The Use of Personal Flotation Devices in the Northeast Lobster Fishing Industry: An Examination of the Decision-Making Process

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

Abstract
Background *This study explored perspectives of Northeast commercial lobstermen regarding the use of personal floatation devices (PFDs). Researchers sought to identify factors contributing to low PFD use, and motivators that could lead to increased use of PFDs.*

Methods *This qualitative research (n=72) included 25 commercial fishermen who participated in in-depth, semi-structured interviews, and 47 attendees of Lobstermen's meetings who engaged in focus groups.*

Results *The results showed substantial barriers to PFD use. Fishermen described themselves as being proactive about safety whenever possible, but described a longstanding tradition of not wearing PFDs. Key factors integrally linked with the lack of PFD use were: Workability, identity/social stigma, and risk diffusion.*

Conclusion *Future safety interventions will need to address significant barriers to PFD use that include issues of comfort and ease of use, as well as social acceptability of PFDs and reorientation of risk perceptions related to falls overboard.*

Keywords: personal floatation device, falls overboard, drowning, occupational health, commercial fishing safety.

INTRODUCTION

Drowning is the leading cause of death among commercial fishermen in the United States and often occurs after a vessel disaster or a fall overboard (Lincoln & Lucas, 2010). Commercial fishing has had one of the highest fatality rates of any occupation. From 2000-2013, a total of 665 fishermen died, 336 from vessel disasters and 198 from falling overboard. None of the victims who died from falling overboard were wearing a personal flotation device (PFD) (NIOSH, 2010).

Poggie and Pollnac (Pollnac et al., 1995, Poggie & Pollnac, 1997) assert that many fishermen believe danger affects *other* careless fishermen, presenting what the authors term the "denial and trivialization" of risk. While they may deny their own personal risk for an injury or accident, Northeast U.S. fishermen are most concerned about falls overboard vs. other dangers

(e.g., fires). Yet, self-reported PFD use by fishermen attending safety training courses in Massachusetts is fairly low with 78% across fisheries and 84% of lobstermen (n=19) reporting not wearing a PFD (n=186). While PFD use is low, these fishermen believe that on a scale of 1-10 (with 10 being most dangerous), fishing is a 7.8 (Pinto, 2014).

Similar contrasts between perceived risk and safety were noted in a study of risk perception among Norwegian offshore fishermen (Bye & Lamvik, 2007). In this study, participants described potentially fatal close calls, emphasizing the story vs. the potential consequences, indicating the story took priority over reflections on safety or risk reduction. The authors theorized that commercial fishermen may perceive a lack of control, making personal protective equipment (PPE) inadequate in a context of inevitable danger.

In New England, 61% of lobstering fatalities occurring between 2000 and 2009 were the result of a fall overboard (NIOSH, 2010). Although prevention of these events is preferable, wearing a PFD greatly increases the probability of survival (Jones, 1999; NIOSH, 1993; NTSB, 1993). Regular PFD use is important, as falls overboard occur without warning, i.e. slipping, rough weather, or entanglement. In cold water, PFDs are particularly useful, as victims are often quickly incapacitated by cold shock (an automatic gasp response, which occurs from the shock of the cold water), swimming failure (muscles and nerves lose the ability to make meaningful movements), or eventually, hypothermia (Brooks et al., 2005).

Some companies and vessel owners do require PFD use, but there are no federal or state PFD requirements. Little research has been performed in New England fisheries on the subject of PFD use. Studies in Alaska indicate resistance to PFD use, yet other research suggests PPE use, such as PFDs, may be more acceptable when workers have input on PPE design (Mayer and Korhonen, 1999). A National Institute for Occupational Safety and Health (NIOSH) study

(Lucas et al., 2012) conducted in Alaska distributed PFDs to fishing workers to evaluate a variety of commercially available models in actual working conditions. Researchers identified barriers to PFD use including discomfort and concerns regarding entanglement (ibid.). Some PFDs received high scores for comfort, and their evaluations stayed consistent over time as they continued to wear them. Workers' opinions and requisites for PFDs varied by fishery type (crabbers, longliners, gillnetters, trawlers), but all identified at least one acceptable PFD. This study affirms the need for tailoring PFD solutions to fishery type.

