Survey Response Report/ Rapport sur les réponses à l'enquête
## Lobster Quality Survey/Enquête sur la qualité du homard
January/janvier 2022

In the summer of 2021, the Lobster Quality Research and Innovation Centre (LQRIC) of Université Sainte-Anne undertook a research project to determine and address critical issues impacting the marketplace quality of live Nova Scotia lobster. As part of this research, a lobster quality survey was developed and sent to industry stakeholders and participants in the Nova Scotia live-lobster export supply chain. The objective was to identify prominent challenges and best practices for maintaining lobster quality throughout the supply chain.

In this report, survey response results are aggregated and presented in a summarized format to assist in determining Nova Scotia industry attitudes and beliefs regarding the determinants of live lobster quality for export markets, and to inform the later phases of the LQRIC lobster supply chain research project. No individual responses or identifying information are disclosed. LQRIC thanks all participants for their valuable contribution to this initiative.

Question 1

Survey respondents were asked to identify the segments of the Nova Scotia live lobster export supply-chain in which they participated (more than one segment may apply to each respondent):

| Segment	No.
Harvester	15
Buyer	6
Intermediate Storage	7
Long-Term Storage	6
Exporter	5
Air Freight	2
Broker (no physical possession)	0
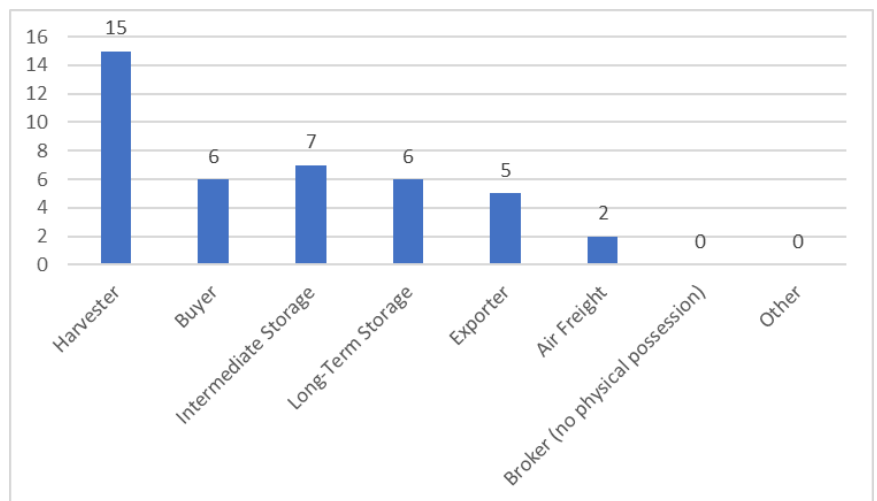
The prevalence of harvesters (15) among the 20 survey respondents is expected, given the larger population of harvesters relative to other roles in the live lobster supply chain. Respondents could select more than one role, with the objective being to determine those who have experience in, and can speak to, the different segments of the live lobster supply chain. Most Buyers also identified as Exporters and several (3) Harvesters also identified as Storage agents.

Question 2

Survey respondents (20) provided the Nova Scotia lobster sector region(s) in which they are engaged (more than one region may apply to each respondent):

