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. Rate is the probability of a fatality occurring.

Fatality rates were calculated for fleets that experienced five or more fatalities during a 10-year period (2005–2014) and where sufficient estimates were available (Figure 6). The denominator that fishing fleet had the highest fatality rate in the fleet were calculated. Over the 10-year period, there were no trends in fatality rates for most Alaskan fleets, except for the halibut/sablefish longline and Bering Sea crab fleets, which experienced significant decreases in their fatality rates. Fatality rates were calculated. Over the 10-year period, there were no trends in fatality rates for most Alaskan fleets, except for the halibut/sablefish longline and Bering Sea crab fleets, which experienced significant decreases in their fatality rates.

To determine the risk of fatalities in different fleets, we need to consider the number of vessels in the fleet, number of fishermen, and the length of time that the vessels operated and were exposed to potential hazards. By calculating rates, we can take into account operating differences, we cannot simply use the number of fatalities in each fleet to compare their risk for fatalities.

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

\[
\text{Fatality Rate (per 10,000 FTEs)} = \frac{\# \text{ fatalities}}{\# \text{ FTEs}} \times 10,000
\]

Vessel Disasters

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

Conduct monthly drills for standby, fire, and flooding. The practical knowledge learned in safety training should be applied each month during drills, allowing fishermen to reinforce the skills needed in an emergency.

Ensure weather integrity of the vessel. The hull and through-hull penetrations should be regularly inspected and maintained. Doors and hatches should remain closed while underway, especially in rough weather. Maintain and test high water alarms before each trip.

Maintain proper watch. Vessel owners and operators should ensure fatigue management policies are in place to watch for groundings and collisions.

Adhere to federal commercial fishing vessel safety regulations. All owners and operators should ensure they are in compliance with appropriate safety regulations. While there are some exceptions, all vessels, including decked vessels and skiff-like vessels, are subject to federal commercial fishing vessel safety regulations. Those working in shifts should be aware of regulations and express concerns to vessel owners and operators regarding surrounding equipment carried on board.

Adhere to stability instructions (if applicable). A vessel should always be allowed to comply with their stability instructions.

Falls Overboard

Wear a PFD on deck. Nationwide, none of the fishermen who died 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 overweight are not witnessed, delaying rescue time and reducing chances of survival. A man-overboard system will alert the crew that a fall overweight occurred, and a device with GPS capabilities can signal the fisherman’s location to vessels in search and rescue efforts.

Add effective recovery devices and re-boarding devices. A rescue sling or similar device is more effective than a life ring for bringing a crewmember back on the vessel. If someone falls overboard, 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 fishermen are prepared to respond to a fall overweight.

Onboard Fatalities

Install safety devices on deck machinery. Emergency stop buttons have been developed specifically for deck machinery on fishing vessels and can be adapted and repositioned with vessel and equipment. Stationary guarding and auxiliary energy stops are also being tested. More information and contact information can be found at: cdc.gov/niosh/topics/fishing/engineering/

Diving Fatalities

Be prepared with vessel operators, safety equipment, and survival team. 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 oxygen delivery systems.

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

Recommendaions
The majority of fatalities (82%) occurred in non-Alaskan fisheries (Figure 3). The salmon fishery experienced the highest number of fatalities with 26 deaths. Eight crewmembers died during vessel disasters, of which five were in the setnet fleet. An additional eight salmon fishermen died after falling overboard, distributed among drift gillnet, setnet, seine, and trawl fleets. Of the six crewmembers, mostly to vessel disasters and falls overboard. The crew lost five lives from a single skiff capsizing. In the dive harvest fleet, three cucumber harvesters perished while diving.

Vessel disasters accounted for 33% of all deaths during 2010–2014, with most victims working in skiffs (Figure 2). Vessel disasters include sinking, capsizing, fire/explosion, and tripping or slipping on deck. The majority of fatalities occurred in non-Alaskan fisheries (82%) and were due to vessel disasters and falls overboard. A slight decrease in the frequency of fatal falls overboard has also been observed; however, there was no change in the proportion of deaths due to falling overboard between the two periods.

Vessel disasters accounted for 33% of all fatalities during 2010–2014, with most victims working in skiffs (Figure 2). Vessel disasters include sinking, capsizing, fire/explosion, and tripping or slipping on deck. The majority of fatalities occurred in non-Alaskan fisheries (82%) and were due to vessel disasters and falls overboard. A slight decrease in the frequency of fatal falls overboard has also been observed; however, there was no change in the proportion of deaths due to falling overboard between the two periods.

