Comparing risk between fleets

Commercial fishing fleets have different numbers of vessels, fishermen, and season lengths. Because of these operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities. Instead, we calculate fatality rates to measure risk. Rate is the probability of an event occurring.

Vessel Disasters

Take a marine safety class at least every five years. Safety training for fishermen is available, affordable, and taxes free. All fishermen should learn and know how to use basic lifesaving equipment like immersion suits, life rafts, EPIRBs, and fire extinguishers to improve their chances of survival in an emergency.

Conduct monthly drills for abandon ship, fire, and flooding. To ensure that all personnel know what to do in an emergency, monthly drills should be conducted. The training program must ensure that all crew members are familiar with vessel operations, safety equipment, and emergency procedures.

Be familiar with vessel operations, safety equipment, and emergency procedures. Be alert and focused while the diver is in the water. Regularly inspect electrical systems, ensure that all systems are in good working condition. Emergency-stop buttons have been developed for use in cases where the electronic off-gas or hazardous materials cylinders on deck in an upright position. Fire extinguishers and fixed extinguishing systems should be checked monthly by an authorized person and replaced when needed.

Falls Overboard

Wear a PFD on deck. Network, none of the fishermen who died from falling overboard were wearing a PFD when they drowned. PFDs can keep fishermen afloat, giving the crew time for rescue.

Use a man-overboard alarm system. Many falls overboard are not witnessed, delaying recovery. A man-overboard alarm system will alert the crew if a fall overboard occurs, and a device with GPS capabilities can signal the fisherman’s location to assist in search and recovery efforts.

Onboard Fatalities

Replace emergency recovery devices and re-boarding ladders. A rescue string or similar device is more effective than a life ring for bringing a crewmember back on the vessel. If someone falls alone, a plan should be in place for them to re-board their vessel unassisted after a fall.

Conduct man-overboard drills monthly. Recovery procedures should be practiced regularly to ensure all crewmembers are prepared to respond to a fall overboard.

Onboard Safety

Install safety devices on deck machinery. Emergency-stop buttons have been developed specifically for deck machinery on fishing vessels and can be adapted and retrofitted onto winches or other machinery. Stainguarding and auxiliary equipment. Stainguarding and auxiliary equipment engineering solutions for falling vessels can be found at:

cdc.gov/niosh/topics/fishing/engineering/

Diving Fatalities

Dive with an experienced, alert tender. Be familiar with emergency procedures for both vessel and dive emergencies. Be alert and focused while the diver is in the water.

Be prepared for a dive emergency. Be prepared to administer first aid, including the use of emergency respirators.

Maintain diving equipment. Ensure that compressors and other equipment used in diving operations are in good working condition.

Why use a fatality rate?

To determine the risk of fatalities in different fleets, we need to consider the number of vessels in the fleet, number of fishermen, and season length. Because of these operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities. Instead, we calculate fatality rates to measure risk. Rate is the probability of an event occurring.

How do we calculate a fatality rate?

We calculate fatality rates using an updated method to calculate FTEs. This improved method matches the various operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities.

Here’s how we calculate FTEs:

Here’s how we use FTEs to calculate a fatality rate:

FTEs = # of Fatalities × 10,000 # of FTEs

FTEs = # Vessels × # Crew per Vessel × # Operating Days = 24 Hours × 2,000 Hours (standard 40-hour work week for the year)

FTEs = # of Fatalities per 10,000 FTEs

Gulf of Mexico Region

Gulf of Mexico Fatality Events, 2010–2014

National Institute for Occupational Safety and Health

Commercial Fishing Safety Research and Design Program

Risk Management

Fatality Rates by Fleet, 2005–2014

Fatality Rate (per 10,000 FTEs)

Northeast Multi-Species Groundfish Trawl

West Coast Multi-Species Groundfish Trawl

Northeast Halibut/Sablefish Longline

West Coast North-San Linguis Ground

Alaska Halibut/Sablefish Longline

Alaska Salmon Tender

Alaska Salmon Drift Gillnet

Alaska Groundfish Freezer Trawl (A80)

Gulf of Mexico Shrimp

Atlantic Clam/Quahog Dredge

Atlantic Scallop Drill Rig

Atlantic Summer Tuna

Atlantic Tuna Drag

Atlantic Winter Tuna

Atlantic Summer Tuna

Atlantic Salmon Tender

Atlantic Salmon Drift Gillnet

Atlantic Salmon Set Gillnet

Figure 8

The Gulf of Mexico shrimp fleet had the nation’s lowest fatality rate among only available to calculate a fatality rate for the shrimp fleet. During 2005–2014, the Gulf of Mexico shrimp fleet reported the fewest fatalities, and where workforce estimates were published in this report cannot be compared to rates published in previous NIOSH studies.