| Region	No.
Bay of Fundy	5
Southwest Nova	12
Southern Shore	2
Eastern Nova Scotia	4
Offshore	1
Cape Breton (Atlantic)	5
Gulf Shore	3
Any/All	1
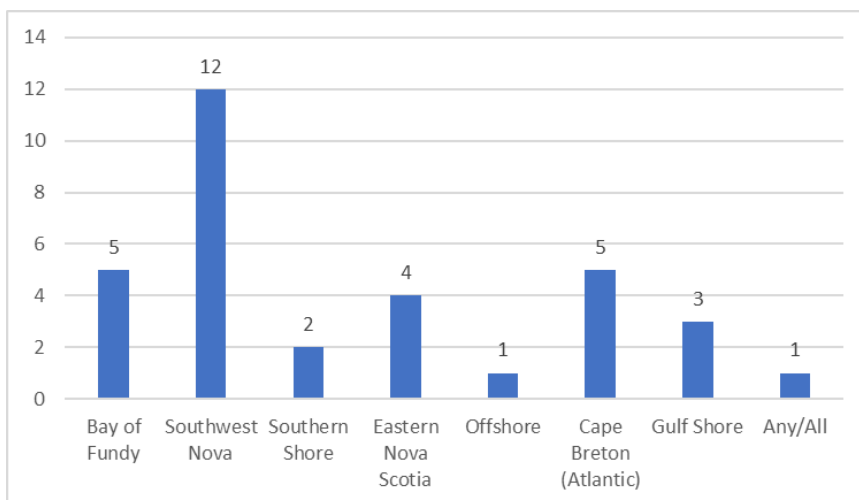
While the 20 survey respondents are generally representative of the the broader Nova Scotia lobster industry regional representation, the small number of respondents is insufficient to imply that survey responses actually represent the views of the entire population. Buyers/Exporters (5) identified with several regions across the province.

Question 3

On a scale of 1 to 5, where 1 is least important and 5 is most important, survey respondents indicated the importance of the following 8 determinants as a measurement of lobster quality:

Determinants of Lobster Quality	1	2	3	4	5	Wtd Ave
Shell Hardness	1	0	0	3	16	4.65
Meat Content	1	0	1	3	15	4.55
Blood Protein (BRIX)	1	1	3	5	10	4.1
Survivability in storage	1	0	1	5	13	4.45
Body/claw shape (culls)	1	1	5	7	6	3.8
Colour	2	1	7	8	2	3.35
Size	1	0	6	8	4	3.74
Sex of lobster	4	3	7	4	2	2.85
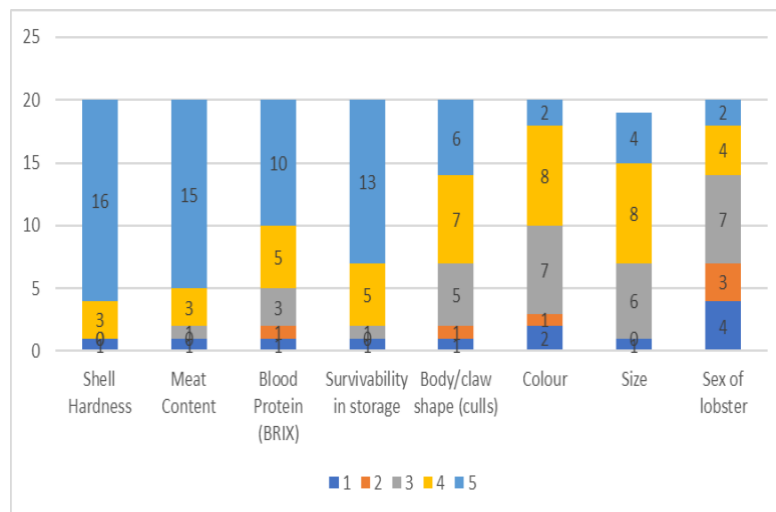
Shell Hardness, Meat Content, Survivability in Storage, and BRIX were identified as the most important measures of lobster quality with weighted averages among the 20 respondents all exceeding 4. Sex and lobster colour were ranked lowest among the 20 respondents (weighted averages below 3.5). Nevertheless, each of the 8 proposed determinants of lobster quality in the table list above had at least 2 respondents (out of 20 total) identify it as the highest level ("5") of importance.

Question 4

For each of the 8 metrics of lobster quality from Question 3, survey respondents indicated, in text responses, the method(s) or tools used to measure the determinants of lobster quality. The following Word cloud diagram summarizes the key text responses provided by the 20 respondents.

The diagram above indicates the summary of the majority of responses indicated "hardness" as the key determinant measured via "visual" and "hand inspection" of lobster as the primary methods used to determine lobster quality. Blood Protein measurements were noted as the exception to visual observations (measured by a blood refractometer). While measuring lobster quality was top of mind for the 20 respondents, the use of technological, quantitative measurement tools (e.g., BRIX) is evidently limited.

