

Hooked on Safety:
An Analysis of Commercial Fishing Safety
and Training Opportunities

A thesis submitted by

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In partial fulfillment of the requirements for the degree of

Master of Arts in

Environmental Policy and Planning

TUFTS UNIVERSITY

August 2018

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Abstract

Commercial fishing holds a strong economic and cultural significance in communities around the United States, yet fishing communities face several barriers to success. The alarmingly high occupational risk associated with commercial fishing is particularly concerning. Safety trainings have been developed to prepare fishermen for life-saving procedures at sea. However, it is clear that there is still a need for more safety training, as the fatality rates for fishing remain consistently among the highest of all occupations in the nation. This thesis utilizes a literature review, case studies of training providers, and survey data analysis to organize information on the state of safety trainings for fishermen. It concludes with recommendations for advocates of safety in the fishing industry. As fishing communities continue to be impacted with tragic consequences of emergencies at sea, this thesis identifies ways that safety regulations can be improved, organizations providing trainings can be strengthened, and how more fishermen can be engaged in a culture of safety.

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List of Abbreviations

Alaska Marine Safety Education Association	AMSEA
The Food and Drug Administration	FAO
Fishing Partnership Support Services	FPSS
Full-Time Equivalents	FTE
Tufts University Institutional Review Board	IRB
McMillan Offshore Survival Training	MOST
National Institute for Occupational Safety and Health	NIOSH
National Oceanic and Atmospheric Administration	NOAA
North Pacific Fishing Vessel Owners Association	NPFVOA
Occupational Safety and Health Administration	OSHA
Personal Flotation Device	PFD
United States Coast Guard	USCG

Chapter 1: Introduction

Commercial fishing plays an important role in cultures and economies across the world and supplies protein for billions of people worldwide (Lucas, 2017). In 2014, the Food and Agriculture Administration (FAO) reported that approximately 18.4 million people worldwide were involved in marine fishing. In addition to the significant economic value of fishing, there is also a cultural value associated with fishing communities. For example, here in Massachusetts, several port towns are intrinsically tied to their fishing culture, which is seen in the St. Peter's Fiesta of Gloucester, the Pier Program of Chatham, and the Annual Herring Run Festival of Plymouth ("Massachusetts on the Hook", 2017). These events celebrate fishing as a cultural resource, which contributes to a strong sense of place for these communities.

Despite the important cultural and economic role fishermen serve in society, small-business fishermen are not succeeding along with the industry and they are often struggling to get by. Challenges for fishing industry workers include fluctuating incomes which make financial planning and obtaining health insurance a challenge. Additionally, small business fishermen work under very strict regulations that limit how much they can catch and at the same time must compete on the market with cheaper imported seafood ("Massachusetts on the Hook", 2017). These issues for fishermen are compounded by the physical dangers associated with commercial fishing. Commercial fishing is consistently identified as one of the most dangerous occupations in the in the United States. In

2000-2006, the fatality rate for US commercial fishermen was more than 28 times higher than the rate for all US workers in the same time period (Day et al., 2010).

The US fishing industry has been researched extensively from different perspectives, including aspects of ecologic, economic, and social health. The occupational health and safety of fishermen will be the focus of this thesis, which is a historic topic of discussion. The topic has been tackled by many, including the Massachusetts-based non-profit organization Fishing Partnership Support Services, which has been a partner in this thesis and is the primary audience.

The non-profit organization Fishing Partnership Support Services (FPSS) addresses the health and safety of commercial fishermen and their families, helping them access health insurance and health care, and conducting a variety of trainings (e.g. ergonomics, CPR, opioid awareness, financial planning, and safety and survival) across New England.

I am particularly interested in the safety and survival trainings offered by FPSS because this seems to be one of the most effective strategies for improving safety. It is essential to have technology available that can keep fishermen safe and it is important to have regulations that require safety gear to be on the boat, but the potential of improved technology and safety gear to keep fishermen safe depends on the training to use them effectively.

Anecdotal stories of how safety training prepared a crew with knowledge and skills that saved them in an emergency demonstrate the value of safety training. A safety training provider in Alaska, called Alaska Marine Safety Education Association (AMSEA), has shared a story of a crab vessel that sank in

January of 2018 outside of the Oregon coast. The owner of the vessel had taken the AMSEA safety training and he expressed that the training helped to save the crew in that sinking, including how to make a distress call, the knowledge of how dangerous smoke inhalation can be, and deploying a life raft, were all critical in the emergency. This testimonial is just one of many to illustrate the power that knowledge gained during training can have to help respond in an emergency.

OBJECTIVES

My thesis will explore whether there are specific characteristics of fishermen who are particularly at risk for injuries and fatalities and identify best practices of safety and survival training programs like those offered by Fishing Partnership Support Services (FPSS) in New England. This research is structured around the following three research questions:

1. Are there specific characteristics of fishermen who are more at risk for injury and fatality?
2. Which groups of fishermen are attending FPSS safety trainings?
3. How can outreach for safety training programs be enhanced?

An aim of this research is to help FPSS and other groups concerned about the well-being of fishermen to enhance and expand outreach and engagement for safety trainings by providing recommendations to FPSS and the industry as a whole after answering the research questions. To accomplish this, I reviewed the existing literature to determine if there are sectors of the fishing industry or characteristics of fishermen that indicate a higher risk of injury or fatality on the

job. I also conducted exploratory case studies of other safety training programs for fishermen to compare with the existing Fishing Partnership program to identify best practices and areas for expansion in outreach strategy and training components. In addition, I analyzed data from participant evaluation surveys of fishermen who attended safety trainings conducted by FPSS to explore the extent to which the most at-risk fishermen are attending safety trainings and identify groups of fishermen who are under-represented. Through the information gathered from this research, I will offer suggestions to FPSS to improve outreach strategies, as well as identify industry best practices for health and safety training.

Chapter 2: Literature Review

The purpose of this literature review is to 1) explore the extent to which US fishermen are at risk in their occupation and which characteristics of fishermen are more likely to be associated with risk than others, 2) provide a history for the development of safety trainings for fishermen, and 3) outline the past and current policy structure around fishing safety that determines the present state and the future of occupational health in fishing.

The information compiled in this review surrounding fishermen's risk is used as a foundation for the evaluation of survey data and analysis, by establishing the characteristics of fishermen that are considered to be most at-risk, and comparing those characteristics to those found to be represented in the FPSS trainings. Additionally, by reviewing the literature regarding US policy associated with safety trainings, the recommendations provided in this thesis are informed by the history of the topic, with the goal of improving future occupational health.

FISHERMEN AT RISK

Commercial fishing is established through research as one of the most hazardous occupations, due to high fatality rates for fishermen observed in many countries (Levin et al., 2016; Zytoon et al., 2017). This literature review focuses on fishermen in all regions within the United States. There are several factors that make commercial fishing a dangerous occupation, some of which are common to other industries with high occupational hazards, such as agriculture and forestry, and some are unique to commercial fishing and a marine workplace (Davis,

2011). Environmental work conditions that contribute to making fishing one of the most dangerous occupations include unstable movement of the boat, extreme temperatures, severe weather, and working in close proximity to complicated machinery (Dzugen, 2010). Additionally, many fishermen work in conditions of stress due to underpaid positions and competition for revenue that can lead to fatigue and a disregard for safety precautions (Liebman, 2013). The remote locations that fishermen travel to during their work also contributes to the risk that incidents can lead to fatality before assistance can reach the vessel. The only medical care available for fishermen at sea comes from other crewmembers on the boat, depending on their knowledge and ability, or the Coast Guard, depending on how far away they are or how quickly they learn of the need for assistance.

The occupational hazards associated with fishing can negatively impact the lives of fishermen in several ways. For example, a recent report from the Massachusetts Department of Public Health found fishing to be among the industries with the second highest rates of opioid related deaths (Freyer, 2018). The opioid epidemic within the fishing industry is tied to the high risk of injuries and illness on the job, which can be treated with opioids to manage the chronic pain. This report is representative of the fundamental challenges that fishing communities face to cope with the dangers of the industry.

In the United States, commercial fishing consistently and alarmingly has one of the highest occupational fatality rates in the country, even though the number of fatalities have generally declined since 2000 (Lucas and Case, 2017). However, it is difficult to determine whether the decline in total fatalities is

attributed to a decrease in the work force or to improvements in safety. During 2000-2006, the fatality rate for US commercial fishermen was 115 deaths per 100,000 fishermen per year, compared to the rate of four deaths per 100,000 workers per year for all US workers over the same time period (Day et al., 2010). Lucas and Case (2017) examined fatality rates from 2010-2014 and found that fatality rates of US fishermen ranged, depending on the region of fishery, from six to 43 times higher than the fatality rate for all US workers during the same period. A career in fishing is not only considered one of the more risky occupations, it receives attention as possibly the most dangerous among other risky occupations. For example, in a 2009 Bureau of Labor Statistics report, fishing had a fatality rate three times higher than the second highest scoring occupation on the list of dangerous careers (Davis 2011). These statistics exemplify the disproportionate dangers of the fishing industry, which make it worthy of attention. It is agreed upon in the literature that commercial fishing is dangerous; however, within the industry there are notable variations in exposure to occupational risk.

VARIATIONS IN RISK

While on the whole, commercial fishing is the most dangerous occupation, there are characteristics within the industry and among fishermen that have been shown to be associated with a higher likelihood of injury or fatality. External characteristics that impact the safety hazards faced by fishermen include the geographic region of the fishery and the target species (Lucas and Case, 2017). Characteristics of the fishermen that have been tied to higher risk include age,

experience with accidents on the job, and whether a fisherman is captain or a crewmember (Zytoon et al., 2017; Ilmarinen, 2001; Kucera et al., 2010; Marvasti, 2017; Davis, 2011).

The risk of injury or death at sea is present for nearly all fishermen and there are many potential causes for harm at sea. In a recent study of fatalities in the US commercial fishing industry from 2000 to 2014, it was determined that the overall leading cause of death for US fishermen was drowning, caused most often by vessel disasters, and secondly from falls overboard (Lucas and Case, 2017). The risk of vessel disasters or falls overboard is always a possibility for any fisherman, but there are measured variations in the risk of fatality or injury among fishermen in the United States.