Fatality rates were calculated for fleets that experienced five or more fatalities during a 10-year period (2005–2014) and where workforce estimates were available (Figure 8). For the Gulf of Mexico, workforce estimates were only available to calculate a fatality rate for the shrimp fleet. During 2005–2014, the Gulf of Mexico shrimp fleet reported the fewest fatalities, and where workforce estimates were published in this report cannot be compared to rates published in previous NIOSH studies.

To determine the risk of fatalities in different fleets, we need to consider the number of vessels in the fleet, number of fishermen, and season length. Because of these operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities. Instead, we calculate fatality rates to measure risk. Rate is the probability of an event occurring.

Here’s how we use FTEs to calculate a fatality rate:
During the 15-year period 2000–2014, 164 commercial fishing deaths occurred in Gulf of Mexico fisheries, averaging almost 11 fatalities annually. For the most recent five-year period (2010–2014), 49 fatalities were recorded, averaging 10 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was vessel disasters; however, during 2010–2014, the leading cause of fatalities was vessel disasters. Vessel disasters accounted for half of all fatalities (25, 51%). During the first decade (2000–2009), 115 fatalities occurred, an average of nearly 12 deaths per year. For the most recent five-year period (2010–2014), 49 fatalities were recorded, averaging 10 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was vessel overboard; however, during 2010–2014, the leading cause of fatalities was vessel disasters.

Vessel disasters resulted in the most fatalities during 2010–2014. A total of 71 vessel disasters occurred in Gulf of Mexico waters during this time period (Figure 4), placing 189 crewmembers at risk of immersion and death. While vessel disasters resulted in the most fatalities, they were not the leading cause of commercial fishing fatalities in the Gulf of Mexico during 2010–2014 (Figure 2). Vessel disasters include sinkings, capsizings, fires, groundings, or collisions/allisions. Of the 16 vessel disasters, nine were due to a fall overboard, six were due to a vessel capsize, and one was due to a vessel being struck by an object or gear. Of the vessel disasters, eight were due to a fall overboard, and one was due to a vessel being struck by an object or gear.

During 2010–2014, 13 crewmembers died from drowning after falling overboard, contributing to 27% of fatalities in the region (Figure 5). None of the crewmembers were wearing a personal flotation device (PFD) when they drowned. Over half (54%) of the falls were not witnessed by other crewmembers, either because the fishermen were alone on the vessel (2) or alone on deck (6). Fatal falls overboard were most frequently caused by losing balance or by contact with gear, including being knocked over by or becoming entangled in gear.

Conclusions

In this region, preventing vessel deaths, fall overboard, and onboard injuries should be priorities. Vessel disasters contributed to half of all fatalities, with the most frequent causes being flooding, fires and explosions, and collisions/allisions. Performing preventive maintenance, attending safety training, and conducting monthly drills are recommended to prevent vessel disasters and to improve chances of survival if a disaster occurs.

To prevent drowning due to fatal falls overboard, fishermen should wear PFDs while working on deck to stay afloat if a fall overboard occurs. Crewmembers should be trained in proper man-overboard recovery procedures. When fishermen choose to fall alone, they should ensure easy-to-re-board v e h i c l e s with a st r i p e d t h a t assist other crewmembers, in case they fall in the water while working alone.

Onboard injury prevention should target winch arrangements, which contributed to nearly half of the onboard fatalities in the region. NIOSH is working on engineering solutions to address this issue by developing and testing winch guards and auxiliary-step devices in the Gulf of Mexico shrimp fleet. More information about engineering solutions for fishing vessels can be found at www.niosh.gov/NIOSH-Topic/FishingEngineering.html.