A related survey of Alaskan fishermen found 64% of fishermen using longline gear (longliners) and 55% of fishermen using gillnet gear (gillnetters) never wear a PFD (Lucas et al., 2013), even though the highest falls overboard rate occurred on longliners (48%) and the highest perceived susceptibility to falls overboard came from gillnetters. Experiences, risk perceptions, and willingness to wear PFDs also appeared to vary across fishery type (ibid.).

Based on these studies, it appears essential to explore the culture, values and experiences of particular fisheries in order to design PFDs that will be most useful to end-users. The intersection of fishing 'culture' and safety has been explored previously by researchers in gulf states working with Vietnamese fishermen (Carruth et al, 2010) This study seeks to expand the understanding of how culture, personal beliefs and experiences impact safety decisions, in general, and regarding PFD use specifically, in the commercial lobster industry. Research questions included the following: What factors influence the decision to wear or not wear PFDs? How do these factors work together to support or dissuade PFD use?

METHODS

Qualitative methodologies are particularly well-suited for exploring participants' motivations, past experiences and the interpretation of these experiences (Strauss & Corbin, 1998). By analyzing fishermen's discussion of safety practices, fishing conditions, and risk history, researchers aimed to identify factors that contribute to low PFD use and factors that could be altered to increase use of PFDs.

Study Sample

This study explored perspectives regarding PFD use on Northeast commercial fishing vessels (Table I and Table II). Because PFD issues can be fishery-specific (Lincoln et al., 2010), the authors narrowed the scope of this study to lobstermen, who account for the largest proportion of falls overboard in the Northeast.

[Insert Table I]

[Insert Table II]

Sampling strategy. Initial participant recruitment was coordinated by Fishing Partnership Support Services (FPSS), located in Massachusetts. FPSS is a non-profit organization that provides a wide range of health, safety, and wellness programs to commercial fishing families in New England. Participants were drawn from a FPSS database of Massachusetts and Maine fishermen, who had participated in a safety course and volunteered to participate in future interviews. Following these initial interviews, additional participants were recruited via participant referrals, lobster association meetings, dockside visits, and local service providers. Participants had varying degrees of safety training, years of experience and fishing preferences (inshore and offshore).

Human subject protections. The Mary Imogene Bassett Hospital Institutional Review Board approved this study. Before each interview, researchers provided information about the study and asked for signed, informed consent. Participants received a $20 gift card for their time.

Data Collection

Interviews were conducted by (*name removed*), in conjunction with (*name removed*) and (*name removed*). Interviews took place at a location of the fishermen's choice: on their boat, at their home, a café, or on the dock. Interviews were typically under an hour and were audio-taped and transcribed verbatim. Researchers provided an overview of study objectives and most fishermen agreed to be interviewed (98% response rate). Interviewers used a semi-structured question guide that explored fishing history, safety practices, perceptions of risk, fishing culture, prior falls overboard experiences and disposition toward PFDs. Samples of questions are provided in Table III.

[Insert Table III]

As interviews proceeded, researchers adapted the guide to explore gaps in understanding and emerging themes. For example, a detailed explanation of the practical and comfort-related barriers to wearing PFDs emerged in initial responses. Underlying contextual and societal factors appeared equally important, but were harder to clarify. As a result, interviews shifted to focus more on societal norms and how risks / near-death experiences impact PFD use. Several participants mentioned an offshore captain who mandated PFD use on his boat. This individual was contacted in order to identify potential factors that could explain this deviation from the PFD norm.

Data Analysis

A grounded theory analytical framework was used to analyze transcripts, as the purpose of the study was to develop a theory of how risk is negotiated and how safety decisions are made among Northeast lobstermen. Grounded theory is used to develop explanatory models that depict prominent constructs and their relationships as they pertain to particular behaviors. It is an inductive method that requires the coding of important sections of transcript, the grouping of codes into categories and the exploration of relationships among categories.