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The majority of fatalities (82%) occurred in nine Alaskan fleets (Figure 3). The salmon fishery experienced the highest number of fatalities with 20 deaths. Eight crewmembers died during vessel disasters, of which five were on the sein net fleet. An additional eight salmon fishers perished after falling overboard, distributed among drift gillnet, purse seine, and trawl fleets. The largest cost for six crewmembers, mostly to vessel disasters and falls overboard. The crew fleet experienced five fatalities from a single skiff capsizing. In the dive harvest fleet, three cucumber harvesters perished while diving.

During the 15-year period 2000–2014, 179 deaths occurred in Alaskan fisheries, averaging nearly 12 fatalities annually (Figure 2). During the first decade (2000–2009), 134 fatalities occurred, for an average of 13 deaths per year. For the most recent five-year period (2010–2014), 45 commercial fishing fatalities were recorded, averaging 9 deaths annually (Figure 1). Compared to the preceding 10-year period (2000–2009), the five-year period has shown a decrease in the frequency of deaths due to vessel disasters and an increase in the frequency of fatal falls overboard. A slight decrease in the frequency of fatal falls overboard has also been observed; however, there was no change in the proportion of deaths due to falling overboard between the two periods.

Vessel disasters accounted for 33% of all deaths during 2010–2014, with most victims working in skiffs (Figure 5). Vessel disasters include sinking, capsizing, fires, groundings, or other events that force crews to abandon ship. Drowning following a fall overboard was the second leading cause of death during this time period (14, 31%). Of the 12 crewmembers who died from injuries sustained onboard vessels, three were due to unintentional drug overdoses and two were suicides. The remaining onboard fatalities involved two crewmembers becoming entangled in equipment, two溺水 in a confined space, two being struck by gear, and one who suffered severe chemical burns. Lower falls were fatal injuries, accounting for three deaths. The single onshore fatality was due to a crewmember suicide.

Conclusion

During 2010–2014, 14 crewmembers died from drowning after falling overboard, contributing to 31% of fatalities in the region (Figure 5). None of the fishermen were wearing a personal flotation device (PFD) when they drowned. Nearly half (43%) of the falls were not witnessed by other crewmembers, either because the fishermen were alone on the vessel (6) or alone on deck (5). Falls overboard were most frequently caused by loss of balance or tripping or slipping on deck.

Safety training for fishermen is available, affordable, and saves lives.
The majority of fatalities (82%) occurred in rural Alaskan fisheries (Figure 3). The salmon fishery experienced the highest number of fatalities with 20 deaths. Eight crewmembers died during vessel disasters, of which five were in the setnet fleet. An additional eight salmon fishermen died after falling overboard, distributed among drift gillnet, setnet, seine, and trawler fleets. Four of those lost at sea were skiffs, mostly to vessel disasters and falls overboard. The crew lost five fishermen from a single skiff capsizing. In the dive harvest fleet, three scuba divers were killed while diving.

The majority of fatalities (82%) occurred in rural Alaskan fisheries (Figure 3). The salmon fishery experienced the highest number of fatalities with 20 deaths. Eight crewmembers died during vessel disasters, of which five were in the setnet fleet. An additional eight salmon fishermen died after falling overboard, distributed among drift gillnet, setnet, seine, and trawler fleets. Four of those lost at sea were skiffs, mostly to vessel disasters and falls overboard. The crew lost five fishermen from a single skiff capsizing. In the dive harvest fleet, three scuba divers were killed while diving.

Vessel disasters accounted for 33% of all deaths during 2010–2014, with most victims working in small boats (Figure 2). Vessel disasters include sinking, capsizing, fires, grounding, or other events that force crew to abandon ship. Storming following a vessel disaster was the second leading cause of death during this time period (29%). Other crewmembers who died from injuries sustained onboard vessels, three were due to unintentional drug overdoses and two were suicides. The remaining onboard fatalities involved two crewmembers becoming entangled in equipment, two entangled in a confined space, two being struck by gear, and one who suffered severe chemical burns. Less frequent were deaths involving injuries, accounting for three deaths. The single onshore fatality was due to a crewmember suicide.

During the 15-year period 2000–2014, 179 deaths occurred in Alaskan fisheries, averaging nearly 12 fatalities annually (Figure 1). Compared to the preceding 10-year period (2000–2009), the five-year period 2010–2014 has shown a decrease in the frequency of deaths due to vessel disasters and an increase in the frequency of fatal falls overboard. A slight decrease in the frequency of fatal falls overboard has also been observed; however, there was no change in the pattern of deaths due to falls overboard during the past two decades.

Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death. Vessel disasters resulted in the most fatalities during 2010–2014. A total of 66 vessel disasters occurred in Alaskan waters during this time period (Figure 4), placing 217 crewmembers at risk of immersion and death.
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. The probability of a fatality occurring.

Vessel Disasters

To take a marine safety class at least every five years. Safety training for fishing is available, affordable, and saves lives. All fishermen should learn and know how to use basic lifesaving equipment like immersion suits. Life, PFDs, and fire extinguishers to improve their chances of survival in an emergency.

Conduct monthly drills for abandoning ship, fire, and flooding. The practical 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. The hull and through-hull penetrations should be regularly inspected and maintained. Doors and hatches should remain closed while underway, especially in rough weather. Maintain and test high water alarms before each trip.

Maintain proper watch. Vessel owners and operators should ensure fatigue management policies and work watches to prevent groundings and collisions.

Adhere to federal commercial fishing vessel safety regulations. All vessels and operators should ensure they are in compliance with appropriate safety regulations. While the law applies to all vessels that operate in federal waters, it may not apply to all commercial fishing vessels. Those working in ships should be aware of regulations and seaworthiness requirements for vessels surroundings equipment carried on board.

Adhere to safety instructions if applicable. A new alert system should be considered periodically. Vessels with more than five fatalities per 10,000 FTEs should always be in compliance with their stability restrictions.

Falls Overboard

Wear a PFD on deck. Nationwide, 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 non-overboard alarm system. Many falls overboard are not witnessed, delaying rescue time and reducing chances of survival. A 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 aches in search and recovery efforts.

Add effective recovery devices and reboarding ladders. A rescue sling 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 reboard their vessel unassisted after a fall.

Conduct man-overboard drills monthly. Rescue procedures should be practiced regularly so all fishermen are prepared to respond to a fall overboard.

Onboard Fatalities

Install safety devices on deck machinery. Emergency stop buttons and safety shut-off devices (e.g., fire stop or oil stop) have been developed specifically for deck machinery on fishing vessels and can be adapted and enriched without disrupting other machinery. Stationary guarding and auxiliary engines are also being tested. More information and links on how to obtain these devices are found at: cdc.gov/niosh/topics/fishing/engineering/

Diving Fatalities

Dive with an experienced, alert team. Be familiar with vessel operations, emergency procedures for both vessel and dive emergency situations. Dive ashore. If a plan is in place for them to reboard their vessel unassisted after a fall.

Be prepared for a dive emergency. Be prepared to administer first aid, including the use of an oxygen delivery system. Be aware of the proper, safety equipment. Ensure that compressors and other equipment used in diving operations are in good working condition.

Recommendations

National Institute for Occupational Safety and Health

Commercial Fishing Fatality Summary

Alaska Region

Fatality Rate (per 10,000 FTEs)

<table>
<thead>
<tr>
<th>Fleet</th>
<th>Fatality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Coast</td>
<td>12.5</td>
</tr>
<tr>
<td>West Coast</td>
<td>8.2</td>
</tr>
<tr>
<td>Alaska</td>
<td>6.1</td>
</tr>
<tr>
<td>Gulf of Mexico</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Here’s how we calculate FTEs:

- # Vessels × # Crew per Vessel × # Operating Days = 24 Hours

- # FTEs (standard 40-hour work week for the year) = # of FTEs

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

- # Fatalities ÷ # of FTEs × 10,000 = Fatality Rate per 10,000 FTEs
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 fatality occurring.

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 the length of time that the vessel spent fishing and exposed to commercial hazards. By calculating rates, we can compare the total number of fatalities observed in each fleet. The results of these rate calculations answer the question: How many fatalities would have occurred in these fleets if all 10,000 fishermen worked regular 40-hour weeks throughout the year?

Fleet size is one of the most important factors that can increase or decrease the risk of fatalities. Vessels that have higher fatality rates are more dangerous than fleets with lower fatality rates.

How do we calculate a fatality rate?
We use a formula that incorporates vessel size, based on our database collection from US Coast Guard investigation reports and documents from vessel operators. For many of the fleets around the US, we also know how much time, deck machinery, and other hazards to which the fishermen are exposed. For this study, we’re using an updated method for calculating FTEs. This improved method matches the calculation method used in estimating the number of fishing vessels. The calculation method has been updated several times in the past, so we now have the ability to compare fatality rates over time. The formula we use for calculating FTEs is:

\[
\text{FTEs} = \left( \frac{\text{# Vessels} \times \text{# Crew per Vessel} \times \text{# Operating Days} \times 24}{2,000 \text{ (standard 40-hour work week for the year)}} \right) \times \frac{\text{# Fatalities}}{\text{# of FTEs}}
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Recommendations

Vessel Disasters
Take a marine safety class at least every five years.
- Safety training for fishing is available, affordable, and accessible. All fishermen should learn 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 vessels, ship, and boarding.
- The practical 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. The hull and through-hull penetrations should be regularly inspected and maintained. Doors and hatches should remain closed while underway, especially in rough weather. Maintain and test high water alarms before each trip.
- Maintain proper watch. Vessel owners and operators should maintain fatigue management policies and use watch alarms to prevent groundings and collisions.
- Adhere to federal commercial fishing vessel safety regulations. All owners and operators should ensure they are in compliance with appropriate safety regulations. While several ships were still operating in violation of safety regulations, the majority of commercial fishing vessels were in compliance with regulations.
- Ensure safety equipment is regularly inspected and tested. Vessels should maintain a record of all inspections and test results, and surrounding survival equipment carried on board.
- Adhere to stability instructions (if applicable). A new version should be considered periodically to ensure that procedures and training are always current and in compliance with their safety regulations.

Falls Overboard
- Wear a PFD on deck. Nationwide, 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 to rescue or resuscitate unassisted after a fall.
- Conduct man-overboard drills monthly. Recovery procedures should be practiced regularly to ensure that all fishermen are prepared to respond to a fall overboard.

Onboard Fatalities
- Install safety devices on deck machinery. Emergency-stop buttons have been developed specifically for deck machinery on fishing vessels. These buttons can be adapted and retrofitted onto winches or other machinery. Stationary guarding and auxiliary devices are also being tested. More information about these devices can be found at: cdc.gov/niosh/topics/fishing/engineering/.
- Be prepared for a dive emergency. Be prepared to institute first aid, including the use of an oxygen delivery system.
- Learn to use basic lifesaving equipment. Ensure that compressors and other equipment used in diving operations are in good working condition.

National Institute for Occupational Safety and Health
Commercial Fishing Fatality Research and Design Program

Commercial Fishing Fatality Summary

Alaska

Fleet

Northeast Multi-Species Groundfish Trawl

Atlantic Skipjack Tuna

West Coast Multi-Species Groundfish Trawl

Atlantic Tuna

East Coast

Atlantic Flounder/Scup/Black Sea Bass

Alaska Halibut/Sablefish Longline

Atlantic Clam/Quahog Dredge

Alaska Salmon Tender

Alaska Halibut/Dungeness Crab

Alaska Salmon Drift Gillnet

Alaska Groundfish Freezer Trawl (A80)

Northeast Multi-Species Groundfish Trawl

Atlantic Clupeid Tuna

West Coast

Alaska Salmon Tender

Alaska Halibut/Sablefish Longline

Atlantic Flounder/Scup/Black Sea Bass

Alaska Halibut/Sablefish Longline

Atlantic Clam/Quahog Dredge

Alaska Salmon Tender

Alaska Halibut/Dungeness Crab

Alaska Salmon Drift Gillnet

Alaska Groundfish Freezer Trawl (A80)

Atlantic Clupeid Tuna

West Coast

Fleet

Northwest Pacific Groundfish Trawl

Atlantic Tuna

West Coast

Alaska Salmon Tender

Atlantic Clam/Quahog Dredge

Alaska Salmon Tender

Alaska Salmon Drift Gillnet

Alaska Groundfish Freezer Trawl (A80)

Atlantic Clupeid Tuna

Why use fatality rates?
To determine the risk of fatalities in different fleets, we need to consider the number of vessels in the fleet, number of fishermen, and the length of time that the vessel spent fishing and went to sea. By calculating rates, we can compare the total number of fatalities observed in each fleet. The results of these rate calculations answer the question: How many fatalities would have occurred in these fleets if all 10,000 fishermen worked regular 40-hour weeks throughout the year?

Fleet size is one of the most important factors that can increase or decrease the risk of fatalities. Vessels that have higher fatality rates are more dangerous than fleets with lower fatality rates.

How do we calculate a fatality rate?
We use a formula that incorporates vessel size, based on our database collection from US Coast Guard investigation reports and documents from vessel operators. For many of the fleets around the US, we also know how much time, deck machinery, and other hazards to which the fishermen are exposed. For this study, we’re using an updated method for calculating FTEs. This improved method matches the calculation method used in estimating the number of fishing vessels. The calculation method has been updated several times in the past, so we now have the ability to compare fatality rates over time. The formula we use for calculating FTEs is:

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