There is ample research cited in the literature through articles and government reports that point out variations in risk among regions and fisheries. The most recent study on this topic through the National Institute for Occupational Safety and Health (NIOSH) presents commercial fishing fatalities from 2000-2014 and shows the highest rates of fatalities in the east coast region and Alaska, with fatality rates calculated per 100,000 full-time equivalents (FTE) (Lucas and Case, 2017).¹

The east coast region is of particular interest for this literature review. The target species associated with highest fatality rates in the east coast region from 2000 to 2014 are Atlantic herring trawl (549 per 100,000 FTE), Atlantic

¹ Full-time equivalents are used as a standard base for comparing rates across different sectors, which are especially useful when comparing rates in a highly-seasonal occupation with irregular working hours, such as fishing, with other nine-to-five occupations. This basis for comparison is the result of a calculation used to take into account the total number of hours worked by fishermen (Lucas and Case, 2017).

clam/quahog dredge (294 per 100,00 FTE), and Northeast multi-species groundfish trawl (243 per 100,000 FTE) (Lucas and Case, 2017). Other fisheries experienced many fatalities during the same time, but they also had higher FTE amounts and so the fatality rates are not as high. The lobstering industry is not accounted for in the Lucas and Case study, and so another article was examined to compare the fatality rates of the east coast lobstermen. According to the Fulmer et al. (2016) study, the Northeast lobster industry had a fatality rate of 47.7 per 100,000 FTE in 2000-2009. Additionally, the Fulmer et al. (2016) study documented non-fatal injury rates for the Northeast lobster industry and found that lobstermen face a much higher rate of non-fatal injury than workers in other fishing and hunting occupations. According to the study, the rate of all injuries in the Northeast lobster industry was 49.7 per 100 FTE from 2000-2009, which is much higher than the 2.1 reportable injuries per 100 FTE across all fishing and hunting occupations (Fulmer et al., 2016).

Research shows that there may be certain characteristics of fishermen that can make them more at risk to injury or fatality on the job than other fishermen. One measurable difference among fishermen is their age, which has been studied as a determining factor in risk of occupational injury. Zytoon et al. (2017) studied work related stress and injuries among fishermen of different age groups and found that the younger and older groups suffered higher injury risk than middle-aged fishermen. This pattern is consistent with studies of safety-related risk related to age in other occupations (Ilmarinen, 2001).

A separate study, which explored injury rates among fishermen in the southeastern US, found that factors associated with higher risk of injury included being occupied with maintenance work and working on another person's boat (Kucera et al., 2010). In a more recent study, Marvasti (2017) explored the determinants of fatal and non-fatal injuries in the southeastern US and found that the number of fishermen in a crew was associated with risk for injury. The results indicate that a larger crew provides relief from burdensome tasks and more assistance on the boat in the event of an emergency.

Another factor in predicting risk is fishermen's past experience with incidents. There is a point of disagreement found in the literature on whether having experienced a previous accident can be expected to be associated with a perception of higher risk. Davis (2011) found that fishermen who had reported experiencing and surviving an accident were associated with evaluating their occupation as less risky. However, Havold (2009) pointed to self-reported prior accident experience as an indicator of fishermen being more likely to acknowledge the high risks of fishing and embrace safety culture.

POLICY

The next phase of this literature review examines information on how policy has been used to facilitate safety training programs for commercial fishing in the past, and how it can be improved to allow safety training programs to expand. Policy and regulations are important in shaping the occupational environment of fishermen. Policies around fishing have been both helpful and

harmful to fishermen safety. There are also policies governed by the Occupational Safety and Health Administration (OSHA) to protect worker safety in other occupations that do not apply to fishermen, who are part of the Agricultural, Forestry, and Fishing exemption category (Liebman, 2013). On the other hand, effective policies have been shown to improve fishing safety and it is possible that supportive policies can facilitate safety trainings for an industry that cannot financially support safety trainings on its own (Dzugen 2010).

Dzugen (2010) outlines the policies that allowed early safety training programs to take shape, notably through funding from the National Oceanic and Atmospheric Administration (NOAA) and other agencies starting in 1985. This funding has long since ceased, but it supplied resources to several safety training programs around the United States. More recently, Levin (2016) writes about the Coast Guard Reauthorization Act of 2010, which requires vessel operators to pass certain criteria, including conducting monthly safety drills under the guidance of a certified Drill Instructor. However, this policy only applies to operators of fishing vessels outside of the 3-mile offshore boundary, and therefore is not comprehensive for hired workers or boats fishing within the 3-mile boundary.

Suggestions for improving the reach and effectiveness of safety trainings in the literature include both mandatory requirements and incentive-based policies. An effective example of the mandatory strategy is seen in the Maine Lobster Apprenticeship Program, which requires newly apprenticing lobstermen to attend a thorough safety training, which has been described as more comprehensive than any other training requirements in the US (Backus, 2014).

The research by Davis (2011) indicates that the apprenticeship program requirements have made a positive impact among younger lobstermen and other peers in regards to risk recognition and safety training attendance.

Another strategy to bolster safety training attendance is through incentives rather than requirements. One possible incentive program may be discounts on insurance premiums for fishermen who receive safety training certification. This requires insurance providers to recognize the benefits and financial value of fishermen who attend safety trainings (Dzugen et al., 2010). The potential for improving safety by providing financial incentives is common in other hazardous occupations. Elser et al. (2010) document several different strategies to provide safety incentives that have been implemented in the public and private sectors. In some examples, they make the case for an overall reduction in expense by investing in safety measures, such as subsidies for improved equipment (Elser et al., 2010). There are also direct connections between regulations that manage fish stocks and the safety of commercial fishermen. Pfeiffer and Gratz (2016) described the unintended consequences of regulations to control fishery resources on fishermen safety. For example, fishing restrictions that seek to reign in resource depletion by drastically limiting the length of the fishing season encourage fishermen to go out to sea as much as possible during the available season, even during dangerous weather events. A different strategy of resource management can rectify this unintended consequence, such as catch shares. Catch share management divides the allowable fish catch among individuals, allowing them to fish on their own time without fear of losing revenue. The impact that

these management regulations can have on fishermen is potentially drastic. Pfeiffer and Gratz (2016) found that after a Pacific coast fishery converted from limited fishing seasons to a catch share strategy, the average annual rate of fishermen going out to sea on days of high wind decreased by 79%. Changing the regulations to allow fishermen more flexibility in days they fish improves the ability to fish in safer weather conditions.

Some sources point to the sustainable seafood movement as one potential resource to improve safety in the fishing industry. Jacquet and Pauly (2007) observed that there has been a considerable effort within the seafood industry to promote sustainable seafood, as a response to overfishing and the detrimental effects on fishery resources. The sustainable seafood movement typically is associated with encouraging responsible management of fisheries to maintain healthy marine resources, but Lucas and Case (2017) suggest that fishermen health and well-being should be incorporated into the classification of sustainable seafood. This is a promising idea based on the popular support that has been garnered around sustainable foods systems, including within the seafood industry (Jacquet and Pauly, 2007).

In addition to funding and regulatory changes, there is agreement in some literature that one path to safer and better-managed fisheries is through improved communications between scientists and practitioners. Rezaee et al. (2016) lay out a framework for translating the results of research conducted on environmental change directly to fishing safety policy. The objective of this framework is to make dissemination of knowledge generated from research more straightforward

for policy-makers to use. This has the potential to streamline the transfer of information from research to policy, and avoid the issue of letting valuable information stagnate in the research arena, without reaching policy. Another article describes a pilot project designed to help Vietnamese shrimp fishermen train on safety practices, such as making mayday calls, and provides an example of moving academic studies out of the research phase and into practical applications (Levin et al., 2012). These strategies for connecting academic research directly to policy and practice may present another opportunity to improve safety for commercial fishermen.

SAFETY TRAININGS

In the past decades, safety trainings for commercial fishermen have been developed as one strategy for improving commercial fishing safety. Safety trainings are intended to instruct fishermen on how to react in an emergency and provide hands-on practice with safety equipment. This review explores the literature on the development of safety trainings in the United States, their effects on safety in the fishing industry, and the common recommendations for improvement of safety trainings.

Trainings are essential to improve safety on fishing vessels. Technological enhancements have helped to make fishing a less dangerous occupation, but as Rezaee (2016) pointed out, appropriate training on vessel equipment is necessary. In addition, safety trainings for fishermen are vital in an industry that has been shown through research to be weak on safety culture (Havold, 2010). The

research by Havold (2010) emphasized the need for improved safety culture by showing that attitudes towards safety among the industry's management can affect safety policies.

Safety trainings for commercial fishermen began in Alaska, one of the country's most dangerous fishing regions, in 1983 following the loss of 14 fishermen on one vessel. Initial safety trainings were conducted by the United States Coast Guard (USCG) with no standardized curriculum (Dzugen, 2010). In 1985, AMSEA (Alaska Marine Safety and Education Association) was organized to standardize the training curriculum, conduct trainings of more safety instructors, and supply safety equipment (Dzugen, 2010). Today there are more safety training programs outside of Alaska, including Fishing Partnership Support Services, operating in the Northeast.

There is literature available to quantify the benefits of offering safety training for commercial fishermen. An early study published in 1995 found a statistically significant association between victims of commercial fishing hazards and those victims not having been trained as Drill Instructors² (Dzugen, 2010). A later study in 2006 confirmed the positive effects of safety trainings by showing that survivors of vessel accidents in Alaska were 1.5 times more likely than fatalities to have been through safety training (Lincoln, 2006). Based on this limited evidence, it appears that safety trainings produce measurable benefits to fishermen who attend the sessions. The research on quantifiable benefits is not extensive, but it has been asserted that not only does safety training improve the

² A Drill Instructor is an individual who has been trained in US Coast Guard approved procedures for conducting safety drills and has been certified as such (Commercial F/V Safety Training Requirements, 2012).

likelihood of the trained fishermen to survive in an emergency, but their training also benefits their crew, which can typically range from three to six people (Dzugen, 2010).

While there is literature that details the success of safety trainings, there are also common criticisms and recommendations for improvement. Levin et al. (2016) make recommendations to improve safety training program strategies. They propose that safety training programs may be more effective if trainings are culturally appropriate, such as providing training materials in Vietnamese, rather than English, for Vietnamese commercial shrimp fishermen in the Gulf of Mexico region. This recommendation may be appropriate in other locations as well, wherever there are populations of non-English speaking fishermen.

There are also recommendations found in the literature citing a greater need for involvement of fishermen in safety culture. Levin et al. (2016) suggest that safety trainings are only useful if fishermen perceive the risk of their occupation and choose to take part in safety education, which many do not. Davis (2011) agreed with this point, and she studied further fishermen's attitudes of their own risk and found that fishermen consistently underestimate the risk associated with their work. This research forms a criticism of safety trainings because fishermen are not inclined to attend safety trainings unless they are required. While safety trainings are required in some circumstances, the regulations requiring training still do not apply to many commercial fishermen.

