RISK PERCEPTIONS OF OCCUPATIONAL NOISE EXPOSURE AND ITS IMPACTS ON FISH HARVESTERS' HEALTH IN NEWFOUNDLAND AND LABRADOR: A MIXED-METHODS STUDY

By © Om Prakash Yadav

A Thesis submitted

to the School of Graduate Studies

in partial fulfillment of the requirements for the degree of

Master of Science (Community Health)

Division of Community Health and Humanities

Faculty of Medicine

Memorial University of Newfoundland

October 2021

St. John's Newfoundland and Labrador Canada

Abstract

Occupational noise exposure is a significant concern for fish harvesters because it can cause severe health problems such as hearing loss, hypertension, stress, anxiety, and sleep disorders. The study investigates the perceptions of noise and self-reported hearing loss among fish harvesters in Newfoundland and Labrador. A mixed-methods research was conducted. A pre-validated survey tool was adopted to assess perceived noise risks and self-reported hearing loss. Semi-structured telephone interviews were conducted to explore noise exposure and associated health problems as well as obstacles and challenges for fishing workers to take noise reduction measures.

Data were collected through 76 survey responses and twelve interviews. Through measuring the perceived benefits, barriers, and self-efficacy score (2.3 to 2.9 out of 5), this research finds a moderately positive attitude of harvesters toward noise reduction and hearing loss prevention. A high perceived attitude and susceptibility score (3.9 to 4.5) suggests that fish harvesters disliked the loud noise and were susceptible to hearing loss. Most interviewees agreed that their workplace is noisy. A conflict between vessel safety and individual health was observed, as participants reported that the reason to avoid wearing hearing protectors is due to various other safety concerns. Participants believe that increasing education, awareness, and training can reduce noise exposure and prevent hearing loss.

Keywords: Fish harvester, Occupational noise exposure, Noise-induced hearing loss, Non-auditory health effects, Newfoundland and Labrador

General Summary

Occupational noise exposure can cause serious health problems for fish harvesters. To understand the noise exposure and related health problems, we conducted research through an online survey and telephone interviews with fish harvesters in Newfoundland and Labrador. Through the survey questionnaire, we examined the perceptions of noise and self-reported hearing loss. The author explores fish harvesters' experiences with noise and related health issues as well as challenges and barriers to preventing hearing loss through telephone interviews. The survey responses indicate a generally positive attitude toward noise-related benefits and barriers. Likewise, the harvesters do not like the high noise and are susceptible to hearing loss. Interview findings show that fish harvesters have conflicts between their onboard safety and individual health. For example, fish harvesters choose not to wear hearing protection devices, as these devices can hinder their communication on board. Education, awareness, and training are needed to prevent noise-related health problems.

Acknowledgments

To begin, let me express my heartfelt gratitude to Dr. Desai Shan. Her unwavering commitment, vast experience, advice, and encouragement aided me in completing this master's thesis. Throughout these years, she has served as a tutor, guide, and staunch supporter, for which I will be eternally grateful. I'd like to express my gratitude to the remaining supervisory team members, Dr. Atanu Sarkar and Prof. Veeresh Gadag, for their indispensable and extraordinary assistance. I would also like to express my gratitude to Dr. Lorenzo Moro, assistant professor in the Faculty of Engineering and Applied Science, Mr. Mark Dolomount, Ms. Brenda Greenslade, and Ms. Courtney Langille, the current Executive Directors of the Professional Fish Harvesters Certification Board (PFHCB) and the Newfoundland and Labrador Fish Harvesting Safety Association (NL-FHSA), and Communication officer Fish, Food and Allied Workers Union (FFAW-Unifor), respectively, for their kind assistance during the research operation. We would like to express our heartfelt appreciation to all fish harvesters who participated in our survey and interviews, as their generosity and cooperation made this work possible. A special thanks go to Mr. Abinu Ajithan Jyothini, a fellow graduate student who was always there to lend a hand during my years in St. John's. Finally, I'd like to express my gratitude to many notable people who have supported me during these years in completing this master's degree: my partner, my son (*Kartik Yadav*), my parents, my family members, and all of my close friends. I would like to express my gratitude to Ms. Myrna Brown and Mr. Eric Brown for their assistance in distributing the research flyer. Mitacs provided funding for this work through the Mitacs Research Training Grant. I acknowledge the financial support of the Ocean Frontier Institute (FOCI), Dean's Special Award (Dr. Shan's Start-up Fund), The Shree Mulay Community Health Graduate Student Award, and Memorial University of Newfoundland.

Contents

List of figures

List of tables

List of appendices

List of Abbreviations

ACFFA: Atlantic Canada Fish Farmers Association

AGC: Atlantic Groundfish Council

BCSFA: British Columbia Salmon Farmers Association

BCSGA: British Columbia Shellfish Growers Association

CCG: Canadian Coast Guard

CCGA: The Canadian Coast Guard Auxiliary

CCPFH: Canadian Council of Professional Fish Harvesters

CIFHF: Canadian Independent Fish Harvesters' Federation

CSIA: Canadian Sport fishing Industry Association

dB HL: Decibels in Hearing Level

dB SPL: Decibels Sound Pressure Level

dB IL: Decibels Intensity Level

DFO: Department of Fisheries and Ocean

FAO: Food and Agriculture Organization of the United Nations

FCC: Fisheries Council of Canada

FFAW: Fish, Food and Allied Workers - Unifor

FFSBC: Freshwater Fisheries Society of *British Columbia*

FNFA: Fundy North Fishermen's Association

FOCI: Future Ocean and Coastal Infrastructure

GT: Gross Tonnage

HI: Hearing impairment

ICHER: Interdisciplinary Committee on Ethics in Human Research

ILO: International Labour Organization

IMO: International Maritime Organization

LOA: Length Overall

MFU: Maritime Fishermen's Union

MOU: Memorandum of Understanding

NAIA: Newfoundland and Labrador Aquaculture Industry Association

NFA: Native Fishing Association

NIOSH: National Institute of Occupational Safety and Health

NL: Newfoundland and Labrador

NL-FHSA: Newfoundland and Labrador Fish Harvesting Safety Association

NSFSC: Nova Scotia Fisheries Sector Council

OFI: Ocean Frontier Institute

OHS: Occupational Health and Safety

OHSA: Occupational Safety and Health Administration

MPa: Micropascals

Pa: Pascals

PEIFA: Prince Edward Island Fishermen's Association

PFHCB: Professional Fish Harvesters Certification Board

PFHCB: Professional Fish Harvesters Certification Board

SHCRs: standardized Hospital Contact Ratios

SPL: Sound Pressure Level

SPSS: Statistical Package for the Social Sciences

TC: Transport Canada

TCMS: Transport Canada Marine Safety

TSB: Transport Safety Board

UFAWU: United Fishermen and Allied Workers' Union - Unifor

USCG: United States' Coast Guard

.

Chapter 1

Introduction

Around 60 million people worldwide are involved in the fishing and aquaculture sectors, with more than half engaged in fishing.[1] Fishing is a major industry in many nations, contributing significantly to the growth and development of the blue economy.[2] It is estimated that approximately five million vessels worldwide, ranging from small non-motorized crafts to large industrial trawlers. Fish and seafood are considered one of Canada's largest food commodities.[3] Canada exported record-breaking marine harvests of $6.6 billion in 2016.[4] From the east to the west coast of Canada, about 50,000 fish harvesters operating 16,911 fishing vessels.[5,6]

The fishing industry has a high risk of occupational injuries and accidents.[7–12] Fish harvesters work in unfavorable conditions that are detrimental to their health and well-being.[13,14] Fish harvesters are exposed to biological agents such as viruses, bacteria, parasites, chemicals, and toxins; psychosocial stressors such as insomnia, anxiety, stress, depression, and suicidal thoughts; and physical challenges such as extreme climate, ultraviolet radiation, vibrations, and noise (Table 1.1).[15–17]

Table 1.1 Commercial fishing safety statistics in Canada[17]

Type of incident	Year	Canada
Total number of casualties	2019	8
Shipping accidents	2019	29%
Accidents aboard ship	2019	37%
Fishing vessel accident rate per 1000 active fishing vessels	2019	5

Occupational noise exposure is a significant risk factor for various auditory and non-auditory health problems, including tinnitus, noise-induced hearing loss (NIHL), fatigue,

irritation, hypertension, impaired physical and cognitive performance, and sleep difficulties.[18–25] Noise has been identified as a significant hazard to fish harvesters' Occupational Health and Safety (OHS).[26–43]

Newfoundland and Labrador (NL) province covers over 29,000 kilometers of coastline and a 2.5-million-square-kilometer continental slope.[44] The fishing industry is a substantial contributor to NL's economy.[45] In 2018, the fishing and seafood industry contributed more than $1.3 billion to NL's gross domestic product.[46] According to Canada's Department of Fisheries and Oceans (DFO), 3409 permits were issued, and 9093 employees (17.7%) were employed in commercial fishing in NL in 2019.[5,47]

WorkplaceNL's no-fault workplace injury insurance protects employers and employees in NL. According to the most recent WorkplaceNL statistics on fishing safety, the rate of lost-time injuries per 100 employees was 1.8, which exceeded the provincial level of 1.6, and six fatalities were reported in 2020. Fish harvesters faced a 13-fold increased risk of death on the job, a fourfold increased risk of serious injury, and a twofold increased risk of hearing loss.[48] Between 2011 and 2017, 8.3% of hearing loss claims were made by NL fish harvesters. The most hearing loss-related claims were filed by 133 NL fishing vessel skippers/fishers, followed by other occupational groups such as heavy equipment operators, carpenters, construction trades assistants and laborers, fish plant workers, fishing vessel deckhands, truck drivers, welders and related machine operators, automotive service technicians/truck mechanics, and electrification technicians (Table 1.2).[48,49]

Table 1.2 Commercial fishing safety statistics in Newfoundland and Labrador

Type of incident	Year	Newfoundland and Labrador
Total number of casualties	2020	6
Lost-time injury rate per 100 workers	2020	1.8
Soft tissue injury rate per 100 workers	2020	1.3
Percentage of serious injury claims	2015–2019	5.1%
Percentage of Hearing loss-related claims	2011–2017	8.3%

The sound pressure level (SPL), or sound exposure, is a property of the sound wave that is frequently used to quantify the amount of sound to which humans are exposed. The human ear is capable of hearing sounds between 20 Micropascals (Pa) (a hearing threshold) and 20 Pascals (Pa) (a pain threshold). Due to the impracticality of utilizing such a huge scale, a logarithmic scale in decibels (dB) was developed. This scale is also consistent with physiological and psychological hearing perceptions.[50] The decibel of SPL is calculated as 20 log10 p_1/p_0, where p_1 is the actual observed SPL of a particular sound and p_0 is a reference value of 20 Pa, which relates to the minimum hearing limit for a healthy adult ear. The auditory range of the human ear is between 0 dB SPL (hearing threshold) and 120-140 dB SPL (pain threshold) on the log scale.[50]

The International Maritime Organization (IMO) established worldwide standards and guidelines for noise-related concerns in the maritime sector. These regulations, however, apply mainly to large industrial and commuter vessels, and fishing vessels are excluded. While other aspects of fishing safety are addressed in other accords (the Torremolinos Protocol and the Cape Town Agreement), no international document explicitly addresses the noise risks experienced by fish harvesters.[28] International organizations and agencies have established minimum safety recommendations for maritime employees. However, the global regulatory framework for fishing vessels is highly fragmented. Standards vary according to the vessel length and are typically not mandatory.[28]

The IMO[51] has established voluntary requirements for fishing vessels with a length overall (LOA) of 12 to 24 meters in terms of construction, structural design, and equipment. Organizations such as the Food and Agriculture Organization (FAO) of United Nations, the International Labour Organization (ILO), and IMO have recommended safe operating guidelines for fishing vessels with a length of less than 12 meters in their safety recommendations for decked and undecked vessels.[52] All the criteria outlined above are optional, and national and provincial authorities govern safety rules for fishing vessels with a length of less than 24 meters.[28]

National regulations are used to restrict the noise levels of fishing vessels in many European nations. In Denmark, the Danish Maritime Authority[53] regulates noise risks through the *Occupational Health and Safety Regulations*. In contrast, in the United Kingdom, noise levels aboard fishing vessels are governed by "*The Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations*".[54] Many countries do not regulate noise levels on fishing vessels but do include noise-related hazards in general OHS regulations.[28]

In the United States, organizations such as the National Institute of Occupational Safety and Health (NIOSH),[55] the Occupational Safety and Health Administration (OSHA),[21] and the United States Coast Guard (USCG)[56] suggest 8-hours noise exposure limits of 90, 85, and 90 A-weighted decibels (dB(A)), respectively, for commercial fishing vessels. When the SPL exceeds 85 dB(A) for more than 8 hours, it results in hearing loss and other human health issues.[57,58] The effects may be exacerbated further by the duration, systematic exposure, frequency, intensity of exposure, and pre-existing risk factors in the exposed population, such as gender, ethnic origin, individual susceptibility, and other physical, chemical, and biological factors.[57]

In the United States, fish harvesters are subject to various noise regulations based on their job description, work area, and sector of operation. These constraints are based on the time-weighted average (TWA) of a worker's workday. OSHA established regulatory standards for occupational noise exposure. OSHA's permissible exposure limit for noise is 90 dB(A) for an eight-hour workday for all workers.[59] OSHA noise exposure standards typically apply to vessels operating up to three miles from the coastal baseline, beyond which the USCG exercises responsibility.[60] The USCG enforces voluntary noise exposure standards comparable to OSHA-mandated measures when normalized to a 24-hour noise exposure time.[60] Their requirements for overexposed harvesters' hearing protection programs are equivalent to OSHA regulations.[41]

In Canada, OHS regulations come under provincial jurisdiction, and the province implements OHS standards at various workplaces, including fishing vessels. According to NL OHS safety regulations, each employer needs to set up and manage a hearing protection program if the 8-hours equivalent noise level of L_{EX} is detected as over 85 dB(A).[61] It is the employer's responsibility to control or reduce the noise level to a safe level by eliminating or controlling risk and providing the worker with proper hearing protection devices and a safe working environment.[61] The *Canada Occupational Health and Safety Regulations*,[62] and the NL *Occupational Health and Safety Regulations*[61] do not specify a value but instead refer to the American Conference of Governmental Industrial Hygienists' threshold limit values (Table 1.3).

Table 1.3 List of noise standards for commercial fishing vessels

Standard	Exposure limits for various durations dB(A)			Exchange rate (dB)	Use of hearing protection required at or above
	8 hours	12 hours	24 hours		
US OSHA[21]	90*	87	82	5	90 dB(A) TWA#
USCG[56]	90	87	82*	5	85 dB(A)
US NIOSH[55]	85*	83	80	3	85 dB(A) TWA#
IMO[63]	85	83	80*	3	85 dB(A)
Canada Occupational Health and Safety Regulations[62]	85*	83	80	3	87 dB(A)
Maritime Occupational Health and Safety Regulations, Canada[64]	≥85-<90*	92	95	3	140 dB(A)
Occupational Health and Safety Regulations, 2012, Newfoundland and Labrador[61]	85*	83	80	3	85 dB(A)

*Criterion level and exposure duration specified in the exposure limit; other values for each limit computed using exchange rate, # Time-Weighted Average.

According to Canadian Centre for Occupational Health and Safety (CCOHS)[65], employers are required to provide hearing protection, train staff, and arrange audiometric testing if the exposure limit exceeds 85 dB(A) or if the sound level limit is greater than 90 dB(A) "at any time" under provincial and federal OHS regulations. Additionally, all provincial and federal governments prohibit unprotected exposure to noise levels exceeding 90 dB(A). Employers are required to take safety precautions even if the equivalent noise exposure is less than 85 dB(A), and workers are exposed to noise levels equal to or greater than 90 dB(A) at any time.[65]

According to *Maritime Occupational Health and Safety Regulations*,[64] the noise levels in a worksite must be below 85 dB. If an employer is unable to keep the noise levels in the workplace below 85 dB, no employee may be exposed during any 24-hour period. In addition to it, an employee must not be subjected to continuous noise levels of greater than 75 dB in the

crew's accommodation. The *Fishing Vessel Safety Regulations*,[66] on the other hand, make no mention of a permissible level of noise or associated safety precautions.

Globally, around two-thirds of all fishing vessels are powered, with 98% having a length of less than 24 meters.[1] Small-scale fishing companies employ a large number of people and are the primary source of revenue for many coastal communities. The majority of the Canadian fleet consists of boats under 80 feet in length.[6] According to Burella[28], noise levels on small-scale fishing vessels in NL exceeded the internationally approved 85 dB(A) for 8-hours guidelines. Burella reported that the noise levels changed between 63.8 and 98.1 dB(A) when the vessels were slowed down using hydraulics and between 60 and 110 dB(A) when the fishing vessels were transferred.[28] Brennan[67] discussed the injury or accident risk perceptions of fish harvesters in NL, reporting that while most fish harvesters accept personal risk as "part of the job," what is frequently overlooked is that there are overarching risk trends that are influenced by a variety of factors such as weather, job responsibilities, and job position. Furthermore, these hazards rapidly change over time as a result of environmental, social, and economic factors.

The OHS regulations in Newfoundland and Labrador cover all workplaces in the province, with no distinction made between land-based and maritime workers. However, fish harvesters work in a confined and moving environment, are exposed to continuous noise during work and rest while on multiple-day fishing trips, and work in a high-risk environment. Therefore, fish harvesters are more vulnerable to noise exposure and associated risks, but no specific regulation addresses noise exposure levels and safety precautions aboard fish vessels. This is a complex governance issue that requires the involvement of both the federal and provincial governments to develop guidelines and criteria for regulating noise exposure aboard fishing vessels and minimizing noise-related health problems of fish harvesters.

The purpose of this master's thesis is to explore the noise risk perceptions, to find out self-reported hearing loss, and to identify potential barriers and challenges in preventing noise-related health problems in NL fish harvesters. The following section (Chapter-2: Literature Review) highlights the multiple health risks linked with fish harvesters' exposure to noise as well as the underlying causes to be addressed. This will be accomplished by thoroughly evaluating the available literature, which identifies critical issues and research gaps.

The remaining part of this thesis is constituted of the following chapters:

Chapter 2 (Literature Review) reviews the existing international, national, and regional research evidence on occupational noise exposure on fishing vessels, the perceived risk of noise, and the associated health impacts on fish harvesters.

Chapter 3 (Methodology) explains the research methods adopted in the present study. A mixed-methods approach will be introduced. The quantitative component is an online survey. In the qualitative component, semi-structured telephone interviews will be described. The sample selection criteria, recruitment strategies, pilot findings, data collection, and analysis will be explained for both research methods.

Chapter 4 (Research Findings) reports the survey findings, including demographic characteristics, vessels profile, jobs description, noise risk perception scores, and self-reported hearing loss. It also presents the thematic analysis of interview data and describes noise risk perceptions, related health problems, and barriers and challenges in preventing noise exposure and hearing loss.

Chapter 5 (Discussion) integrates the research findings with the existing literature and discusses the Health Belief Model, health capital approach in relation to the research findings and describes the strengths and limitations of research.

Chapter 6 (Conclusions) provides major findings, policy recommendations, and suggests future research opportunities.

The appendix contains the Committee on Ethics in Human Research (ICEHR) ethics application and ethics approval letters for the research. Furthermore, it includes survey tools such as a recruitment letter, an information sheet, a consent form, and a noise risk perception questionnaire. For the qualitative component of the study, it also includes an interview recruitment letter, an information sheet, a consent form, and a semi-structured interview guide. Lastly, it covers a research flyer containing both survey and interview information.

Chapter 2

Literature Review

Sound is considered a sensory perception, and composite patterns of sound waves are usually perceived as music, speech, or noise.[68] Noise is defined as an undesirable or unpleasant sound that can negatively affect human health, wildlife, and the ecosystem.[69] Noise is recognized as one of the most common occupational and environmental hazards.[57]

Three fundamental physical properties define a sound wave: frequency, amplitude, and temporal variation. The term "frequency" refers to the number of times per second that a vibratory pattern oscillates in the time domain. Amplitude is a term that relates to the pressure of sound. There are several facets to the temporal fluctuation of sound, such as the length of the sound. Due to the fact that sound pressure is proportional to sound intensity (measured in units of power or energy), the sound magnitude can be expressed in pressure, power, or energy units.[70] The sensory perception of sound depends on the frequency (measured in hertz) and pressure on the eardrum (measured in dB). The specific sound heard by a human is calculated as dB(A).[68] Time is represented in a variety of temporal units or can be converted to phase in angular degrees.[70]

Fish harvesters are one of the population groups vulnerable to a high noise levels, and they suffer from various adverse health effects. Noise sources on a fishing vessel differ according to the type and size of the vessel. Hydraulics, haulers, old ropes, engine, generators, and other auxiliary machinery also produce noise on fishing vessels.[10,71,72] Some noise sources such as propellers and electric generators run continuously for the proper functioning of a fishing vessel.

Fishing operations vary from a single day to multiple fishing days, depending on the type of catch and size of the fishing vessels. Noise levels are different for different types and sizes of fishing vessels (Table 2.1).

Table 2. 1 Noise levels with the duration of work and type of fishing vessel

First author & country	Year	Trip	Working hours	Type & size of vessel	Level of noise
Albizu et al. & Brazil[33]	2020	Single-day	>8 hours	Seiners (18.30–26 meters); Gillnetters (16.90–22 meters); Trawlers (20.40–21 meters); live-bait tuna vessels (24–28 meters)	63.2–108.9 dB(A)
Burella et al. & Canada[10]	2019	Single to multiple days	Not mentioned	Pots, Hand-line, Jigger, Gillnetters, Purse Seiner, Trawls	Slow Downs with Hydraulics: 63.6–98.1 Transfer: 60.7–107.1 dB(A)
Anwar et al. & Indonesia[32]	2019	Single day	>8 hours	Not mentioned	101.7±2.34 dB(A)
Levin et al. & United States[29]	2016	Single day	< 8 to >16 hours	Commercial shrimpers	62–105 dB(A)
Paini et al. & Brazil[30]	2009	Multiple days	Up to 24 hours	Small vessels with or without engine	Vessels without engine 38–58 dB(A); Vessels with engine 90–108 dB(A)
Neitzel et al. & United States[60]	2006	Single-day	12 hours	Not mentioned	86.8–97.7 dB(A)

Additionally, personnel in the fish harvesting industry may dwell on board vessels during multi-day fishing operations. As a result, while they are on board but not working their shifts, they may be subjected to noise levels below occupational noise exposure guidelines but still damaging to their long-term health.[28] Sometimes, fish harvesters are required to work longer than 8-hours a day on multi-day trips and are subjected to constant noise throughout the day and night.[28,60,73–75]

Loud continuous noise can cause detrimental health effects, including physical and psychological health impairment, making the workplace more hazardous than a land-based work environment.[76,77] Loud noise is very damaging to the inner ear (cochlea). A single exposure to extremely loud noises or prolonged exposure to loud sounds might result in hearing loss. Loud noise can cause damage to the cochlea's cells and membranes. Long-term exposure to high noise can overstretch the hair cells in the ear, resulting in their death. As long as the exposure continues, the hearing loss develops. Even when noise exposure has ceased, adverse consequences may persist. In most cases, injury to the inner ear or auditory nerve system is irreversible.[78]

Peretti et al.[79] conducted a study and concluded that fishing workers should have access to quieter areas after their work shifts. A noisy environment in crew quarters directly impacts the comfort and habitability of fish harvesters. The IMO has recommended some noise control guidelines for crew spaces, but they do not apply to fishing vessels.[28,80] Since no international organizations suggest mandatory standards for noise control, noise regulation comes under the direct control of national and regional legislation. As discussed in the previous chapter, no federal law exist in Canada that determines the maximum allowable noise on fishing vessels less than 24 meters LOA or 150 GT.

It is essential to identify the noise levels at different vessel locations to take the actions necessary to mitigate onboard noise exposure. In the literature, several studies highlight the noise levels on fishing vessels and noise-related health problems among fish harvesters. Further, we discuss noise levels on different locations of fishing vessels and various types of fishing vessels, followed by an exploration of the studies reflecting onboard noise exposure and its impact on fish harvesters' auditory and non-auditory health.

2.1 Noise levels on fishing vessels

The most frequently used measure of acoustic wave intensity is the SPL, which has a strong correlation with the human sense of loudness. SPL is measured in dB through several devices, including a noise dosimeter, a sound level meter, an integrated sound level meter, and a data acquisition system.[65,81] SPL is a physical measure of sound and has a reasonable correlation with loudness since a higher SPL corresponds to the impression of louder sounds, although other measurements have a stronger correlation. For instance, a 60 Hz tone at 80 dB SPL sounds approximately as loud as a 1000 Hz tone at 30 dB SPL. The Fletcher Munson Curve, which is sometimes referred to as equal-loudness contours, is connected to physics and the way the auditory system reacts to various frequencies. The Fletcher Munson Curve is a mathematical representation of the connection between sound pressure and frequency.[82]

Studies conducted worldwide assessed the noise levels and its impacts on fish harvesters on different types and sizes of fishing vessels, including various fishing operations. Fulmer et al.[83] highlighted the ergonomic risk involved in fishing activities. It measured the noise levels on small fishing vessels in Massachusetts, while Neitzel et al.[60] recorded noise exposure in large fishing vessels. Many studies highlight noise exposure levels on fishing vessels, ranging from 60.6 to 124.1 dB(A), and the highest noise level was reported in the engine rooms.[15,27,29–33] The noise level was detected as higher than NIOSH's recommended guidelines in most studies.[27,29–31,33,35] Higher SPL values were observed in fishing vessels where hydraulic gears and electrical power generators were installed.[10,28,30] A study suggested a link between noise exposure and load on boat engines and concluded that engine-related hearing loss is a significant risk factor among fish harvesters[27] (Table 2.2).

Table 2.2 Studies describing noise exposure levels on different fishing vessels

First author & Country	Year	Type of fish vessels	Methods	Major findings
Burella et al. & Canada[10]	2019	Pots, Hand-line), Jigger, Gillnetters, Purse Seiner, Trawls	SPLs (Data acquisition system and hand-held noise dosimeter)	Noise levels during slowdowns with hydraulics: 63.6–98.1 dB(A); during transfer: 60.7–107.1 dB(A)
Peretti et al. & Italy[79]	2013	Not mentioned	Sound levels	Noise exposure levels: 80 to 90 dB(A).
Zytoon & Egypt[84]	2012	Gill/trammel, Purse seiner, Trawler	SPLs	Noise levels at: Gill/trammel: 68.7–95.9 dB(A); Purse seiner: 61.2–97.3 dB(A); Trawler: 60.6– 93.5 dB(A)
Fulmer et al. & United States[83]	2002	Lobster fishing vessels and Gillnetters	Audio dosimeter installed on the observer on the boat	Noise levels at: Lobster fishing vessels: 75.2–116.2 dB(A); Gillnetters: 87 to 124.1 dB(A)
Neitzel et al. & United States[60]	2006	Noise exposure assessed	Sound-level meter, Dosimeters	Noise exposure levels 63.1 to 96.8 dB(A)
Inaoka et al., & Japan[85]	1992	Noise levels during “payao” fishing and traditional “oikomi” fishing	Not mentioned	Noise level during “Payao” fishing: ≈64 to 94 dB, “Oikomi” fishing ≈60 to 100 dB

Zytoon[84] recorded noise exposure on fishing vessels of various sizes at different sites and stations using sound meters and measured the noise exposure among the fish harvesters using noise dosimeters in the Egyptian fleet. A study was done by Burella[28] highlighted noise levels on various fishing vessels and showed the noise level ≈ 75 dB(A) in the crew spaces and ≈ 105 dB(A) in the engine room. Noise exposure on fishing decks was also observed as high as ≈ 95 dB(A). In most of the studies, the 8-hours equivalent noise level was measured as higher (85

dB(A)) than the limit suggested by the National Institute for Occupational Safety and Health (NIOSH)[28,55] (Table 2.2).

2.2 Noise levels on fishing vessels and noise-induced auditory health impacts

Studies were conducted among fish harvesters to evaluate health conditions[35], hospital contacts[34], and audiological tests[85] indicate hearing problems such as noise-induced hearing loss (NIHL) are significant issues. NIHL is an irreversible condition and will progress with exposure. Prolonged noise exposure leads to the restriction of daily activities such as conversation and enjoying music.[28]

Table 2.3 and 2.4 represent the noise levels reported at various fishing vessels and their auditory health impacts among fish harvesters. Studies were conducted to measure the noise exposure and audiometric testing among fish harvesters and shrimp trawlers on small fishing vessels in Brazil and the Mexican Gulf.[29,30] Kaerlev et al.[34] highlighted that NIHL is a significant issue among Danish fish harvesters. They recorded standardized hospital contact ratios (SHCRs) for hearing loss and concluded that NIHL was more frequent in persons who worked in the engine rooms. Similarly, a study done by Levin et al.[29] found a high level of noise exposure (94.8 to 105.0 dB(A)) in the engine room. They also observed that NIHL was directly related to the number of years spent fishing.[29] The studies mentioned above reflect insights into the noise levels on fishing vessels and highlight that fish harvesters' occupational noise exposure is a global issue.

Table 2. 3 Studies describing noise exposure levels and auditory health impacts among fish harvesters

First author & Country	Year	Demographic information [N, Gender (M/F), Age (Years)]	Methods	Major findings
Albizu et al. & Brazil[33]	2020	466, M, 18–67 years	SPLs, questionnaire survey, and audiological assessment.	SPLs >80 dB(A); Tinnitus (49%); NIHL (79%) observed in engine-room keepers; NIHL risk increases with the length of employment.
Anwar et al. & Indonesia[32]	2019	40, M, ≥21 years	SPLs, Audiometric testing	Noise intensity (Mean±SD): 101.7±2.342 dB; Prevalence of hearing loss in 97.50% ears; Positive relationship of hearing loss with age, working period, and noise intensity
Mansi et al. & Italy[15]	2019	108, M, 49 years (Average)	Self-reported health conditions and assessment of noise exposure levels.	Highest SPL (106 & 109 dB(A)) observed in the engine compartment; Lowest SPL (70.5 and 78.8 dBA) was recorded in the sleeping berth; Low-frequency sounds can cause acoustic damage.
Myers et al. & United States[27]	2018	52 manuscripts	Assessment of occupational health risk factors.	Noise exposure ranged from 56–114 dB(A); Noise exposure was considered a global risk irrespective of vessel size.
Sholihah et al. & Indonesia[31]	2017	186, M	SPLs, hearing function test, questionnaire survey	Noise levels >85 dB in around two-thirds of participants; Hearing loss (60.2%) >90% participants that did not use earplugs
Levin et al. & United States[29]	2016	227, M (191), F (31), ≥21 years	SPLs, Audiometric testing, comprehensive survey	Noise levels: 94.8–105 dB(A)) in the engine room; NIHL was associated with length of employment (not with age); Hearing impairment (HI) was associated with age (not with the size of the fishing vessel).
Paini et al. & Brazil[30]	2009	141, M, 18 to 77 Years	SPLs, Audiometric test, questionnaire survey	SPLs recorded 38–58 dB(A) and 90–108 Leq dB(A) in vessels with and without an engine, respectively.

Table 2.4 Studies describing noise-related auditory health impacts among fish harvesters

Author & Country	Year	Demographic information [N, Gender (M/F), Age (Years)]	Methods	Major findings
Eckert et al. & United States[40]	2018	Pre-season survey: 60, M (56), F(4), 19–73 Years; Mid-season survey: 38, M (35), F (3), 19–73 Years	Self-reported hearing loss, Audiometric testing.	Self-reported hearing loss (50%); Physical examination hearing loss (80%)
Masterson et al. & United States[41]	2018	17 299, M (12455), F (4844), 18–75 Years	Audiometric data analyzed	Hearing loss: 19.47%
Levin et al. & United States[43]	2016	217 & 206, M, ≥21 Years	Assessment of NIHL-related attitudes and beliefs.	NIHL-related behavioral beliefs, normative beliefs, and control beliefs changed significantly.
Arumugam et al. & India[38]	2015	63, M, 30–50 Years	Otorhino-laryngoogic assessment. Audiometry test	Hearing loss: 28.57%,; Tinnitus: 19.04%
Zeigelboim et al. & Brazil[39]	2015	30, M, 33–67 Years	Assessment of otoneurologic signs and symptoms, vestibular examination.	Tinnitus (66.7%); Hearing loss (53.3%); Positive cases in Vestibular examination (≈ 43%)
Poulsen et al. & Denmark[36]	2014	Literature review	Hospital records.	SHCR for NIHL, tinnitus, conductive, and sensorineural hearing loss was 142 (118-171). Increased hospitalization rate for HI.
Zeigelboim et al. & Brazil[37]	2014	13, M, 33–62 Years	Assessment of otoneurologic signs and symptoms, vestibular examination.	Hearing loss (76.9%) and tinnitus (61.7%). Positive cases in Vestibular examination (≈39%)
Kaerlev et al. & Denmark[34]	2008	3702, M	Assessment of SHCRs	Increased risk rates of NIHL in engine room personnel. Duration and length of employment were not associated with the NIHL.
Novalbos et al. & Spain[35]	2008	247, M, 40.3±11.5 Years	Self-reported medical conditions and lifestyle	Hearing problems were found in 6% of the participants.

2.3 Noise-induced non-auditory health impacts among fish harvesters

Besides the effects on hearing, noise exposure can cause several non-auditory health problems, including hypertension, irritation, anxiety, distress, hormone disorders, sleep disorders, and mental health issues. Scientific evidence indicates that workplace noise can also have several non-auditory effects. Scientific evidence shows that workplace noise can cause various non-auditory health problems, including hypertension, irritation, anxiety, annoyance, stress, hormonal disturbances, sleep disturbances, impaired psychological well-being, and psychiatric problems.

Table 2.5 reflects noise-related non-auditory health impacts among fish harvesters. A small number of studies have demonstrated the effects of occupational noise exposure on work performance as well as biochemical and effects on the immune system.[18,19,86,87] Studies conducted among fish harvesters also reflect non-auditory health problems, including annoyance, cardiovascular disease, sleep disturbance, and cognitive impairment.[27,30,31,33,36,37,39,40,83]

Table 2.5 Studies describing noise-related non-auditory health impacts among fish harvesters

Author & Country	Year	Demographic information [N, Gender (M/F), Age/Mean age (Years)]	Methods	Major findings
Myers et al. & United States[27]	2018	52 manuscripts	Assessment of occupational-related health risks	Physical and psychological disorders can occur.
Mansi et al. & Italy[15]	2017	108, M, 49 Years	Self-reported health conditions	Low-frequency sounds can cause cardio-vascular, gastric, and sleeping disorders.
Zeigelboim et al. & Brazil[39]	2015	30, M, 33–67 Years	Assessment of otoneurologic signs and symptoms, vestibular examination.	Dizziness (63.3%); Fatigue (36.7%); Anxiety (23.3%); Depression (16.7%)
Arumugam et al. & India[38]	2015	63, M, 30–50 years	Assessment of Otorhinolaryngologic signs and symptoms, Audiometry testing	Headache: 38.09%; Sleep disturbances (7.9%); Noise exposure acts as a stressor.
Zeigelboim et al. & Brazil[37]	2014	13, M, 33–62 years	Assessment of otoneurologic signs and symptoms, vestibular examination.	Dizziness and headache (46.1%); Fatigue (46.1%); Depression (23%); Anxiety (15.3%); Insomnia (7.7%); Agitation during sleep (7.7%).
Gander et al. & New Zealand[42]	2008	17, M	Assessment of otoneurologic signs and symptoms, vestibular examination.	Split sleep; High sleepiness ratings; Reduced sleep quality.

2.4 Governance of the fishing industry in Canada

In Canada, the roles and jurisdictions of various government agencies regulating fisheries are complex and overlap. Fisheries administration and management are supervised by different federal and provincial organizations in Canada. Fishing vessels' safety, security, and

environmental protection are the shared responsibilities of government agencies, vessel owners, and operators.

2.4.1 Federal institutions and regulations

Four major federal agencies: Transport Canada (TC)[88], DFO[89], Canadian Coast Guard (CCG)[90], and Transport Safety Board of Canada (TSB)[91], are responsible for providing license, certification, registration of fishing vessels, safety, and training, navigational aids, permits and funding programs for fish and seal harvesting, security, environmental protection, pollution control and marine investigations (Table 2.6).

Table 2. 6 Major federal agencies governing fishing industry in Canada

S. No.	Name of the agencies	Role and responsibilities
1.	TC[88]	Marine safety security and navigation; vessel licensing, registration, inspection, and certification; providing liability and Compensation, investigating maritime accidents
2.	DFO[89]	Funding for commercial fishing and conservation; Issuing Commercial fishing licenses; Exporting and importing fish; Commercial fishery regulations, compliance, policies promoting sustainable fisheries, and industry restructuring; International fishery management; Consultations and evaluations with the public on commercial fishing problems in Canada; Reporting requirements for commercial fisheries
3.	CCG[90]	Navigation; Search and rescue; developing plans and responding to marine pollution; maritime security; safety training programs; providing icebreaking services
4.	TSB[91]	conducting independent investigations; identifying safety deficiencies, recommendations to mitigate safety flaws; publicizing investigations and findings

Various federal regulations, including *Marine Personnel Regulations*[92], *Fire and Boat Drills Regulations*,[93] and *Safe Working Practices*,[94] are implemented under the *Canada Shipping Act*, 2001.[95] Even though they share some similarities with the provincial OHS regulations, they are designed for the specific nature of vessel operations. All Canadian provinces have particular OHS legislation that addresses health and safety matters within the region. However, provincial

legislation includes some provisions that apply to services on the water. Some local governments have signed memorandums of understanding with the federal government to govern overlapping matters.[96] Both federal and provincial regulations monitor the safety of the crew of fishing vessels. As indicated by the current *Fisheries Act*, the government's current inclination seems to reflect central power as the "ultimate authority".[97]

2.4.1.1 Transport Canada (TC)

TC is a federal regulatory agency responsible for crew and vessels' safety and security. TC distributes safety information primarily through ship safety bulletins.[98] TC develops, regulates, and enforces various maritime regulations, services, and policies. *Fishing Vessel Safety Regulations* are monitored by TC for boats with a length of less than 24.4 meters or less than 150 GT. Through the *Fishing Vessel Safety Regulations*, TC oversees equipment safety, operational safety, and vessel stability. TC's maritime safety and protection program produces and manages many regulations and related operating procedures, guidelines, and policies aiming to enhance marine transportation safety and security while also ensuring it is environmentally friendly and commercially viable.[99]

TC has developed safety modifications for small fishing vessels in collaboration with the Canadian Independent Fish Harvesters Federation, representing over 10,000 fish harvesters across Canada. TC also consults with other stakeholders and fishing industry organizations to develop minimum safety standards for fishing vessels, crew members, and operations.[100]

TC administers shipping regulations, vessel safety, navigation, and inspections. TC is accountable for shipping policies and plans and develops safe, reliable, effective, and environmentally efficient transport.[101]

Transport Canada Marine Safety (TCMS) has a national regulatory system for overseeing fishing vessels' operating and structural safety. TCMS also manages the *Safe Working Practices Regulations,* which guide the vessel's crew on operating in a safe and protected manner. In addition, the *Marine Personnel Regulations* stipulate the competencies of fishing masters and engineers. However, the federal government does not have authority over crews' occupational well-being when employed.[102]

2.4.1.2 Department of Fisheries and Ocean Canada (DFO)

The DFO is a federal institution in charge of fishery administration regulations, strategies, and policies as per the *Fisheries Act* and related regulations. CCG of the DFO is accountable for the search and rescue of fishing vessels and maritime communications as per the *Oceans Act.*[99] The DFO is also responsible for maintaining healthy and sustainable marine ecosystems through environmental safety, security, and sound science. The DFO promotes industrial growth in the marine and fisheries divisions and leads reform in aquaculture and biotechnology.[89]

The DFO oversees the administration of fishing resources conservation in Canada under the *Constitution Act* (1867) and *Constitution Act* (1982), which provide power for the management of "sea coast and inland fisheries" to the Canadian government. In addition, three statutes: the *Department of Fisheries and Oceans Act* (1978), *Fisheries Act* (1985), and *Oceans Act* (1996), give the DFO the power to manage and protect fishery resources, including fisheries, habitat, and aquaculture.[98,103]

2.4.1.3 Canadian Coast Guard (CCG)

The primary service line programs of the CCG include marine navigation safety, marine communications and traffic services, ice breaking, rescue, safety, environmental emergency

response, and technical and operational services. The CCG works with fishing industries that require effective distress and safety communications and navigation systems. The fishing industry also emphasizes the CCG's environmental protection mandate.[104,105] The Canadian Coast Guard Auxiliary (CCGA) is essential for the search and rescue network.

