e., for weeks). In these cases, "Soft" and damaged lobsters are not ideally suited for longer term storage, neither are they suited for transport to international markets as live product since they may expire in transit. The Lobster Quality Centre through the Marine Research Centre in laboratory in Petit de Grat actively engages lobster facilities throughout the province of Nova Scotia to undertake sampling and water quality analyses and to advise owners on best practices toward developing improved conditions for lobster harvesting and facilities storage.

7.5 Future Preseason Sampling Survey Outlook

Future sampling surveys will continue to follow the traditional protocols (Table 1) toward maintaining the integrity of the longitudinal database – one of the world's longest marine scientific databases. This continuation seeks to ensure the availability to industry of annual LFA 33 and 34 information on the status of lobster quality including individual lobster statistics, lobster harvests by location-area samples, lobster sample counts, moult stages (pleopod analyses), and hardness scale analyses.

Finally, future reports and research initiatives will seek:

- to establish and apply a lobster grading function consistent with industry grading schemes (Lane et al 2024, update in progress);
- to develop the program of temperature data collection and/or temperature modelling analyses (e.g., regression of surface temperatures to estimate bottom temperatures) associated with the changing marine climate, and the potential for creating conditions that may lead to increased incidences of epizootic shell disease (ESD);
- to develop a specific Quality Indicator time series for each location and inside-outside area that combines lobster landings, BRIX, and other quality measures across the subareas of LFA34;
- to develop statistical analyses using the information in the entire ALMQ database 2006-2025 to discriminate years into quality categories for direct comparison and future analysis and prediction;
- to develop a dynamic BRIX level model for the 8 locations in order to track sample BRIX level changes over the preseason sampling period and to prepare a forecast of (i) BRIX level distributions and (ii) average BRIX estimates for the start of the commercial season at end November annually to be presented in the Preseason Summary of the commercial season;
- to develop, beginning in 2025 a prediction score based on industry feedback at the start of the season to evaluate the performance of the preseason summary report predictions compared to

actual results at the start of the LFA33 and 34 commercial seasons; and, finally,

- to match lobster quality analyses with ongoing feedback from industry as to the usefulness of the information for improved industry value and decision making.
- to develop a lobster Catch (kg) Per Trap (CPT) analysis based on commercial and sampling data and link to indices of catchable lobster biomass by subarea.
- to develop a funding plan for the continuation of the extended ALMQ into 2025 and beyond including promoting this continued work with the LQC Advisory Board, the Department of Fisheries and Aquaculture of the Province of Nova Scotia, and Fisheries and Oceans Canada and to maintain the stellar working relationship between Coldwater Lobster Association and the Lobster Quality Centre, Université Sainte-Anne.

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8 References

Berry, B., Thériault, M., and Lane, D. 2016. Lobster Quality Monitoring Program: Southwest Nova Scotia (LFA 33 and 34). Presentation to the Minister of Fisheries and Oceans, Canada, Pubnico, N.S., July 27. Prepared by the Centre de recherche marine, Université Sainte-Anne, 15p.

Coldwater Lobster Association. 2022. Fishermen working together for a better future. Accessed March 7, 2022 at: https://www.coldwaterlobster.ca

David, A., Tobin, T., Thériault, M. and Lane, D. 2024. Lobster Dynamic BRIX Level Modelling: Start of Year Average BRIX and Catch per Trap Forecasts. Working Paper #16, Lobster Quality Centre (LQC) Working Paper Series. Centre de recherche marine, Université Sainte-Anne (In progress).

Factor, J.R. (Ed.) 1995. Biology of the Lobster (*Homarus americanus*).Academic Press:SanDiego.528p.

Fisheries and Oceans Canada. 2024. Canada's Fish and Seafood Trade in 2023: Overview. Economics, Statistics, and Data Governance Directorate. Strategic Policy Sector. July. 28p. Accessed March 21, 2025 at: https://publications.gc.ca/collections/collection_2024/mpo-dfo/Fs1-89-2023-eng.pdf

Fisheries and Oceans Canada. 2022. Lobster Catch and Effort for Nova Scotia LFAs 27 to 38. Commercial Data Division, Maritimes Region. March. Data provided to D. Lane.