SUMMARY

In reviewing the research, clear themes have evolved. It has been established that commercial fishermen are at risk in their careers, and the risk among fishermen varies based on characteristics such as region, fishery, age, and captain or crew status. There is evidence that safety trainings are effective in alleviating some of this risk, by providing fishermen with experience before they are in an emergency situation. However, the literature indicates that fishermen are not typically willing to attend trainings voluntarily. Regulations implemented federally and on the state level have pushed some fishermen to attend trainings by making them mandatory, but a significant gap remains today.

Through this literature review I have explored the past and recent research on occupational risk for commercial fishermen, the literature on the development of safety trainings and their effects on fishing safety, and the policy surrounding commercial fishing safety. The information gained through this examination on the literature provides background for further analysis on safety trainings provided for commercial fishermen in this thesis. The context of past and current research also contributes to shaping the recommendations to follow.

Chapter 3: Methodology

The methodology for this thesis includes a literature review, interview-based case studies, and a quantitative analysis of post-training survey data. These methods explore the risks of commercial fishing and development of safety training programs for fishermen, and respond to the research questions identified in Table 1. The results of the analyses provide the context for the recommendations at the conclusion of this thesis.

The literature review provides background to understand the context of US commercial fishing today and safety training programs for fishermen. The literature review section is driven around the questions of whether there are specific characteristics of fishermen who are more at risk for injury and fatality. The analysis of survey data examines the fishermen who are attending FPSS safety trainings. The interview-based case studies detail the conditions faced by safety training programs and pursues the question of how outreach for safety training programs can be enhanced through a cross case comparison. The final method of data analysis explores the fishermen represented in the post-training surveys that responded with characteristics associated with higher risk, as identified in the literature review.

Table 1: Research Questions and Methods

Research Question	Methods Used
Are there specific characteristics of fishermen who are more at risk for injuries and fatalities?	Literature review
Are fishermen who are more at risk for injuries and fatalities, as determined by literature review, attending safety trainings?	Data analysis
How can outreach for safety training programs be enhanced?	Case studies and interviews

CASE STUDIES

I present case studies of safety training programs in the US to inform an evaluation of best practices and compare the outreach strategies and training components of different programs. The case studies are based on interviews with representatives of organizations offering safety trainings.

Selection of safety training program cases was determined based on their similarity to FPSS. Similarity was gauged by the risks faced by the fishermen who are targeted for safety training. Programs were identified through web searches and advice from current safety instructors and other professionals, including an informational interview with Kevin Plowman of the US Coast Guard. I then followed up on this information with web searches to identify four programs similar to FPSS, based on the criteria of either operating as a non-profit as FPSS does, or offering trainings to fishermen who work in a similar fishery environment as those served by FPSS.

Before contacting professional representatives of safety training programs, I created a list of interview questions to compare the different programs, including

outreach strategies and features of the offered training programs. I also included questions about areas of expansion they see for safety training programs in the US and how to involve more fishermen in safety trainings. Additionally, organization-specific sub-questions were developed based on the informational interview with Kevin Plowman, which provided further context than could be gained through internet searches alone. Interview questions were included in an application to the Tufts University Institutional Review Board (IRB) for exempt status approval prior to any contacts with interviewees (Appendix A).

INTERVIEWS

I conducted four interviews with representatives of the selected safety training programs. After IRB approval was received, I extended invitations to be interviewed through phone calls or emails to the four intended interviewees. All four invitations to be interviewed were accepted and after the initial contact I followed up with a second email, which included further description of the thesis research and scheduling options.

Interviews were conducted over the phone in a semi-structured format, meaning that there was a standard set of interview questions for every interview, but as conversations differed from one another, follow up questions differed in each interview. Interviews lasted 45-60 minutes to gather all the necessary information. Detailed notes were taken for each interview and information provided in the interview was coded in a table to represent the nature of the information for the purpose of analysis and presentation. The information was

initially sorted into broad categories depending on whether the topic related to the organization, safety training programs, or regulations. Later the information was analyzed for themes and interview notes were coded again based on those themes, which are identified in the case studies chapter. These case studies contributed to shaping the policy recommendations in this thesis.

DATA ANALYSIS

The third stage of analysis for this thesis examined the results of surveys distributed by FPSS to fishermen following participation in safety trainings around New England. I examined these surveys to determine which groups of fishermen are attending FPSS trainings, and how they fit into the groups identified in the literature review. I determined this by first identifying groups of fishermen who are at risk as established in the literature review. This sub-group of fishermen in New England who are determined to be at risk in the literature review was searched for in the FPSS safety training evaluation surveys to determine whether they are attending safety trainings. Fishermen attending safety trainings were grouped based on responses to survey questions including 1) years of fishing experience 2) returning or new attendees 3) experience in certain fisheries, and 4) have experienced injury, man overboard, or other life-threatening situations. Recommendations for the FPSS safety trainings were based on the findings of this survey analysis. For those who are attending, I explored strategies that can be used to improve outreach further, based on information from the literature review and case studies.

Chapter 4: Cases

The purpose of conducting case studies for this thesis is to explore examples of other safety training programs in the United States to identify commonalities among organizations in terms of best practices, challenges, perspectives, and potential areas for improvement. The organizations identified in this chapter all share a similarity in that they provide the USCG-approved fishing vessel Drill Instructor training. Modules included in the fishing vessel Drill Instructor training address abandoning the vessel, fire fighting, recovering individuals from the water, flooding, immersion suits, and radio distress calls. However, the organizations differ on various factors including additional courses offered, structure of courses, funding sources, and populations served.

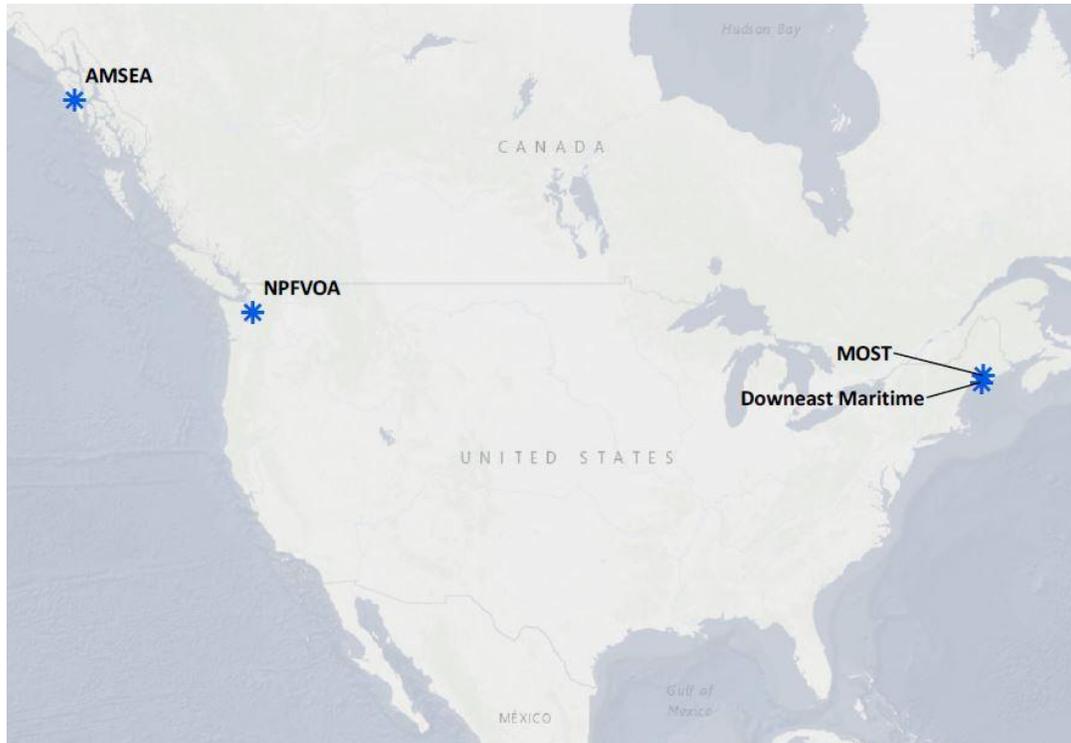
The primary research question targeted by the case study method outlined here is “How can outreach for safety training programs be enhanced or expanded?” The interviews and case study analysis help to shape the recommendations at the conclusion of this thesis. The four cases listed in Table 1 and shown geographically on Figure 1 provide an introduction to each of the four cases. The cross case comparison of these four organizations is structured by identified themes.

Table 2: Comparison of cases

	Regional Fisheries	Location	Funding Structure	Standard Cost of Drill Instructor Course
Downeast Maritime	Northeast Groundfish Trawl, Atlantic Clam / Quahog Dredge	Thomaston, ME	For-Profit	\$360
McMillan Offshore Survival Training (MOST)	Northeast Groundfish Trawl, Atlantic Clam / Quahog Dredge	Belfast, ME	For-Profit	\$225
Alaska Marine Safety Education Association (AMSEA)	Alaska Salmon Set Gillnet, Alaska Bering Sea Crab	Sitka, AK	Non-Profit	\$0 (for commercial fishermen)
North Pacific Fishing Vessel Owners Association (NPFVOA)	West Coast Groundfish Trawl, West Coast Non-Tribal Dungeness Crab	Seattle, WA	Non-Profit	\$110 - 135

CASE DESCRIPTIONS

Figure 1: Map of case study organizations



DOWNEAST MARITIME INC.

Downeast Maritime Inc. is a for-profit private company offering USCG approved fishing vessel Drill Instructor training, as well as several other approved and non-approved courses to fishermen and other mariners. This organization has two main offices, one of which is based in Thomaston, Maine. Their second office is based in South Carolina. Downeast Maritime relocated to these regional offices in the mid-1990s. The organization has also conducted trainings in other locations around New England, including Connecticut and Massachusetts. They have

established a formal partnership with Midcoast First Aid LLC and the Maine Maritime Academy (Downeast Maritime 2017).

Downeast Maritime Inc. was chosen to be profiled for a case study based on their location of service, which is in a similar region as FPSS. For this thesis, the Maine division is described because they serve a similar population of New England fishermen as FPSS. Downeast Maritime differs from FPSS in their funding sources. In this case, the trainings are offered to participants for a profit-generating fee.

Lindsay Pinkham was the representative of Downeast Maritime who was interviewed in order to provide more detail for the case study. Pinkham is a managing partner of Downeast Maritime, and has worked with the organization since 2007. Prior to working with Downeast Maritime, she worked at the Maine Maritime Academy. In addition, she is the sole owner of Midcoast First Aid LLC, which also provides trainings for first aid related techniques.