Following each interview, transcripts were coded using QSR NVivo 10. The Project Coordinator assigned codes to text, while the Principal Investigator and other members of the research team reviewed the assigned codes and negotiated emerging categories. As interviews proceeded, emerging categories were explored, the boundaries of categories were defined and relationships among core categories were assessed. Interviews were conducted until novel ideas or patterns ceased to emerge. A research diary and memos were used to track sampling decisions, changes to the moderator's guide, emerging categories, and questions to be explored in subsequent interviews. The diary and memos were used by the research team to facilitate negotiation and discussion of results. This process continued until a theory of PFD use, risk and safety decision-making processes developed.

RESULTS

Providing Context: Current Safety/Risk Practices Among Northeast Lobster Fishermen

In order to provide context regarding the PFD decision-making process, it is important to outline the safety activities that are undertaken by commercial fishermen, in order to compare these to decisions regarding PFD use. In interviews, fishermen described several types of routine safety activities. These included:

Vessel maintenance. Maintenance was largely aimed at keeping the fishing vessel functioning reliably. Activities included checking and maintaining the engine, pumping the bilge, keeping the deck clean and checking the weather. These practices were seen as common-sense considerations and key to economic success and survival.

> *I'm always, always checking everything; always taking preventative measures to not break down and not have injuries on the boat...It's monitoring everything and keeping your eye on everything, especially the maintenance with the engine….*

Extra-initiatives. In addition to maintenance, the fishermen took extra initiative to make their lives safer / easier by adding individualized safety features. Activities ranged from simple, inexpensive solutions such as a line overboard to facilitate re-boarding the vessel in the event of a fall overboard, to more complex or expensive changes that involved modifying the boat, e.g. with ladders, life slings, or rope lockers.

> *One improvement we did with it is we put a, where the line comes in around the hauler and it falls down on the deck, we put a hole there so the line goes in the hole… That way you're not standing on rope all day.*

Government-regulated safety. These safety activities included vessel drills, the provision and maintenance of life rafts, flares, fire extinguishers, PFDs, survival suits, and other required activities. For most fishermen, regulations were not viewed favorably, even when the fishermen noted that the safety equipment could be helpful. Fishermen described the regulations as being either excessive (adding to the existing difficulties of fishing) or too expensive (to purchase and maintain), both of which create additional stress: *"It's quite a bit. It's at least a $1000 to $700 a year. All your little bells and whistles for your survival box there that you have, the lights, the flares, all those things, the EPIRB."* * Emergency Position Indicating Radio Beacon*

In discussions of general safety activities taken and not taken, fishermen described a variety of factors which included how habitual the activity is (*Can I do it without thinking about it?*); as well as economic and time concerns (i.e., *How much does it cost? Will it improve efficiency or make work more difficult*?).

The PFD Dilemma

In relation to PFDs, lobster fishermen described a longstanding tradition of never wearing PFDs and most participants were skeptical that this would ever change, despite the fact that many had taken safety trainings. Many also reported having falls overboard and shared stories of close friends, coworkers and family who were lost at sea. As one captain described: "*We had a fellow here (name removed), must have been 15-20 years ago, fall overboard and we lost him. Never found his body. Found his boots but never found his body. That didn't get people to wear a PFD"*.

While exploring the paradox between exposures to these experiences and lack of PFD use, three over-arching primary themes or categories emerged. These included *workability, social stigma/identity, and risk diffusion.*

[Insert Table IV]

Workability. Fishermen universally stated that PFDs are not comfortable and interfere with work, creating a considerable barrier to use. Fishermen also indicated concerns that PFDs increase entanglement risk and that new, improved PFD designs were too costly to consider (Table IV).

Comments regarding PFD utility did not appear to be informed by experience with recent designs as most had never tried the newer inflatable or built-in raingear PFD styles, let alone

worn one while fishing. For the most part, comments were based on speculation, hearsay or on seeing observers or US Coast Guard wearing PFDs: *"I don't even have one. I don't have one aboard the boat. I tried one years and years ago. I see the observers come aboard and they put theirs right over their oilskins and they can't even move."*

Identity/social stigma. It was striking that fishermen universally and immediately described independence and freedom as prominent reasons for why they chose fishing as a career. Responses included the general culture *"it's an independent lot..."* and their own identity, *"[What] I like the most about it, [is] that I'm responsible for producing something and I see the direct results of my work"*. Independence and freedom also figured prominently in conversations about PFDs: *"I don't even wear an oilskin jacket because I like to be free to move around."*

This freedom translated to a physical feeling of wellbeing during fishing, of fishing with the least restriction and being autonomous. They described PFDs as an encumbrance and spoke of a long tradition and habit precluding PFD use: "*I don't know anybody that wears them.*" Some fishermen were surprised when asked about wearing PFDs, as if the longstanding social norm led to a default assumption that PFDs are not worn.

