TITLE: Occupational Health and Safety Portrait of Lobster Fishers from a St. Lawrence' Gulf Community.

Running title: Lobster Fishers' Health and Safety

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Abstract

Lobstering industry workers are known to have poor overall health and low safety records, but there is still a gap in information concerning Canadian lobster fishers. To report occupational health and safety characteristics of an Atlantic Canada community of lobster fishers and to assess differences between captains and deckhands. Twenty-eight participants (10 captains, 18 deckhands) were questioned and self-reported on lifestyle, general health status, work-related musculoskeletal disorders and traumatic injuries. The data collected reveals both groups' high prevalence of cardiometabolic and musculoskeletal health issues. Captains reported more occupational exposition and health issues as well as showed poorer lifestyle habits than deckhands. Fishers reported potential solutions to reduce occupational risks, presented in three types: lifestyle, working behaviours and leadership. This study evaluated a community of Canadian lobster fishers regarding their occupational health and safety. Potential avenues for mitigating occupational risk specific to this community will nurture future implementation.

Keywords

Fishing, Physical activity, Risk factors, Cardiovascular diseases, Musculoskeletal disorders, Occupational injuries, Health promotion, Lifestyle habits.

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1. INTRODUCTION

Commercial fishing is an important industry to the Canadian economy and is vital for 1100 coastal communities [1]. In 2018, the annual value of landings exceeded 3.7 billion CAD$ and represented nearly 46,000 direct jobs (captains, deckhands) [1]. The fish and seafood processing industry depends on harvesting activity and represents a value of 6.6 billion CAD$ and nearly 27,000 jobs [1]. One of the biggest proportions is related to the lobstering industry which contributes to nearly 45% of the total landed value and is estimated to be worth over 1.4 billion CAD$ [1]. The lobstering industry is located on the Atlantic coast, which includes Nova Scotia (54.4 %), New Brunswick (20.6 %), Prince-Edouard Island (12.4%), Québec (8.3%), and Newfoundland-and-Labrador (3.3%) provinces (proportion of commercial landings value)[2].

As with many others, the flip side of this type of fishery is the high cost related to this hazardous occupation since they are known to have poor overall health and low safety records. In the United States of America (USA) as an example, the "fishing and hunting industry" has the highest rate of occupational death, which is nearly 10 times higher than police officers (132.1 vs. 13.4 fatalities per 100 000 workers, respectively) and 6 times more than agricultural workers (132.1 vs. 20.9 fatalities per 100 000 workers, respectively) [3]. In Canada, there are no centralized data comparing professions or industries. However, the Transportation Safety Board of Canada (TSB) reported 114 fishers' fatalities between 2011 and 2021 [4]. Also, a TSB's older report reveals that lobster fishing is associated with the largest number of fatalities, i.e. approximately 20 % of all fatalities reported between 1999-2010 [4]. It was documented that each fisher's death cost over 2 million CAD$ to the Canadian economy, but more importantly they directly impacted workers' families and the whole community [5].

In the USA, Fulmer's team published the most extensive studies of occupational health and safety (OHS) among lobster fishers from two Atlantic coastal states (Maine and Massachusetts)[6–8]. The incidence rates for all injuries were nearly 50 % (in full-time equivalent, FTE) of which 15 % required treatment [6,8]. Approximately 82 % of their lobster fishers' sample (n = 395) reported experiencing

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musculoskeletal pain in the past 3 months. Back (59.8 %), shoulder (38.5 %), hand/wrist (29.1%) and knee/shin (26.6 %) were the most frequent sites of reported pain. Interestingly, the authors compared captains and deckhands, and they observed a higher prevalence of pain among the captains for the past three months compared to their deckhands (84.5 % vs. 74.2 %, respectively)[6,8].

While Fulmer's studies shed light on occupational injury or musculoskeletal disorders of American Lobster fishers, it is hard to find comparable data in Canada. Indeed, there is no data centralization, and each province has its own OHS bills and rules. For instances, in New Brunswick, lobsters' fishers can be covered by personal insurance paid by himself or the captain through their professional association, while in Québec, they are covered through the public worker's compensation organization (i.e. Commission des normes, de l'équité, de la santé et de la sécurité du travail; CNESST). Nonetheless, it is possible to provide some insight related to occupational injuries. Lobstering was liable for nearly 21% of CNESST claims in the fishing industry between 2005-2015 [5], representing the first claim source in this workers' group. No nature or type of claimed injury was provided by the organization. The CNESST also reported that the average cost per injury claim for the lobster fishers was approximately 4 times higher than average workers' claims from other industries [5] (206 500 CAD$ vs. 52 000 CAD$, respectively). A lobster fisher that cannot work because of an occupational injury will be impacted financially but it will also have a social costs [9].

Considering the gap in information among Canadian lobster fishers, the objective of the current study was to explore the OHS characteristics of a St. Lawrence's Gulf community of lobstering fishers for captains and deckhands. In addition, it sought to identify solutions to reduce or help to prevent traumatic injury and musculoskeletal disorders.

2. MATERIALS AND METHODS

2.1 Design

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A cross-sectional observational-based design was adopted to achieve the objective of this project. A series of self-reported questionnaires was administered to the cohort after the 2022 lobstering season. This study received institutional research ethics board approval (CER-120-952).

2.2 Participants

The recruitment was done directly on the wharf of a North-Eastern Acadian community in New Brunswick (Canada) during the lobstering 2022 season, which comprised forty-three crews. This approach was used to facilitate the development of a trusting relationship between the crews and the research team. From that ten crews volunteered to participate in this project. Eight crews were formed of 1 captain and 2 deckhands, and two other crews with 1 captain and 3 deckhands. Within the 32 fishers initially interested, four deckhands decided to withdraw from the study. Thus, twenty-eight lobster fishers were participants (n = 1 female, 27 males) and were divided into two groups, according to their respective roles on the fishing boat (i.e. 10 captains, 18 deckhands). No participants were thereafter excluded. The demographic characteristics are presented in the results section.

