

ABSTRACT

Understanding the Risk Perception of Commercial Fishermen

by

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Commercial fishing is indisputably one of the most dangerous occupations in the United States and the world. Due to the hazardous work conditions such as bad weather, the commercial fishing industry is plagued with high amounts of fatal and non-fatal injuries. Safety training is mandatory, but resources are minimal to none in many areas of the United States. The aim of the research is to understand the risk perception of commercial fishermen. Understanding how commercial fishermen perceive risk can help to tailor safety training opportunities to utilize already limited resources. An increased awareness of hazards in other industries has shown to lower injuries from the specific hazard. Therefore an increased knowledge of the fishermen's perceptions of risk may provide valuable information to industry trainers to provide enhanced educational opportunities and training programs for the fishermen. Qualitative methods in the form of semi-structured interviews were conducted with fourteen commercial fishermen from the gulf coast of Florida and inner outer banks of North Carolina. A quantitative survey covering demographics and fishing experience was included with the interviews. Interviews were transcribed and reviewed using thematic analysis to establish reoccurring themes. Results from the research concluded that commercial fishing have heightened perceptions of risk. The fishermen interviewed were all aware of the high risks associated with their profession. Unfortunately common themes such as inexperienced workers, quotas/regulations, and drug use only increase the high risks. In the future training initiatives need to be focused on creating

fishery specific courses, in order to make trainings as relevant to the work environment as possible. Continued research and safety interventions are needed to help lower fatality and injury rates in the commercial fishing industry.

Understanding the Risk Perception of Commercial Fishermen

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by

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Introduction

Commercial fishing is undoubtedly one of the most dangerous occupations in the world. Compared to other industries commercial fishing has a much higher rate of fatal and non-fatal injuries. The International Labor Organization (ILO) estimates that approximately 58 million people worldwide are involved in fishing or aquaculture with 15 million employed full time (ILO, 2016). The ILO reported that commercial fishing “is one of the most challenging and hazardous occupations” with high injury and fatality rates worldwide (ILO, 2016). According to the United States Department of Labor (DOL) reports the fishing industry has an incidence rate of 58.3 per hundred thousand workers (DOL, 2015). This is much higher than the national average of 3.4 per hundred thousand workers. The Center for Disease Control (2015) reported that commercial fishing fatality rates are 29 times higher than the national average. Commercial fishing is second only to logging for the highest fatality rate. The high rate of fatal accidents is caused by the many inherent hazards that are present in most fishing situations. Every time a fishermen leaves port, they are aware of the high risk that is associated with their profession.

The risks involved on a commercial fishing boat are exponentially increased by natural hazards such as large waves and high winds. Climate change is also causing uncertainty for once known weather patterns. Dwindling fish stocks from decades of overfishing are causing fishermen to undertake greater risk (Sumaila et al., 2016). For example going farther offshore to new fishing grounds for longer periods of time are some of the new risks fishermen are facing. One of the major reasons why fishermen accept the many risks associated with the profession is the money. According to the National Oceanic and Atmosphere Association (NOAA) in 2015 an estimated 9.7 billion pounds of fish were caught by commercial fishermen. This amount of product was estimated to be worth approximately 5,236,764,662 U.S. dollars (NOAA, 2016). Commercial

fishing has become safer in recent years through the implementation of new policies that limit the amount of fish boats can catch, most fisheries have adapted safer practices. Such practice might entail not fishing during storms, with the fishermen knowing their livelihood won't be affected by a missed day. Despite policies that limit the amount of fish a boat can catch, very little has been done to mitigate the hazards associated with the industry. New policies such as construction requirements to make vessels safer have helped to lower fatality rates throughout the country, but are not the only solution. The Commercial Fishing Industry Vessel Safety Act of 1988 (CFIVSA) was able to make safety equipment a requirement for fishing vessels. Later, in 2010, the Coast Guard Authorization Act (CGAA) was responsible for making safety training mandatory on all vessels working 3 miles or more off shore. The CFIVSA and CGAA were very successful at lowering fatality rates from vessel disasters (fire, sinking, capsizing). The problem is that while fatality rates have been lowered in the area of vessel disasters other hazards such as falling overboard are proving to be a higher risk. The Center for Disease Control (CDC) compiled information from 2000-2015 on the commercial fishing industry for a report and estimated 725 fishermen perished (CDC, 2015). Of those that died, 221 individuals passed away as a result of falling overboard. In the United States, falling overboard is the second leading cause of the death next to vessel disasters (fire, sinking, capsizing) (CDC, 2015). Falls overboard account for thirty percent of all commercial fishing fatalities. All of those who died from falling overboard were not reported wearing a Personal Flotation Device (PFD). One of the deadliest regions with over twenty two percent of the all fatalities was the Gulf of Mexico. Of the 164 fatalities recorded from 2000-2015, twenty seven percent resulted from falls overboard (CDC, 2015).

Safety training is mandatory, but resources are minimal to none in many areas including the Gulf of Mexico. Understanding how commercial fishermen perceive risk can help to tailor

safety training opportunities to utilize already limited resources. An increased awareness of hazards in other industries has shown to lower injuries from the specific hazard (Leiter, 2009). Therefore increased awareness of the hazards of falling overboard could help lower overall fatality rate. An increased knowledge of the fishermen's perceptions of risk may provide valuable information to industry trainers to provide enhanced educational opportunities and training programs for the fishermen. Despite the high fatality rates in the fishing industry little research has been done on the topic of risk perception. It is important to understand how a high risk population such as commercial fishermen perceives risk, so that industry trainers can tailor safety interventions to focus on the risks that workers may perceive to be less dangerous than others. It can be assumed through the literature review that commercial fishermen are aware of the high risk of death from vessel disasters. What is not known is if they are aware that there is a higher chance of fatality from falling overboard than from vessel disasters. Therefore the aim of this research is to try and understand how commercial fishermen perceive risk. In an effort to better understand this high risk population's perceptions of risk research will be conducted in the Tampa Bay area of Florida, by interviewing commercial fishermen. Collected data will be analyzed using both qualitative and quantitative methods. The quantitative analysis will be a statistical analysis to provide possible correlations between relevant factors. Interview data will be transcribed and examined for similarities between individuals with a focus on the risks the fishermen perceive to be worst. Available literature regarding risk perception of commercial fishermen is limited. Research into the commercial fishing industry is also limited. Further research into the commercial fishing industry will increase the body of knowledge and offer insight into the commercial fishermen as high risk workers.

Literature Review

Available research on the commercial fishing industry is limited. A majority of the studies have been focused on the hazards and risks associated with the dangerous industry. Despite the research that has been done, in the future commercial fishing will continue to be one of the deadliest occupations in the world. Sumalia et al. (2016) suggest the point that commercial fishing is not a sustainable occupation for the future. Coming generations of fishermen are going to be faced with reality of smaller fish stocks resulting in less gross product. Since the 1950's the commercial fishing industry has grown as the technology has improved over time. Technology advancements, including sonar and larger vessels, have resulted in increased harvests of different species. Dwindling fish stocks have become a global problem due to the decades of overfishing by large countries including the United States. In the last 20 years the need for more sustainable fishing practices has been noted, and policies such as Sustainable Fishing act of 1996 have been passed (NOAA, 2016). Some policies adopted by many industrialized countries are designed to help the fish populations rebound to a healthier state (Sumaila et al., 2016). However according to Sumaila et al. (2016) many developing countries are less likely to adopt sustainable fishing practices. Sustainable fishing is not a concern to a country which is struggling to feed its people. The Sumaila et al. (2016) study showed that as the global fish stocks continue to fall, fishermen are being forced to go farther offshore for longer amounts of time in search of fish. The farther a boat travels off shore, along with the increase of days at sea greatly increase risk of the vessel sustaining a malfunction. Jin & Thurnberg (2005) focused on commercial fishermen in the northeastern United States where there is a high fatality rate amongst scallop and ground fish fisheries. After analyzing content from accident reports they were able to focus the determinants of fishing vessel accident severity. The research showed that there were certain accidents such as

capsizing, sinking, and fires that resulted in higher rate of death. The study showed that there is a direct correlation between the severity of the accident and increased wind speed, pressure, vessel age, and lower stability. A negative correlation was found between vessel size and severity which suggested that smaller vessels have a higher chance of having a severe accident versus a larger vessel (Jin & Thunberg, 2005). With a positive correlation pointing towards more severe accidents as a result of higher winds and pressure, fishermen are finding it harder to predict future weather plans to help minimize vessel damage (Jin & Thunberg, 2005). Predicting weather patterns can help improve safety by allowing the fishermen to stay in port when the weather is dangerous. Unfortunately with the growing effects of climate change past weather data is becoming less reliable. Once foreseeable weathers patterns are now becoming more powerful and unpredictable. A study by Rezaee et al. (2016) showed similar results to Jin & Thurnberg in that “high winds, low temperatures, and presence of ice increase fishing incident rates”. These results can be interpreted to assume that fishing in storms is one of the most dangerous acts for fishermen. When the weather gets worse the research was able to demonstrate that fishing activities lowered as a result. The problem is that sometimes not every boat is going to return home to port during a storm. For economic reasons captains will risk their lives and vessels in order to catch their desired amount of product. One of the main problems is that there is a direct correlation between dangerous weather and higher chances of catastrophic events (Rezaee, et al., 2016). As a result of climate change the once predictable weather patterns are getting much stronger than past events. In the last twenty years extreme weather systems (hurricanes) have increased with severity and frequency. This is a significant risk factor for fishermen because this means their work environment is getting increasingly dangerous. In order to catch the most product as possible fishermen are risking their lives at sea. With depleting fish stocks as a result

of decades of overfishing, comes to need to fish longer for the same amount of catch (Sumaila et al., 2016). Since the end of World War Two there has been a dramatic increase in the amount of fish that are taken from the oceans. Before World War Two most fishing was done only in coastal waters. Improvements on vessel technology and fishing practices have allowed fishermen to venture farther in the depths of our oceans. As a result of these changes there has been an overfishing of many fish species in the last seventy years (Sumaila et al., 2016). The increase of overfishing has depleted global fish stocks to record low numbers. As a result fishermen are having to go farther offshore for longer amounts of time in search of more fish. As mentioned before an increase in severe storms along with more days at sea in the pursuit of fish, has made this occupation dramatically more dangerous (Sumaila et al., 2016). With increased time at sea comes the higher risk of a catastrophic event such as flooding, capsizing, and fire (Jin, 2014). A study done on the safety culture of commercial fishermen in southern Australia showed that commercial fishermen are aware of the many dangers associated with their profession; however, regardless of the awareness, they repeatedly puts themselves in dangerous situations (Casey et al., 2017).

Safety culture

Håvold (2010) issued a questionnaire to 209 fishermen in Aalesund harbor, Norway covering various topics about safety culture. The fishermen in this study were involved in a number of different fishing methods including trawls, long lines, fishing nets, and closing nets. This variety of fishing methods gave a larger view of the safety culture of commercial fishermen. The main goal of this study was to figure out what kind of safety culture is prevalent in the fishing industry. According to the Occupational Safety and Health (OSHA) a safety culture is the knowledge of risks and how safety is managed in specific industries (OSHA, 2015). Håvold's

survey (2010) revealed that many of the risk fishermen faced were different for each fishery. A fishery is a term used to describe different types of fishing and different fishing regions. An example of a fishery are the grouper fishermen of the Gulf of Mexico or shrimping off the coast of Virginia. Some of the fisheries seemed to be more aware of the severity of risk that is faced compared to other similar fisheries. The reason for this is that some fisheries are educated on the possible dangers of their profession more than others. According to Håvold some of the reasons that some fishermen were more aware than others of possible dangers are because of past experiences that may have included themselves or family. Having an event such as capsizing a boat happen to the individual or a family member made the person more aware of the dangers. Being aware of the hazards is the first step to having a positive safety culture. The study concluded that fishermen learn the best from past experiences and perceive risk differently from boat to boat (Håvold, 2010). Figuring out the safety culture of commercial fishermen is a big first step to understanding how to better protect this industry. With an increased awareness of the hazards associated with fishing comes the possibility to minimize any potential damages. Additional quality and targeted information presented to this high risk group could increase their chances of survival in dangerous situation. Being able to recognize and identify different hazards is crucial for workers in the fishing industry. Improving workers' perceptions of the risk can help to limit potential injuries

Hazards and risks

Commercial fishermen are faced with a multitude of hazards other than dangerous weather when they enter their work environment. According to the National Institute for Occupational Safety and Health (NIOSH) injuries including slips, trips, and falls accounted for 12 percent of all injuries in the fishing industry (NIOSH, 2015). A main reason why slips, trips, and falls

present a higher risk than on land is because of the chance to fall overboard. Falling overboard is one of the leading causes of fatalities in this industry. NIOSH (2015) was able to gather data and concluded that from 2010 through 2014 there were 210 fatal falls overboard with the highest concentration from the Gulf of Mexico. Throughout all fishing industries worldwide comes the inherent risk of falling overboard. One way to help minimize this fatality rate is to simply wear a Personal Flotation Device (PFD), which can help a person from drowning. The CDC collected data on the number of fatalities in the fishing industry from 2000-2009. Out of a total of the 504 fatalities 155, or 31 percent, of the deaths were from falling overboard. None of the people who died from falling overboard were wearing a PFD (CDC, 2010). Lucas et al. (2013) used a questionnaire of four different fisheries in Alaska: long liners, crabbers, gillnetters, and trawlers. Each was asked questions on their use of PFDs, their perceived thoughts on falling overboard, and other issues with this nature. The results showed that long liners almost never wore PFD's because they thought it would be an entanglement issue; gill netters thought it would also be an interference in their daily activities. Unfortunately the idea that they won't fall overboard is one of the leading reasons why fishermen won't wear their PFD's. Young age which is attributed to a lack of experience is also a leading trait for not wearing PFDs. After administering the questionnaire the results showed that most long liners and gillnetters never wore PFDs while working. The study did show that 22% of crabbers and 51% trawlers did wear PFD's on a regular basis while working (Lucas et al., 2013). One assumption for why trawlers had the highest rate of PFD use is because they had the highest aged workers which correlate to greater experience and increased awareness of the high risk of falling overboard. It was apparent that each group perceived risk differently as a result of past experiences and personal knowledge. The risk of a fatality is increased when individuals decide not to wear their PFD's. Wearing a PFD is an

important safety issue that seems to be overlooked from Alaska to the Gulf of Mexico. While falling overboard is one the most fatal risks associated with fishing it is not the only hazard.