Freedom was also discussed in terms of safety regulations: fishermen were wary of being told to wear PFDs by the government and viewed their current safety methods as sufficient. To many fishermen, wearing a PFD should be a personal choice, based on their personal priorities. Fishermen also indicated it would be embarrassing to wear a PFD and that only children or 'green' crew wear them. Unlike other safety items that can be stored out of sight until needed, a PFD is constantly visible, and can be socially stigmatizing. Although many fishermen said they would not judge another man who wore a PFD, they also used language that implied they would be seen as incompetent, if they wore one. As one captain said, if he wore a PFD in the

wheelhouse other people would look askance, thinking: "*He [has] lost it. I don't know if I want to work for him anymore. The only way he's going to drown is if the boat goes down."* This was also reinforced in discussions of why someone else *should* wear one. As one captain said: "*I know a guy that's gone over twice, 2 or 3 times now, tying down the pots. He pulls on the rope and the rope let go on the other end and he's gone over a couple of times. He's kind of clumsy so he should wear one anyways just 'cause."*

Superstition was also given as a reason that fishermen don't wear PFDs. Participants said the act of putting on a PFD could be viewed as inviting bad luck: *"If they put it on then that means something might happen. Fishermen are very superstitious."*

Contradictions were often seen in discussions of how PFD use relates to individual identity and social culture. For example, one captain said: *"I don't think it's so much comfort as it's just something, it's a macho thing"* but as he continued to reflect aloud about reasons, he went on to say, *"I don't think that the macho thing is that much of a big deal. I think it's [PFD] just another piece of equipment that will get in the way. If it could be incorporated where you don't have to think about it and you don't see it then it would work."*

One exception to the trend in social acceptability of PFDs came from a husband and wife fishing team. Following a boat explosion, which resulted in severe burns for the husband, they embarked on aggressively preparing for other unexpected risks and encouraged each other to stay safe and alive. During bad weather, these two captains wear inflatable PFDs. One other exception was a captain who wore a PFD briefly after she had knee surgery. All other participants reported never wearing a PFD, not even when fishing alone, at night or in bad weather.

Risk diffusion. Fishermen acknowledged the dangers of commercial fishing; however, they also stated that, *"you'd never go fishing"* if you dwelled on risks too much*."* Participants described ways of coping with or reconciling these risks, (i.e. either *managing, accepting or avoiding thinking of risk*) and how these relate to PFD use. These coping mechanisms allowed fishermen to feel that they didn't need PFDs and to avoid thinking about the risks of drowning (see Figure I).

[Insert Figure I]

Managing risk. Many fishermen listed various ways of managing their risk for falling overboard, which included safety in numbers, type of boat and stern design, fishing during the summer, the physical location in the boat (working in the cabin), and inshore fishing location as methods for eliminating the need to wear a PFD.

Accepting risk. Discussions of falls overboard also revealed a fatalistic view that some accidents cannot be prevented and that sometimes PFDs will not save you from dying. Examples included: a rope around a leg, falling overboard when alone, falling overboard in winter and circumstances where fishermen would not be able to re-board the boat. These were all given as examples of accidents that 'just happen,' even for experienced fishermen. Fishermen acknowledged that as much as they try to manage risk, an accident can occur:

> *Even the most experienced person, multiple forces can come into play to make something happen and there's nothing that you can do about it. It doesn't matter how much sea time you have or how strong you are.*

Avoiding thoughts of risk. Fishermen described avoiding thoughts about drowning or speaking about it with others. They felt that dwelling on these risks would impede their ability to work effectively. As one fisherman described, *"Drowning would be the worst way to die--lonely and terrible. I have a terrible fear of drowning. You'd go down, struggle, come back up,*

struggle, take water, go down, struggle, come back up, struggle, go down…" To compensate, this fisherman said, they just avoid thinking about it:

> *I'm just saying. It can happen but do you think about [dying] when you're driving? No. Maybe not too much and maybe if you did you'd say: "It's probably not good for me to think about this so I'm just not going to… It's just a human thing. That's the same whether you're driving to work…or you're working on a boat. You just don't think about it.*

While fishermen regularly employed a mixture of these three coping strategies, many comments were contradictory, reflecting the complexity of working in a profession where risk, and loss, is commonplace.