2.3 Procedures

The data was collected on the phone when the participants deemed it appropriate. Each collection was performed confidentially and individually by the same researcher assuring that the data collection was performed consistently and reliably. Upon the phone call, each participant was briefed on the objective of the project and the data collection procedure. A researcher read the letter of information and the consent form. After answering the questions and providing verbal approval to participate in this project, the participant started a sixty-minute assessment.

2.4 Data collection

Participants self-reported all information collected, which was divided into eight questionnaires. Here is the detail of the questionnaires:

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1. The socio-demographic and professional questionnaire was the first questionnaire and asked questions about sex, age, years of experience and years of education. In addition, participants were asked about the number of weeks they worked during the lobstering season, the average hours per week they worked, how many days off (or rest day) they had, and how many traps they lifted on average per day.
2. In the second questionnaire, participants reported if they were suffering from diagnosed cardio-metabolic issues (high blood pressure, dyslipidemia or hypercholesterolemia, diabetes, high glycemia, …), respiratory issues (asthma, sleep apnea, emphysema, …), musculoskeletal issues (musculoskeletal disorders, arthritis, …), chronic pain, psychosocial issues (anxiety, depression, PTSD, …). They also reported if they were smokers or not (cigarette, e-cigarette), and if they used regular medications (prescribed or not) and their type of usage.
3. The third questionnaire was related to Framingham's non-laboratory-based equation validated by D'Agostino et al. [10]. This equation is based on seven parameters (sex, age, medications for high blood pressure, diabetes, smoking, body mass index (BMI), and systolic blood pressure) and provides a 10-year cardiovascular disease (CVD) risk categorized as low, moderate, and high.
4. The fourth questionnaire addressed sleep quality during the lobstering season and was assessed by the Pittsburgh Sleep Quality Index (PSQI). The PSQI evaluates seven aspects of sleeping (quality, latency, duration, efficiency, disturbances, medication, daytime dysfunction) and distinguishes two types of sleepers: poor and good. The PSQI was first introduced by Buysse et al. [11], where they validated the internal homogeneity, consistency, validity as well as the sensitivity and specificity.
5. The fifth questionnaire used Huet's equation [12] to estimate cardiovascular fitness level by prediction of the maximal oxygen uptake (VO^2 max). The equation used ten questions about physical practice (intensity, type, recurrency, duration, effort perception), practice history (as a teenager), smoking, weight, performance level history, and health conditions. The validity and reliability were measured by Trivel et al. [12]. Furthermore, an additional question was asked to

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the participants: "*Does the lobstering season impact your physical activity practice*?" There were five possible answers: "*continued*", "*increased*", "*decreased*", "*stopped*", "*already not practicing*".

6. The sixth questionnaire was the Nordic Questionnaire [13,14]. This questionnaire is a validated tool measuring the history of work-related musculoskeletal disorders (MSD) and their occupational impact in the last 12 months and in the last 7 days [13,14]. The questionnaire is divided by anatomical regions: neck, shoulder, elbow, hand, wrist, back (upper, lower), hip, thigh, knee, ankle and feet. Additionally, the participants were asked if they usually work despite MSD and which ones were caused by the lobstering activities as well as the causes of them.
7. For the seventh questionnaire, participants were asked to report the last five years of traumatic lobstering-related injuries related to a single event, including the body region, type of injury and its cause.
8. The eighth questionnaire was an open-ended question: "*What would you suggest to help reduce the risk of injury on board of lobster fishing boat (this includes but is not limited to accidents and difficult work tasks)? Or in other words, what advice would you give to someone starting on a lobster boat to avoid injury?* "

2.5 Data processing

All data from the questionnaires were recorded on paper and subsequently transferred electronically. Afterward, some data were computed to be categorized. More precisely, participants' BMI was calculated and categorized using Health Canada guidelines [15]. The data from Framingham's non-laboratory-based questionnaire was used to compute 10-year cardiovascular disease (CVD) risk [10]. Based on data from the Huet's questionnaire, an estimated VO^2 max was calculated following the equations of Huet [12]. Considering that the equations were validated on ergocycle, the categorization of participants' level of cardiovascular fitness was done according to ergocycle guidelines from the ACSM [16]. The guideline divided cardiovascular fitness into five levels (poor, fair, good, superior, excellent) categorized by age and sex. Accordingly to Buysse et al. [11], the data from Pittsburgh Sleep Quality Index (PSQI) questionnaires was used to compute and categorize sleep quality. After analyzing

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all participants' answers to the open-ended question (suggestions about how to reduce the risk of injury), it was decided to group the data into three categories: lifestyle habits, behaviours adopted during lobstering activity and leadership.

2.6 Descriptive statistics

The data were divided into two groups: captains and deckhands. Demographic characteristics are presented using the spread (m ± SD). Descriptive statistics were also used to describe the prevalence (number of individuals (n) and its proportion (%)) and distribution of the occupational health and injury characteristics.

3. RESULTS

3.1 Socio-demographic and professional

Twenty-eight lobstering fishers were divided into two groups according to their role. The first group was ten male captains aged 54.1 ± 9.9 years with 23.3 ± 12.0 years of experience as captains and they had been 31.5 ± 14.7 years in the lobstering industry. The second group was eighteen deckhands where seventeen were males and one participant was female. The deckhands' age and years of experience were 41.0 ± 11.6 years and 14.9 ± 8.1 years, respectively. Table 1 presents the socio-demographic and professional characteristics of the cohort.

In 2022, the lobster fishing area 23 was open from May 3rd until June 30th (59 days). The cohort reported for this season that captains and deckhands' groups have worked on average, respectively, 63.5 ± 8.8 hours and 64.7 ± 8.7 hours per week (7 days per week). Also, both groups reported having taken, respectively, 1.6 ± 0.9 days off and 1.9 ± 1.1 days off for the whole season. Most of the days off were forced by weather and dangerous navigation conditions. The captain at the wharf decides to take a day off, which means that the crew must be gathered at the fishing boat while the captains decide, and then return home for the rest of the day. Two deckhands have taken longer time off (2 additional days) because of sickness absences. One crew (1 captain, 2 deckhands) had stopped for a couple of

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197 additional days because of a mechanical problem (boat). Each captain stated that they used 300 traps
198 daily (quota restricted by Fisheries and Oceans Canada; DFO, 2022). Approximately 80 % of both groups
199 had at least another job outside of the lobstering season, whereas 75 % of captains (who worked
200 outside of the lobstering season), worked in other fisheries compared to 44.4 % of the deckhands.

201 3.2 General Health

202 Table 2 presents the BMI distribution among that cohort of lobster fishers and shows that 80.0 % of
203 the captains were overweight or obese compared to 66.7 % of the deckhands. The average BMI was
204 similar between both groups (28.0 ± 3.3 kg/m^2 and 27.5 ± 3.9 kg/m^2, respectively). Table 3 reveals a
205 higher prevalence of self-reported health issues (cardiometabolic, respiratory, musculoskeletal,
206 psychosocial, chronic pain) among the captains' group. More precisely, the results show that 50 % of
207 the captains' group had a moderate to high risk of developing CVDs in the next 10 years compared to
208 30 % of the deckhands' group (Table 4). Table 5 shows that the percentile of the estimated VO^2 max
209 was also higher for the deckhand group than captains (84.7 ± 8.7 vs. 68.0 ± 19.4 percentile,
210 respectively). More precisely 83.3 % of the deckhands' group had VO^2 max superior to excellent
211 compared to 40.0 % of the captains' group.

212 3.3 Lifestyle Habits

213 There was a higher prevalence of smokers among the deckhands' group (22.2 % vs 10.0 %) (Table 3).
214 Table 6 presents that the captain group has a higher prevalence of poor sleep quality than the
215 deckhands' group (50.0 % vs. 33.3 %). Table 7 presents the physical activity habits of both groups and
216 shows that the deckhands' group was more physically active during and out of the lobstering season
217 than the captains' group (88.9 % vs. 50.0 %).

218 3.4 Musculoskeletal issues

219 The data from two types of musculoskeletal issues were collected, traumatic injuries and MSDs (Table
220 8). No injury was self-reported for the 2022 fishing season among both groups. Nonetheless, one-third

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of the participants were injured in the last five years (Table 9). Despite that no specific cause of injury was found, it seems that hand/wrist and thigh were affected for both groups. Most of the cohort suffered from MSD while working during the lobstering season. More precisely captains seem to suffer more from MSD than the deckhands' group (90.0 % vs. 66.7 %). Captains had a high prevalence (≥ 40.0 %) of shoulder, back and neck issues compared to deckhands with hand and back issues. Forty percent of the captain group reported having at least one MSD caused by lobstering duty and it was 22.2 % for the deckhands' group. Among these participants, one captain had MSDs caused by awkward postures while steering the fishing boat. Three captains and one deckhand had reported issues caused by repeated motion while handling the lobsters and other species. Two deckhands reported that awkward postures while handling gaff, trawl line and buoy or when using high force while pulling traps were the causes of MSDs. One deckhand reported that standing up on a moving fishing boat was the cause of his MSD.

Table 10 presents the summary of answers related to the questions "*how to prevent or reduce the risk of injury and musculoskeletal disorders among lobstering fishers?*". It is possible to divide all the answers collected into three categories. The first category was the most answered among the cohort (100.0 %) and was related to lifestyle habits. More precisely, it was found that all captains and 83.3 % of the deckhands' group consider that an adequate physical condition could help to reduce the risk of injury or MSD. Thirty percent of the captains and 50.0 % of the deckhands' group identified that fitness level must be maintained or enhanced. Four means have been reported by the fisher's cohort: staying physically active all year, participating in a pre-season workout (one to three months prior to the lobstering season), doing strength and cardio workouts (all year or pre-season workout) and performing warm-up routines (stretching and mobility exercises) on the fishing boat during the first transit (from the wharf to the first series of traps).

In the second category, 50.0 % of the captain and 44.4 % of the deckhands' groups suggested behaviours to be adopted during lobstering activities to reduce the risk of traumatic injuries and MSDs.

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246 The third category was suggested by 30.0 % of the captains and 77.7 % of the deckhands' group where
247 leadership enhanced had been suggested (for captains and deckhands). The item "captain
248 responsibilities" referred more to a "cause" than to a solution to enhance the safety on board, where
249 the captains must have good navigation skills and decision-making processes such as managing harsh
250 weather and working pace in a moving environment. Moving trap lines which is a decision made by
251 the captain, to take on board traps and move them to another area to evaluate, if it would be more
252 productive, was also identified as a risky situation traps are stacked on deck, thus reducing the working
253 area and increasing the risk of falling traps once they are pilled-up.

254 ## 4. Discussion

255 The data collected provides an occupational health and safety portrait of a lobster fisher's community
256 in the St-Lawrence Gulf (within an Acadian community from North-Eastern New Brunswick). Overall,
257 the data reveal that lobster fishers had a high prevalence of cardiometabolic and musculoskeletal
258 health issues (60.7 % and 75.0%, respectively). Three-quarters of the lobster fishers reported working
259 with musculoskeletal pain or discomfort during the lobstering season in 2022, and a third of the fishers
260 reported having a work-related traumatic injury in the past five years. More specifically captains
261 reported suffering from more health issues and showed poorer lifestyle habits than the deckhands,
262 but both groups showed a similar prevalence of traumatic injury related to lobstering.

263 Considering the lack of research in this area, comparing our findings with other studies remains
264 difficult. Nonetheless, it is possible to rely on common trends with lobster fishers from the Maine and
265 Massachusetts states in the USA [6–8]. In fact, Fulmer et al. [7] evaluated the musculoskeletal health
266 of a large number of lobster fishers' cohort (n=395) that is comparable to our sample in terms of years
267 of age, experience, and difference between captains and deckhands regarding years of age and
268 experience. We observed a higher prevalence of musculoskeletal disorders (MSDs) when the
269 participants worked (i.e.: felt in the past seven days) than in Fulmer's study (75% vs 60%). However,
270 the same trend appears where deckhands are more afflicted with hand/wrist and back issues than

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captains, and captains reported more neck problems than deckhands. These similarities and disparities are understandable between both studies (Fulmer et al. [7] and the current study) considering that the same occupational activity but performed in different contexts. Compared to Canada, in the USA, there is no lobstering season per se, the lobstering is practiced across the year. Indeed, In the USA, there is no lobstering season per se and the lobstering is practiced across the year. Assuming that a quarter is 62.5 days, USA lobster fishers (Maine, Massachusetts) work approximately 383 hours in their higher quarter (summer) [6,8]. In Canada, in the lobster fishing area 23, 2022 season was established to 59 days. Of these, our cohort had worked 57 days, approximately 9 hours per day, which represent a total of 513 hours for the spring quarter. Therefore, it appears that the Canadian lobstering context is performed more likely in an intensive way. Consequently, it might explain why the current cohort presents a higher prevalence of MSDs. Despite the lobstering periods, there are regional differences among the equipment and techniques used. Anecdotally, during the data collection, some fishers reported differences in the lobster fishing industry. For instance, no generic hauler is used, and each fishing boat uses its own hauling system. More studies would be useful to understand the impacts of diverse lobstering practices on the musculoskeletal health of lobster fishers, and on its optimization in order to reduce this high prevalence of MSDs.

Furthermore, the result of the current study highlights the occupational health differences among captains and deckhands. As mentioned earlier, captains showed poor health and lifestyle habits, which might be explained by higher age, year of experience (or total occupational exposition), and high level of responsibilities [6,8]. It is well-known and documented that age and total occupational exposition (year of experience) are associated with an increased risk of developing or amplifying existing health issues (musculoskeletal, cardiometabolic). Even though the current study did not directly assess the influence of responsibilities, it is more likely to assume that the captains, who are self-employed workers running a business, are more inclined to have poor health issues and lifestyle habits. In fact, it is documented that self-employment is associated with a greater risk of developing or amplifying cardiovascular and psychosocial issues as well as sleep disturbances than the employees

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297 (deckhands)[17,18]. In addition, Lee et al. [18] observed an increased risk of psychosocial issues over
298 50 years old, which is the average age of the current captain's group. Whether it is the captain's health
299 or the impact of the captain's responsibilities on the crew's safety, they are a lack of interest from the
300 researchers.

301 Deckhands reported better health status than captains as well as they reported fewer health issues
302 and healthier lifestyle habits. Outside of the lobstering season, nearly 90 % of the deckhands' group
303 practiced physical activity regularly, and more than half added their practice close to the World Health
304 Organization (WHO) adults' recommendations of; "*[…] at least 150–300 minutes of moderate-intensity*
305 *or at least 75–150 minutes of vigorous-intensity aerobic physical activity […] and also muscle-*
306 *strengthening activities at a moderate or greater intensity that involve all major muscle groups on 2 or*
307 *more days a week*" [19]. The practice of regular physical activities is known to reduce the risk of chronic
308 health conditions [19], which might help to explain why deckhands reported fewer health issues.
309 Nonetheless, the most likely reason might be related to traumatic injury and MSD prevention. The
310 deckhands' answers appear related and consistent between physical activity practice and the best way
311 to prevent traumatic injury and MSD questionnaires, where deckhands reveal that they regularly
312 practice physical activity and recommend the practice of physical activity to reduce the risk of
313 traumatic injury and MSD. Thus, it seems that the prevention of health conditions was, fortunately, a
314 side effect. Promoting physical activity practice among lobster fishers must be encouraged, using a
315 social marketing approach per se [20]. The promotion must include open access to training programs
316 (i.e. structured strength and cardiovascular exercises) tailored to the occupational demands.

317 Traumatic injuries and MSDs are an important part of the OHS risk in lobster fishers. Previously, it was
318 explored that the practice of physical activity appears to influence the risk positively (by reducing it)
319 [19]. Nevertheless, the recommendations of lobster fishers also covered the adoption of behaviours
320 and leadership on the fishing boat. The behaviours category can be perceived as safety behaviours that
321 need to be adopted by deckhands to stay safe and the general attitude toward the deckhand

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professions (acceptance of the job' context, job satisfaction). The recommendations of being focused and aware were related to the prevention of traumatic injuries while lifting without exertion and asking for help were more related to the prevention of MSDs. The "taking your time" recommendation was oriented to both (i.e. traumatic injury, MSD). Either way, based on these recommendations, there is limited influence on the causes of work-related injury and MSDs. However, the leadership category might raise some explanations and ways to prevent further work-related injuries and disorders.

Most of the leadership category recommendations were toward the captain, even though the teamworking was oriented within the whole crew. According to the answers, captains have an important part in the OHS of the crew. Captains are responsible for adequately training their employees, ensuring the equipment's maintenance and improvement, providing the necessary resting time, and acquiring adequate navigation skills. Moreover, captains make difficult decisions that impact the crew's safety, like, moving trap lines. To do so, deckhands must take on board the traps and stack them up on deck, increasing the risk of falling traps. In fact, this specific event occurred to a deckhand who was a participant in this study. Captains play an important role in the occupational safety of their crew, however, responsibilities it also shared, where all the responsibilities do not stand alone to the captains, but also to the whole crew. Even though captains significantly impact safety on board, some workers might perceive changes as challenging. For example, a captain who wanted to reduce musculoskeletal discomfort related to repetitive motions suggested a rotation in duty stations among his deckhands, who rejected the idea. Occupational health and safety develops along a non-linear path, where captains and deckhands are partners. It is essential to continue the research to better understand the influence of each partner in this endeavour, but also to help tailor interventions toward lobster fishers' realities.

A knowledge transfer process combined with a human-centered design approach could facilitate the co-construction of health interventions with local stakeholders that are better tailored to their realities [21]. By relying on the use of techniques that enable the people involved to communicate, interact,

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empathize and stimulate, the human-centered design approach is a creative problem-solving framework that allows an understanding of needs, desires and experiences that often goes beyond what the people themselves have realized in relation to the problem to be solved [22]. In a future project, we would like to explore how the combination of knowledge transfer and human-centered design can facilitate the development of occupational health and safety interventions from a perspective by, for and with lobster fishers.

4.1 Limitations

The data were collected from questionnaires, thus it was a self-reported perception. Considering that the responses were obtained during telephone interviews, a social desirability bias can also be present. However, due to the number of questionnaires to be completed in this research, and the potential of low literacy level of some participants, it would have been difficult to use self-administered questionnaires which would have reduced the occurrence of social desirability bias [23]. In addition, objective and direct measurements should be performed in further study to confirm our observations.

There was only one woman, therefore preventing us from portraying a more accurate depiction of the work-related risk of injuries and MSDs for females in the lobster industry. This portrait of a North-Eastern Acadian community in New Brunswick is only a piece of the Canadian puzzle since other fishing communities display different challenges due to the heterogeneity of the population, work-related skills, boat and equipment used, navigation and geographical context, lobster habitats and environment as well as federal and provincial regulations.

The small sample limits also the generalizability of our results. This study is, however, part of a long-term perspective, as in subsequent phases we intend to co-construct, implement and evaluate occupational health and safety interventions in the same setting. The results of this study will therefore serve as a baseline for evaluating the effectiveness of future interventions.

5. Conclusions

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To our knowledge, this study was the first evaluation of occupational health and safety among Canadian lobster fishers. More importantly, it has highlighted potential interventions to reduce the health and safety burden among these communities. Since the challenges and solutions are brought up by the community, it is more likely that an intervention may be implemented by and for them. By having such a substantial economic benefit for Canada, we should also seek to develop and implement successful ergonomic and public health interventions to take care of these fishing communities more broadly.

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391 REFERENCES

392 [1] Chalupovitsch M, Lafrance D, Nguyen T, Library of Parliament. Statistics For Canada's 2018
393 Commercial Fisheries. Libr Parliam HillNotes Quick Reads Can Top 2020.
394 https://hillnotes.ca/2020/06/01/statistics-for-canadas-2018-commercial-fisheries/ (accessed
395 May 31, 2023).
396 [2] Government of Canada, Fisheries and Oceans Canada. 2018 Value of Provincial Commercial
397 Landings. Seafisheries Landed Value Prov 2018 2022. https://www.dfo-
398 mpo.gc.ca/stats/commercial/land-debarq/sea-maritimes/s2018pv-eng.htm (accessed May 31,
399 2023).
400 [3] USAFact. How many police officers die in the line of duty? USAFacts 2022.
401 https://usafacts.org/articles/how-many-police-officers-die-in-the-line-of-duty/ (accessed May
402 31, 2023).
403 [4] Transportation Safety Board of Canada (TSB). Statistical summary: Marine Transportation
404 Occurrences in 2021. Government of Canada; 2022.
405 [5] Pérusse M, Cadieux J, Lebeau M, Fecteau R, Francoeur L-A, Dufresne Dubé V, et al. Cap sur la
406 prévention : Vers le développement d'une culture de sécurité dans l'industrie de la capture des
407 pêches maritimes commerciales. Rimouski (QC): Comité permanent sur la sécurité des bateaux
408 de pêche du Québec (CPSBPQ); 2020.
409 [6] Fulmer S, Buchholz B, Jenkins P, Scribani M. Work-Time Exposure and Acute Injuries in Inshore
410 Lobstermen of the Northeast United States (Corrigendum). J Agromedicine 2017;22:185–185.
411 https://doi.org/10.1080/1059924X.2017.1304789.
412 [7] Fulmer S, Buchholz B, Scribani M, Jenkins P. Musculoskeletal Disorders in Northeast Lobstermen.
413 Saf Health Work 2017;8:282–9. https://doi.org/10.1016/j.shaw.2016.12.004.
414 [8] Fulmer S, Buchholz B, Jenkins P, Scribani M. Work-Time Exposure and Acute Injuries in Inshore
415 Lobstermen of the Northeast United States. J Agromedicine 2016;21:190–9.
416 https://doi.org/10.1080/1059924X.2016.1143431.

This manuscript has been published and is available in the:
International Journal of Occupational Safety and Ergonomics (JOSE);
DOI:10.1080/10803548.2024.2366634.

[9] Marshall SW, Kucera K, Loomis D, McDonald MA, Lipscomb HJ. Work related injuries in small scale commercial fishing. Inj Prev 2004;10:217–21. https://doi.org/10.1136/ip.2003.005058.

[10] D'Agostino RB, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. Circulation 2008;117:743–53. https://doi.org/10.1161/CIRCULATIONAHA.107.699579.

[11] Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193–213. https://doi.org/10.1016/0165-1781(89)90047-4.

[12] Trivel D, Calmels P, Léger L, Busso T, Devillard X, Castells J, et al. Validity and reliability of the Huet questionnaire to assess maximal oxygen uptake. Can J Appl Physiol Rev Can Physiol Appl 2004;29:623–38. https://doi.org/10.1139/h04-040.

[13] Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 1987;18:233–7.

[14] Dickinson CE, Campion K, Foster AF, Newman SJ, O'Rourke AM, Thomas PG. Questionnaire development: an examination of the Nordic Musculoskeletal questionnaire. Appl Ergon 1992;23:197–201.

[15] Health Canada. Canadian Guidelines for Body Weight Classification in Adults: Quick Reference Tool for Professionals 2003.

[16] Liguori G, American College of Sports Medicine (ACSM). ACSM's Guidelines for Exercise Testing and Prescription. 11th ed. Wolters Kluwer; 2021.

[17] Krittanawong C, Kumar A, Wang Z, Baber U, Bhatt DL. Self-employment and cardiovascular risk in the US general population. Int J Cardiol Hypertens 2020;6:100035. https://doi.org/10.1016/j.ijchy.2020.100035.

This manuscript has been published and is available in the:
International Journal of Occupational Safety and Ergonomics (JOSE);
DOI:10.1080/10803548.2024.2366634.

[18] Lee Y, Lee J, Kim U-J, Han E, Ham S, Choi W-J, et al. Analysis of self-reported mental health problems among the self-employed compared with paid workers in the Republic of Korea. Ann Occup Environ Med 2022;34:e8. https://doi.org/10.35371/aoem.2022.34.e8.

[19] World Health Organization (WHO). Physical activity. WHO Newsroom Fact Sheets 2022. https://www.who.int/news-room/fact-sheets/detail/physical-activity (accessed May 31, 2023).

[20] Goethals L, Barth N, Hupin D, Mulvey MS, Roche F, Gallopel-Morvan K, et al. Social marketing interventions to promote physical activity among 60 years and older: a systematic review of the literature. BMC Public Health 2020;20:1312. https://doi.org/10.1186/s12889-020-09386-x.

[21] Bergeron DA, Rey L, Murillo Salazar F, Michaud AM, Ccaniahuire Laura F. An ounce of prevention is worth a pound of cure—the arts as a vehicle for knowledge translation and exchange (KTE) in public health during a pandemic: a realist-informed developmental evaluation research protocol. BMJ Open 2022;12:e058874. https://doi.org/10.1136/bmjopen-2021-058874.

[22] Giacomin J. What Is Human Centred Design? Des J 2014;17:606–23. https://doi.org/10.2752/175630614X14056185480186.

[23] Krumpal I. Determinants of social desirability bias in sensitive surveys: a literature review. Qual Quant 2013;47:2025–47. https://doi.org/10.1007/s11135-011-9640-9.

This manuscript has been published and is available in the:
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459 TABLES

460 Table 1. Self-reported socio-demographic and professional characteristics among a cohort of 28
461 lobster fishers.

Categories	Group Captains (n = 10) n (%)	 Deckhands (n = 18) n (%)
Age [years]		
Average (m ± SD)	54.1 ± 9.9	41.0 ± 11.6
< 30	0 (0.0)	6 (33.3)
31–40	1 (10.0)	1 (5.6)
41–50	4 (40.0)	6 (33.3)
51–60	1 (10.0)	3 (16.7)
>60	4 (40.0)	2 (11.1)
Education [years]		
Average (m ± SD)	11.3 ± 2.1	11.8 ± 1.5
≤ 6 (elementary)	0 (0.0)	0 (0.0)
7–9 (middle school)	3 (30.0)	2 (11.1)
10-12 (high school)	5 (50.0)	8 (44.4)
>12 (college, university)	2 (20.0)	8 (44.4)
Professional experience		
Lobstering [years]		
Average (m ± SD)	31.5 ± 14.7	14.9 ± 8.1
≤ 5	2 (20.0)	5 (27.8)
6–15	0 (0.0)	6 (33.3)
16–25	2 (20.0)	4 (22.2)
26-35	2 (20.0)	1 (5.6)
>35	4 (40.0)	1 (5.6)
As captain [years]		
Average (m ± SD)	23.3 ± 12.0	
≤ 5	3 (30.0)	
6–15	0 (0.0)	NA
16–25	4 (40.0)	
26-35	1 (10.0)	
>35	2 (20.0)	
Hebdomadary working (7 days)		
Average [hour/week] (m ± SD)	63.5 ± 8.8	64.7 ± 8.7
≤ 45	1 (10.0)	2 (11.1)
46–55	3 (30.0)	3 (16.7)
56–65	1 (10.0)	5 (27.8)
66–75	5 (50.0)	5 (27.8)
>75	0 (0.0)	3 (16.7)
Day off during whole lobstering season [day]		
Average (m ± SD)	1.6 ± 0.3	1.9 ± 0.3
1-2	9 (90.0)	14 (77.8)
3-4	0	2 (11.1)
5-6	1 (10.0)	2 (11.1)
Other jobs outside lobstering		
Yes	8 (80.0)	15 (83.3)
No	2 (20.0)	3 (16.7)

Note. n = number of individuals; % = percentage based on the group; NA = non-applicable.

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463 Table 2. Distribution of BMI among a cohort of 28 lobster fishers.