When an individual gets cut or poked on a fishing boat it is more serious than the same cut on land. Fishing boats are full of sharp objects such as fish hooks, filet knives, and gaffs. When working on an unstable and slippery fishing vessel the sharp objects become a serious threat. One of the most popular forms of fishing that is accepted throughout the world is longlining (Fitzgerald, 2013). Fitzgerald (2013) studied the environmental conservation habits of fishing boats and described the long line boats as having over 100,000 hooks on a single line that could be up to 62 miles in length. A major problem with having so many hooks is the chance of getting cut or poked while the boat is moving. Not only are the chances of getting poked or cut by a sharp object but also the wound getting infected should it not be properly cleaned and maintained. Commercial fishing boats can be incredibly unsanitary places to work. With the handling of dead and live fish comes the potential risk of being infected by some kind of bacteria or virus. A simple cut or poke from a hook can potentially be infected by a plethora of different pathogens. This situation has the potential to become life threatening if wounds are not cleaned (Fitzgerald, 2013). This is why cuts are much more dangerous on the ocean compared to on land. Cuts and slashes can come from other sources than hooks and knives. High tension wires that are drawn up hydraulically by winches can cause serious injuries such as amputations or death in the event that one breaks. These types of wires are used commonly in every fishing region for dredging and trawling operations (NIOSH 2015).

Another injury that is common in fishing is bruises and crushes from heavy gear. Some fisheries like those in Alaska use large traps to catch crabs, lobsters, and some species of fish. When stacking these traps on the deck of the boat before setting them in the ocean the worker is at

risk of getting crushed (Lucas et al., 2013). Other objects on the deck of the boat can also cause severe injury such as ice boxes and large nets. With an always fluctuating work place normally non-dangerous objects such as fish boxes can become crush hazards.

According to the fishermen interviewed for this research one of the biggest threats to the commercial fishing industry is the rising use of prescription pills, opiates, and other drugs. According to a CDC report from March of 2018 “Drug overdoses killed 63,632 Americans in 2016. Nearly two-thirds of these deaths (66%) involved a prescription or illicit opioid” (CDC,2018).Drugs such as Heroin, OxyContin, and Fentanyl are all causing close to 115 people to die a day in the United States (CDC, 2018) this number keeps growing steadily every year. Unfortunately the commercial fishing industry is one where high risk and death is a common occurrence. According to captains interviewed in this research, drugs have always been present in the commercial fishing industry. The problem now is that opiates are killing the workers. From the interviews opiates were found to be one of the biggest issues in the commercial fishing industry. There are no statistics on drug or opiate abuse in the commercial fishing industry , which may be a point of interest for future research.

Globally, the hazards associated commercial fishing are fairly similar. Other developed countries have reported having the same occupational hazards as studies in the United States. Workers who are exposed to numerous hazards have an increased chance of sustain an injury while working. Norway has an injury rate of 25.38 of 1000 workers in 2000 and France also had higher rate of 143 per 1000 workers (Chauvin & Bouar, 2007). Research by industrialized countries such as Norway, France, Portugal and the United Kingdom all shared similar results concluding that commercial fishing is the one of most dangerous occupations worldwide. Increased research of the commercial fishing industry in these countries has given rise to new

safety policies to improve outdated requirements. Lower injury and fatality rates are a result of the new safety policies. Unfortunately the accident rate for commercial fishermen is still higher than injuries sustained on land worldwide. Chauvin & Bouar (2007) found similar results for the French fishing sector. After analyzing the cause of different injuries onboard fishing vessels from 1996- 2001, Chauvin & Bouar (2007) were able to organize the data as seen below in Table 1?

Table 1: Injuries onboard fishing vessels from 1996- 2001 in France Chauvin & Bouar (2007)

	Operation of fishing gear (%)	Processing the catch (%)	Other (%)	Total (%)
Fall on board	13.7	18.2	25.6	17.2
Collision with a fixed obstacle	12.2	11.0	13.6	12.0
Struck-swept along-pinned	37.8	10.1	14.4	25.0
Cut-pricked	12.2	26.7	8.6	16.2
Excessive effort-awkward movement	14.4	24.6	14.1	17.6
Other	9.7	9.5	23.7	12.0
Number of injured men	3183	1987	1061	6231

The data shows that being struck, swept along, or pinned was the number one cause of injury by a 20 percent margin. Followed next by falls onboard, excessive- awkward movements, and cuts-prick (Chauvin & Bouar, 2007).The injuries sustained on commercial fishing boats only varies slightly from one fishing style to another. Crab fishermen are more likely to get crushed or pinned by heavy objects while long liners are more prone to cuts and pokes from hooks (Mcguinness et al., 2013). Despite the different methods of fishing the injuries are relatively similar in type and prevalence. In Norway the highest rates injuries were sustained from entanglements and crushes

(Mcguinness et al., 2013) This was followed by blow from a heavy object, falling onboard, and cuts or pokes (Mcguinness et al., 2013). Despite the area of the globe where the injuries were sustained in, the commercial fishing industry experiences these hazards as a whole, in all sectors of the industry. Zytoon (2012) evaluated the occupational hazards within the Egyptian fishing industry. Fishing practices were primarily trawling and longlining with gill nets after followed by seining. These fishing methods are common through all fishing industries in the world.

Administering a questionnaire and a small interview the data revealed that the injuries sustained in the Egyptian fisheries was the same as other countries. Zytoon (2012) found that slips and trips to the deck or floor were the most prevalent of injuries. Second was the being in contact with different objects. These could be fish boxes, ropes, other common items found on fishing vessels. The main injuries were bruises, abscess/wounds, bone fracture, and burns. As mentioned the fishing industry has a plethora of hazards that can harm workers. A hazard that has not been looked into as deeply as other hazards such as falling overboard, but still important to minimize is noise exposure. Zytoon studied the noise exposure of commercial fishermen in Egypt to determine if what areas of a ship its workers were exposed to the most noise. Questionnaires along with decibel measurements were taken from twenty four fishing boats to determine the noise exposure of workers. The results of the questionnaire and measurements showed that the engine room had the most amount of noise out of other areas of the boat. On average the noise levels were 5-10dB higher in the engine room compared to on the outside deck of the vessel (Zytoon, 2013). Other parts of the boat showed to have noise levels around 85 dB which the NIOSH exposure limit for an eight hour period. The problem lies with that fishermen are usually exposed to these noise levels for more than the recommended time amounts. Since commercial fishermen are working in one of the most dangerous work environments it is important for them to be aware of their

settings. With impaired hearing as a result of noise exposure, the chance of a catastrophic event occurring will be increased. Zytoon concluded that commercial fishermen are exposed to high levels of noise on a daily basis. More research needs to be done on this hazard along with limiting the time of exposure for workers. A study done on the fishing industry in Portugal showed that despite advancements in technology, occupational hazards are still at high levels of incidence (Antão, Almeida, Jacinto, & Soares, 2008). The research aimed to find the main reasons behind the high rate of injuries despite the improved working conditions and fishing practices from advancements in technology. Antão et al. (2008) concluded that the lack of safety training was one the main reasons why injury rates were still high. Despite the fact that safety requirements and technologies have improved, the lack of safety training has resulted in high injury rates. Proper training is an important aspect of improving the safety of fishermen.

Safety training

Commercial fishing remains to be one of the most dangerous occupations on the planet. Every year the fatality and injury rates remain much higher than other industries such as manufacturing. For these reasons it was pertinent that polices be made to address the issues at hand. In 1988 the United States Congress passed the Commercial Fishing Industry Vessel Safety Act (CFIVSA) which made requirements for safety equipment on all vessels (U.S Congress, 1988). Such policies as CFIVSA that make life rafts, PFD's, Emergency Position Indicating Response Beacons, Immersion suits, and flares mandatory have unquestionably saved lives over the years. After the implementation of the CFIVSA an evaluation was performed by NIOSH to measure the effectiveness of the safety regulation. NIOSH published that from 1997-1999 the CFIVSA was able to raise the survival rate of commercial fishermen 98 percent. This is an improvement from 1993-1997 where the survival rate was only at 77 percent for commercial

fishermen (NIOSH, 2012). The improvements on required safety equipment have certainly helped raise the survival rate of workers in this high risk industry. A stipulation of the CFIVSA is that every fishing vessel must have safety decal issued by the U.S. Coast Guard. The Coast Guard is responsible for handling mandatory dockside safety examinations for all commercial fishing vessels. Every two years the vessel is required to have a safety evaluation to make sure all of their safety gear is working, stored properly, and within expiration dates (USCG, 2016). If the boat does not meet the requirements for the decal they will not be able to fish. This is to make sure that all vessels are following the safety regulations of the CFIVSA.

The CFIVSA has been a successful piece of legislation that has saved countless numbers of lives over the last 29 years. This policy was responsible for requiring lifesaving equipment on commercial fishing vessels and safety inspections by Coast guard safety examiners. In 2010 a new piece of legislation was introduced to ensure all vessels fishing past three nautical miles from shore were meeting safety regulations. The Coast Guard Authorization Act of 2010 (CGAA) required that all vessel operators must take a USCG approved safety course. Another requirement was for the constructions, design, and maintenance of new vessels being built (Authorization Act 2010). The vessel operator must take a safety course to become a Coast Guard certified Emergency Drill Conductor (EDC). In order to become an EDC the fishermen must go through an eight to ten hour safety class covering different safety topics and lifesaving techniques. The U.S. Coast Guard regulation CFR § 28.270 Instruction, drills, and safety orientation states:

(a)Drills and instruction. The master or individual in charge of each vessel must ensure that drills are conducted and instruction is given to each individual on board at least once each month. Instruction may be provided in conjunction with drills or at other times and places

provided it ensures that each individual is familiar with their duties and their responses to at least the following contingencies:

- (1) Abandoning the vessel;
- (2) Fighting a fire in different locations on board the vessel;
- (3) Recovering an individual from the water;
- (4) Minimizing the effects of unintentional flooding;
- (5) Launching survival craft and recovering lifeboats and rescue boats;
- (6) Donning immersion suits and other wearable personal flotation devices;
- (7) Donning a fireman's outfit and a self-contained breathing apparatus, if the vessel is so equipped;
- (8) Making a voice radio distress call and using visual distress signals;
- (9) Activating the general alarm; and
- (10) Reporting inoperative alarm systems and fire detection systems.

(b) *Participation in drills.* Drills must be conducted on board the vessel as if there were an actual emergency and must include participation by all individuals on board, breaking out and using emergency equipment, testing of all alarm and detection systems, donning protective clothing, and donning immersion suits, if the vessel is so equipped.

(c) *Training.* No individual may conduct the drills or provide the instructions required by this section unless that individual has been trained in the proper procedures for conducting the activity.

The curriculum for the class focuses primarily on preventing loss of life after a vessel disaster. This includes instructions on how to operate life rafts, emergency GPS, Personal Flotation Devices (PFD), flares, and other lifesaving equipment (AMSEA, 2016). Hopefully the fishermen will never have to use this equipment in their careers. The EDC class uses hands on methods to get the fishermen familiar with all of their lifesaving equipment. Being acquainted with the equipment is crucial during an emergency situation where every second counts. Part of the class and is conducting emergency drills onboard a fishing vessel such as fire, flooding, or abandoning ship. The drills are supposed to be conducted monthly and logged by Coast Guard regulations (USCG, 2016). The reality is little enforcement has been made on this regulation because so few people have taken the class. Limited numbers of instructors who are able to teach the class have resulted in a large percentage of fishermen who have not received the training. Therefore the coast guard cannot enforce a regulation that many have not been able to comply with. The NOAA observer program has been helpful at getting fishermen to comply with safety regulations. In order to receive higher catch quotas and certain permits fishermen must participate in the NOAA observer program. This program requires that captains allow the NOAA observer to collect data on their fish catch while out at sea. The observers will not work on a boat that does not have the required safety examination sticker issued by the coast guard. If the observer is not able to work on the boat then the captain can lose their quota or permits. Therefore it is pertinent that the captains ensure their boats pass the safety examination, so they can continue to fish (NOAA, 2005). In order to receive the safety examination sticker vessel operators must attend a USCG approved safety training.