ALASKA MARINE SAFETY EDUCATION ASSOCIATION (AMSEA)

The Alaska Marine Safety Education Association (AMSEA) is a non-profit organization that offers several USCG approved and non-approved courses to commercial and subsistence fishermen and recreational boaters. The most established location of operation for their courses is in Alaska, but AMSEA instructors work in other regions across the United States, including the Pacific coast and Gulf of Mexico. AMSEA was formed in 1985 and has trained over 200,000 people since then (AMSEA 2016).

AMSEA was selected as a case study based on their non-profit status, which is a similarity shared with FPSS. Additionally, AMSEA operates in a region that consistently ranks as one of the most dangerous fisheries in the United States, along with the Northeast region. Although the organization is based in Alaska, AMSEA has the notable distinction of maintaining a network of instructors that now work nationwide. The representative of AMSEA interviewed for this case study was Jerry Dzugen. Dzugen is the Executive Director of AMSEA and has worked in the safety training industry for over 30 years.

Like FPSS, the AMSEA organization operates as a non-profit. They receive funding from public and private sources and are able to offer their safety trainings at free or reduced cost to the participants. The list of courses offered by AMSEA is extensive. In addition to the USCG-approved fishing vessel Drill Instructor training, they offer dive harvest safety training, ergonomics, risk assessment management, survival psychology, sleep deprivation avoidance, and vessel stability, among others.

MCMILLAN OFFSHORE SURVIVAL TRAINING (MOST)

McMillan Offshore Survival Training (MOST) is a for-profit company based in Belfast, Maine and offers USCG approved and non-approved safety training courses to fishermen and workers of other industries that operate in offshore waters including aviation and offshore petroleum industries. There are also representatives of MOST offering courses in California, Equatorial Guinea, and Nigeria. The company started business in the 1970s, originally focusing on

trainings for offshore petroleum personnel in the Gulf of Mexico (McMillan Offshore 2014).

MOST was selected for a case study because the population of Maine fishermen they serve is similar to those served by FPSS. For the purpose of comparison to FPSS and the other organizations operating in the Northeast region, the case study for MOST focuses on the Maine office and services provided there and throughout New England. The representative from MOST who was interviewed for this case study is John McMillan, who is the principal controller of the company. McMillan has been conducting safety trainings for offshore occupations for over 20 years and is the United States representative for the International Association of Safety and Survival Training.

NORTH PACIFIC FISHING VESSEL OWNERS ASSOCIATION (NPFVOA)

NPFVOA is a member-based non-profit organization in Seattle, Washington. The organization offers many USCG approved and non-approved courses to fishermen for a fee or reduced fee for some fishermen. NPFVOA employs three staff members and offers ten USCG approved courses and several supplementary courses to train fishermen in stability, collision avoidance, medical techniques at sea, and other skills. Karen Conrad is the Executive Director of NPFVOA and was interviewed for this case study.

This organization was included in the selection for case studies based on their non-profit structure, which is a similarity shared with FPSS. NPFVOA differs from FPSS on the cost of training because NPFVOA charges a fee for their

courses unlike FPSS which offers trainings at no cost. However, NPFVOA is able to offer a reduced cost for courses to fishermen or companies based out of Washington through contributions to the Seattle Fishermen's Memorial fund.

CROSS CASE COMPARISONS

The following section provides an analysis of the information gathered from each case through a cross case comparison structured by theme. The themes that were identified were broad topics of interview discussion and have been categorized as adaptation, engagement, promotion, measuring success, challenges, and future improvement. Within each theme, commonalities among cases are identified and explored. Information in the following section, unless otherwise noted, is sourced from interviews with organization representatives.

ADAPTATION

Organizations that offer safety trainings are capable of offering courses beyond the USCG requirements for fishermen, and must make decisions on where to dedicate their resources. The topics of safety training programs are often dictated by the USCG requirements for approved courses. However, the USCG requirements are seen as the bare minimum, and so some organizations go beyond the requirements and offer supplementary trainings. Changes in trainings offered, or alterations to the existing trainings are typically based on three primary drivers: subjective input, objective data, and reaction to tragedy.

Subjective input

Input of information to safety training providers based on opinions or expressed needs, such as from fishermen or instructors, can be called subjective input. Regardless of for-profit and non-profit structure, one impetus of program adaptations are based on subjective input, including the expressed needs of fishermen. Evaluations that are offered following safety trainings to participants are valuable sources of information on whether they were perceived as helpful or engaging. While USCG requirements may prohibit eliminating certain training topics, when training is not perceived as helpful, a revision of instruction methods may improve the engagement in the weaker trainings. Additionally, opinions and other subjective input from fishermen has been the source of adaptation for AMSEA courses. For example, their sleep deprivation training and ergonomics training were both developed after receiving subjective input in the form of feedback from fishermen and instructors that could not be found in objective input, such as casualty reports.

Objective data

In addition to subjective input, objective data can be a driver for course alterations. Objective data includes reports on accidents, injuries, and casualties collected by entities such as USCG or NIOSH. It is defined as objective data here because it is based on collected numbers, as opposed to expressed needs directly from individual fishermen. When reports include data on causes of accidents that can be addressed through training, this may provide a rationale for additional trainings.

The USCG and NIOSH reports are typical data sources that can provide insight into the risks for fishermen that are objectively measured and can be addressed through training. For example, objective data from a 2006 USCG study of fishing vessel fatalities showed that approximately half of fatalities were due to instability and flooding and so this information spurred AMSEA to incorporate stability and flooding control into their curriculum. The most prevalent example of this type of input is through USCG, which set the requirements for safety trainings based on accident and casualty reports. The parameters set by USCG are then the main driver for safety training programs for all organizations.

At AMSEA, other objective data has served as a tool in the classroom as well. Certain powerful data have been incorporated into curriculums to be regularly brought up in class as a method to gain attention from fishermen. For example, AMSEA instructors have found that they are able to grab attention by bringing up that of the last 226 fishermen who had fallen overboard, none of them were wearing Personal Flotation Devices (PFDs), based on information from NIOSH. In this instance, the courses already heavily emphasized the use of PFDs before the data, but the data became an integral piece in the course as a method to get attention.

NPFVOA has also observed that objective data from NIOSH serves as a driver for change in policy of companies that run fishing boats in that region, similar to the way that safety studies inform changes in safety training programs. An example of change in company policy as a result of objective data is seen in

more and more companies requiring PFDs to be worn on deck, which is a result of NIOSH safety studies that quantify the need for PFDs to prevent drowning.

Reaction to tragedy

An unfortunate driver of course adaptations is the reactive response to vessel accidents and deaths. A tragic event encourages attention on multiple levels. When a boat sinks and lives are lost, the regional population pays attention. During that time the need for safety training becomes more palpable and trainings can be altered to focus on safety techniques that may have been neglected in the accident.

Additionally, laws and regulations are reactive to accidents. Politicians and regulators also pay attention following an accident that results in casualties, and so requirements around safety trainings may change, necessitating adaptations of safety training courses by organizations. This type of reaction was seen following the 2004 sinking of the Northern Edge from New Bedford, which lost five crew members with only one surviving. Following the disaster, laws governing the requirements for safety trainings became more stringent (Cook, 2005).

Company policies, as well as regulations, are changed in direct reaction to accidents. At NPFVOA, this has been commonly observed with companies that work out of the region. For example, company policies have changed to require sleeve protectors on rain gear after a sleeve cuff became caught in the chain of a fish filleting machine, causing the arm to twist.

ENGAGEMENT

Engaging fishermen who are not required to attend safety trainings is important for encouraging safety in the industry. Even for fishermen who are covered by safety training requirements, engaging them in courses beyond the requirements is a task attempted by organizations offering training. The case studies show that there are commonalities among organizations around engagement efforts.

Resistance to attending

Efforts to engage fishermen in safety trainings are met with resistance from those who are not required to be certified and even from fishermen who are required to participate in safety training. NPFVOA finds that the most common reason cited for resistance is a lack of time. The most effective time to offer trainings is during the time immediately leading up to or following the fishing season. Safety trainings are an extra task for fishermen during busy times of the year - either when they are preparing for the fishing season or when they are wrapping up the season. Fishermen are not inclined to be distracted away from their other responsibilities during these times.

At Downeast Maritime, it appears based on perception of the instructors that only 10% of safety training attendees are there because they want to be. The other vast majority attend the trainings because they are required by either the state or federal laws, and would not attend otherwise. Based on the same perception by instructors, the 10% of fishermen who appear to be interested in trainings are the people who are new to fishing, but not the fishermen who have

spent their lives fishing in Maine. The more veteran fishermen appear to believe that they will not learn new information through training and so it is not worth the time or cost. This perception that veteran fishermen often believe that safety training will not teach them anything new was echoed through other cases.

Hands-on learning

When in courses, instructors have found that the most well-received trainings are the ones that are student-centered and incorporate multiple instructive methodologies. In AMSEA courses, trainings are rarely based on lectures and instead focus on engaging the participants in hands-on activities and practicing the techniques with their peers and the instructors as much as possible. This type of training mirrors the way that fishermen should run the required safety drills onboard their vessels. For safety techniques to be most effective, they should be practiced instead of discussed. NPFVOA found that when asked how they conducted their drills they have admitted to discussing the safety steps around a table instead of practicing them. Instructors at AMSEA insist that hands-on experience is where most of the learning happens. Hands-on experience allows participants to learn from mistakes before it might happen in a real emergency, such as carrying a fire extinguisher the incorrect way and exhausting the extinguishing agent before reaching the fire. Practice is especially relevant for PFDs, immersion suits, and boarding the life raft. Getting into an immersion suit or a life raft can be challenging, particularly in an emergency situation, and so regular practice through safety drills is critical in making sure that the users know

how their immersion suits fit, what they can and cannot do with their hands in the suit gloves, and how they can best get into a life raft.

Some organizations have found that it is helpful to conduct safety trainings in realistic environments, such as practicing use of immersion suits in cold water, instead of in practice environments, such as in a pool. Immersion in cold water is not recommended by USCG, but supplemental trainings that are not USCG approved are offered by NPFVOA and are used to train fishermen in the safety techniques while in the environment they may face in an emergency situation. NPFVOA found that fishermen appreciate the trainings in real-world settings, including trainings involving cold-water ocean and trainings conducted on the fishermen's boats when possible. NPFVOA explains that there are multiple benefits to conducting trainings on the fishermen's boats. Training on their own boats provides fishermen a chance to work with their own gear and identify any issues with the gear, such as incorrectly registered EPIRBs or life rafts incapable of being deployed where they are stored. Additionally, conducting the training on fishermen's own boats helps to foster the muscle memory that may be needed in an emergency because they are working with their own gear and can be reminded of how to access it.