		Group	
		Captains (n = 10)	Deckhands (n = 18)
Classification BMI	(kg/m^2)	n (%)	n (%)
Normal weight	18.5 – 24.9	2 (20.0)	5 (27.8)
Overweight	25.0 – 29.9	4 (40.0)	7 (38.9)
Obese class I	30.0 – 34.9	4 (40.0)	6 (33.3)

Note. n = number of individuals; % = percentage based on the group. Classification of Body Mass Index (BMI) is based on: Health Canada. Canadian Guidelines for Body Weight Classification in Adults: Quick Reference Tool for Professionals. 2003.

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466 Table 3. Self-reported health characteristics among a cohort of 28 lobster fishers.

	Group	
	Captains (n = 10)	Deckhands (n = 18)
	n (%)	n (%)
Cardiometabolic issues	8 (80.0)	9 (50.0)
- High blood pressure (HBP)	*3 (30.0)*	*4 (22.2)*
- Dyslipidemia/hypercholesterolemia (lipidemia)	*3 (30.0)*	*1 (5.6)*
- High glycemia	*0 (0.0)*	*1 (5.6)*
Respiratory issues	3 (30.0)	4 (22.2)
- Asthma	*2 (20.0)*	*2 (11.1)*
- Sleep apnea	*1 (10.0)*	*2 (11.1)*
Musculoskeletal issues	9 (90.0)	12 (66.7)
- Musculoskeletal disorders	*9 (90.0)*	*12 (66.7)*
- Arthritis	*1 (10)*	*1 (5.6)*
Chronic pain	3 (30.0)	4 (22.2)
Psychosocial issues	3 (30.0)	3 (16.7)
- Anxiety disorders	*3 (30.0)*	*3 (16.7)*
Smoker	1 (10.0)	4 (22.2)
Medication	8 (80.0)	8 (44.4)
- HBP	*3 (30.0)*	*4 (22.2)*
- Lipidemia	*1 (10.0)*	*0 (0.0)*
- Pain	*3 (30.0)*	*2 (11.1)*
- Anxiety	*2 (20.0)*	*2 (11.1)*
- Sleep	*4 (40.0)*	*3 (16.7)*
- Asthma	*2 (20.0)*	*0 (0.0)*
- Gastric	*1 (10.0)*	*1 (5.6)*

Values presented: n = number of individuals; % = percentage based on the group.

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Table 4. 10-year cardiovascular disease (CVD) risk among a cohort of 28 lobster fishers.

	Group	
	Captains (n = 10)	Deckhands (n = 18)
Risk Level	n (%)	n (%)
Low	3 (30.0)	9 (50.0)
Moderate	3 (30.0)	6 (33.3)
High	4 (40.0)	3 (16.7)

Note. The risk was computed from Framingham's non-laboratory-based equation (D'Agostino et al. 2008). Values presented: n = number of individuals; % = percentage based on the group.

Table 5. Categorization of the estimated VO^2max among a cohort of 28 lobster fishers

	Group	
	Captains (n = 10)	Deckhands (n = 18)
Categories	n (%)	n (%)
Poor	1 (10.0)	0 (0.0)
Fair	2 (20.0)	1 (5.6)
Good	3 (30.0)	2 (11.1)
Superior	1 (10.0)	5 (27.8)
Excellent	3 (30.0)	10 (55.6)

Note. The estimated VO^2 max was based on Huet's equation (Trivel et al. 2004). The categories of estimated VO^2 max came from the ACSM (2022). Values presented: n = number of individuals; % = percentage based on the group.

Table 6. Sleep quality during the lobstering season among a cohort of 28 lobster fishers

	Group	
	Captains (n = 10)	Deckhands (n = 18)
Categories	n (%)	n (%)
Poor sleep quality	5 (50.0)	6 (33.3)
Good sleep quality	5 (50.0)	12 (66.7)
Somnolence issues at work	4 (40.0)	4 (22.2)
Sleep time (hours) (m ± SD)	6.45 ± 1.25	6.56 ± 1.05
4h00–5h59	4 (40.0)	5 (27.8)
6h00–7h59	4 (40.0)	9 (50.0)
8h00–9h59	2 (20.0)	4 (22.2)
Bedtime (24 hours) (m ± SD)	20.5 ± 0.90	20.5 ± 1.08
18h00–19h59	3 (30.0)	4 (22.2)
20h00–21h59	5 (50.0)	10 (55.6)
22h00–24h00	2 (20.0)	4 (22.2)
Wake-up time (24 hour) (m ± SD)	2.95 ± 0.51	3.03 ± 0.48
1h00–1h59	0 (0.0)	1 (5.6)
2h00–2h59	4 (40.0)	5 (27.8)
3h00–4h00	6 (60.0)	12 (66.7)
Sleep apnea	1 (10)	2 (11.1)
Sleep medication (prescribed or not)	4 (40.0)	3 (16.7)

Note. The Pittsburgh Sleep Quality Index (PSQI) assesses the sleep quality.
Values presented: n = number of individuals; % = percentage based on the group.

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Table 7. Self-reported physical activity practice based on Huet's questionnaire (Trivel et al. 2004) among a cohort of 28 lobster fishers.