The CCGA unit is comprised of around 5000 volunteer craft operators and professional fish harvesters who use their vessels for various activities conducted by the CCGA. This agency also provides a safe boating course and safety equipment demonstration and is involved in safe boating shows and displays.[106] The CCG is a unique working agency in the DFO. The CCG works to secure the safety of navigators in Canadian waters and preserve Canada's aquatic ecosystem. The CCG strengthens Canada's industrial growth through the secure and effective flow of marine trade.[90,107]

2.4.1.4 Transport Safety Board (TSB)

Since 1999, the TSB has been in charge of monitoring fishing safety. The TSB conducts independent investigations of fishing vessel accidents, makes recommendations to eliminate safety deficiencies, and reports publicly on their investigations and observations.[108]

The TSB makes recommendations to mitigate or eliminate safety concerns that may pose a risk to marine transport and should be made aware by authorities and industry. The Canadian Transportation Accident Investigation and Safety Board Act requires federal officials to refer to TSB recommendations and report their response to safety concerns within 90 days. The Act does not oblige other stakeholders to reply to the TSB's recommendation, but they frequently do.[109]

2.4.2 Non-profit organizations

Some non-profit organizations work with federal, provincial, and territorial government bodies to raise concerns about fish harvesters' safety, security, and stability. These organizations

include the Canadian Council of Professional Fish Harvesters (CCPFH), [110] Canadian Independent Fish Harvesters' Federation,[111] Canadian Sport Fishing Industry Association,[112] Fisheries Council of Canada,[113] and Keep Canada Fishing,[114] are working across Canada to address and highlight various issues faced by fish harvesters.

2.4.3 Governing agencies in Newfoundland and Labrador

In NL, agencies including the Department of Fisheries and Aquaculture,[115] Fish, Food and Allied Workers-Unifor (FFAW-Unifor),[116] the Professional Fish Harvesters Certification Board (PFHCB),[117] Newfoundland and Labrador-Fish Harvester Safety Association (NL-FHSA),[118] WorkplaceNL,[119] and Memorial University's Marine Institute[117] are dealing with various issues related to fishing workers and related concerns. The Department of Fisheries, Forestry, and Agriculture, Newfoundland and Labrador supports the improvement and expansion of these sectors. The department works with multiple stakeholders to achieve sustainable growth in all industries in NL.[115] FFAW assists fish harvesters in Newfoundland and Labrador by addressing fleet-specific concerns, keeping the fleet aware of price and quota information, and representing the fleet in negotiations.[116]

The NL-FHSA supports NL fish harvesters by enhancing the safety culture in the fishing industry, advocating and exchanging best standards, enabling an effective stakeholder counseling framework and collaborative strategy for security, motivating fish harvesters through transferring knowledge, and fostering accessible, affordable, and appropriate safety education.[117]

The PFHCB assists NL fish harvesters by promoting by promoting the interests of fish harvesters as a professional group; operating and maintaining a fish harvester registry; developing, evaluating, and advising professionalization courses; identifying professionalization specifications; issuing certificates of licensure to qualified fish harvesters.[117]

WorkplaceNL provides injury insurance and a no-fault workplace to workers and employers across the province under the Workplace Health, Safety, and Compensation Act guidelines. In addition, the Marine Institute of Memorial University[117] provides training courses to NL fish harvesters through various community-based education programs supported by the government and industry.

The Marine Institute has developed a fishing vessel stability simulator collaborating with TC, the CCPFH, and the New Brunswick School of Fisheries.[98] Many non-profit organizations, including FFAW-Unifor,[116] NL-FHSA,[118] PFHCB,[117] Newfoundland and Labrador Aquaculture Industry Association (NAIA),[120] and Atlantic Groundfish Council (AGC)[121] are working in the fishing sector in the province.

Based on current fishing governing regulations of Canada, no specific mechanism controls and manages minimum noise levels on fishing vessels. However, different Canadian provinces provide various compensation claims for work-related accidents and injuries to workers. According to WHO,[122], a person is considered having hearing loss if they are unable to hear at the same level as someone with normal hearing, which is defined as hearing thresholds of 20 dB or greater in both ears. The dB is a logarithmic standard measurement used to represent the loudness of a sound compared to a reference level. Decibels in Hearing Level (dB HL) is a term that is frequently used in audiology to describe the dB level displayed on an audiometer. As mentioned previously, a popular way to describe the amplitude of a sound is in decibels Sound Pressure Level (dB SPL), using a reference value of 0.0002 dynes/cm 2. A less often used unit of sound intensity is decibels Intensity Level (dB IL).[123]

In NL, WorkplaceNL uses a permanent functional impairment rating schedule to assess the degree of impairment and provide compensation claims accordingly. This ranking schedule is

similar to other plans used by various payout jurisdictions in Canada in several ways. An American National Standards Institute audiometric calibration method is used for the loss of sense of hearing, and hearing loss is averaged at 500, 1000, 2000, and 3000 hertz. Hearing loss of 80 dB(A) or more is considered permanent loss of hearing in that ear.[124] Reassessments for further hearing damage will be accepted if the employee has continued to be exposed to unsafe noise levels at work.[124] This could be one way to provide financial support to fish harvesters who lost their hearing while working in a noisy environment. However, this is just a supportive mechanism. More stringent policies to control high noise levels and recommend mandatory hearing protection devices on fishing vessels are required to prevent noise-related health problems.[24]

According to DFO statistics, the total number of employees in Canada who work primarily in harvesting was 51,381 in 2019. The total number of fish harvesters registered in NL in 2019 was 9093.[5] According to NL Labour Market statistics,[125] males and females accounted for 81% and 19% of those working in fishing occupations, respectively. An unsafe working environment on fishing vessels has been identified as a significant concern and recognized by many independent researchers over the past several years.[28,33,60,79,83–85] Consequently, many researchers have concentrated on classifying possible risks and evaluating their associated hazards concerning vessel security, stability, and damage and the health and well-being of fish harvesters.[15,29,31,32,36,40,43,126–128]

The studies mentioned above examine the high noise levels (>85 dB(A)) on fishing vessels and reflect various noise-related auditory and non-auditory health problems among fish harvesters. However, few studies identify noise-associated risk and health behavior among fish harvesters. Identifying noise-related health behavior among fish harvesters can explain and

predict fish harvesters' health behavior, thereby preventing noise exposure and noise-induced health problems.

We have designed our study with the following aims to address the concerns mentioned above:

1. To assess noise risk perceptions and self-reported hearing loss of fish harvesters using a noise risk perception questionnaire, including the perceived benefits of noise reduction, perceived barriers to noise reduction and hearing loss prevention, perceived self-efficacy in reducing noise exposure, perceived attitudes toward noise, and perceived susceptibility to noise-related hearing loss. These are the key indicators of the Health Belief Model (HBM), which predicts individual health beliefs and behaviors.
2. To explore fish harvesters' perceptions of occupational noise exposure, onboard noise control prevention and management, and existing barriers and challenges in preventing hearing loss through semi-structured interviews.

The existing literature highlights that fishing is one of the most hazardous professions, and fish harvesters experience multiple health problems. As previously stated, the studies reflected insights into the noise levels on fishing vessels, highlighting occupational noise exposure as a significant health concern for fish harvesters. During the literature review, we could not find a study that explored the perceptions of noise exposure and self-reported hearing loss among fish harvesters in any jurisdiction across the globe. Therefore, a mixed-methods study was proposed to fill this knowledge gap through an online survey and telephone interviews among NL fish harvesters with the following research questions and hypotheses.

Research questions and hypotheses for quantitative research:

I raised quantitative and qualitative research questions based on evidence from the existing literature and current research gaps.

Research Questions for Quantitative Research:

1. What are the perceptions of occupational noise exposure among NL fish harvesters?
2. What are the extent and distribution of self-reported occupational noise-induced hearing loss among NL fish harvesters?

I formulated the following hypotheses after reviewing the available literature on occupational noise exposure and associated health problems among general workers and fish harvesters:

1. NL fish harvesters have a low awareness of occupational noise exposure.
2. The extent and distribution of self-reported occupational noise-induced health problems in NL fish harvesters depend on the duration of exposure, types of vessels, nature of the job, and demographic factors.

Research questions for qualitative research:

1. How do NL fish harvesters cope with occupational noise exposure and perceive noise-induced health problems onboard fishing vessels?
2. What are the barriers and challenges for NL fish harvesters to cope with their perceived occupational noise exposure and occupational noise-induced health problems?

Chapter 3 examines the methods used in this study. This chapter justifies the research methods selected, ethical approval, and quantitative survey methods, including the study design, sample selection technique, pilot study, and statistical data analysis. Next, it explains the qualitative methods used, including developing an interview guide (constructing semi-structured

interview questions), strategizing for sample collection, performing telephone interviews, transcribing audio recordings, and analyzing qualitative data.

Chapter 3

Methodology

This chapter describes the justification for the methods selected and used in this study. First, the chapter describes the conceptual design of the study, revealing the rationale and overall strategy. Next, it explains the survey and telephone interview schedule and the instruments used. After that, it elaborates on the sample selection strategy, ethical concerns, data collection, and the statistical analysis process.

3.1 Theoretical perspectives of this research

3.1.1 Health Belief Model (HBM)

A group of social psychologists at the United States Public Health Service originally adopted the HBM to address "the widespread failure of people to accept disease preventives or screening tests for the early detection of asymptomatic disease"; the model was later expanded to include patients' responses to symptoms and compliance with prescribed medical regulations. The HBM's fundamental components are derived from a well-established body of psychological and behavioral theory, which postulates that behavior is primarily determined by two variables: (1) an individual's value placed on a particular goal; and (2) an individual's estimate of the probability that a given action will accomplish that goal. When these variables were conceptualized in terms of health-related behavior, the following relationships emerged: (1) the desire to avoid illness (or, if already ill, to recover), and (2) the belief that a particular health action will prevent disease.[129,130]

The model's initially suggested that for an individual to take action to avoid disease, they have to believe that (1) they are personally susceptible to it, (2) that the occurrence of disease

will have at least a moderate impact on some aspect of their life, and (3) that making a specific decision will benefit them by limiting or reducing their susceptibility.[130]

The HBM conceptual frameworks are derived from ideas from cognitive psychology.[131] In the early twentieth century, cognitive theorists argued that rewards influenced expectations rather than directly influencing action. Cognitive theorists claim that mental processes are critical because conduct is a product of the degree to which individuals value an outcome and their judgment of whether a specific action will result in that outcome.[132] When it comes to health-related habits, the goal is to avoid illness. The hope is that a particular health measure may prevent the ailment for which individuals believe they may be at risk.[131]

The underlying HBM components are postulated to differ between people and to predict health-related behavior involvement.[129]

1. **Perceived benefits** (four items): While the acknowledgment of personal susceptibility to a circumstance believed to be severe was found to be a motivating factor for behavior, it did not indicate the specific action that was likely to be taken; this was hypothesized to be heavily influenced by beliefs about the efficacy of the various delivery actions in reducing disease risk. Thus, until a person has been sufficiently convinced, they are unlikely to embrace a suitable personal measure until it is deemed feasible and successful.[129,130] In this thesis, this subscale explores harvesters' perception of the benefits/effectiveness of noise reduction to decrease noise-related health problems.
2. **Perceived barriers** (five items): The possible negative consequences of a specific health action may pose an obstacle to engaging in the suggested habit. A type of cost-benefit analysis is assumed to occur in which the individual assesses the efficacy of the activity against perceived costs, risks (e.g., adverse effects, iatrogenic consequences), the

unpleasantness (e.g., discomfort, distress), inconvenience, time commitment, and other factors.[129,130] In this thesis, this subscale refers to a harvester's perception/feelings towards the challenges/obstacles in completing a prescribed action for noise reduction and hearing loss prevention.

3. **Perceived self-efficacy** (four items): In 1988, self-efficacy was included in the HBM's four elements (perceived benefits, barriers, susceptibility, and severity). Self-efficacy relates to a subjective experience of one's ability to accomplish a task effectively. In an attempt to better explain individual disparities in health behaviors, self-efficacy was introduced to the HBM. The model's designers recognized that self-efficacy (i.e., belief in one's ability to change results) was an essential element of health behavior change.[130,133] In this thesis, this subscale highlights the harvester's self-confidence in successfully adopting a task to reduce noise levels and noise exposure.
4. **Perceived Attitude** (three items): According to this view, attitudes develop automatically and persistently due to ideas stored in memory, which subsequently drives conduct. The number and types of attainable beliefs change according to motivation, capacity to interpret attitude-relevant information, and circumstances. Based on these factors, it is demonstrated that the perception of planned behavior is consistent with evidence on the role of cognitive tasks in the stimulation of behavior and attitudes and the observation that attitudes can differ according to how they are communicated.[134] In this thesis, this subscale explores a harvester's acceptance of occupational noise.
5. **Perceived susceptibility** (four items): Individuals have a broad range of sentiments about their vulnerability to a type of sickness (in the event of medically documented illness, this component has been reformed to include questions about susceptibility

estimations, belief in the diagnosis, and overall susceptibility to sickness). As such, this dimension relates to an individual's subjective assessment of the risk of developing a disease.[129,130] This thesis records harvesters' risk perceptions of noise and self-reported hearing loss.

Employees are often unmotivated to take action against noise since noise-induced hearing loss develops gradually, is imperceptible, and has an unpredictable onset.[135] Individuals who have noise-induced hearing loss are frequently unaware of their condition until the damage is severe.[135]

Hearing loss is considered an unavoidable side effect of various activities. Fatalism is a term that refers to the view that injuries and sickness are an inevitable outcome of work. Fatalism is a challenge to occupational safety, as fatalistic individuals accept severe accidents and injuries as unavoidable.[135] According to research, maintenance workers, were much more focused on preventing immediate dangers and less worried about risks such as occupational noise that might have future harmful consequences.[136]

The Canadian Standards Association (CSA) classifies hearing protection as Class A, B, or C, based on the amount of noise reduction provided. The following protection is suggested for eight hours of exposure (Table 3.1)[137]:

Table 3. 1 Recommended hearing protection at different levels of noise exposure

Exposure: Lex, 8 (dB(A))	Recommended class
Less than 90	C
More than 90 up to and including 95	B
More than 95 up to and including 105	A
More than 105	Dual*

* It is mandatory to use dual hearing protection. It is necessary to wear both Class A and B earmuffs.

According to a recent study conducted in NL, fish harvesters should wear Class-B hearing protectors to facilitate communication among crew members who could avoid interfering

with their awareness of the environment, as a failure to do so could jeopardize other aspects of fishing safety.[28]

Psychological health theory is advantageous for auditory research because while hearing loss is an illness with effective treatment, only about a quarter of those who can benefit from using a hearing aid do so. The evaluation of health behaviors must be a component of any study project to determine why there is a paucity of health-promoting behavior.[138,139] The HBM will aid in determining how NL fish harvesters perceive occupational noise risk. One of the survey components of this thesis includes a 20-items questionnaire on noise risk perception that is based on these five key indicators of the HBM.

Reliability of noise risk perception questionnaire:

The reliability of a questionnaire is a method for assessing the measurement scale used to gather data. To obtain valid results, observations must be done using a reliable test method. The reliability coefficient has values ranging from 0 to 1.0. A coefficient of 0 indicates no reliability, whereas a value of 1.0 shows perfect reliability. Due to the inherent error in all testing methods, reliability coefficients will never approach 1.0. In general, if a standardized test's reliability is greater than.80, it is regarded to have good reliability; if it is less than.50, it is not regarded to be a reliable tool.[140] Calculating alpha has become a routine method in medical education research when multiple-item evaluations of a topic are employed as it needs just one test administration compared to other analyses (e.g., test-retest reliability predictions).[141] Cronbach's alpha is a measure of internal consistency that is commonly used to determine the correlations between the responses on an evaluation instrument. Cronbach's alpha determines the correlation between all parameters in every combination; a high-reliability estimate should be as near to 1 as feasible.[142] The present study questionnaire was adopted from a study conducted by Purdy and Williams.[135]

The authors performed the questionnaire's reliability assessment using Cronbach's alpha and found a value of 0.81, which is considered as indicating good reliability.[135]

3.1.2 Health Capital Approach

The promotion of health care services can assist employees in improving their performance and general quality of life. If this is the case, these services contribute to human capital investment, enhancing both the efficiency of labor services and the accompanying quality of life. Improved health instantly benefits both employees and employers by increasing mental clarity, endurance, and vitality while on the job. Thus, investing in the prevention and treatment of illness and impairment improves physical vitality and mental enthusiasm for life and work, thereby increasing productivity and the enterprise's labor value. Thus, the corporation and its employees have significant incentives to invest in health capital, just as they do in job training and education programs.[143]

For qualitative risk assessment, health capital is one approach to exploring the risk in an individual's attributes and distinguishing disparities such as a lack of training, education, or experience. In this approach, such risk is considered quantifiable. The leading cause of injury at the workplace is the human error associated with a lack of performance, fatigue, stress, or inadequate training.[144] This approach pointed out that personal safety training and education to improve information and awareness are the most suitable ways to decrease workplace risk. Some researchers pointed out that adopting fatalism as a coping mechanism for risky conditions can obstruct or impede the safety training process by preventing at-risk workers from adopting proper protective measures.[145–147] It is necessary to note that risk perception can directly impact workers' health and well-being and affect their likelihood of being involved in an injury or accident. Increased risk perception can cause stress, anxiety, or depression.[67]

Through health promotion programs that include training, education, and information, the health capital approach helps match workers with actual risk in their environment. This research suggests a new mechanism for integrating employment and health based on Mildred Blaxter's[148] concept of 'health capital.' Through this technique, I study the concept's use in elucidating prevalent beliefs about employees' intensification and self-perceived health. This perspective describes how workers' perceptions of increased job effort are shaped by their view that continued employment necessitates a high demand for their health capital.

This study explores the risk perceptions and health impacts of fish harvesters in NL. The study's first objective is to assess the risk of noise perception and self-reported hearing loss in active fish harvesters. It contributes to a better understanding of the perceived benefits of noise reduction, the barriers to noise reduction, attitudes toward noise, and self-reported hearing loss among fish harvesters in NL. The second objective of the research is to understand fish harvesters' experiences with noise exposure, the health effects of noise exposure, and the existing challenges in preventing noise-induced health problems. Fish harvesters were encouraged to share their experiences and provide comments on minimizing noise exposure and enhancing noise control legislation, regulations, policy, and practice.

3.2 Research framework

Study design

The present research is a mixed-methods study that includes a cross-sectional, descriptive questionnaire-based online survey and semi-structured telephone interviews.

Study setting

The study was conducted among commercial fishing workers in Newfoundland and Labrador, Canada.

Target Population

Commercial fish harvesters working in Newfoundland and Labrador, Canada, are considered the target population for this research.

Ethical Approval

The Interdisciplinary ICEHR at the Memorial University of Newfoundland granted ethical approval [Appendix A]. The application for ethical clearance was initiated on October 9, 2020 [20210888-ME]. The ethics approval was granted on December 1, 2020 [Appendix B]. An amendment in the ethics application was requested to add information about the incentives for the study participants. The ICEHR approved the ethics amendment request in June 2021 [Appendix C]. Various instruments were constructed to implement the survey and interview, including a recruitment email, information sheet, consent form, survey questionnaire, interview semi-structured guide, and research flyer [Appendix D–L].

All Tri-Council Policy Statement guidelines were followed to ensure the confidentiality of participants' information. Participants' responses were kept anonymous, and no personally identifiable information such as the participants' names, email addresses, or IP addresses was collected. All data were saved electronically in a password-protected and encrypted format. The study's findings are utilized exclusively for academic purposes, and the information is accessible only to the research team.

The study was conducted purely on a voluntary basis. The research information and flyer clarified that this study is not required by any fishing organization/s or union that disseminates the research information on our behalf. Participants had the option of skipping questions they did not wish to answer.

Following completion of the survey, participants were asked to provide their email address and/or contact number for a chance to win one of four e-gift cards. Participants were redirected to a separate page to prevent survey responses from being associated with their contact information (email address/contact number). Individuals were urged to engage in an online interview. Additionally, the interviewees were selected for the e-gift cards. Following the end of the study, the e-gift cards were emailed to randomly selected four survey and twelve interview participants.

Inclusion criteria:

1. Fish harvesters must be between the ages of 18 and 65 years.
2. NL fish harvesters are classified under apprentice fish harvester, professional fish harvester Level-I and Level-II, and actively working on fishing vessels for one year or more.

Exclusion criteria:

1. Fish harvesters with a previous history of working in a noisy environment other than fishing vessels for one year or more.
2. Fish harvesters with a pre-existing diagnosed hearing problem/s before joining as a fish harvester.

3.3 Online survey methods

Sample size:

As per the literature search, no such study explores the perception of noise among fish harvesters conducted across the globe. The sample size calculation was found to be difficult without having a prevalence value of noise exposure among fish harvesters. Considering the exploratory nature of this research and the perceived low response rate due to the prevailing

COVID-19 pandemic, it was planned to approach the entire population of fish harvesters in Newfoundland and Labrador.

Study instrument:

A 37-item questionnaire containing two sections (A & B) was adopted for the quantitative survey. Section-A consists of a 20-item questionnaire that includes questions regarding perceived noise benefits (four items), perceived barriers in noise reduction and prevention of hearing loss (five items), the perceived self-efficacy of being able to reduce noise exposure and noise levels (four items), attitude towards noise (three items), and perceived noise susceptibility to hearing loss (four items). A five-point Likert scale (1=strongly agree, 2=agree, 3=neither agree nor disagree, 4=disagree, and 5=strongly disagree) was used to record the responses. Five items [items 1 to 4 and item 12] of the noise risk perception questionnaire were reversed for scoring purposes. After reversing the scores, a high score (5) indicates that subjects consider noise reduction beneficial, perceive barriers to be reduced, have high self-efficacy, a negative attitude toward the noise, and increased perceived susceptibility.

A 17-item questionnaire was used in section B, which includes questions regarding sociodemographic details, job profile, vessel characteristics, the experience of loud noise exposure, use of hearing protectors, and self-reported hearing loss questions (Appendix G). Various studies have been conducted across diverse population groups using the noise perception questionnaire adopted in this research.[149–153]

Sample selection strategy:

The research flyer provided the study's title, a brief statement of its purpose, inclusion and exclusion criteria, two online links to additional information about the survey, and one link to participate in the online survey. The research flyer was distributed via multiple online

platforms, including Facebook, Twitter, LinkedIn, Instagram, and the websites of three fishing organizations: the PFHCB, the NL-FHSA, and the FFAW-Unifor union. At the end of the survey, participants were offered the opportunity to participate in a follow-up online interview. Respondents were redirected to a new page after selecting "Yes", where they could input their email address and/or phone number. Participants' email addresses were collected for the raffle or interview selection and immediately erased once they received e-gift cards.

3.4 Qualitative research methods

Sample size:

A sample size of 30 was chosen for qualitative semi-structured interviews. However, due to the COVID-19 outbreak, communication resources were limited to disseminating research materials and contacting potential research volunteers. As a result, I was able to interview only twelve fish harvesters.

Interview guide:

In the online interviews, questions related to noise-induced auditory and non-auditory health problems, experiences with preventing and managing noise exposure and noise-induced health problems, and barriers and challenges to preventing noise-related health problems were considered (Appendix K).

Sample selection strategy:

Interviews were conducted using the same recruiting strategy as the survey.

3.5 Pilot study

A pilot study was conducted before the primary research to assess the feasibility of the study questionnaire and interview guide.

3.6 Study Procedure

A cross-sectional, descriptive questionnaire-based quantitative survey and semi-structured interview-based qualitative study was conducted to assess the perception of occupational noise exposure and its impact on fish harvesters' health. The survey questionnaire was designed such that it did not take over 20 minutes to complete. The average interview length was one hour, and it was done over the telephone. Telephone interviews were audio-recorded for the data analysis. The study was conducted from August 2020 to May 2021. The online survey and telephone interviews were conducted between January and April 2021.

3.7 Statistical Analysis

For the quantitative study, survey data were entered into a Statistical Package for the Social Sciences [Chicago, IL, USA. Version 20.0] software file from the Qualtrics™ survey webpage. Descriptive statistics analysis was done to calculate the frequency distribution, percentages, mean, range, and percentile. The Chi-square test/Fisher's exact test was used for cross-tabulation analysis to determine the association of age, gender, education, length of employment, and vessel characteristics with the noise risk perception. A p-value of 0.05 was used to determine if an association was statistically significant. Qualitative data analysis was done using the thematic analysis approach.[154,155] The health capital approach[156] was used to understand fish harvesters' experiences towards noise exposure and identify potential barriers and obstacles to preventing noise-induced health problems.

Tables and graphs were prepared for the presentation of the results. The interviews were digitally recorded using a digital recording device and transcribed verbatim. Thematic analysis was used to analyze the collected qualitative data. Data were manually categorized to identify various themes to understand better the noise prevention and management strategies used by NL

fish harvesters and potential barriers and challenges to preventing noise-induced health problems. The principal investigator of the research organized the themes.

3.8 Summary

Chapter 3 describes the research methods, including research design, development, and distribution of study instruments. Chapter 4 describes the survey findings such as demographic information, vessel characteristics, employment profiles, frequency distribution, and cross-tabulation of these findings with the noise-perception questionnaire. Chapter 4 further describes the qualitative results with different themes that emerged through the online interviews.

Chapter 4

Research findings

We begin by describing demographic data such as gender, age, education level, employment profile; vessel characteristics; and self-reported hearing loss through graphs and frequency tables. Following that, frequency distributions and cross-tabulations illustrate the relationship between the noise risk perception questionnaire and demographic data, vessel characteristics, employment characteristics, and self-reported hearing loss.

This chapter concludes with an analysis of the interview data, including demographic information about the participants' ages, genders, and employment profiles, and a thematic analysis of the qualitative data. At the end of the chapter, the significance and limitations of the research are discussed. Chapter 5 connects the study findings to data from the literature outlined in chapter 2, analyses existing research and regulatory gaps, and makes recommendations for mitigating noise exposure and noise-related health concerns among fish harvesters.

4.1 Online survey findings

Pilot study

Pilot testing of the survey was done among seven participants, and two fish harvesters were involved in the pilot testing of interview questions. All the participants were asked to provide feedback about the structure and relevance of the survey and interview questions, followed by a discussion of the inclusion or exclusion of any additional questions. All participants unanimously approved the current survey questionnaire and semi-structured interview questions. However, two participants suggested the implementation of an in-person survey to get more study samples. Due to the COVID-19 pandemic, the online survey approach was retained for additional investigation.

Demographic data

For this study, 101 participants completed an online survey, with 21 entries being excluded due to completely missing values. Four of the remaining participants were deemed ineligible due to their lack of PFHCB certification. As a result, the final statistical analysis included data from 76 fish harvesters. Approximately 80.3% and 19.7% of the participants were male and female, respectively.

Around 30% of fish harvesters were between the ages of 51 and 60 in the current study, followed by 23.8%, 22.2%, and 20.6% in the 41–50, 61–65, and 31–40 year age groups, respectively. Only 3.2% of fish harvesters in the 24–30 year age group responded to the survey (Figure: 4.1). The mean age of survey participants was 50.62±11.09 years, ranging from 24 to 65 years. When age was classified into two dichotomized variables (40 years and under and 41 years and over), more than two-thirds of participants (76%) fell into the over-40 year age group.

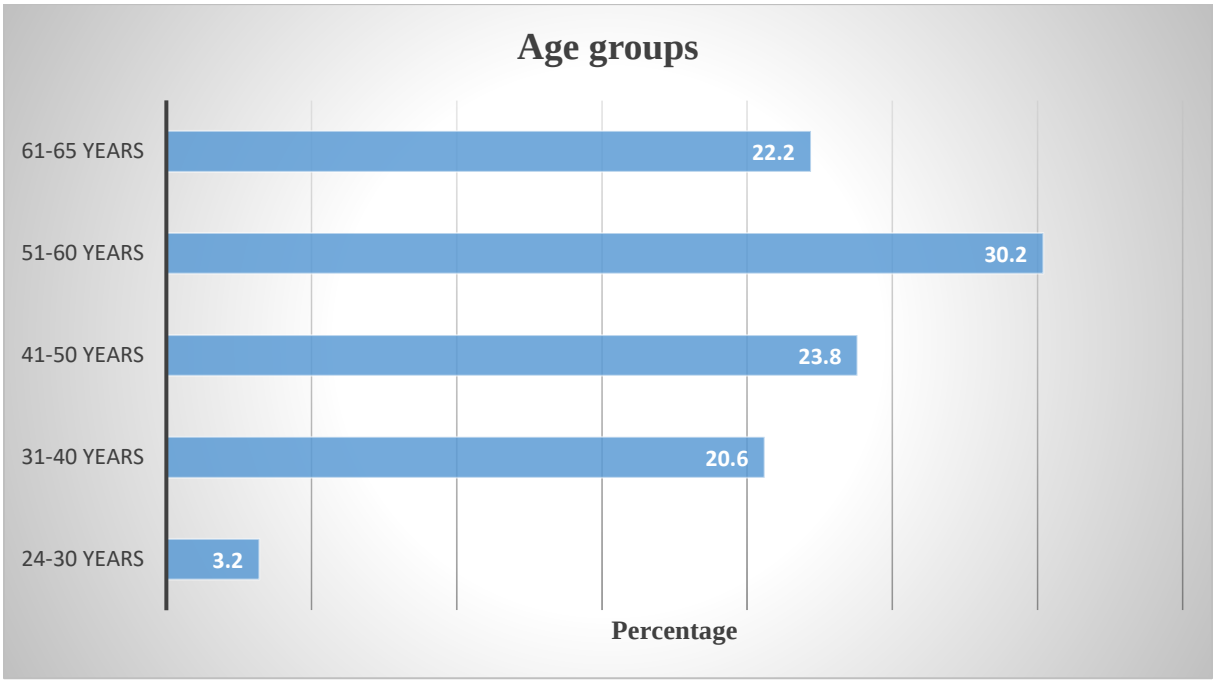


Figure 4. 1: Distribution of participants according to age groups

Table 4.1 illustrates the distribution of educational attainment among study participants. Around 50% of fish harvesters completed their education at high school, with approximately 18% completing their education at the technical and university level. About 8% of fish harvesters finished junior high school, and 4% earned a college degree. In addition, two participants obtained their fishing master-IV certification, while another two earned their fishing master-II and III certifications.

Table 4.1 Distribution of level of education among study participants

Education	Frequency	Percent
Up to Junior High	5	7.6
High School	34	51.5
Technical school	12	18.2
University	8	12.1
Any other	7	10.6
Total	66	100.0

Note: Any other category contains education from college, and certification of fishing master II, III, and IV

When education is categorized into two binary variables (up to high school and beyond high school), approximately 60% and 40% of fish harvesters, respectively, completed their education up to high school and beyond high school.

Around three-fourths (75.8 %) of survey participants were certified as professional fish harvesters Level II. In comparison, 13.6 % and 10.6 %, respectively, were classified as professional fish harvesters Level I and apprentice fish harvesters (Figure 4.2). When the category of professional certification was divided into two binary variables (Level-II and lower than Level-II), nearly two-thirds (76%) of participants were certified at Level-II. Around 24% were certified with a certificate lower than Level-II.

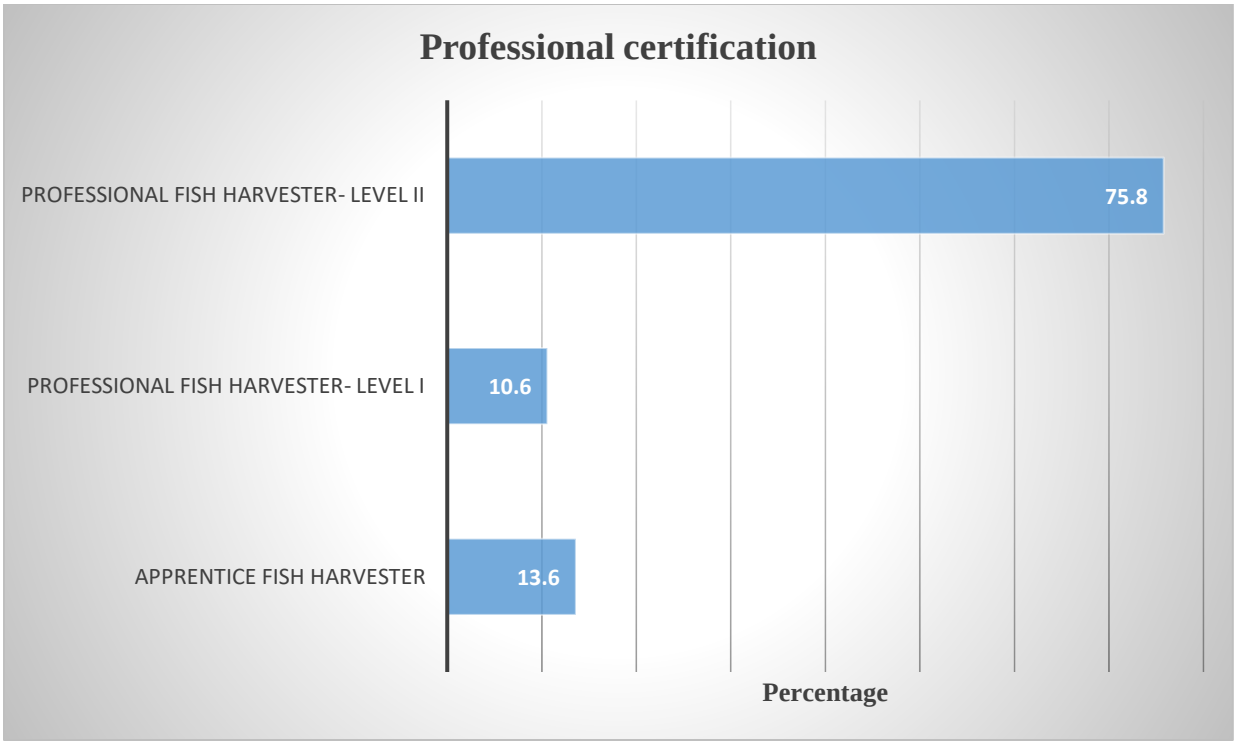


Figure 4. 2: Distribution of fish harvesters according to professional certifications

Around two-thirds of fish harvesters worked as captains/skippers, while approximately 14% and 12% worked as deckhands and mates, respectively. According to the findings, five participants in any other category worked as crew members, fishing partners, self-employed fishers, deckhands and skippers, deckhands, mates, and skippers (Table 4.2).

Table 4.2 Distribution of job position categories of fish harvesters

Which of these best describes your work?	Frequency	Percent
Captain/Skipper	44	66.7
Mate	8	12.1
Deckhand	9	13.6
Any other	5	7.6
Total	66	100

Note: Any other category contains work positions as crew member, fishing partner, self-employed fisherman, Deckhand and Skipper, and Deckhand, Mate and Skipper

Vessel characteristics:

Respondents indicated that they worked on approximately 50% and 20% of decked and undecked vessels, respectively. Approximately a third of participants (29%) worked on both types of boats (Figure 4.3).