Question 5

For each of the segments of the lobster supply chain indicated by survey respondents in Question 1, respondents noted their greatest impact on lobster quality from the time lobster is received in their segment of the supply chain until it leaves their possession.

As the diagram demonstrates, "handling practices" were reported by all but a small number of respondents among the 20 respondents recorded, followed closely by "water quality". Specifically, "water temperature" was mentioned as a key measure of "water quality", with a small number (3) also mentioning "oxygen levels". Finally, "time out of water", including "live wells on vessels", were also mentioned by a number (6) of respondents.

Question 6

For each of the most important factors identified in Question 5 above, respondents indicated the method(s) or tools they use to measure and/or assess these important factors. The following diagram summarizes the key text responses provided by the 20 respondents:

As the diagram above demonstrates, methods used to measure lobster quality reported by many respondents included the importance of monitoring of water temperature, while some also measure oxygen in water using various tools, and BRIX blood protein measurement using a refractometer. The importance of handling lobsters carefully and as little as possible were a focus among the 20 survey respondents.

Question 7

Across the entire supply-chain, respondents indicated those factor(s) that have the greatest impact on lobster quality and mortality. Respondents were asked to specify which segment(s) of the supply-chain the factor applies to, and to include which point in the supply-chain has the greatest impact on live lobster quality and mortality.

As the diagram above demonstrates for this survey question, the majority of the 20 respondents noted that "handling" had the greatest impact on lobster quality and mortality, followed by the need to maintain good "water quality" throughout the supply chain (on boats, in intermediate and longer term storage), specifically temperature and oxygenation.

Question 8

Survey respondents described their processes for checking lobster for quality and mortality once it enters their possession in the supply chain. Respondents were asked to include descriptions of timing of checks, and typical sample sizes that are checked from shipments.

All Harvesters (14 of 19 respondents) reported a "visual check" was made on harvested lobsters from trap to boat, and boat to intermediate storage. These visual checks by Harvesters included specific processes for:
1) Manual feel of shell hardness or soft shell (reported by 10 out of 14 respondents as Harvesters);
2) Observation of lobster strength (reported by 6 respondents as Harvesters);
3) Visual checks for punctures (specifically reported by 5 respondents as Harvesters);
4) Visual check for sex and presence of eggs (specifically reported by 4 respondents as Harvesters);
5) Sampling (3-5 lobsters per crate) of blood protein (using a 'BRIX meter') (reported by 1 Harvester).

Respondents identifying as Buyers/Exporters (5 of 19 reported respondents) all reported on "grading" and "sorting" within 12 to 24 hours ("seasoning at facilities") after arrival at storage facilities. Specifically, these respondents also noted:
1) Lobsters were weighed on arrival and after 24 hours;
2) "Protein analysis" samples (from 1 of 50 crates) within 5 hours of arrival to "determine shelf life of the product";
3) Random daily checks of each storage tank water quality, full lobster grading for selected harvesters upon entry;
4) Lobsters subsequently checked for "damaged/dead/weak" lobster;
5) After 24 hours, checks also were made of water quality (ammonia, temperature, salinity).

Question 9

On a scale of 1 to 10, with 10 being excellent and 1 being poor, survey respondents were asked to estimate the average quality of lobster at the time it <u>enters their possession</u> in the supply chain. The 20 survey respondents provided the following average quality ratings counts:

| Rating	1	2	3	4	5	6	7	8	9	10	Average Rating
Response Counts	0	0	0	0	2	0	1	8	5	4	8.3
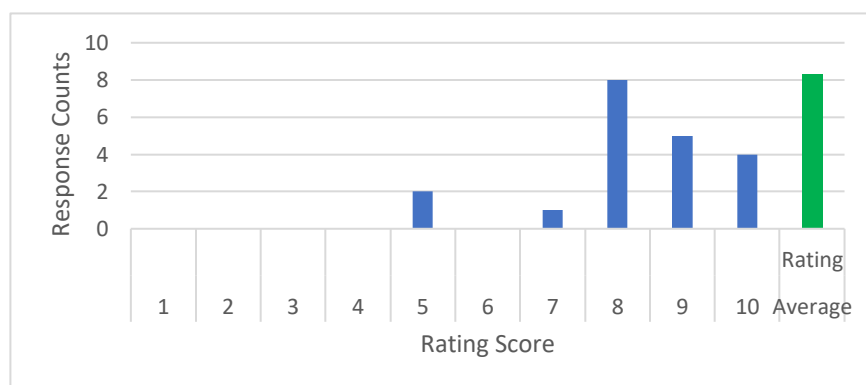
The majority of survey respondents (17 of 20) indicated a high (8 or greater) rating of lobster quality that they received in their segment of the supply chain. The remaining respondents (3 of 20) were Harvesters who assigned low ratings ("5","7") to catches. The overall weighted average rating of all 20 respondents exceeded 8 indicating a high level of received quality of lobster to their segment of the supply chain.

Question 10

Survey respondents estimated the percentage loss from mortality, on average, at the time the lobster <u>enters their possession</u> in the supply chain. Reported average mortality is that found by respondents once received from the previous segment of the supply chain, not including shrinkage/water weight loss. Responses from 19 of the 20 respondents indicated the following:

| Mortality Range	Counts
0%-1%	13
1%-3%	5
3%-5%	1
5%-7%	0
>7%	0
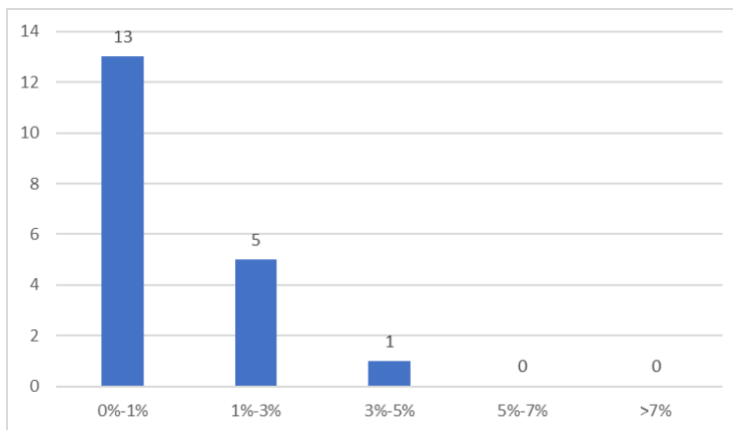
Respondents generally recognized the lowest level of indicated mortality (less than 1%) among lobster received to their segment of the supply chain. These results are consistent with the high quality ratings reported in Question 9 above. It is clear that lower lobster mortality along the supply chain is a concern among respondents. It is also acknowledged that even low level mortality along the supply chain can have cumulative effects that would reduce the value of live lobster shipments.

Question 11

On a scale of 1 to 10, with 10 being excellent and 1 being poor, survey respondents indicated the general quality of lobster at the time it <u>leaves their possession</u> in the supply chain. Responses from 19 of the 20 respondents gave these results:

| Rating	1	2	3	4	5	6	7	8	9	10	Weighted Average
Response Counts	0	0	0	0	0	1	1	6	6	5	8.6
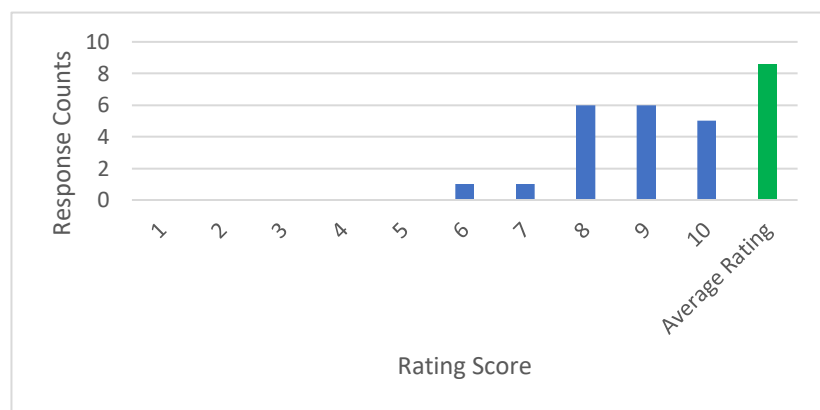
As for Question 9 above, the majority of survey respondents (17 of 19) indicated a high (8 or greater) rating of lobster quality that leaves their possession segment of the supply chain. The remaining respondents (2 of 19) were Harvesters who assigned low ratings ("6","7") to catches leaving their boats. The overall weighted average rating of all 19 respondents exceeded 8 indicating a high level of quality of lobster leaving their segment of the supply chain. It is notable that respondents indicate that the weighted average of lobster quality leaving their segment exceeds the weighted average of lobster quality entering their segment implying improbable quality improvement overall.