Creating a welcoming environment

One strategy to engage fishermen in safety trainings is to establish the instructional area as a welcoming environment. Instructors at AMSEA have found that it is important to make it clear during courses that fishermen will not be punished for admitting to having been unsafe at work. Participants in trainings are

encouraged to share their stories of dangerous or unsafe situations or decisions at work in a non-judgmental setting. Establishing the classroom as an environment for sharing stories is beneficial in engaging fishermen, and removes the impression that they are being corrected by an authority. MOST has observed that fishermen who may be resistant to training at first may become important proponents for training, and so even the difficult participants should be supported to return for more training.

In addition to establishing a welcoming environment for fishermen to talk openly and share stories within the classroom, making it clear that all are invited to attend safety trainings is also valuable in engaging fishermen to attend trainings. AMSEA's efforts to engage fishermen have improved when they encourage fishermen to bring their friends. AMSEA has found that reminding potential training participants that they are allowed to invite their friends has motivated more people to attend, and younger people in particular are more interested and engaged when they are able to invite a group.

Confronting denial with real-life experience

Safety training providers see that it is difficult to engage fishermen in safety training because some fishermen do not believe that they may ever find themselves in an emergency situation. At NPFVOA one of the typical attitudes they find from fishermen is denial that it will ever happen to them. This sentiment was echoed through AMSEA and MOST as well. Each organization has a similar strategy to address denial by confronting it with real life experiences of other fishermen who thought it would never happen to them. The methods used include

inviting captains who had experienced vessel sinking, showing videos of sinking events, and including news on regional vessel accidents in newsletters. Through confronting denial with real life experience, organizations are able to engage fishermen in training by demonstrating that it can happen to them or any other boats that they may be in the vicinity of, and they can be more capable of handling an emergency either on their own boat or another boat by taking safety training and running the drills.

PROMOTION

All organizations that offer safety trainings make efforts to promote their trainings to fishermen, whether the organizations are for-profit or non-profit. Some have more robust promotion strategies than others, and some methods change with different regions, but themes have been identified that apply to all cases.

Word of mouth

All organizations that were profiled as case studies have implemented several different strategies to promote their programs to fishermen. Although none of the cases have staff members exclusively dedicated to promotion, all organizations have promotional techniques and share the promotional responsibility. Typical promotion methods include, among others, advertising in fishermen's forums, local newspapers, social media, and in flyers at harbormasters' offices. Methods of promotion that appear to return the most response are the ones that are based on methods that fishermen use to

communicate. For example, AMSEA maintains a list of recommended forms of communication in each community, based on suggestions of the main “hubs” of information from local instructors or fishermen. Additionally, AMSEA has found a successful strategy through using Facebook to post articles of interest to fishermen, which establishes their page as a reliable resource that fishermen follow and can become aware when AMSEA is offering safety trainings.

All organizations have found through decades of experimentation with various forms of promotion that the most dependable form of promotion is word of mouth. AMSEA found that approximately 44% of fishermen who attend their trainings heard about the training through word of mouth, based on a random survey of 10 classes. The second most frequent response on the survey was the “Other” category, meaning that they heard about it through USCG, a captain, family, or friend.

NPFVOA has found that nearly all of their participants attend trainings because they had attended previously or had heard about the training through the USCG, or through word of mouth, such as from a captain. Among training programs that offer evaluation surveys, all include a questions asking the respondent how they heard about the training and the most frequent response is a word of mouth from family or a friend.

Reach out to young fishermen

Promotion efforts are valuable to all demographics of fishermen because all are at risk and safety training has the potential to benefit anyone, but one common promotional target of the cases studied here is putting an emphasis on

outreach to younger people. Most organizations pointed out that fishermen in their communities are aging out, and there are fewer younger fishermen coming in to take their place. Not only is targeting trainings to younger people a strategy for promoting safety in the industry, but it is also a strategy to continue the industry. At Downeast Maritime, employees are involved in a program for high schoolers in the Penobscot Bay area of Maine, called the Skippers program. The Skippers program works with young fishermen while they go through high school and teaches them about safety, but also other practical skills such as small business planning and basic navigation. The program tries to establish a safety culture earlier on in the young fishermen's careers, so that they and their peers might view safety training as more of a norm than older generations.

In Alaska, AMSEA pursues outreach to younger people in public and private schools. AMSEA has conducted trainings in approximately 76% of Alaskan school districts, and particularly reaches out to districts where fishing is a common occupation. In AMSEA's home port of Sitka, trainings are frequent for the community's school-aged children. In this area, parts of the training are taught in school to children for every other grade from 1st to 7th and sometimes in high school as well. Other organizations are less active in their engagement of younger people, but emphasize involvement of younger fishermen by encouraging captains to invite their younger crews to safety trainings as well.

MEASURING SUCCESS

The definition of success varies depending on the organization, the audience, and the objective of training. Techniques to measure success differ slightly between for-profit and nonprofit organizations, due to their funding structures. For non-profit organizations, there are more metrics to report to their funders, while organizations that are funded based on course fees have only internal measurements for success. Between the two different structures, commonalities have been identified.

Process evaluation / Outcome evaluation

There are separate versions of success as measured by organizations and all cases identified measurements using either a process or an outcome evaluation, or a combination of both. A process evaluation is a measurement of attendance at trainings, number of courses offered, or trainings offered in the year. This type of measurement is collected in all cases, whether or not there is a requirement to do so, as for non-profits receiving grant funding. The other method of measuring success is an evaluation of outcome. This method is focused on the results of training and not just the trainings themselves. AMSEA, MOST, and NPFVOA all have forms of outcome evaluation. AMSEA and NPFVOA both measure outcome through results of participant surveys with questions on quality of the training and future behavior changes. In addition, AMSEA measures outcome by collecting the number of people who have been in accidents who were trained and how many have been in accidents who were not trained. By comparing the numbers,

they connect survivability in accidents with training. For MOST, successful trainings are ones that result in a perceived attitude change by the fishermen and makes them more comfortable and confident with the idea of emergency situations.

Stories

Similar to evaluating outcome rather than the process, the stories that come from safety trainings are an essential version of measuring success and making clear the necessity for trainings. Stories include testimonials from fishermen and success stories from the perspective of instructors. The power of stories was referenced by both AMSEA and NPFVOA. At NPFVOA, the need for training is demonstrated through not only stories of teaching the safety skills to fishermen, but also stories such as teaching 40 Sudanese fishermen to swim, which is a skill that approximately 18% of the fishermen attending safety trainings at NPFVOA do not have. AMSEA clarified that stories are one of the most essential measurements of success because they resonant with people more than the evaluation data of success does. Funders often ask for stories of fishermen saved by training, which they can use in lobbying for more funding of their programs. The stories appear to be the most powerful method of demonstrating success to others, even more than presenting data that demonstrates success. AMSEA has 180 stories of fishermen potentially saved by training. The stories include testimonials from fishermen who used the skills in an emergency and fishermen who avoided a vessel emergency by taking extra care, attributed to the safety training.

CHALLENGES

The following section addresses challenges faced by organizations and how they have worked to overcome those challenges. All cases have faced challenges unique to their conditions. The following are examples of challenges that were mentioned by multiple cases.

Uncertain funding sources

The nonprofit organizations referred to inconsistency of funding as a challenge to the success of their organization and of engaging fishermen in safety trainings in general. AMSEA has struggled in the past with inconsistency in funding which made long term planning difficult. AMSEA depends on certain public and private sources and most years a few sources will make up the majority of their annual funding, but some years they will not receive funding at all. During dips in funding they have had to make up for it through different sources. One alternative strategy has been to offer trainings to agencies such as state departments or private businesses, and charge them training fees at market rate.

Inadequate Enforcement

AMSEA and NPFVOA also see inconsistency as a challenge in the enforcement realm. The agencies see gaps in enforcement of safety regulations, which allows fishermen to avoid taking the safety trainings. There is frustration over the discrepancy between federal laws that have been approved, such as Coast Guard Authorization Acts, and the regulations that have yet to be written to supplement those laws. The laws, if enforced, would support potentially life-

saving safety trainings, but in many cases the USCG regulations do not exist to enforce the law. Organizations are in the process of overcoming this challenge by speaking with leadership of the USCG about the issue.

Flexibility to overcome challenges

Flexibility was commonly mentioned as an important facet for an organization to be capable of overcoming many day-to-day challenges. Flexibility has been used in scheduling, funding sources, and instructional methodology. AMSEA has been flexible with their sources of funding, as detailed earlier. MOST has used flexibility in instructing trainings to better fit the needs of particular audiences by including warm water survival practices for trainings conducted in the Gulf of Mexico that are not included in cold water environments of New England. Downeast Maritime and NPFVOA both find flexibility helpful when scheduling trainings, which is a valuable strategy to manage the lack of time that fishermen have cited as the reason for avoiding safety training. Downeast Maritime sees their small organizational size as an advantage towards flexibility, because they are able to readjust their schedule to better fit the availability of fishermen or companies they are training.

The fishermen who need training the most do not attend

Some organizations spoke of frustration with attempts to reach out to the fishermen who most adamantly resist safety training. Some organizations and instructors find that fishermen who attend trainings, especially if not required by regulations to attend, are the ones who already are involved in a safety culture and already know of the steps they need to take to avoid risk and manage

emergencies. On the opposite end of the spectrum, organizations find that the fishermen who are the most difficult to get into a safety training are often the ones who need it the most. NPFVOA referred to a region of the Washington/Oregon coast that has a large number of accidents and injuries and has been a target for outreach for several years. NPFVOA has reached out to fishermen in that region and offered safety trainings free of charge with little success.

FUTURE IMPROVEMENT

The interviewees were asked about their thoughts on how safety trainings could be improved in the future. There was a lot of agreement among cases on ways that safety trainings for fishermen can be improved. The subjects of agreement are discussed here.

More accessibility

Suggestions for the future often involve a desire to improve accessibility of safety trainings for fishermen. Organizations in this industry believe that safety trainings should be more accessible both geographically and in terms of affordability. AMSEA and Downeast Maritime suggest increased federal funding for safety training programs, so that fishermen do not have to pay out of pocket to attend. They believe that making safety trainings free, or made available at a reduced cost, will alleviate some of the resistance from fishermen and encourage more attendance. Additionally, there is a potential argument that investing in safety training may reduce search and rescue costs down the road by making the fishing industry safer and reducing the need for expensive rescue operations.

Expanding the geographic locations of safety trainings was also suggested as a strategy to improve access for fishermen, and make it easier for them to fit safety training into a busy schedule by putting safety trainings right where fishermen work and reduce the need for travel.