Only a few organizations offer the USCG approved training with The Marine Safety Institute and Alaska Maritime Safety Education Association (AMSEA) being the largest leaders.

The CGAA has created a high demand for training from these organizations which have limited resources. Since the creation of the EDC class in the early 90's both organizations have taught thousands of fishermen in the US waters. Historically and currently most of the EDC classes are held on the pacific coast and north eastern seaboard. Both areas have seen a dramatic decrease in fatalities over the year. Unfortunately one area of the US has had very little training due to a lack of resources and that is the Gulf of Mexico (GOM). Currently there are less than a hundred marine safety EDC class instructors certified in the country, with most being on the west coast and north eastern seaboard. For the entire gulf coast from Corpus Christi, TX to Key West, FL there are only ten active instructors. The problem is that even with ten instructors the amounts who actually teach classes consistently is far less. The resources for the GOM are scarce and therefore have received less training than the other areas. This could be an underlying reason of why the fatality rate in the GOM is higher than any other US body of water. Currently the GOM leads the country with the most fatal and nonfatal injuries in the commercial fishing industry. Figure 1 below illustrates the number of fatal and non-fatal injuries that have occurred in the GOM from 1992- 2012. In the twenty year span an estimated 444 fishermen experienced a fatal injury, non-fatal injury, or went missing (Marvasti, 2014).

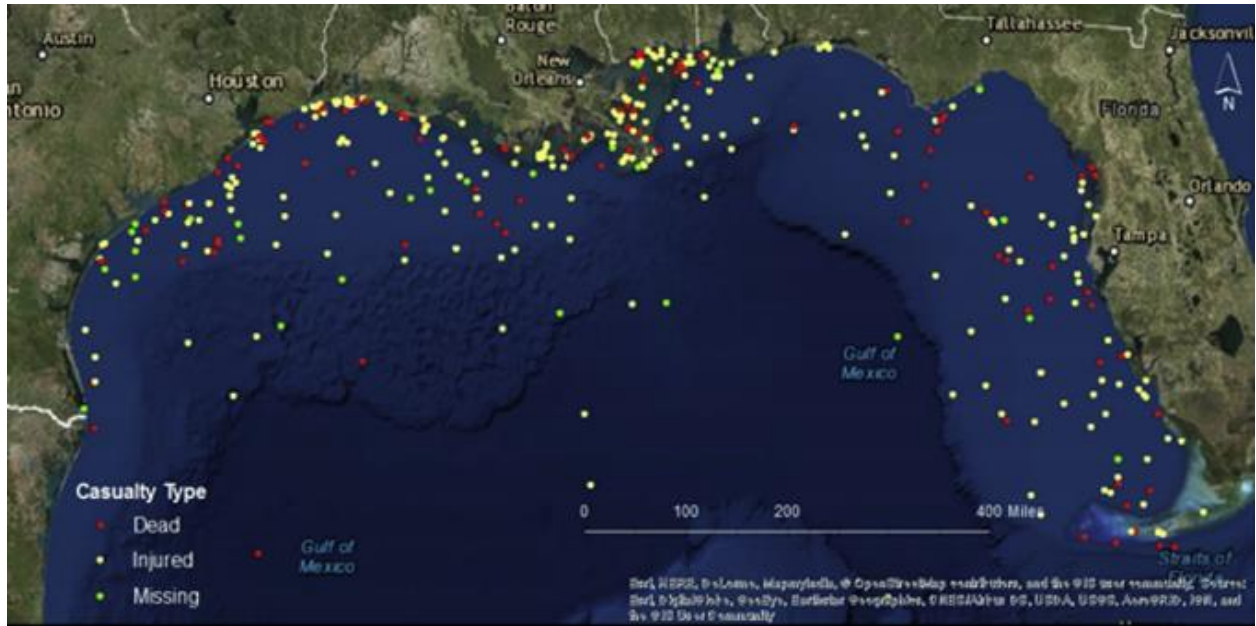


Figure 1. Fatal and Non-Fatal Injuries in the Gulf of Mexico 1992-2012. (Marvasti, 2017),

The Center for Disease Control reported that from 2000-2015 an estimated 725 fishermen perished in the United States. In the Gulf of Mexico 164 fishermen died which accounts for over twenty two percent of all fatalities in the industry (Marvasti, 2017), making the GOM the deadliest body of water for commercial fishing in the United States. Marvasti (2017) was interested in determining risk factors for fishermen in the GOM, and found correlations that suggest injuries are more likely to occur in bad weather and when there's a potential to earn more money. The study also found a positive correlation between the CGAA, which made safety training mandatory for vessel operators, and a decrease in fatal and non-fatal injuries (Marvasti, 2017). A decrease in fatal and nonfatal injuries since the Authorization Act of 2010 shows that the mandatory safety training may be contributing to the lower injury rates. Unfortunately the small number of instructors in the GOM is a limiting the amount of fishermen that are able to take the training. Limited resources have left a large high risk population vulnerable to future fatalities. A

shortage of instructors in this region means a large percentage of this industry will never receive formal safety training.

The CFIVSA and the CGAA have been very successful at lowering the fatality rates associated with vessel disasters. Requiring lifesaving equipment was like picking the low hanging fruit for this industry. Since the CFIVSA has been implemented almost thirty years ago the overall rate for fatalities has decreased for this high risk industry. Preventing loss of life during a vessel disaster has been the main focus. Unfortunately in this time period another hazard has become of increased concern and now rivals vessel disasters for number fatalities year after year. Falling overboard is the highest risk hazard that a fishermen could face in the Gulf of Mexico. It is important to consider that when a vessel disaster happens such as ship sinking there are usually multiple casualties associated with it. Not every vessel disaster has multiple casualties, but these catastrophic hazards have the potential to cause multiple deaths very quickly.

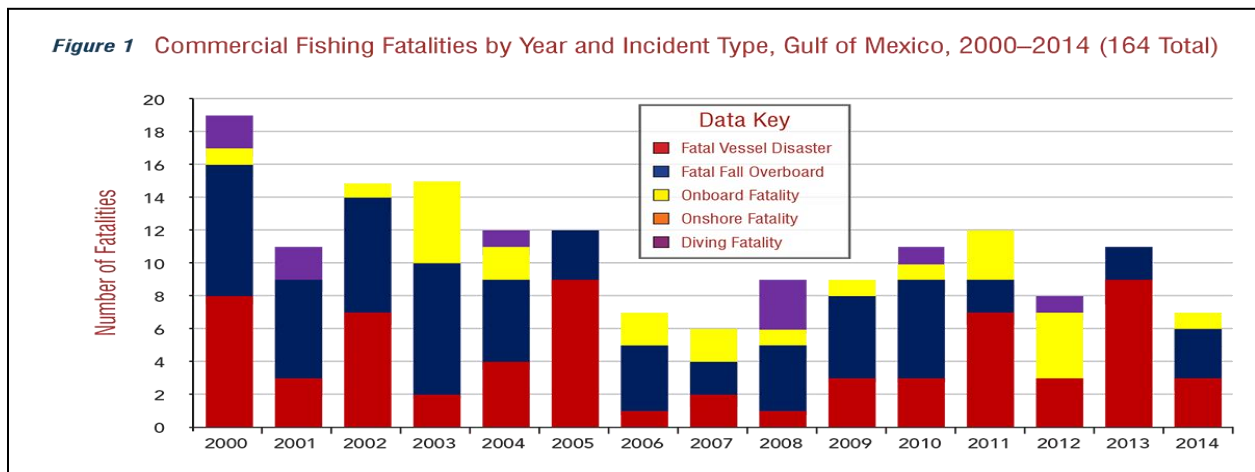


Figure 2. Commercial Fishing Fatalities by Year and Incident Type, GOM 2000-14 (NIOSH, 2017)

Looking at Figure 2 from NIOSH (2017), it can be seen that vessel disasters and falls overboard account for the vast majority of fatalities every year. If for example in the year 2000 there were 19 fatalities with eight coming as a result of a vessel disaster, while the other eight were from falling overboard. At glance the two hazards look of equal importance with vessel disasters seeming more significant due to the nature of the hazard. The eight that perished from the vessel disaster could have been from one or two boats. It is very unlikely that the eight that died from vessels disasters were eight separate incidents. The eight people who died from falling overboard were most likely individual events. When someone falls overboard they do so by themselves. Unfortunately out of all the 221 people who died from falling overboard between 2000 and 2015 none were wearing a personal flotation device. Over half of the persons who fell overboard witnessed doing so (NIOSH, 2012). The fact that falls overboard are usually singular events highlights that there is a higher chance of fatality from falls overboard than vessel disasters. Vessel disasters can cause more deaths with fewer events, but stem from issues that are less controllable such as bad weather. Whereas falling overboard is usually an individual event that could have potentially been prevented if for example a PFD was worn. Commercial fishermen understand that they work in one of the deadliest occupations in the world. These workers are faced with the harsh reality that they may not return home after work (Håvold, 2010). Even compared to other high risk industries such as construction or logging, commercial fishing has a much higher fatality rate (BLS, 2015). To think these workers are unaware of the dangers they face on a daily basis would be discourteous. Unfortunately these workers have to put the thoughts of dying in the back of their minds, so they can continue to make money for their families. When this happens a workers perception of risk can be skewed which could result in a faulty judgment that leads to a fatality. Inaccurate evaluations of potential risk can lead to

undesired and unsafe work habits (Leiter, 2009). Being able to accurately perceive the risks that are associated with fishing are crucial to survival. Risk perception can be defined as “a highly personal process of decision making, based on an individual’s frame of reference developed over a lifetime, among many other factors” (Brown, 2014). A workers perception of risk is the driving factor behind what decisions they will make. How they rank the hazards around them is responsible for how they will behave and act.

Perception of risk

Risk perception is a vast topic that encompasses many different types of risk other than safety. Its applications to safety have been used to understand workers decision making processes and how to limit injuries from hazards. Fishermen are often faced with a multitude of hazards that could be fatal with one wrong step. Studies have shown that “when hazards are not recognized, or when the safety risk is not accurately perceived, workers may not be able to adopt effective safety measures to prevent injury” (Albert et al., 2014). An increased awareness of hazards in other industries has shown to lower injuries from the specific hazard. Researchers were interested in trying to understand the impact that safety training has on hazard recognition and safety risk perception in the construction industry. The research shows that workers who participated in safety training were able to recognize a larger percentage of hazards, and thus perceived the risks associated with the hazard as higher. Researchers also concluded that safety “training efforts are a viable intervention to improve the perception of safety risk” (Namian et al., 2016). Other research focused on the role of safety training and risk perception in the Italian printing industry. The results showed that an increased awareness of hazards from personal experience or education lowered the injury rate for the hazard. Safety training was crucial when

trying to improve the overall safety culture of an organization. Workers were more prone to perform safe work habits after learning about the potential injuries that can occur (Leiter, 2009).

Available literature regarding risk perception of commercial fishermen is limited. One of the studies (Davis, 2012) was conducted off the waters of Maine and focused on understanding how fishermen perceived risk. It was determined that fishermen constantly undervalued the risks around them. Fishermen in this study rated their overall occupational risk as average when research shows the contrary (Davis, 2012). Further investigation found that “Overall, there was a general failure to understand the larger role that accidents play, along with the importance of safety equipment and training in mitigating these risks” (Davis, 2012). The study utilized a quantitative survey to help determine the risk perception of this population. Similar research was conducted off the coast of Texas and comparable results were found. Fishermen were surveyed for the research and nearly sixty percent of the 133 participants ranked their occupational risk as very safe to neutral (Gulf). This coincides with the idea that fishermen undervalue their occupational risk in different regions. A lack of training and education was seen to be the biggest issue for the GOM. The fishermen’s perception of risk was found to be low. Despite the undervaluing of risk and low risk perception, the research found that fishermen were very willing to participate in any available safety training.