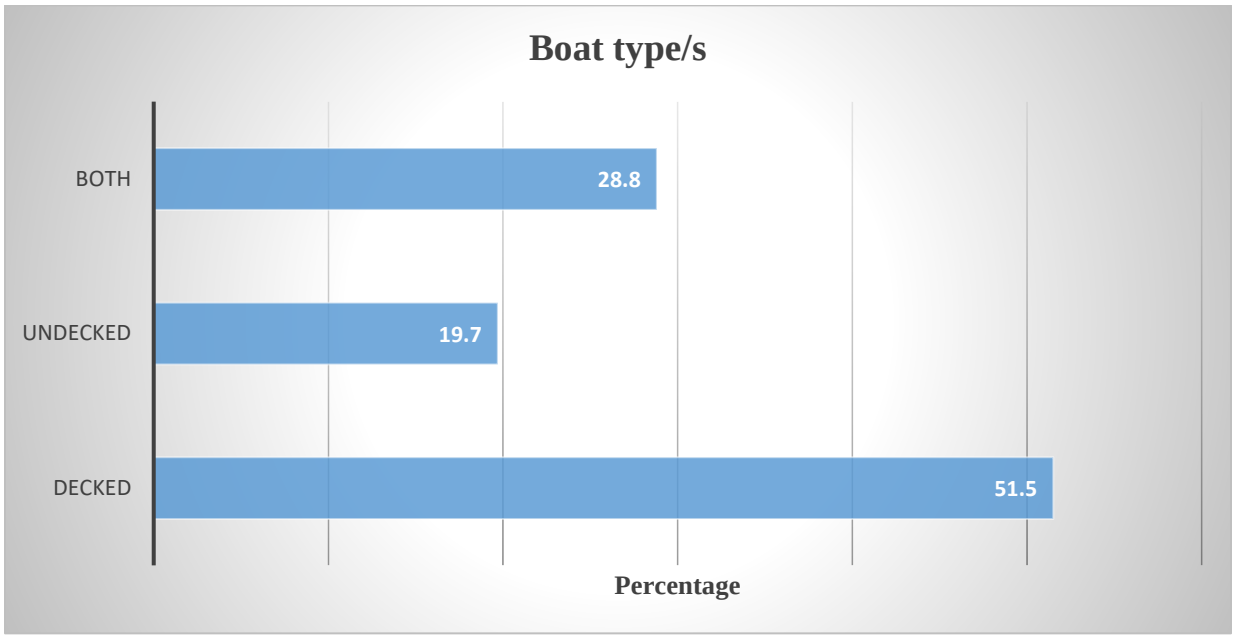
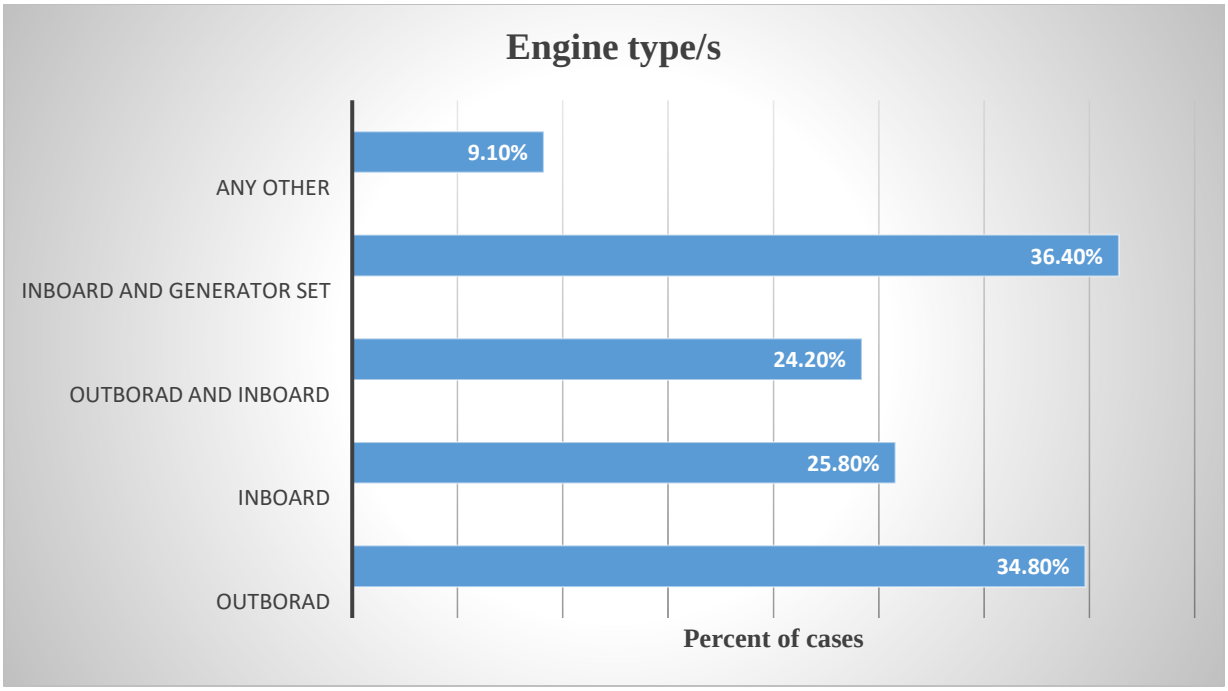


Figure 4. 3: Distribution of fishing vessels according to types of deck

Figure 4.4 illustrates the percentage of fish harvesters who operate boats powered by various engine types/s. Please keep in mind that some harvesters work on multiple boats with varying engine types, vessel lengths, GTs, fishing gear, and species harvested, so the total percentage in these cases exceeds a hundred. Around 28% and 27% of participants, respectively, used inboard and outboard engines on their boats. About 20% and 19% worked on boats with inboard engines and ships with both outboard and inboard engines, respectively.

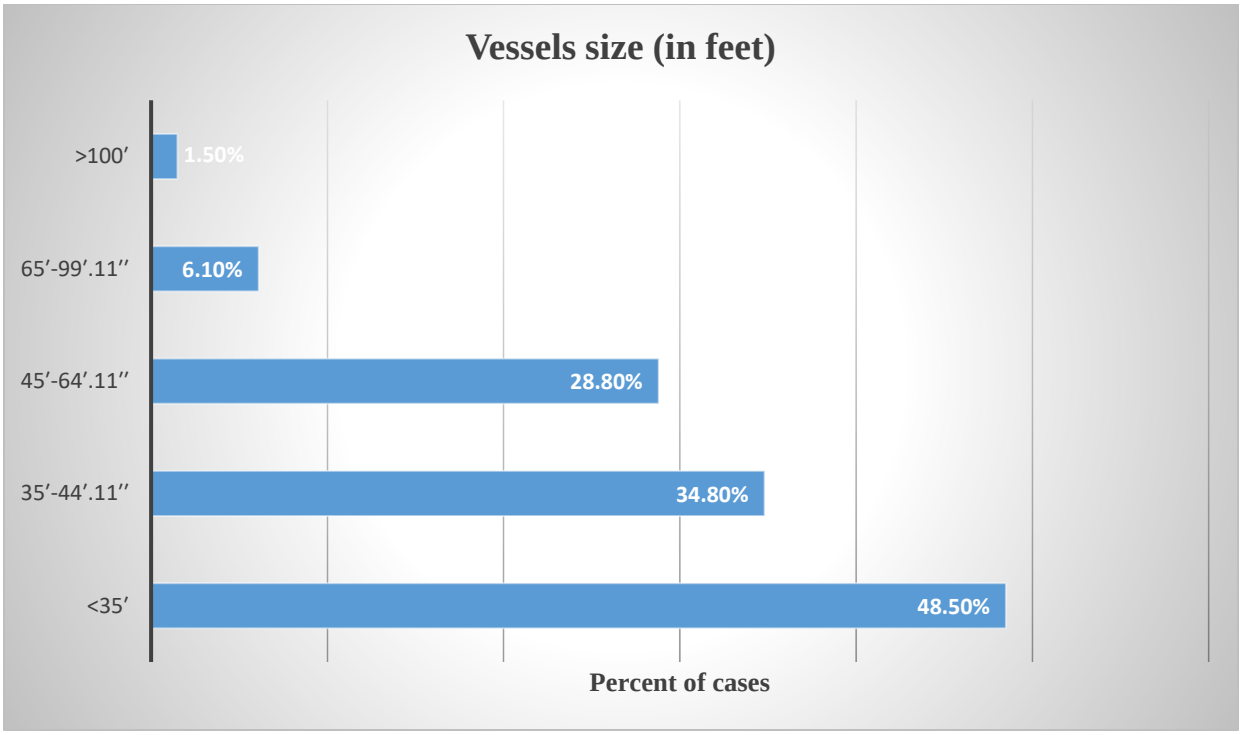


Note: More than one contributing factor could be identified in a single case

Figure 4. 4: Distribution of percentages of fish harvesters using vessels with different types of engines

Around 40% of participants worked on fishing vessels less than 35 feet, while approximately 29% and 24% worked on ships 35–44.11 feet and 45–64.11 feet, respectively. Four and one participants, respectively, worked on fishing vessels measuring 65–99.11 feet and over 100 feet (Figure 4.5).

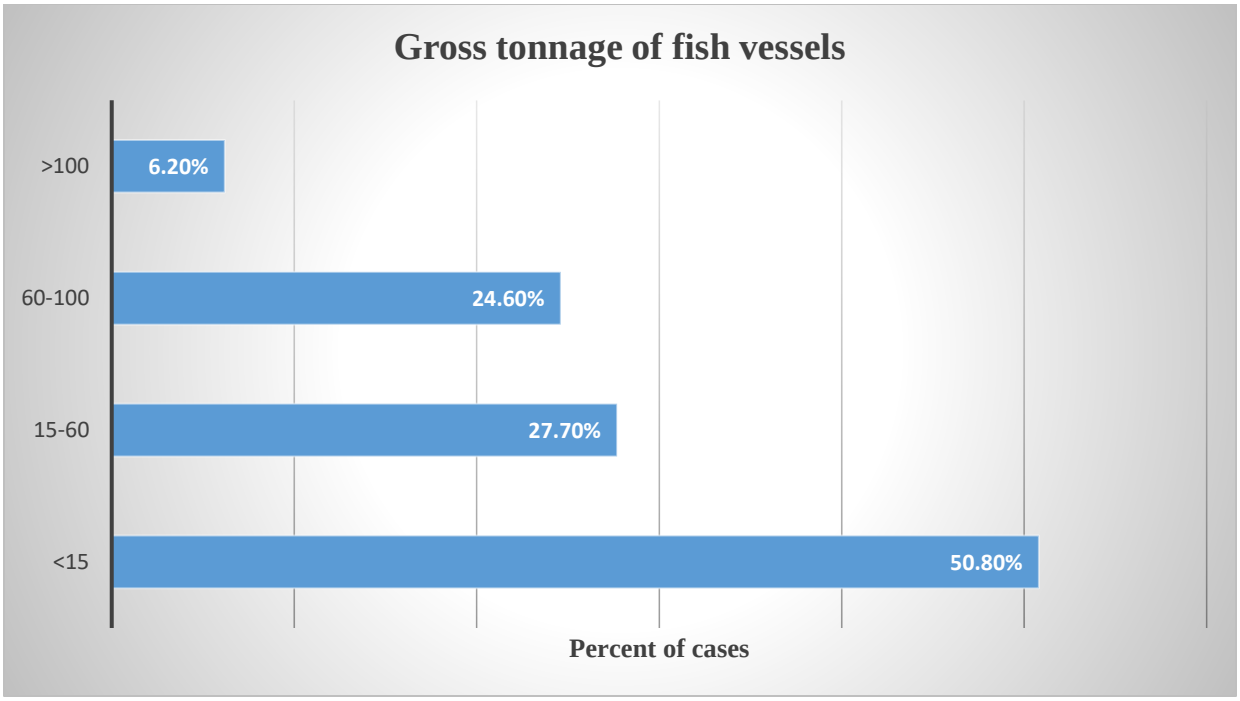
While all fishing vessels are classified into two sizes (small and medium/large), approximately 73% of fish harvesters worked on small vessels measuring less than 44.11 feet. In contrast, about 27% worked on medium and large ships measuring 45 feet or longer.



Note: More than one contributing factor could be identified in a single case

Figure 4. 5: Distribution of percentages of fish harvesters using vessels with different lengths

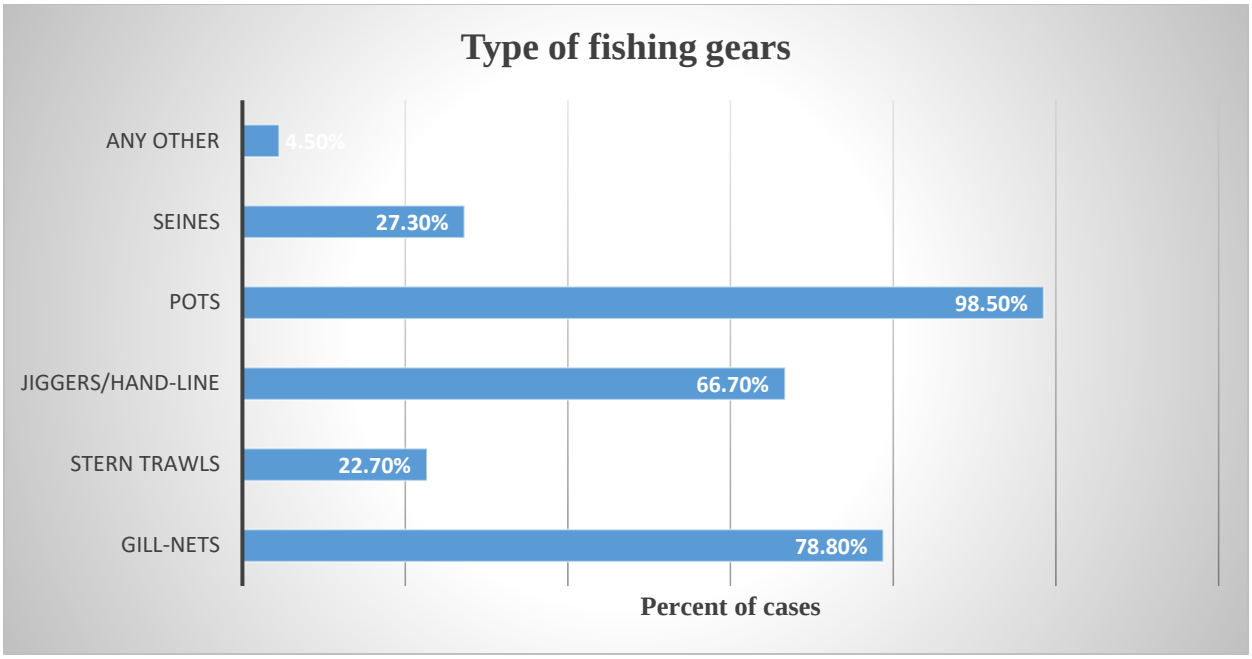
According to Figure 4.6, nearly half of all fish harvesters worked on vessels with a gross tonnage (GT) of less than 15, followed by approximately 25%, 23%, and 6% on vessels with GT of 15–60, 60–100, and over 100. When we categorized fishing vessels into <15 and ≥15GT, we observed an approximately similar distribution in both categories.



Note: More than one contributing factor could be identified in a single case

Figure 4. 6: Distribution of percentages of fish harvesters using vessels with GT

The distribution of the various types of fishing gear used by study participants is depicted in Figure 4.7. One-third of participants (33%) used pots, followed by gill nets (26%) and jiggers/hand-lines (22%). Around 9% and 8% of participants, respectively, used seiner and stern trawl fishing gear. Three participants used dredges and handlines.

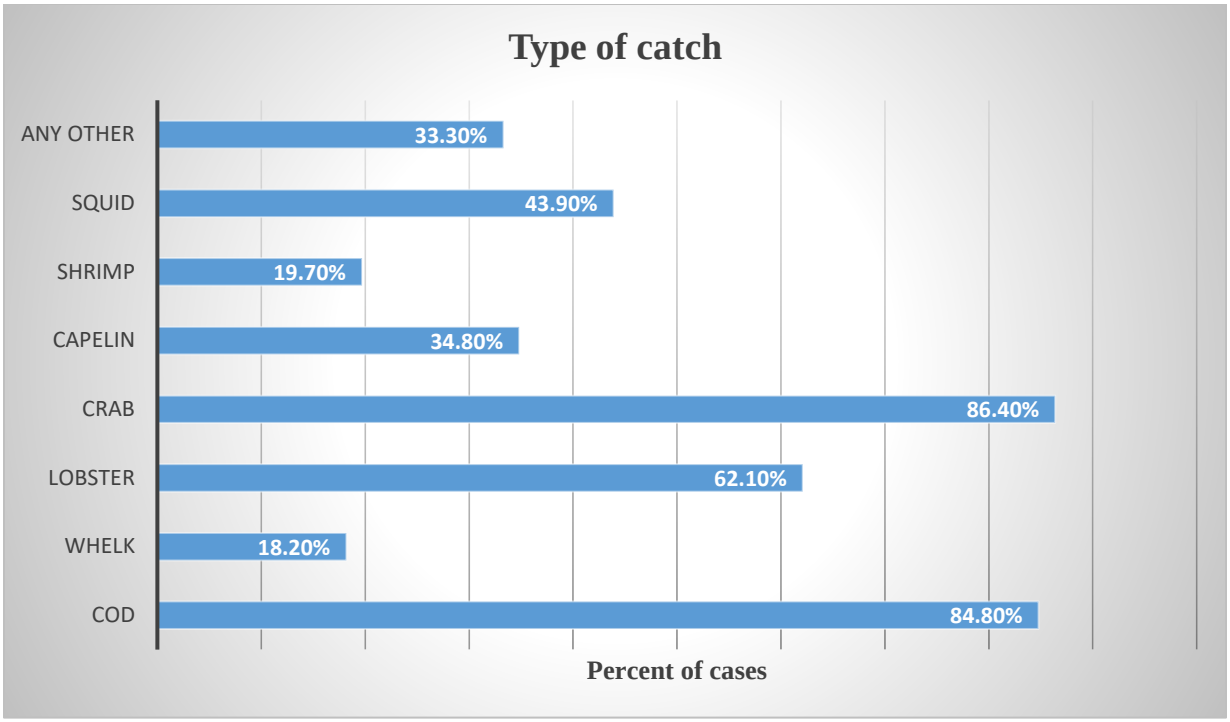


Note: More than one contributing factor could be identified in a single case

Figure 4. 7: Distribution of percentages of fish harvesters using vessels with different fishing gear

Job profile:

Cod and crab fishing were observed in 85.8% and 86.4% of the surveyed population, whereas 62.1% of the population engaged in lobster fishing. The remaining individuals fished for squid and capelin in proportions of 43.9% and 34.8%, respectively. About 19.7% of participants caught shrimp and 18.2% caught whelk, respectively. Around 33.30% of participants were fishing different types of catch, including sea cucumber, halibut, herring, scallop, mackerel, turbot, or a combination of these species (Figure 4.8).



Note: More than one contributing factor could be identified in a single case

Figure 4. 8: Distribution of percentages of fish harvesters using vessels with different types of catch

Around 29.7%, 25%, and 17.2% of participants, respectively, had worked in the fishing industry for 21–30, 31–40, and 41–50 years. Only 6.3% and 4.7% of participants, respectively, had been fishing for 51–60 years or fewer than ten years (Figure 4.9). When the total employment duration is divided into two categories (up to 20 years and over 20 years), approximately 75% worked in the fishing industry for over 20 years, while 25% worked for less than 20 years.

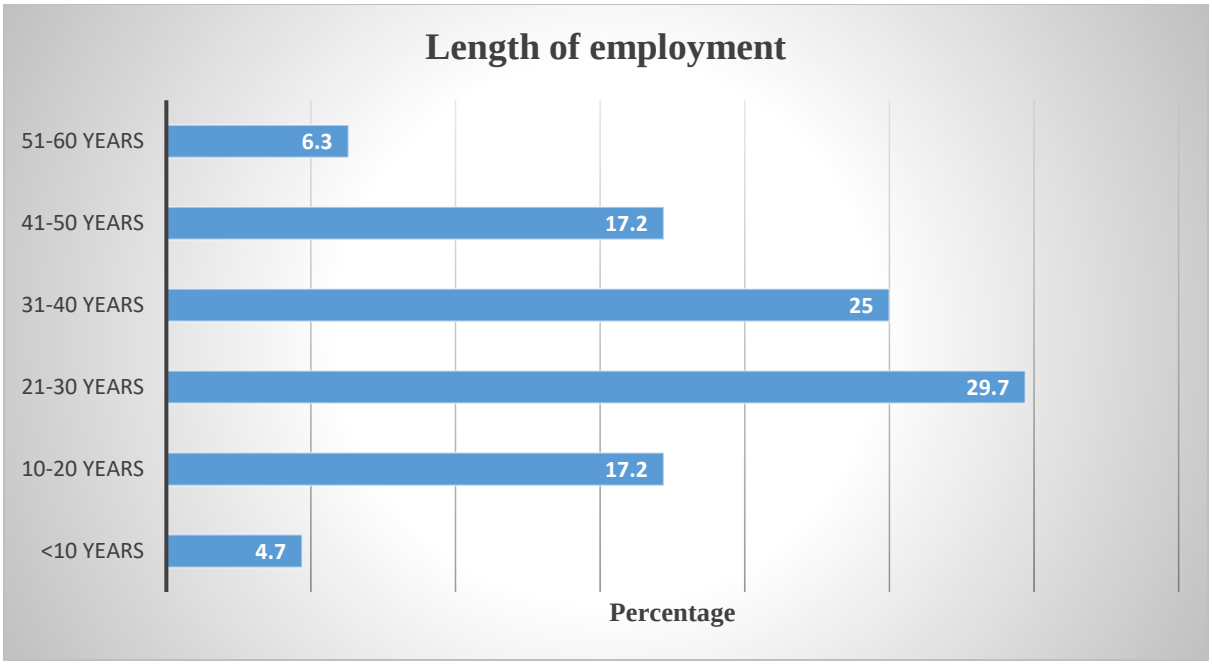


Figure 4. 9: Distribution of percentages of fish harvesters with different lengths of employment

When asked about their tenure in their current job position, 25%, 23.4%, 21.9%, and 18.8% of participants indicated that they had worked for less than 10, 10–20, 21–30, and 31–40 years, respectively. Only 11% of participants had worked in their current position for 41–50 and 51–60 years (Figure 4.10).

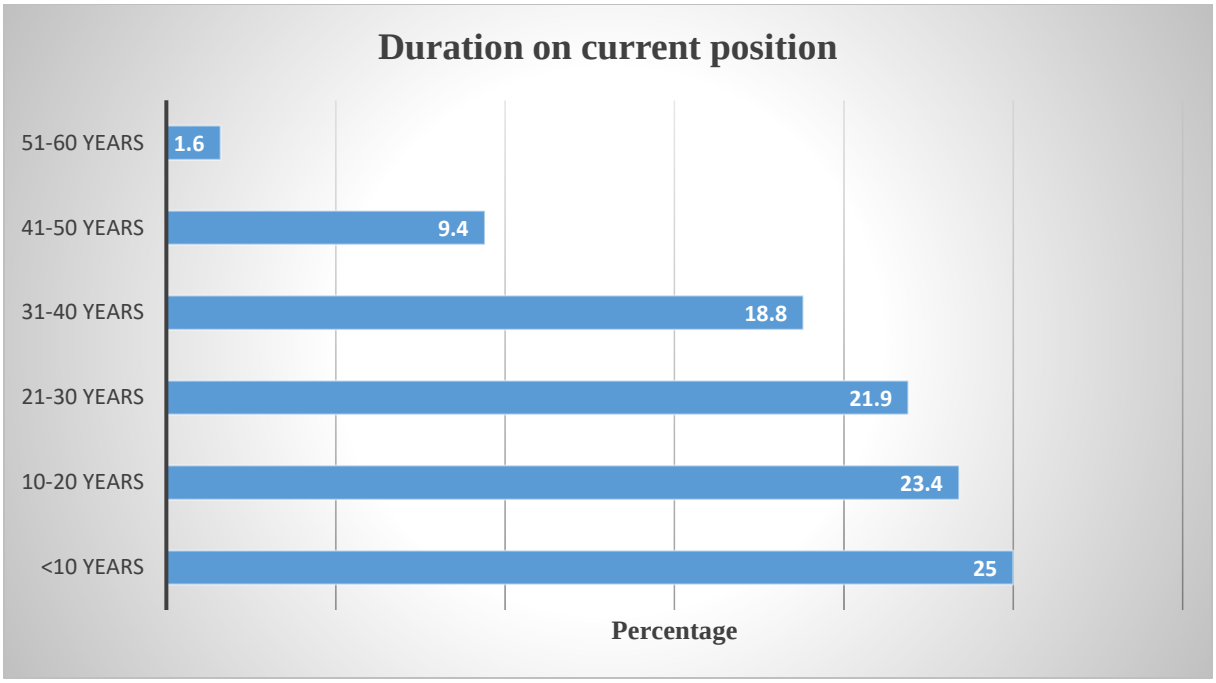


Figure 4. 10: Distribution of percentages of fish harvesters with different durations of employment in their current position

Self-reported Noise Exposure and Use of Hearing Protectors:

When asked, "During the past month in your work area, what percentage of the time during the working day were you exposed to loud noise (loud enough to require you to raise your voice)?", one-third of study participants stated that they were exposed to loud noise less than 10% of the time. Only 19.3% indicated that they were frequently exposed to loud noise between 71% and 80% of the time. Less than 10% of fish harvesters reported being exposed to loud noise between 21–30%, 41–50%, 61–70%, and 91–100% of the time. When the total number of responses was divided into two categories (less than or equal to 50% of the time and over 50% of the time), approximately 54% and 46% of participants, respectively, responded to less than or equal to 50% of the time and over 50% of the time (Figure 4.11).

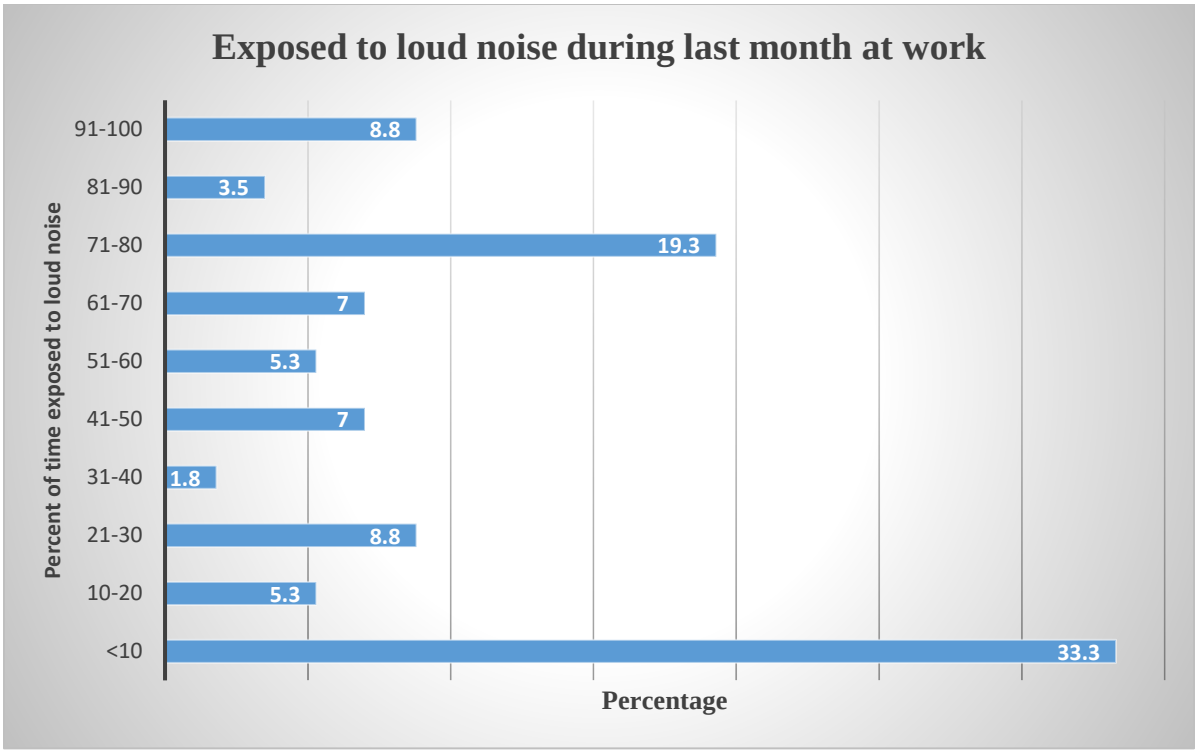


Figure 4. 11: Distribution of percentage of fish harvesters exposed to loud noise while on board during the past month

When asked, "During the past month, what percentage of the time during the working day did you wear hearing protectors (earmuffs or earplugs)?", approximately three-fourths of participants responded that they wore hearing protectors less than 10% of the time. Around 12% of those surveyed responded that they wore hearing protection between 10% and 20% of the time while working. Seven percent of respondents indicated that they wore hearing protectors 41–50% of the time (Figure 4.12).

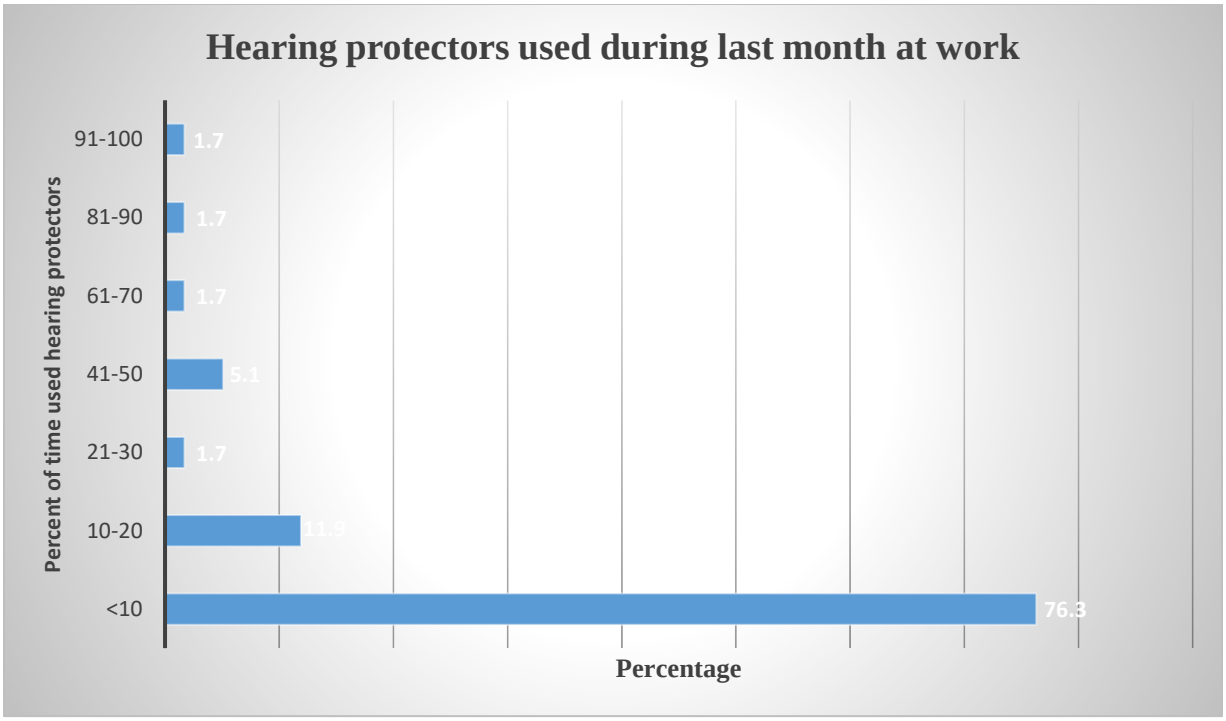


Figure 4. 12: Distribution of percentage of fish harvesters wearing hearing protectors while on board during the past month

While dividing the use of hearing protectors during the previous month into two categories (0% and greater than 0%), approximately 73% of participants reported never wearing hearing protectors.

Hearing difficulties and associated problems

The hearing difficulty status of fish harvesters is depicted in Figure 4.13. Around 62.1% of the total survey respondents indicated they have a hearing impairment, while approximately 30.3% and 7.6% responded with "no" and "can't say," respectively.

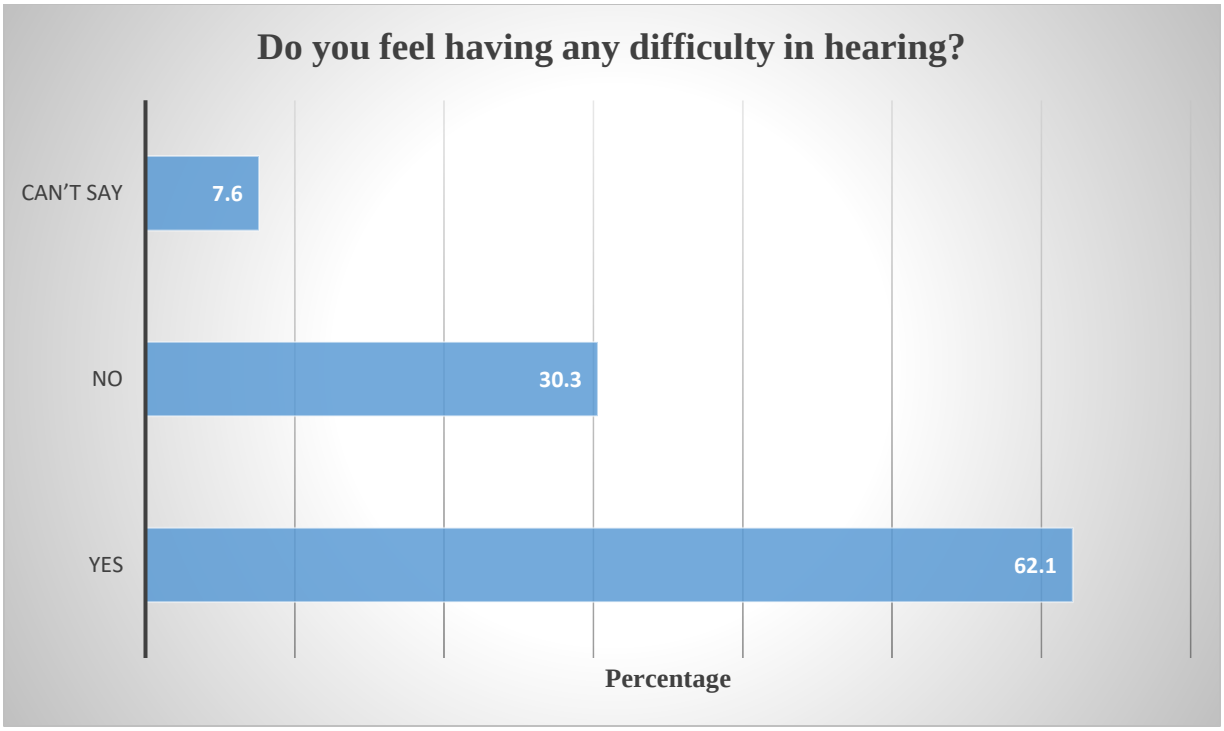


Figure 4. 13: Distribution of percentages of fish harvesters based on their hearing difficulty status

When asked if they had any noise/ringing in their ears, fish harvesters responded differently. Around 46.9% and 28.1% of participants, respectively, responded with "occasionally" and "never," while approximately 15.6% and 9.4% responded with "always" and "frequently," respectively (Figure 4.14).

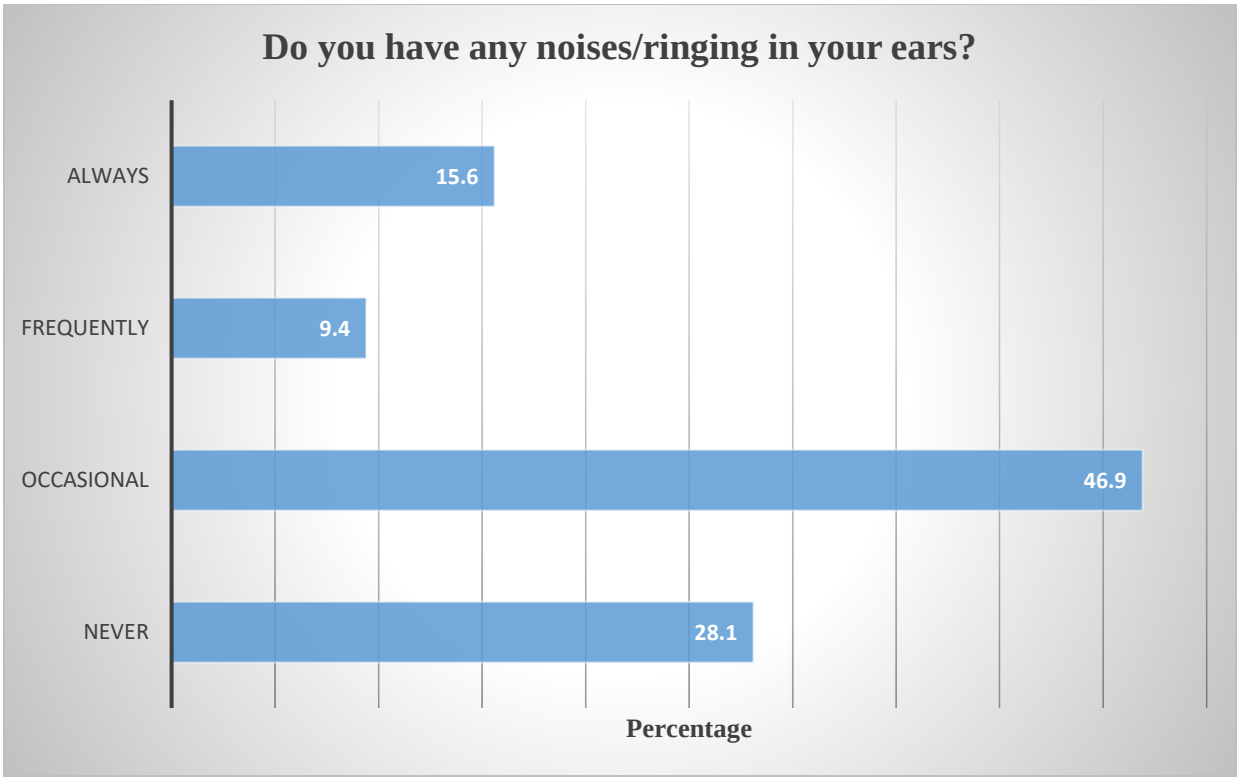


Figure 4. 14: Distribution of percentages of fish harvesters based on their ringing ears status

When asked, "Does an immediate family member or friend feel that you have hearing loss?", approximately 61.5% of those polled said "yes". In comparison, roughly 23.1% and 15.4% said "no" and "can't say," respectively (Figure 4.15).

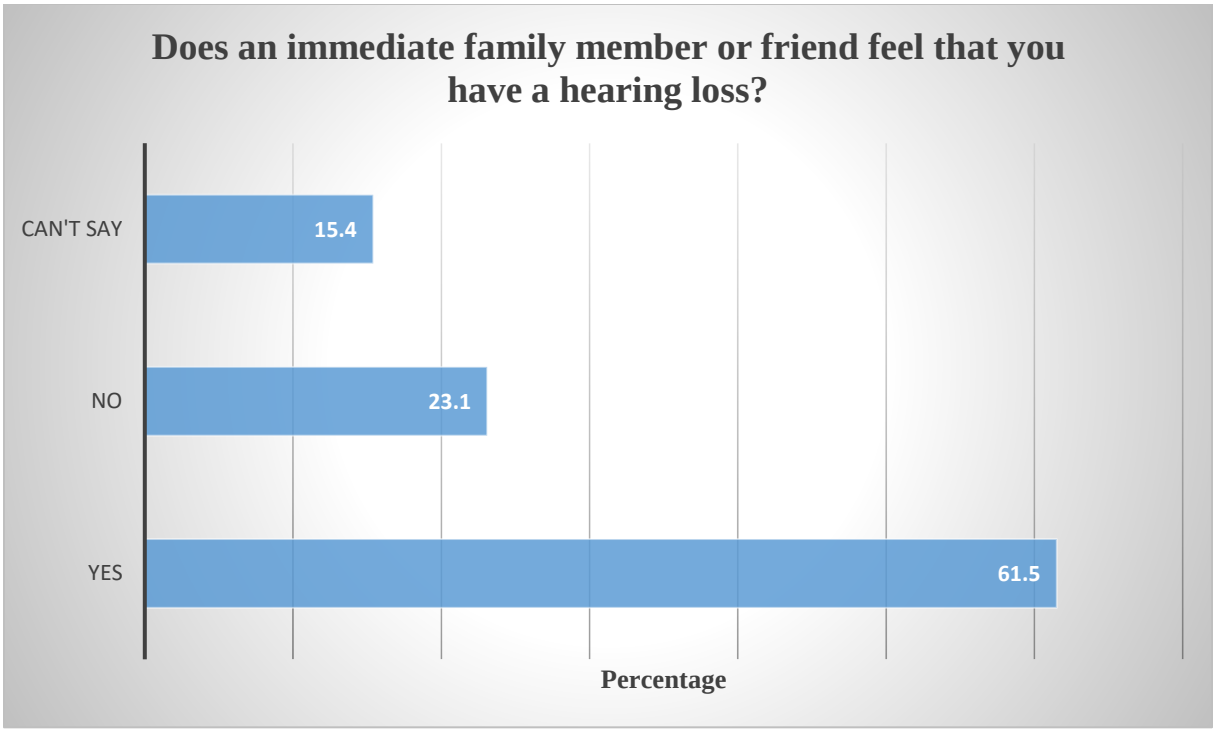


Figure 4. 15: 15Distribution of fish harvesters according to their hearing loss as per the perception of their family members/friends

When asked if they had taken a hearing test, roughly 52.3% and 47.7% of participants said "yes" and "no," respectively (Figure 4.16). Approximately 79% of participants who had hearing tests reported that their employers did not organize their hearing tests, while 21% reported that their employers conducted their hearing tests. When asked if hearing test results were explained to them, most participants (87.9%) said "yes," while 12.1% said hearing test results were not explained to them.