DISCUSSION

The purpose of this study was to identify barriers and potential motivators to PFD use amongst fishermen in the Massachusetts and Maine commercial lobster fishing industry. Our results indicate key areas of focus for PFD interventions that would include innovative product design and persuasive messaging, particularly in the areas of workability, identity/social stigma, and risk diffusion, all of which appear to impact behavior.

Specifically, the Northeast lobstermen cited fears of entanglement, discomfort, and interference with work as primary reasons for not wearing a PFD. For PFD designs to be attractive, they must consider functionality (e.g., no bulk) with minimal interference in work. These sentiments were also reflected in the research of Davis (2011, 2012) with fishermen in Maine who found evidence of risk denial and the need for improved safety equipment and training for commercial fishermen. This is also congruent with findings from PFD research in Alaska (Lucas et al, 2012, 2013). In the NIOSH study of PFD varieties the highest rated PFD was a low-profile inflatable vest with a rubber coating and soft neck lining. It was designed specifically for commercial fishermen. This PFD was rated highly comfortable by most

fishermen in the different vessel groups surveyed in Alaska (Lucas et al., 2012). In addition to this model, another PFD manufacturer has recently designed a new flotation vest with fishermen in the Pacific Northwest that has a low price point (NIOSH, 2014). Another finding among the lobstermen resembled findings in the Alaskan NIOSH study, which showed Alaska fishermen did not know that new styles of inflatable and raingear- integrated PFDs existed (Lucas et al., 2012). Similarly, the lobstermen were unfamiliar with some innovative flotation gear.

Findings offered by Power (2008) in her study of risk perception among New England fishermen also illuminated the gap between knowledge of risk and safety responsiveness. Her participants valued safety trainings in their discourse but privileged the use of common sense in practice. These sentiments were reflected in the discussions with our participants who prioritized commonsense, being alert and having experience as more essential than a PFD. Similar conclusions were identified in a study by Pollnac and colleagues (1995) with New England fishermen who found favored precautions help them address the dangers of the work, while not being constant reminders of possible drowning. As our study indicates, these proactive safety methods differ from PFDs in crucial ways: they are not worn on the person, are helpful without being an impediment to fishing or comfort, can be done once and then not thought about again, and are socially acceptable within the fishing community.

Discussions of risk and methods of coping with it were also highlighted in a 2007 study conducted by Bye and Lamvik. In this study, researchers observed that Norwegian fishermen appear to downplay risk in order to get the job done and make money. Another study examining stress within the fishing industry workforce found that fishermen have personality traits that allow them to cope with the dangers and risks of their work environment, while embracing their work with zeal (Pollnac et al., 2011).

A dualistic conception of risk expressed in Power's (2008) study and the present study points to the importance of risk messaging. As Power argues, it is essential to bridge the gap between the risks perceived by the workers and the risks perceived by researchers. Several participants in the present study asked the interviewers if they had ever been on a lobster boat, indicating that researchers could not possibly understand the decision to not wear a PFD without having experienced life as a sternman or captain. As such, researchers may need to rely on fishermen to advocate for PFD use with peers.

Lastly, regulation does not appear to be a favorable approach for encouraging PFD use. Not only would this be difficult to enforce, it would strongly compete with fishermen's identity and enjoyment of fishing. As stated by Kaplan and Powell (2000), fishermen need to feel comfortable about contributing information to the government, and that their contributions will not be used against them in a future regulation that they have no significant role in shaping.