Question 12

Survey respondents estimated the percentage loss from mortality, on average, <u>from the time lobster is received until it leaves their possession</u> in in the supply chain. Reported average mortality is that found by respondents once received from the previous segment of the supply chain, not including shrinkage/water weight loss. Responses from the 20 respondents gave these results:

Mortality Range	Counts
0%-1%	14
1%-3%	6
3%-5%	0
5%-7%	0
>7%	0
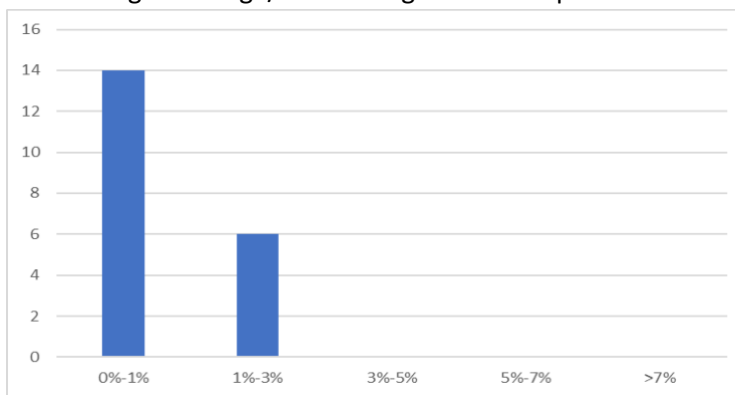
The majority of respondents (14 of 20) recognized the lowest level of indicated mortality (less than 1%) among lobster leaving their possession of their segment of the supply chain. It is clear that low lobster mortality along the supply chain is an expectation among respondents. It is also acknowledged that even low level mortality along the supply chain can have cumulative effects that would reduce the value of live lobster shipments.

Question 13

Respondents provided suggestions and additional information deemed to be helpful to improve live lobster quality, including any best practices, methods or tools you use and their results.

Among the 14 survey responses to this last question, survey respondents provided the suggestions and additional information categorized into 3 main topics:

1) *Grading* – reward/penalize harvesters for lobster quality including premiums for reduced stress and well-handled lobster for the live market; use a standardized grading system on the boat and grade before shipping;
2) *Storage* – keep lobsters cool; do not overcrowd; monitor temperature of water/air; consider caging systems for unbanded lobsters to keep separate; consider storing lobster in cooler natural ocean bottom waters not floating at surface and instead of closed tanks;
3) *Live Wells & Water Quality* – need for more education at the harvest level; handle lobsters less and with care and require good circulation with evenly displaced flow to eliminate dead zones; test facilities by checking water metrics randomly

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Please note:

Respondents were asked to provide their personal email address to receive this summary of the survey response results. However, due to restrictions of the survey software, the LQRIC organizers were not able to retain and identify survey respondents emails despite the voluntary completion of respondents emails that were retained and not provided to LQRIC. Consequently, while the survey respondents identies remain confidential, LQRIC organizers are not able to provide direct feedback to survey respondents. Measures will be taken to provide this report to NS Fisheries Associations and lobster companies from which the population of respondents come. It is nevertheless the intention of LQRIC to follow up with all interested parties to further the discussions on the determinants and the improvement of lobster quality in Nova Scotia. On behalf of LQRIC, thank you again for your support of this lobster quality initiative.