To help prevent vessel disasters, ensure watercraft integrity of the vessel and perform maintenance to prevent fires and explosions.

Safety training for fishermen is available, affordable, and saves lives.
During the 15-year period 2000–2014, 164 commercial fishing deaths occurred in Gulf of Mexico fisheries, averaging almost 11 fatalities annually. For the most recent five-year period (2010–2014), 49 fatalities were recorded, averaging 10 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was falling overboard; however, during 2010–2014, the leading cause of fatalities was vessel disasters.

Vessel disasters accounted for half of all fatalities (25, 51%). During the first decade (2000–2009), 115 fatalities occurred, averaging 10 fatalities annually. During 2010–2009, the leading cause of fatalities in the region was vessel disasters; however, during 2010–2014, the leading cause of fatalities was vessel disasters.

Figure 3 shows the number of vessel disasters by fleet type. The shrimp fleet had the highest number of vessel disasters, with 27, accounting for 51% of all vessel disasters. The other fleets that experienced vessel disasters were oyster, menhaden, snapper/grouper, and shark. The oyster fishery had the highest number of fatalities due to vessel disasters, with 13, accounting for 27% of all vessel disasters.

Conclusions

In this region, preventing vessel disasters, falls overboard, and onboard injuries should be priorities. Vessel disasters contributed to half of all fatalities, with the most frequent causes including flooding, fire and explosion, and collision/allision. Performing preventive maintenance, attending safety training, and conducting monthly drills are recommended to prevent vessel disasters and to improve chances of survival if a disaster occurs.

To prevent drowning due to falls overboard, fishermen should wear PFDs while working on deck to stay afloat if a fall overboard occurs. Crewmembers should be trained in proper man-overboard recovery procedures. When fishermen choose to fish alone, they should ensure easy to-re-board their vessels without assistance from other crewmembers. In case they fall in the water while working alone.

Onboard injury prevention should target winch entanglements, which contributed to nearly half of the onboard fatalities. For the most recent five-year period (2010–2014), 24 fatalities were recorded, averaging 4.8 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was falling overboard; however, during 2010–2014, the leading cause of fatalities was falls overboard. During 2000–2009, 113 fatalities occurred, averaging 10 fatalities annually. During 2010–2014, 67 fatalities were recorded, averaging 13 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was falling overboard; however, during 2010–2014, the leading cause of fatalities was falls overboard.
During the 15-year period 2000–2014, 164 commercial fishing deaths occurred in Gulf of Mexico fisheries, averaging almost 11 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was vessel disasters. For the most recent five-year period (2010–2014), 49 fatalities were recorded, averaging almost 12 deaths per year. For the most recent five-year period (2010–2014), 49 fatalities were recorded, averaging 10 fatalities annually. During 2000–2009, the leading cause of fatalities in the region was vessel disaster, however, during 2010–2014, the leading cause of fatalities was vessel disasters.

Vessel disasters accounted for half of all fatalities (25, 51%). During 2000–2009, vessel disasters caused 42 commercial fishing deaths. During 2010–2014, vessel disasters killed 25 fishermen. In the shrimp fleet, a single vessel disaster resulted in three crewmember deaths. In the menhaden fishery, a single vessel disaster resulted in nine crewmember deaths, resulting from two vessel disasters, three falls overboard, and an onboard injury. The oyster fishery experienced nine fatalities, resulting from two vessel disasters, three falls overboard, and an onboard injury. The opah fishery experienced four fatalities, with two resulting from vessel disasters and two from falls overboard. In the redfish fishery, a single vessel disaster resulted in three crewmember deaths.

Conclusions

In this region, preventing vessel deaths, vessel overboard, and onboard injuries should be priorities. Vessel deaths contributed to half of all fatalities, with the most frequent causes including flooding, fires and explosions, and collisions/groundings. Performing preventive maintenance, attending safety training, and conducting monthly drills are recommended to prevent vessel deaths and to improve chances of survival if a disaster occurs.