Fisheries and Oceans Canada. 2021. Maritimes Region Lobster Economic Update. Prepared for the Maritimes Region Lobster Advisory Committee, September 24. 41p.

Fisheries and Oceans Canada. 2020. Lobster Fishing Areas 27 – 38: Integrated Fisheries Management Plan. (Updated 3-31-2020.) Accessed March 5, 2021 at: https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/maritimes/2019/inshore-lobster-eng.html

FSRS. 2022. Fishermen & Scientists Research Society. Atlantic Lobster Moult and Quality Project, 2006-2015. Accessed March 7, 2022 at: https://fsrsns.ca/atlantic-lobster-moult-and-quality-almq/

Gardner, M., Marriott, H., Rodger, R., Sackton, J. 2010. From Trap to Table - A Long Term Value Strategy for the Canadian Lobster Industry. October. Prepared for the Lobster Council of Canada by Gardner-Pinfold Associates. 160p.

Gooch, M., Marenick, N., Fewer, J., Arenburg, H., Phillips, K., Laplain, D., Dent, B. 2015. To determine how Nova Scotia's lobster industry can increase its competitiveness and profitability — a pilot project. Final Report for the Catch-to-Plate Committee. January 28. 34p.+appendix.

Gorman, M. 2016. Lobster-quality monitoring project already paying off. CBC News. September 16. Accessed March 31, 2020 at: https://www.cbc.ca/news/canada/nova-scotia/lobsters-quality-fishermen-eastern-shore-1.3765682

Lane, D., Gurney, B., Thériault, M., Babin, N., Mulock, H., Mattock, K. 2025a. Statistical Analyses for Lobster Quality Determinants and Predictions. Working Paper #11, Lobster Quality Centre (LQC) Working Paper Series. Centre de recherche marine, Université Sainte-Anne. 25p. (In progress)

Lane, D., Theriault, M., David, A., Tobin, V. 2025b. Nova Scotia Lobster Model Dynamics. Working Paper #9, Lobster Quality Centre (LQC) Working Paper Series. Centre de recherche marine, Université Sainte-Anne. 11p. (In progress)

McLachlan, G. J. (2004). *Discriminant Analysis and Statistical Pattern Recognition*. Wiley Interscience. 533p.

Martineau, N., Mulock, H., and Lane, D. 2024b. Lobster Quality 2024 Preseason Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Preseason Summary Report. November. 42p. Accessed March 8, 2025 at: https://www.coldwaterlobster.ca/wp-content/uploads/2024/11/ALMQ_2024-Preseason-Summary-Report-November-2024.pdf

Mattock, K. Mulock, H., and Lane, D. 2024a. Lobster Quality 2023-2024 Preseason and In-Season Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Final Report. March. 57p. + appendices. Accessed March 7, 2023 at: https://www.coldwaterlobster.ca/atlantic-lobster-moult-and-quality-project/

Mattock, K., Mulock, H., and Lane, D. 2023b. Lobster Quality 2023 Preseason Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Preseason Summary Report. November. 30p. Accessed March 8, 2023 at: https://www.coldwaterlobster.ca/wp-content/uploads/2022/11/LQ_2022-Preseason-Summary-Report-FINAL.pdf

Mattock, K. Mulock, H., and Lane, D. 2023a. Lobster Quality 2022-2023 Preseason and In-Season Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Final Report. March. 57p. + appendices. Accessed March 7, 2023 at: https://www.coldwaterlobster.ca/atlantic-lobster-moult-and-quality-project/

Mattock, K., Mulock, H., and Lane, D. 2022b. Lobster Quality 2022 Preseason Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Preseason Summary Report. November. 30p. Accessed March 8, 2024 at: https://www.coldwaterlobster.ca/wp-content/uploads/2022/11/LQ_2022-Preseason-Summary-Report-FINAL.pdf