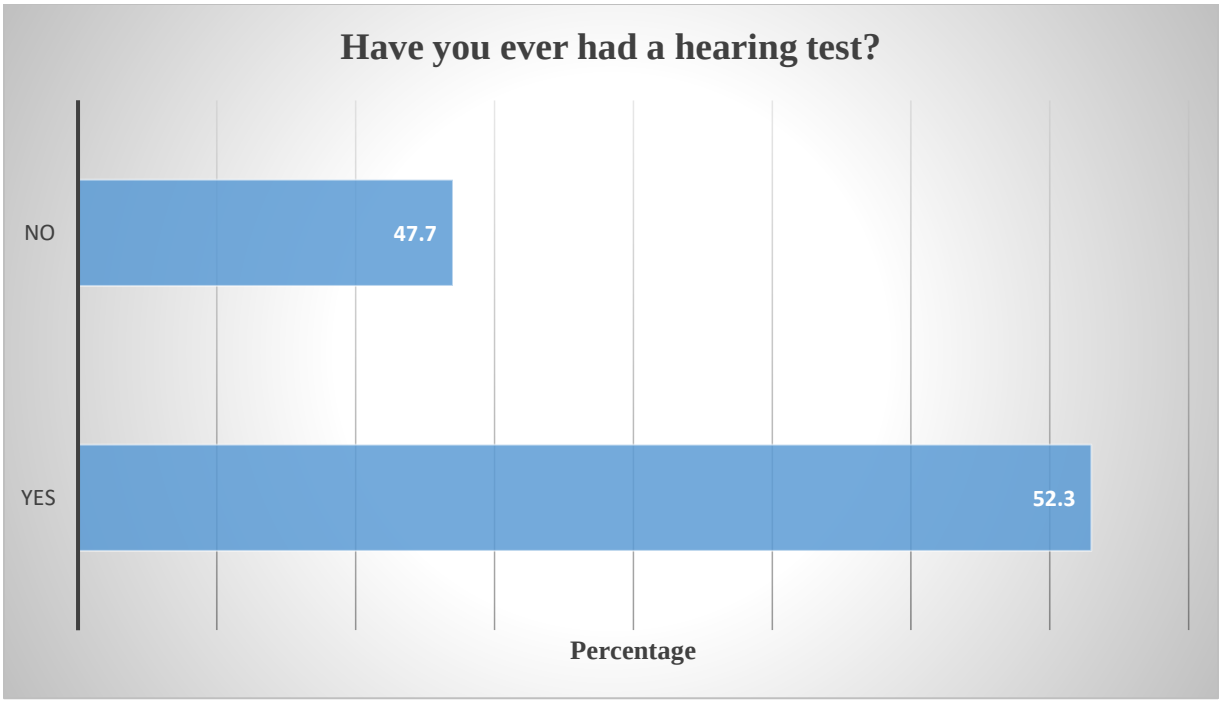


Figure 4. 16: Distribution of percentages of fish harvesters based on their hearing test status

When asked if it was difficult to follow a conversation with background noise, approximately 57% of participants said "yes," while approximately 29% and 14% said "no" and "can't say," respectively.

Noise perception questionnaire:

The noise perception questionnaire is comprised of twenty questions, five of which are subscales based on the HBM.

The data in Table 4.3 represent observations of fish harvesters' noise risk perception scores. The central tendency and dispersion parameters are computed by adding the responses to the noise risk perception questionnaire's various subscales. According to the study's findings, perceived benefits, barriers, and self-efficacy scores ranged between 2.3 and 2.9, reflecting that fish harvesters have a moderately positive attitude toward noise reduction and hearing loss

prevention. The perceived attitude and susceptibility scores ranged between 3.9 and 4.5, showing that participants disliked loud noises and were predisposed to hearing loss.

Table 4.3 Descriptive statistics of the noise risk perception questionnaire

	Para-meters	Perceived Benefits mean	Perceived Barriers mean	Perceived self-efficacy	Perceived attitude	Perceived susceptibility
N	Valid	72	76	76	75	76
	Missing	4	0	0	1	0
Mean		2.3	2.9	2.3	3.9	4.5
Median		2.3	3.0	2.3	4.0	5.0
Std. Deviation		0.9	0.7	0.7	0.9	0.7
Minimum		1.0	1.2	1.0	1.7	1.8
Maximum		4.8	4.8	4.8	5.0	5.0
Percentiles	**25**	1.8	2.6	1.8	3.3	4.3
	75	2.8	3.2	2.8	4.7	5.0

The perceived benefit subscale responses, which range from 1 to 4, are summarized in Table 4.4. The majority of respondents (53–82%) agreed with the critical nature of a noise-free work environment. However, between 11% and 19% expressed a lack of interest in the anticipated benefits of a noise-free workplace. Around 71% and 82% of respondents agreed that a calmer work environment would make work less stressful and make them feel better. On the other hand, approximately 33% and 27% of respondents, respectively, denied that noise impairs their ability to think or focus and that noise harms their health other than hearing.

Table 4.4 Perceived benefits of noise reduction [Statement: 1 to 4]

Perceived Benefits	Work would be less stressful if it is quieter.	I will feel better if my workplace is less noisy.	Noise stops me from being able to think or focus on work.	Noise has bad effects on my health other than hearing.
	N (%)	N (%)	N (%)	N (%)
Strongly agree	27 (36.0)	32 (43.2)	10 (13.2)	12 (16.0)
Somewhat agree	26 (34.7)	29 (39.2)	30 (39.5)	30 (40.0)
Neither agree nor disagree	14 (18.7)	8 (10.8)	11 (14.5)	13 (17.3)
Somewhat disagree	5 (6.7)	3 (4.1)	18 (23.7)	15 (20.0)
Strongly disagree	3 (4.0)	2 (2.7)	7 (9.2)	5 (6.7)
Total	75 (100)	74 (100)	76 (100)	75 (100)

The results of the perceived barriers to noise reduction and hearing loss prevention are shown in Table 4.5. Participants agreed (45% to 75%) with statements 5 to 7 but disagreed with statements 8 and 9 (50% to 79%). Around 12% to 20% of participants expressed neutral opinions. However, between 68 and 75% of participants believed that hearing protectors are uncomfortable and impair their normal hearing at work. Around 21% of respondents agreed that vessel owners are unconcerned about OHS. Half of the participants stated that their coworkers were unconcerned about workplace noise.

Table 4.5 Perceived barriers to noise reduction and hearing loss prevention [Statement: 5 to 9]

Perceived Barriers	I do not have time to do anything about the noise at work.	Hearing protectors stop me from hearing what I want to hear.	Hearing protectors are un-comfortable.	Vessel owners are not interested in occupational health and safety.	My mates at work don't worry about noise.
	N (%)	N (%)	N (%)	N (%)	N (%)
Strongly agree	15 (19.7)	33 (43.4)	21 (27.6)	1 (1.3)	4 (5.3)
Somewhat agree	19 (25.0)	24 (31.6)	31 (40.8)	6 (7.9)	21 (27.6)
Neither agree nor disagree	15 (19.7)	9 (11.8)	12 (15.8)	9 (11.8)	13 (17.1)
Somewhat disagree	18 (23.7)	10 (13.2)	8 (10.5)	15 (19.7)	18 (23.7)
Strongly disagree	9 (11.8)	0 (0.0)	4 (5.3)	45 (59.2)	20 (26.3)
Total	76 (100)	76 (100)	76 (100)	76 (100)	76 (100)

Table 4.6 summarizes participants' responses to questions about their perceived self-efficacy in reducing noise exposure at work. Participants agreed on three statements in this subscale, which indicate their inability to reduce workplace noise, their ability to use earplugs and earmuffs, and their acceptance that developing quieter equipment is difficult. However, when asked about the proper use of earplugs and earmuffs, we received conflicting responses from participants. Around 39% and 42% of participants, respectively, disagreed and agreed with the proper use of earplugs and earmuffs.

Table 4.6 Perceived self-efficacy in being able to reduce noise levels and noise exposure [Statement: 10 to 13]

Perceived Self-efficacy	I cannot reduce noise at work.	I am not sure that I can use hearing protectors correctly.	I know how to use my earmuffs or earplugs.	It is difficult to make equipment quieter.
	N (%)	N (%)	N (%)	N (%)
Strongly agree	23 (30.3)	4 (5.3)	43 (56.6)	42 (55.3)
Somewhat agree	24 (31.4)	28 (36.8)	17 (22.4)	24 (31.6)
Neither agree nor disagree	6 (7.9)	14 (18.4)	4 (5.3)	5 (6.6)
Somewhat disagree	16 (21.1)	14 (18.4)	6 (7.9)	2 (2.6)
Strongly disagree	7 (9.2)	16 (21.1)	6 (7.9)	3 (3.4)
Total	76 (100)	76 (100)	76 (100)	76 (100)

Table 4.7 summarizes participants' responses to questions about their perceived attitude toward workplace noise exposure. Participants expressed a range of opinions in response to the statement, "The noise at work does not bother me." Around 38% and 53% of participants, respectively, agreed and disagreed with this statement. However, participants disagreed with the following two statements regarding their willingness to work in a noisy environment and work more efficiently in a noisy environment (77- 82%).

Table 4.7 Perceived attitude to noise exposure [Statement: 14 to 16]

Perceived Attitude	The noise at work does not bother me.	I like my workplace when it is noisy.	I work better if the workplace is noisy.
	N (%)	N (%)	N (%)
Strongly agree	5 (6.4)	0 (0.0)	0 (0.0)
Somewhat agree	24 (31.6)	1 (1.3)	3 (4.0)
Neither agree nor disagree	7 (9.2)	13 (17.1)	14 (18.7)
Somewhat disagree	26 (34.2)	22 (29.0)	19 (25.3)
Strongly disagree	14 (18.4)	40 (52.6)	39 (52.0)
Total	76 (100)	76 (100)	75 (100)

The participants' perceptions of their susceptibility to hearing loss are summarized in Table 4.8. Most of the participants (82–93%) disagreed with all the statements on this subscale, indicating a high propensity for hearing loss. For example, when participants were asked if noise would make no difference to their hearing ability while working in a quieter workplace, approximately 18% expressed their agreement. Similarly, about 11% of fish harvesters voiced agreement with the statement that hearing a continuous loud noise at work would not affect their hearing ability.

Table 4.8 Perceived susceptibility to hearing loss from noise [Statement: 17–20]

Perceived Susceptibility	My hearing will not be damaged by noise at work.	It will make no difference to my hearing if it is quieter at work.	Listening to loud noise at work does not affect hearing in old age (in the future).	The noise only affects hearing in people with sensitive ears.
	N (%)	N (%)	N (%)	N (%)
Strongly agree	1 (1.3)	1 (1.3)	0 (0.0)	1 (1.3)
Somewhat agree	3 (4.0)	7 (9.2)	4 (5.3)	0 (0.0)
Neither agree nor disagree	6 (7.9)	6 (7.9)	4 (5.3)	4 (5.3)
Somewhat disagree	16 (21.1)	17 (22.4)	9 (11.8)	12 (15.8)
Strongly disagree	50 (65.8)	45 (59.2)	59 (77.6)	59 (77.6)
Total	76 (100)	76 (100)	76 (100)	76 (100)

Conversion of Likert scale responses to the noise risk perception questionnaire into a dichotomized scale:

In this section, I analyze the responses by dividing them into two distinct categories (agree and disagree). Due to the low frequency of several categories in the noise risk perception questionnaire, we converted the five-point Likert scale (1=strongly agree, 2=somewhat agree, 3=neither agree nor disagree, 4=somewhat disagree, 5=strongly disagree) into a dichotomized scale (agree and disagree) by categorizing responses 1 and 2 as agree and responses 3 to 5 as disagree. We combined “neutral” opinions and “disagree” responses to avoid further reducing the frequency and to facilitate comparisons using the chi-square/exact Fisher's test[157].

Collapsing the five-point Likert scale into a binary scale does not affect the results' performance. Literature evidence demonstrated that dichotomous or trichotomous scales outperformed the current five-point scale, implying that such merging may eventually supplant the initial scale.[157–164] As a result, in all subsequent association analyses in this section, we used

the chi-square/exact Fisher's test to determine the association between the clear-cut opinions (agree or disagree) and the appropriate variable, and we provide the corresponding p-values. This will enable comparisons of noise risk perceptions with other variables, such as demographic data, vessel characteristics, job description, and questions about self-reported hearing loss, hearing protectors, hearing difficulty, and hearing tests (Table 4.9).

Table 4.9 Description of codes of the revised category

Code	Revised response categories	Original responses
1.	Agree	Strongly agree (1) + somewhat agree (2)
2.	Disagree	Neither agree nor disagree (3) + somewhat disagree (4) + Strongly disagree (5)

Association of noise risk perceptions with age group:

We compared the noise risk perception responses to a dichotomized age parameter. Age is classified as less than 40 years old (younger adults) or greater than 40 years old (older adults). Around three-fourths of participants agreed with the perceived benefits and self-efficacy statements. Similarly, when participants responded to the statements related to the perceived barrier, approximately two-thirds agreed in both categories.

On the other hand, 83% and 60% of participants in the younger and older adult categories, respectively, expressed disagreement when responding to the statements of the perceived attitude subscale. Over 90% of participants expressed dissatisfaction with the perceived susceptibility statements in both age categories. The association between age and noise risk perception was found to be statistically insignificant ($p>0.05$) (Table 4.10).

Table 4.10 Association of noise risk perception with age group

Subscales	Responses	Age group		Total	Exact Sig. (2-sided)
		Younger adults (<40 Years)	Older adults (≥40 Years)		
		N (%)	N (%)		
Perceived benefits	Agree	35 (79.5)	11 (73.3)	46 (78.0)	0.721$
	Disagree	9 (20.5)	4 (26.7)	13 (22.0)	
	Total	44 (100)	15 (100)	59 (100)	
Perceived barriers	Agree	34 (78.8)	10 (66.7)	44 (69.8)	0.757*
	Disagree	14 (29.2)	5 (33.3)	19 (30.2)	
	Total	48 (100)	15 (100)	63 (100)	
Perceived self-efficacy	Agree	37 (77.1)	11 (73.3)	48 (76.2)	0.740$
	Disagree	11 (22.9)	4 (26.7)	15 (23.8)	
	Total	48 (100)	15 (100)	63 (100)	
Perceived attitude	Agree	8 (17)	6 (40)	14 (22.6)	0.082*
	Disagree	39 (83)	9 (60)	48 (77.4)	
	Total	47 (100)	15 (100)	62 (100)	
Perceived susceptibility	Agree	4 (8.3)	1 (6.7)	5 (7.9)	1.000$
	Disagree	44 (91.7)	14 (93.3)	58 (92.1)	
	Total	48 (100)	15 (100)	63 (100)	

*Chi-square test, $Fisher's Exact Test

Association of noise risk perception with level of education:

We classified education levels into two categories (up to high school and above high school education). More than three-fourths of participants agreed with the perceived benefit statements in both categories. While responding to perceived barrier statements, approximately 85% of participants in the 'up to high school' category agreed. In contrast, participants in the 'above high school' category expressed nearly equal levels of agreement and disagreement. The association between the perceived barriers of noise reduction and education was found to be statistically significant ($p < 0.05$). The majority of participants (over 63%) agreed with self-efficacy statements in both education categories. On the contrary, over 70% of participants expressed dissatisfaction with perceived attitude statements in both categories. Similarly, over 89% of participants disagreed with statements on perceived susceptibility in both categories. All

other subscales, except perceived barriers, were found to be statistically insignificant ($p>0.05$) when compared to the level of education (Table 4.11).

Table 4.11 Association of noise risk perception with the level of education

Subscales	Responses	Level of education		Total	Exact Sig. (2-sided)
		Up to High School	Above high school		
		N (%)	N (%)		
Perceived benefits	Agree	28 (77.8)	21 (80.8)	49 (79)	1.000*
	Disagree	8 (22.2)	5 (19.2)	13 (21)	
	Total	36 (100)	26 (100)	62 (100)	
Perceived barriers	Agree	33 (84.6)	14 (51.9)	47 (71.2)	0.006*^
	Disagree	6 (15.4)	13 (48.1)	19 (28.8)	
	Total	39 (100)	27 (100)	66 (100)	
Perceived self-efficacy	Agree	33 (84.6)	17 (63)	50 (75.8)	0.078*
	Disagree	6 (15.4)	10 (37)	16 (24.2)	
	Total	39 (100)	27 (100)	66 (100)	
Perceived attitude	Agree	6 (15.8)	8 (29.6)	14 (21.6)	0.227*
	Disagree	32 (84.2)	19 (70.4)	51 (78.5)	
	Total	38 (100)	27 (100)	65 (100)	
Perceived susceptibility	Agree	2 (5.1)	3 (11.1)	5 (7.6)	0.393$
	Disagree	37 (94.9)	24 (88.9)	61 (92.4)	
	Total	39 (100)	27 (100)	66 (100)	

*Chi-square test, $Fisher's Exact Test, ^Significant ($p<0.05$)

Association of noise risk perception with professional certification:

We classified participants based on their professional certifications into two groups (below Level-II certified and Level-II certified) and examined the relationship between noise risk perceptions and professional certification. More than two-thirds of fish harvesters agreed with the statements based on perceived benefits, barriers, and self-efficacy in both categories.

On the other hand, approximately 69% and 82% of respondents, respectively, were in disagreement when responding to statements on perceived attitude in the below-Level-II and Level-II certified categories. Similarly, over 90% of harvesters disagreed with statements on perceived noise susceptibility in both certification categories. The association between all

subscales and the professional certification was found to be statistically insignificant (p>0.05) (Table 4.12).

Table 4.12 Association of noise risk perception with professional certification level

Subscales	Responses	Professional Certification		Total	Exact Sig. (2-sided)
		Below level II	level II		
		N (%)	N (%)		
Perceived benefits	Agree	13 (81.3)	36 (78.3)	49 (79)	0.555$
	Disagree	3 (18.8)	10 (21.7)	13 (21)	
	Total	16 (100)	46 (100)	62 (100)	
Perceived barriers	Agree	11 (68.8)	36 (72)	47 (71.2)	0.517*
	Disagree	5 (31.3)	14 (28)	19 (28.8)	
	Total	16 (100)	50 (100)	66 (100)	
Perceived self-efficacy	Agree	12 (75)	38 (76)	50 (75.8)	0.588$
	Disagree	4 (25)	12 (24)	16 (24.2)	
	Total	16 (100)	50 (100)	66 (100)	
Perceived attitude	Agree	5 (31.3)	9 (18.4)	14(21.5)	0.226*
	Disagree	11 (68.8)	40 (81.6)	51 (78.5)	
	Total	16 (100)	49 (100)	65 (100)	
Perceived susceptibility	Agree	0 (0)	5 (10)	5 (7.6)	0.237$
	Disagree	16 (100)	45 (90)	61 (92.4)	
	Total	16 (100)	50 (100)	66 (100)	

*Chi-square test, $Fisher's Exact Test

Association of noise risk perception with vessel size:

We categorize the fish harvesters based on the size of the boats they were working on. The two formed categories were small vessels (44.11 feet) and medium and large vessels (≥45 feet). Over two-thirds of fish harvesters agreed with the statement on perceived benefits, barriers, and self-efficacy in both categories. On the other hand, approximately 65% and 82% of respondents, respectively, disagreed with statements on perceived attitude in the small boat and medium and large boat categories. Similarly, over 82% of harvesters disagreed with statements on perceived susceptibility in both categories. The association between all subscales and sizes of boats fish harvesters were using was found to be statistically insignificant (p>0.05) (Table 4.13).

Table 4.13 Association of noise risk perception with the sizes of boats fish harvesters were working on

Subscales	Responses	Vessels sizes		Total	Exact Sig. (2-sided)
		Small vessels (<45 feet)	Medium and large vessels (≥45 feet)		
		N (%)	N (%)		
Perceived benefits	Agree	31 (75.6)	14 (82.4)	45 (77.6)	0.736[$]
	Disagree	10 (24.4)	3 (17.6)	13 (22.4)	
	Total	41 (100)	17 (100)	58 (100)	
Perceived barriers	Agree	30 (66.7)	14 (82.4)	44 (71)	0.348[$]
	Disagree	15 (33.3)	3 (17.6)	18 (29)	
	Total	45 (100)	17 (100)	62 (100)	
Perceived self-efficacy	Agree	36 (80)	12 (70.6)	48 (77.4)	0.502[*]
	Disagree	9 (20)	5 (29.4)	14 (22.6)	
	Total	45 (100)	17 (100)	62 (100)	
Perceived attitude	Agree	8 (18.2)	6 (35.3)	14 (23)	0.184[*]
	Disagree	36 (81.8)	11 (64.7)	47 (77)	
	Total	44 (100)	17 (100)	61 (100)	
Perceived susceptibility	Agree	2 (4.4)	3 (17.6)	5 (8.1)	0.122[$]
	Disagree	43 (95.6)	14 (82.4)	57 (91.9)	
	Total	45 (100)	17 (100)	62 (100)	

[*]Chi-square test, [$]Fisher's Exact Test

Association of noise risk perception with the GT of vessels fish harvesters work on:

We categorize the GT of vessels fish harvesters worked on into two groups (<15 GT and ≥15 GT). More than two-thirds of participants agreed with the responses to statements on perceived benefits, barriers, and self-efficacy in both categories. On the other hand, approximately 96% and 63% of harvesters, respectively, disagreed with statements on perceived attitude in <15 GT and ≥15 GT categories. Similarly, over 84% of harvesters disagreed with statements on perceived susceptibility in both GT categories.

The relationship between perceived attitude and susceptibility and GT was found to be statistically significant ($p<0.05$), but the relationship between perceived benefits, barriers, and self-efficacy was not found to be statistically significant ($p>0.05$) (Table 4.14).

Table 4.14 Association of noise risk perception with the GT of vessels fish harvesters work on

Subscales	Responses	Gross tonnage (GT)		Total	Exact Sig. (2-sided)
		<15	≥15		
		N (%)	N (%)		
Perceived benefits	Agree	21 (80.8)	23 (76.7)	44 (78.6)	0.755*
	Disagree	5 (19.2)	7 (23.3)	12 (21.4)	
	Total	26 (100)	30 (100)	56 (100)	
Perceived barriers	Agree	19 (67.9)	24 (75)	43 (71.7)	0.578*
	Disagree	9 (32.1)	8 (25)	17 (28.3)	
	Total	28 (100)	32 (100)	60 (100)	
Perceived self-efficacy	Agree	22 (78.6)	25 (78.1)	47 (78.3)	1.000*
	Disagree	6 (21.4)	7 (21.9)	13 (21.7)	
	Total	28 (100)	32 (100)	60 (100)	
Perceived attitude	Agree	1 (3.7)	12 (37.5)	13 (22)	0.002$^{\$\wedge}$
	Disagree	26 (96.3)	20 (62.5)	46 (78)	
	Total	27 (100)	32 (100)	59 (100)	
Perceived susceptibility	Agree	0 (0)	5 (15.6)	5 (8.3)	0.055$^{\$\wedge}$
	Disagree	28 (100)	27 (84.4)	55 (91.7)	
	Total	28 (100)	32 (100)	60 (100)	

*Chi-square test, $Fisher's Exact Test, ^Significant ($p<0.05$)

Association of noise risk perception with the duration of employment:

Based on the employment duration of fish harvesters, two categories: ≤20 and >20 years, were formed. More than two-thirds of participants agreed with the responses to statements on perceived benefits, barriers, and self-efficacy in both categories. On the other hand, approximately 63% and 83% of harvesters, respectively, disagreed with statements on perceived attitudes in the ≤20 and >20 years of employment duration categories. Similarly, over 92% of harvesters disagreed with statements on perceived susceptibility in both types of employment

duration categories. The relationship between the length of employment and all subscales was found to be statistically insignificant ($p > 0.05$) (Table 4.15).

Table 4.15 Association of noise risk perception with the duration of employment

Subscales	Responses	Duration of employment		Total	Exact Sig. (2-sided)
		≤20 Years N (%)	>20 Years N (%)		
Perceived benefits	Agree	12 (75)	36 (80)	48 (78.7)	0.728$
	Disagree	4 (25)	9 (20)	13 (21.3)	
	Total	16 (100)	45 (100)	61 (100)	
Perceived barriers	Agree	11 (68.8)	35 (71.4)	46 (70.8)	1.000*
	Disagree	5 (31.3)	14 (28.6)	19 (29.2)	
	Total	16 (100)	49 (100)	65 (100)	
Perceived self-efficacy	Agree	11 (68.8)	38 (77.6)	49 (75.4)	0.514*
	Disagree	5 (31.3)	11 (22.4)	16 (24.6)	
	Total	16 (100)	49 (100)	65 (100)	
Perceived attitude	Agree	6 (37.5)	8 (16.7)	14 (21.9)	0.095*
	Disagree	10 (62.5)	40 (83.3)	50 (78.1)	
	Total	16 (100)	48 (100)	64 (100)	
Perceived susceptibility	Agree	1 (6.3)	4 (8.2)	5 (7.7)	1.000$
	Disagree	15 (93.8)	45 (91.8)	60 (92.3)	
	Total	16 (100)	49 (100)	65 (100)	

*Chi-square test, $Fisher's Exact Test

Association of noise risk perception with hearing difficulty status:

We categorized respondents' replies to hearing impairment into two categories: "Yes" and "No" and compared them to the questionnaire on noise risk perception. More than two-thirds of participants agreed with statements on perceived benefits, barriers, and self-efficacy in both categories. On the other hand, approximately 88% and 55% of harvesters, respectively, disagreed with statements on perceived attitudes in both categories.

However, 45% of harvesters who did not have hearing difficulties agreed with perceived attitude statements. In both categories, over three-fourths of harvesters disagreed with perceived susceptibility statements. The association between perceived attitude and susceptibility to

hearing difficulties was statistically significant ($p < 0.05$). However, the association between all other subscales was found to be statistically insignificant ($p>0.05$) (Table 4.16).

Table 4.16 Association of noise risk perception with hearing difficulty status

Subscales	Responses	Hearing difficulty		Total	Exact Sig. (2-sided)
		Yes	No		
		N (%)	N (%)		
Perceived benefits	Agree	29 (76.3)	15 (78.9)	44 (77.2)	1.000$^{\$}$
	Disagree	9 (23.7)	4 (21.1)	13 (22.8)	
	Total	38 (100)	19 (100)	57 (100)	
Perceived barriers	Agree	28 (68.3)	15 (75)	43 (70.5)	0.767*
	Disagree	13 (31.7)	5 (25)	18 (29.5)	
	Total	41 (100)	20 (100)	61 (100)	
Perceived self-efficacy	Agree	31 (75.6)	14 (70)	45 (73.8)	0.758*
	Disagree	10 (24.4)	6 (30)	16 (26.2)	
	Total	41 (100)	20 (100)	61 (100)	
Perceived attitude	Agree	5 (12.5)	9 (45)	14 (23.3)	0.009$^{*\wedge}$
	Disagree	35 (87.5)	11 (55)	46 (76.7)	
	Total	40 (100)	20 (100)	60 (100)	
Perceived susceptibility	Agree	0 (0)	5 (25)	5 (8.2)	0.003$^{\$\wedge}$
	Disagree	41 (100)	15 (75)	56 (91.8)	
	Total	41 (100)	20 (100)	61 (100)	

*Chi-square test, $^{\$}$Fisher's Exact Test, $^{\wedge}$Significant ($p<0.05$)

Association of perception of noise with experience of loud noise during work in the last month:

The relationship between noise risk perception responses and the frequency of percentage of time exposure to loud noise in the last month during work was analyzed. Based on the percentage of time fish harvesters were exposed to loud noise at work over the previous month, two categories (fish harvesters are exposed for less than or equal to 50% of the time and more than 50% of the time) were created. Over 60% of participants agreed with statements on perceived benefits, barriers, and self-efficacy in both categories. On the other hand, approximately 76% and 81% of harvesters disagreed with perceived attitude statements in both

categories. Furthermore, over 90% of harvesters disagreed with views on perceived susceptibility in both categories. When compared to the frequency of the percentage of time exposed to loud noise with noise risk perception subscales, it was found to be statistically insignificant ($p>0.05$) (Table 4.17).

Table 4.17 Association of noise risk perception with the percentage of time exposed to loud noise in the last month during work

Subscales	Responses	Percentage of time exposed to loud noise		Total	Exact Sig. (2-sided)
		≤50%	>50%		
		N (%)	N (%)		
Perceived benefits	Agree	24 (82.8)	18 (78.3)	42 (80.8)	0.734*
	Disagree	5 (17.2)	5 (21.7)	10 (19.2)	
	Total	29 (100)	23 (100)	52 (100)	
Perceived barriers	Agree	18 (60)	22 (84.6)	40 (71.4)	0.074$
	Disagree	12 (40)	4 (15.4)	16 (28.6)	
	Total	30 (100)	26 (100)	56 (100)	
Perceived self-efficacy	Agree	24 (80)	22 (84.6)	46 (82.1)	0.737$
	Disagree	6 (20)	4 (15.4)	10 (17.9)	
	Total	30 (100)	26 (100)	56 (100)	
Perceived attitude	Agree	7 (24.1)	5 (19.2)	12 (21.8)	0.751*
	Disagree	22 (75.9)	21 (80.8)	43 (78.2)	
	Total	29 (100)	26 (100)	55 (100)	
Perceived susceptibility	Agree	3 (10)	1 (3.8)	4 (7.1)	0.615$
	Disagree	27 (90)	25 (96.2)	52 (92.9)	
	Total	30 (100)	26 (100)	56 (100)	

*Chi-square test, $Fisher's Exact Test

Association of noise risk perception with the percentage of time hearing protectors were used in the last month during work:

Participants were asked about the percentage of time they used hearing protectors in the preceding month during work. The responses were classified into two categories (never used hearing protectors and hearing protectors were used more than 0% of the time) to compare noise

risk perceptions. Over two-thirds of participants agreed with statements about perceived benefits, barriers, and self-efficacy in both categories.

On the other hand, approximately 72% and 87% of harvesters, respectively, disagreed with statements on perceived attitudes in both categories. Similarly, over 88% of harvesters disagreed with statements on perceived susceptibility in both categories. The association between all noise risk perception subscales and the frequency of percentage of time hearing protectors were used was found to be statistically insignificant ($p>0.05$) (Table 4.18).

Table 4.18 Association of noise risk perception with the percentage of time hearing protectors were used in the past month during work

Subscales	Responses	Percentage of time used hearing protectors		Total	Exact Sig. (2-sided)
		0%	>0%		
		N (%)	N (%)		
Perceived benefits	Agree	28 (75.7)	12 (85.7)	40 (78.4)	0.705$^{\$}$
	Disagree	9 (24.3)	2 (14.3)	11 (21.6)	
	Total	37 (100)	14 (100)	51 (100)	
Perceived barriers	Agree	28 (70)	10 (66.7)	38 (69.1)	1.000*
	Disagree	12 (30)	5 (33.3)	17 (30.9)	
	Total	40 (100)	15 (100)	55 (100)	
Perceived self-efficacy	Agree	33 (82.5)	11 (73.3)	44 (80)	0.468$^{\$}$
	Disagree	7 (17.5)	4 (26.7)	11 (20)	
	Total	40 (100)	15 (100)	55 (100)	
Perceived attitude	Agree	11 (28.2)	2 (13.3)	13 (24.1)	0.311$^{\$}$
	Disagree	28 (71.8)	13 (86.7)	41 (75.9)	
	Total	39 (100)	15 (100)	54 (100)	
Perceived susceptibility	Agree	2 (5)	2 (13.3)	4 (7.3)	0.298$^{\$}$
	Disagree	38 (95)	13 (86.7)	51 (92.7)	
	Total	40 (100)	15 (100)	55 (100)	

*Chi-square test, $^{\$}$Fisher's Exact Test

Association of noise risk perception with the hearing test status of fish harvesters:

Fish harvesters were asked whether they had undergone hearing tests in the past. The association between noise risk perception and hearing test status was analyzed based on the

participants' responses (Yes/No). Around 65–84% of participants agreed with statements on perceived benefits, barriers, and self-efficacy in both hearing test status (Yes/No) categories. On the other hand, approximately 85% and 75% of harvesters, respectively, disagreed with statements on perceived attitudes in both categories. In both categories of hearing test status, over 90% of harvesters disagreed with views on perceived susceptibility. The association between noise risk perception and hearing test status was found to be statistically insignificant ($p>0.05$).

Table 4.19 Association of noise risk perception with hearing test status

Subscales	Responses	Hearing test status		Total	Exact Sig. (2-sided)
		Yes	No		
		N (%)	N (%)		
Perceived benefits	Agree	23 (74.2)	25 (83.3)	48 (78.7)	0.534*
	Disagree	8 (25.8)	5 (16.7)	13 (21.3)	
	Total	31 (100)	30 (100)	61 (100)	
Perceived barriers	Agree	26 (76.5)	20 (64.5)	46 (70.8)	0.413*
	Disagree	8 (23.5)	11 (35.5)	19 (29.2)	
	Total	34 (100)	31 (100)	65 (100)	
Perceived self-efficacy	Agree	23 (67.6)	26 (83.9)	49 (75.4)	0.158*
	Disagree	11 (32.4)	5 (16.1)	16 (24.6)	
	Total	34 (100)	31 (100)	65 (100)	
Perceived attitude	Agree	5 (15.2)	9 (29)	14 (21.9)	0.232*
	Disagree	28 (84.8)	22 (71)	50 (78.1)	
	Total	33 (100)	31 (100)	64 (100)	
Perceived susceptibility	Agree	2 (5.9)	3 (9.7)	5 (7.7)	0.663$
	Disagree	32 (94.1)	28 (90.3)	60 (92.3)	
	Total	34 (100)	31 (100)	65 (100)	

*Chi-square test, $Fisher's Exact Test

Summary of quantitative findings:

The mean, frequency distribution, and cross-tabulation of 76 survey participants' data were analyzed. Male harvesters participate in more significant numbers than female harvesters. Around half of the participants were over the age of 40 and had not completed high school. Only

four participants mentioned their educational background as fish master-II, III, or IV. Approximately three-quarters of the participants held PFHCB level-II professional certification. Around two-thirds of harvesters mentioned their captain/skipper position. About half of the harvesters worked exclusively on decked fishing boats. Around 60% of harvesters worked on fishing vessels equipped with sole inboard engines or inboard engines equipped with generator sets. Most participants (over 50%) worked on small and medium-sized fishing vessels with a GT of less than 15. Pots, gill-nets, and jiggers/hand lines were the most frequently used fish harvesting gear. Approximately 80% of harvesters had over 30 years of fishing experience. Over one-third of harvesters reported hearing loud noise less than 10% of the time, and more than three-fourths reported wearing hearing protectors less than 10% of the time during their last month of work. While more than 60% of fish harvesters reported hearing difficulties, only 25% reported experiencing tinnitus on a regular or frequent basis. Over 60% of participants stated that their family and friends believed they had hearing loss. About 52% of all participants had undergone a hearing test.

When the noise risk perception scale responses were analyzed, the perceived benefits, barriers, and self-efficacy scores ranged between 2.3 and 2.9, indicating that fish harvesters have a moderately positive attitude toward noise reduction and hearing loss prevention. The perceived attitude and susceptibility scores ranged between 3.9 and 4.5, indicating that participants disliked loud noises and were susceptible to hearing loss.

Most cross-tabulations between noise risk perception statements (perceived benefits, barriers, and self-efficacy) and other variables such as demographic information, vessel characteristics, job profile, and self-reported hearing loss reveal greater agreement (over 60%) in both dichotomized categories. However, when harvesters were asked about their perceived attitude

and susceptibility, the majority (over 60%) expressed disagreement with the compared dichotomized parameters. The association of responses of perceived attitude and susceptibility items with GT of fish vessels used by fish harvesters (<15GT and ≥15GT) was found to be statistically significant ($p < 0.05$). A statistically significant relationship of responses to perceived barriers with the level of education categories (upto high school and above high school) was observed ($p<0.05$). Similarly, a statistically significant association of responses to perceived attitude and susceptibility with hearing difficulty status (presence or absence of hearing difficulty) was observed ($p<0.05$).

4.2 Qualitative interview findings

Demographic information

Preliminary data analysis was undertaken to determine the theoretical data saturation. We determined from our findings that we had reached a threshold of saturation, beyond which gathering more data would not give additional information pertinent to our study. I discovered similar trends in the data, which convinced me empirically that the data collection reached theoretical saturation. As a result, I ceased data collection and concluded our analysis.

Twelve telephone interviews were performed. The experience of fish harvesters ranges from less than ten years to more than fifty years. Fish harvesters interviewed had a range of job positions, including owner/operator/skipper, second mate, and deckhand. The fish harvesters are engaged in various fishing activities, including the harvesting of crab, lobster, capelin, mackerel, herring, halibut, cod, whelk, scallops, and turbot. The fish harvesters operated a variety of vessels ranging in length from 12.5 feet to 160 feet.

Table 4.20 Study sample by type of interview participants

ID	Role	Type of boat	Commute time	Type of catch and seasons
FH-1	Owner of the enterprise	35-footer	Day trip	Crab: early April to June; Cod: August up until November
FH-2	Owner of the enterprise	34.11 and 22-footer	Day trip	Crab: early April to June; Cod: August up until November
FH-3	Owner (Captain)	Not available	9–10 hours	Crabs, Lobster, Codfish, Scallops, and Whelk; April to November
FH-4	Owner of enterprise (Skipper)	40-footer	Day trip	Crab, Cod, and Capelin; Spring of the year
FH-5	Owner of enterprise (Captain)	23-footer	Day trip	Crab, Snow Crab, Lobster, and Catfish.
FH-6	Owner/operator (Skipper)	60-footer	10–24 hours, 1–2 weeks,	Crabs, Capelin and Cod; April to mid-December
FH-7	Second mate	30-footer	Day trip (12 hours)	Crab/lobster: April; Halibut: July
FH-8	Owner of enterprise/operator	160-footer	3-day trip (12 hours/day)	Not available
FH-9	Deckhand	22-28-footer, 39.11-footer	24-hour trip (5 hours work /5 hours rest)	Lobsters, Cod, Halibut, Whelk,
FH-10	Skipper/Captain	60-footer	Day trip, 4–5 days trip, 1–2 weeks trip,	Capelin: daily (July to August); Crab:4–5 days (Late April to May); Mackerel: 1–2 weeks (September); Herring: October to November
FH-11	Owner of enterprise/operator (Mate/Deckhand/ Skipper)	65-footer, 45-footer, 25-footer	- Not available	May to December Spring: Crab; After spring: Capelin, Seine, Mackerel, cucumbers
FH-12	Work on electronics of the boat, sounds, radar, GPS	12.5-footer, 34.11-footer	7 hours	Crab and Cods

Themes that emerged from the qualitative interview data analysis

4.2.1 Noise exposure to fishing vessels

In this research, we aim to explore noise exposure and the impacts of noise on the health and well-being of fish harvesters and how they cope with these challenges. Out of 12 interview participants, 11 work on vessels less than 80 feet, and only one harvester works on a 160-foot boat. Fishing vessels over 80 feet (24.4 meters) or 150 GT are considered large fishing vessels. Therefore, most of the fish harvesters interviewed work on small fishing vessels.

4.2.1.1 Noise sources

Fish harvesters were asked about the primary noise sources on fishing vessels they work on. All the participants considered the engine to be one of the primary sources of noise. Fish harvesters reported the primary noise sources on fishing vessels as below,

> *"Actual noise from the engine that comes out from the exhaust, from the exhaust comes up the roof..." (FH-1),*
> *"They are supposed to be the engine and the hydraulics" (FH-2),*
> *"The engine that you have in the boat…" (FH-4),*
> *"Primary noise would be the main engine, generator…" (FH-6),*
> *"The most noise is in the engine room…" (FH-8).*

Apart from the motor, the harvesters identified the following principal sources of noise: hydraulics, winches, transporters, generators, and ropes. Ten out of twelve harvesters believed their workplace is noisy. Fish harvesters expressed their concerns about noise sources on fishing vessels. Participants noted the following sources of noise:

> *"The winch can be noisy when we're hauling pots because a rope comes up around the rope makes a noise" (FH-1),*
> *"I'm running a nine-horsepower system, which requires a nine-horsepower gas utility system, and sometimes that could be very annoying, very loud…" (FH-5), "The diesel engine is on, and the diesel generators are on, so it's fairly noisy when all of the deck turns on, and all of the hydraulics are on, so it's noisy when we're working" (FH-6),*
> *"In a small boat, in the 22-footer, I mean you got the outboard motor going on, and you got your hauler motor on, which is fairly loud in just a small area…" (FH-9),*
> *"It is always noisy because the generator and motors are on" (FH-10).*

Some fish harvesters pointed out that the fishing ropes themselves are a source of the noise. According to fish harvesters, the noise level generated by the ropes is relatively high and highly obnoxious. Concerning the noise made by the ropes, fish harvesters stated,

> *"...old rope was coming in and making noise..." (FH-3),*
> *"...the rope comes up around the rope and makes a noise..."(FH-1),*
> *"…the rope gone through the crab hauler, there is a creaking noise…" (FH-12);*
> *"If you believe the difference between an old and new rope, and it becomes, screeching to quit" (FH-3).*

According to one fish harvester, the noise reduction is attributed to the introduction of new ropes, who stated, *"...the only thing that could help (to reduce noise) would be the new rope that we have is pretty quiet, and it makes a big difference..." (FH-3).*

4.2.1.2 Duration of noise exposure

The majority of fish harvesters (10 out of 12) go on day trips to catch fish. However, some fish harvesters (4 out of 12) spend several days fishing.

4.2.1.3 Auditory health problems

Most (9 out of 12) harvesters claimed that they have no hearing impairment. Three harvesters reported a hearing loss but were unaware of the cause. One person was confident that they had hearing problems but had never been examined. Another participant discussed job noise exposure and the subsequent hearing loss. *"Well, I can't really say that my hearing loss was caused by noise at work because it doesn't get proven, but I'm sure it played a really big role in factories,"* they said *(FH-5).* One participant expressed concerns about their hearing issue, stating, *"Yes, I, I do actually (hearing problem). I am pretty sure that I have to get tested, but I'm pretty sure I have got lots of hearing problems, guaranteed " (FH-7).*

Another harvester voiced concerns about their hearing issue, stating, *"I think it happens in the wintertime. I can't contribute my hearing problem with the boats" (FH-12).* Two

participants stated that while they do not have a hearing impairment, they know other fish harvesters who have hearing problems.

Four participants self-identified as having tinnitus. One participant described their experience with tinnitus, stating,

> *"Sometimes, if I'm at home, and I'm doing something, and my wife is upstairs, and she calls out to me. I would say most of the time if there's a radio on or if there's water running or television or something, I have to stop, and I have to say 'what you said' and because I don't hear her speaking to me " (FH-1).*

The harvester then revealed the cause of their tinnitus, stating that they were exposed to the loud noise of a power tool and had tinnitus as a result. One harvester said that they suffer from tinnitus on occasion. Another harvester stated concerning their tinnitus, *"Just now and then (tinnitus). But I do hear it ringing, yes, I do. Like I said, that's the reason why I did try wearing earmuffs" (FH-7).* According to one fish harvester, they develop tinnitus exclusively when exposed to loud sounds. They clarified this by stating, *"Not very often. When you get a ringing noise in your ears, you usually get it when the noise is too loud" (FH-8).*

On the contrary, three harvesters admitted hearing issues during interviews, while four participants mentioned having tinnitus. They expressed their opinion and explained the social stigma associated with hearing loss among fish harvesters. They clarified,

> *"…if you ask somebody (about the hearing problem), you will get a different response. You'll say, 'oh no, my hearing is fine.' Yes, nobody likes to admit it because there is a stigma around hearing loss. People who can't hear properly, other people think,* oh, *people associate hearing loss with intelligence. If somebody can't hear properly. Well, they're not very intelligent or* something like that, *but that's a social thing" (FH-1).*

While this may be a complicated scenario, it is difficult to foresee with limited consideration, and additional research is necessary to learn more about this societal stigma.

4.2.1.4 Other health problems

The majority of the study participants reported no other health problems, such as irritation, annoyance, stress, headache, poor physical performance and decision-making capacity, emotional difficulties, or voice changes resulting from working in a noisy workplace. Nevertheless, some participants stated that they encountered some of these conditions due to working in a noisy workplace (Table 4.21). However, none of the fish harvesters reported having any general health concerns such as hypertension and other related issues associated with working in a noisy workplace.

Table 4.21 Noise-related health conditions reported among fish harvesters

Health conditions	Fish harvesters ID											
	FH-1	FH-2	FH-3	FH-4	FH-5	FH-6	FH-7	FH-8	FH-9	FH-10	FH-11	FH-12
Irritation							✓					
Annoyance					✓						✓	
Stress												
Headache					✓							
Emotional challenges							✓					
Sleep disturbance			✓	✓			✓	✓	✓	✓		
Communication difficulties				✓		✓	✓			✓		
Fatigue			✓				✓					
Physical performance affected			✓				✓		✓			
Decision-making ability affected					✓		✓		✓			
Tinnitus (noise in your ear or head)			✓		✓		✓					
Changes in your voice volume			✓				✓	✓		✓	✓	

4.2.1.4.1 Noise Annoyance and Irritation:

The majority of respondents (75%) claimed that they do not experience annoyance or irritation due to fishing vessel noise. However, some argued that they do on occasion. *"We are just used to it" (FH-10),* a harvester stated, and the majority of participants responded *"No."* Participants' responses varied such as,

> *"Annoyance sometimes, from time to time headache, yes" (FH-5),*
> *"Sometimes the noise gets annoying. But I guess the way we work, we just do work, and it goes on" (FH-11),*
> *"It irritates me with the noise" (FH-7).*

Three out of twelve participants stated that they occasionally get annoyed or irritated due to noise exposure from fishing vessels. Harvesters' general perspective shows that they have acclimated to working in a noisy environment and are no longer bothered by the constant noise aboard fishing vessels.

4.2.1.4.2 Stress

None of the participants found it stressful to work in a noisy environment on the fishing vessels. All the harvesters replied that they do not feel stressed because of noise exposure at their workplace.

4.2.1.4.3 Headache

The majority of participants (83%) reported no headaches due to noise exposure from fishing vessels. However, two participants reported experiencing headaches, though one stated that the symptoms were not related to noise exposure. They explained that it could be related to something else, but the noise will not help to decrease that (FH-3). One participant stated that they do get headaches, but they are caused by fog. They continued by saying,

> *"If you are around an industrial park and we got a big truck warning. It is like that. We do have headaches on a workboat, but it is not because of noise, it's because of Fog, that constant wetness that burns your eyeballs out" (FH-12).*

4.2.1.4.4 Decision-making ability

Around 60% of participants reported no difficulties with decision-making due to working in a noisy environment. In contrast, some individuals reported difficulties as a result of constant noise exposure at their place of employment. One participant described the effect of noise on their decision-making ability, saying,

> *"Sometimes, the noise bothers me to the point where I do make some rush decisions, but overall, on a scale of 1 to 10, I would have rated 2, maybe 3. Noise doesn't really influence my decisions to hold on" (FH-5).*

Another participant said,

> *"Operating the boat, and the hydraulics, it's kind of nerve-racking for me, because I can't hear the other person is working on deck and then vice versa" (FH-7).*

Another participant commented on the difficulties of decision-making in a noisy work environment, noting,

> *"Sometimes, I guess, if you are on lobster, you can't hear, you can't think well" (FH-6). "I would say it does for some people, like, I know there are some vessels that are quite loud, so I guess you have to wear hearing protection,"*

One participant explained, expressing the perplexing nature of decision making,

> *" I would say for some people that it (impair decision-making ability) does, like, I know there are some vessels that are quite loud that mean I guess you have to wear hearing protection I don't know how you would do it otherwise" (FH-9).*

Another participant stated their dissatisfaction with working in a noisy workplace, stating that it was *"...I could done it more better and it (noise) would not help the situation for sure..." (FH-7).*

4.2.1.4.5 Emotional challenges

When asked, "Have you encountered emotional challenges as a result of noise exposure on the vessel/s?", the majority of fish harvesters (92%) stated that they did not encounter emotional difficulties while working in a noisy environment. However, one participant indicated that they experienced emotional problems and stated, *"Yes, sometimes it's emotional and just*

wanting to say, like, you know, wanting to give up and just, like, wanting to retire and stuff" (FH-7). The harvesters indicated that working at home and outside is challenging, but they are forced to work due to their financial situation.

4.2.2.2.6 Sleep disturbances

Approximately 40% of fish harvesters reported difficulties sleeping as a result of occupational noise. Individuals reported a variety of explanations for their sleep difficulties. Sleep interruptions, according to one participant, are related to the volume of noise (FH-8). Another participant stated that they are caused by workplace noise (FH-10). One participant noted that sleep disturbances depend on work schedules and timings (FH-7). According to one harvester, engine noise is responsible for sleep disturbances (FH-4). Another participant mentioned that this is similar to jet lag. They feel continuous noise even as they return home.

4.2.1.4.6 Fatigue

Although most participants (83%) disagree that working in a loud environment might cause exhaustion, two harvesters stated they occasionally feel exhausted due to working in a noisy environment (FH-6 & 7). The replies ranged from *"Yes, I do" (FH-7)* to *"Yes, a little bit, I suppose" (FH-6).*

4.2.1.4.7 Communication problems

The majority of participants (67%) believe they have no communication issues due to onboard noise. However, some individuals (4 out of 12) noted difficulties in communication due to noise exposure. Three of them stated that they needed to raise their voices to communicate effectively (FH-7, 9, 10). One harvester mentioned communication issues because of exposure to onboard noise. In response to a question regarding communication challenges, they stated,

"Sometimes yeah, when everyone's busy, you know, lots of noise, you don't pay attention to what you are hearing and saying" (FH-6).

One participant conveyed their frustrations with working in a loud, noisy setting by saying, *"I got to screech when I'm on the deck, you know, it's hard on the ears" (FH-7).* Similarly, another participant emphasized the difficulty of communicating in a noisy environment, stating, *"When you are on the deck, it is hard to hear, and you need to talk louder" (FH-10).* For fish harvesters, communication is essential since it is closely connected to their onboard safety. Almost unanimously, participants stated they do not like to use hearing protectors out of concern for a communication breakdown, resulting in an accident.

4.2.1.5 Adaptation in a noisy environment

Most fish harvesters admit that their work environment is loud, and they are accustomed to this noise. The following are some of our research participants' perspectives on workplace noise and related behavior,

> *"The diesel engine on, diesel generators on, so fairly noisy on all the deck, turn on all the hydraulics, so it's noisy when you're working" (FH-6),*
> *"In the small boat, in the 22-footer, I mean you got the outboard motor going on, and you got your hauler motor on, which is fairly loud in just a small area" (FH-9),*
> *"The loudest noise exposure to when we were moving from one string to the next or when we're coming from the harbor out to the crab fishing grounds, and that's when the engine is running full, full RPM, and it's that's it loud, and so, if you are on the deck, it can be noisy" (FH-1),*
> *"It's always noisy, because the generator and motors are on" (FH-10).*

One fish harvester gave their opinions, which demonstrate the adaptation of fish harvesters

> *"…I have been fishing all my life, like fishing for 30 or 40 or 50 years. They (fish harvesters) used to do what they do and will do for the next five or ten years. I don't think it is going to make a great deal of difference anyway, so as you're getting older and if you have hearing loss if you have been here for 40 years, you're going to be inclined like this" (FH-2).*

The opinion of this fish harvester suggests a tolerance for noise and adaptation to a loud environment, an example of fatalistic behavior.

4.2.1.5.1 Limited noise preventive measures

While working aboard fishing vessels, most participants (11 out of 12 fish harvesters) do not wear hearing protection. One fish harvester commented on the oil and gas industry's mandatory use of hearing protection devices. They stated that they previously wore hearing protectors while working in the oil and gas industry but no longer wore them because he owns a fishing business. It highlights fishing organizations' failure to adopt a regulatory strategy in the *Fishing Vessel Safety Regulations* requiring minimal noise exposure and the mandatory use of hearing protection devices on fishing vessels when exposed to loud noise. According to one fish harvester, no one wears hearing protection on their fishing vessel. Another fisherman stated that they had never been required to wear hearing protection at the workplace.

When asked how they avoid excessive noise on the job, the majority of fish harvesters responded inconsistently. Three fish harvesters indicate that they wear earmuffs when operating noisy power tools or performing other general labor, but not when working on the fishing boats. Three fish harvesters stated that they wear ear protection only when entering the engine room. One participant said that they typically walk away from the source of the noise. According to one harvester, they would shut down the hauler motor and relocate away from the noisiest areas if possible. Similarly, another harvester stated that they occasionally shut down the engines during the lunch hour. As one fisherman put it, *"I don't know. Noises, so just a loud noise. Just a loud sound" (FH-8).*

4.2.1.5.2 Learning to tolerate noise

One harvester acknowledged their dissatisfaction with working in a noisy environment by commenting,

> *"You used to that noise and learned to operate. It is not an uncomfortable noise, you know, it's tolerable, like an old engine room running is tolerable. Yes, she might have to speak a little louder, but it is still tolerable, like, you know, instead of speaking a little bit but not a big laugh" (FH-2).*

A second fisherman replied,

> *"Well, it is only loud noise you get when you get down into the engine room when the engine is running; we just wear earmuffs down there. Up on deck, the noise level is not that bad; the deck is on the fishing vessel blocking the noise of the engine coming out. Don't be too bad working wise" (FH-3).*

4.2.1.6 Safety and health: a conflicting value

Three harvesters noted that fishing is a dangerous activity and that harvesters' safety may be affected if they do not use hearing protection while working.

"The challenges on our fishing vessels are that when you wear a hearing device to block the noise, you are also blocking other people who are working around you from hearing what they are saying, and if somebody falls over the boat, and they are trying to sing out to the captain, and he got a hearing device and can't hear, and that could be a major problem," said one participant (FH-3).

Another harvester expressed his safety concern, stating,

> *"The obstacles, like I have been saying is, having that protection to protect yourself, but also being able to hear somebody and when something has happened in…" (FH-9).*

Similarly, another participant stated, *"If you cannot understand each other, it could be an accident, right" (FH-10).*

The majority of fish harvesters stated that hearing protectors jeopardize their safety aboard vessels. One fish harvester voiced worries about the usage of hearing protection and the associated safety risks, saying,

> *"I preferred to hearing over wearing earmuffs or anything like that. Safety is absolutely number one on board the ocean and has been something like earmuffs takes away safety" (FH-12),*

"...number one thing is the safety of the crew, and hearing is part of safety, but it is always on top of that stuff," he continued (FH-12).

The same fish harvester stated their sentiments regarding the use of hearing protection and the associated safety concerns, saying, *"You NEED your hearing. Must be able to hear a change in everything" (FH-12).*

4.2.1.6.1 Lack of safety training

The majority of participants (83%) did not believe that the noise was considered throughout their safety training and management courses. Only two respondents indicated that noise was a component of some of their training courses. A harvester stated,

"…it is recommended to wear hearing protection in the engine room at all times" (FH-8).

Another attendee noted that *"In some courses, it (noise) was mentioned…" (FH-5).*

One participant replied while asking about participation in any training course,

"No, no, not that I know of, the training courses, I took part in, nothing really covers hearing or noise protection and anything like that. Now, I know there's a Newfoundland and Labrador Safety Association or something like that but I have heard too much about them but they don't really push any regulations or anything like that, or any courses or training that stopped you know" (FH-9).

One participant attended CCG survival training courses but could not identify any discussions of noise and related health problems in any of the sessions.

"I also work with the Canadian Coast Guard, and I do courses with them," a fisherman said *(FH-7),*
"... sometimes do some survival training. All kinds of survival training, we put in on your survival suits, you know, everything like that, not once, I did go for training, and anybody talked about, like, hearing problem" (FH-7).

Another participant stated as follows:

"I did a safety course. I've done a couple of safety courses. I don't specifically recall hearing protection. There may have, but I am not sure" (FH-1).

Similarly, one harvester responded, *"I think there is something for Basic safety training that talks about but no specific for noise" (FH-2).*

Again, one participant stated, *"I do not do lots of courses. I do not recall the actual anything noise safety course" (FH-12).* As a vessel owner, one participant stated, I arranged for safety training for my crew members. They continued,

> *"...on the bigger vessels; they are nice factories, much bigger, probably way more training, and maybe hearing risk factors would become more or more frequently" (FH-5).*

When asked, "How are you coping with noise exposure?" participants reacted in a variety of ways.

As one participant said,

> *"We just try to drown out the best we can, but we don't wear hearing protection like we are around the deck of the boat, and an old rope was coming in and making noise. You just try to drown out the noise by yourself. We are wearing hearing protection for our ears, is not really, it's not really a good practice, I guess, when we run on deck and work over" (FH-3). "Don't have much hope, but if we just deal with it as you go and close the door of the engine room and everything as secure as you can" (FH-6).*

In response to a question about noise coping strategies, one participant stated,

> *"Like I said, hearing protection when you are in the engine room, lots of time, I have my caps cover my ear with protection, and just avoid heavy noise" (FH-8).*

One person discussed the possibility of replacing current hearing protection devices with some new, more advanced ones. As they stated,

> *"You did the best you can at the time, you know, you just get to deal with it, not much you can change the time unless they come up with something good enough that you can hear somebody talking and drown out your background noise. Other than that, you just do the best you can at the time" (FH-9).*

The findings indicate that fish harvesters require noise safety training and education from their fishing organizations and employers to understand the level of noise exposure, the types of

hearing protectors available, the proper use of hearing protectors, and the adverse health effects of noise.

4.2.1.7 Barriers and challenges in noise prevention

The study participants identified various barriers and challenges to mitigate onboard noise exposure and potential hearing loss prevention measures. The harvesters emphasized the importance of education and motivation, enhanced safety measures, technological innovation, and vessel owners/operators' roles and responsibilities. Two fish harvesters noted no impediments or hurdles to noise prevention (FH-4, 6).

One participant expressed their concern about noise and the escalating rate of hearing loss and stated, *"Lots of people are losing their hearing probably due to it, but so far I have not, but I noticed people losing their hearing over noise on boats" (FH-12).* The majority of participants stated onboard safety as a significant concern that prevents them from using hearing protection. Two individuals reported feeling uneasy while using hearing protection.

4.2.1.7.1 Education and Awareness

One fish harvester emphasized the critical role of public education and awareness regarding noise exposure and its health consequences. *"I believe a significant portion of it is simply education, becoming educated and aware of the problem and how to prevent it,"* they observed (FH-1). Education is a critical component in changing health behaviors and increasing awareness. Noise hazards should be incorporated in routine safety training to educate fish harvesters.

4.2.1.7.2 New technology

Some harvesters pointed out the importance of improving technology to avoid noise exposure and associated health problems. As one participant put it,

"For winches, they used to be with gas-operated winches and generators. Now, we're coming out with electric what we notice, cut down the noise a big time. Okay, you know, for motors, you can put on some extra mufflers and different things like that" (FH-2).

On the other hand, another participant stated that electric haulers are inefficient compared to gas haulers.

"I see they are coming out with eight electric haulers now, but it doesn't seem to have the same ability as a gas-powered hauler motor, what I see anyway, and, I mean, the fishermen want the ability to be able to get things done efficiently, and that electric motor doesn't seem to have the capacity to handle that", he explained (FH-9).

Similarly, another harvester highlighted the drawbacks of battery-powered haulers.

"We did hear about some hauler that runs on batteries," the harvester said (FH-7). "The disadvantage is that our skipper has concerns that it is going to be too slow to haul the traps. If you have a longer day, like 200 or 180 traps to haul, and then sometimes you have got 100 traps to haul for crabs and lobster 180 traps, and if it is slow, it is gonna make for a long day", they added *(FH-7).*

Another participant suggested that the current diesel engine and generator be improved to make them quieter. *"Try to get the diesel motors quiet, and I suppose the generators,"* they stated *(FH-11).*

Likewise, another harvester said,

"The biggest thing would be the engine, engine room noise, and equipment noise. I do not think too much we can do, just pretty much just make the boats make sure that you know that you will get them as quiet as you can, and that's what you can do" (FH-8).

4.2.2.5.3 Responsibility of the employer/owner

One participant highlighted that protecting crew members is the employer's or vessel owner's responsibility. The harvester emphasized the importance of hearing protection and that the employer should provide it.

One fish harvester stated,

"The only protocol that can be put in place there is ear protection. I guess it would have been stressful for the workers, so they are directly in my boats. They are my

employees. The risk factor of them would be mine; it is a workplace. The employer does not allow, say it's my vessel, so it does not protect them, whatsoever" (FH-5).

It is the responsibility of the owner or operator to ensure that supplies are available onboard. Most fish harvesters questioned for this study were owners. When asked about the availability of hearing protection devices on board, they all stated that they had adequate supplies. On the other hand, when asked the same question by the employee fish harvesters, two respondents said they did not have sufficient hearing protectors on board, and one stated that they would bring their ear muffs.

4.2.2.5.4 Gaps in OHS regulations

One participant commented on the provincial organizations' lack of support for fisheries. They stated,

"I mean I never heard of workplaceNL putting much efforts into the fishery and I never heard of anything or any program or meetings, there are going on and talking about the fisheries" (FH-9).

One fish harvester proposed a mandatory rule requiring the proper use of hearing protection devices on fishing vessels. They stated,

"…try to introduce new mandatory hearing protection, may be from the federal-provincial government or workplaceNL even" (FH-5).

The fish harvester continued by stating that vessel owners/operators should be required to attend workshops and seminars on hearing preservation (FH-5).

One fish harvester suggested that fish harvesters should undergo regular hearing tests (FH-1). One fish harvester discussed a grant program funded by the Atlantic Fishery Foundation that reimburses electric pot haulers. The FFAW-unifor union in NL organizes it. The union will reimburse $5000 for the cost of the electric pot hauler. However, fish harvesters must first

purchase it before applying for reimbursement. Many fish harvesters lack the capital necessary to buy it up front. They expressed their emotions:

> *"You get $5,000 reimbursement for these new electric pot haulers, but I mean you have to buy everything up front, and I know a lot of fishermen can't go. You'll get your five grand back, but I mean, it's you have to buy everything up front, you know. Like a lot of fishermen don't have six or seven thousand to throw them on a product. And then you have to wait a couple of months or a month for the money back. You know, that's an issue. I mean, it doesn't seem to be, to talk about in the fishery, FFAW or professional official certification board or the safety associations seems to be kept straight, on noise, or noise prevention" (FH-9).*

Although most fish harvesters stated they have hearing protector supplies on board, one harvester indicated they need to bring their own. *"I got the earmuffs for myself, but I don't have them for other crew members, and I do take them with me,"* expressed one fish harvester (FH-7). Two additional fish harvesters stated that they do not have any hearing protectors on board. The owners of vessels are responsible for providing necessary ear protection devices to their crew.

4.2.2.6 Limited external support

When asked, "Has the PFHCB)/NL-FHSA)/FFAW)/WorkplaceNL offered any assistance with noise-related challenges?" participants responded differently.

> *"I guess, yes, we do have insurance from union FFAW-union, workplace health safety and all. I think its branches and sub-branch of union thing, and I think if something happened, they would help out,"* one harvester replied *(FH-3).*

Two participants acknowledged the FFAW union's support, stating,

> *"Probably the union, I can remember, a while ago, when I did receive some pictures from the union about the noise level and workplace" (FH-5),*
> *"Fishery and food union is the only ones that I know. They were the ones to help them pay for his hearing aids" (FH-7).*

The remaining participants (67%) could not recall any support for noise-related challenges provided by any of NL's fishing organizations. When asked if they were covered by workers' compensation or supplementary health insurance for noise-related problems, most

respondents (75%) indicated they were; however, three respondents were unaware of their coverage under any insurance for noise-related health problems.

The quantitative and qualitative findings reflect fish harvesters' risk perceptions regarding occupational noise exposure and related health issues, with the overall risk perception of fish harvesters regarding noise-related risks being found to be low to moderate. The perceived attitude and susceptibility subscale, on the other hand, indicates a favorable attitude toward noise reduction and hearing loss prevention. Qualitative interviews reveal a conflict between safety and health and the adaptability and acceptance of noise at work in fish harvesters' behavior. Chapter five discusses quantitative and qualitative data observations and the reasons for these perceptions and behaviors of fish harvesters.

Chapter 5

Discussion

The perceptions of fish harvesters on the risk of occupational noise exposure are influenced by various factors, including job duration, training and management, and safety attitude and behavior. To begin safety training and prevention, it is necessary to identify several types of risks and study how employees recognize, interpret, and respond to these hazards. Numerous causal relationships between risk behavior, risk identification, risk awareness, and exposure may be significant for risk reduction and management.[165]

The purpose of this research is to find out the risk of noise perception among fish harvesters in NL and to explore the barriers and impediments to noise reduction and the prevention of hearing problems.

This chapter examines and discusses many forms of noise-related risk perception prevalent among fish harvesters via the Health Belief Model (HBM) perspective. Following that, I discuss the effect of health capital factors on noise-related safety, drawing on the experience of NL fish harvesters. After studying the component of health capital, I draw connections between the existing global regulatory frameworks discussed in Chapter 2 and the findings of this study to identify current policy requirements.

The concluding chapter (Chapter 6) will summarize and emphasize the study's most significant results, identify the study's limitations, and suggest future research to fill the existing policy gaps. Seventy-six participants completed an online survey in the present research, and twelve harvesters were interviewed via telephone. Three studies have been undertaken in NL to explore occupational risk and safety among fish harvesters.

Murray and Dolomount[166] performed the first study to assess fish harvesters' safety attitudes and practices in NL. Two similar studies were done by Power[167] and Brennan[67], which shed light on occupational safety and risk perception among 46 NL fish harvesters. Seventeen focus group interviews were conducted in both studies.[67,167] Burella[28] proposes short-term and long-term solutions to reduce the onboard harmful noise levels on NL's small-scale fishing vessels. The author examined noise risk perceptions in thirty-six boat owners and operators working on 12 fishing vessels under 24 meters in length.

Only 20% and 8% of female harvesters, respectively, responded to the online survey and interview. Similarly, additional studies revealed female involvement rates of 13.7%, 11.7%, and 2.2%, respectively.[29,67,167] Certain studies stated that they included solely male participants.[30,33,35,36,42,85] In general, female harvesters were underrepresented in all of the research described above. However, statistics indicate that provincial employment rates for female fish harvesters increased from 8% in 1981 to 19% in 2016.[156]

According to NL Labor Market statistics,[125] most fish harvesters (57%) were in the 25–54 years age group, followed by 32% in the 55–64 years age group. However, only 4% and 7% of fish harvesters were reported in the 15–24 years and 65+ years age groups. The average age of fish harvesters in this study was 50.62$\pm$11.09 years. Similarly, Brennan and Power's research determined comparable findings, with the average age of participants being 47 years.[67,167] Again, in another global study, the mean age of fish harvesters was observed to range between 40.3-51 years.[27,30,32,37,40,42,168,169] The age group of 41 to 65 years old had the highest proportion of fish harvesters (76%) in the current study. According to research, the majority of fish harvesters globally are in their forties or fifties.

The present study's statistics indicate that the majority of participants (60%) completed high school. Brennan[67] reported similar statistics (78%) in a survey of NL fish harvesters. In contrast, one study conducted in the United States revealed that 26% of fish harvesters completed high school, while 41% and 10% completed college and graduate school.[40] In the current study, 75.8% of total survey respondents were certified as professional fish harvesters Level II. In comparison, 13.6% and 10.6%, respectively, were certified as professional fish harvesters Level I and apprentice fish harvesters. Similarly, a study of fish harvesters in NL found that 86% were registered as professional fish harvesters with Level-II certification. In contrast, 6.75% were classified as Level-I and apprentice fish harvesters.[167]

According to job description data, 66.7% of fish harvesters held the post of captain/skipper, while approximately 14% and 12% were on the position of deckhand and mate, respectively. In a study conducted by Power[167] and Brennan,[67] similar results (69.2% and 65% skippers, respectively) were observed. Approximately 49% of participants operated aboard fishing vessels less than 35 feet in length in the current study. Brennan found similar results (50%) in their research.[67] However, according to research conducted by Power,[167] two-thirds of questioned fish harvesters worked in vessels shorter than 35 feet in length.

Crab (86.4%), cod (84.8%), and lobster (62.1%) are the three most frequently fished species by fish harvesters, followed by squid (43.9%), capelin (34.8%), shrimp (19.7%), and whelk (18.2%). Around 33.3% of fish harvesters targeted other species such as herring, halibut, cucumber, and turbot. In contrast, fish harvesters harvested approximately 73%, 58%, and 44% of snow crab, cod, and seals, respectively, in 2004.[67] The limited harvesting of cod witnessed in 2004 may be related to the fact that a ban that took effect on July 2, 1992, remains in effect, with only a limited commercial fishery permitted in NL.[67]

When examining the experience of fish harvesters, it was noted that the majority of participants, around 30%, 25%, and 17%, had worked in fishing industries for 21–30, 31–40, and 41–50 years, respectively. The fish harvesters collectively have 30.44 years of experience. It is comparable to other studies in which the average experience of fish harvesters was reported to be 31 years, 24.4 years, and 25 years.[35,67,169]

5.1 Hearing problems

Approximately 62% of survey respondents said they have a hearing impairment, whereas around 30% and 8% responded "No" and "Cannot say," respectively. In contrast, according to Paini et al.[30] and Levin et al.,[29] fish harvesters reported hearing issues in the range of 16–25% and 10%, respectively. However, audiometric testing found 26–88% and 82.4% hearing loss in both studies (Table 5.1).

Table 5.1 Prevalence of tinnitus and hearing loss among fish harvesters

First author & Country	Year	Tinnitus	Hearing loss
Albizu et al. & Brazil[33]	2020	48.63%	46.7–78.1%
Anwar et al. & Indonesia[32]	2019	Not available	97.50%
Mansi et al. & Italy[15]	2019	Not available	27%
Masterson et al. & United States[41]	2018	Not available	19.47%
Eckert et al. & United States[40]	2018	Not available	80%
Sholihah and Hanafi & Indonesia[31]	2017	Not available	60.2%
Zeigelboim et al. & Brazil[39]	2015	66.7%	53.3%
Arumugam et al. & India[38]	2015	19.04%	28.57%,
Zeigelboim et al. & Brazil[37]	2014	61.7%	76.9%
Paini et al. & Brazil[30]	2009	Not available	Small boats: 72–97% Boats without an engine: 36%
Novalbos et al. & Spain[35]	2008	Not available	6%
Casson et al. & Itlay[170]	1998	Not available	63%

It demonstrates fish harvesters' hesitation to recognize hearing loss problems. It also corroborates the interview findings from the current research, which indicated that some fish harvesters believed hearing testing was necessary to ascertain the true prevalence of hearing loss. According to one fish harvester, hearing loss carries a cultural stigma, which some feel is connected to intelligence.

A study conducted in the United States by Eckert et al.[40] confirms the disparities between self-reported and physically examined hearing loss. The investigators discovered 50% self-reported hearing loss and 80% hearing loss by physical assessment in this study. It is consistent with our research findings, according to which 62% of fish harvesters admitted to having hearing difficulties and more than 60% of participants reported that their relatives and friends believed they had hearing loss. In comparison, only 25% of individuals reported having tinnitus. Further research is warranted to determine the prevalence of hearing loss using a physical examination method in NL fish harvesters.

5.2 Risk perceptions of noise

Fish harvesters' attitudes and behaviors play a significant role in developing any health risk, the consequence of risk, or related adverse outcomes. Fish harvesters have substantial insights into the sources of risk and develop individual strategies to reduce perceived risk.[171] Noise perception indicates that the physical properties of noise and attitudes are determined by personal attributes.[172]

The perception of risk indicators highlights the difference between perceived and actual risk. In this research, the assessment of noise risk perception and self-reported hearing loss is an attempt to demonstrate noise risk perception and related attitudes and behaviors and identify its

association with sociodemographic characteristics and other work-related factors among fish harvesters.

We used a questionnaire to assess risk perceptions based on the HBM. The HBM was first developed by social scientists at the United States Public Health Service to explain why people fail to employ disease prevention techniques or screening tests for early disease diagnosis. Patients' reactions to symptoms and adherence to medical treatments were later applications of the HBM. According to the HBM, an individual's belief in a personal threat of illness or disease, along with an individual's conviction in the efficacy of the recommended health behavior or activity, predicts the likelihood that they will adopt the behavior.[173]

The HBM is a theoretical framework for guiding and managing programs aimed at promoting health and preventing disease. It is used to demonstrate and forecast the evolution and change in people's health behaviors. It is a widely used model for assessing health-related behaviors.[174] The HBM defines the critical factors influencing health behaviors as an individual's perceived susceptibility to sickness or disease (perceived susceptibility), a belief in the severity of the consequences (perceived severity), perceived benefits of action (perceived benefits), perceived barriers to action, exposure to factors that prompt action (cues to action), and faith in one's ability to succeed (self-efficacy).[174]

According to the literature search, no study identified a risk of noise perception among fish harvesters. Several studies, however, found general views of safety and risk among fish harvesters. Murray and Dolomount,[166] Power,[167] and Power et al.[175] discussed how NL fish harvesters perceive occupational risks and the state of the safety culture. They discovered that, despite increased awareness of safety issues and hazards as a result of professionalization, accidents and work-related injuries were still accepted as an inevitable part of a harvester's

professional life[166] and that efforts to change this resulted only in the implementation of mandatory safety training, which allowed harvesters to work safely.[174] In fisheries around the globe, fishing vessel owners share this attitude toward safety.[176,177]

The current study found that fish harvesters' awareness scores for perceived benefits, barriers, and self-efficacy ranged between 2.3 and 2.9, indicating a moderately positive attitude toward noise reduction and hearing loss protection. On the other hand, a high perceived attitude and susceptibility score of 3.9 to 4.5 suggested that participants disliked loud noises and were susceptible to hearing loss.

The wide range of results on both subscales indicated that individuals held divergent views on noise sensitivity. Burella[28] investigated noise awareness levels among NL fish harvesters. The findings suggest that the skippers of the assessed vessels are unaware of the risks posed by onboard noise sources and noisy job activities while fishing. It established that harvesters are frequently exposed to potentially unsafe noise levels and have limited awareness of this threat (poor awareness).[28]

The majority of respondents (53–82%) agreed with the benefits of a noise-free work environment on the perceived benefit subscale. Similarly, individuals expressed a relatively favorable view about perceived benefits.

The relationship between perceived barriers and educational attainment reveals an interesting fact. The perceived barrier subscale reveals an individual's indifference toward noise reduction. We divide education into up to high school and beyond high school education categories. The relationship between education level and perceived barriers was statistically significant ($p<0.05$). When asked about perceived barriers related to noise, fish harvesters with a level of education above high school expressed a mixed opinion, whereas those with a level of education up to high

school expressed a clear opinion (disagreement). However, generalization from a small sample size is difficult.

When the relationship between perceived attitude and susceptibility and the GT of fishing vessels was examined, it was discovered that fish harvesters operating medium or large vessels had limited awareness compared to those operating small fishing vessels. Likewise, when the relationship between perceived attitude toward noise reduction and perceived susceptibility to hearing loss was examined concerning the presence or absence of hearing difficulties, it was discovered that fish harvesters without hearing difficulties agreed with noise-related perceived attitude and susceptibility statements. It reveals that participants who did not have hearing loss could not identify noise as a potential risk factor for hearing loss. In contrast, fish harvesters who experience hearing loss develop an awareness of and sensitivity to noise. Again, it would be premature to conclude from such a small sample size, but it does suggest a direction for future research that could delve deeper into the underlying factors to gain a better understanding of the relationship between sociodemographic determinants and noise risk perceptions.

One of the subscale's statements focused on the vessel owners' lack of concern for their employees' OHS. It may explain why we received a sizable reaction in disagreement with the statement, as most of our participants (67%) were skipper/captains and, hence, potential vessel owners. However, we did not ask any questions that could differentiate vessel owners from the rest of the respondents. Out of four questions on the perceived self-efficacy subscale, participants agreed on three, including their incapacity to limit noise at work, their ability to wear earplugs and earmuffs, and their acceptance that developing quieter equipment is difficult. However, when asked about the proper usage of hearing protection, we received conflicting responses from

participants. It could be because participants were unfamiliar with the term "hearing protectors," as most participants agreed on the following question about using earmuffs and earplugs.

However, during the survey's piloting phase, fish harvesters expressed their perplexity about this issue. When asked about their perceived attitude, approximately 38% of participants stated that noise does not bother them. It demonstrates workplace tolerance towards the noise. This type of behavior, which disregards potential hazards, is referred to as fatalism. Denial, passive acceptance, and fatalism are all techniques for dealing with the intense individualizing rhetoric of regulatory and political authorities. It can be challenging to create a safe space to speak out against or fight established paradigms, and believing one "in God's pocket" is one way to express fatalism positively.[67]

The majority of participants (82–93%) disagreed with all of the questions on the effect of noise on hearing abilities on the perceived susceptibility subscale. This demonstrates that fish harvesters are susceptible to hearing loss.