Relevant

Another theme in suggestions to improve upon safety trainings is to make them as relevant to the audience as possible. For MOST, that means adjusting the training programs for the environment they are teaching in. MOST works to make their trainings more relevant by altering the supplemental techniques based on whether they are teaching in cold or warm water conditions. At AMSEA, making trainings relevant means incorporating regional or cultural-specific language into the training or recruiting instructors from certain communities to teach courses to their peers. AMSEA finds that culturally-relevant styles of instruction are more impactful because if an instructor is not familiar with the community then there may be nuances in language that can be misused. For NPFVOA and Downeast Maritime, they use their flexibility as small organizations to bring their trainings to the fishermen's boats, which make the training more relevant to the fishermen by working in their own environment. Each organization works to make trainings relevant to the fishermen and suggestions for future improvement include building on relevance.

Regulations

Across the board organizations pointed to regulations as a subject for future improvement. Suggestions to improve regulations in the future include

developing regulations through the USCG that have been approved by the Coast Guard Authorization Acts, moving from reactive to proactive solutions, and making safety trainings a requirement for more fishermen. Organizations stress the need for USCG regulations to implement approved laws, particularly for certain aspects such as collection of data by trainers and requirements for more frequent Drill Instructor certification renewal. Interviewees also pointed out that new safety-related regulations are often implemented only following an attention-grabbing accident. Therefore, the regulations that are written to promote safety training appear to be reactive. The opinion of those interviewed is that new regulations should be written proactively, based on research or input from people in the field. Making certification a requirement for more fishermen will improve safety as well. The current requirement for federally permitted boats to have drill instruction can be expanded to include smaller boats and those fishing inside of the offshore boundary, which face the same risks of accidents as federally-permitted boats (Commercial F/V Safety Training Requirements, 2012).

Chapter 5: Survey Analysis

This section presents the descriptive statistics of survey responses from the FPSS Safety Training Surveys (Appendix A). The purpose of this analysis stage is to examine characteristics of the participants in FPSS trainings. The results are compared against information gathered in the literature review and case study phases of this research. Groups of fishermen who are identified in the literature review as being particularly at high risk that are represented in the survey results are identified. Additionally, when appropriate, practices identified in the case studies are connected with the survey data.

Survey data was collected by FPSS in spring and fall training seasons through a questionnaire that changed slightly during the time frame. All fishermen who participated in the FPSS safety and survival training complete a paper-based survey at the end of each training before receiving a certification card and other end of day activities. Some questions changed in different versions of the survey across this time period, in line with a developmental approach to evaluation and changes in FPSS learning needs. The data was available for Fall 2013 to Spring 2017 and captured 958 responses during that time frame, which represents nearly 100% of fishermen who attended FPSS safety trainings during this timeframe. The number of survey respondents in each season is listed in Table 3 below. It is unclear what percentage of the larger population of active fishermen within the area is captured by these surveys, because that information is insufficient or

unavailable.. The following charts illustrate the amount of responses to questions on the surveys.

Table 3: Survey observations

Survey Season	# of Observations
Fall 2013	38
Spring 2014	153
Fall 2014	51
Spring 2015	220
Fall 2015	51
Spring 2016	214
Fall 2016	50
Spring 2017	181

SURVEY RESPONSES

How did you hear about this course?

This question is necessary to quantify the most effective methods of outreach used by FPSS for promoting safety trainings. Out of the nine training seasons with survey data that are examined in this chapter, three of them did not include this question. The five seasons of survey data that did include this question are detailed here.

The responses to the question about how participants heard about the course indicate that FPSS has promoted their trainings through several different outlets, all of which were represented in the responses. Methods that were consistently selected by the most respondents include “Friend, coworker, or captain” and

“Other”. These results resonate with case study findings, in which other organizations identify word of mouth as the most essential method of promotion for safety trainings. Responses for the “Other” category were specified in the survey results, but were too varied to categorize. Typical specifications include the Marine Fishermen’s Forum and the Maine Lobstermen’s Association, which are events that FPSS staff attends to conduct outreach with individual fishermen via tables and 1:1 conversations. Table 4 presents the percentage of responses for “Friend, coworker, or captain” and “Other” and illustrates that these two options together make up the most frequently cited promotional methods. Figure 2 presents the percentages of responses for other options to the question.

Another aspect of interest in this data is the growth of Facebook as a selected response, indicating that is becoming a more effective promotional tool for fishermen. From Fall 2013 to Spring 2017, the respondents selecting Facebook as where they heard about the course had risen consistently from 2.1% to 8.2%. This increase implies that social media platforms such as Facebook are being used more and more as a source of information. However, it still does not appear as effective as the word of mouth or “Other” categories, as can be seen in Figure 2 below.

Table 4: Selected responses from “How did you hear about this course?”

	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017
Friend, coworker, or captain	1	30	24	104	25	84
Percent of Total	2.17%	32.97%	39.34%	36.62%	33.33%	38.53%
Other	13	16	4	27	5	33
Percent of Total	28.26%	17.58%	6.56%	9.51%	6.67%	15.14%

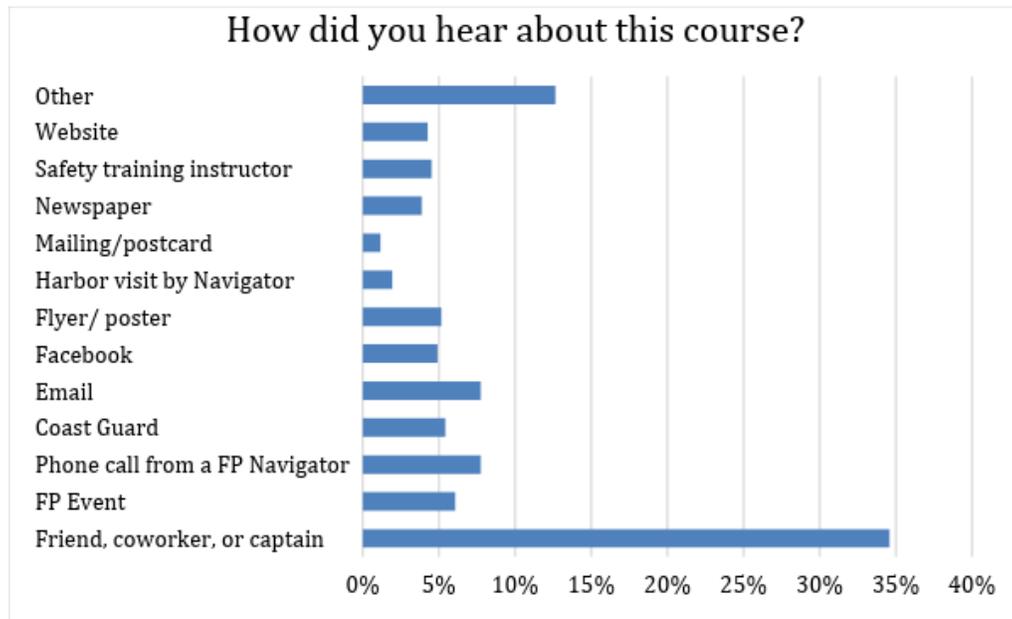


Figure 2: Chart of total percentages from “How did you hear about this course?”

How many years have you been fishing?

All surveys through Fall 2013 to Spring 2017 included the question of how many years the respondent has been fishing. It is interesting to note that in each season, the majority of fishermen report having been fishing for more than ten years. The greatest percentage of respondents reporting fishing for over ten years was in Spring 2015. This result appears to reflect a sentiment from the case studies, which pointed out that fishing communities are seeing their working fishermen get older, with fewer fishermen in the younger generation taking over the work for them. Figure 3 illustrates a comparison of responses to the question, “How many years have you been fishing?” and shows that most respondents in each season had been fishing for more than ten years.

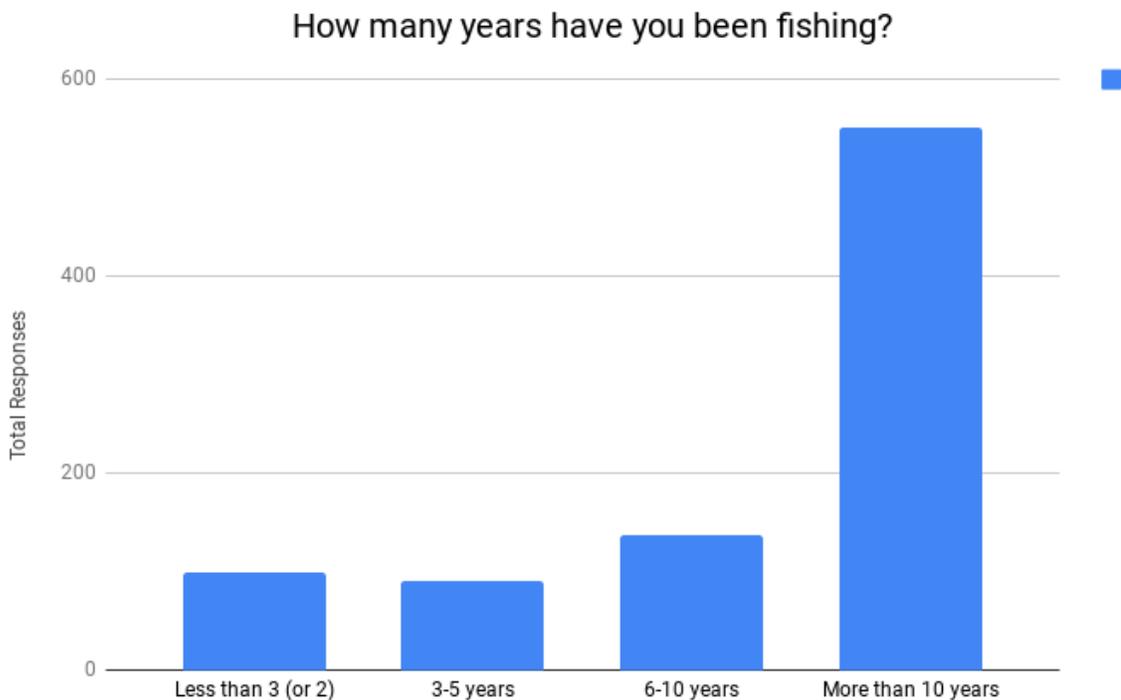


Figure 3: Comparison chart for responses to “How many years have you been fishing?”

In which fisheries have you worked in the past five years?

All surveys included questions requesting respondents to list the fisheries in which they have recently worked. Earlier surveys asked which fisheries respondents have worked in the past three years, and these responses were grouped in with responses for the later surveys which asked for fisheries worked in the past five years.

The results show that the most common fisheries worked by fishermen attending FPSS trainings are lobster and groundfish. These fisheries are the most common in the Northeast, based on studies by NOAA (2017). Lobster and groundfish are also two fisheries associated with the highest fatality rates among Northeast fisheries and so it is appropriate that fishermen working in lobster and groundfishing attend trainings. Figure 4 below illustrates the responses the responses to this question for each season.