Strengths and Limitations

Fishermen readily engaged in this qualitative study, sharing generously of their time and ideas and exploring solutions with us. However, participation focused on commercial lobster fishermen in Maine and Massachusetts, and as such, responses could vary based on other geographic regions or fisheries and may not generalize to other fisheries or locations. This study mainly involved captains. Although many had been sternmen before becoming captains, had fished alone and covered many of the tasks on the boat, there may be unique perspectives to be gathered from interviewing sternmen who rely on their captains for their safety equipment. In addition, several fishermen expressed concerns about regulating PFD use. This may have affected fishermen's comfort in sharing details regarding PFD behaviors.

CONCLUSION

This study identifies several formidable barriers to the widespread and consistent use of PFDs in the commercial lobster fishing industry. In particular, PFDs are widely regarded by lobster fishermen as uncomfortable, costly, and a potential entanglement hazard. In addition, participant discussions identify the discord between what they value as fishermen—freedom—and the use of PFDs, which is also reflected in the lack of peer support for PFD use. Lastly, perceptions of risk and ways of mitigating concerns relating to drowning or falls overboard permit fishermen to continue their work, despite the knowledge that these events are entirely possible.

In conclusion, future PFD interventions will need to devote considerable attention to improvements in PFD design, as well as a reduction in costs. Efforts will also need to focus on repositioning PFD use as a routine part of doing a dangerous and engaging job, something that is consistent with a defined and desired commercial fishing identity.

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Table I Demographic Characteristics of Individual Interview Research Participants

Participant	Male	Female	Total
Captain	20	2	22
Crew	2	1	3
Total	22	3	25

Table II *Demographic Characteristics of Additional Research Participants*

Participant	Male	Female	Total
Key Informant[1]	1	0	1
Group meetings[2]	41	6	47
Overall Total	42	6	48

[1]Offshore captain who mandates PFDs for crew

[2](Removed identifier names for submission)

Table III *Moderators Guide Questions: Sample of Inquiry.*

What drew you to fishing?

What is your biggest priority when you're working on the boat?

What does it take to survive in commercial fishing?

Are you concerned about being injured or killed on the boat while working?

What helps to keep you safe?

Have you ever fallen overboard? What are things you do to reduce this risk?

What would you think if you saw another fisherman wearing a PFD?

Could you name some of the biggest reasons for not wearing a PFD while working on the boat?

Could you name some of the most persuasive reasons for wearing a PFD while on the boat?

If you don’t wear PFD’s on a typical work day, are there ever times when you have chosen to wear one, even briefly, can you describe the circumstances? (winter, nighttime, alone, or in a storm?)

If you were wearing a PFD do you think it would increase your chance of survival?

Are there unwritten rules about safety that everyone follows, like a 'fishermen's code' that you could describe for us?

Table IV *Descriptions of PFDs as Impractical, Unworkable, and Unwanted*

Rationale	Description	Quotations

Comfort	Fishermen described PFDs as hot, uncomfortable, restrictive, and cumbersome. They did not want to add anything to existing gear.	*"Everything's right up close and if you've got something that's pushing your arms out and rubbing under your arms it would drive you crazy* *"No [haven't worn one]. Cause I haven't found one that's comfortable."*
Added risk, impediment to work	Fishermen described ways in which a PFD could increase the risk of entanglement, or of the danger of unintentional inflation. Fishermen felt inflatable PFDs would not hold up under the grueling work conditions on commercial fishing boats, saying abrasion, sun exposure, and wear and tear would all negatively impact PFD reliability.	*"Everything's moving fast."* *"The main thing is getting in the way of the work."*

		"It's just cumbersome."
		"I haven't seen anything that works."
		"If there's a jagged piece of wire it will cut and rip through things."
		"It would get filthy. It would have fish oil all over it. I just don't see them as being practical for us."
Cost	The typical type-I, closed cell, foam PFDs cost around $10. More comfortable work vests cost around	*"Believe me…. we would love to have the best, safe equipment in the world. As long as you make the*

$50. Buying inflatable PFDs or raingear with built-in floatation are more expensive. The cost for an inflatable PFD or one with built-in inherent flotation in gear ranges from $140-250. In addition, inflatable PFDs require inspection, maintenance and replacement.	*money to pay for it. But if the money ain't there…some of these things we're asking for even though they can save our life it's just impossible for us."* *"I guess the best thing is if you can give the vests away."*