Noise perception responses were analyzed with demographic variables, employment characteristics, vessel characteristics, and self-reported hearing loss. Perceived barrier responses were found to be statistically significant ($p<0.05$) when associated with the level of education. Similarly, perceived attitude and susceptibility responses were found to be statistically significant when related to the GT of fishing vessels used by fish harvesters and hearing difficulty status. The remaining associations were determined to be statistically insignificant. It demonstrates a lack of a relationship between demographic characteristics and noise risk perception. However, due to the small sample size, generalization of the results is challenging. It was revealed that fish harvesters with hearing issues had significantly different perceptions of attitude and susceptibility; however, the results were not statistically significant on the other

subscales. Participants who did not experience hearing loss expressed a neutral attitude about noise exposure and hearing loss. Participants who reported being exposed to loud noise at least 50% of the time in the preceding month strongly agreed with the perceived benefits response. It explains that those who are more sensitive to noise are more likely to recognize noise reduction and hearing protection benefits than those who are not. Other subscales of noise perception tests yielded nearly identical responses from both groups. However, there is no statistically significant difference observed between the groups. During the previous month of work, fish harvesters who did not use hearing protectors demonstrated an inadequate assessment of perceived barriers and self-efficacy for noise reduction, hearing loss prevention, and reduced noise levels. It indicates that participants who do not wear hearing protection have difficulty controlling noise exposure at work.

Participants who did not receive a hearing test agreed on the perceived benefits and barriers, indicating that they take further precautions to protect themselves from noise exposure. The participants who had their hearing tested exhibited relatively negative behavior when considering noise reduction at work.

5.3 Health Capital Approach

For public health, the employment environment provides unique difficulties and problems. On the one hand, all risk appears to be environmental and controllable or preventable in the workplace. Yet, on the other hand, it is associated with social conflict and hence carries significant commercial repercussions. Occupational injury and sickness are industrial issues that arise from social perceptions of technology and labor in the service generation process.[178] According to current research, fish harvesters prioritize safety in their work.

The health capital approach to risk considers factors such as an individual's degree of education and training, knowledge, behaviors, and risk expectations. Many policymakers and administrators whose actions directly or indirectly affect safety and protection have never set foot aboard a fishing boat, something harvesters understand and frequently detest. One of the primary goals of this thesis is to clarify the implicit parts of harvesters' experience, safety measures, and difficulties to make them more accessible to external policy and compliance specialists.

Our findings contrast with scholars who have identified health capital components as a coping mechanism[166] and injury proclivity[177] as the main risk and hazard variable at sea. According to the current research, most fish harvesters widely recognize that they operate in a noisy workplace. When asked about a solution for preventing excessive noise, one fish harvester stated, *"I just got used to it" (FH-10).* It demonstrates the coping mechanisms of those who attempt to trivialize the risk (161). Other fish harvesters concurred, stating, *"... there's not much you can do..." (FH-9),* and *"Do not have much hope…" (FH-6).* According to some experts, many fatalities and disabilities are due to repetitive injuries sustained by employees rather than hazardous work circumstances. According to Iverson and Irwin's hypothesis, high injury rates result from fewer employees being involved in numerous accidents rather than a large number of employees being involved in mishaps. As a result, the most effective method for reducing casualties is to target the most vulnerable individuals.[179]

Our study findings contradict this idea, as just one fish harvester fell overboard due to being unaware of his surroundings due to the use of hearing protection. Three subjects, however, reported hearing loss, and four individuals reported having tinnitus, despite the fact that they had no prior history of going overboard or any other injury. Given that one seafarer fell overboard

twelve times in the last decade, the frequency of "falling overboard" incidents may be seen as supporting the accident-prone theory concept. Rather than one person becoming more "prone" to noise exposure than another, I believe noise exposure is more directly related to the specific employment activity, work location, duration of employment, or type of fishing vessel. For example, a worker working on deck or in the engine room is more susceptible to noise exposure than a captain in the wheelhouse.

Typically, harvesters begin fishing in April and continue through November or December (Table 3.1). During their off-season, which spans from January to March, they frequently repair and maintain vessels. Fish harvesters who spend numerous days fishing are more susceptible to noise exposure, which can have a negative effect on their health and well-being. On a moving platform, noise from multiple sources such as engines, haulers, hydraulics, generators, and weather can disrupt fish harvesters' sleep, resulting in various additional health concerns.

Another critical component that health capital researchers have linked to risk is fish harvesters' training, education, skill, and experience. Ten of the twelve participants were unaware of any available noise safety instruction. Only two fish harvesters received training on noise exposure and associated health risks in the professional certification procedure. Due to a lack of training and education, fish harvesters become accustomed to workplace noise and disregard the repercussions.

Working in a noisy setting can result in a variety of auditory and non-auditory health concerns. Noise-induced hearing loss (NIHL) and tinnitus are the two most common auditory health concerns. NIHL is a chronic and irreversible condition produced by either a sudden exposure to loud noise or an extended period of excessive noise exposure. Tinnitus is a condition in which a person hears a ringing or clicking sound in one or both ears. NIHL and tinnitus are

serious health issues associated with workplace noise exposure. Apart from that, noise exposure can result in irritation, stress, anxiety, depression, diminished cognitive function and disrupted sleep, all of which can contribute to various systemic health issues.

Noise is a key element that has the potential to cause stress. Burella[28] conducted research to determine the noise levels aboard several fishing vessels in Newfoundland and Labrador. The data indicates that the majority of fishing vessels exceeded the recommended noise levels. According to the findings of this study, NL fish harvesters work in a noisy environment. However, predicting the presence or absence of stress with a single question is challenging. As a result, it may be re-examined using specific instruments for better understanding. Headaches are not found to be a common health problem among fish harvesters. The finding suggests the adaptability of fish harvesters in their working environment. Acceptance of noise is a gradual process that may be understood via the lens of the health capital approach. Fatalism can delay or hinder the safety training process by discouraging at-risk personnel from adopting necessary protective measures. The conduct of fish harvesters is consistent with the findings of our research. Due to years of employment, fish harvesters acquire acclimatization to loud environments. The majority of health issues caused by noise exposure are chronic and develop over time. As a result, it is exceedingly challenging to comprehend the harmful consequences of noise early in life.

The literature is replete with evidence linking occupational noise exposure to health concerns. However, due to a lack of information regarding noise-related health problems, fish harvesters believe their hearing impairment is unrelated to their work on fishing vessels. We also inquired about hearing issues in our online survey. Around 62% of fish harvesters reported having hearing issues. This disparity prompts the question: Is there any social stigma connected

with hearing loss? The under-reporting of hearing problems by participants could be a result of associated social stigma. Additionally, one of the fish harvesters mentioned this stigma. They stated that fish harvesters are averse to admitting their hearing impairments because they associate it with intelligence.

None of the fish harvesters could connect their general health issues and noise exposure when asked about their general health. Many fish harvesters reported to have received general safety training but had not attended seminars or training on noise exposure and its accompanying health hazards. One fish harvester attended a CCG survival training course but found no mention of noise in any of the courses (FH-7). As one participant put it, *"I have done a couple of safety courses. I do not specifically recall hearing protection. There may have, but I am not sure" (FH-1).* Similarly, one harvester responded, *"I think there is something for basic safety training that talks about but no specific for noise" (FH-2).*

"Once It's Gone, It's Gone" - The SafetyNet Centre for OHS Research, Memorial University of Newfoundland, in partnership with the NL-FHSA, is creating awareness by sharing information through videos providing information on noise-induced hearing loss and suggesting methods to prevent onboard noise exposure.[180] Fishing organizations should regularly use this type of information awareness training to encourage healthy behavior and to aid in identifying noise as a potential health hazard. While advanced equipment can undoubtedly decrease onboard noise levels, the equipment must also be affordable and acceptable to fish harvesters. For example, electric generators and hydraulics are becoming more prevalent and hold great potential for future application.

5.4 Regulatory Structure

Fish harvesters voiced a mixed reaction to legislation proposals aimed at reducing noise exposure on fishing vessels. One fish harvester emphasized the importance of noise exposure and hearing protection safety training. "It (hearing protection) could be emphasized as much as you know, wearing a life jacket and those kinds of personal protection survival suits, immersion suits, hearing protection. It should be as important as everything else" (FH-1). However, no other fish harvesters submitted their views on proposed modifications to noise exposure and hearing protection regulations. It is most likely because regulatory authorities, particularly those in positions of authority, can affect their fishing experiences and activities as well as the occupational risk parameters.[181] Government regulators want to personalize and approach fishing safety through the prism of human resource management, whereas fish harvesters are worried about the influence of regulations on safety. They are concerned about how their structural integrity is being jeopardized.[67]

Two fish harvesters stated that regulations regarding noise exposure and the mandatory use of hearing protection should be implemented for large vessels. However, the literature indicates that small vessels emit noise over the recommended levels. A recent study on fish harvesters in NL showed that harvesters operating on small fishing vessels were frequently exposed to harmful noise levels.[28] The skippers were unaware of the risk of noise exposure on their ships.[28] One fish harvester expressed dissatisfaction with the current lack of noise exposure restrictions and the future risk of hearing loss. The fish harvester has recently taken up fishing and is currently working with his father. He alluded to the absence of policies, saying,

"I think there could be more done and more focused done, like, I mean, like, my father says he is 60 years old, and he had been fishing for 40 years is a bit too late for him, his hearing is gone" (FH-9).

He urged that authorities and stakeholders should take this issue seriously and protect the hearing of new fish harvesters. The majority of fish harvesters we spoke with were vessel owners. However, some fish harvesters who work as employees on fishing vessels emphasized the vessel owners' responsibility to provide adequate hearing protection on board.

According to one fish harvester, there are not enough hearing protection supplies on board, and they said, *"I got the earmuffs for myself… " (FH-7).* Concerning crew members' issues about noise exposure and related safety issues, one fish harvester stated, *"I am not sure if they have anyone (noise safety concern), an inspector comes around to make sure the noise on the boat is too loud…" (FH-12).* It demonstrates the importance of requiring fishing vessels to undergo frequent noise safety inspections to monitor noise exposure. Additionally, employers should be responsible for meeting all regulations, including providing personal protective equipment on board and considering noise exposure in their safety management process. There is a need for necessary standards to ensure that noise levels on small and large fishing vessels are kept to a minimum following provincial OHS regulations. The local government should enforce workplace safety regulations on fishing vessels to protect fish harvesters from exposure to loud noise on board.

5.5 Importance and limitations

The research highlights the perceived risk of noise exposure and describes the perspectives of NL fish harvesters on noise exposure and related health consequences as well as noise prevention and management on fishing vessels. The study aims to bridge some gaps that currently exist between fish harvesters and policymakers. Rather than viewing fish harvesters as passive receptors of research findings, the current research gives them an active voice to express their experiences and expectations.

A strength of the study is that it integrates data from current fish harvesters to evaluate marine risk perception better. This study contributes vital information to the knowledge base of fish harvesters, fishing organizations, safety educators, and regulatory bodies. The work contributes to the body of knowledge addressing noise exposure and associated health hazards in commercial fishing. The study adds to the scholarly body of information regarding noise exposure and related health risks in commercial fisheries and stays within a broad context.

In terms of limitations, we could not obtain a higher response rate for both the online survey and the telephone interview. Due to COVID-19 restrictions, we employed an online sample recruiting technique. We attempted to disseminate the research flyer via social media platforms and to include information about the research on the websites of several fishing organizations in NL. However, due to the brevity of the data collection period and COVID-19 limits, we could only gather 76 replies to the survey and perform 12 interviews. Additionally, we were unable to conduct enough interviews with female fish harvesters. Collecting detailed information over the phone proved difficult. We also allowed participants to participate via Zoom or Skype, but everyone preferred to speak on the phone. The majority of interviewees reported experiencing sleep difficulties. According to our findings, we could have included fish harvesters' working hours in the survey and interview questions to understand noise-induced sleeping problems better.

One of the limitations could be adopting quantitative method used for cross tabulation data analysis. In this method, we collapse the Likert scale into a binary scale to find out the association of noise perception score with other dependent variables such as vessel characteristics, job profile, and self-reported health problems. The methodological literature demonstrates a diversity of viewpoints about the dichotomization of quantitative measurements.

The possible limitations of this method include the loss of information about individual variation, the loss of effect size and power, exaggeration in assessments with two independent variables, and an increased likelihood of observing non-linear relationships.[182]

Summary

This chapter discussed the survey and interview findings through the lens of the health belief model and the health capital approach. Socio-demographic determinants such as gender, age, education, and work experience of our study participants are similar to other global studies. This research suggests that around two-third of fish harvesters reported hearing difficulties, which is also consistent with the findings from other studies. In contrast, fish harvesters' experience of tinnitus was observed to be different.

While comparing noise risk perception scores of fish harvesters, a similar observation was reported in a study conducted by Purdy and Williams[135] among other workers. A moderately positive score for perceived benefits, barriers, and self-efficacy suggests that fish harvesters are aware of noise reduction and hearing loss prevention benefits. A high attitude and susceptibility score, on the other hand, reflects fish harvesters' dislike of occupational noise and susceptibility to hearing loss.

Further, I explained the fish harvester’s noise risk perceptions and related health behavior. Fish harvesters who have hearing difficulties report a positive perceived attitude and susceptibility. The health capital approach explains how education, training, and awareness can be used as a tool for health investment. Regular education and training sessions for fish harvesters would assist them in recognizing noise-related health concerns and obtaining early medical care. Fish harvesters' adaptation to a noisy environment and their behavior of tolerating noise at work can have negative health consequences and jeopardize their health and well-being.

There is a need for regular training and educational programs to promote awareness regarding noise exposure and its adverse health impacts.

The noise risk perceptions of NL harvesters highlight the significance of an inter-sectoral strategy for noise safety on fishing vessels, one that considers health capital and health belief factors and the interaction of these elements in industrial and policy change. Developing a policy to prevent fish harvesters from occupational noise exposure and related health consequences should include the use of health prevention techniques such as behavior change, educational and medical intervention. By integrating all stakeholders in developing a noise regulation framework, it will be possible to maintain the appropriate noise level on fishing vessels and therefore safeguard fish harvesters from the detrimental health consequences of noise.

Chapter 6

Conclusions

The perceived risk of noise and the health consequences experienced by NL fish harvesters highlight the need for a more comprehensive exploration of noise-related safety issues that takes into account variables such as biophysical, environmental, structural, and human resources as well as their interactions within the context of industrial and policy transition. Our study's findings from the survey and telephone interviews with NL fish harvesters reveal various beliefs and attitudes about onboard noise exposure and related health concerns. This concluding chapter summarizes the study's significant findings. Following this summary, I examine the study's strengths and limitations and the implications and recommendations for further research.

6.1 Major findings

The online survey findings emphasize self-reported noise exposure, the use of hearing protection, and hearing impairments. In response to a question, "During the past month in your work area, what percentage of time during the working day were you exposed to loud noise (loud enough to require you to raise your voice)", only about 19% of participants responded that they were exposed to loud noise 71–80% of the times, while the majority of harvesters responded that they were exposed to loud noise less than 10% of the times. Participants' response to another question, "During the past month, what percentage of the time during the working day did you wear hearing protectors (earmuffs or earplugs)?" revealed that the majority of participants (76.3%) wore hearing protectors less than 10% of the times. Of these, 73% of participants never wore a hearing protector while at work. Only around 10% of interviewees stated that they wore hearing protectors more than 50% of the time while working. These findings indicate more regulatory and management efforts should be made to improve the wearing rate of hearing

protectors. Employers are responsible for ensuring that crew members wear hearing protection properly during work.

About 62% of respondents overall said that they have hearing difficulties compared to approximately 30% and 8% who responded "no" and "cannot say," respectively. It demonstrates that hearing loss is prevalent among fish harvesters in NL. However, around 47% and 28% of participants responded "rarely" and "never" when asked about ringing in their ears. Only approximately 16% and 9% of respondents, respectively, said that they "always" or "frequently" have ringing ears. When asked, "Does an immediate family member or friend feel that you have a hearing loss?" more than 62% of participants responded "yes," whereas between 23% and 15% responded "no" and "cannot say." Around 52% of individuals responded affirmatively when asked about their hearing test status.

Noise risk perception score between 2.3 to 2.9 for perceived noise benefits, perceived barriers, and perceived self-efficacy to reduced noise and prevent hearing loss indicates a moderately positive noise risk perception among NL fish harvesters. The perceived attitude toward noise reduction and perceived susceptibility to hearing loss scores ranged from 3.9 to 4.5, indicates NL fish harvesters dislike excessive noise and have a reasonably high susceptibility to hearing loss. Overall, a broad range of values across all subscales showed that individuals held divergent views on noise perception. However, during the interviews, most participants expressed varying opinions on noise exposure and noise-related health concerns. For example, whereas hearing impairments were observed in approximately 62% of participants in the survey findings, just three participants stated they had hearing difficulties during the phone interviews. It may be related to a societal stigma associated with hearing loss and its perceived relationship to intelligence. Additional insights from the interviews include fish harvesters' perceptions of

occupational noise and its associated health impacts. Two fish harvesters denied that their hearing loss was the result of occupational noise. However, one harvester stated unequivocally that workplace noise is the cause of their hearing loss.

Numerous non-auditory health concerns have been linked to workplace noise exposure in the literature. However, none of the participants could relate their medical health concerns to noise exposure. It might be due to a lack of training to make them aware of onboard noise exposure and associated health risks. However, establishing a direct link between noise and related health risks is challenging due to the presence of other co-variables, such as the duration of noise exposure, frequency and amplitude of noise, and aging. Sleep disturbance is one of the issues most frequently mentioned by fish harvesters. It could result from inconsistent work schedules or continuous noise exposure even during resting hours at fish vessels. Some fish harvesters emphasized the need to get up early and to work throughout the day. Occasionally, they work only two to three days a week. This type of work schedule and noise levels may synergistically affect fish harvesters' sleeping patterns.[183]

The majority of fish harvesters interviewed often go fishing on day trips. We were unable to acquire data on their specific work hours. If fish harvesters work for lengthy periods, for example, more than eight hours a day. In this case, noise level beyond 70 dB for an extended time may also damage hearing.[71] None of the participants found working in a noisy atmosphere on fishing vessels stressful. However, research conducted with different workers indicates that occupational noise exposure is one of the risk factors for stress.[22,184–186] Due to the inherent risks of the sea, fishers who work for extended periods without contact with their families are particularly susceptible to stress and related disorders.[180] Additional research is necessary to

determine the true nature of the problem. Specific tools to measure stress may be beneficial in determining the true nature of the situation.

Due to noise exposure during work, fish harvesters encountered difficulties with decision-making abilities. *"Sometimes, I guess, if you are on lobster, you can't hear, you can't think well,"* one fish harvester explained (FH-6). The vast majority of participants reported never encountering emotional difficulties when working aboard a fishing vessel. However, one fish harvester expressed the will to quit the job by stating, *"...sometimes it is emotional and just wanting to say, like, you know, wanting to give up and just like wanting to retire and stuff..." (FH-7).* Four out of twelve participants noted communication difficulties due to working in a noisy setting.

Most fish harvesters are aware of the noisy work environment and have adapted to it. This shows fish harvesters' fatalistic conduct, acceptance of noise, and adaptability in a noisy work setting. While working aboard fishing vessels, most participants (11 of 12 fish harvesters) do not wear hearing protectors. It could be a significant reason why more than two-thirds of respondents to our survey reported having hearing problems. The data are alarming and indicate that fishing organizations and others should pay heed to this issue. The findings of this study may be helpful to policymakers in developing future regulations on noise exposure on fishing vessels.

6.2 **Implications and directions for future research**

According to the methodological implications of this study, future researchers may desire to incorporate the following questions into their interviews to elicit extra information regarding present and anticipated future regulations:

a. Are you familiar with current OHS regulations addressing noise exposure in a general work environment?

b. What are the advantages and disadvantages of current OHS regulations governing noise exposure in the workplace?
c. Do you feel that fishing vessels should be subject to these regulations? If that is the case, could you please elaborate?
d. Are any modifications to the current OHS Occupational Safety and Health Administration standards addressing noise exposure and the use of hearing protection devices necessary?
e. What are the roles and responsibilities of fishing employers in terms of minimizing onboard noise levels?

In a recent study, noise exposure levels were detected on various fishing boats in NL. However, data on hearing loss among fish harvesters remain scarce. We could acquire a better knowledge of hearing loss status by doing a physical examination and studying how it relates to noise exposure among NL fish harvesters. Clinical data on hearing loss could be obtained by audiometric testing. Apart from hearing issues, non-auditory health problems might be thoroughly studied to ascertain a probable relation between noise and associated health problems. While the current study's participants did not report experiencing stress from working in a noisy setting, the literature suggests a relationship between occupational noise exposure and stress. We identified a unique finding, which may be worth further examination in future studies.

Health promotion and disease prevention require a strong emphasis on education and training. Fishing organizations should take the initiative and conduct educational and training programs to educate the harvesters about the risk of noise and associated health problems. For example, Fish Safe BC provided harvesters with essential information regarding standard noise

levels on a fishing vessel, noise-induced hearing loss, hazardous noise levels, hearing protectors and their capabilities of blocking noise, and the selection of appropriate hearing protectors. Additionally, the NL-FHSA educates fishers on how noise exposure impacts their health and well-being. Besides education and training, harvesters should be urged to submit to onboard noise monitoring, periodic hearing exams, and medical examinations. The federal and provincial governments should take the lead in adopting noise-reduction recommendations and rules for fishing vessels. Federal authorities such as TC may provide guidelines to promote the use of quieter equipment and devices.

Bibliography:

1. FAO. *The State of World Fisheries and Aquaculture 2020: Sustainability in action*. FAO; 2020. doi:10.4060/ca9229

2. Martini R, Lindberg C. Fishing for tomorrow: Managing fisheries for sustainable development. *OECD*. 2013;(2):12. doi:http://dx.doi.org/10.1787/888932860218

3. Cision. Canada's world-class fish and seafood products on display and in demand. *CNW Group Ltd.* https://www.newswire.ca/news-releases/canada-s-world-class-fish-and-seafood-products-on-display-and-in-demand-853125655.html. Published March 14, 2019. Accessed June 2, 2021.

4. Fisheries and Oceans Canada (DFO). Facts on Canadian Fisheries. Fisheries and Oceans Canada, Government of Canada. Published March 17, 2017. Accessed May 6, 2021. https://www.dfo-mpo.gc.ca/fisheries-peches/sustainable-durable/fisheries-peches/species-especes-eng.html

5. Fisheries and Oceans Canad (DFO). Employment: Fishing-related employment by industry and province. Fisheries and Oceans Canada, Government of Canada. Published March 23, 2021. Accessed June 17, 2021. https://www.dfo-mpo.gc.ca/stats/cfs-spc/tab/cfs-spc-tab2-eng.htm

6. Fisheries and Oceans Canad (DFO). Licences. Fisheries and Oceans Canada, Government of Canada. Published November 1, 2019. Accessed June 2, 2021. https://www.dfo-mpo.gc.ca/stats/commercial/licences-permis-eng.htm

7. Jin D. The determinants of fishing vessel accident severity. *Sci Direct*. 2014;66:1-7. doi:10.1016/j.aap.2014.01.001

8. Jin D, Thunberg E. An analysis of fishing vessel accidents in fishing areas off the northeastern United States. *Saf Sci*. 2005;43(8):523-540. doi:10.1016/j.ssci.2005.02.005

9. Jensen OC, Petursdottir G, Holmen IM, Abrahamsen A, Lincoln J. A review of fatal accident incidence rate trends in fishing. *Int Marit Health*. 2014;65(2):47-52. doi:10.5603/IMH.2014.0011

10. Burella G, Moro L, Colbourne B. Noise sources and hazardous noise levels on fishing vessels: The case of Newfoundland and Labrador's fleet. *Ocean Eng*. 2019;173:116-130. doi:10.1016/j.oceaneng.2018.12.062

11. Antão P, Almeida T, Jacinto C, Guedes Soares C. Causes of occupational accidents in the fishing sector in Portugal. *Saf Sci*. 2008;46(6):885-899. doi:10.1016/j.ssci.2007.11.007

12. Food and Agriculture Organization of the United Nations (FAO). Insurance and safety at sea. Food and Agriculture Organization of the United Nations. Accessed May 5, 2021. http://www.fao.org/fishery/topic/16617/en

13. Woodhead A, Abernethy K, Szaboova L, Turner R. Health in fishing communities: A global perspective. *Fish Fish*. 2018;19(5):839-852. doi:10.1111/faf.12295

14. Murray M. Fish harvesters with injuries' accounts of their experiences with the workers' compensation system. *Work Read Mass*. 2007;28:47-56.

15. Mansi F, Cannone ESS, Caputi A, et al. Occupational Exposure on Board Fishing Vessels: Risk Assessments of Biomechanical Overload, Noise and Vibrations among Worker on Fishing Vessels in Southern Italy. *Environments*. 2019;6(12):127. doi:10.3390/environments6120127

16. World Health Organization (WHO). Hazard prevention and control in the work environment: Prevention and Control Exchange (PACE) : a document for decision-makers. Published online February 1995. Accessed May 5, 2021. https://apps.who.int/iris/handle/10665/60994

17. TSB. Marine transportation occurrences in 2019. Transportation Safety Board of Canada. Published February 19, 2020. Accessed August 4, 2021. http://www.bst-tsb.gc.ca/eng/stats/marine/2019/ssem-ssmo-2019.html

18. Basner M, Babisch W, Davis A, et al. Auditory and non-auditory effects of noise on health. *Lancet*. 2014;383(9925):1325-1332. doi:https://doi.org/10.1016/S0140-6736(13)61613-X

19. Concha-Barrientos M, Campbell-Lendrum D, Steenland K. Occupational noise: Assessing the burden of disease from work-related hearing impairment at national and local levels. Published online 2004. https://www.who.int/quantifying_ehimpacts/publications/en/ebd9.pdf

20. Canadian Centre for Occupational Health and Safety (CCOHS). Noise - Non-Auditory Effects : OSH Answers. Canadian Centre for Occupational Health and Safety (CCOHS), Government of Canada. Published May 5, 2021. Accessed May 5, 2021. https://www.ccohs.ca/

21. United States Department of Labor. Occupational Safety and Health Administration. United States Department of Labor. Accessed May 5, 2021. https://www.osha.gov/noise/health-effects

22. Sheppard A, Ralli M, Gilardi A, Salvi R. Occupational Noise: Auditory and Non-Auditory Consequences. *Int J Environ Res Public Health*. 2020;17(23). doi:10.3390/ijerph17238963

23. IOSH. Health effects of noise in the workplace. IOSH. Accessed May 5, 2021. https://iosh.com/resources-and-research/our-resources/occupational-health-toolkit/noise/

24. Ramage-Morin PL, Gosselin M. *Canadians Vulnerable to Workplace Noise*. Statistics Canada; 2018:9-17. Accessed May 5, 2021. https://www150.statcan.gc.ca/n1/pub/82-003-x/2018008/article/00002-eng.htm

25. Feder K, Michaud D, McNamee J, Fitzpatrick E, Davies H, Leroux T. Prevalence of Hazardous Occupational Noise Exposure, Hearing Loss, and Hearing Protection Usage Among a Representative Sample of Working Canadians. *J Occup Environ Med*. 2017;59(1):92-113. doi:10.1097/JOM.0000000000000920

26. Burella G, Moro L. A Comparative Study of the Methods to Assess Occupational Noise Exposures of Fish Harvesters. *Saf Health Work*. Published online October 20, 2020. doi:10.1016/j.shaw.2020.10.005

27. Myers ML, Durborow RM, Kane AS. Gulf of Mexico Seafood Harvesters, Part 2: Occupational Health-Related Risk Factors. *Safety*. 2018;4(3):27. doi:10.3390/safety4030027

28. Burella G. Long- and short-term solutions for mitigating hazardous noise exposure and noise levels on board vessels from the small-scale fishing fleet of Newfoundland and Labrador. Published online May 2020. Accessed May 5, 2021. https://research.library.mun.ca/14431/

29. Levin J, Curry W, Shepherd S, Nalbone T, Nonnenmann M. Hearing loss and noise exposure among commercial fishermen in the gulf coast. *J Occup Environ Med*. 2016;58(3):306-313. doi:10.1097/JOM.0000000000000642

30. Paini MC, Morata TC, Corteletti LJ, Albizu E, Marques JM, Santos L. Audiological findings among workers from Brazilian small-scale fisheries. *Ear Hear*. 2009;30(1):8-15. doi:10.1097/AUD.0b013e31818fba17

31. Sholihah Q, Satria Hanafi A. Relationship of noise and the use of ear plugs with hearing disorders on fishermen. *Asian J Sci Res*. 2017;10(2):104-109. doi:10.3923/ajsr.2017.104.109

32. Anwar M, Savitri E, Dyah T. Audiometric profile of fishermen using motor boat in Barombong village, Makassar. *Indian J Public Health Res Dev*. 2019;10(10):1530-1534. doi:10.37506/ijphrd.v10i10.5983

33. Albizu EJ, de Oliveira Gonçalves CG, de Lacerda ABM, Zeigelboim BS, Marques JM. Noise exposure and effects on hearing in Brazilian fishermen. *Work Read Mass*. 2020;65(4):881-889. doi:10.3233/WOR-203139

34. Kaerlev L, Jensen A, Nielsen PS, Olsen J, Hannerz H, Tüchsen F. Hospital contacts for noise-related hearing loss among Danish seafarers and fishermen: a population-based cohort study. *Noise Health*. 2008;10(39):41-45. doi:10.4103/1463-1741.40822

35. Novalbos J, Nogueroles P, Soriguer M, Piniella F. Occupational health in the Andalusian fisheries sector. *Occup Med Oxf Engl*. 2008;58(2):141-143. doi:10.1093/occmed/kqm156

36. Poulsen TR, Burr H, Hansen HL, Jepsen JR. Health of Danish seafarers and fishermen 1970-2010: What have register-based studies found? *Scand J Public Health*. 2014;42(6):534-545. doi:10.1177/1403494814534538

37. Zeigelboim BS, Silva TP da, Carvalho H, et al. Otoneurologic findings in a fishermen population of the state of Santa Catarina: preliminary study. *Int Arch Otorhinolaryngol*. 2014;18(1):006-010. doi:10.1055/s-0033-1358584

38. Arumugam I, Tukalan G, Anchery VA, Khosh A. Evaluation of noise induced hearing loss in fishermen who work in motor boats in Karaikal. *Akshantala Enterp Priv Ltd*. 2015;4(73):12645-12651. doi:10.14260/JEMDS/2015/1823

39. Zeigelboim BS, Santos da Carvalho HA, de Oliveira Gonçalves CG, et al. Otoneurological symptoms in Brazilian fishermen exposed over a long period to carbon monoxide and noise. *Noise Health*. 2015;17(78):300-307. doi:10.4103/1463-1741.165053

40. Eckert C, Baker T, Cherry D. Chronic health risks in commercial fishermen: A cross-sectional analysis from a small rural fishing village in Alaska. *J Agromedicine*. 2018;23(2):176-185. doi:10.1080/1059924X.2018.1425172

41. Masterson EA, Themann CL, Calvert GM. Prevalence of hearing loss among noise-exposed workers within the agriculture, forestry, fishing, and hunting sector, 2003-2012. *Am J Ind Med*. 2018;61(1):42-50. doi:10.1002/ajim.22792

42. Gander P, van den Berg M, Signal L. Sleep and sleepiness of fishermen on rotating schedules. *Chronobiol Int*. 2008;25(2):389-398. doi:10.1080/07420520802106728

43. Levin JL, Gilmore K, Shepherd S, et al. Factors influencing safety among a group of commercial fishermen along the Texas Gulf Coast. *J Agromedicine*. 2010;15(4):363-374. doi:10.1080/1059924X.2010.509701

44. Fisheries and Oceans Canada (DFO). About Us. Fisheries and Oceans Canada, Government of Canada. Published March 25, 2021. Accessed May 6, 2021. http://www.nfl.dfo-mpo.gc.ca/NL/about

45. Department of Finance, Newfoundland and Labrador. The fishing industry from 1987-96. Economics and Statistics Branch, Department of Finance, Newfoundland and Labrador. Accessed May 6, 2021. https://www.gov.nl.ca/publicat/tags/text/page23.htm

46. Fisheries and Land Resources. *Seafood Industry Year in Review 2018*. Minister of Fisheries and Land Resources, Newfoundland and Labrador; :1-60. Accessed May 6, 2021. https://www.gov.nl.ca/ffa/files/publications-pdf-syir-2018.pdf

47. Fisheries and Oceans Canada (DFO). Fishers information. Fisheries and Oceans Canada, Government of Canada. Published April 13, 2021. Accessed May 6, 2021. https://www.dfo-mpo.gc.ca/stats/commercial/licences-permis/fishers-pecheurs/fp19-eng.htm

48. WorkplaceNL. Newfoundland and Labrador Hearing Loss-Related Claims. Published online October 2018. Accessed May 6, 2021. https://workplacenl.ca/site/uploads/2019/06/hearing-loss-claims-20181121.pdf

49. WorkplaceNL. Serious Injury Facts: 2015-19. WorkplaceNL. Published October 2020. Accessed June 16, 2021. https://workplacenl.ca/site/uploads/2019/06/20200930-2019-Serious-Injury-Facts-2015-19-Final.pdf

50. Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). How is sound measured? European Union. Published 2008. Accessed September 20, 2021. https://ec.europa.eu/health/scientific_committees/opinions_layman/en/hearing-loss-personal-music-player-mp3/l-3/2-sound-measurement-decibel.htm

51. International Maritime Organization. Fishing vessel safety. International Maritime Organization. Published 2019. Accessed September 15, 2021. https://www.imo.org/en/OurWork/Safety/Pages/Fishing%20Vessels-Default.aspx

52. Food and Agriculture Organization of the United Nations, International Maritime Organization, International Labour Organisation, eds. *Safety Recommendations for Decked Fishing Vessels of Less than 12 Metres in Length and Undecked Fishing Vessels*. Food and Agriculture Organization of the United Nations; 2012.

53. Danish Marine Authority. Notice A from the DMA. Danish Marine Authority. Accessed May 12, 2021. https://www.dma.dk/Vaekst/Rammevilkaar/Legislation/Pages/Notice-A-from-the-DMA.aspx

54. Government of the United Kingdom. The Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007. Government of the United Kingdom. Accessed May 12, 2021. https://www.legislation.gov.uk/uksi/2007/3075/contents/made

55. Centre for Disease Control and Prevention. Occupational Noise Exposure Revised Criteria 1998. Published online June 1998. Accessed May 6, 2021. https://www.cdc.gov/niosh/docs/98-126/pdfs/98-126.pdf?id=10.26616/NIOSHPUB98126

56. United States Coast Guard. Navigation and vessel inspection circular no. 10-82, change 2. Published online September 18, 1989. Accessed May 6, 2021. https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/NVIC/1982/n10-82ch2.pdf

57. Domingo-Pueyo A, Sanz-Valero J, Wanden-Berghe C. Disorders Induced by Direct Occupational Exposure to Noise: Systematic Review. *Noise Health*. 2016;18(84):229-239. doi:10.4103/1463-1741.192479

58. American Speech-Language-Hearing Association (ASHA). Loud Noise Dangers. American Speech-Language-Hearing Association (ASHA). Accessed May 9, 2021. /public/hearing/loud-noise-dangers/

59. Centre for Disease Control and Prevention. Noise and hearing loss prevention. Centers for Disease Control and Prevention. Published February 6, 2018. Accessed June 2, 2021. https://www.cdc.gov/niosh/topics/noise/reducenoiseexposure/regsguidance.html

60. Neitzel RL, Berna BE, Seixas NS. Noise exposures aboard catcher/processor fishing vessels. *Am J Ind Med*. 2006;49(8):624-633. doi:10.1002/ajim.20332

61. Government of Newfoundland and Labrador. Occupational Health and Safety Regulations, 2012. House of Assembly, Newfoundland and Labrador. Published 2018. Accessed June 9, 2021. https://www.assembly.nl.ca/legislation/sr/regulations/rc120005.htm

62. Justice Laws Website. Canada Occupational Health and Safety Regulations. Justice Laws Website, Government of Canada. Published April 30, 2021. Accessed May 12, 2021. https://laws.justice.gc.ca/eng/regulations/sor-86-304/page-1.html

63. International Maritime Organization. Adoption of the code on noise levels on board ships. International Maritime Organization. Published November 30, 2012. Accessed May 12, 2021. https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/Documents/MSC%20-%20Maritime%20Safety/337(91).pdf

64. Justice Laws Website. Maritime Occupational Health and Safety Regulations. Justice Laws Website, Government of Canada. Published June 3, 2021. Accessed June 16, 2021. https://laws-lois.justice.gc.ca/PDF/SOR-2010-120.pdf

65. Canadian Centre for Occupational Health & Safety (CCOHS). OSH Answers Fact Sheets. Canadian Centre for Occupational Health & Safety, Government of Canada. Published June 3, 2021. Accessed June 3, 2021. https://www.ccohs.ca/oshanswers/phys_agents/exposure_can.html

66. Justice Laws Website. Fishing Vessel Safety Regulations. Justice Laws Website, Government of Canada. Published June 3, 2021. Accessed June 16, 2021. https://laws.justice.gc.ca/PDF/C.R.C.,_c._1486.pdf

67. Brennan SL. "In God's pocket": accidents, injuries, and perceptions of risk among contemporary Newfoundland fish harvesters. Published online 2008. Accessed May 6, 2021. http://research.library.mun.ca/id/eprint/9193

68. Gillespie A. Noise Pollution, the Oceans, and the Limits of International Law. *Oxf Univ Press*. 2011;21(1):114-139. doi:10.1093/yiel/yvr005

69. Britannica. Noise pollution. Encyclopedia Britannica. Accessed September 21, 2021. https://www.britannica.com/science/noise-pollution

70. Impairments NRC (US) C on DD for I with H, Dobie RA, Hemel SV. *Basics of Sound, the Ear, and Hearing*. National Academies Press (US); 2004. Accessed September 20, 2021. http://www.ncbi.nlm.nih.gov/books/NBK207834/

71. Centre for Disease Control and Prevention. What Noises Cause Hearing Loss? Centers for Disease Control and Prevention. Published October 7, 2019. Accessed May 9, 2021. https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html

72. Hildebrand J. Sources of Anthropogenic Sound in the Marine Environment. *US Mar Mammal Comm Jt Nat Conserv Comm UK Lond Engl*. Published online 2004:16. doi:Corpus ID: 15105412

73. Narayanakumar R, Sathiadhas R, Natarajan A. Economic performance of marine fishing methods in India. *Mar Fish Inf Serv Tech Ext Ser*. Published online January 1, 2009:3-16.

74. Dineshbabu A, Sujitha T, Shailaja S. Efficacy of spatial study on catch and effort from fishing vessels for strengthening fisheries management. *J Mar Biol Assoc India*. 2017;59:31-35. doi:10.6024/jmbai.2017.59.1.1923-05

75. Martin SB, Morris C, Bröker K, O'Neill C. Sound exposure level as a metric for analyzing and managing underwater soundscapes. *J Acoust Soc Am*. 2019;146(1):135-149. doi:10.1121/1.5113578

76. Mode NA, Wopat P, Conway GA. *Proceedings of the Second International Fishing Industry Safety and Health Conference.* U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; 2006:404. doi:10.26616/NIOSHPUB2006114

77. Hystad S, Nielsen M, Eid J. The impact of sleep quality, fatigue and safety climate on the perceptions of accident risk among seafarers. *Rev Eur Psychol AppliquéeEuropean Rev Appl Psychol*. 2017;67:259-267. doi:10.1016/j.erap.2017.08.003

78. Centers for Disease Control and Prevention. How Does Loud Noise Cause Hearing Loss? Published November 24, 2020. Accessed September 24, 2021. https://www.cdc.gov/nceh/hearing_loss/how_does_loud_noise_cause_hearing_loss.html

79. Peretti A, Nataletti P, Bonfiglio P, di Bisceglie AP. Noise in fishing vessels. *G Ital Med Lav Ergon*. 2013;35(4):215-218.