The data also appear to show that there is a seasonal variation. It has been observed that safety trainings held in the spring attract a larger audience as fishermen are preparing for the fishing season, as opposed to trainings held at the end of the season in the fall. Additionally, any variation in fisheries represented by training participants indicates that fishermen in certain industries may be more likely to attend trainings in certain seasons.

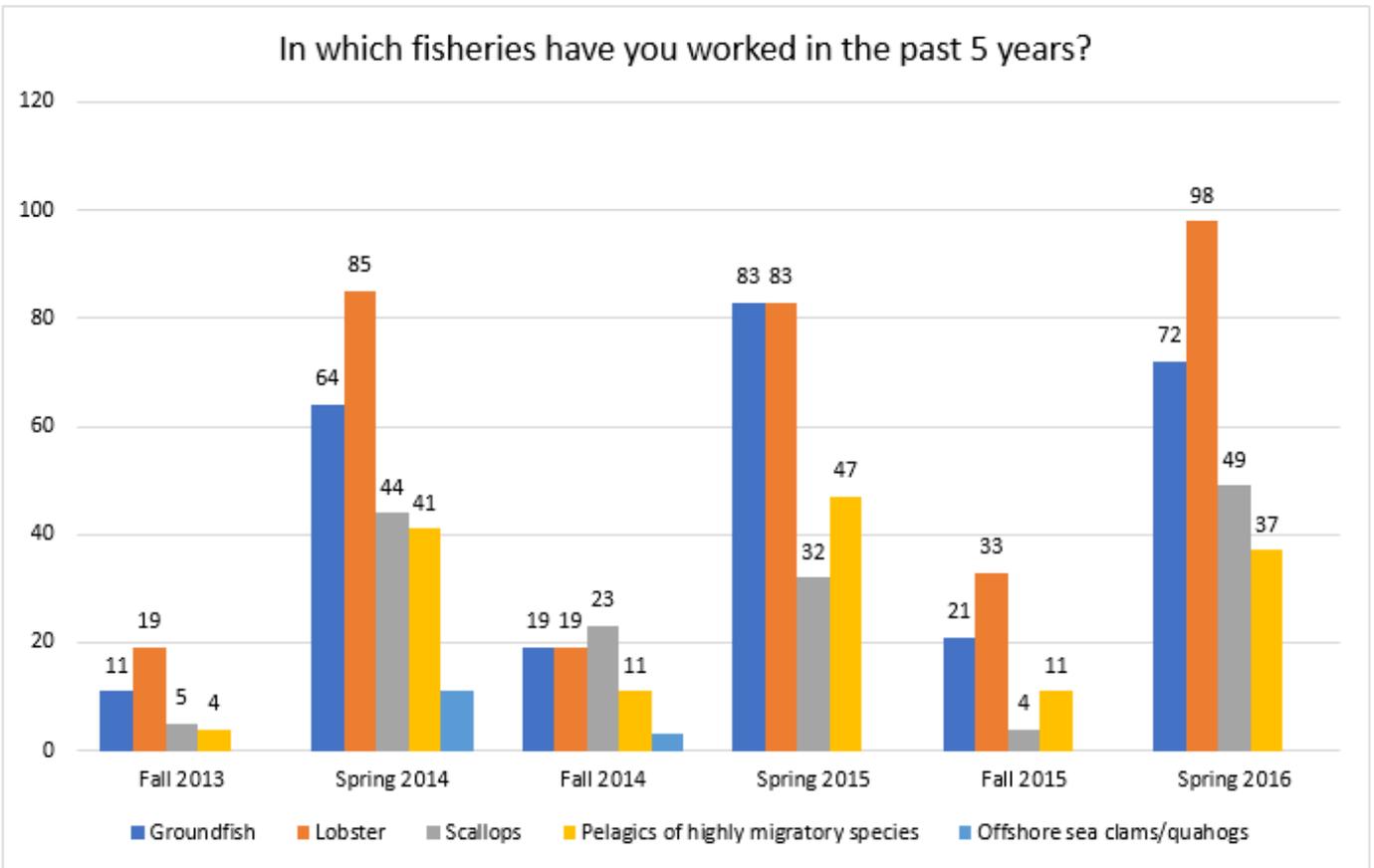


Figure 4: Comparison chart of responses to “In which fisheries have you worked in the past 5 years?”

Which of the following have you experienced in the past five years?

A question on the surveys asks fishermen to identify situations they have experienced at work, out of a list of potential options (Figure 5). Of the options presented, those most frequently chosen in the total of all seasons had to do with injuries. More than a quarter of the fishermen (27%) reported that they had “Seen an injury on a vessel or on the dock” and 18% reported that they had “Been hurt on the job”. This response corresponds to studies of injuries among Northeast lobster fishermen, which found that injury rates in lobstering are much higher than the

injury rate for all fishing and hunting occupations, at an injury rate of 49.7/100 FTE as compared with 2.1/100 FTE (Fulmer et al., 2016). The types of injuries or whether treatment was required are not described. Fewer fishermen report life threatening accidents or man overboard situations, but the amounts are still alarmingly high.

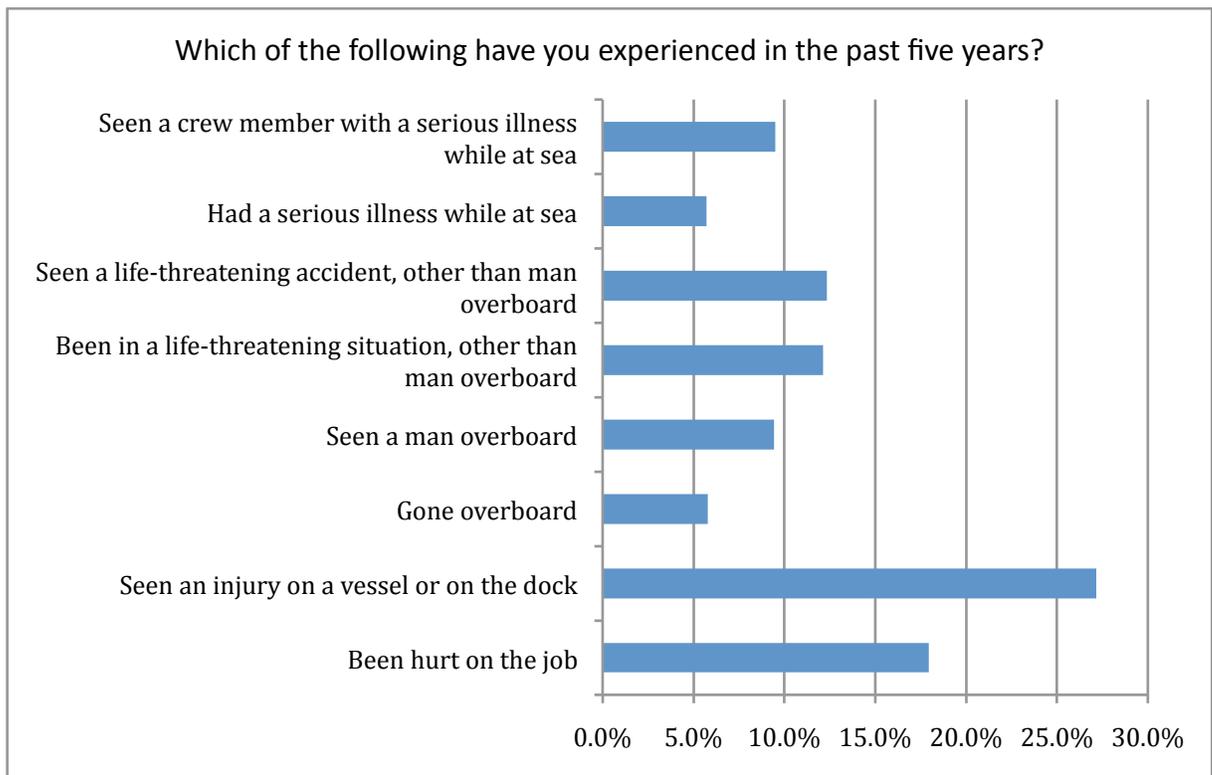


Figure 5: Chart of total responses to “Which of the following have you experienced in the past five years?”

Have you ever had a coworker who died in a fishing accident?

Additionally, the surveys ask fishermen if they have ever had a coworker who died in a fishing accident (Table 5). Overall in Fall 2013 to Spring 2017, there were 16% of fishermen who did lose a coworker in a fishing accident. By training

season, the percentages of fishermen who had a coworker who died in a fishing accident varied from 10.2% in Fall 2014 to 20.75% in Spring 2014.

Table 5: Percentage of responses to “Have you ever had a coworker who died in a fishing accident?”

	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017
No	86.49%	77.40%	87.76%	78.77%	84.00%	81.46%	85.42%	85.31%
Yes	13.51%	18.49%	10.20%	20.75%	14.00%	16.59%	14.58%	12.43%
I don't know	0.00%	4.11%	2.04%	0.47%	2.00%	1.95%	0.00%	2.26%

SUMMARY

This chapter provides an examination, through the course evaluation survey data, of who has been attending FPSS safety trainings. The results have consistently corresponded to information gathered earlier in the literature review and case studies chapters. In the absence of information on the larger population for comparisons, conclusions can be drawn about the survey data by comparing it to the themes identified in earlier research. The observations from the survey data analysis provides valuable insight into how the the FPSS trainings compare with other organizations and those insights contribute to the final recommendations.

Chapter 6: Discussion and Recommendations

The following recommendations are based on a synthesis of the information gathered through three research methods used for this thesis, which are the literature review, case studies, and survey data analysis. Themes that were connected across multiple research methods have been identified and are described here as recommended areas for focusing attention and resources. When appropriate, the recommendations can be addressed to FPSS, other organizations committed to the health and safety of fishermen, or the Northeast fishing industry as a whole.

REGULATIONS

Regulators around the fishing industry play an essential role in promoting safety for fishermen, because the regulations can make better safety a requirement to work. The history of regulations around safety trainings were reviewed in the literature review and suggestions for improved regulations were mentioned repeatedly in the case study interviews. Of the various ways that regulations could be enhanced, there are a few opportunities for improvement within safety regulations for commercial fishing that appear from the research to be more feasible and should be addressed.

The current regulations that require safety training for fishermen only apply to fishermen on federally documented boats and not on other, state registered, commercial fishing boats and only those operating outside the three mile boundary line. According to an interview with Ted Harrington from USCG

District 1, the difference between federally documented boats and boats that are not documented is based on volume and does not correspond to any difference in safety or risk. The regulations should be revised by USCG to require safety training for more fishermen. The USCG has been provided with the authorization to enact these regulations that have the potential to improve safety through the 2010 Coast Guard Authorization Act, so it is essential that USCG implement their authorization through these regulations.