	Group	
	Captains n (%)	Deckhands n (%)
Impact of the lobstering season on physical activity	*n = 10*	*n = 18*
Continued practice	2 (20.0)	4 (22.2)
Increased practice	0 (0.0)	0 (0.0)
Decreased practice	0 (0.0)	5 (27.8)
Stopped practice	3 (30.0)	7 (38.9)
Inactive	5 (50.0)	2 (11.1)
Physical activity performed	*n = 5*	*n = 16*
Types of activities		
- *Walk*	3 (60.0)	8 (50.0)
- *Tai chi*	1 (20.0)	0 (0.0)
- *Strength training*	1 (20.0)	9 (56.3)
- *Aerobic training (boxing, elliptical, running)*	1 (20.0)	8 (50.0)
- *Unspecified*	0 (0.0)	3 (18.8)
Perception of intensity		
- *Easy*	3 (60.0)	4 (25.0)
- *More and less difficult*	1 (20.0)	6 (37.5)
- *Difficult*	1 (20.0)	6 (37.5)
Duration		
- *Less than 30 minutes*	0 (0.0)	0 (0.0)
- *30 to 45 minutes*	1 (20)	2 (12.5)
- *45 to 60 minutes*	0 (0.0)	0 (0.0)
- *Over 60 minutes*	4 (80.0)	12 (66.7)
- *Unspecified*	0 (0.0)	2 (12.5)
Recurrency		
- *1-2 times per week*	0 (0.0)	1 (6.3)
- *3-4 times per week*	0 (0.0)	6 (37.5)
- *More than 5 times per week*	5 (100.0)	7 (43.4)
- *Unspecified*	0 (0.0)	2 (12.5)

Note. For the questions related to physical activity practiced outside of the lobstering season, the proportions were calculated based on the number of individuals participating in physical activity. Values presented: n = number of individuals; % = percentage based on the group.

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Table 8. Work-related musculoskeletal disorders (MSD) among a cohort of 28 lobster fishers.

	Individuals who reported working with MSD n (%)	Body regions n (%)		Individuals who reported working with MSD caused by the lobstering n (%)	Body regions n (%)		Causes
Captains (n = 10)	9 (90.0)	Neck:	5 (55.6)	4 (40.0)	Neck:	1 (25)	Awkward posture while steering the boat
		Shoulder:	6 (66.7)		Shoulder:	2 (50)	Awkward posture while steering the boat
		Elbow:	2 (22.2)				Unknown
		Hand:	3 (33.3)		Hand:	3 (75)	Repeated motion (handling lobster, fish)
		Back:	6 (66.7)		Back:	1 (25)	Awkward posture while steering the boat
		Knee:	3 (33.3)		Knee:	1 (25)	Awkward posture while steering the boat
		Foot:	2 (22.2)				
Deckhands (n = 18)	12 (66.7)	Neck:	2 (16.7)	4 (22.2)	Neck:	1 (20)	Awkward posture while handling gaff, trawl line and buoy
		Shoulder:	4 (33.3)				
		Elbow:	2 (16.7)		Shoulder:	1 (20)	Awkward posture while handling gaff, trawl line and buoy
		Hand:	6 (50.0)				
		Back:	5 (41.6)		Elbow:	1 (20)	Repeated motion (handling lobster, fish)
		Hip:	2 (16.7)		Hand:	1 (20)	Repeated motion (handling lobster, fish)
		Knee:	3 (25.0)		Back:	2 (40)	Awkward posture while handling gaff, trawl line and buoy
		Foot:	4 (33.3)				Awkward posture and high force while pulling traps
					Foot:	1 (20)	Standing up on a boat in motion

Note. Musculoskeletal disorders are developed through chronic, repetitive movements or cumulative trauma of bodily reaction, daily exposure to whole-body vibration and/or overexertion in work-related tasks (Centers for Disease Control and Prevention (CDC), 2018; CCOHS, 2019). Values presented: n = number of individuals; % = percentage based on the group.

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Table 9. Last 5-years of work-related injuries among a cohort of 28 lobster fishers.

	Individual n (%)	Body regions	Types	Causes
Captains (n = 10)	3 (30.0)	Wrist Hand Thigh	Fracture Crushed Torn muscle	Slip and fall on deck Jammed equipment (hauler) Excessive effort while steering
Deckhands (n = 18)	5 (27.8)	Head Eye Hand (n = 2) Thigh	Concussion Laceration Laceration (n = 2) Torn muscle	Slip and fall on deck Whipped by a rope Lobster handling (n= 2) Fallen trap

Note. Injuries are due to an event (accident), where each injury occurred to a different fisher.
Values presented: n = number of individuals; % = percentage based on the group.

Table 10. The themes answered related to the strategies suggested to help to reduce the risk of musculoskeletal injuries and disorders among 28 lobstering fishers.

	Group	
	Captains (n = 10) n (%)	Deckhands (n = 18) n (%)
Lifestyle habits		
- Being active (all year)	5 (50.0)	8 (44.4)
- Fitness level	3 (30.0)	9 (50.0)
- Pre-season workout	4 (40.0)	6 (33.3)
- Strength and cardio workout	2 (20.0)	9 (50.0)
- Warm-up routine (workday)	1 (10.0)	4 (22.2)
- Well rested (sleep, no alcohol)	2 (20.0)	1 (5.6)
- Weight management (food intake)	1 (10 .0)	1 (5.6)
- Nothing special to do	0 (0.0)	3 (16.7)
Behaviours adopted during occupational activity		
- "Being focused on the task"	1 (10.0)	2 (11.1)
- "Being aware of …" (environment, equipment, tasks, colleagues)	1 (10.0)	2 (11.1)
- "Take your time doing your tasks"	1 (10.0)	1 (5.6)
- Doing the heavy lifting without overexertion	2 (20.0)	3 (16.7)
- Asking for help	0 (0.0)	1 (5.6)
- Accepting the demands and difficulty of the job (tasks, work shift, early morning, long hours, few rest days, high level of difficulty, moving and restricted environment)	1 (10.0)	2 (11.1)
- Enjoying the job	0 (0.0)	1 (5.6)
Leadership		
- Teamwork	0 (0.0)	2 (11.1)
- Training and learning curve	0 (0.0)	3 (16.7)
- Equipment (maintenance, improvement)	2 (20.0)	3 (16.7)
- Rest day (one day off once a week)	0 (0.0)	3 (16.7)
- Captain responsibilities (navigation skills, weather, working pace, trap moving)	2 (20.0)	6 (33.3)

Note. Values presented: n = number of individuals; % = percentage based on the group.

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