80. Government of Canada. Regulations Amending the Small Fishing Vessel Inspection Regulations. Published July 13, 2016. Accessed May 6, 2021. https://gazette.gc.ca/rp-pr/p2/2016/2016-07-13/html/sor-dors163-eng.html

81. Brüel & Kjær. What is a Sound Level Meter? Brüel & Kjær: an HBK company. Accessed June 3, 2021. https://www.bksv.com/en/knowledge/blog/sound/what-is-a-sound-level-meter

82. Whitehouse K. How To Use The Fletcher Munson Curve (A Simple Explanation). Producer Hive. Accessed September 21, 2021. //producerhive.com/ask-the-hive/fletcher-munson-curve-simple-explanation/

83. Fulmer S, Buchholz B. Ergonomic exposure case studies in Massachusetts fishing vessels. *Am J Ind Med*. 2002;Suppl 2:10-18. doi:10.1002/ajim.10086

84. Zytoon MA. Occupational noise exposure of fishermen aboard small and medium-scale fishing vessels. *Int J Ind Ergon*. 2013;43(6):487-494. doi:10.1016/j.ergon.2012.08.001

85. Inaoka T, Kitano T, Nagano M, et al. Work history, health conditions and hearing loss of Ishigaki fishermen. *Nihon Eiseigaku Zasshi Jpn J Hyg*. 1992;47(5):923-933. doi:10.1265/jjh.47.923

86. Kopke RD, Weisskopf PA, Boone JL, et al. Reduction of noise-induced hearing loss using L-NAC and salicylate in the chinchilla. *Hear Res*. 2000;149(1-2):138-146. doi:10.1016/s0378-5955(00)00176-3

87. Fritschi L, Brown AL, Kim R, Schwela D, Kephalopoulos S, eds. *Burden of Disease from Environmental Noise: Quantification of Healthy Life Years Lost in Europe*. World Health Organization,; 2011.

88. Transport Canada. Marine transportation: Services and information. Government of Canada. Published March 19, 2020. Accessed May 11, 2021. https://tc.canada.ca/en/marine-transportation

89. Fisheries and Oceans Canada. Fisheries and Oceans Canada. Government of Canada. Published May 5, 2021. Accessed May 11, 2021. https://www.dfo-mpo.gc.ca/index-eng.html

90. Canadian Coast Guard. Canadian Coast Guard. Government of Canada. Published May 3, 2021. Accessed May 11, 2021. https://www.ccg-gcc.gc.ca/index-eng.html

91. Union of Canadian Transportation Employees. *The Canadian Coast Guard: A Case for Change*. Union of Canadian Transportation Employees; 2016:8. Accessed May 11, 2021. https://sencanada.ca/content/sen/committee/421/POFO/Briefs/UCTE_CCG_E.pdf

92. Justice Laws Website. Marine Personnel Regulations. Government of Canada. Published April 30, 2021. Accessed May 11, 2021. https://laws-lois.justice.gc.ca/eng/regulations/sor-2007-115/

93. Justice Laws Website. Fire and Boat Drills Regulations. Government of Canada. Published April 30, 2021. Accessed May 11, 2021. https://laws-lois.justice.gc.ca/eng/regulations/SOR-2010-83/

94. Justice Laws Website. Safe Working Practices Regulations. Government of Canada. Published April 30, 2021. Accessed May 11, 2021. https://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._1467/

95. Justice Laws Website. Canada Shipping Act, 2001. Government of Canada. Published April 30, 2021. Accessed May 11, 2021. https://laws-lois.justice.gc.ca/eng/acts/c-10.15/

96. Chircop AE editor, Gold E editor, Kindred HM editor, Moreira W editor, Canadian Electronic Library (Firm) distributor. *Canadian Maritime Law*. 2nd edition. Irwin Law; 2016. Accessed May 11, 2021. http://ezproxy.library.dal.ca/login?url=http://www.deslibris.ca/ID/476366

97. Lane DE. Property rights and governance in Canadian fisheries. *Optim J Public Sect Manag*. 29(1):1-8.

98. Transportation Safety Board of Canada. *Marine Transportation Safety Investigation Report M19A0090*. Transportation Safety Board of Canada; 2019. Accessed May 11, 2021. https://www.tsb.gc.ca/eng/rapports-reports/marine/2019/m19a0090/m19a0090.html

99. House of Commons. Evidence - FOPO (42-1) - No. 90 - House of Commons of Canada. Government of Canada. Published March 22, 2018. Accessed May 11, 2021. https://www.ourcommons.ca/DocumentViewer/en/42-1/FOPO/meeting-90/evidence

100. Transport Canada. Small fishing vessel safety. Government of Canada. Published November 19, 2018. Accessed May 11, 2021. https://tc.canada.ca/en/marine-transportation/marine-safety/small-fishing-vessel-safety

101. Transport Canada. Transport Canada Portfolio. Government of Canada. Published January 4, 2021. Accessed May 11, 2021. https://tc.canada.ca/en

102. Transportation Safety Board of Canada. *Reassessment of the Responses to Marine Transportation Safety Recommendation M99-02: Workplace Safety on Fishing Vessels*. Transportation Safety Board of Canada; 2010:1-32. Accessed May 17, 2021. https://www.tsb.gc.ca/eng/recommandations-recommendations/marine/1999/rec-m9902.html

103. Chudnow R. In search of effective management : case study of the British Columbia Dungeness crab (Cancer magister) fishery and lessons from domestic and international experience. Published online 2012. doi:10.14288/1.0073517

104. UCTE_CCG_E.pdf. Accessed May 11, 2021. https://sencanada.ca/content/sen/committee/421/POFO/Briefs/UCTE_CCG_E.pdf

105. Canadian Coast Guard. Coast Guard Activities. Government of Canada. Accessed May 11, 2021. http://www.craigmarlatt.com/canada/security&defence/ccg.html

106. Canadian Coast Guard Auxiliary. Welcome to the CCGA National Web Site. Government of Canada. Accessed May 11, 2021. https://ccga-gcac.ca/

107. Canadian Coast Guard. The Government of Canada enhances search and rescue services in Eastern Newfoundland. Government of Canada. Published August 22, 2019. Accessed May 17, 2021. https://www.canada.ca/en/canadian-coast-guard/news/2019/08/the-government-of-canada-enhances-search-and-rescue-services-in-eastern-newfoundland.html

108. Transportation Safety Board of Canada. Commercial fishing safety. Government of Canada. Published October 29, 2020. Accessed May 11, 2021. https://www.tsb.gc.ca/eng/surveillance-watchlist/marine/2020/marine-01.html

109. Transportation Safety Board of Canada. Marine transportation safety recommendations. Government of Canada. Accessed May 11, 2021. https://bst-tsb.gc.ca/eng/recommandations-recommendations/marine/index.html

110. Canadian Council of Professional Fish Harvesters. Canadian Council of Professional Fish Harvesters. Canadian Council of Professional Fish Harvesters. Accessed May 11, 2021. http://www.fishharvesterspecheurs.ca/

111. Canadian Independent Fish Harvesters Federation. Canadian Independent Fish Harvesters Federation. Canadian Independent Fish Harvesters Federation. Accessed May 11, 2021. http://fed-fede.ca/

112. The Canadian Sportfishing Industry Association (CSIA). Our Mandate. CSIA - The Canadian Sportfishing Industry Association. Published 2017. Accessed May 11, 2021. http://www.csia.ca/our-mandate/

113. Fisheries Council of Canada. Home. Fisheries Council of Canada. Published 2019. Accessed May 11, 2021. https://fisheriescouncil.ca/

114. Keep Canada Fishing. Home. Keep Canada Fishing. Published 2021. Accessed May 11, 2021. https://keepcanadafishing.com/

115. Fisheries, Forestry and Agriculture. Fisheries, Forestry and Agriculture. Government of Newfoundland and Labrador. Accessed May 11, 2021. https://www.gov.nl.ca/ffa/

116. FFAW-Unifor. Overview. FFAW-Unifor. Published 2021. Accessed June 4, 2021. https://ffaw.ca/

117. PFHCB Professional Fish Harvesters Certification Board. HOME. PFHCB Professional Fish Harvesters Certification Board. Published 2016. Accessed May 11, 2021. https://www.pfhcb.com

118. HOME. NL-FHSA. Accessed April 8, 2021. https://www.nlfhsa.com

119. WorkplaceNL. How can we help? WorkplaceNL. Published 2021. Accessed May 11, 2021. https://workplacenl.ca/

120. Newfoundland and Labrador Aquaculture Industry Association (NAIA). Who We Are. Newfoundland and Labrador Aquaculture Industry Association (NAIA). Published August 20, 2021. Accessed June 4, 2021. https://naia.ca/index.php/association/naia

121. Homepage. Atlantic Groundfish Council. Accessed May 11, 2021. https://atlanticgroundfishcouncil.ca/

122. World Health Organization (WHO). Deafness and hearing loss. World Health Organization (WHO). Accessed September 21, 2021. https://www.who.int/westernpacific/health-topics/hearing-loss

123. Thieme Medical Publishers. Psychoacoustics. Thieme Medical Publishers. Accessed September 21, 2021. http://www.thieme.com/media/samples/pubid1260387312.pdf

124. WorkplaceNL. Permanent Functional Impairment Rating Schedule. WorkplaceNL. Published November 2009. Accessed May 15, 2021. https://workplacenl.ca/site/uploads/2019/06/pfi-rating-schedule-20171116.pdf

125. Department of Immigration, Population Growth and Skills, Newfoundland and Labrador. Labour Market Information. Newfoundland and Labrador, Canada. Accessed May 11, 2021. https://www.gov.nl.ca/labourmarketinformation/career/fishermen-women/

126. Myers M, Durborow R, Kane A. Gulf of Mexico Seafood Harvesters, Part 2: Occupational Health-Related Risk Factors. *Safety*. 2018;4:27. doi:10.3390/safety4030027

127. Zeigelboim BS, da Silva TP, Carvalho H, et al. Otoneurologic findings in a fishermen population of the state of santa catarina: preliminary study. *Int Arch Otorhinolaryngol*. 2014;18(1):6-10. doi:10.1055/s-0033-1358584

128. Zeigelboim BS, Santos da Carvalho HA, Gonçalves CG de O, et al. Otoneurological symptoms in Brazilian fishermen exposed over a long period to carbon monoxide and noise. *Noise Health*. 2015;17(78):300-307. doi:10.4103/1463-1741.165053

129. Janz NK, Becker MH. The Health Belief Model: A Decade Later. *Health Educ Q*. 1984;11(1):1-47. doi:10.1177/109019818401100101

130. Rosenstock IM. Historical Origins of the Health Belief Model. *Health Educ Monogr*. 1974;2(4):328-335. doi:10.1177/109019817400200403

131. Glanz K, Rimer BK, Viswanath K. *Health Behavior: Theory, Research, and Practice, 5th Ed.* 5th ed. Jossey-Bass/Wiley; 2015. Accessed June 4, 2021. https://psycnet.apa.org/record/2015-35837-000

132. Lewin K, Dembo T, Festinger L, Sears PS. Level of aspiration. In: *Personality and the Behavior Disorders*. Ronald Press; 1944:333-378. https://psycnet.apa.org/record/1944-19900-020

133. Glanz K, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. *Annu Rev Public Health*. 2010;31(1):399-418. doi:10.1146/annurev.publhealth.012809.103604

134. Ajzen I, Fishbein M. Attitudes and the attitude-behavior relation: reasoned and automatic processes. *Eur Rev Soc Psychol*. 2000;11:1-33. doi:10.1080/14792779943000116

135. Purdy S, Williams W. Development of the noise at work questionnaire to assess perceptions of noise in the workplace. *J Occup Health Saf - Aust N Z*. 2002;18(1):77-83.

136. Milhinch J, Dineen R. *Noise and Hearing in the Construction Industry: A Study of Workers'views on Noise and Risk on a Victorian Site*. Incolink; 1997.

137. Work Safe BC. Hear for Good: Preventing Noise Exposure at Work. Work Safe BC. Published November 2014. Accessed September 22, 2021. https://www.worksafebc.com/en/resources/health-safety/books-guides/hear-for-good-preventing-noise-exposure-at-work?lang=en

138. Schulz KA, Modeste N, Lee J, Roberts R, Saunders GH, Witsell DL. Factors influencing pursuit of hearing evaluation: Enhancing the health belief model with perceived burden from hearing loss on communication partners. *Int J Audiol*. 2016;55(sup3):S69-S78. doi:10.3109/14992027.2015.1136437

139. National Institute of Deafness and Other Communication Disorders. Quick statistics about hearing. Published online March 25, 2021. Accessed September 22, 2021. http://www.nidcd.nih.gov/health/statistics/quick-statistics-hearing

140. Florida Center for Instructional Technology, University of South Florida. Classroom Assessment. Florida Center for Instructional Technology, University of South Florida. Accessed September 21, 2021. https://fcit.usf.edu/assessment/basic/basicc.html

141. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53-55. doi:10.5116/ijme.4dfb.8dfd

142. Sullivan GM. A Primer on the Validity of Assessment Instruments. *J Grad Med Educ*. 2011;3(2):119-120. doi:10.4300/JGME-D-11-00075.1

143. Gardner HH, Gardner BD. Health as human capital: Theory and implications a new management paradigm. http://www.hcmsgroup.com/wp-content/uploads/2012/05/WP01-HHC-Theory-and-Implications-2012-01-161.pdf

144. Yeow, JA, Ng PK, Tan KS, Chin TS, Lim WY. Effects of stress, repetition, fatigue and work environment on human error in manufacturing industries. *J Appl Sci*. 2014;14:3464-3471. doi:10.3923/jas.2014.3464.3471

145. Binkley M. *Voices from Offshore: Narratives of Risk and Danger in the Nova Scotian Deep-Sea Fishery*. 53rd edition. Institute of Social and Economic Research; 1994. https://cbra.library.utoronto.ca/items/show/2134.

146. Roberts JT. Psychosocial effects of workplace hazardous exposures: Theoretical synthesis and preliminary findings. *Soc Probl*. 1993;40(1):74-89. doi:10.1525/sp.1993.40.1.03x0073u

147. Binkley M. *Risks, Dangers, and Rewards in the Nova Scotia Offshore Fishery*. McGill-Queen's University Press, 1995.; 1995. Accessed May 11, 2021. https://www.jstor.org/stable/j.ctt817x2

148. Bloor M. An essay on 'health capital' and the Faustian bargains struck by workers in the globalised shipping industry. *Sociol Health Illn*. 2011;33(7):973-986. doi:https://doi.org/10.1111/j.1467-9566.2011.01347.x

149. Thorne PR, Ameratunga SN, Stewart J, et al. Epidemiology of noise-induced hearing loss in New Zealand. *N Z Med J*. 2008;121(1280):33-44.

150. Bockstael A, Botteldooren D, Bruyne LD, Vinck B. Personal hearing protection and comfort: indispensable but not a matter of course. *Eur Acoust Assoc*. Published online 2012:335-339.

151. Williams W, Purdy S. Fatalism is highly correlated with perceived barriers, self-efficacy and workplace safety climate. *J Occup Health Saf - Aust N Z*. 2005;21(3):247-252.

152. Williams W, Purdy S, Storey L. Assessing the workplace safety climate. *J Occup Health Saf - Aust N Z*. 2005;21(1):61-66.

153. Bockstael A, Bruyne LD, Vinck BB. Attitudes and beliefs concerning hearing protectors and noise exposure. *Can Acoust*. 2011;39(3):92-93.

154. Kebapcı A, Güner P. "Noise Factory": A qualitative study exploring healthcare providers' perceptions of noise in the intensive care unit. *Intensive Crit Care Nurs*. 2021;63:102975. doi:10.1016/j.iccn.2020.102975

155. Reddy RK, Welch D, Thorne P, Ameratunga S. Hearing protection use in manufacturing workers: a qualitative study. *Noise Health*. 2012;14(59):202-209. doi:10.4103/1463-1741.99896

156. Sund B. Economic evaluation, value of life, stated preference methodology and determinants of risks. Published online 2010. Accessed September 21, 2021. https://www.diva-portal.org/smash/get/diva2:372086/FULLTEXT01.pdf

157. Jeong H-J, Lee W-C. The level of collapse we are allowed: comparison of different response scales in safety attitudes questionnaire. *Biom Biostat Int J*. 2016;Volume 4(Issue 4):128-134. doi:10.15406/bbij.2016.04.00100

158. Dolnicar S, Grün B. How constrained a response: A comparison of binary, ordinal and metric answer formats. *J Retail Consum Serv*. 2007;14(2):108-122. doi:10.1016/j.jretconser.2006.09.006

159. Dolnicar S, Grün B, Leisch F. Quick, Simple and Reliable: Forced Binary Survey Questions. *Int J Mark Res*. 2011;53(2):231-252. doi:10.2501/IJMR-53-2-231-252

160. Li Z. Applications of Rasch analysis in consumer research for new food product development. Published online February 2019. Accessed September 22, 2021. https://etheses.whiterose.ac.uk/24435/

161. Marinova-Todd SH, Colozzo P, Mirenda P, et al. Professional practices and opinions about services available to bilingual children with developmental disabilities: An international study. *J Commun Disord*. 2016;63:47-62. doi:10.1016/j.jcomdis.2016.05.004

162. Robins G, Pattison P, Elliott P. Network models for social influence processes. *Psychometrika*. 2001;66(2):161-189. doi:10.1007/BF02294834

163. Percy L. An argument in support of ordinary factor analysis of dichotomous variables. *Cincinnati OH Assoc Consum Res*. 1976;03:143-148.

164. University of St Andrews. Analysing likert scale/type data. University of St Andrews. Accessed September 22, 2021. https://www.st-andrews.ac.uk/media/ceed/students/mathssupport/Likert.pdf

165. Thepaksorn P, Siriwong W, Neitzel RL, Somrongthong R, Techasrivichien T. Relationship between noise-related risk perception, knowledge, and the use of hearing protection devices among para rubber wood sawmill workers. *Saf Health Work*. 2018;9(1):25-29. doi:10.1016/j.shaw.2017.06.002

166. Murray M, Dolomount M, Newfoundland, Occupational Health and Safety. *Safety Attitudes and Practices among Newfoundland Inshore Fishermen and Related Personnel*. publisher not identified; 1994.

167. Gerarda Power N. Occupational risks, safety and masculinity: Newfoundland fish harvesters' experiences and understandings of fishery risks. *Health, Risk & Society*. 2008;10(6):565-583. doi:10.1080/13698570802167405

168. Novalbos J, Nogueroles P, Soriguer M, Piniella F. Occupational health in the Andalusian Fisheries Sector. *Occup Med Oxf Engl*. 2008;58(2):141-143. doi:10.1093/occmed/kqm156

169. Eklöf M. Perception and control of occupational injury risks in fishery--a pilot study. *Work Stress*. 2002;16(1):58-69. doi:10.1080/02678370110114694

170. Casson FF, Zucchero A, Boscolo Bariga A, et al. Work and chronic health effects among fishermen in Chioggia, Italy. *G Ital Med Lav Ergon*. 1998;20(2):68-74.

171. Murray M. *SafeCatch Final Report*. Memorial University of Newfoundland; 2006:114. https://www.mun.ca/safetynet/library/Fishery1/SafeCatch_Final_Report.pdf

172. Nahid M. Occupational noise induced hearing loss and engineered noise control : knowledge and perception in the food products manufacturing industry in British Columbia. Published online 2009. doi:10.14288/1.0070859

173. The Health Belief Model. Boston University School of Public Health. Accessed May 14, 2021. https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/behavioralchangetheories2.html

174. The Health Belief Model - Rural Health Promotion and Disease Prevention Toolkit. Rural Health Information Hub (RHIhub). Accessed May 14, 2021. https://www.ruralhealthinfo.org/toolkits/health-promotion/2/theories-and-models/health-belief

175. Power N, Neis B, Brennan S, Binkley M. *Newfoundland and Labrador Fish Harvesters' Perceptions of Risk*. Memorial University of Newfoundland; :19. https://www.mun.ca/safetynet/library/Fishery/POR.pdf

176. Håvold JI. Safety culture aboard fishing vessels. *Saf Sci*. 2010;48(8):1054-1061. doi:10.1016/j.ssci.2009.11.004

177. Lucas DL, Case SL, Lincoln JM, Watson JR. Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Saf Sci*. 2018;101:190-196. doi:10.1016/j.ssci.2017.09.009

178. Encyclopedia.com. Occupational Safety and Health: Ethical Issues. Encyclopedia.com. Accessed May 13, 2021. https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/occupational-safety-and-health-i-ethical-issues

179. Iverson RD, Erwin PJ. Predicting occupational injury: The role of affectivity. *J Occup Organ Psychol*. 1997;70(2):113-128. doi:https://doi.org/10.1111/j.2044-8325.1997.tb00637.x

180. SafetyNet, Memorial University of Newfoundland. New videos to prevent noise-induced hearing loss on fishing vessels. Memorial University of Newfoundland. Published March 26, 2021. Accessed May 16, 2021. https://www.mun.ca/safetynet/

181. Jermier JM, Gaines J, McIntosh NJ. Reactions to Physically Dangerous Work: A Conceptual and Empirical Analysis. *J Organ Behav*. 1989;10(1):15-33.

182. MacCallum RC, Zhang S, Preacher KJ, Rucker DD. On the practice of dichotomization of quantitative variables. *Psychol Methods*. 2002;7(1):19-40. doi:10.1037/1082-989x.7.1.19

183. Sleep Foundation. Coping strategies for shift work disorder. Sleep Foundation. Published December 18, 2020. Accessed May 16, 2021. https://www.sleepfoundation.org/shift-work-disorder/tips/coping-strategies

184. Fredriksson S, Hammar O, Torén K, Tenenbaum A, Waye KP. The effect of occupational noise exposure on tinnitus and sound-induced auditory fatigue among obstetrics personnel: a cross-sectional study. *BMJ Open*. 2015;5(3):e005793. doi:10.1136/bmjopen-2014-005793

185. Eriksson HP, Andersson E, Schiöler L, et al. Longitudinal study of occupational noise exposure and joint effects with job strain and risk for coronary heart disease and stroke in Swedish men. *BMJ Open*. 2018;8(4):e019160. doi:10.1136/bmjopen-2017-019160

186. Chen S, Ni Y, Zhang L, et al. Noise exposure in occupational setting associated with elevated blood pressure in China. *BMC Public Health*. 2017;17(1):107. doi:10.1186/s12889-017-4050-0

Appendix A: Ethics clearance application

Comments:

Other Project Team Members

Prefix	Last Name	First Name	Affiliation	Role In Project	Email
Dr.	Moro	Lorenzo	Faculty of Engineering and Applied Science\Department of Ocean and Naval Architectural Engineering	Co-Principal Investigator	lmoro@mun.ca
Dr.	Shan	Desai	Faculty of Medicine\Division of Community Health and Humanities	Supervisor	dshan@mun.ca
Dr.	Sarkar	Atanu	Faculty of Medicine\Division of Community Health and Humanities	Co-Supervisor	atanu.sarkar@med.mun.ca
Dr.	Gadag	Veerabhadra (Veeresh)	Faculty of Medicine\Division of Community Health and Humanities	Co-Supervisor	VGADAG@MUN.CA

Common Questions

1. Degree Program

#	Question	Answer
1.1	Please indicate the project program related to the application.	Master's Thesis
1.2	If OTHER, please specify.	

2. Previous or Other Research Ethics Board Approval

#	Question	Answer

2.1	Have you applied for clearance from another board/committee at Memorial such as Animal Care or BioSafety? If 'Yes', include a copy of any approval letter(s) granted in the Attachments tab.	No

3. Organizational or Community Consent

#	**Question**	**Answer**
3.1	If this research involves an organization or community such as an Aboriginal government, school board, daycare, or church, consultation should begin prior to the submission of an ethics application. Describe the engagement process and include any related correspondence in the Attachments tab. If permission will not be sought prior to the involvement of individual participants, explain why and/or describe any alternate forms of consultation that may take place.	N/A

4. Start/End Dates

#	**Question**	**Answer**
4.1	Estimated START date for recruitment:	25th October, 2020
4.2	Estimated END date for data collection:	30th July, 2021

5. Secondary Use of Data

#	**Question**	**Answer**
5.1	Does your project involve the secondary use of data?	No
5.2	If YES to question 5.1, specify the nature / type of data, the purpose for which it was initially collected, and provide the name of the data holder (e.g. person; government agency / department). If the data is not available in the public domain, a copy of correspondence granting access from the data holder must be uploaded in the Attachments Tab.	

6. Project Funding

#	**Question**	**Answer**
6.1	Please select the appropriate funding status for this project. If this project is NOT funded and no funding is being sought, skip Questions 6.2 - 6.6 and proceed to the “Contracts and/or Research/Partnership Agreements” tab (Section 7).	Funded

6.2	If funded, or funding is being sought, please indicate the funding agency/sponsor. If there are multiple sources of funding please enter each on a new line.	Ocean Frontier Institute (OFI), Mitacs, Dean's Special Award (Dr. Shan's Start-up Fund), Memorial University of Newfoundland
6.3	If you indicated in 6.1 that funding is being sought, specify whether or not this project will proceed if funding is not obtained.	
6.4	Will funds be administered through Memorial's Research Grant and Contract Services (RGCS) office?	Yes
6.5	If you answered NO or OTHER to 6.4, explain.	
6.6	If YES to 6.4, specify the principal investigator for the associated funding AND provide the RGCS Awards file number(s):	Dr. Desai Shan RGCS Awards

7. Contracts and/or Research Partnership Agreements

#	**Question**	**Answer**
7.1	Is there a funded or non-funded contract or research / partnership agreement associated with this research?	No
7.2	If YES to question 7.1, specify the parties to the contract/agreement below, and upload a copy in the Attachments tab. Ensure that intellectual property, data access, and data ownership provisions are fully and accurately disclosed in the "Use, Access, Ownership, and Storage of Data" tab, and in the consent form(s).	

8. Conflict of Interest

#	**Question**	**Answer**
8.1	Is there any aspect of a contract/agreement that could put any member of the research team in a potential conflict of interest?	No
8.2	If yes, identify the conflict(s), explain how you will inform research participants of them, and discuss how they will be mitigated.	
8.3	Is any member of the Committee ineligible to review your application because of a conflict of interest?	No
8.4	If yes, please indicate.	

9. Scholarly Review

#	**Question**	**Answer**

9.1	Please choose all that apply.	The research project has undergone scholarly review prior to this application for ethics review.
9.2	If you have indicated the research project has undergone, or will undergo, scholarly review, specify the review committee, such as departmental research committee, peer-review committee, or funding agency.	Mitacs Review
9.3	[Students Only] The research project has been reviewed by my supervisor(s).	Yes

Attachments

Doc / Agreement	**Version Date**	**File Name**	**Description**
Amendment	2021/05/10	20210888 .docx	Amendment form
Application Form	2020/11/26	R-1_20210888_Application revised.docx	Revised Application (Added New link for online survey)
Application Form	2020/11/14	20210888_Application revised.docx	Application form (Sample recruitment strategy Modified and highlighted)
Application Form	2021/05/10	20210888 _ethics application.docx	Application form [Added information in question no. 15 and research grant section]
Information Sheet/Letter	2020/11/14	[4-B] Information sheet_Consent form_Interview.docx	Information sheet and consent form (Interview)
Information Sheet/Letter	2020/11/14	[3-B] Information Sheet_Interview.docx	Information sheet (Interview)
Information Sheet/Letter	2020/11/14	[3-A] Information sheet_Survey.docx	Information sheet (Survey)

Information Sheet/Letter	2020/10/08	Annex 3 Information Sheet and Consent Forms.docx	N/A
Information Sheet/Letter	2021/05/10	[3A] Information sheet_Survey.docx	Survey information sheet shows the details of incentive proposed to be given to study participants.
Information Sheet/Letter	2021/05/24	Revised_Information sheet_Survey.docx	Revised survey information sheet
Information Sheet/Letter	2021/05/24	Revised_Information Sheet_Interview.docx	Revised Interview Information Sheet
Informed Consent Form	2020/12/01	Revised survey consent form.docx	Revised survey consent form
Informed Consent Form	2021/05/24	Revised_Online Consent_Survey.docx	Revised Online Survey Consent
Informed Consent Form	2021/05/24	Revised_Information sheet_Consent form_Interview.docx	Revised Interview Information sheet with Consent form
Letter (Approval)	2020/12/01	5 - 0888 Approval Letter.pdf	N/A
Letter (Approval)	2021/05/27	7 - 0888 Amendment #1 Approval.pdf	Amendment #01
Letter (Modification Request)	2020/11/04	4-0888 Decision Letter 2 .pdf	4-0888 Decision Letter 2
Recruitment Document	2020/11/26	R-1_[1-A&B] Research Flyer (For survey and Interview).docx	Revised recruitment document (research flyer): New survey link added.
Recruitment Document	2020/11/26	R-1_[2-A] Recruitment email_Survey.docx	Revised recruitment email for online survey

			(New survey link added)
Recruitment Document	2020/11/26	R-1_[2-B] Recruitment email_Interview.docx	Revised recruitment document (Recruitment email for interview)
Recruitment Document	2020/11/14	[2-B] Recruitment email_Interview.docx	Recruitment email (Interview)
Recruitment Document	2020/11/14	[2-A] Recruitment email_Survey.docx	Recruitment email (Survey)
Recruitment Document	2020/11/14	[1-A&B] Research Flyer (For survey and Interview).docx	Research flyer (Survey and interview)
Recruitment Document	2021/05/24	Revised_Recruitment email_Survey.docx	Revised Survey Recruitment email
Recruitment Document	2021/05/24	Revised_Recruitment email_Interview.docx	Revised Interview Recruitment email
Research Instrument	2020/11/14	[5-A] Survey Questionnaire (Sec A& B).docx	Survey Questionnaire
Research Proposal/Protocol	2020/11/14	[5-B] Interview Guides.docx	Interview Guide (Interview)
Response Summary	2020/11/26	R-1_20210888_Response Summary.docx	Response summary
Response Summary	2020/11/14	20210888_ResponseSummary.docx	Response summary
Response Summary	2020/11/04	ResponseSummaryTemplate.docx	Response Summary TEMPLATE
TCPS2 Certificate	2020/10/09	tcps2_core_certificate_Veerabhadra_Gadag.pdf	N/A

TCPS2 Certificate	2020/10/09	tcps2 core certificate_Dr Atanu sarkar.pdf	N/A
TCPS2 Certificate	2020/10/09	tcps2_core_certificate_Dr. Desai Shan.pdf	N/A
TCPS2 Certificate	2020/10/08	tcps2_core_certificate_Yadav Om Prakash.pdf	N/A
Variable List	2020/11/14	[4-A] Online Consent form_Survey.docx	Online consent form
Variable List	2020/10/09	Supervisory Signature Page.pdf	N/A
Variable List	2020/10/08	Annex 5_Information sheet_Consent form_Survey questionnaire.docx	N/A
Variable List	2020/10/08	Annex 4_Information sheet_Consent form_Interview Guides.docx	N/A
Variable List	2020/10/08	Annex 2 Invitation to Participate (Flyer).docx	N/A
Variable List	2020/10/08	Annex 1 Recruitment email.docx	N/A

Appendix B: Ethics approval letter

MEMORIAL UNIVERSITY

Interdisciplinary Committee on
Ethics in Human Research (ICEHR)

St. John's, NL Canada A1C 5S7
Tel: 709 864-2561 icehr@mun.ca
www.mun.ca/research/ethics/humans/icehr

ICEHR Number:	**20210888-ME**
Approval Period:	December 1, 2020 – December 31, 2021
Funding Source:	MUN [RGCS#20201883]
Responsible Faculty:	Dr. Desai Shan Division of Community Health and Humanities
Title of Project:	*Perception of occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador's fleet: A mixed-method study*

December 1, 2020

Mr. Om Prakash Yadav
Division of Community Health and Humanities
Faculty of Medicine
Memorial University of Newfoundland

Dear Mr. Yadav:

Thank you for your correspondence addressing the issues raised by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) concerning the above-named research project. ICEHR has re-examined the proposal with the clarification and revisions submitted, and is satisfied that the concerns raised by the Committee have been adequately addressed. In accordance with the *Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans (TCPS2)*, the project has been granted *full ethics clearance* to December 31, 2021. ICEHR approval applies to the ethical acceptability of the research, as per Article 6.3 of the *TCPS2*. Researchers are responsible for adherence to any other relevant University policies and/or funded or non-funded agreements that may be associated with the project.

The *TCPS2* **requires** that you submit an Annual Update to ICEHR before December 31, 2021. If you plan to continue the project, you need to request renewal of your ethics clearance and include a brief summary on the progress of your research. When the project no longer involves contact with human participants, is completed and/or terminated, you are required to provide an annual update with a brief final summary and your file will be closed. If you need to make changes during the project which may raise ethical concerns, you must submit an Amendment Request with a description of these changes for the Committee's consideration prior to implementation. If funding is obtained subsequent to approval, you must submit a Funding and/or Partner Change Request to ICEHR before this clearance can be linked to your award.

All post-approval event forms noted above can be submitted from your Researcher Portal account by clicking the *Applications: Post-Review* link on your Portal homepage. We wish you success with your research.

Yours sincerely,

Kelly Blidook, Ph.D.
Vice-Chair, Interdisciplinary Committee on
Ethics in Human Research

KB/bc

cc: Supervisor – Dr. Desai Shan, Division of Community Health and Humanities
Director, Research Grant and Contract Services

Appendix C: Ethics approval letter (Amendment)

MEMORIAL UNIVERSITY

Interdisciplinary Committee on
Ethics in Human Research (ICEHR)

St. John's, NL Canada A1C 5S7
Tel: 709 864-2561 icehr@mun.ca
www.mun.ca/research/ethics/humans/icehr

ICEHR Number:	**20210888-ME**
Approval Period:	December 1, 2020 – December 31, 2021
Funding Source:	MUN [RGCS#20201883]
Responsible Faculty:	Dr. Desai Shan Division of Community Health and Humanities
Title of Project:	*Perception of occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador's fleet: A mixed-method study*
Amendment #:	***01***

May 27, 2021

Mr. Om Prakash Yadav
Division of Community Health and Humanities
Faculty of Medicine
Memorial University of Newfoundland

Dear Mr. Yadav:

The Interdisciplinary Committee on Ethics in Human Research (ICEHR) has reviewed the proposed revisions for the above referenced project, as outlined in your amendment request dated May 10, 2021, and is pleased to give approval to the revised research incentives, as described in your request and subsequent communication, provided all other previously approved protocols are followed.

The *TCPS2* **requires** that you **strictly adhere to the protocol and documents as last reviewed** by ICEHR. If you need to make any other additions and/or modifications during the conduct of the research, you must submit an Amendment Request with a description of these changes, for the Committee's review of potential ethical issues, before they may be implemented. Submit a Personnel Change Form to add or remove project team members and/or research staff. Also, to inform ICEHR of any unanticipated occurrences, an Adverse Event Report must be submitted with an indication of how the unexpected event may affect the continuation of the project.

Your ethics clearance for this project expires **December 31, 2021**, before which time you must submit an Annual Update to ICEHR, as required by the *TCPS2*. If you plan to continue the project, you need to request renewal of your ethics clearance, and include a brief summary on the progress of your research. When the project no longer requires contact with human participants, is completed and/or terminated, you need to provide an annual update with a brief final summary, and your file will be closed.

All post-approval ICEHR event forms noted above must be submitted by selecting the *Applications: Post-Review* link on your Researcher Portal homepage.

The Committee would like to thank you for the update on your proposal and we wish you well with your research.

Yours sincerely,

Kelly Blidook, Ph.D.
Vice-Chair, Interdisciplinary Committee on
Ethics in Human Research

KB/bc

cc: Supervisor – Dr. Desai Shan, Division of Community Health and Humanities

Appendix D: Survey recruitment letter

Dear Fish Harvester,

You are invited to participate in a research to evaluate the perception of occupational exposure to noise and self-reported hearing loss through a survey. The survey will help to assess self-reported hearing loss and the perceived benefits of reducing noise and protecting hearing among the fish harvesters in Newfoundland and Labrador. The study is led by Mr. Om Prakash Yadav (Principal Investigator) and supervised by Dr. Desai Shan, Dr. Atanu Sarkar, and Professor Veeresh Gadag of the Division of Community Health and Humanities, Faculty of Medicine, Memorial University. This study is a part of the masters' thesis of Mr. Yadav.
We are looking for fish harvester volunteers of different categories (Apprentice, Level-I, and Level-II) to complete an online survey **from January to April, 2021.** Please note that this survey is not a requirement of any organization such as Professional Fish Harvesters Certification Board (PFHCB) or Newfoundland and Labrador- Fish Harvester Safety Association (NL-FHSA) or Fish Food Allied Worker unifor (FFAW), any other organizations or unions that are distributing it on our behalf. The survey should take you no more than 20 minutes and it includes questions related to the perception of occupational noise exposure in section-A and questions related to sociodemographic details, vessel characteristics, the experience of loud noise, use of hearing protectors, and self-reported hearing loss in section-B.

Compensation for participating: Everyone who completes the surveys will be invited to enter their email into a draw for a chance to win one of four e-gift cards to Amazon valued at $50. The odds of winning are relative to the number of participants who choose to enter. Winners will be drawn in after the completion of the survey and will be notified by email/mobile text.

Follow up interview: We invite thirty participants for an online interview conducted on zoom/skype or over the phone. First thirty participants will be selected for the interview on a first-come, first-serve basis. As a token of our gratitude for participating in the interview, we would like to offer you an e-gift card to Amazon valued at $20.

Participants need to provide their email address and/or mobile phone number. After completion of the survey, participants will be directed to a separate link, which will prevent your contact information (email address/mobile number) from being associated with your survey responses. The principal investigator will contact the four lucky draw winners from the survey and the first 30 interview participants individually via email or mobile text to arrange for delivery of the Amazon e-gift card.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to comply with Memorial University's ethics policy. If you have ethical concerns about the research, such as how you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.
If you are interested in participating, the online survey can be accessed at the following link:

https://mun.az1.qualtrics.com/jfe/form/SV_4GxhXlIuV25PtIx

Sincerely,
Om Prakash Yadav (Masters Student)
Principal Investigator,
Memorial University of Newfoundland

Appendix E: Survey information sheet

Perception of occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador

Dear Fish Harvester,

You are invited to participate in a research to evaluate the perception of occupational exposure to noise and self-reported hearing loss through a survey. The survey will assess the perceived benefits of reducing noise, barriers in reducing noise, attitudes towards the noise, and self-reported hearing loss among fish harvesters in Newfoundland and Labrador.