Similar research has been done in Northern Ireland (Booth & Nelson, 2014) and Norway (Bye & Lamvik, 2007) using quantitative methods and both studies found comparable results. Research completed in New England found that one of the biggest problems with commercial fishermen is their tendency to “trivialize or totally deny the dangers associated with their occupation” (Poggie et al., 1995). This tendency to deny dangers and risks is later described as “risk denial” (Poggie et al., 1995). Risk denial is an underlying theme in several studies done on

commercial fishermen. One of the issues is that risk denial can lead to an inaccurate perception of risk for the worker. This can increase the chance of sustaining an injury from one of the many hazards fishermen face. All of the research done on commercial fishing has discussed the fact that fishermen are faced with a plethora of hazards and high risk situations. A study conducted on fishermen off the coast of North Carolina and was focused on trying to understand what work methods fishermen use to stay safe from different known hazards. McDonald and Kucera (2007) used ethnographic approaches to perform in depth interviews to gather data. The researchers were interested on understanding what risks the fishermen faced while working and what measures they took to keep themselves safe. Results have shown that fishermen are aware of the many risks they face and staying safe was constant struggle. McDonald and Kucera (2007) noted that qualitative methods work especially well “when researching workers who work independently and are not part of an established institutionalized safety program”. Using an ethnographic approach to understand how fishermen stay safe proved to be successful method for collecting data.

Research in other industries has shown that an increased awareness of hazards can lower injury and fatality rates for the specific hazard (Leiter, 2009). Having greater knowledge about a hazard gives the worker a better opportunity to make safer decisions to minimize chance of injury. Safety training is an important tool that can be used educate the workers on potential outcomes from unsafe work habits and also to minimize the risk associated with hazards. Researchers in Australia were able to conclude that increased amounts of safety training along with education about dangerous hazards were beneficial to the prawn fishermen in the study. Communication of safety was found to be a big factor for whether fishermen would adopt safer working behaviors (Casey, Krauss, & Turner, 2017). Proper training can be utilized to improve

the perception of risk for a population by highlighting the hazards viewed as unsafe. Some hazards may seem more unsafe than others, but the reality may be contrary. This can result in a lowered perception of risk which can lead to misinformed decisions. Unfortunately for the case of commercial fishermen a wrong decision could result in serious injury or death. Therefore understanding the risk perception of a population can aid industry trainers in tailoring safety trainings to address the risks and hazards that are relevant. Information concerning how a population ranks and views risk could be beneficial to developing future safety interventions.

The commercial fishing industry is in need of improved safety interventions to combat the issue of high fatality and injury rates. The GOM has the highest fatality rate of any body of water in the US, with falls overboard being the greatest threat to fishermen in this region. An increased awareness of hazards in other industries has shown to lower injuries from the specific hazard (Leiter, 2009). Therefore increased awareness of the high probability of dying after falling overboard could help lower overall fatality rate for the GOM. Research has shown that commercial fishermen are aware of the hazards and risks they face daily (Håvold, 2010). It would be valuable to understand if commercial fishermen perceive falling overboard to be a greater or lesser risk than a vessel disaster. An increased knowledge of the fishermen's perceptions of risk may provide valuable information to industry trainers to provide enhanced educational opportunities and training programs for the fishermen. The CGAA made safety training mandatory for all vessel operators. Since the act's implementation there has been a decrease in fatal and nonfatal injuries nationwide (Marvasti, 2017). Limited resources for training organizations have resulted in large populations who have not received training. Fishermen may only have the opportunity to receive the training once during their career. Therefore it is important the information that is being presented, is as relevant to their work environment as possible.

Tailored training programs for specific fisheries and regions are outlined by the National Occupational Research Agenda (NORA) agendas of NIOSH for the future of the industry (NORA GOALS). The aim of this research is to understand the risk perceptions of commercial fishermen which could provide valuable information for industry trainers to enhance training programs.

Methods

Commercial fishermen are an inherently difficult population to study. Due to the fact that they tend to lack a permanent working location, gathering data can be challenging for researchers. Quantitative methods have been utilized in other studies to better understand the risk perception of commercial fishermen (Davis, 2012). Quantitative methods only gather a limited amount of information and when used alone can lack the depth of knowledge needed to provide effective safety interventions. A study by McDonald and Kucera conducted on fishermen in North Carolina used qualitative interviews to gather data. The researchers explained that qualitative research is useful for the commercial fishing industry and has the potential to be a valuable technique for future research (Mc Donald and Kucera, 2007). Qualitative research tends to focus on perceptions and experiences of participants to grasp how they comprehend those experiences (Tutty, Rothery, Grinnell, & Austin, 1996). Data collected from qualitative research is often collected from techniques such as interviews and observations. The information gathered from qualitative methods is later analyzed to understand how people make sense of their experiences (Richards & Morse, 2007). Qualitative methods have been successfully utilized in a variety of settings to gather information that may be excluded when only using quantitative methods. The use of open ended questions can lead to deeper personal answers and more valuable information than pre-determined answers on a survey (Runge et al., 2014). Qualitative techniques invites an interpretation of risk from the fishermen's perspective and health and safety topics to be brought forth that may otherwise be missed by the researcher. This method also respect the fishermen by making certain that their voices are heard; opinions considered, and recognizing that they are they parts in their lives. For these reasons this research utilized qualitative methods in the form of semi

structured interviews to gather the needed data. A sixteen question quantitative survey covering fishing experience and demographics was included to compare statistical data points. The use of both qualitative and quantitative methods yielded data that helps answer the research question of ‘How commercial fishermen perceive risk?’.

Ethnographer background

The uniqueness of this study is that it is led by a US Coast Guard approved Marine Safety Instructor. The ethnographer has been providing the mandatory Onboard Drill Conductor training highlighted by the CGAA, for over five years. His responsibility was the entire state of Florida with focus on the Gulf Coast. Over the five years he has had the opportunity to instruct over 600 fishermen on life saving techniques. This opportunity has also allowed for the researcher to gather a vast network of fishermen to choose from for the interviews. These credentials will aid in the gathering of data by establishing credibility with the fishermen that should lead to deeper personal interviews.

Population

Data from the main sample population of nine commercial fishermen was collected from the Gulf region Florida ranging from Steinhatchee to Tampa Bay. An additional smaller population of five commercial fishermen was researched in the Outer Banks region of North Carolina. Results from both populations were compared for similar or conflicting results. The interviewer has a vast network of commercial fishermen who are willing to participate. Therefore other sampling methods utilized in other studies on commercial fishermen such as snowball

ethnography will not be used (Mc Donald and Kucera, 2007). In the Florida population the researcher was able to contact three owners of fish markets that gave contact information about their fishermen. The North Carolina fishermen were contacted by a private individual with family in the commercial fishing industry. The individual then gave the researcher contacts for several fishermen in the inner outer banks. Fishermen were contacted and asked to participate in the interviews. All of the fishermen that were contacted wanted to participate in the research. Interviews and surveys were conducted in the winter months of December and January when the fishermen are on land due to bad weather and repairs. During this time the interviewer made contact with the fishermen at their boats, docks, back seat of trucks, and offices. Participants for this research are commercial fishermen who work in the Gulf of Mexico. Because of high fatality and injury rates, fishermen from this region were interviewed to help understand the population's perception of risk. A smaller sample of fishermen who work in the Outer Banks of North Carolina were interviewed and used as a comparison group. The only requirement for the research is that the participants are actively employed on a commercial fishing vessel as a captain or deck hand.

Data Collection

Qualitative and quantitative methods were utilized to gather data from the sample populations. Using both methods yielded valuable information. A qualitative semi-structured interview was given to the fishermen along with a short survey. Interviews were conducted at the participants fishing vessel or a preferred location. Fishermen tend to lack a permanent working location, so their fishing vessel is the best option. The semi- structured interviews contained 8-10 questions, and lasted approximately thirty minutes. Interview questions can be found in Appendix 2. Open ended questions were utilized to gain in-depth responses from the fishermen. Interviews

were recorded and later transcribed for detailed thematic analysis. Specific topics and themes (ex. Vessel disaster, PFD use, falling overboard) were introduced accordingly to help add structure to the interviews. Fishermen were asked to discuss their feelings, opinions, and perceptions of the many hazards that are faced on a continual basis. Along with the interviews a short sixteen questions survey was administered. The survey questions are adapted from research that was focused on understanding what factors influence safety among commercial fishermen on the coast of Texas. Questions in the survey focused on demographics, fishing experience, riskiness of occupation, and if they have received safety training. The survey questions can be found in Appendix 3. Qualitative data was transcribed and examined using thematic analysis.

Analysis

Thematic analysis will be utilized to interpret the interviews for reoccurring themes and ideas. The focus of the interviews will be to answer the research question on “How commercial fishermen perceive risk?”. The key to thematic analysis is to identify and analyze reoccurring patterns from the qualitative data. Once all of the data has been gathered the interviews will be transcribed and reviewed repeatedly. A six stage analysis process will be utilized to code the data. The six steps are as followed; data familiarization, initial code generation and data sorting by code, searching for themes, reviewing themes, and reporting of the findings (Braun and Clark, 2006). Emerging themes and ideas were analyzed to further understand how commercial fishermen perceive risk. Thematic analysis was used in this research because it allows for the researcher to gain insight on a specific area of focus. The established themes and ideas of the sample population in Tampa will be compared to the sample population in North Carolina. Transcripts from this research will not be included to conceal the identities of the fishermen who

participated. The stories that were told are incredibly deep and personable, therefore they could be linked to individual people if read by familiar parties. Protecting the identities of the fishermen who helped to describe their deadly industry is of the utmost importance to the researchers. An example of the six stage thematic analysis process is provided below in Table 2 below and was adapted by findings Braun and Clark (2006).

Table 2: Six stage thematic analysis example

<p>Data familiarization</p>	<p>The first stage of the thematic analysis process for the researcher is to familiarize themselves with the data. Data familiarization can be achieved while in the process of collecting data. While the researcher is collecting data from qualitative methods, they can begin to form ideas on what topics, phrases, or words are being mentioned frequently. While conducting my research I was immersed into my data by conducting personal interviews and then transcribing them from voice recordings. This process of reviewing and transcribing allowed me to become immersed in my data which is beneficial for the remaining process.</p>
<p>Initial coding</p>	<p>While the researcher is familiarizing themselves with the data certain topics,</p>

	<p>phrases, and words should appear more frequently than others. The repeated topics, phrases, and words will become the first codes for the analysis. The codes that are found will later serve as support for common themes. For example while analyzing my transcripts certain topic such as “paying attention” and “bad weather” was commonly mentioned. These topics would serve as codes in the analysis. Once a set of codes has been established the next step is to label all of the codes as they appear in the transcripts.</p>
<p>Data sorting by code</p>	<p>After reviewing the data and establishing a list of codes, the researcher will then label all of the codes as they appear In the transcripts. This process will create a visual aid to help determine what codes are mentioned the most. Counting of the individual codes will also allow for the researcher to identify the most significant codes. For example when analyzing my data, I would use codes such as “FO” for falls overboard and mark this code every time</p>

	falling overboard was mentioned.
Search for themes	<p>Once the data has been analyzed completely by coding, then the researcher can search for common themes. Themes are more complex than codes, but a code with enough significance can serve as a theme. Themes can be a collection of common codes that share similarities such as Inexperienced workers. Themes can also be important codes such as ‘bad weather’. The goal of this step in the thematic analysis is to take all of the codes from before and group them into reoccurring themes. For example some codes used in this research were fire, sinking, and maintenance. These three codes were grouped into the common theme of vessel disasters. Grouping of codes allows for more complex themes to arise and to be supported.</p>
Review of themes	<p>If the process is followed as such, a list of themes that is smaller than the codes list will be created. Some themes are going to have more significance than others. For these</p>

	<p>situations it is possible to consider having main themes with supporting sub themes. Themes need to be analyzed repeatedly by the researcher in order to form discussion points about the themes. Once common themes are addressed it is important to ensure they are in fact valid themes. The best method to ensure validity of the found themes is to have outside sources verify the results. For example after identifying the three major themes and ten subthemes in the current research, two commercial fishermen along with a qualitative writing expert validated my findings. They were given the list of common themes that were found and established they were common. The step of ensuring validity with the analysis is crucial for the process.</p>
<p>Report findings</p>	<p>The final step to the thematic analysis is to report the findings. Themes should be mentioned by importance and supported by sub themes, if any are found. Analysis of the</p>

	<p>themes is required in order to create valuable discussion points for the research. Themes should be presented in a manner where they are introduced then explained in detail. After explanation of the theme quotes should be added to support the findings. For example when discussing the theme of “serious injuries” an explanation on why this was a common them was given. Then directly below the section was an italicized quote “I saw a guy get cut in half on a scallop boat”. This quote directly supports the theme that the fishermen mentioned of “serious injuries”. The more supporting quotes that are available will strengthen the analysis of the themes.</p>
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The research was approved by the University Institutional Review Board (#17-002867). See Appendix 4.