Mattock, K. Mulock, H., and Lane, D. 2022a. Lobster Quality 2021-2022 Preseason and In-Season Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Final Report. March. 57p. + appendices. Accessed March 7, 2022 at: https://www.coldwaterlobster.ca/atlantic-lobster-moult-and-quality-project/

Mattock, K., Mulock, H., and Lane, D. 2021b. Lobster Quality 2021 Preseason Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Preseason Summary Report. November. 27p. Accessed March 7, 2022 at: https://www.coldwaterlobster.ca/atlantic-lobster-moult-and-quality-project/

Mattock, K. Mulock, H., and Lane, D. 2021a. Lobster Quality 2020-2021 Preseason and In-Season Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Final Report. March. 45p. + appendices. Accessed March 7, 2022 at: https://www.coldwaterlobster.ca/atlantic-lobster-moult-and-quality-project/

Mattock, K., Mulock, H., and Lane, D. 2020. Lobster Quality 2020 Preseason Sampling Program, Southwest Nova Scotia LFA33 & LFA34: Preseason Summary Report. November. 24p. Accessed March 7, 2022 at: https://www.coldwaterlobster.ca/atlantic-lobster-moult-and-quality-project/

Nova Scotia. 2020. Lobster Quality Research and Innovation Centre to Help Fishery. Nova Scotia Department of Fisheries and Aquaculture, News Release. February 26. Accessed March 6, 2020 at: https://novascotia.ca/news/release/?id=20200226009

Retzlaff, A., R. Claytor, B. Petrie, C. Frail, J. Tremblay, D. Pezzack, and J. Lavallée. 2007. Variation in molt timing and market quality in the American lobster *Homarus americanus*. Bedford Institute of Oceanography: 2006 in Review. Cat. No. Fs101-3/2006E, ISBN: 978-0-662-46177-7, ISSN: 1499-9951. 22–26.

Thakur, K., Revie, C., Stryhn, H., Scott Tibbetts, S., Lavallee, J., Vanderstichel, R. 2017. Risk factors associated with soft-shelled lobster Homarus americanus) in southwestern Nova Scotia, Canada. FACETS. 2:15-33.

Thériault, G., Hanlon, J., and Creed, L. 2013. Report of the Maritime Lobster Panel. November. 96p. Accessed March 31, 2020 at: https://novascotia.ca/fish/documents/Maritime-Lobster-Panel-Report-NOV1.pdf

Thériault, M., David, A., Frame, S., Samson, S., Mdaini, Z., and Lane, D. 2024. Lobster Quality Determinants for Product Grading. *Aquaculture, Fish and Fisheries.* 4(2). 16p. DOI: https://dx.doi.org/10.1002/aff2.161

Travis, N. 2024. Lobster Quality Up While Catches Are Down in LFA 33-34. *Navigator*. January 17. 3p. Accessed April 3, 2024 at: https://thenavigatormagazine.com/lobster-quality-up-while-catches-are-down-in-lfa-33-34-survey/

Withers, P. 2024. Lobster prices at the wharf hit $18 a pound in Nova Scotia. CBC Nova Scotia. March 6. Acessed April 12, 2024 at: https://www.cbc.ca/news/canada/nova-scotia/lobster-wharf-price-hits-18-dollars-a-pound-in-nova-scotia-1.7135374

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Contact:

Coldwater Lobster Association
368 Main Street, Suite 105 Yarmouth, NS, B5A 1E9
(902) 742-5247
Email: admin@coldwaterlobster.ca
Website: www.coldwaterlobster.ca

Centre sur la qualité du homard/Lobster Quality Centre
Centre de recherche marine, Université Sainte-Anne
3433 route 206, Petit de Grat, Nouvelle-Ecosse B0E 2L0
(902) 578-7344
Email : Daniel.Lane@uSainteAnne.ca
Website: https://www.usainteanne.ca/centre-de-recherche-marine
https://www.usainteanne.ca/en/research/units/lqc