The study will be led by Mr. Om Prakash Yadav (Principal Investigator) and supervised by Dr. Desai Shan, Dr. Atanu Sarkar, and Professor Veeresh Gadag. This study is a part of the masters' thesis of Mr. Yadav. This research is funded by Ocean Frontier Institute (OFI), Mitacs, and the Memorial University of Newfoundland.

Purpose of Study: The study is designed to evaluate the perception of noise exposure and self-reported hearing loss among fish harvesters in Newfoundland and Labrador.

Participation: If you choose to participate, you will be asked to complete two sections of this survey. The survey should take you no more than 20 minutes and includes questions related to the perception of occupation noise exposure, sociodemographic details, vessels characteristics, the experience of loud noise, use of hearing protectors, and self-reported hearing loss.

Possible Benefits, Risks, and Discomforts of participating: We anticipate that little harm could come from participating in this study. Participating in the survey might not benefit you, but we might learn things that will help others. We hope the benefit to you, your organization, and society in general that can come from a better understanding of the policy environment will compensate for the investment of your time.

Compensation for participating: Everyone who completes the surveys will be invited to enter their email into a draw for a chance to win one of four e-gift cards to Amazon valued at $50. The odds of winning are relative to the number of participants who choose to enter. Winners will be drawn in after the completion of the survey and will be notified by email/mobile text.

Follow up interview: We invite thirty participants for an online interview conducted on zoom/skype or over the phone. First thirty participants will be selected for the interview on a first-come, first-serve basis. As a token of our gratitude for participating in the interview, we would like to offer you an e-gift card to Amazon valued at $20.

Participants need to provide their email address and/or mobile phone number. After completion of the survey, participants will be directed to a separate link, which will prevent your contact information (email address/mobile number) from being associated with your survey responses.

The principal investigator will contact the four lucky draw winners from the survey and the first 30 interview participants individually via email or mobile text to arrange for delivery of the Amazon e-gift card.

Confidentiality and anonymity: We will follow all protocols to keep your information confidential. Your responses will be confidential and we do not collect any identifying information such as your name, email address or IP address. All data is stored in a password and encrypted protected electronic format. The results of this study will be used for academic purposes only and the data will only be accessed by the researchers mentioned above.

Data storage: Anonymous data will be stored as password-protected electronic encrypted files and accessed by the named investigators. Data will be stored for a minimum of five years, and at which point, it will be destroyed. Emails entered into the raffle (compensation for participating) or submitted to participate in the interview (Follow up interview) will be destroyed immediately after winners are drawn and contacted and/or participants selected for

the interview and will only be accessed by the principal investigator (Mr. Yadav) for the purposes of the raffle and/or for the interview.

Voluntary Participation: Your decision to participate in this study is entirely voluntary. This survey is not a requirement of any organization/s such as Professional Fish Harvesters Certification Board (PFHCB) or Newfoundland and Labrador- Fish Harvester Safety Association (NL-FHSA) or Fish Food Allied Worker (FFAW) unifor union, any other organizations or unions that are distributing it on our behalf. Participants reserve the right to skip questions they do not want to answer (exceptions include an indication of the consent).

Surveys will remain open up to April 30, 2021, following the invitation to participate, at which point it will be closed. If at any point, you decide to withdraw your participation while completing the survey, you may do so by simply closing your browser window.

Note that data entered up until the point of abandonment will be analyzed. However, once you complete this survey and click submit, your data cannot be removed because we are not collecting any identifying information, and therefore we cannot link individuals to their responses.

Information about study results: You can obtain these results by contacting Mr. Om Prakash Yadav through email: opyadav@mun.ca or Telephone: +1 (709) 770 6592. We will develop a plain language research report to share the findings with you through distributing it on various social media platforms such as Twitter, LinkedIn, Facebook, and sharing its link via multiple organizations, including PFHCB, NL-FHSA, and FFAW unifor union. We will also welcome your feedback through the email and telephone contact mentioned above. This research is a masters' thesis project, and it will be publicly available on the web page of Queen Elizabeth-II (QEII) Library of Memorial University in the thesis collection/research repository section at https://research.library.mun.ca/.

Ethics: The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as how you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Contact Information: We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Mr. Om Prakash Yadav (opyadav@mun.ca or 709-770 6592) or supervisors, Dr. Desai Shan (dshan@mun.ca), Dr. Atanu Sarkar (atanu.sarkar@med.mun.ca) and Professor Veeresh Gadag (vgadag@mun.ca) at any time with questions, comments, or concerns.

Sincerely,

Om Prakash Yadav

(Principal Investigator)

Dr. Desai Shan

(Supervisor)

Dr. Atanu Sarkar

(Co-supervisor)

Dr. Veeresh Gadag

(Co-supervisor)

Appendix F: Survey online consent form

Perception of occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador

Dear Fish Harvester,

You are invited to participate in a research to evaluate the perception of occupational exposure to noise and self-reported hearing loss through a survey. The survey will assess the perceived benefits of reducing noise, barriers in reducing noise, attitudes towards the noise, and self-reported hearing loss among fish harvesters in Newfoundland and Labrador.

The study will be led by Mr. Om Prakash Yadav (Principal Investigator) and supervised by Dr. Desai Shan, Dr. Atanu Sarkar, and Professor Veeresh Gadag. This study is a part of the masters' thesis of Mr. Yadav. This research is funded by Ocean Frontier Institute (OFI), Mitacs, and the Memorial University of Newfoundland.

Purpose of Study: The study is designed to evaluate the perception of noise exposure and self-reported hearing loss among fish harvesters in Newfoundland and Labrador.

Participation: If you choose to participate, you will be asked to complete two sections of this survey. The survey should take you no more than 20 minutes and includes questions related to the perception of occupation noise exposure, sociodemographic details, vessels characteristics, the experience of loud noise, use of hearing protectors, and self-reported hearing loss.

Possible Benefits, Risks, and Discomforts of participating: We anticipate that little harm could come from participating in this study. Participating in the survey might not benefit you, but we might learn things that will help others. We hope the benefit to you, your organization, and society in general that can come from a better understanding of the policy environment will compensate for the investment of your time.

Compensation for participating: Everyone who completes the surveys will be invited to enter their email into a draw for a chance to win one of four e-gift cards to Amazon valued at $50. The odds of winning are relative to the number of participants who choose to enter. Winners will be drawn in after the completion of the survey and will be notified by email/mobile text.

Follow up interview: We invite thirty participants for an online interview conducted on zoom/skype or over the phone. First thirty participants will be selected for the interview on a first-come, first-serve basis. As a token of our gratitude for participating in the interview, we would like to offer you an e-gift card to Amazon valued at $20. Participants need to provide their email address and/or mobile phone number. After completion of the survey, participants will be directed to a separate link, which will prevent your contact information (email address/mobile number) from being associated with your survey responses. The principal investigator will contact the four lucky draw winners from the survey and the first 30 interview participants individually via email or mobile text to arrange for delivery of the Amazon e-gift card.

Confidentiality and anonymity: We will follow all protocols to keep your information confidential. Your responses will be confidential and we do not collect any identifying information such as your name, email address or IP address. All data is stored in a password and encrypted protected electronic format. The results of this study will be used for academic purposes only and the data will only be accessed by the researchers mentioned above.

Data storage: Anonymous data will be stored as password-protected electronic encrypted files and accessed by the named investigators. Data will be stored for a minimum of five years, and at which point, it will be destroyed. Emails entered into the raffle (compensation for participating) or submitted to participate in the interview (Follow

up interview) will be destroyed immediately after winners are drawn and contacted and/or participants selected for the interview and will only be accessed by the principal investigator (Mr. Yadav) for the purposes of the raffle and/or for the interview.

Voluntary Participation: Your decision to participate in this study is entirely voluntary. This survey is not a requirement of any organization/s such as Professional Fish Harvesters Certification Board (PFHCB) or Newfoundland and Labrador- Fish Harvester Safety Association (NL-FHSA) or Fish Food Allied Worker (FFAW) unifor union, any other organizations or unions that are distributing it on our behalf. Participants reserve the right to skip questions they do not want to answer (exceptions include an indication of the consent).
Surveys will remain open up to April 30, 2021, following the invitation to participate, at which point it will be closed. If at any point, you decide to withdraw your participation while completing the survey, you may do so by simply closing your browser window.
Note that data entered up until the point of abandonment will be analyzed. However, once you complete this survey and click submit, your data cannot be removed because we are not collecting any identifying information, and therefore we cannot link individuals to their responses.

Information about study results: You can obtain these results by contacting Mr. Om Prakash Yadav through email: opyadav@mun.ca or Telephone: +1 (709) 770 6592. We will develop a plain language research report to share the findings with you through distributing it on various social media platforms such as Twitter, LinkedIn, Facebook, and sharing its link via multiple organizations, including PFHCB, NL-FHSA, and FFAW unifor union. We will also welcome your feedback through the email and telephone contact mentioned above. This research is a masters' thesis project, and it will be publicly available on the web page of Queen Elizabeth-II (QEII) Library of Memorial University in the thesis collection/research repository section at https://research.library.mun.ca/.

Ethics: The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as how you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Contact Information: We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Mr. Om Prakash Yadav (opyadav@mun.ca or 709-770 6592) or supervisors, Dr. Desai Shan (dshan@mun.ca), Dr. Atanu Sarkar (atanu.sarkar@med.mun.ca) and Professor Veeresh Gadag (vgadag@mun.ca) at any time with questions, comments, or concerns.

Sincerely,

Om Prakash Yadav
(Principal Investigator)

Dr. Desai Shan
(Supervisor)

Dr. Atanu Sarkar
(Co-supervisor)

Dr. Veeresh Gadag
(Co-supervisor)

Appendix G: Survey questionnaire

SECTION A

We're interested in what you think about noise.

The statements about noise at work are mentioned below.

Please mark each statement with one response ONLY

Please see an example below:

It is never noisy at work. (If you strongly disagree with this statement)

				X
Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

1. Work would be less stressful if it is quieter.

Strongly disagree	Somewhat disagree	Neither agree Nor disagree	Somewhat agree	Strongly agree

2. I will feel better if my workplace is less noisy.

Strongly disagree	Somewhat disagree	Neither agree Nor disagree	Somewhat agree	Strongly agree

3. Noise stops me from being able to think or focus on work.

Strongly disagree	Somewhat disagree	Neither agree Nor disagree	Somewhat agree	Strongly agree

4. Noise has bad effects on my health other than hearing.

Strongly disagree	Somewhat disagree	Neither agree Nor disagree	Somewhat agree	Strongly agree

5. I do not have time to do anything about the noise at work.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

6. Hearing protectors stop me from hearing what I want to hear.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

7. Hearing protectors are uncomfortable.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

8. Vessel Owner is not interested in Occupational Health and Safety.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

9. My mates at work don't worry about noise.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

10. I cannot reduce noise at work.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

11. I am not sure that I can use hearing protectors correctly.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

12. I know how to use my earmuffs or earplugs.

Strongly disagree	Somewhat disagree	Neither agree Nor disagree	Somewhat agree	Strongly agree

13. It is difficult to make equipment quieter.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

14. The noise at work does not bother me.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

15. I like my workplace when it is noisy.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

16. I work better if workplace is noisy.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

17. My hearing will not be damaged by noise at work.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

18. It will make no difference to my hearing if it is quieter at work.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

19. Listening to loud noise at work does not affect hearing in old age (in future).

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

20. Noise only affects hearing in people with sensitive ears.

Strongly agree	Somewhat agree	Neither agree Nor disagree	Somewhat disagree	Strongly disagree

SECTION B

This section is for research purposes only.

Your identity will NOT be revealed to your employer and others.

Your personal information:

1. Gender:
    a. Male
    b. Female
    c. Other
    d. Prefer not to say
2. Year you were born (YYYY)..…….
3. The highest level of education you have attained?
    a. Up to Junior High
    b. High School
    c. Technical school
    d. University
    e. Any other (please specify)……
4. According to the Professional Fish Harvester Certification Board (PFHCB), you are classified under which category
    a. Apprentice Fish harvester
    b. Professional Fish harvester- level I
    c. Professional Fish harvester- level II
    d. I am not certified with the PFHCB

5. Which of these describes your work?

    a. Captain/Skipper
    b. Mate
    c. Deckhands
    d. Any other (Please specify)……

6. What are the vessel characteristics of the MAIN vessels on which you are working
    A. Boat type/s:
        i. Decked
        ii. Undecked
        iii. Both
    B. Engine type/s (can choose multiple response):
        i. Outborad
        ii. Inboard
        iii. Outborad and Inboard
        iv. Inboard and Generator set
        v. Any other (Please specify)……
    C. Length (Feet) of the vessel/s (can choose multiple response):
        i. <35′
        ii. 35′-44.11″
        iii. 45′-64.11″

iv. 65′-99.11″
v. >100′

D. Gross Tonnage (GT) of vessel/s (can choose multiple response):
i. <15
ii. 15-60
iii. 60-100
iv. >100

E. Type of fish gear use in vessel/s (can choose multiple response):
i. Gill-nets
ii. Stern Trawls
iii. Jiggers/hand-line
iv. Pots
v. seines
vi. Any other (please specify)……

F. Type of species harvesting (can choose multiple response):
i. Cod
ii. Whelk
iii. Lobster
iv. Crab
v. Capelin
vi. Shrimp
vii. Squid
viii. Any other (Please specify)……..

7. How long have you been doing commercial fishing?……

8. How long have you been in your current job position?……

9. Do you feel having any difficulty in hearing?
   a. Yes
   b. No
   c. Can't say

10. Do you have any noises/ringing in your ears?
    a. Never
    b. Occasional
    c. Frequently
    d. Always

11. During the past month in your work area, what percentage of time during the working day were you exposed to loud noise (loud enough to require you to raise your voice)? (Please reply in percentage (%))
    ……

12. During the past month, what percentage of the time during the working day did you wear hearing protectors (earmuffs or earplugs)? (Please reply in percentage (%)) ……..

13. Does an immediate family member or friend feel that you have a hearing loss?
    a. Yes
    b. No

14. Have you ever had a hearing test?

    a. Yes
    b. No

15. If you had a hearing test, was it organized through your employer?

    a. Yes
    b. No
    c. Not applicable

16. If you had a hearing test, did someone explain the results to you?

    a. Yes
    b. No
    c. Not applicable

17. Do you find it very difficult to follow a conversation at home if there is background noise, e.g., TV, radio, children playing?

    a. Yes
    b. No
    c. Can't say

COMMENTS:……
……

ENTER FOR A CHANCE TO WIN!

Everyone who completes the surveys will be invited to enter their email into a draw for a chance to win one of four gift cards to Amazon valued at $50. The odds of winning are relative to the number of participants who choose to enter. Winners will be drawn in after the completion of the survey and will be notified by email.

a. Yes
b. No

Would you like to participate in a follow-up interview?

If yes, you need to provide your contact information (e.g. Telephone number or email address). As an appreciation of your participation, you will be given an Amazon gift card of $20. (First 30 participants will be selected for the interview on a first come, first serve basis). On clicking 'Yes' you will be redirected to a different link to submit your contact information so that your information will not connect to this survey responses.

a. Yes
b. No

Appendix H: Interview recruitment letter

Dear Fish Harvester,

My name is Om Prakash Yadav, a master student of Dr. Desai Shan, Dr. Atanu Sarkar and Professor Veeresh Gadag, faculty members in the Division of Community Health and Humanities at Memorial University of Newfoundland.

We are conducting a research on occupational noise exposure and its impact on fish harvester's health in Newfoundland and Labrador. This study is part of my master's thesis. The purpose of the study is to explore the experience of occupational noise exposure, identify noise-induced auditory and non-auditory health effects, management and prevention of noise-induced health problems and highlight the existing barriers and challenges in health and safety regulations to prevent the noise-induced health problems in Newfoundland and Labrador.

We are looking for fish harvester volunteers of different categories (Apprentice, Level-I, and Level-II) to complete an online interviews **from November 2020 to April 2021.** Please note that this interview is not a requirement of any organization such as Professional Fish Harvesters Certification Board (PFHCB) or Newfoundland and Labrador-Fish Harvester Safety Association (NL-FHSA) or Fish Food Allied Worker unifor (FFAW), any other organizations or unions that are distributing it on our behalf.

You may participate in the research if you are:

- a fish harvester (Apprentice, Level I, and Level II),
- 18 to 65 years of age, who is actively working on fish vessels since one year or more in Newfoundland and Labrador's fleet.
- with no previous history of working in a noisy environment other than fishing vessels for one year or more.
- with no pre-existing diagnosed hearing problem/s before joining as a fish harvester.

We are contacting to invite you to participate in the study, which involves being available for an interview between 1 – 1.5 hours in length, conducted by telephone or on-line for example, Skype/Zoom. Topics include on board noise exposure and its current management and prevention approaches, and identification of existing barriers and challenges in prevention of noise-induced health problems. You will be given an opportunity to share your experiences and provide us suggestions to mitigate the excess noise exposure and to improve legislation, regulation, policy and practices. There is no need to prepare for the interview, as it will be like a conversation and you can choose what you want to share with us.

I would like to assure you that the study has been reviewed and received ethics clearance through the Interdisciplinary Committee on Ethics in Human Research at Memorial University. The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as your rights as a participant, you may contact the Chairperson of the ICEHR at icehr.chair@mun.ca or by telephone at 709-864-2861.

The final decision about participation is yours. This is an independent study undertaken by researchers from Memorial University. To participate in this study is not a work or requirement of your employer or union. Everything that you tell us in the interview will be confidential and when we present results of the research, we will not release your name or any information that could identify you. You are also entitled to withdraw your participation within three months of the interview date and there is no need to provide any explanation.

First thirty participants will be selected for the interview on a first-come, first-serve basis. As a token of our gratitude for participating in the interview, we would like to offer you an e-gift card to Amazon valued at $20.

Participants need to provide their email address and/or mobile phone number. The principal investigator will contact the first 30 interview participants individually via email or mobile text to arrange for delivery of the Amazon e-gift card.

If you need more information about this research, please read the Letter of Information found here: https://tinyurl.com/sefpuz4z

[If you are interested in participating or you have any questions about this study, please contact me at opyadav@mun.ca or by phone at (709) 770-6592.]

Thank-you in advance for considering my request,

Yours sincerely,

[Om Prakash Yadav, Master's Student]

Division of Community Health and Humanities

Memorial University of Newfoundland

Appendix I: Interview Information Sheet

Information Sheet

Project title: Perception of occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador

Lead Researcher:

Om Prakash Yadav, Master's Candidate

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 770 6592

Email: opyadav@mun.ca

Supervisor and Co-supervisors:

Dr. Desai Shan (Assistant Professor in Occupational Health and safety)

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 864 4921

Email: dshan@mun.ca

Dr. Atanu Sarkar (Assistant Professor in Environmental and Occupational Health)

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 749 3590

Email: atanu.sarkar@med.mun.ca

Dr. Veeresh Gadag (Professor of Biostatistics)

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 754 1133

Email: vgadag@mun.ca

Funding provided by: Ocean Frontier Institute (OFI), Mitacs, Memorial University of Newfoundland

Introduction:

We invite you to take part in a research study being led by Mr. Om Prakash Yadav, a master's student from Memorial University of Newfoundland. Mr. Yadav is doing this study for his masters' thesis. Choosing whether or not to take part in this research is entirely your choice. There will be no impact on you if you decide not to

participate in the research. The information below tells you about what is involved in the research, what you will be asked to do and about any benefit, risk, inconvenience or discomfort that you might experience.

You should discuss any questions you have about this study with Mr. Om Prakash Yadav or Dr. Desai Shan or Dr. Atanu Sarkar or Dr. Veeresh Gadag. Please ask as many questions as you like. If you have questions later, please contact Mr. Om Prakash Yadav or Dr. Desai Shan or Dr. Atanu Sarkar or Dr. Veeresh Gadag at any time.

Purpose and Outline of the Research Study:

The proposed research aims to explore the perception of occupational noise exposure, and self-reported hearing loss, management and prevention of noise-induced auditory and non-auditory health problems by NL fish harvester and to highlight the existing barriers and challenges in preventing noise-induced health problems in Newfoundland and Labrador. It could help fish harvesters to protect from noise-related health problems.

We have studied the publicly available sources and have some questions to which we hope you will be able share your experiences and provide us suggestions to mitigate the excess noise exposure, and to improve legislation, regulation, policy and practices. There is no need to prepare for this interview as it will be like a conversation and you can choose what you want to share with us.

Topics include for the interview are on board noise exposure and its current management and prevention approaches, and identification of existing barriers and challenges in prevention of noise-induced health problems.

Who Can Take Part in the Research Study?

You may participate in the research if you are one of the following personnel:

- a fish harvester (Apprentice, Level I, and Level II),
- 18 to 65 years of age, who is actively working on fish vessels since one year or more in Newfoundland and Labrador.
- with no previous history of working in a noisy environment other than fishing vessels for one year or more.
- with no pre-existing diagnosed hearing problem/s before joining as a fish harvester.

What You Will Be Asked to Do?

You are invited to participate in an online interview which will last about 1 – 1.5 hours through Zoom[1]/Skype[2] with Mr. Om Prakash Yadav. Interview will be audio-taped for later analysis. If you happen to say something that you do not want to be transcribed, you can tell us, and we will omit it. ([1]Zoom privacy policies can be found at https://zoom.us/privacy, [2] Skype privacy policies can be found at https://www.skype.com/en/legal/)

Withdrawal from the study:

Participation in this research study is voluntary. If you decide to participate in this study, you can refuse to answer questions you do not want to answer or leave the interview without giving a reason. You may withdraw from the study within three months after the date of interview.

Possible Benefits, Risks and Discomforts:

We anticipate that little harm could come from participating in this study. Participating in the study might not benefit you, but we might learn things that will benefit others. We hope the benefit to you, your organisation and society in general that can come from a better understanding of the policy environment will compensate for the investment of your time in this study.

The risks associated with this study are minimal, such as being bored or fatigued. However, you will be offered breaks between activities to reduce these risks. In addition, if you choose to share your experiences of observing or experiencing occupational health and safety incidents, being stranded at fish vessel, discussing this kind of

experience may cause emotional discomfort, such as stress. However, you can refuse to answer these questions, or leave the interview without giving a reason. This interview may also take up some your rest time/work time, you can schedule a time for the interview which is most convenient for you or leave the interview at any time.

If you feel uncomfortable or grief after sharing such experiences, please consult the website of Canadian Mental Health Association https://cmha.ca/find-your-cmha to find a nearest counselling service in your region. In Newfoundland and Labrador, please call CMHA NL at (709)-753-88550 or 1-877-753-8550 (Toll Free) for counselling support.

Compensation for participating: First thirty participants will be selected for the interview on a first-come, first-serve basis. As a token of our gratitude for participating in the interview, we would like to offer you an e-gift card to Amazon valued at $20.

Participants need to provide their email address and/or mobile phone number. The principal investigator will contact the first 30 interview participants individually via email or mobile text to arrange for delivery of the Amazon e-gift card.

How your information will be protected:

Although we plan to associate your answers with your job title, such as Apprentice, Level I, and Level II fish harvester in our future publications, your individual identity will be kept confidential, which means that your contribution to this research will not be linked to your identity. Any document containing personal information will be stored in a locked cabinet and will only be accessed by the principal investigator Mr. Yadav. Email inquiries, contact information recorded digitally will be stored in the researcher's password-protected email boxes and encrypted files, before the interviews. After the interviews, the email inquiries will be deleted.

Recorded interviews will be transcribed and the names will be removed in the transcripts to ensure the identity of the participant will remain confidential. Mr. Yadav will transcribe the audio recordings. Transcription confidentiality agreements will be signed to ensure that your identity will not be disclosed and all identifying information will be removed in the process of transcribing.

Only Mr. Yadav can have access to the raw data (audio recordings). The audio recordings and encrypted master list of identifying information will be stored for 5 years after completion of the research. Audio recordings will be destroyed after 5 years, once the research is completed. But the anonymized transcripts will be kept as long as active analysis and publication continues, up to 15 years, to ensure maximum use for research purposes.

We will use a participant number/pseudonym (not your name) in our written and computer records so that the information we have about you, contains no names. All your identifying information will be securely stored. All electronic records will be kept secure in an encrypted file on the researcher's password-protected computer. Your name will not be linked to anything that is said, and every effort will be made to report the findings in ways that cannot be traced to any particular participant. The risk that readers know who you are, will be minimum.

We will describe and share our findings in presentations and journal articles. We will be very careful to only talk about group results so that no one will be identified. In the publication of research findings, all personal information, including names of ships/vessels, employers and home communities will all be removed. This means that you will not be identified in any way in our reports. Pseudonyms will be assigned in any resulting publications and presentations.

However, considering the maritime sector is a small circle, even though we have adopted the measures above, there are still limits to anonymity. For example, discussing a well-known incident/accident/compensation claim, and increase the risk for the participant to be identified. Therefore, if you have concern that your answer to certain questions may increase the risk of identification, please skip the questions and there is no need to give any reason. After the interview, if you have concern that some of your answer may increase your risk of identification, you are free to withdraw within three months after the interview date.

How to Obtain Results:

We will provide you with a short description of group results when the study is finished. No individual results will be provided. This research is a masters' thesis project and it will be publically available at the web page of Queen Elizabeth-II (QEII) Library of Memorial University in the thesis collection/research repository section at https://research.library.mun.ca/. You can obtain the results by contacting Mr. Om Prakash Yadav, through Email: opyadav@mun.ca or Telephone: +1 (709) 770 6592. We will develop a plain language research report to share the findings with you through distributing it on various social media platforms such as twitter, LinkedIn, Facebook and sharing its link via various organizations such as Professional Fish Harvester Certification Board (PFHCB), NL-Fish Harvesters Safety Association (NL-FHSA) and Fish Food Allied Worker Unifor (FFAW) union. We will also welcome your feedback through the email and telephone contact approaches above mentioned.

Questions:

We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Mr. Om Prakash Yadav (at 709-770 6592 or opyadav@mun.ca) at any time with questions, comments, or concerns about the research study.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Appendix J: Interview online consent form

Consent to Participate in a Research Study: Signature Page

Project Title: Perception of occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador

Lead Researcher:

Om Prakash Yadav, Master Candidate

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 770 6592

Email: opyadav@mun.ca

Supervisor and Co-supervisors:

Dr. Desai Shan (Assistant Professor in Occupational Health and safety)

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 864 4921

Email: dshan@mun.ca

Dr. Atanu Sarkar (Assistant Professor in Environmental and Occupational Health)

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 749 3590

Email: atanu.sarkar@med.mun.ca

Dr. Veeresh Gadag (Professor of Biostatistics)

Division of Community Health and Humanities

Memorial University of Newfoundland

Telephone: 709 754 1133

Email: vgadag@mun.ca

Regarding withdrawal during data collection:

You understand that if you choose to end participation during data collection, any data collected from you up to that point, you can choose (1) the data to be retained by the researcher, (2) the data to be returned to you, (3) the data to be destroyed.

Regarding withdrawal after data collection:

You understand that if you choose to withdraw after data collection has ended, your data can be removed from the study up to three months after the date of interview.

During the COVID-19 pandemic period, your consent to participate will be obtained and documented either by e-signature or by recorded oral consent at the start of the interview or convey your consent in an email message to principal investigator [Mr. Om Prakash Yadav at opyadav@mun.ca].

Your e-Signature Confirms:

I have read the explanation about this study.

I have been given the opportunity to discuss it and my questions have been answered to my satisfaction.

I understand that I have been asked to participate in an online interview that will occur at a location acceptable to me, and that the interview will be recorded.

I understand direct quotes of things I say may be used without identifying me.

I agree to take part in this study.

My participation is voluntary, and I understand that I am free to withdraw from the study within three months after the date of interview.

I agree to be audio-recorded ☐ Yes ☐ No

I agree that the anonymized transcript of my interview can be archived in a research repository and accessed by Mr. Om Prakash Yadav, Dr. Desai Shan, Dr. Atanu Sarkar and Dr. Veeresh Gadag.

☐ Yes ☐ No

Your e-Signature Confirms:

I have read what this study is about and understood the risks and benefits. I have had adequate time to think about this and had the opportunity to ask questions and my questions have been answered.

I agree to participate in the research project understanding the risks and contributions of my participation, that my participation is voluntary, and that I may end my participation.

_____ _____ _____

Name of Participant Signature Date

Researcher's Signature:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

_____ _____

Signature of Principal Investigator Date

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Oral Consent Script

[This will apply if the participant agrees to take part in a telephone interview.]

Introduction:

Hello. I am Om Prakash Yadav. I am a master's student of Dr. Desai Shan, Dr. Atanu Sarkar and Dr. Veeresh Gadag. I am conducting interviews about occupational exposure of noise and its impact on fish harvester's health in Newfoundland and Labrador**.** This research is funded by Ocean Frontier Institute (OFI), Mitacs and Memorial University of Newfoundland, St. John's, NL.

Thank you for agreeing to talk to me over the phone. Have you had any chance to read the information sheets I have sent to you?

[If yes]

- Do you have any questions or would like any additional details? *[Answer questions.]*
- Do you agree to participate in this study knowing that you can withdraw at any point with no consequences to you?
  [If yes, ask next question.]

  [If no, thank the participant for his/her time.]

- Do you agree the interview to be audio recorded?
  [If yes, ask next question]

  [If no, start the interview without audio recording]

- Do you agree that the anonymized transcript of the interview can be archived in a research repository, accessed by other researchers in addition to Dr. Yadav and his co-investigators?
  [If yes, start the interview]

  [If no, take a note indicating the consent scope and start the interview]

[If no, read the script below aloud]

Let me introduce more about our research.

I'm inviting you to do a one-on-one telephone interview that will take about 60-90 minutes. This study is about occupational exposure of noise and its impact on fish harvester's health and to highlight barriers and challenges facing by NL fish harvesters in preventing noise-induced health problems. Topics include on board noise exposure and its current management and prevention approaches, and identification of existing barriers and challenges in prevention of noise-induced health problems.

Are there any risks to doing this study?

The risks associated with this study are minimal, such as being bored or fatigued. However, you will be offered breaks between activities to reduce these risks. In addition, if you choose to share your experiences of observing or experiencing occupational noise exposure and safety incidents, discussing this kind of experience may cause emotional discomfort, such as stress.

You might find some questions uncomfortable to answer. You do not need to answer questions that make you feel uncomfortable or that you do not want to answer. And you can withdraw (stop taking part) from the research within three months after the interview date. If you feel uncomfortable or grief after sharing such experiences, please consult the website of Canadian Mental Health Association https://cmha.ca/find-your-cmha to find a nearest counselling service in your region.

In Newfoundland and Labrador, please call CMHA NL at (709)-753-88550 or 1-877-753-8550 (Toll Free) for counselling support.

I describe below the steps I am taking to protect your privacy.

Information that you provide to us will be kept private. Any document containing personal information will be stored in a locked cabinet and will only be accessed by the research team. Email inquries, contact information recorded digitally will be stored in the researcher's password-protected email boxes and encrypted files. After the interview, the email inquiries will be deleted. Recorded interviews will be transcribed and the names will be removed in the transcripts to ensure the identity of the participant will remain confidential. Mr. Yadav will transcribe the audio recordings. All identifying information will be removed in the process of transcribing.

The audio recordings and encrypted master list of identifying information will be stored for up to 5 years after completion of the research. But the annoymised transcripts will be kept as long as active analysis and publication continues, up to 15 years, to ensure maximum use for research purposes.

We will describe and share our findings in presentations and journal articles. We will be very careful to only talk about group results so that no one will be identified. In the publication of research findings, all personal information, including names of ships, employers and home communities will all be removed. This means that ***you will not be identified in any way in our reports***. Pseudonyms will be assigned in any resulting publications and presentations.

Benefits:

Participating in the study might not benefit you, but we might learn things that will benefit others. We hope the benefit to you, your organization and society in general that can come from a better understanding of the policy environment will compensate for the investment of your time in this study.

Voluntary participation:

- Your participation in this study is voluntary.
- You can withdraw from the study at any time up to three months after the date of the interview
- If you decide to stop participating, there will be no consequences to you.
- If you decide to stop we will ask you how you would like us to handle the data collected up to that point.
- This could include returning it to you, destroying it or using the data collected up to that point.
- If you do not want to answer some of the questions you do not have to, but you can still be in the study.
- If you have any questions about this study or would like more information you can call or email me at **709-770-6592** or opyadav@mun.ca.

We will develop a plain language research report to share the findings with you through distributing it on various social media platforms such as twitter, LinkedIn, Facebook and sharing its link via various organizations such as Professional Fish Harvester Certification Board (PFHCB), NL-Fish Harvesters Safety Association (NL-FHSA) and Fish Food Allied Worker Unifor (FFAW) union. Please let me know if you would like a summary and what would be the best way to get this to you. We will welcome your feedback through the email and telephone contact approaches above mentioned.

Consent questions:

- Do you have any questions or would like any additional details? *[Answer questions.]*
- Do you agree to participate in this study knowing that you can withdraw at any point with no consequences to you?
  [If yes, ask the next question.]

  [If no, thank the participant for his/her time.]

- Do you agree the interview to be audio recorded?
  [If yes, ask next question]

  [If no, start the interview without audio recording]

- Do you agree that the anonymized transcript of the interview can be archived in a research repository, accessed by other researchers in addition to Dr. Yadav and his co-investigators?
  [If yes, start the interview]

  [If no, take a note indicating the consent scope and start the interview]

Consent through email message

The participants can also submit their consent through an email message to the principal investigator of the research. [Mr. Om Prakash Yadav at opyadav@mun.ca]

Appendix K: Interview guide

Perception of Occupational exposure of Noise and Its Impact on Fish Harvester's Health in Newfoundland and Labrador.

Interview Schedules

This interview schedule consists of: Schedule for Apprentice, Level I, and Level II fish harvester

- Thank the participant at the beginning.
- Tell them that the purpose of this interview is to understand occupational noise exposure and its impact on fish harvester's health
- Remind the participant that their participation is completely voluntary, and that they can stop any time they want. Their identity will not be revealed and all responses will be anonymized.
- Remind the participant that they can skip any questions that they do not wish to answer.

Background

1. Can you please tell me about yourself?
    a. Your current position and the types of fish vessels, you usually work on.
    b. How long have you been doing work in the fishing industry?
    c. How long have you been in your current position?

Impact of occupational noise exposure

1. What is your role on a fish vessel? Can you tell me about your responsibilities? Can you tell me about your work schedules on fishing vessels, including rotation, shift schedules, rest between voyages?
2. Does noise at the workplace bother you? Can you give me some examples?
3. In your opinion, what are the primary noise sources at your worksite during your work hours and rest hours?
4. Have you experienced any health problems due to noise at work? If yes, what are they?
5. Have you experienced any following problems because of noise exposure at the vessel/s?
    a. Irritation
    b. Annoyance
    c. Stress
    d. Headache
    e. Emotional challenges
    f. Sleep disturbance
    g. Communication difficulties
    h. Fatigue
    i. Physical performance affected
    j. Decision-making ability affected
    k. Tinnitus (noise in your ear or head)
    l. Changes in your voice volume
6. Did you notice any change in your hearing ability?
7. Have you previously had a hearing test? Would you mind to share the result with me?
    a. Is there any Impact of this on your family and your relationships?

Hearing Protection Measures

8. What equipment and devices are available at a fish vessel for noise protection, during work hours and rest hours?
9. How do you prevent yourself from loud noise at the worksite? Any different measures you follow during working hours and rest hours?
10. Do you regularly wear hearing protection devices?

11. Are hearing protection devices affordable to buy, and are these devices easy to use?
12. Do you feel comfortable while wearing hearing protection devices?

Safety Training and Management

13. Is noise prevention covered in any of your training or courses required for fish harvester? If yes,
    a. Who arranges this training for you?
    b. Are these training helpful for you to cope with the above challenges?
14. How are you coping with noise exposure?
    d. Can you please explain this to me?
    e. Can you give some examples?
15. Do you have sufficient PPE (hearing protection devices) supplies on board, including earplugs, semi-insert earplugs, and earmuffs?
16. Has your vessel owner/s helped you with the above challenges? If yes, then how?

Has the noise exposure included in the safety management system (incident reporting and safety communication) on board, and how?

Barriers

1. In your opinion, what are the obstacles and challenges in preventing noise-related harm to people in the fishing sector?
    a. At Administration level
    b. At Employer/Company level
    c. At Union level
    d. At Government (Provincial & Federal level)
2. If there is one thing that could help you reduce the noise you work in, what would it be?
3. Are you covered by workers' compensation or supplementary health insurance? If yes,
    a. Did you claim hearing loss in the past?

External supports: Has PFHCB/NL-FHSA/FFAW-Unifor/WorkplaceNL provide any support with the challenges above? If yes, then how?

Final comments:

Do you have any policy suggestions? What measures may help you to prevent noise-related health problems?

Is there anything else that you would like to share with us?

Once again thank you for providing your valuable time and inputs for this study.

==========

If you wish to be kept informed of the study's final results, please provide your email address. We will send you a copy of the journal paper once it is accepted for publication. This research is a masters' thesis and it will be publically available at the web page of Queen Elizabeth Library II (QEII) of Memorial University in the thesis collection/research repository section at https://research.library.mun.ca/.

Appendix L: Research flyer

Invitation to Participate in an Online Interview and/or Survey

Perception of occupational exposure of noise and its impact on fish harvesters' health in Newfoundland and Labrador

Are you:

- a fish harvester (Apprentice, Level I, or Level II),
- 18 to 65 years of age, who is actively working on fishing vessels for one year or more in Newfoundland and Labrador.
- with no previous history of working in a noisy environment other than fishing vessels for one year or more.
- with no pre-existing diagnosed hearing problem(s) before joining as a fish harvester.

If so, we invite you to share your perception of noise, self-reported hearing loss, experiences related to occupational noise exposure and provide us with suggestions to mitigate on board noise exposure and noise-induced health problems.

Topics for interview and/or survey include perception of noise exposure, self–reported hearing loss, on board noise exposure and its current management and prevention approaches, and identification of existing barriers and challenges in prevention of noise-induced health problems.

You will be given an opportunity to share your experiences and provide us with suggestions to mitigate the noise exposure and to improve legislation, regulation, policy and practices. There is no need to prepare for this interview and/or survey as it will be like a conversation or brief online survey and you can choose what you want to share with us.

This is an independent study undertaken by researchers from Memorial University. This study is part of the researcher's masters' thesis. The study is not a requirement of the specific organization/s and/or union/s that is distributing it on our behalf. Participation in this study is not a work or requirement of your employer or any organization/s or union/s.

This research is funded by Ocean Frontier Institute (OFI), Mitacs, and Memorial University of Newfoundland.

If you are interested in participating in the interview, please contact Mr. Om Prakash Yadav at opyadav@mun.ca or (709)-770-6592).

If you want to know more about the interview, you can click here: https://tinyurl.com/yxbrnrck

If you want to know more about the survey, you can click here: https://tinyurl.com/y5vjep9h

If you are interested in participating in the online survey, please click on this anonymous survey link:
https://mun.az1.qualtrics.com/jfe/form/SV_4GxhXlIuV25PtIx

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as your rights as a participant, you may contact the Chairperson of the ICEHR at icehr.chair@mun.ca or by telephone at 709-864-2861.