Results

Quantitative data

Fourteen commercial fishermen were interviewed from the Florida gulf coast and inner outer banks of North Carolina. All of the commercial fishermen that were interviewed were males. The youngest interviewed was twenty seven years old and the oldest was sixty seven. The average age was fifty three with ninety three percent of the interviewees being over the age of forty six. Ten out of the fourteen fishermen were captains with the other four being deckhands. Most of the fishermen were not from a long family tree of fishermen, with fifty percent being the only generation to fish, and another twenty nine percent only having one more generation. One fisherman had over five generation of fishermen in their family. A majority of the fishermen had been fishing over fifteen years with seventy nine percent of the interviews. This is because seventy one percent of the population interviewed are captains which requires more experience. The three major methods of fishing were shrimping, bandit reel grouper/snapper/reef fish, and longlining. One of the grouper/snapper/reef fishermen would occasionally dive and use a spear gun to fish. Six of the fourteen were shrimpers with another four in the other two categories. Fishermen in this population fished mostly outside fifty miles. The average amount of time out at sea was one to two weeks. Half of the fishermen said that they wear a seatbelt when riding in a vehicle. This question was asked in another interview conducted on commercial fishermen and shows that fishermen engage in known high risk activities. Like the seatbelts, fishermen were asked if they smoked cigarettes with seventy nine percent reporting yes. This along with the seat belt question that a majority of the fishermen are engaged in known high risk activities. Out of fourteen, six of the fishermen rated their job as risky, four as neutral, three as safe, and one as very safe. The eight that rated their job as neutral to very safe could be supporting data for risk

denial. Ten out of the fourteen fishermen were part of the NOAA observer program. This is because the four that were not in the observer program were the deck hands, potentially making this a biased question. Boats that are part of the NOAA observer program are required to be up to all regulations in order to allow NOAA observers to travel with the fishermen. Being part of the NOAA observer program allows fishermen to gain access to specialty permits and increased quotas. Ninety three percent of the fishermen interviewed had received safety training in the past. Over half of the population, fifty-seven percent, has personally known a person who had suffered a fatal injury while working. Every fisherman had heard countless stories of others that had perished. In the case of an emergency such as a vessel disaster seventy-nine percent of the fishermen knew how to use their basic lifesaving equipment consisting of a PFD, Life raft, and EPIRB. Another eighty six percent could conduct all of their basic safety drills consisting of machinery hazards, abandoning ship, fighting fires, and man overboard. The reason that both of these questions received positive values can be attributed to the amount of previous safety training (95%) and that most of the population that was interviewed were captains, who have more experience.

Thematic analysis

Interviewing commercial fishermen proved to be an enlightening experience. Unfortunately this population of workers faces an unimaginable amount of risks and hazards. Statistics show that commercial fishing is one of the deadliest occupations in the United States (DOL, 2015). What is alarming is the conditions that these workers are forced to endure. After interviewing fourteen commercial fishermen from the gulf coast of Florida and North Carolina a list of common themes were described by both groups. Data saturation was reached for all of the

themes mentioned. A qualitative thematic analysis was completed on all of the interviews to find common themes amongst the populations.

Three underlying themes arose frequently during the interviews; “lack of experienced workers”, “Quotas and regulations”, and “Opiates and other drugs”. Each of these themes was supported by ten subthemes which included “bad weather”, “operating at night”, “vessel disaster”, “serious injuries”, “Paying attention”, “falling overboard”, “sharks”, “hauling gear”, “no good help”, and “confidence”. Validity was ensured by addressing the noted themes with two commercial fishermen and a qualitative research expert. All three of the parties confirmed that the common themes listed are valid and offer an insight into the industry. Commercial fishing is inherently dangerous, but when these multiple variables are thrown into the mix such as rough weather, inexperienced help, and economic pressures from regulations, equates to one of the most dangerous occupations in the United States. In the following sections, explanations of the themes are provided followed by italicized sections which are direct quotes from the fishermen who participated in the interviews.

Inexperienced workers

An inexperienced work force is the greatest underlying issue and most common theme expressed in the interviews. Captains were always worried about crew members. Crew members worried about themselves and the others around them. All of the other sub themes to be mentioned become increasingly dangerous when the workers in the situation are not experienced. The commercial fishing industry is one of the most unforgiving and dangerous in the world, therefore experience is crucial to survival (DOL, 2015). Unfortunately safety training efforts have

not reached the entire population of workers in this industry and so many are left to learn as they go. The idea of learning on the job is common in many industries, but few industries have the same severity of consequences for minor mistakes as the commercial fishing industry. Crippled by the high risk of industry, young workers willing to make a living in this deadly industry are few and far between. This leaves many captains and boat owners wondering what will happen in the future for the industry.

Industry quotas and regulations

With the growing concern for the health and vitality of our oceans comes the need for stricter fishing regulations. Recently quota systems have been enacted to help manage the fish stocks and harvests. Along with quotas have been stricter regulations on what and how much a boat can catch of a specific species of fish. The stricter regulations have made commercial fishing economically more difficult. Increased prices of fuel, insurance, and boat maintenance has made commercial fishing a difficult industry in which to begin a career. The increase in the consumption of cheaper imported seafood has started to make some markets such as shrimping hard because of competition from foreign markets. The quota systems were designed to help manage the fisheries and also eliminate the derby aspect of commercial fishing. In this context a derby refers to a style of fishing where everyone fishes from the first day of the season till biologists close the season. It is a “if I don’t catch the fish someone else will” mentality, which can result in risker behaviors. This system has taken pressure off fishermen to fish everyday even in rough weather, but not for the whole year. With the quota system, fish that is not caught one year will not be given for the following year. It is a use it or lose it style of system. Therefore it is in the best interest of the captain to catch their entire quote, even if that means going out in rough

weather. .. This has taken the derby aspect from the beginning of the year and unfortunately pushed it to the end of year which is still season for rough weather.

“These quota ordeals it ain't doing nothing but running young, younger generation away from fishing. There aint no young people around here wanting to commercial fish. It all wants to be imported out of a pond. And that's the way going to be”

“, I think the IFQ system is kind of put a Little bit of an end to that. But then towards the end of the year. You got quota you got a catch or you're going to lose it. So I guess in that regard puts more you know more of a Derby into it again. So sort of takes some of it out but then towards the end when you get down there near the end you didn't catch what you thought you were caught... You know we've taken that. The beginning of the year derby away but we've replaced it with an end of the year derby”

Opiates and other drugs

According to the interview participants an underlying issues for the entire fishing industry is the rising use of opiates. Drugs have always been predominant in the commercial fishing industry as captains explained, but the rise in prescription pill abuse and opiates is taking a devastating toll on the industry. Because of the high stress and everything that's been listed above, it is not uncommon for these people to self-medicate to cope. Unfortunately this epidemic has left captains wondering how much longer the industry is going to survive. Unexperienced help who are under the influence of powerful narcotics are hazardous to themselves on land. When all the other variables of commercial fishing are added to that, it makes for a high chance of a fatal mistake. Every fishermen claimed that things can happen quickly on a fishing boat and if

you're not paying attention and alert, it can be fatal. This makes the use of drugs while working or going through withdrawals a major risk factors for a fatal or severe accident. Two of the Gulf of Mexico captains claimed that now people would take a drug called Suboxone that helps counter the negative effects of opiate withdrawals, while fishing. Along with Suboxone people were carrying around Narcan, a lifesaving drug that counteracts opiate overdoses if administered fast enough. This combination of drugs allows for the opiate addict to continue working through withdrawals on Suboxone and potentially come back to life after an overdose with Narcan. Both drugs are valuable tools in the battle against opiate addiction, but the availability of these drugs has made working drug free harder to accomplish. The fear is that this drug combination will spread to other fisheries around the country. Captains interviewed were very adamant about how they worry about their crews, more than they worry about themselves. Low amounts of safety training, lack of experience in workers, and a drug influenced workforce add to the reasons commercial fishing is one of the deadliest industries in the United States.

*“Oh you got a lot of damn pill heads around here. It's hard to find good straight help. Sure is between the pills and the damn crack. Lot of crack right here on board. Yeah, I mean it's something, I guess they were worried you go to the commercial fishing industry. So yeah. Anywhere you anywhere I take that boat anywhere. I'd take that boat. If I got a crew member around that use drugs, he could find em buddy. I don't give a s*** where you pulled up and give him, give him some money in his pocket in four or five hours he going to have what he wants. They will find it I don't give a s***. They going to find it.”*

“You also don't have to be very old to be finishing off your life either. The opioids the way they are. “

“Look at all the drugs taking over”

“Someone of them the spirits in them. Some just gets burnt out. And that’s what it’s from”

*“We were concerned about our industry to be honest with you because you know you know young people work ethic ***** sucks. Excuse my language there but it's fact. And you know with the opioid epidemic now”*

“I've seen overdoses in Cortez on the dock. There's been a few people that. You know overdose those. They just lost their guy, year before last”

“Now you can use Suboxone and your Narcan and you're good on either side. If you got a buddy doing the same thing if you kill yourself he can bring you right back”

Weather

Weather is one of the top concerns for all the commercial fishermen interviewed. Each fisherman was well aware of the power the ocean. Getting caught out in bad weather is a situation that all the fishermen had experienced. Some had even lost boats due to weather or knew of someone who had lost their lives in bad weather. Weather was a recurring theme for all the interviews and all hazards on the boat became exponentially more dangerous in bad weather. The fishermen also made the point that most of your catastrophic events are likely going to happen in bad weather due to unpredictability and stress on the vessel. Staying away from bad weather was a theme that came up often along with bad weather showing up even after extensive planning. Participants were asked what they thought was the most dangerous part of commercial fishing. Several responded with the following:

“Well that’s basically the most dangerous parts the weather and handling gear”

“Because nothing is really gonna break until it gets rough when you're in that weather that shackle gets more stress onto it. Cables got stress onto it and then when something, something breaks and its rough, it makes for a bad time make for bad times”

“Weather changes which happen that are unexpected”

“Mother Nature, I've been so scared out there. I've had lifejackets on life gear on, the whole nine yards.”

“Weather, you mess with is long enough and you'll run into it for sure... at times you can always figure in March, February, March, there's cold fronts and the high pressures will start clashing and he's always going to be a 100 mph winds somewhere. Every time it comes across the United States. Look at Texas, you look at Arkansas and tornadoes is touching down and hitting and torn up. Houses that same weather comes across here to our coast and we're out here fishing and we got to deal with it when he gets here. I always remembered I had a good friend last year, got caught in a water spout in South Carolina talking on the telephone to him. I heard he had turned over. They didn't save nobody”

“That and it's not very safe in the winter time when the fronts come through and decides blow 40. You can't get anchor to bite out at a hundred and somewhat fathoms and you're screwed. Then you have to steam in to. If you have mechanical problem then you're really screwed”

*“The rougher it is, the s***tier it is, the darker it is, and that's when the bad stuff happens. It's not slick calm and the porpoises jumping, that never happens”*

“we're always go to at least New York, you know, and it gets bad up there and it gets bad fast up there, you know, I mean lot of times you when the weather's coming, but sometime it gets

there before and sometime they give out 25 and it'll blow 45. You say we're 25 we can do that its right up to our boundary. You know, 20 to 30, which sometime we work in that. But hey, when it gets there you think is going to be 25 and its 45 takes a long time to get in and out of there.”

Operating at night

Operating at night was a major concern for all of the fishermen. Events’ occurring at night was a theme that usually could escalate to a major incident such as a fall overboard or boat collisions. Like weather, operating at night increased the dangers of hazards. Unfortunately most fishermen have to operate at night to either fish or travel to fishing spots. One of the biggest concerns that is related to night time is collisions with other boats. High amount of traffic in the Gulf of Mexico make fishing at night a dangerous activity. According to the fishermen recreational boaters add another danger because of their lack of experience. Several occasions can be quoted where boats almost ran into an anchored up fishing boat. High traffic was a common theme found mainly in the Gulf of Mexico but also in North Carolina.

“The other one that I’m most concerned about is I run a lot at night... I’ve seen logs out there. You know this big around. 20 30 foot long ones you know if you hit something like that. You’d be sunk in a matter of minutes. If you’re a cruising along at night and 20 or 30 knots.

“The guy that I was with, the captain that was running the boat. He was, he’d been doing it all his life eighty years ago, 75 years old after that because he lost respect for the seas, for the season and you know, he thought he was, we’ve done it so many years and he just lost respect for the wind. He shouldn’t have been trying to go through there at night time”

“Get run over at night, or running over somebody you don’t see”

“I mean recently we were fishing up off the Crystal River and there was a tug and barge that came really close to us. In the middle of the night. Now we had been awake for it. What it was I thought it was two boats because it was the light was so far separated, had to be like a 300 foot barge.”

Falling overboard

Falling overboard was a main theme for all the fishermen. Every one of them knew the high probability of drowning that follows if one falls overboard. These were also for different reason depending on how and where you fished. In the north Atlantic where most of the NC fishermen that were interviewed fish in the winter, is extremely cold water. Entering that water without a survival suit can result in sudden shock and rapid onset of hypothermia, both of which are a fatal combination. In the Gulf of Mexico falling overboard while anchored up could be a death sentence. The reason being is that if that tide is coming or going, if a fishermen falls overboard by the time the boat can be de anchored, they could be hundreds of yards away. Add rough weather and night time conditions and the situation just got much worse. A few fishermen were concerned with people urinating off the side of the boat at night when everyone is sleeping and slipping into the water. Usually the boat on auto pilot so no one knows they disappeared until they are miles away. This was a nightmare that some have had to endure.

“Actually my father fell overboard on a recreational boat. Taking a leak. And His wife was, Didn't know it. The boat was on autopilot cruising about 20 knots. Didn't know it for about 15 20 minutes. But fortunately it was a very calm warm day. And she was able to turn around and head back and found him”

“I’ve seen them fall a couple times. But the net was right there when dragging the net. They were on the doors clearing doors and tickler chains. Just grabbed ahold of the net and pulled themselves right back up”

“The guy that he's got to train the first mate, I saved his lives not to many years ago. He fell overboard and uh, who was shrimping in Georgia and I just happened to dropping our nets and just happened to...He was walking back this way at the corner and I see him. The net hit him the turtle shooter him. He'd. He'd done a flip and went overboard real quick, I grabbed the whip line off and ran back there and threw the rope to him he just back there he was in shock because he was small fellow”

“You don’t fall your ass overboard”

*“Yah I lost a man overboard. That was all when I first started running a boat and lost him overboard and he drown it. We found him. But s***, 10 days later or something he'd come up. It was right out here in the sound.”*

“One time he fell. He slipped and fell while we're on the way out and try and it was hanging out in some kind of way. You reached out to get something and slipped into that board right there. Saved him. He. He hollered and we slowed down and got him back on the boat”

*“Well the misconception about the Gulf of Mexico is you got a long time to live after you hit the water, bulls*** you got 30 minutes. Hour and a half you’re going to start cramping and go to sleep.”*

“You know one of the biggest fear I have out here especially this time of year is you guys get up in the middle if the night to take piss. That's a very dangerous thing to do. I asked them not

*just open the door piss on the deck. I don't care I mean you got blood you got guts and s*** I mean your piss is probably the cleanest s*** on the deck.”*

Sharks

The shrimpers know not to fall off not only because of the struggle to get back on the vessel, but more so for sharks. Sharks are known to follow shrimp boats as they unload their by catch. There are several quotes from the fishermen who have known or heard of people falling to the sharks off a shrimp boat. Sharks were also a reoccurring theme for fishermen simply because they are the apex predator in the ocean and they respect that. In the Gulf of Mexico commercial divers use spear guns to harvest fish one at a time while underwater. This operation requires the fishermen to remain underwater amassing a harvest of fish. Divers in in the Gulf of Mexico claimed that sharks trying to eat their catch were their main concern after basic diving techniques.

“cause down south you don't mess up fall overboard because sharks is going to get you...in the ocean not in the sound, in the ocean is just as bad as what they are in St Augustine , but I'm telling you as long as this pickup, you don't mess up and fall overboard. If anything gets done most of the time we'll bring it all to the side of the boat just to keep a man from going out there At times you got to go. First thing you do, bud be careful. Take your time. Don't take no chance, that's a captain speaking .to the man that's working with you and might know cause we've seen them by the thousands, thick I told my young ones, do not go in the ocean and I'm a commercial fisherman and I know what the deal is for those sharks”

“Last year or last summer or whatever they didn't find the bodies or nothing cause the shark probably eat them up”

“But I backed away off a diving just because the sharks were getting so bad. And. It's just intimidating when you get a 10, 12 foot shark come up to you when you're spearfishing. Bigger than you are. But now I just got a shark shield...I've never been bit I've had them put me in the boat. I've had them take the fish I've had them too close for comfort. Coming up you know right up to where. They're following me all the way up to the boat. I don't like that”

Frank: Have you heard of anyone falling overboard to the sharks?

F1: oh yah you don't even want to think about it

Paying attention

Paying attention was one of the major themes was addressed by all fishermen. It was stressed that not paying attention in this industry can be a death sentence. Every fishermen, both captain and crew, knew the importance of paying attention to your surroundings. Other factors such as rough weather and inexperienced help can help raise the chance of a serious injury if the individual is not paying attention to their surroundings. Commercial fishing is a “learn as you go” industry that has very little formal training involved. The “learn as you go” attitude can lead to fatal consequences if the worker does not learn fast enough. This theme was common in all the interviews.

“You got to pay attention for. Them”

“You got to look after each other. If you don't look after each other. Then you aint got a crew”

“That man that you, depending on the your life, he might not be paying attention to what's going on your side”

*“You just have no control over that one f***ing second that somebody's not thinking”*

“What if they're not paying attention, you know, a winding the net up, uh, the neck and get hung up a go on the outside of that net real quick and hit somebody. It's just so many variables in fishing that way you can get hurt that you've got to always be on top”

“Pay attention. You know that if someone got time on a boat and experience on a boat, they're not telling you something that's not useful to you. They're telling you something either from experience or something that they learned that you really need to pay attention. Be aware because it's. It's a dangerous, dangerous occupation”

*“Well that's all a fly by the seat of your f***ing pants job there. There's no way to train for that s*** right. And people can lose finger and s*** just form that one job”*

“They might do it a thousand times, but it might be a one time when they're not paying attention. And I've seen it and I've seen it where there not paying attention and you know”

“And he got to watch out for your gear to, you know, your nets your ropes all that stuff. You got to watch out for another man. You know if you on a winch, the other man is running. You got to watch out. For what he's doing do you got to pay attention to everybody there. I mean, you know, if he back there on the deck not running the winch and you ain't ready, I could drag you overboard board or you know, hurt you real bad. Just gotta pay attention to what you're doing”

Serious injuries

Every fishermen interviewed had witnessed a serious injury on their boat, if they didn't sustain one themselves. Losing fingers, toes, hands and other body parts was mentioned several times. Stories of decapitation and being cut in half also were reported. Every fisherman had known someone who had died or come close to death from serious injuries while fishing. There are multiple reasons for the serious injuries, but most stem from not being attentive about one's work environment. Another factor that can attribute to a serious injury is sleep deprivation. Several fishermen mentioned how working with lack of sleep has influenced their actions. Commercial fishermen are forced to work long hours in order to harvest fish when there are fish present, sometimes staying up for days at a time. Sleep deprivation is a major concern for fishermen because it can easily lead to a serious injury. Unfortunately for the commercial fishing industry serious injuries and amputations are somewhat normal occurrences.

In response to have they ever seen or sustained a serious injury themselves the fishermen answered,

"Just pulled a finger off... The pinky finger"

"I had one guy that had his toe chopped off on a hatch"

*"They were. Pulling the anchor. That you we're talking about a guy standing underneath the three quarter one inch line with a hung anchor underneath of a davit. G** D*** davit broke. You stand by the way that things was set up. The anchor was actually behind him so when it came down and broke it just cut his f***ing head off. Body went overboard and the head went in the floor"*

*“And he went down there long Jean on and got down there and slipped. And his jeans caught the coupling of the shaft out right which pulled his leg down into the bilge and damn near ripped his whole f***ing calf off”*

“I’ve been out there and seen people cut in half when I was scalloping”

*“The worst injury I’ve seen in my life when my dad got his hand cut off right here on the belt, done any engine room, got cut. Slam off. I was like a 15 years old on the deck, you know, working with him, been up two or three days, went down how belt come off. And he went down there to put that belt on. He had done it a million times that time, son of a bitch got him and cut his hand when he come up. He had about that much of his all way around with a piece of bone bout that big holding this to that, it was bad. I had to tie down a sheet cut sheets and tie them around there. I couldn't get her to stop bleeding. My granddaddy was on there, which he was kind of old, he went all the pieces, man, when they had happened f***ed him up, but my dad laid down in front of the wheel house and I started pressure and put them sheets around. I couldn't get the blood to hardly stop bleeding. My Daddy told me, say, boy, if you don't get that blood to stop, I'm gonna die right here and that scared the s*** out of met. I got her ass tight then I'll put. I got her tight. I got the blood stopped and the coastguard come, got him off the boat and he lost his hand”*

Hauling Gear

Winches

Hauling and setting gear was a major theme that arose. Captains and crew explained that the most dangerous moments to work were when setting and hauling the gear. This operation is increasingly dangerous when other variables such as rough weather are added. Winches, nets,

long line clips, and hooks make up the majority of the types of gear. The fast paced environment of a fishing boat and other factors such as inexperience, helped to explain the high chance of sustaining a serious injury. Every fishery is different when it comes to setting gear and also different hazards. Boats with winches were particularly dangerous and talked about in great detail during the interview. Captains stressed their concern over workers getting caught up in the winch from not paying attention.

“You know what a dangerous thing on that boat is that damn winche right there. They need to fix something to keep people from going up in them... because some time or another or somebody's gonna slip. I don't know when. But one wrap you through buddy. There had been some of them done that too, man. I ain't never had a one happened but that's what stresses me out on a scallop boat”

“We'll say the winches things happen. You know, what? Aint payin attention. No second chance. That's it. That's it most of the time... oh yah I tell my crew how far I want him to stay away from the winches and don't, you know, don't stand up on no net you know, keep your feet out of the ropes or. But mostly the winches. If I got to tell you again, you'll be fired, I don't want him nowhere close to the winches, you know, like spooling cable”

“When that cable is winding come underneath the cable, they might do it a thousand times, but it might be a one time when they're not paying attention. And I've seen it and I've seen it where there not paying attention and you know, we got splices on them cables sometimes and it's nothing for them to turn their back like this and the splice catches him back in a jacket or something and nobody's in front of that winch watching and shut that winch off. They'll be wound up in the winch”

Hooks

Hooks were another major concern for long liners and grouper snapper boats in the Gulf of Mexico. Hooks were also a concern to shrimpers who may pull lost gear up by accident when pulling their nets. Stories were told of workers getting hooked from not paying attention and going down with the longline. Deck hands working too fast and not paying attention could easily lose a finger while clipping hooks to a longline. Grouper snapper boats considered getting hooked a common occurrence. The gear being used in these operations are a single line with multiple hooks attached at different points. Bringing fish on board the boat with no control could result in a serious injury from a dangling hook.

*”And these days we're used an 8, 9, 10, 12 foot leaders back in the day when we first started our leaders were like 18 inches long. People used to get hooked and drug off the boat on a regular basis. We're safer now but I've seen some incidents in the past year where you can still get f***ing hurt back there setting that gear. And that's probably the most dangerous place on the boat. When you're stringing gear. If s*** happens back there your captain can't really see what's going on when he does by the time it happens you're off the boat or already hurt.”*

*“Leaders that was part of the training back then was if you get hooked jump with it, don't try to let it rip through you, go with it. That was part of the training back then. Guys would literally start sinking with the gear when they started panicking. Instead of un-snapping themselves from the f***ing line. Had a lot of guys get hurt bad back then”*

“But you talk about hooks a while ago. Yeah. We catch the same hooks and when we've dragging the inner chains and our nets on where one might be snagged where the fishermen's line log or law are broken. The Hook, the fish shook the hook off in there. We'd come along and catch

it. We're not paying attention when we're pulling our nets and bags back in. And a we done got caught with that same hook before because we don't ever mess, with hooks, you've got to, you got to stay on top of looking for stuff like that. Mono filament, don't go nowhere. They don't rot. It's right there. It's horrible stuff"

Fish Poisoning

Based on the account of the fishermen a major concern was their awareness and fear of fish poisoning which was a staph infection that had the potential to develop into MRSA. According to the CDC "MRSA is methicillin-resistant *Staphylococcus aureus*, a type of staph bacteria that is resistant to several antibiotics... If left untreated, MRSA infections can become severe and cause sepsis - a life-threatening reaction to severe infection in the body" (CDC). Contracting MRSA was a major concern of both crew and captain. Cleaning wounds immediately is a must to try and prevent the staph infection from developing. Every fisherman in the gulf has known someone or has had MRSA. Keeping the boat cleaned with bleach is a sign of the boats overall condition. Due to the warmer climate the chance of bacteria incubating and developing into staph infections is higher than other fishing regions. Small injuries from handling fish and gear could result in contracting a deadly staph infection if not cared for properly.

"Yah fish poisoning. I think that all these boats need to have anti biotics on them...I mean when you're working on the back deck it's hot and your arm chafes between your legs it causes bumps then the next thing you know its fish poisoning. You don't get it from fish exactly it's like a staph infection like concrete poisoning."

"MRSA. You know I've had MRSA before. Extremely painful now I'm very conscious of any cuts that I get. I'll take care of them right away. But I try not to get any is the main thing"

“(The fish) bit him through the glove you know Poking through the glove. And what they said was the summertime and he puts on the gloves guts the fish, Takes off the gloves, Drives to the next spot. Where he actually fishes with the gloves And They said that he and the fish slime and the guts and everything they get in the gloves and Incubated... He was in the hospital for three or four days. They had to like filet his hand open. Clean out that tendon and all of that without. Cutting It. And he had a port. He had every day there's really strong antibiotics going right to your heart. They're so strong they can't put it into your veins. Mess up your veins.”

“There are boats here that I won't get on. You know when you get off you wanna take an alcohol bath”

“Right even though you keep things clean with lysol and bleached, your still going to get it sometimes

Vessel Disasters

Fire

Vessel disasters were a main concern for everyone interviewed for obvious reason. The condition of the boat seemed to be major factor when finding the root cause of an event. Fires were one of the fishermen's greatest concerns, for the quickness that they can spread. A situation with a fire that seems to be controlled can get out of hand very easily. Boats made of wood and fiberglass were of greatest concern for the fact that fiberglass is extremely flammable and almost completely un-extinguishable with common fire extinguishers. Newer boats that were made of steel and of larger size had better techniques for extinguishing fires due to their many compartments. All of the fishermen had either experienced a fire personally or known someone

who had experienced a fire on their vessel. Because of the remote nature of the commercial fishing industry having a fire offshore can be a catastrophic event. In response to have you ever had a fire on your boat.

“Just small ones. Nothing too bad. You know you’d smell them. It would be the blower motor on the exhaust or something like that”

*“Closest Call I’ve ever had ever had was on that Thompson there I got trapped in the engine room there this last year. We had an alternator rebuilt. The guy didn't do it right.... I told the guys to put power to it so we just start the boat make sure. They put the power everything just erupted in flames. Yeah the whole wire harness and everything all the plastic from the dash all the way down caught fire. I was down I couldn’t breathe. I was like choke and couldn’t see couldn’t get out. It took me a couple of minutes but it finally had to feel my way out burnt the s*** out of my legs and stuff but I end up getting out of the engine room and everything is cleared all the smoke out. We got the boat started getting it get back home so”*

*“Thing is about getting that fire going in the engine room and you're not in there. By the time you figured out that that's what's happening and you have a fuel line or an oil line which was even worse. Feeding that fire. The fiberglass catches on. You're in trouble you're out of the fire. It's time to get off the f***ing boat”*

“We one time we had changed so something an exhausting and I will hold holding back and we looked at it and we see smoke coming off the engine room and what it was exhaust. When I went down the steps to go. When I went down to see where the fire was it was already black, was everything I could to get back up the steps. I just grabbed the extinguisher on the deck real quick and just started spraying, turn the fire off...I put the fire out. But that was, you got really by lucky

cause it, cause I didn't, we didn't really know what. All I could see was the flames licking them installation up at the ceiling and it was only minutes but still this is a good thing.”

“Fire, you know, not a, nothing that couldn't be handled in a 10 seconds, 15 seconds nothing that was scary or . It had to me really worried about. Hope I never have one of those”

Sinking

Having a vessel take on water and sink was a concern for all fishermen. All of the fishermen had either been a survivor of a boat sinking or knew someone who had been involved. Unfortunately a majority of fishermen had known individuals to die as a result of a vessel sinking. Wooden boats losing structural wooden boards and capsizing were the cause of most of the vessels sinking's in the population interviewed.

“I'm the survivor of a sinking. I had to be airlifted out of the water at night it was scary. Yeah. yah we went down off of Oregon inlet, boat went aground.”

“But I lost the boat one time in, uh, three crew members. Nineteen 85 in January of 1985 up in may port, Florida scalloping Calico's scallops really, uh, turned her over. But you're putting the scallops on the deck. Calicos, and they pile them up too high and it got rough. She got the top heavy and flipped. Lost the whole work (crew).”

“Yeah, had about almost sink on me before out there board came off of a wood boat now I would've been in a mess the whole boat sunk in , something about three minutes and my brother were right behind me where we're heading in we had been out for a week. And he was about a half a mile behind and he pulled right? Tommy got side of it and she would level with the water and I stepped right on his boat. That's how fast it sunk just like that, a board came off of it, wow. She went down to buddy like three minutes...”

“Anyway I had a hole about that big that was just gushing right up into the engine room. And luckily it was a really nice day it was slick calm. So it took a screwdriver jumped in the water and before I did that I took a bullet float. I knew what size the hole was I've got this bullet float. Well they sent us all these bullet floats. They got the hole in the middle and this one didn't. It was a defect. It was like just a big piece of plastic there cork. Yes, so I took it and I shaved it down like that were just like this. And then it spread out. I jumped in the water took the screwdriver put it up on the screen popped the screen off that it shoved it in. Was good enough to where we finished our trip”

“The boat that was pulling them the rope broke up, which everybody seems to think what happened was it was so rough that rope pulling data pulled. The whole bow was a wooden boat, hope for the whole bow stem right off the boat and to open up and when he, when, when it turned him loose, he said they would have no power. The seas turned them to the side and my, my, my nephew said all he said was a black wall on a window there and the boat rolled”

Lack of maintenance

Old wooden boats were what was mentioned from years past. It was explained that boats sank much more when they were made of wood. Other concerns from captains were the conditions of other boats in their fleets that were not receiving the proper funding for maintenance. Boat conditions have improved, but other owners need to maintain their vessel to ensure the safety of the crew. Many vessel disasters that were mentioned during the interviews can be attributed to lack of maintenance.

“The only thing that's keeping you alive on that boat, is that boat floating.”

“We’ve got one captain out here what has he lost 3. Damn good captain I mean but maintenance is not his prime thought”

“well i think the boats are a lot better now than they were 50 years ago, you know, the boats are a bigger and stronger and it's a whole different ballgame...they were wood now they're steel and weren't many steel boats around here.”

“The only thing I can say is that our older boats aren't getting fixed up. There kinda just letting them go till they go. Or putting a patch on them. Maybe just the shape of the fleet. You're either like this right here or the other way. There is no in between... there is something strange about that. But that's the way it is. It's because it's hard to put your money back into your boat that's why”

“Well I mean there is a tremendous amount of Boats commercial boats that are. Old and Outdated. That really should be upgraded you know rebuilt or replaced or something. I mean there's getting some nicer boats in the fleet. There's some stuff I don't know if you noticed that boat t Mary was tied up. I wouldn't go in there to the island on that”

Confidence

Still, the industry has become much safer. Captains felt confident in their abilities because they know the new safety equipment that is required will help them. The average age for captains was 53 and they remembered fishing years past with little to no safety equipment. The commercial fishing industry has become incredibly safer over the last 40 year from better designed boats and mandatory safety equipment. This confidence can be short lived however if

the crew and captain do not know how to operate the emergency equipment which stems from lack of training.

“I’m not worried about sinking or nothing because you can see pretty much what I have. You know and as far as fires go I can pretty much contain a fire pretty well too. Because I can completely seal my engine room. And my lazeret is sealed and my floor peak is sealed. So pretty much I can put an engine room fire out and the only other fire would be electrical, grease fire or something...well I’m really cocky cause I think this boats unsinkable but every boats sinkable”

“Me I used to go out there with a single engine boat. No rafts no EPIRBS. You know when I was a kid. I always wanted a raft, a life raft and they didn’t have EPIRBS you know .Now with all that safety gear feel pretty safe. Obviously anything can happen.”

“We weren't safety conscious like we should have been when we were younger we thought we were indestructible. Yeah we didn’t have any common sense that over the years you know we learned to be you know responsible and you know and actually care about people that work for us.”

“No good help”

The biggest issue with the commercial fishing industry that can be concluded from the research is the lack of good experienced help. Help in this context refers to deck hands and crew who work for the captains. When asked the question was it hard to find good help, all captains unanimously replied that help was difficult to find. The gap between the age of the captains and the age of the crew keeps growing with every year. Much of this is due to the rising costs of fishing through quota’s and regulations that young people are choosing different occupations. Due

to rising prices on fishing permits and boat maintenance commercial fishing is a very hard industry to start a new career. The rising expenses are keeping new workers and captains away from the industry. One exception is individuals who have a family background in commercial fishing, who can acquire the tools necessary to fish. The biggest issue with new workers is the lack of experience in an already extremely hazardous industry. As mentioned before this industry is unforgiving and one wrong move could be fatal. Lack of experience in the fishing industry and little safety training in some areas, continue to contribute to the high fatality rates. Analysis of the interviews found that commercial fishermen tend to not only fear for their own lives, but for the person next to them also. This finding stems from the concept that they are in control of themselves, but cannot control the actions of others. Captains were especially concerned with the fact that they find few experienced workers in this industry. For that reason they constantly have to worry about the workers on their boats.

“A whole lot of it, if you're not born and raised in it, he just can't walk off the street and get on the back of one of these boats”

“It's hard to find anyone good... You just hope someone out of the bunch is smart enough to figure stuff out. I mean as a general hull I don't have much faith in crewman.”

“Me being a new green horn. Just carelessness. Not thinking of what can happen... Everything is new to me. Everything's a hazard to me.”

*“That's the art of what we do these days. These guys like to try to push their luck see if you can get five six seven eight clips off that came up and all knotted up and s*** just to be their own hero. You don't need to be my f***in hero, because I don't want you to do that”*

*“ This controls the speed of the spool. If i think they're going too fast. I'll pull that some bitch all the way back. I'll take it out of gear or just sit there and wait for them to f****ing catch up with the hooks or get them all untangled and s*** like that. I'm not going to sit there and let the hook themselves, be stupid about it”*

“I have a whole new crew. One for a year and half, one for 6 months, and one on one trip. So I'm constantly having to train right now.

Conclusions

There are many reasons why the commercial fishing industry is plagued by high amounts of injuries and fatalities. One of the main themes to arise during the interviews was the lack of experienced workers. The work environment for commercial fishing is littered with serious hazards, when an un-experienced worker is present it can lead to a deadly outcome quickly. All of the sub themes that were mentioned (“weather”, “operating at night”, “vessel disaster”, “serious injuries”, “Paying attention”, “falling overboard”, “sharks”, “hauling gear”, “no good help”, “confidence”, “Quotas and regulations” and “Opiates and other drugs”) become increasingly dangerous when unexperienced workers are added to the equation. Inexperienced workers are not only a hazard to themselves, but also to others working around them.

The information that was gained from the interviews can be useful to industry trainers. The research shows that commercial fishermen are aware of the many dangers that they face on a regular basis. For this reason they are extremely cautious about every move that they make while fishing. The individuals that do not take caution will most likely end up with an injury at some point in their career. Commercial fishermen perceive the world around them in a range from neutral to very risky, which may show that risk denial is common amongst this population. Since the unexperienced workers are a major concern for all parties on the fishing vessel it is crucial that industry trainers try to focus their efforts on this group. As commercial fishing has become safer with mandatory safety equipment and safety classes, there comes a need to target an intervention on the crew members of a vessel. Training in the past has mainly targeted captains of vessels, because they are usually the most experienced and have the most control over their boat. Therefore having a captain who is able to perform emergency drills is pertinent to the survival of the crew. At this point, it is more important for trainers to also focus on crew members

that are not captains. One recommendation for industry trainers to have future training focused on getting more crew members and deck hands to participate in safety training efforts. Another suggestion is for trainers to incorporate the information from this research into their current curriculum to cover specific topics that are particularly dangerous to crew members such as hauling gear, fish poisoning, and the risks of taking drugs while fishing. Commercial fishermen have a heightened risk perception because they are well aware of the many dangers they face. Unfortunately due to economic reasons, fishermen are forced to put negative thoughts about a hazard to the side in order to continue fishing. Improved training efforts that include fishery specific hazards could bring valuable information to at risk workers. This could help to lower the injury and fatality rates by providing lifesaving information to the group within the population that is suffering the most. An increased awareness of hazards has proven in other industries to lower injuries from that specific hazard.

According to NIOSH reports commercial fishing is one of the deadliest occupations in the United States. The leading causes of death in the commercial fishing industry are vessel disasters followed closely by falls overboard. Vessel disasters usually stem from causes that are not personal decisions such as bad weather or lack of vessel maintenance. Falling overboard on the other hand is an individual situation that usually stems from personal choices. These choices could include anything from not standing in the right spot to watching nets or ropes when hauling gear. The point being that commercial fishermen are more likely to fall overboard than experience a vessel disaster due to the personal nature of the event. Analysis of the interviews concluded that fishermen are aware of the dangers that accompany falling overboard, but do not see this as their greatest risk. Instead the analysis showed that fishermen are confident in their own personal abilities to not fall overboard. This idea supports the fact that commercial fishermen are not

necessarily worried about themselves, but are more worried about other people's actions.

Fishermen were more worried about things out of their control such as bad weather or getting hurt on the vessel while hauling gear than falling overboard. This information can be used by industry trainers to improve training efforts by tailoring the interventions to the group of fishermen at the particular safety class. Using a blanket curriculum that organizations are using now has worked in the past, but fishery specific interventions will be needed in the future.

Future research on high risk workers in the commercial fishing industry should try and focus on acquiring more participation from crew members instead of captains. One of the major limitations of this research was the fact that 10 out of 14 fishermen interviewed were captains. Captains tend to be more experienced and have a general concern over the safety of the crew and vessel for economic reasons. Another limitation of this research was the fact that 91% of the participants interviewed had taken the Emergency Drill Conductor safety class. Since most of the participants had received the training most were aware of occupational risks associated with commercial fishing. The last limitation was that this research did not address worker fatigue in the interview process. Fatigue was a variable that often appeared around serious injuries and vessel disasters. Further research into how fatigue is affecting the workers in this industry could provide insight on causes of serious injuries or vessel disasters. This fact helps to explain why the commercial fishermen who were interviewed had heightened perceptions of risk. The analysis of the interviews showed that one of the greatest concerns for captains and crew was unexperienced workers who could pose a danger to themselves or others. Therefore future training efforts need to focus on acquiring more insight from deckhands and crew members. Further insight into the population could yield information that could improve training efforts. Deck hands and crew members are harder to interview because of their nomadic nature. Crew members will often work

on a number of different boats during different fishing seasons. For this reason future research should focus on the risk perception of deck hands and crew members in the commercial fishing industry in order to gain a well-rounded view. Increased participation from crew members in safety trainings is necessary to help lower injury rates in the commercial fishing industry. Commercial fishing will remain one of the deadliest occupations in the United States if the workers do not receive more safety interventions.

Other research showed that commercial fishermen have a low perception of risk and I would argue the contrary. Commercial fishermen are well aware of the risks that they face. The problem lies with three main issues which are unexperienced workers, drugs, and economic pressure. No matter the exposure to the hazards fishermen are still faced with those three issues. If fishermen are unexperienced they may make a wrong move and suffer. If a fishermen is under the influence of drugs they may do something wrong and suffer. Economic pressures will make fishermen perform work that under lesser circumstances may not be performed. For these reasons it is important to consider that this population does not have a lower perception of risk than other groups, but face a great deal of risk denial in order work.

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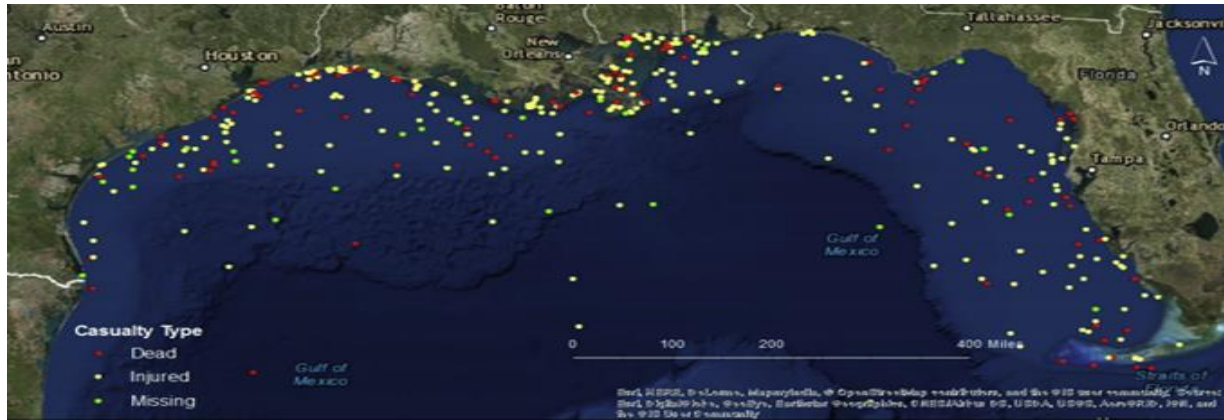
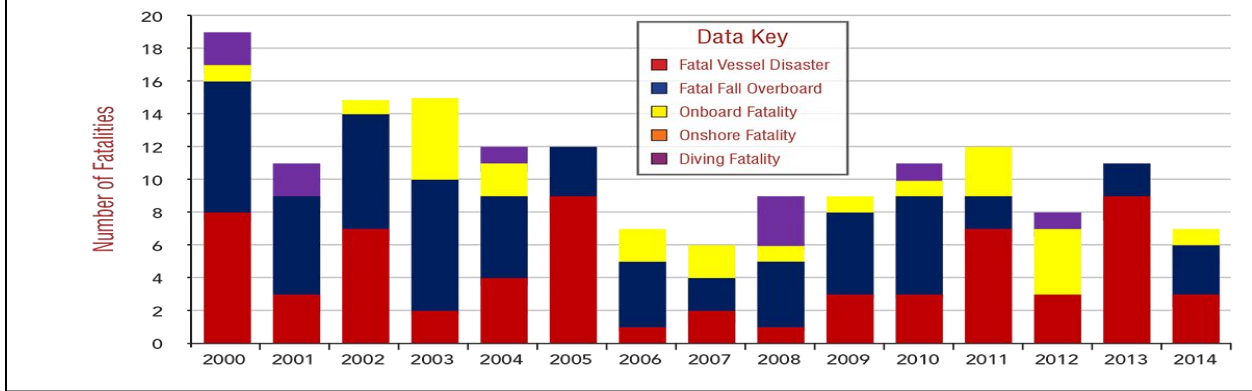
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Appendix 1

Figure 1 Commercial Fishing Fatalities by Year and Incident Type, Gulf of Mexico, 2000–2014 (164 Total)



	Operation of fishing gear (%)	Processing the catch (%)	Other (%)	Total (%)
Fall on board	13.7	18.2	25.6	17.2
Collision with a fixed obstacle	12.2	11.0	13.6	12.0
Struck–swept along–pinned	37.8	10.1	14.4	25.0
Cut–pricked	12.2	26.7	8.6	16.2
Excessive effort–awkward movement	14.4	24.6	14.1	17.6
Other	9.7	9.5	23.7	12.0
Number of injured men	3183	1987	1061	6231

Data familiarization	The first stage of the thematic analysis process for the researcher is to familiarize themselves with the data. Data familiarization can be achieved while in the process of collecting data. While the researcher is collecting data from qualitative methods, they can begin to form ideas on what topics, phrases, or words are being mentioned frequently. While conducting my research I was immersed into my data by conducting personal interviews and then transcribing them from voice recordings. This process of reviewing and transcribing allowed me to become immersed in my data which is beneficial for the remaining process.
Initial coding	While the researcher is familiarizing themselves with the data certain topics, phrases, and words should appear more frequently than others. The repeated topics, phrases, and words will become the first codes for the analysis. The codes that are found will later serve as support for common themes. For example while analyzing my transcripts certain topic such as “paying attention” and “bad weather” was commonly mentioned. These topics would serve as codes in the analysis. Once a set of codes has been established the next step is to label all of the codes as they appear in the transcripts.
Data sorting by code	After reviewing the data and establishing a list of codes, the researcher will then label all of the codes as they appear In the transcripts. This process will create a visual aid to help determine what codes are mentioned the most. Counting of the individual codes will also allow for the researcher to identify the most significant codes. For example when analyzing my data, I would use codes such as “FO” for falls overboard and mark this code every time falling overboard was mentioned.
Search for themes	Once the data has been analyzed completely by coding, then the researcher can search for common themes. Themes are more complex than codes, but a code with enough

	<p>significance can serve as a theme. Themes can be a collection of common codes that share similarities such as Inexperienced workers. Themes can also be important codes such as ‘bad weather’. The goal of this step in the thematic analysis is to take all of the codes from before and group them into reoccurring themes. For example some codes used in this research were fire, sinking, and maintenance. These three codes were grouped into the common theme of vessel disasters. Grouping of codes allows for more complex themes to arise and to be supported.</p>
<p>Review of themes</p>	<p>If the process is followed as such, a list of themes that is smaller than the codes list will be created. Some themes are going to have more significance than others. For these situations it is possible to consider having main themes with supporting sub themes. Themes need to be analyzed repeatedly by the researcher in order to form discussion points about the themes. Once common themes are addressed it is important to ensure they are in fact valid themes. The best method to ensure validity of the found themes is to have outside sources verify the results. For example after identifying the three major themes and ten subthemes in the current research, two commercial fishermen along with a qualitative writing expert validated my findings. They were given the list of common themes that were found and established they were common. The step of ensuring validity with the analysis is crucial for the process.</p>

Report findings	<p>The final step to the thematic analysis is to report the findings. Themes should be mentioned by importance and supported by sub themes, if any are found. Analysis of the themes is required in order to create valuable discussion points for the research. Themes should be presented in a manner where they are introduced then explained in detail. After explanation of the theme quotes should be added to support the findings. For example when discussing the theme of “serious injuries” an explanation on why this was a common them was given. Then directly below the section was an italicized quote “I saw a guy get cut in half on a scallop boat”. This quote directly supports the theme that the fishermen mentioned of “serious injuries”. The more supporting quotes that are available will strengthen the analysis of the themes.</p>
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Appendix 2

Francis Bly

Research topic: Understanding the Risk Perception of Commercial Fishermen

Interview questions

Global research question:

What are the most dangerous risks that you have experienced while working?

Prompts to guide conversation:

Please explain what a normal work day is for you?

What are some things that make a bad day at work worse?

Have you sustained any serious injuries while fishing?

Have you or anyone you've known been in a vessel disaster?

Have you or anyone you've known fallen overboard?

What was the worst "close call" that you've experienced?

Do you have any safety rules for your vessel?

What is one risk that most fishermen fear, but is the least of your worries?

Is there any risk you know other fishermen are afraid of?

Have you received any formal safety training for your occupation?

How has your occupation effected your personal and family life

Appendix 3

Survey questions

1. What is your age?
2. What is your gender?
3. Which of the following best describes your job in commercial fishing? Select only one.

Captain or Deckhand

4. How many generations of your family have commercial fished? Just me, 2, 3, 4, 5+
5. How long have you been in commercial fishing? <1year, 1–3, 3–5, 5–10, 10–15, >15 years
6. Which of the following is your major catch as a commercial fisherman? Shrimp, Grouper/Snapper/Reef, Longline
7. How far offshore do you normally fish? <3 mile, 3-10, 11-25, 25-50, 50+
8. How many days do you normally stay out on a single trip? 1-3, 3-7, 7-14, 14+
9. Do you smoke cigarettes?
10. Do you normally wear a seat belt while driving?
11. How risky is your work? Very safe, Safe, Neutral, Risky, Very risky
12. Are you part of the NOAA observer program? Yes or no
13. Have you ever received safety training? Yes or no
14. Do you personally know anyone who has suffered a fatal injury while working?
15. Which of the following could you show and tell how to use correctly in case of an emergency? Select all that apply. PFD, lift Raft, EPIRP
16. Which of the following could you show and/or tell how to take care of correctly? Select all that apply. Machinery hazards, Abandoning vessel, Fighting fires, Man overboard

Appendix 4

EAST CAROLINA UNIVERSITY

University & Medical Center Institutional Review Board

4N-64 Brody Medical Sciences Building · Mail Stop 682

600 Moye Boulevard · Greenville, NC 27834

Office 252-744-2914 Call: 252-744-2914 · Fax 252-744-2284 Call: 252-744-2284 ·

www.ecu.edu/ORIC/irb

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB

To: Francis Bly

CC: Michael Behm

Date: 12/13/2017

Re: UMCIRB 17-002867

Understanding the Risk Perception of Commercial Fishermen

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 12/12/2017 to 12/11/2018. The research study is eligible for review under expedited category # 6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Interview Questions for Thesis.docx

Interview/Focus Group Scripts/Questions

IRB consent letter Bly.docx

Consent Forms

Survey questions.docx

Surveys and Questionnaires

Thesis Proposal Bly.docx

Study Protocol or Grant Application

The Chairperson (or designee) does not have a potential for conflict of interest on this study

Appendix 5

Dear Participant,

I am a student at East Carolina University in the Masters of Occupational Safety program. I am asking you to take part in my research study entitled, “Understanding the Risk Perception of Commercial fishermen?”

The purpose of this research is to explore, describe, and evaluate the risk perceptions of commercial fishermen. By doing this research, I hope to learn how commercial fishermen perceive their occupational risks. This information can later be used by industry trainers to improve training efforts by addressing the risks and hazards perceived to be of higher importance. Your participation is completely voluntary.

You are being invited to take part in this research because of your commercial fishing occupational background. The amount of time it will take you to complete this interview approximately 20-30 minutes. Interviews will be recorded for purposes of transcription. A 16 question survey will also be given covering demographics and occupational risk.

During this interview and survey, you will be asked questions that are related to different occupational risks associated with commercial fishing and how you view the possibility of sustaining an injury from the specified risks.

Your name and contact information will remain confidential and will not be released beyond my thesis advising committee and the ECU Institutional Review Board (IRB) that will oversee this research. Therefore some of the IRB members or the IRB staff may need to review my research data. Your identity will be evident to those individuals who see this information. However, I will take precautions to ensure that anyone not authorized to see your identity will not be given that information. Your responses will be kept confidential and no data will be released or used with your identification attached.

If you have questions about your rights when taking part in this research, call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, call the Director of ORIC, at 252-744-1971.

You do not have to take part in this research, and you can stop at any time. If you decide you are willing to take part in this study, please indicate your verbal consent and we will continue on with the interview process.

Thank you for taking the time to participate in my research.

Sincerely,
Francis E. Bly
Principal Investigator

Signature _____ Date _____