Additionally, it is possible for safety requirements to be implemented on the state level and it would be beneficial to do so, based on the model set by the Maine Lobster Apprenticeship Program. As discussed in the literature review and referenced in the case studies, the state of Maine Department of Marine Resources requires every fisherman in the apprenticeship program for lobster licenses to complete safety training. This program has been seen as successful in elevating awareness of safety skills. In the absence of improved federal regulations, more comprehensive regulations can come from the state level as a requirement for licenses.

DATA COLLECTION

Throughout research, access to data and whether data has been collected or not, was a prevalent theme that can be examined as an area for future improvement. Strong and reliable data sources can serve multiple purposes for safety in commercial fishing, such as providing a basis for comparisons and measurement of progress or areas of need.

The data collected by FPSS through post-training surveys appears to be beneficial and that effort should be continued. The data serves to quantify the characteristics of fishermen attending the trainings, measure the success of the program, and can be used to collect input from fishermen for consideration on how the trainings can be improved. According to the case studies, other organizations such as AMSEA and NPFVOA use data to track the fishermen that have attended safety trainings and identify ways to enhance their trainings through modifying the teaching methods based on feedback or outreach to communities of need if they are not being represented in the data. This effort is already undertaken by FPSS and should be continued.

There is also data that is collected through NIOSH, which could be improved. Presently, NIOSH collects information and produces reports on fishing fatalities. This information is critical in identifying hazards and finding ways to reduce tragic deaths. In addition to collecting this information, NIOSH should collect data on injuries as a way to target the hazards causing injuries for fishermen at work. According to the survey data collected by FPSS, 27% of the fishermen surveyed had seen an injury on a vessel or on a dock in the past five years from the time of survey and 18% had been hurt on the job themselves. However, the type of injury, the source of the injury, and whether or not the injury required treatment are not captured. Collecting this information through safety training surveys would create a longer survey, which would likely reduce the number of participants willing to fully respond to the surveys. It would be more appropriate for NIOSH to collect this information, starting at least with injuries

that are reported through health care records. By collecting data on injuries, safety trainings can be adjusted to address the hazards causing these injuries as well.

ENGAGEMENT AND PROMOTION

An objective throughout the research has been to identify strategies to improve engagement and promotion of safety trainings that can be used by FPSS and other organizations. There have been observations that have emerged through the case studies and the survey analysis as important areas for focus in regards to promoting safety training courses and engaging fishermen in safety.

Recommendations related to that theme are described here.

The FPSS survey results indicate that out of the methods through which fishermen can hear about the safety training course, Facebook is becoming a more effective mode of promotion among fishermen than it used to be. As a recommendation for improving promotion of safety training courses, FPSS should make more of an effort to bolster their social media presence. FPSS can model a strategy used by AMSEA, which was described in the case studies. AMSEA uses Facebook to post articles about topics that are of interest to fishermen, which establishes the AMSEA Facebook account as an informational resource with the hope of then making promotions about safety training courses more likely to garner attention.

Another recommendation for FPSS to promote their safety training courses is to increase targeting efforts to younger fishermen and young people in fishing communities. The FPSS survey results to the question of how long

respondents have been fishing indicate that the majority of fishermen attending FPSS trainings have been fishing for more than 10 years. This result may be due to a disproportionately older population of working fishermen and less young fishermen, as was observed in the case studies, and not due to a lack of success for FPSS promotion among younger fishermen. Nevertheless, the case studies suggest that other organizations are actively reaching out to younger fishermen and find it worthwhile. Both Downeast Maritime and AMSEA have been involved in active promotion of safety training in school-aged children in fishing communities by offering training programs through schools. In order to foster better safety practices for the next generation of fishermen in the FPSS service area, targeting young fishermen may be worth pursuing.

ACCESSIBILITY

Another prevailing theme to be discussed is accessibility of safety trainings for fishermen. Topics revolving around accessibility were observed in both the literature review and the case studies. Possible options for improving access for fishermen are detailed further here through recommendations for FPSS and Northeast state governments.

Case interviews established that safety trainings can attract and engage a larger audience by working on improving cultural relevance. At AMSEA, this takes the shape of having instructors based out of the same communities that they are working in, who are able to connect training activities to local knowledge with culturally appropriate language. This is confirmed with research of effective,

culturally relevant safety trainings for Vietnamese Gulf shrimp fishermen, which is detailed in the literature review. FPSS already uses a community health model, by employing Navigators from within the community who are present during the training. Other safety training providers could benefit from this type of model. To promote culturally accessible safety trainings, FPSS should continue to use the community health model and share that strategy with other organizations.

In addition to cultural accessibility, a need that was identified in the case studies and the literature review was geographic and financial accessibility. AMSEA, NPFVOA, and Downeast Maritime all referenced affordable and geographically accessible trainings as an area of future improvement for safety trainings. FPSS already offers safety trainings free of cost to fishermen, and so this recommendation is for state governments to devote funding to all safety training providers so that trainings can be offered affordably for all fishermen. Additionally, increased funding may potentially allow the resources to provide safety trainings at more locations, and improve geographic accessibility for fishermen. Inaccessible locations were mentioned in the case studies as a reason cited by fishermen for not attending safety trainings, and so expanding access on a geographic front is another opportunity to improve safety training availability for fishermen. Increased funding is a necessity for this industry, in the absence of the safety oversights regulated by government in other industries.

LIMITATIONS

The recommendations provided here are meant to serve as potential options for devoting resources and attention that have been backed up by research. They are not a comprehensive list of improvements that are necessary to alleviate the dangers associated with commercial fishing. The intention has been to identify areas for development that have also been confirmed through the research methods as having potential to advance safety. The recommendations have been structured around the specific conditions for FPSS and the Northeast area, and so may not be applicable beyond the Northeast. Likewise, suggestions that have been based on case studies from different organizations may not translate in separate conditions. However, the recommendations presented here have been triangulated through the research and are worthy of consideration when examining potential options to improve safety trainings.

Another limitation of the analysis was a lack of data on fishermen to serve as a comparison with the FPSS survey data. An original intention of this thesis was to identify any groups of fishermen from the larger population who were not being represented in the FPSS group. However, the data on the larger population is not sufficient to make that comparison.

Additionally, the case study analysis would have benefited from a larger selection of organizations. Having more case study information to draw from in the cross-case comparisons would have ultimately bolstered the recommendations. The selection was limited to four organizations due to the

criteria of similarity with FPSS based on location or non-profit status and further limited based on availability of connections.

FUTHER RESEARCH

The research presented in this thesis could be advanced in several directions. One avenue for future research is related to the limitations described earlier. Further research on the commercial fishermen population in the Northeast would be a benefit to any other studies that seek to examine groups of fishermen as compared with the greater population. This issue has been identified in past research, and there have been attempts to quantify characteristics of fishermen. However, the potential for useful research on fishing populations remains apparent.

Another productive avenue for research may be a cost-benefit analysis on the cost of safety training for fishermen compared with the cost of employing USCG resources to assist vessel accidents and conduct search and rescue procedures. Early on in the process of this thesis, a cost-benefit analysis was considered as the focus of this research but was not pursued. However, such research may be utilized to promote some of the recommendations suggested as part of this thesis, such as the recommendation for more regulatory support of safety trainings.

Any further research on the difference in effectiveness among style and structure of trainings would also be useful to safety training providers. Safety courses can vary from one to another by style of education, such as hands-on or

lecture techniques, duration of training modules, or the setting in which courses are taught. Research to document the effects of learning associated with these differences would be useful.

CONCLUSION

Commercial fishing plays an essential and respected role in local economies yet fishing communities are faced with pervasive challenges. The risk of injury and fatalities associated fishing is a distressing issue but one that can be addressed. There have been notable advances in improvements for safety in the industry, including an active and focused effort to promote and require safety training for fishermen in the past few decades as a way to prepare fishermen for the risks associated with their occupation. This thesis reviewed the history of fishing safety training, as well as the current state of research on variations in risks for fishermen, the effectiveness of safety trainings, and different policies related to safety training. The information gathered in the review was joined with a cross-case comparison of four different organizations providing safety trainings, along with an analysis of survey data collected from fishermen by FPSS.

Through the three methods of research identifiable themes emerged that serve as foundations for considering how to enhance safety training programs in the future. Through the case studies, it was clear that while each organization faced different circumstances in terms of service population and resources, there were common themes of success and challenge faced by organizations with regards to promoting courses, engaging fishermen, and adapting their programs.

Lessons learned through the case studies were instrumental in analyzing the FPSS data. Through the data analysis it was possible to apply some of the information gathered in the other research methods into the examinations of survey data, to look for noteworthy trends, such as the age and experiences of training participants. The recommendations that were presented are the result of synthesizing information from the three methods of research.

The fishing industry in New England as a whole has the potential to thrive if supplied with the appropriate support from its community and its government. The threat to safety inherent in fishing can appear overwhelming but when we look at the progress that has been made we can see that even though commercial fishing is inherently a dangerous occupation, improvements in safety are attainable. The active work of proponents for fishermen and the fishing industry has considerably advanced the fishing safety and the effectiveness of trainings that facilitate safety. With more attention given to the potential for safety trainings to save lives at sea, fishermen and fishing communities can confidently enjoy the health, well-being, and security that they deserve.

Appendix A

Interview Questions for Organization Representatives

Background Information

1. Where is your organization located? What region do you serve?
2. What is your role at the organization? How long have you worked there?

Outreach Strategies

3. How many staff are employed by your organization? Are there employees devoted to outreach?
4. How many safety trainings are offered by your organization each year?
 - a. About how many people attend each training/year?
 - b. Are there more younger or older fishermen attending?
 - c. Are there more captains or hired workers attending?
5. What methods does your organization use to advertise safety trainings? (Social media, newsletters, etc.)
6. How are you measuring success for your safety training program? Based on your criteria, do you feel that the program is successful?
7. Has your organization faced any challenges to bringing fishermen to the safety trainings? How have you overcome those challenges?

Training Components

8. What kinds of trainings are offered by your organization? Why?
9. What skills are covered in safety trainings
10. At what time of the season are your trainings offered?
 - a. At what time of day?
 - b. Why?

11. Are there any features of the trainings offered by your organizations that are different than training programs offered elsewhere?
12. In what ways have your trainings changed over time?
 - a. How did you recognize the need to change?
13. How do you conduct your trainings to overcome the issue that many fishermen do not acknowledge the high risk associated with fishing?

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