To prevent drowning due to falls overboard, fishermen should wear PFDs while working on deck to stay afloat if a fall overboard occurs. Crewmembers should be trained in proper man-overboard recovery procedures. When fishermen choose to fall alone, they should ensure easy to re-board vessels without assistance from other crewmembers, in case they fall in the water while working alone. Onboard injury prevention should target winch arrangements, which contributed to nearly half of the onboard fatalities in the region. NIOSH is working on engineering solutions to address this issue by developing and testing winch guards and auxiliary-stop devices in the Gulf of Mexico shrimp fleet. More information about engineering solutions for fishing vessels can be found at www.cdc.gov/niosh/topics/fishingengineering/.
Commercial fishing fleets have different numbers of vessels, fishermen, and season lengths. Because of these operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities. Instead, we calculate fatality rates to measure risk. Risk is the probability of a fatality occurring.

### Fatality Rates

<table>
<thead>
<tr>
<th>Fleet</th>
<th>Fatality Rate (per 10,000 FTEs)</th>
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<tbody>
<tr>
<td>Northeast Multi-Species Groundfish Trawl</td>
<td></td>
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</tbody>
</table>

F/fatality rates were calculated for fleets that experienced five or more fatalities during a 10-year period (2005–2014) and where workforce estimates were available (Figure 6). For the Gulf of Mexico shrimp fleet, workforce estimates were only available to calculate a fatality rate for the shrimp fleet. During 2005–2014, the Gulf of Mexico shrimp fleet had the lowest fatality risk among fleets where fatality rates were calculated.

### Recommendations

#### Vessel Disasters

- **Take a marine safety class at least every five years.** Safety training for fishermen is available, affordable, and taxes lives. All fishermen should learn and know how to use basic lifesaving equipment like immersion suits, life rafts, EPIRBs, and fire extinguishers to improve their chances of survival in an emergency.
- **Conduct monthly drills for abandon ship, fire, and flooding.** Regularly to ensure all crewmembers are prepared to respond to a full overboard.
- **Wear a PFD on deck.** Why? Because fishermen who died from falling overboard were wearing a PFD when they drowned. PFDs can keep fishermen afloat, giving the crew time for rescue.
- **Dive with an experienced, alert tender.** Why? Because accidents involving decompression sickness can happen anytime and anywhere.
- **Add effective recovery devices and re-boarding systems to assist in search and recovery efforts.** Why? Because a person who falls overboard can be pulled back to the crew, safely. A man-overboard system will alert the crew that a fall has occurred, and a device with GPS functionality will indicate the crewmember’s location to assist in search and recovery efforts.
- **Conduct man-overboard drills monthly.** Why? Because accidents involving decompression sickness can happen anytime and anywhere.

#### Onboard Fatalities

- **Avoid safety devices on deck machinery.** Why? Because safety devices on deck machinery are often over-used and become ineffective.
- **Be alert and focused while the diver is in the water.** Why? Because divers need to be aware of their surroundings and the environment.
- **Be familiar with vessel operations, safety equipment, and procedures for both vessel and dive emergencies.** Why? Because fishermen should be prepared for a dive emergency. Be prepared to administer first aid, including the use of an AED.

#### Diving Fatalities

- **Know and derive a plan for them as well.** Why? A plan should be in place for them to re-board their vessel unassisted after a fall.
- **Maintain diving equipment.** Why? Because accidents involving decompression sickness can happen anytime and anywhere.

### Fire, Illuminating Gasoline

- **Regularly inspect electrical wiring, hoses, and fuel and oil lines for cracking and damage.** Why? Because damaged wiring and electrical connections can cause fires and explosions.
- **Store combustible materials, such as thinners, solvents, and flammable liquids, in designated lockers or storerooms away from hot surfaces, electrical equipment, and machinery.** Why? Because combustible materials can cause fires.
- **Wear a PFD when they drown.** Why? Because fishermen who died from falling overboard were wearing a PFD when they drowned. PFDs can keep fishermen afloat, giving the crew time for rescue.
- **Dive with an experienced, alert tender.** Why? Because accidents involving decompression sickness can happen anytime and anywhere.
- **Add effective recovery devices and re-boarding systems to assist in search and recovery efforts.** Why? Because a person who falls overboard can be pulled back to the crew, safely. A man-overboard system will alert the crew that a fall has occurred, and a device with GPS functionality will indicate the crewmember’s location to assist in search and recovery efforts.

### Falls Overboard

- **Use a man-overboard alarm system.** Why? Because many falls overboard are not witnessed, diving recovery can be more difficult. An underwater man-overboard system will alert the crew that a fall overboard occurred, and a device with GPS capabilities can signal the fisherman’s location to assist in search and recovery efforts.
Comparing risk between fleets

Commercial fishing fleets have different numbers of vessels, fishermen, and season length. Because of these operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities. Instead, we calculate fatality rates to measure risk. Risk is the probability of a fatal event occurring.

Vessel Disasters

- Take a marine safety class at least every five years. Safety training for fishermen is available, affordable, and taxes are low. All fishermen should learn and know how to use basic lifesaving equipment like immersion suits, life rafts, EPBRS, and fire extinguishers to improve their chances of survival in an emergency.
- Conduct monthly drills for abandon ship, fire, and flooding. Regular knowledge learned in safety training should be applied each month during drills, allowing fishermen to reinforce the skills needed in an emergency.
- Ensure watertight integrity of the vessel. Hull and through-hull penetrations should be regularly inspected and maintained. Doors and hatches should remain closed while underway, especially in rough seas. Maintain and test high water alarms before each trip.
- Perform maintenance activities to prevent fires and explosions. Regularly inspect electrical wiring, hoses, and oil and fuel lines for cracking and damage. Store combustible materials, such as thinners, solvents, and flammable liquids, in designated lockers or storage areas away from heat sources. Secure diesel gas or hazardous fuel into cabinets or approved fuel tanks.
- Ensure EPIRBs and fixed extinguishing systems be checked monthly. Fire extinguishers and fixed extinguishing systems should be checked monthly and be properly maintained. Authorized person and replaced when needed.
- Use a man-overboard alarm system. A man-overboard alarm system will alert the crew that a fall overboard occurred, and a device with GPS capabilities can signal the fisherman’s location to emergency responders. ЕPIRBs, and fire extinguishers to improve their chances of survival in an emergency.
- Environmental conditions on deck must be such that the fisherman is wearing the appropriate equipment for their work environment.

Falls Overboard

- Maintain diving equipment. The practical knowledge learned in safety training should be applied in day-to-day operations. The use of an oxygen delivery system.
- Be alert and focused while the diver is in the water. Do not be focused on vessel operations, safety equipment, and procedures for both vessel and dive emergencies.
- In case of an extreme emergency. Medical and rescue procedures are available on board. In case of an extreme emergency. Medical and rescue procedures are available on board.
- Use a man-overboard alarm system. Many falls overboard are not witnessed, delaying recovery to the point where the fisherman’s chances of survival are greatly reduced. Use a man-overboard alarm system will alert the crew that a fall overboard occurred, and a device with GPS capabilities can signal the fisherman’s location to emergency responders.
- Add effective recovery devices and re-boarding ladders. A rescue ring or similar device is more effective than a life ring for bringing a crewmember back on the vessel. If someone falls alone, a plan should be in place for them to re-board their vessel unassisted after a fall.
- Require a man-overboard drill monthly. Recovery procedures should be practiced regularly to ensure all members are prepared to respond to a fall overboard.

Onboard Fatalities

- Local safety devices on deck machinery. Emergency stop buttons have been developed specifically for deck machinery on fishing vessels and can be adapted and retrofit to existing machinery. Stationary guarding and auxiliary equipment to cover control stations and operating areas is also being tested. More information about the testing of these stop systems can be found at: niosh.gov/topics/engineering/engineering-solutions-fishing-vessels-can-be-
- To determine the risk of fatalities in different fleets, we need to consider the number of vessels in the fleet, number of fishermen, and where workforce estimates were available (Figure 6). For the Gulf of Mexico, workforce estimates were only available to calculate a fatality rate for the shrimp fleet. During 2005–2014, the Gulf of Mexico shrimp fleet experienced the highest number of fatalities in the nation, with 48 crewmember deaths. However, due to the large size of the workforce, during this period the Gulf of Mexico shrimp fleet had the nation’s lowest fatality rate among fleets where fatality rates were calculated.

# Vessels × # Crew per Vessel × # Operating Days × 24 Hours
2,000 Hours (standard 40-hour work week for the year)

Why use a fatality rate?

- To determine the risk of fatalities in different fleets, we need to consider the number of vessels in the fleet, number of fishermen, and operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities.