National Institute for Occupational Safety and Health

Safety Research in the Alaskan Commercial Fishing Industry

Jennifer M. Lincoln, PhD, CSP

Samantha Case, MPH

Presentation to the US Coast Guard Marine Casualty Hearing

F/V Scandies Rose

March 2021

Center for Maritime Safety and Health Studies

Commercial Fishing Safety Research and Design Program

- Scientific research on safety problems and solutions
- Provide high quality, relevant information
- Research findings used by
  - Fishing industry
  - Government agencies
  - Marine safety trainers

NIOSH Commercial Fishing Research

Research By Hazard Type

Search by Topic

Regions | Solutions | Projects and Impacts | Resources

- National Overview
- Alaska
- West Coast
- East Coast
- Gulf of Mexico
- Hawaii/Pacific

https://www.cdc.gov/niosh/topics/fishing/
https://www.cdc.gov/niosh/maritime/

USCG-NIOSH Partnership

Memorandum of Agreement (MOA)

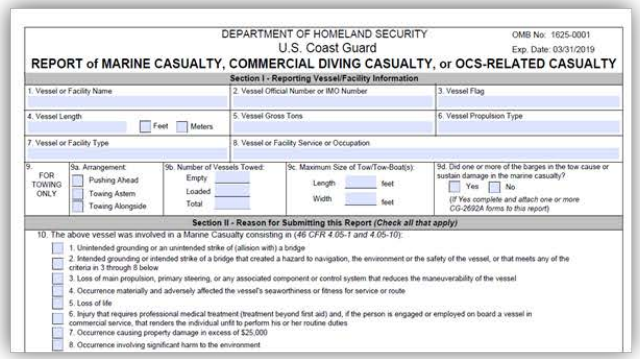
- Last renewed in 2019
- NIOSH scientist granted USCG credentials as federal affiliate
- Access to MISLE to manually review cases
- Conduct statistical analyses of data
- Identify causes of hazards leading to deaths and injuries

March 2014 Signing to expand Memorandum of Agreement

Coast Guard RADM Joseph Servidio and NIOSH Director, Dr. John Howard

NIOSH Commercial Fishing Incident Database (CFID)

Marine casualty occurs → Coast Guard or local law enforcement investigates → NIOSH reviews reports → Information entered into Commercial Fishing Incident Database (CFID)



DEPARTMENT OF HOMELAND SECURITY
U.S. Coast Guard
OMB No: 1625-0001
Exp. Date: 03/31/2019

REPORT of MARINE CASUALTY, COMMERCIAL DIVING CASUALTY, or OCS-RELATED CASUALTY

Section I - Reporting Vessel/Facility Information

1. Vessel or Facility Name | 2. Vessel Official Number or IMO Number | 3. Vessel Flag
4. Vessel Length ☐ Feet ☐ Meters | 5. Vessel Gross Tons | 6. Vessel Propulsion Type
7. Vessel or Facility Type | 8. Vessel or Facility Service or Occupation
9. FOR TOWING ONLY — 9a. Arrangement: ☐ Pushing Ahead ☐ Towing Astern ☐ Towing Alongside | 9b. Number of Vessels Towed: Empty / Loaded / Total | 9c. Maximum Size of Tow/Tow-Boat(s): Length feet / Width feet | 9d. Did one or more of the barges in the tow cause or sustain damage in the marine casualty? ☐ Yes ☐ No (If Yes complete and attach one or more CG-2692A forms to this report)

Section II - Reason for Submitting this Report *(Check all that apply)*

10. The above vessel was involved in a Marine Casualty consisting in *(46 CFR 4.05-1 and 4.05-10)*:
☐ 1. Unintended grounding or an unintended strike of (allision with) a bridge
☐ 2. Intended grounding or intended strike of a bridge that created a hazard to navigation, the environment or the safety of the vessel, or that meets any of the criteria in 3 through 8 below
☐ 3. Loss of main propulsion, primary steering, or any associated component or control system that reduces the maneuverability of the vessel
☐ 4. Occurrence materially and adversely affected the vessel's seaworthiness or fitness for service or route
☐ 5. Loss of life
☐ 6. Injury that requires professional medical treatment (treatment beyond first aid) and, if the person is engaged or employed on board a vessel in commercial service, that renders the individual unfit to perform his or her routine duties
☐ 7. Occurrence causing property damage in excess of $25,000
☐ 8. Occurrence involving significant harm to the environment

Overview

- Fatalities in the Alaska Fishing Industry
- Safety Focus: BSAI Crab Fishery
- NIOSH Key Research: Vessel Disasters and Survival Factors
- Safety Recommendations

Overview

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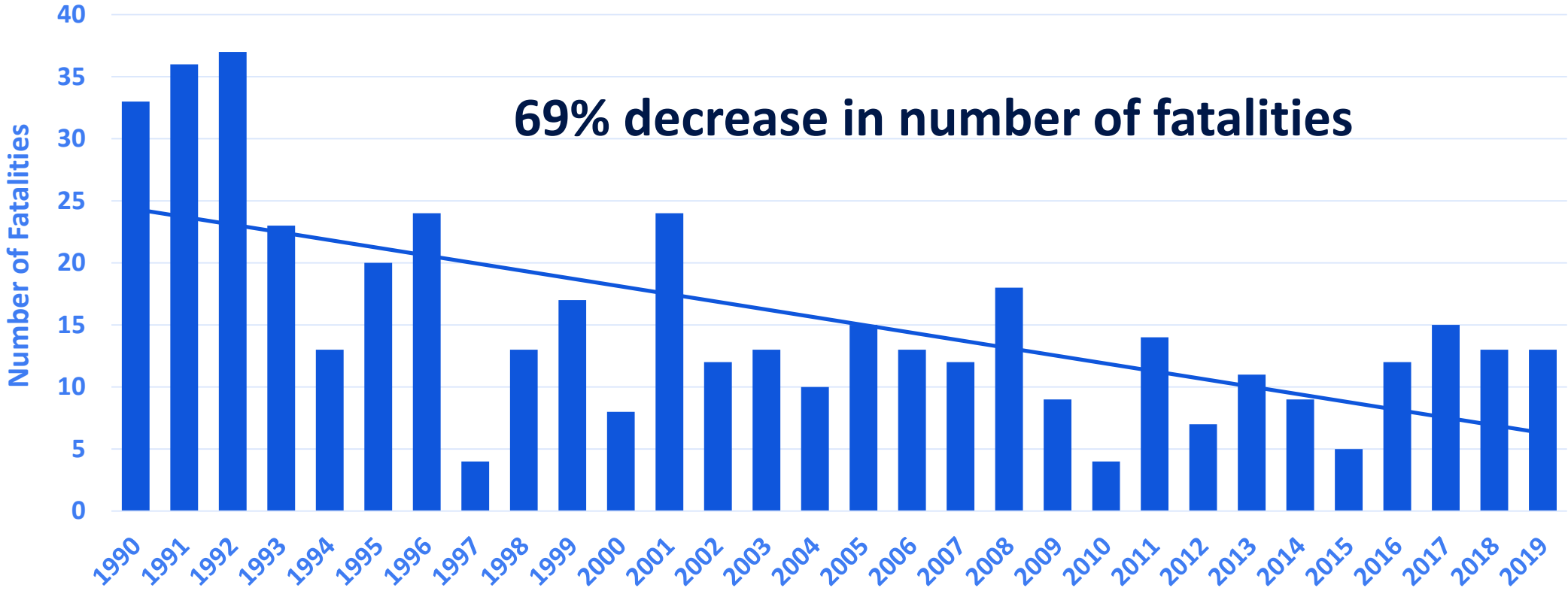
Commercial Fishing Fatalities, Alaska, 1990–2019

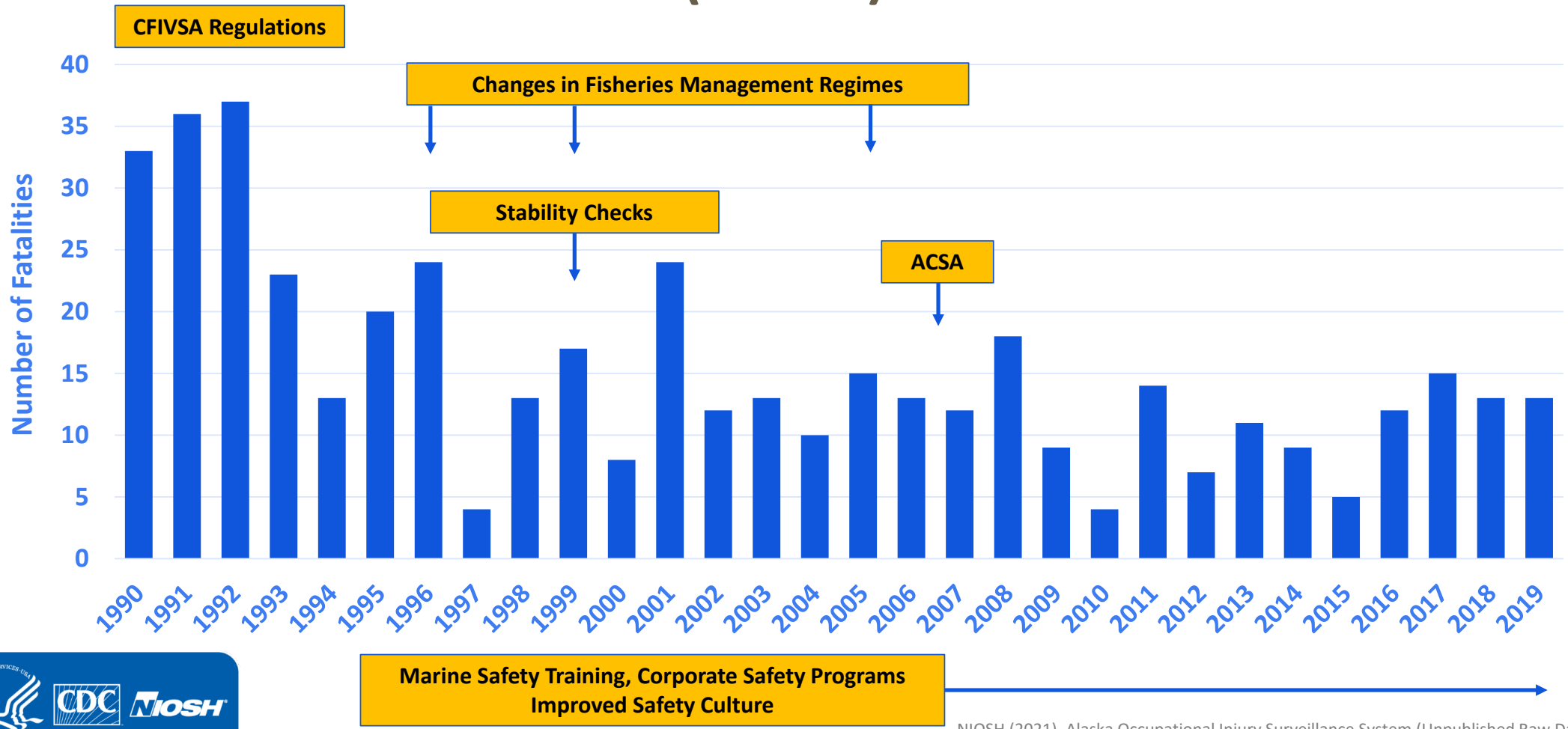
(n=457)



NIOSH (2021). Alaska Occupational Injury Surveillance System (Unpublished Raw Data).

IRR = 0.96
p < 0.001

Commercial Fishing Fatalities, Alaska, 1990–2019 (n=457)



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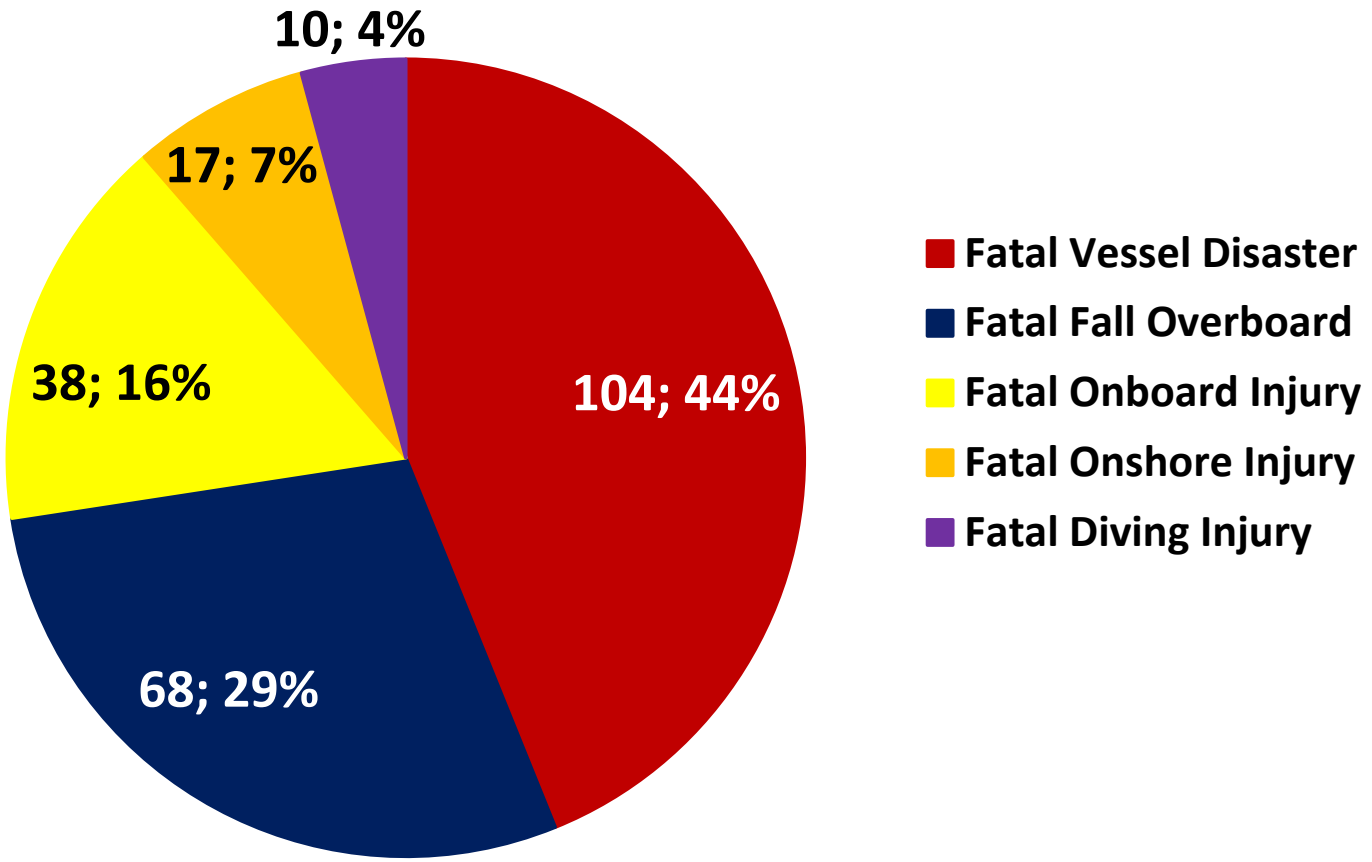
Commercial Fishing Fatalities by Incident Type, Alaska, 2000–2019 (n=237)



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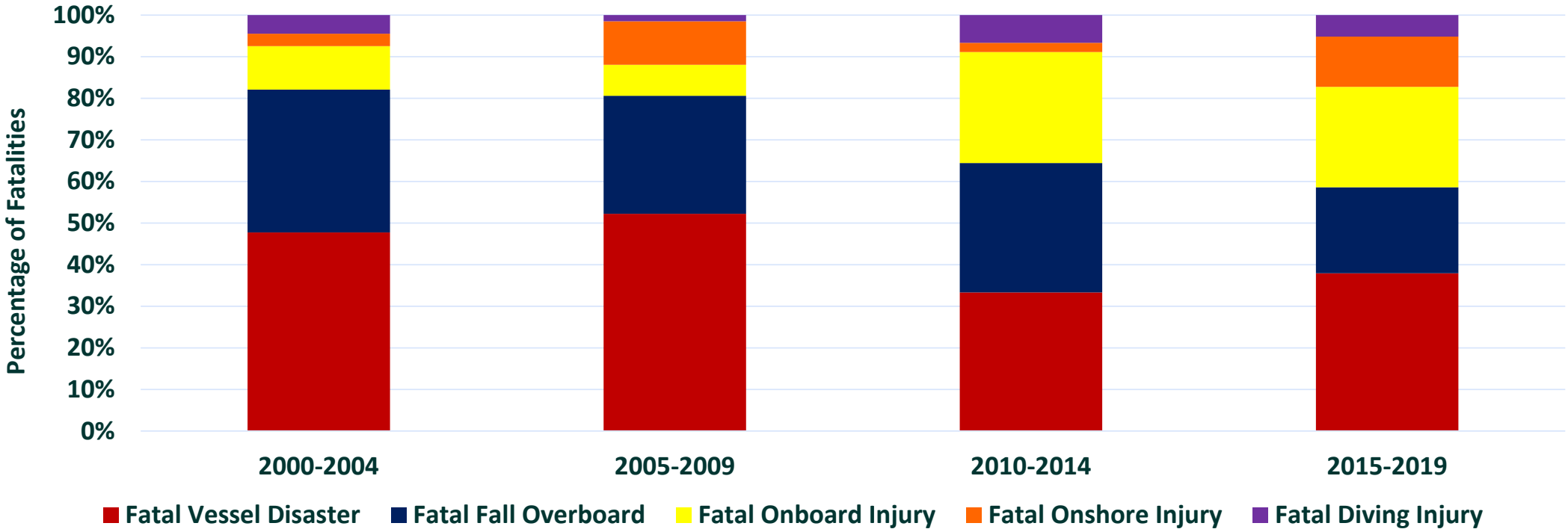
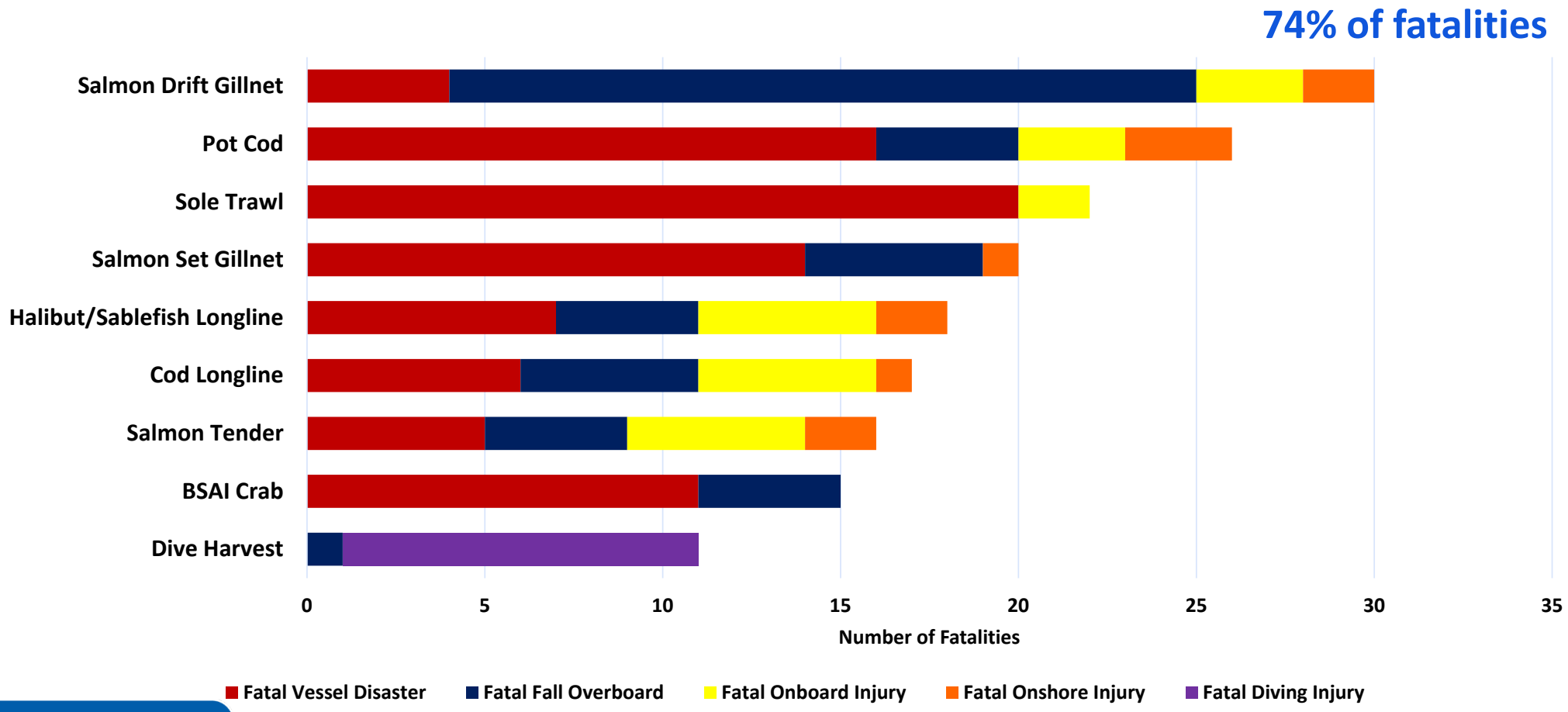


NIOSH (2021). Commercial Fishing Incident Database (Unpublished Raw Data).

Alaskan Fisheries with ≥10 Fatalities, 2000-2019 (n=175)

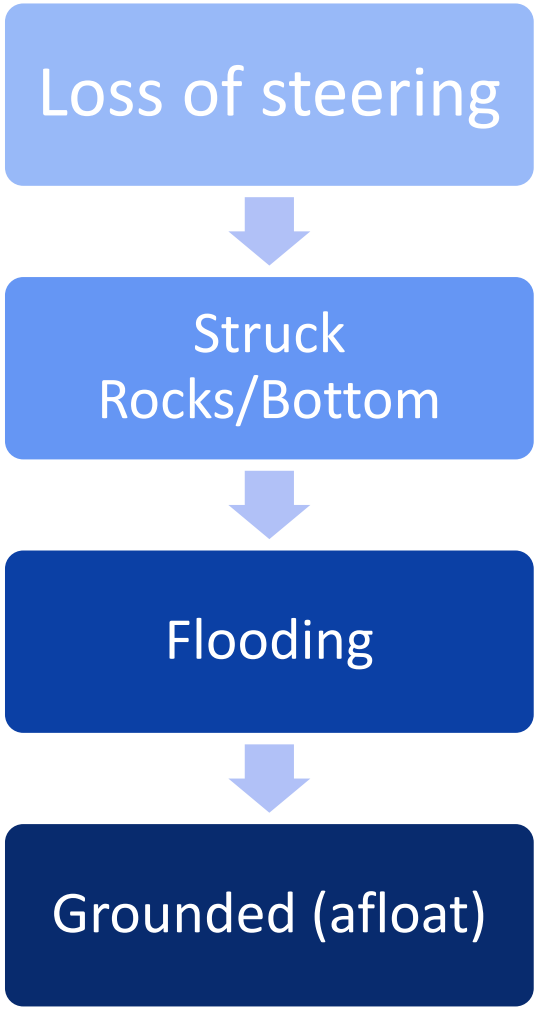


NIOSH (2021). Commercial Fishing Incident Database (Unpublished Raw Data).

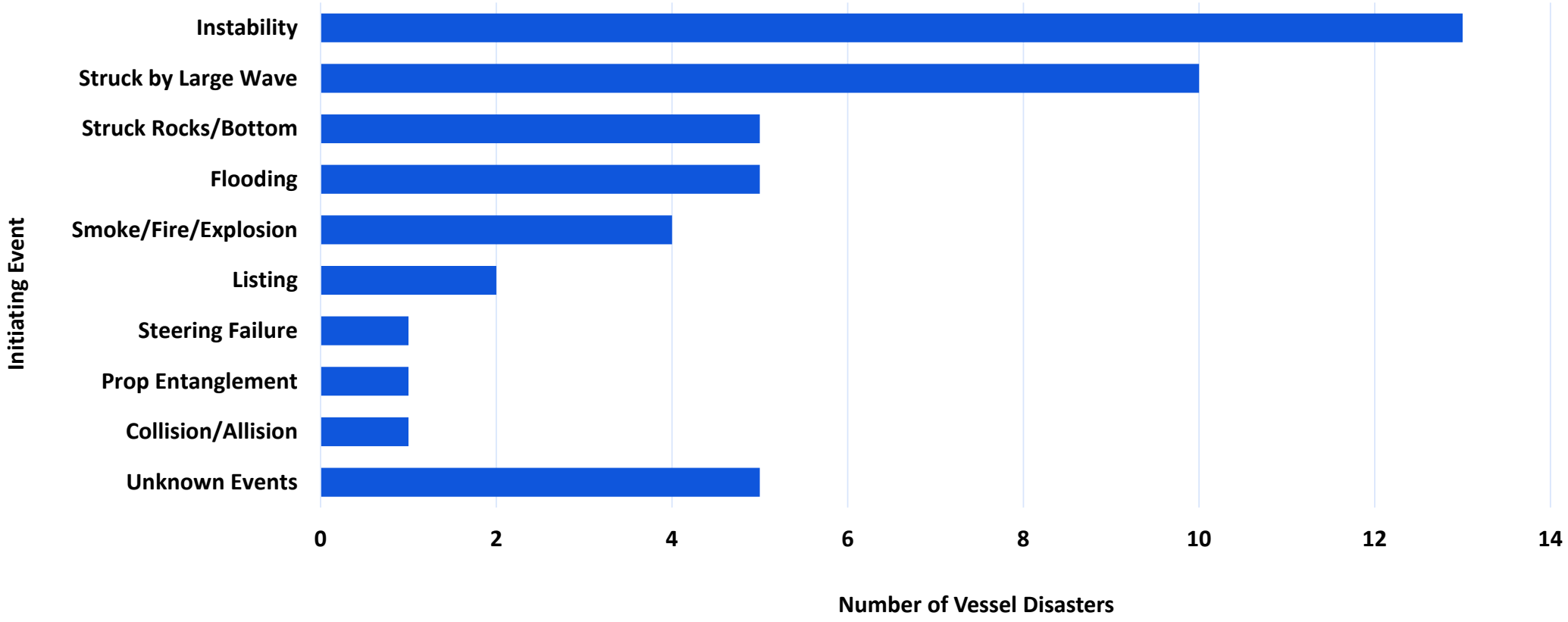
CFID Variables for Vessel Disasters

- Initiating Event, Subsequent Event(s), Final Event
- Contributing factors (e.g., human factors)
- If **flooding** occurs:
  - Type of flooding
  - Cause of flooding
  - Location of flooding
- If **instability** occurs:
  - Cause of instability

Example of vessel disaster sequence of events coding



Initiating Events of Fatal Vessel Disasters, Alaska, 2000-2019 (n=47)



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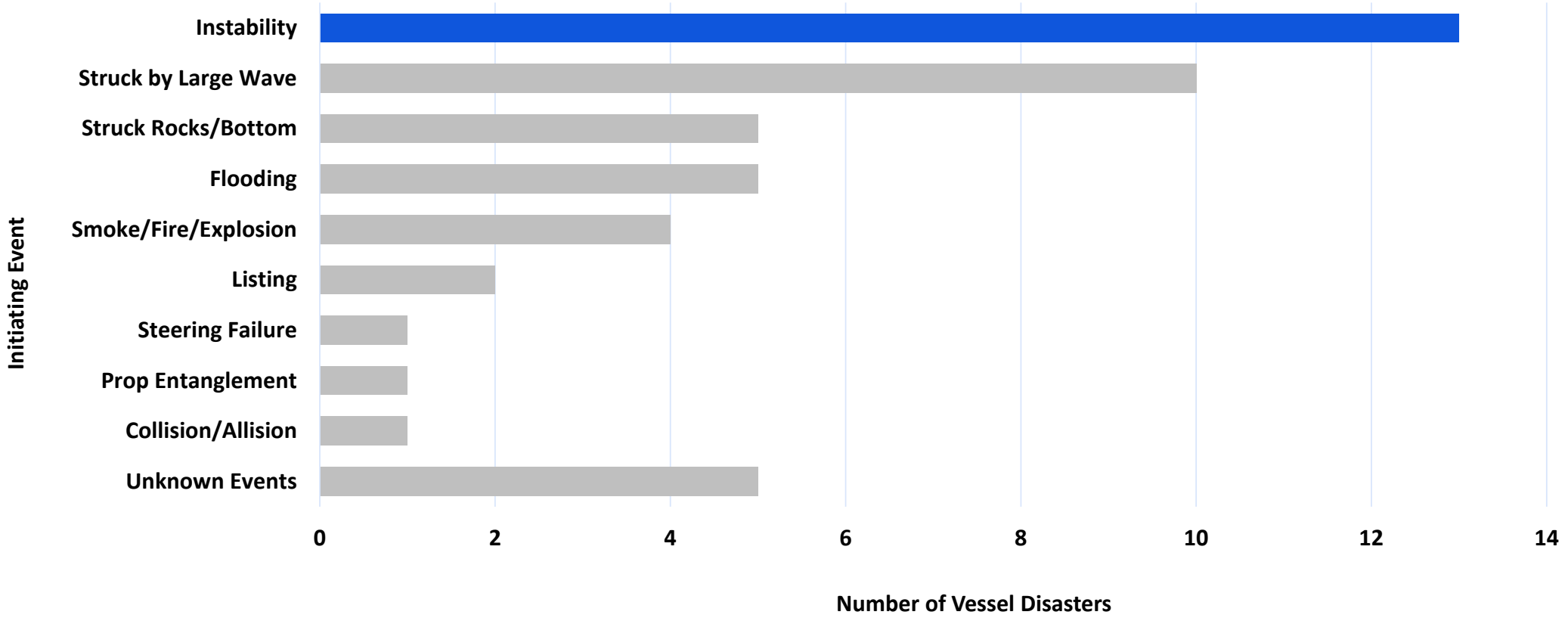

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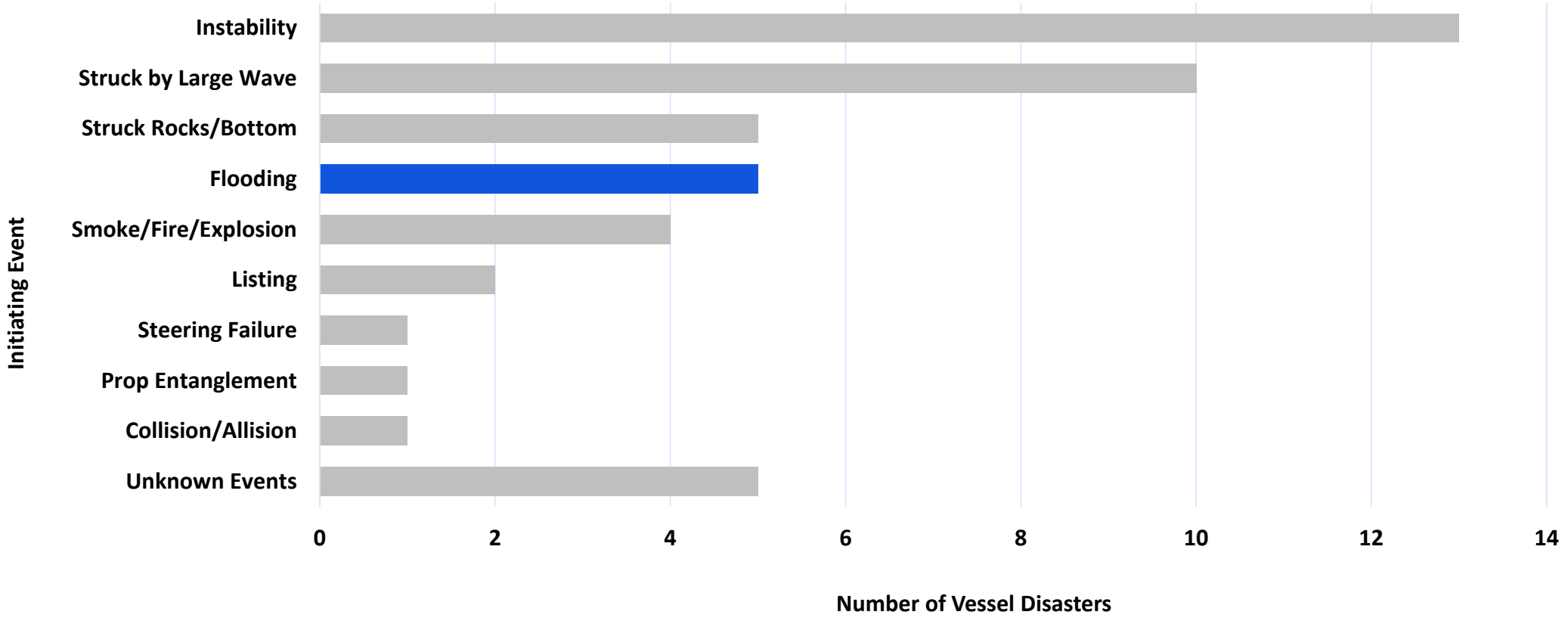

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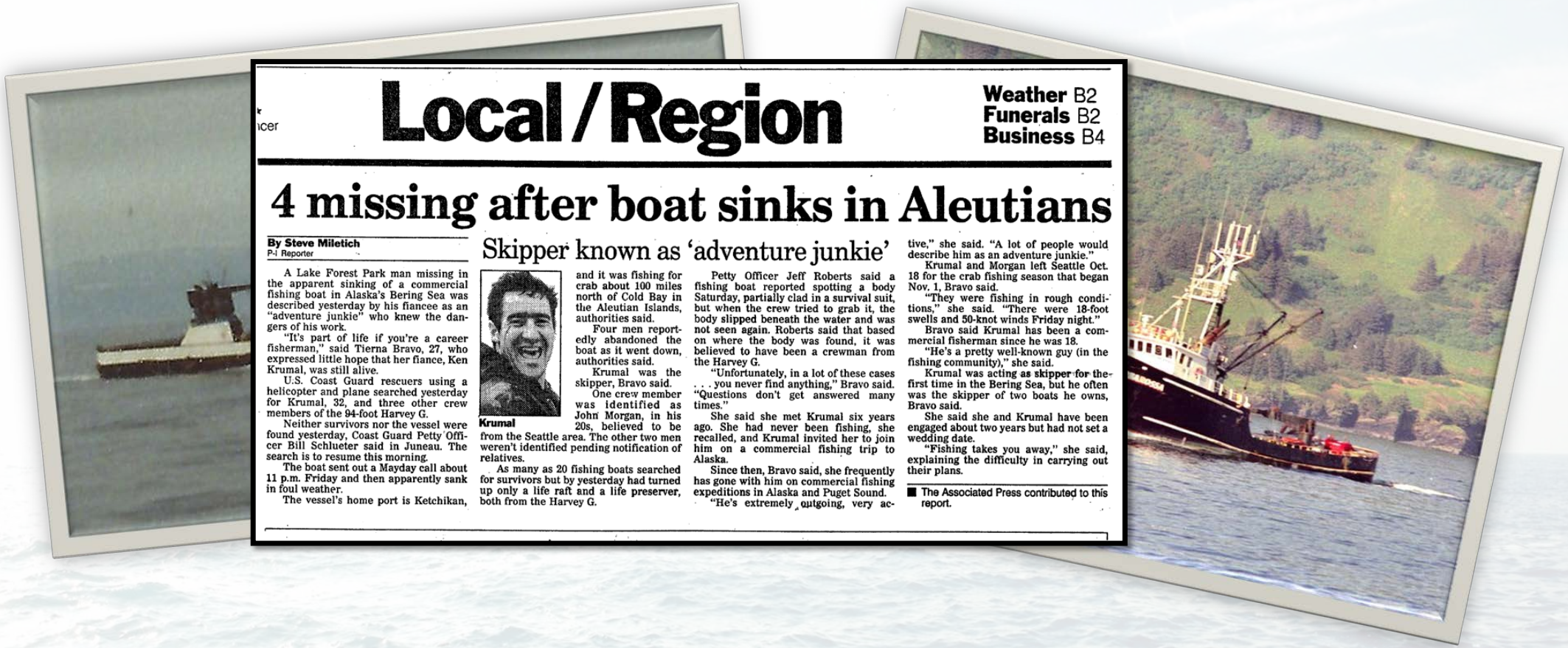

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Local / Region

Weather B2
Funerals B2
Business B4

4 missing after boat sinks in Aleutians

By Steve Miletich
P-I Reporter

A Lake Forest Park man missing in the apparent sinking of a commercial fishing boat in Alaska's Bering Sea was described yesterday by his fiancee as an "adventure junkie" who knew the dangers of his work.

"It's part of life if you're a career fisherman," said Tierna Bravo, 27, who expressed little hope that her fiance, Ken Krumal, was still alive.

U.S. Coast Guard rescuers using a helicopter and plane searched yesterday for Krumal, 32, and three other crew members of the 94-foot Harvey G.

Neither survivors nor the vessel were found yesterday, Coast Guard Petty Officer Bill Schlueter said in Juneau. The search is to resume this morning.

The boat sent out a Mayday call about 11 p.m. Friday and then apparently sank in foul weather.

The vessel's home port is Ketchikan, and it was fishing for crab about 100 miles north of Cold Bay in the Aleutian Islands, authorities said.

Four men reportedly abandoned the boat as it went down, authorities said.

Krumal was the skipper, Bravo said.

One crew member was identified as John Morgan, in his 20s, believed to be from the Seattle area. The other two men weren't identified pending notification of relatives.

As many as 20 fishing boats searched for survivors but by yesterday had turned up only a life raft and a life preserver, both from the Harvey G.

Skipper known as 'adventure junkie'

Krumal

Petty Officer Jeff Roberts said a fishing boat reported spotting a body Saturday, partially clad in a survival suit, but when the crew tried to grab it, the body slipped beneath the water and was not seen again. Roberts said that based on where the body was found, it was believed to have been a crewman from the Harvey G.

"Unfortunately, in a lot of these cases . . . you never find anything," Bravo said. "Questions don't get answered many times."

She said she met Krumal six years ago. She had never been fishing, she recalled, and Krumal invited her to join him on a commercial fishing trip to Alaska.

Since then, Bravo said, she frequently has gone with him on commercial fishing expeditions in Alaska and Puget Sound.

"He's extremely outgoing, very active," she said. "A lot of people would describe him as an adventure junkie."

Krumal and Morgan left Seattle Oct. 18 for the crab fishing season that began Nov. 1, Bravo said.

"They were fishing in rough conditions," she said. "There were 18-foot swells and 50-knot winds Friday night."

Bravo said Krumal has been a commercial fisherman since he was 18.

"He's a pretty well-known guy (in the fishing community)," she said.

Krumal was acting as skipper for the first time in the Bering Sea, but he often was the skipper of two boats he owns, Bravo said.

She said she and Krumal have been engaged about two years but had not set a wedding date.

"Fishing takes you away," she said, explaining the difficulty in carrying out their plans.

■ The Associated Press contributed to this report.

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Coast Guard to focus on wny crab boat and crew vanished

By Scott Sunde
P-I Reporter

The Coast Guard has suspended its air and sea search for the crab boat Barbarossa and its six crewmen and has begun to focus on what may have led to the vessel's disappearance in the Bering Sea.

A spokesman at the Coast Guard's Juneau office said authorities suspended the search late Tuesday after two days of good weather allowed aircraft and a cutter to cover more than 20,000 square miles of ocean near the Pribilof Islands. But only a little debris was found.

Even if the crewmen were wearing the survival suits the vessel was carrying, they could not have survived in the cold waters of the Bering Sea this long, the spokesman said.

One of the crewmen, Don Bright, 31, is from Marysville, and a second, Brian McPherson, has family in Tacoma. The other four are from Alaska.

If all six crewmen are dead, the sinking of the Barbarossa would rank as the worst fishing vessel accident in Alaskan waters since the Aleutian Enterprise sank in the Bering Sea last March 22, said Lt. Cmdr. Richard Blais of the Coast Guard's investigations office in Anchorage. Nine people died in the sinking of that Seattle-based factory trawler.

Blais said investigators have begun collecting information on the Barbarossa, its operations and crew, and the weather it faced.

Bender Shipbuilding of Mobile, Ala., made the Barbarossa, according to Ken Holland, the Anacortes, Wash., man who owned the boat. Bender officials were unavailable for comment yesterday. Bender also converted the Aleutian Enterprise into a factory trawler.

Crab vessels of possibly the same make as the Barbarossa may have had problems in Alaskan waters before, including a sinking in the early 1980s, Blais said.

The Coast Guard also will be interviewing former crewmen and people in the Pribilof Islands who may have seen the vessel being loaded, Blair said.

Weather conditions also will be reviewed. Other crab fishermen near where the Barbarossa is thought to have run into trouble early Sunday reported 40-knot winds and 15-foot seas.

The Barbarossa's skipper, George Brandenburg of Kodiak, Alaska, was not required to have a license to operate the vessel since it weighed less than 200 gross tons, Coast Guard officials said. It could not be determined yesterday whether Brandenburg, a veteran fisherman, had ever been cited for marine safety violations.

Coast Guard records do show the Barbarossa was cited for two minor violations in November 1989.

There also was a crew change on the vessel shortly before it disappeared. A sister of Bright said yesterday that she believed her brother transferred from a crab-processing boat to the Barbarossa, a crab-catching boat, as recently as Saturday.

Marylea Hebert said her family had been told by Holland that Bright agreed to work on the vessel after a crewman quit. Holland said yesterday that all he knows is that there was a recent crew change.

In spite of the suspension of the search, Hebert said the family believes that Bright, the oldest of six children, has survived.

"Don was a fighter. We're hoping one way or the other that he's still out there," she said. "We're waiting. We're going to give him more time."

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F/V NORTHWEST MARINER
Lost at sea 1-15-95

Larry, Jim, Troy, Bobby, Bruce & Rob

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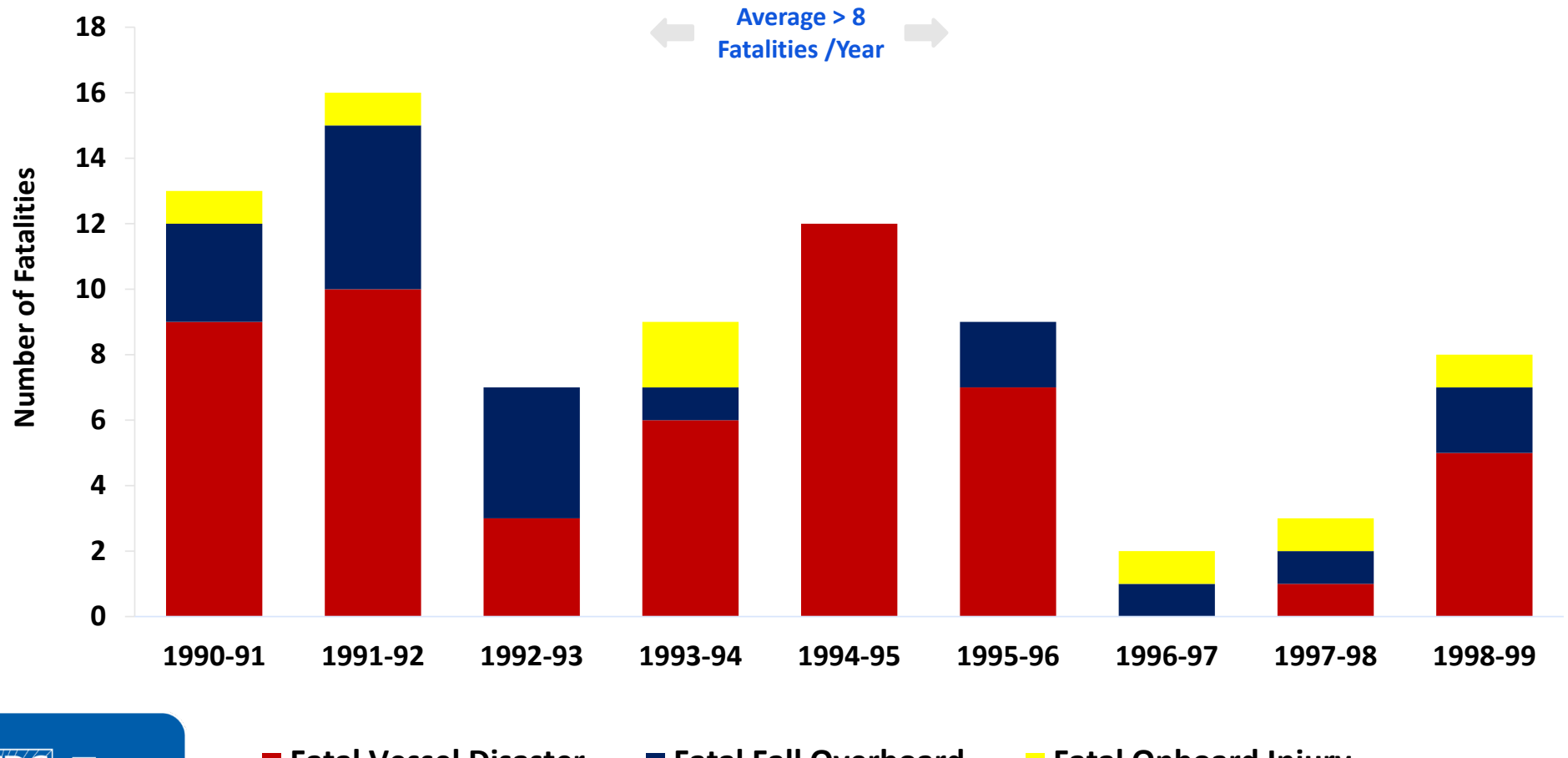
Bering Sea / Aleutian Island Crab Fishery Fatalities (1990-1999)



Source: NIOSH

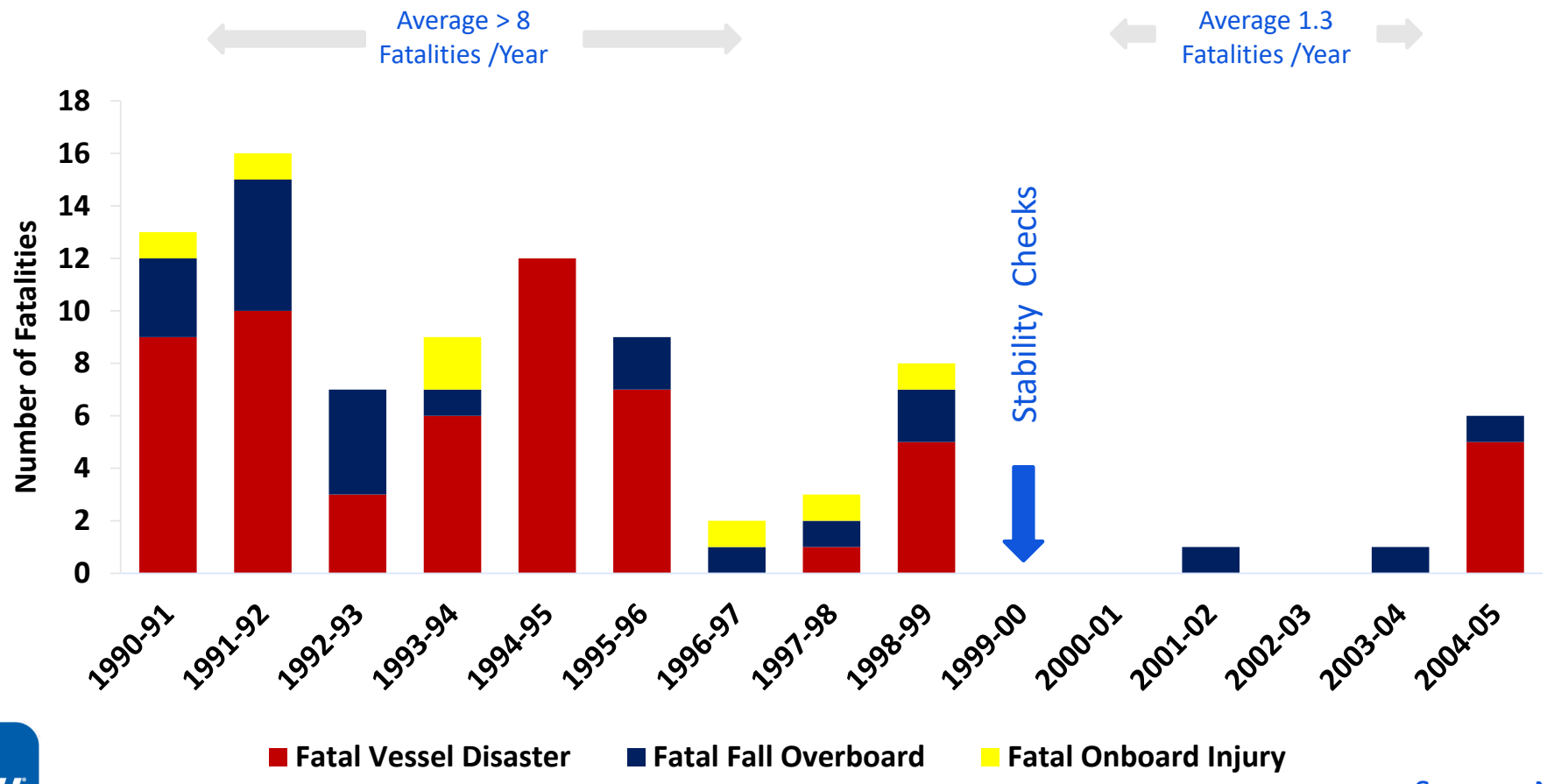
Safety and Stability Checks

- Travel to main crab ports with USCG FVS personnel
- Evaluate stability reports
- Dangerous work but…the real stress was in the wheelhouse
- Other boats started pulling pots

At the Dock Stability Check: Results

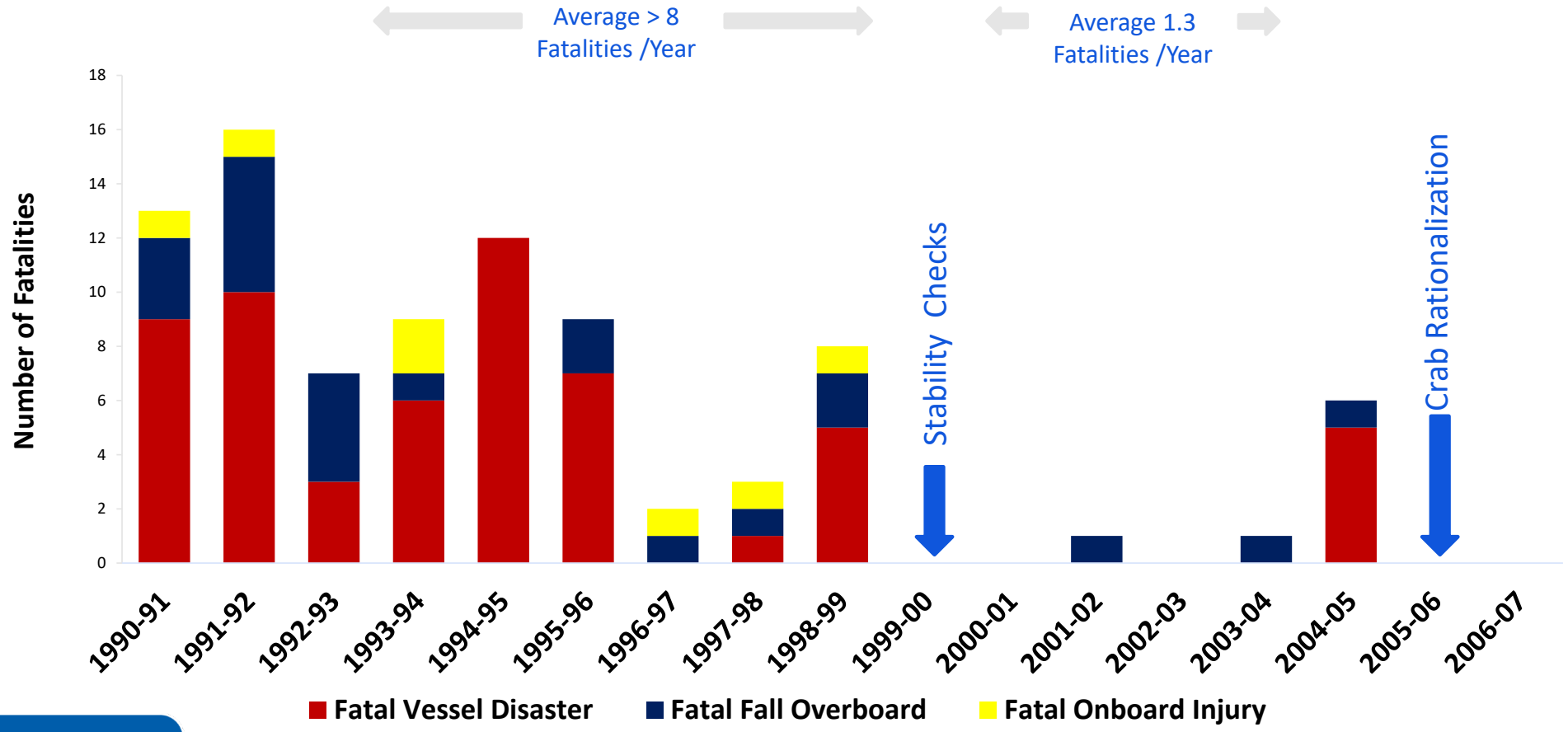
- Conducted compliance checks on 50% of fleet 3 days before start of season
- 2 vessels detected in an overloaded condition within first hour.
- Problem corrected at the dock
- Crab industry leadership LOVED IT!

Bering Sea / Aleutian Island Crab Fishery Fatalities (1990-2005)



Source: NIOSH

Bering Sea / Aleutian Island Crab Fishery Fatalities (1990-2006)



Source: NIOSH

Quota Based Management Systems and Safety

- What are we talking about? IFQs, Rationalized, Quota systems
  - an allocation is given to a person, vessel, etc.
  - Ending “race to fish”
- Results in
  - Fleet consolidation
  - Lengthens the total period of time fish are caught
  - Flexibility to avoid bad weather
  - Allows for investment in vessel, crew, and overall operation
- Unintended consequences
  - Race for catch history

Safety Impacts: BSAI Crab Rationalization: 5-year Review

Appendix B

Review of Safety Under the Crab Rationalization Management Program for Bering Sea and Aleutian Islands Crab Fisheries

Jennifer M. Lincoln, PhD, CSP
Alaska Pacific Regional Office
National Institute for Occupational Safety and Health

CDR Christopher J. Woodley, MMA
United States Coast Guard

Introduction

This section analyzes the safety performance of the Bering Sea / Aleutian Island (BSAI) crab fleet since 2005. As part of this analysis, the safety performance of the BSAI crab fleet from 1990-2005 is also discussed to provide more information leading up to the Crab Rationalization (CR) program. Several factors have been influential in affecting the safety of this fleet during this time frame (Woodley et.al., 2009; Lincoln & Lucas, 2010). This paper will review the following elements and will conclude with further recommendations.

1. Fatality History, 1990-1999
2. U.S. Coast Guard Stability and Safety Compliance Checks, 1999 - present
3. Crab Rationalization (CR) Program 2005 – Present

https://www.npfmc.org/wp-content/PDFdocuments/catch_shares/Crab/5YearRev1210_AppxB.pdf

BSAI Crab Fisheries Environment Prior to Rationalization

- Winter, cold temps and icing, high winds and seas, poor weather
- Vessel length <85 feet- > 125 feet
- Season lengths shrinking- “race to fish”
- Minimally crewed with 5-7 people
- Pots– 750 to 850+lbs (empty and with no ice) – loaded 3-5 tiers high

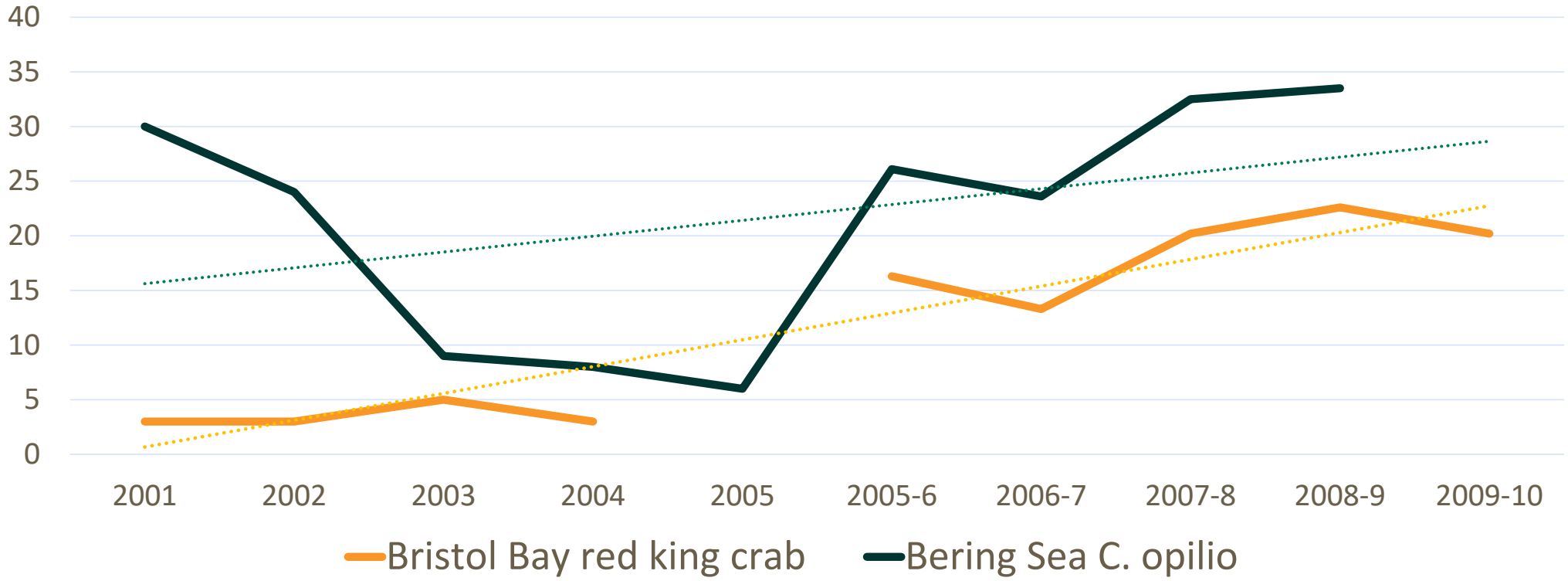
Where can risk be reduced?

Effects on the Vessels

Reduction in Participant Vessels by vessel length, 2001-2009/10				
Fishery	Vessels <85 feet	Vessels 85-100 feet	Vessels 100-125 feet	Vessels >125 feet
Bristol Bay red king crab	93% reduction	77% reduction	66% reduction	62% reduction
Bering Sea C. opilio	~100% reduction	71% reduction	60% reduction	53% reduction

Sources: ADFG fish tickets and NMFS RAM catch data (for 2005-2006 through 2009-2010)

After Crab Rationalization, Average Days Fished Greatly Increased



Source: 2001 to 2005 is season length; 2005-6 to 2009-10 is fishing days from crab EDR data. No data for Bristol Bay red king crab in 2005 and Bering Sea C. opilio and 2009-10

BSAI Rationalization Impacts

- Fishery pace has slowed slightly
  - Average Pot lift/vessel day decreased
    - 32% Red King Crab
    - 17% for Bering Sea C. opilio fishery

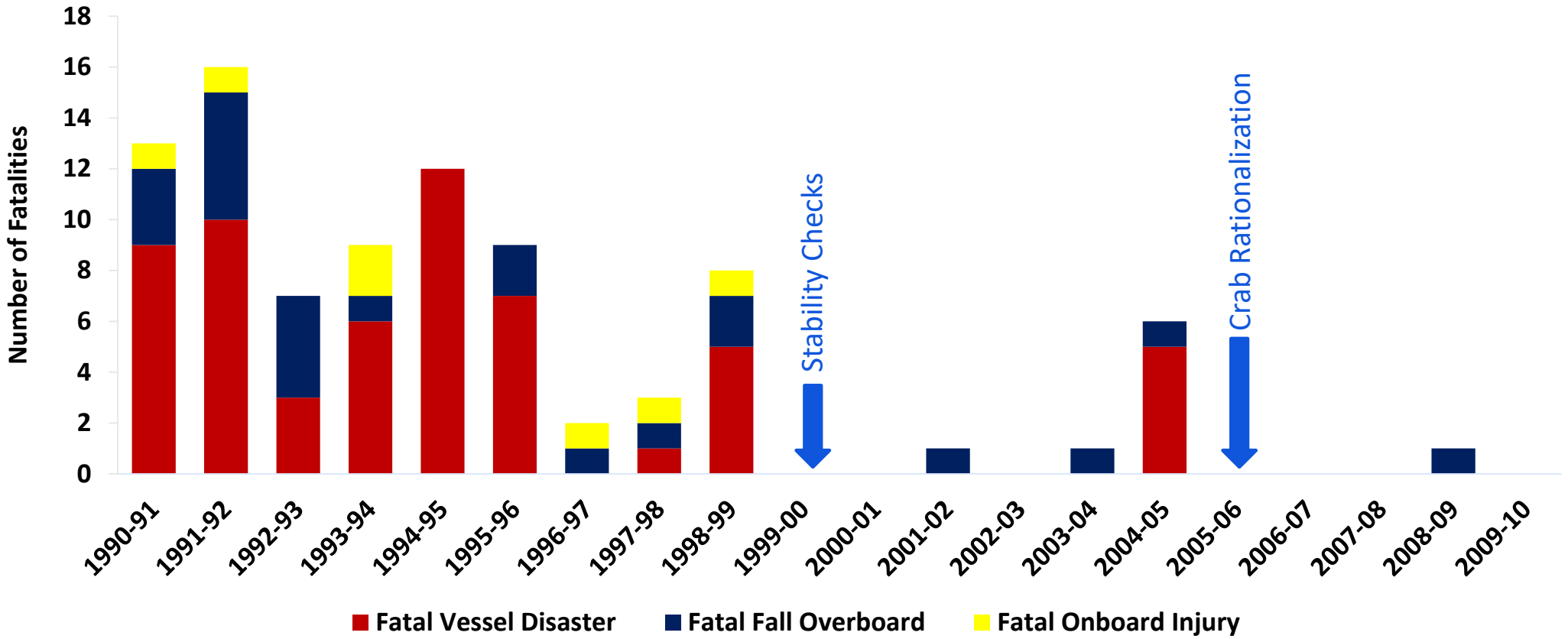
Effects on Operations

- Delay departure
  - anecdotal
- Vessel cooperatives
  - Great tool to reduce risk
  - It gives members the ability to transfer quota to avoid bad weather
- Fewer pots
  - Recorded during stability checks

Summary: Crab Rationalization and Safety– First Five Years

- Fatality rates decreased several seasons before rationalization started
- Continued to be no vessel losses
- Other Risk Reductions
  - Increase in fishing season length
  - Fewer smaller vessels
  - Vessel cooperatives
  - Decrease in pots carried
  - Decrease in pot-lifts/vsl day

Bering Sea / Aleutian Island Crab Fishery Fatalities (1990-2010)



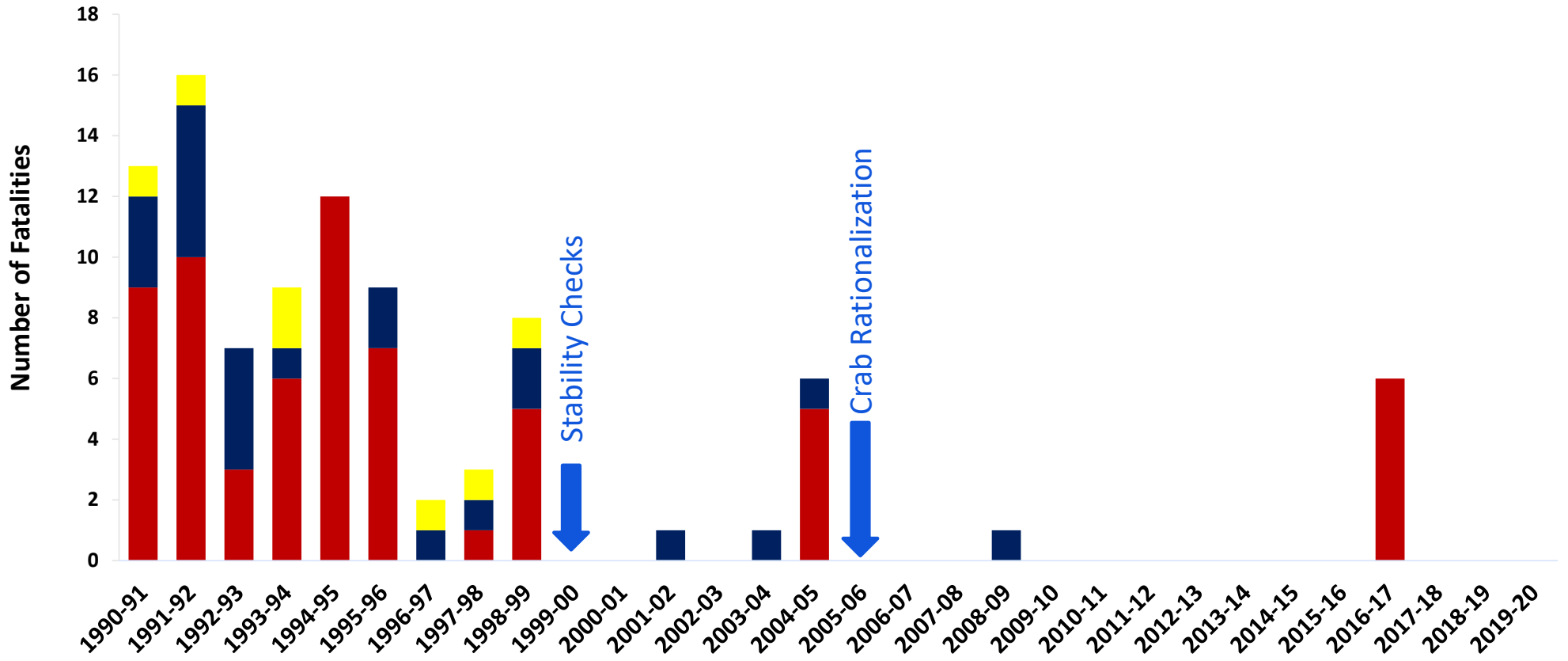
Source: NIOSH

Impacts of Crab Rationalization on Safety

- Ended the Race to Fish
- Greatly increased flexibility w/ rationalization
- Reduction in fleet size w/ remaining vessels larger
- Fewer pots & reduced pot hauls
- Vessels can avoid poor weather
- Mandatory decals / departure reporting
- Stability and Safety Checks can't be done the same way

Photo: USCG, Petty Officer 3rd Class Erik Swanson

Bering Sea / Aleutian Island Crab Fishery Fatalities (1990-2020)



Source: NIOSH

Environmental Hazards: Winter in Alaska

- Exposure to the elements
  - Cold weather, darkness
  - Bad, impending weather
  - Pots and icing - stability
- Long hours/Shift work
  - 24-hour operation
  - Extended shifts, sleep deprivation

Competing Priorities and Choices

- Continued desire to minimize days at sea to reduce operational costs
- Meeting delivery dates
  - Program is complicated and deliveries must be matched with processors
  - Schedule prevents everyone from delivering at once
- Also, other priorities not operationally related

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- Fatalities in the Alaska Fishing Industry
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NIOSH Vessel Disaster Research

- Two studies analyzed fishing vessel disasters in Alaska
- Asked two questions:
  1. Do vessel-related characteristics (e.g., history of casualties) predict vessel disasters?[1]
  2. If a vessel sinks, what factors improve survival chances?[2]

Crewmember rescued by USCG after vessel sinking. Photo: USCG.

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NIOSH Vessel Disaster Research

- Two studies analyzed fishing vessel disasters in Alaska
- Asked two questions:
  1. **Do vessel-related characteristics (e.g., history of casualties) predict vessel disasters?[1]**
  2. If a vessel sinks, what factors improve survival chances?[2]

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Study Approach

- Systematically **compare vessels** involved in disasters to those that were not

Cases

- A commercial fishing **vessel** involved in a **catastrophic event** that resulted in the entire crew abandoning the vessel in **Alaska** during **2010-2015**.
- Source: NIOSH Commercial Fishing Incident Database

Controls

- A commercial fishing **vessel** that was **active in Alaska** during **2010-2015** and **did not experience a vessel disaster**.
- Sources: State of Alaska, National Marine Fisheries Service
- Three control vessels randomly selected for each case vessel

Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Characteristics of Interest

Data Sources:
- NIOSH
- State of Alaska
- National Marine Fisheries Service
- US Coast Guard

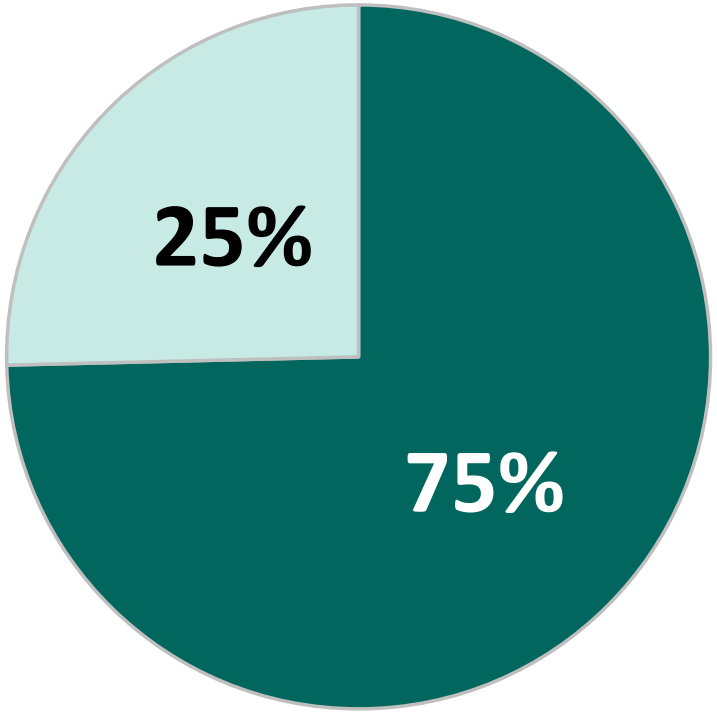
10-Year Reported Vessel Casualty History	None One or More
Fishing Vessel Safety Decal	Current Expired None
Documentation	Federally Documented State Registered
Vessel Age (years)	< 25 ≥ 25
Length (feet)	< 50 50 – 78 ≥ 79
Hull Material	Fiberglass Aluminum Steel Wood

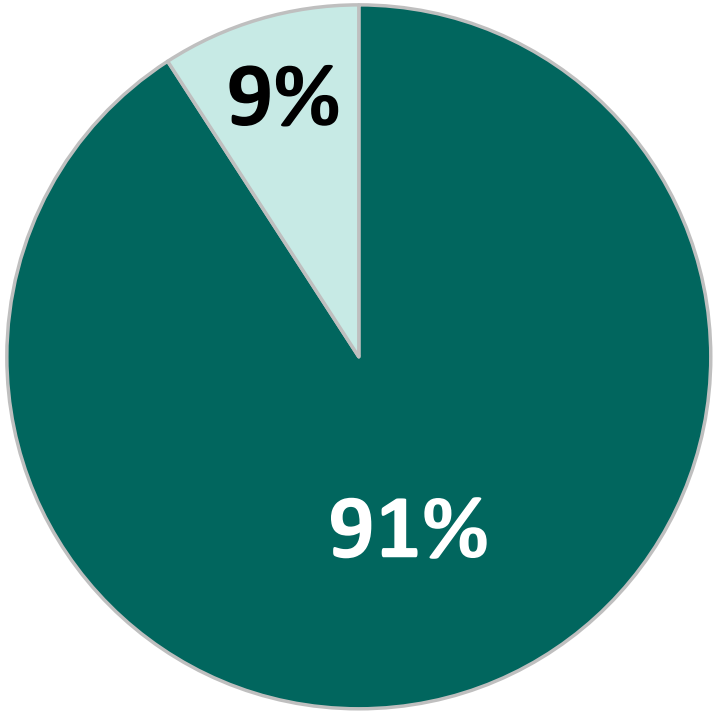
Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessel Characteristics: 10-Year Casualty History

Cases

Controls



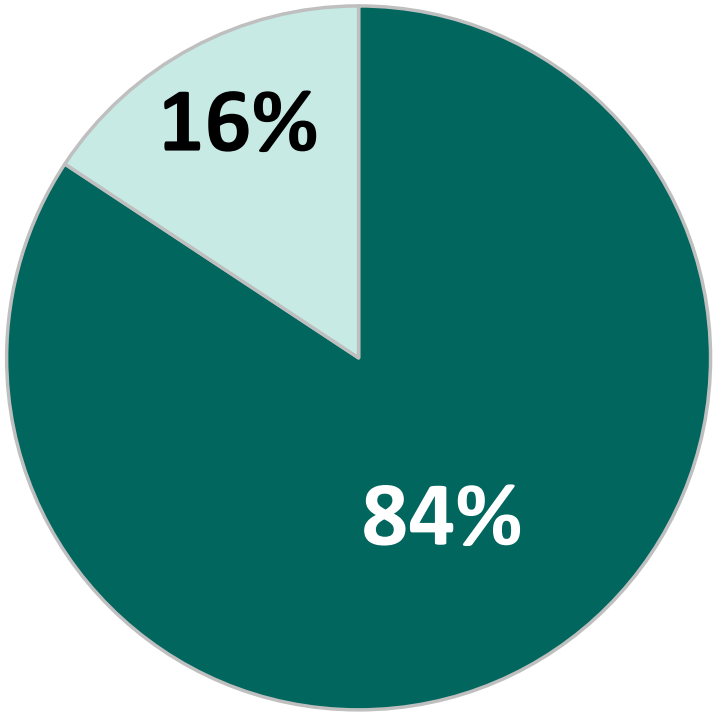


None
One or More

Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessel Characteristics: Documentation

Cases



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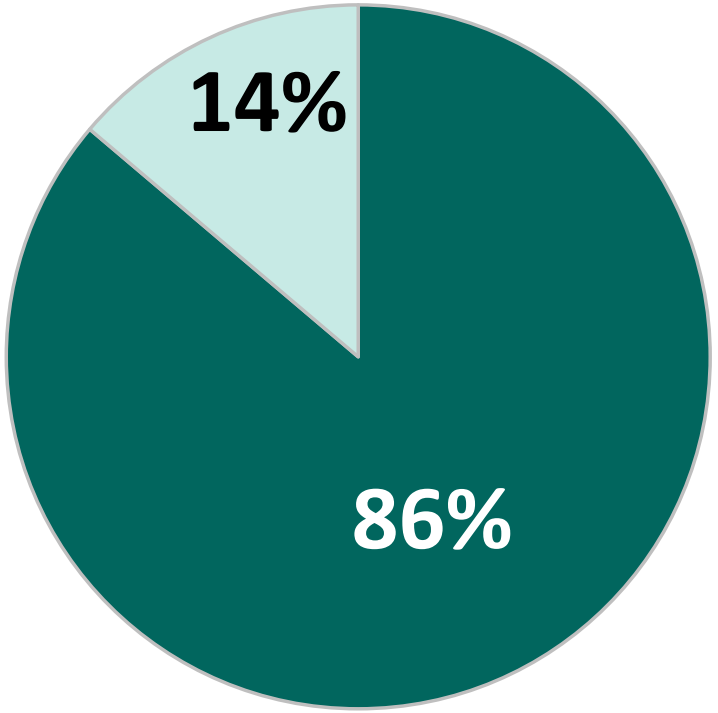
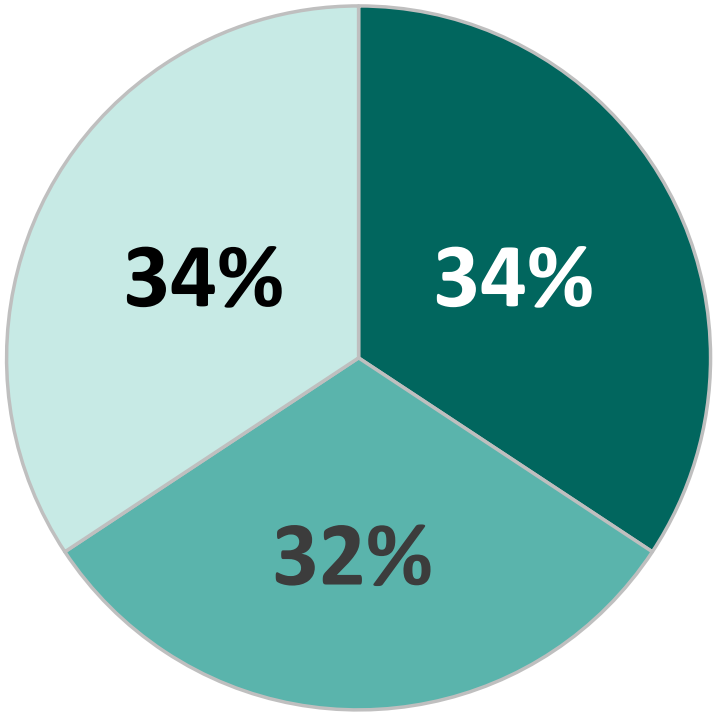


- Federally Documented
- State Registered

Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessel Characteristics: Safety Decal

Cases



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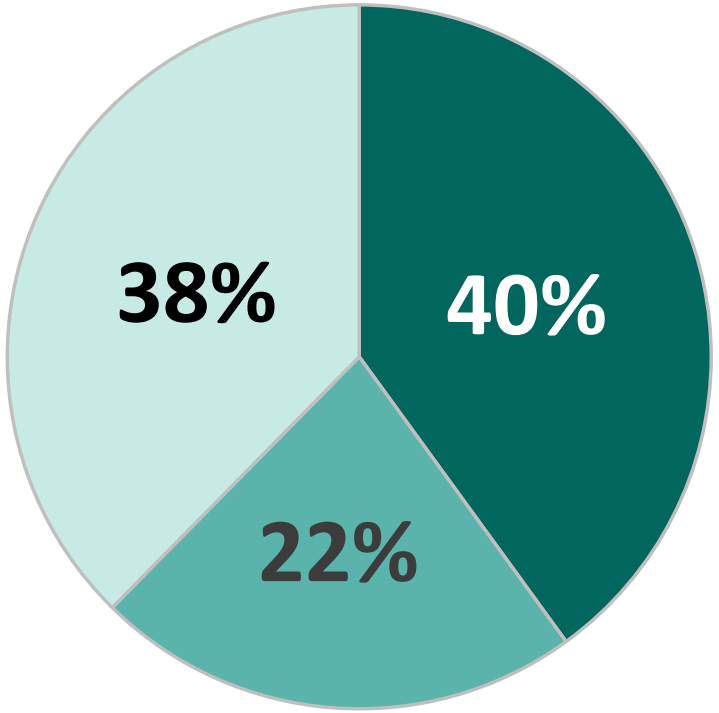
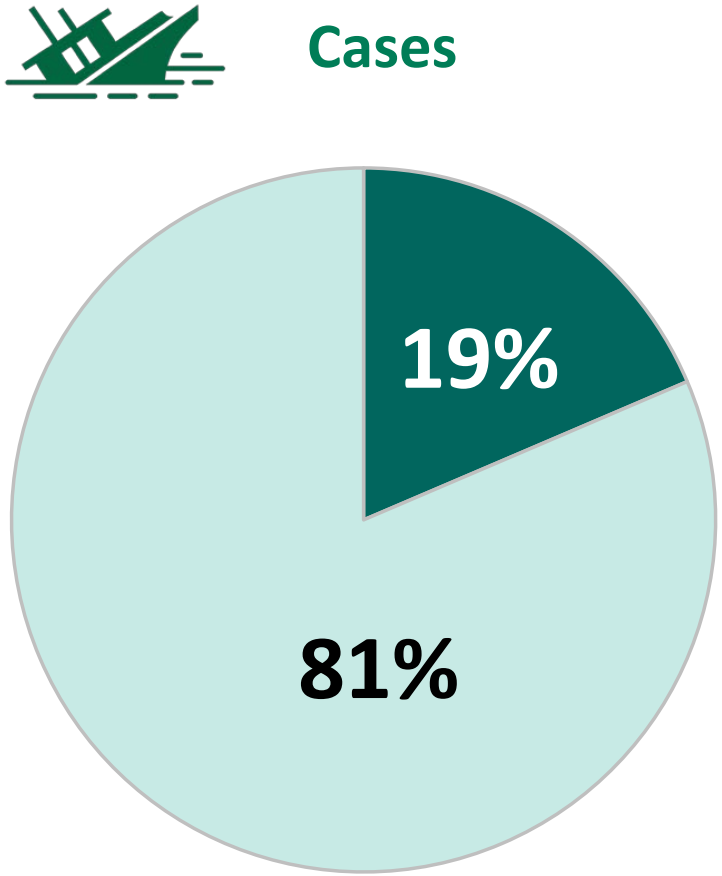


Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessel Characteristics: Vessel Age (years)

Cases



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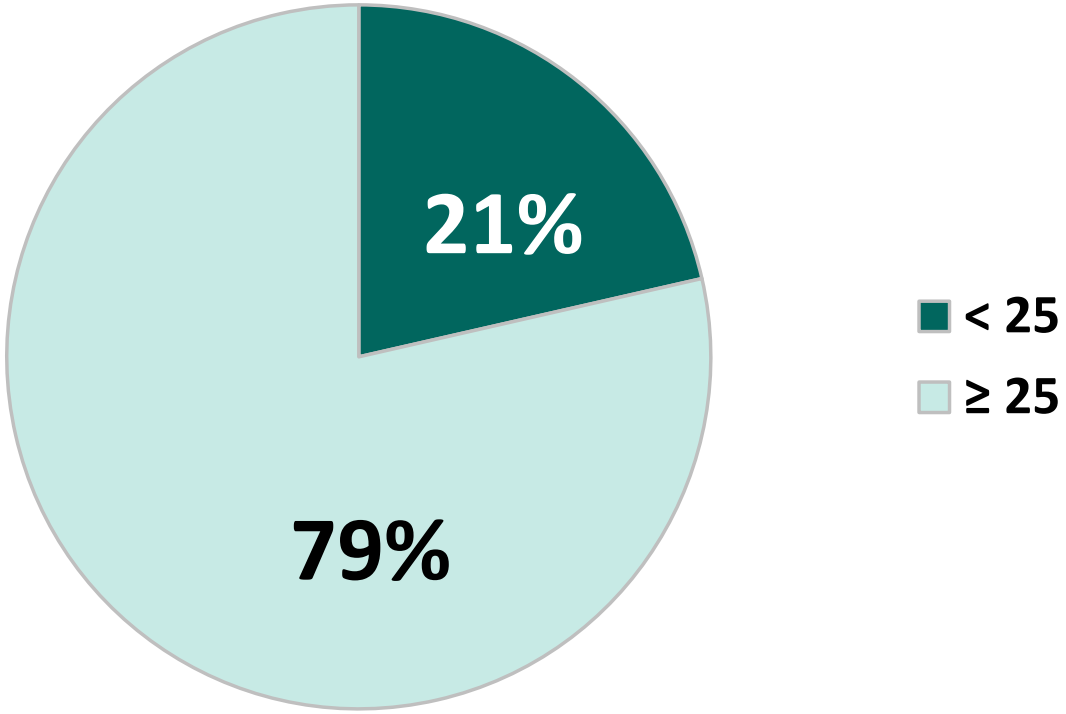
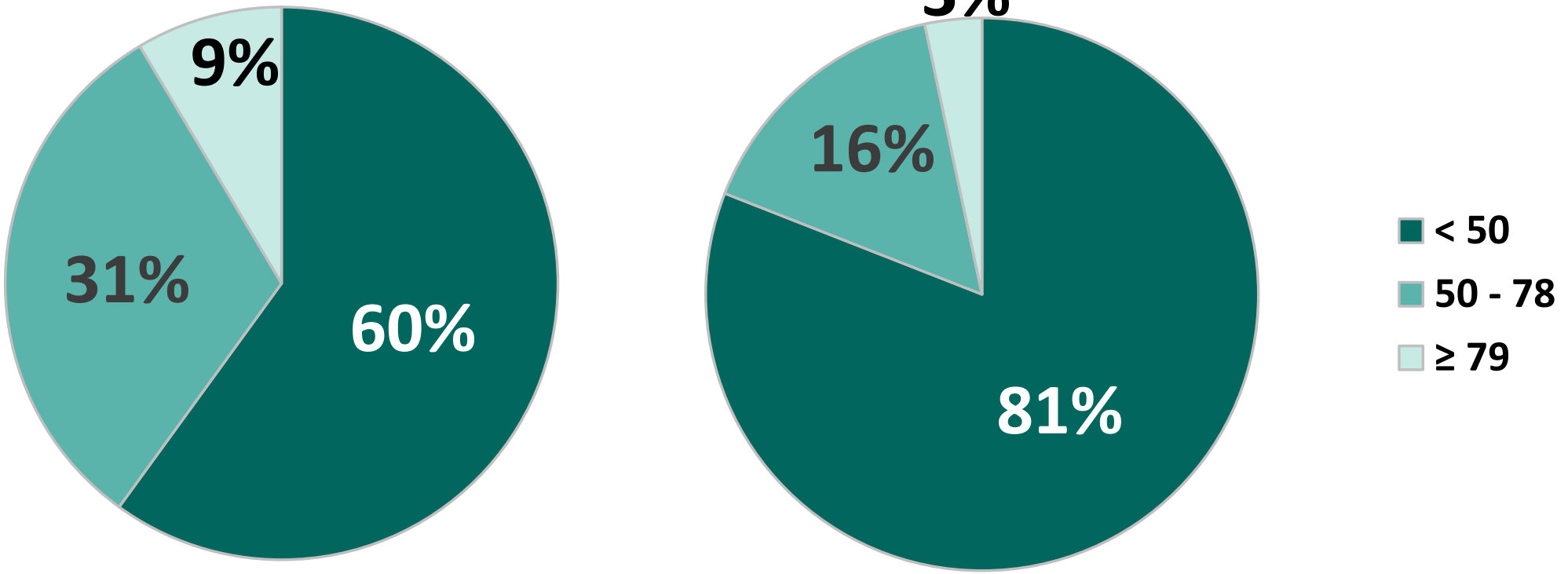


Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessel Characteristics: Length (feet)

Cases

Controls

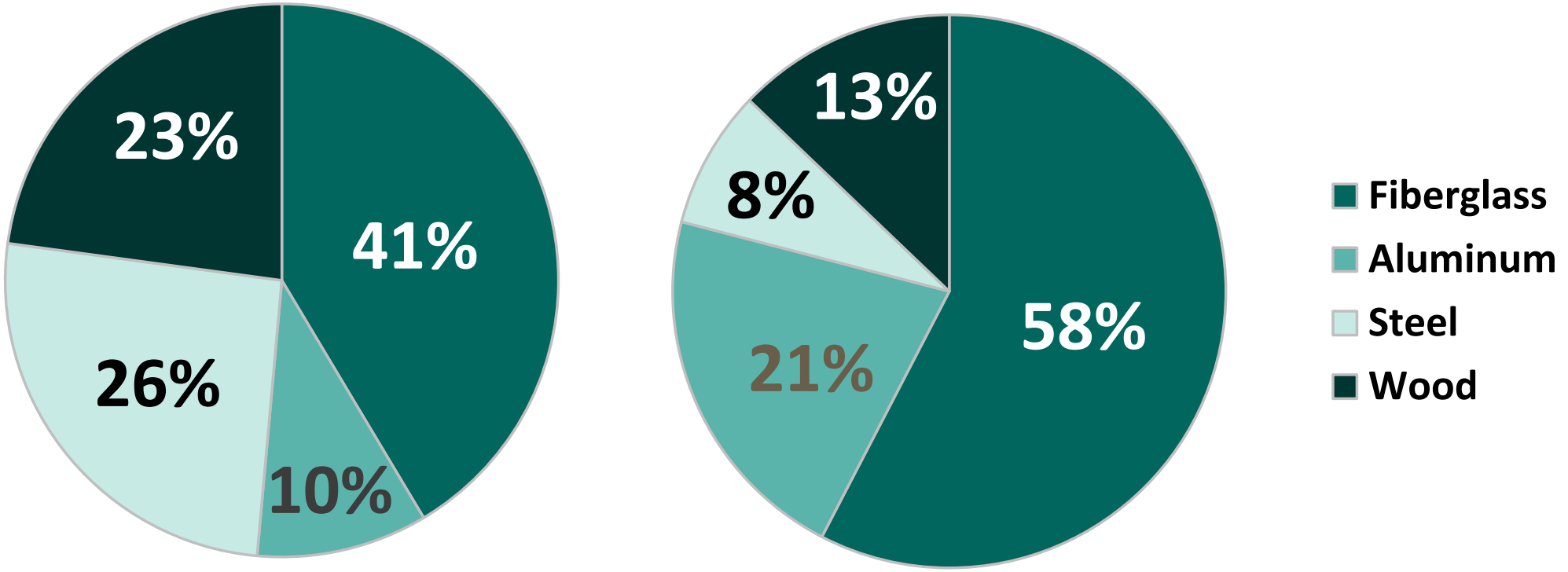


Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessel Characteristics: Hull Material

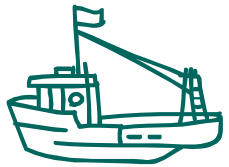
Cases

Controls



Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Vessels involved in disasters were…



- **3x more likely** to have **reported vessel casualties** in the previous 10 years
- **2.4x more likely** to have an **expired fishing vessel safety decal**
  - Could be due to larger safety problems, such as poor safety culture/climate, lack of routine maintenance, etc.
- **3.3x more likely** to have **steel hulls**
  - Could be indicative of the types of fishing operations (e.g., winter fishing; farther offshore)

Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

Conclusions

- Findings provide support for Coast Guard-led initiatives
  - **Alternate Safety Compliance Programs (ASCPs) / Voluntary Safety Initiatives and Good Marine Practices**: safety guidance for unclassed vessels >50’ and >25 years
  - **Dockside Examinations**: Now mandatory for vessels operating >3 nautical miles offshore

- Vessel casualties as risk factor
  - Preventative maintenance plan
  - Complete repairs when casualties do occur

- Further research warranted

Case, S. L., & Lucas, D. L. (2020). Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. *Journal of safety research*, *75*, 51-56

NIOSH Vessel Disaster Research

- Two studies analyzed fishing vessel disasters in Alaska
- Asked two questions:
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Crewmember rescued by USCG after vessel sinking. Photo: USCG.

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Study Approach

- Compare **survivors and victims** of vessel disasters
- Includes:
  - Decked commercial fishing vessels
  - Sinkings and capsizings
  - Alaskan waters
  - 2000–2014
- Excludes:
  - Undecked vessels (i.e., skiffs)
  - Groundings and fires

Air Station Kodiak assists commercial fishing vessel. Photo: USCG.

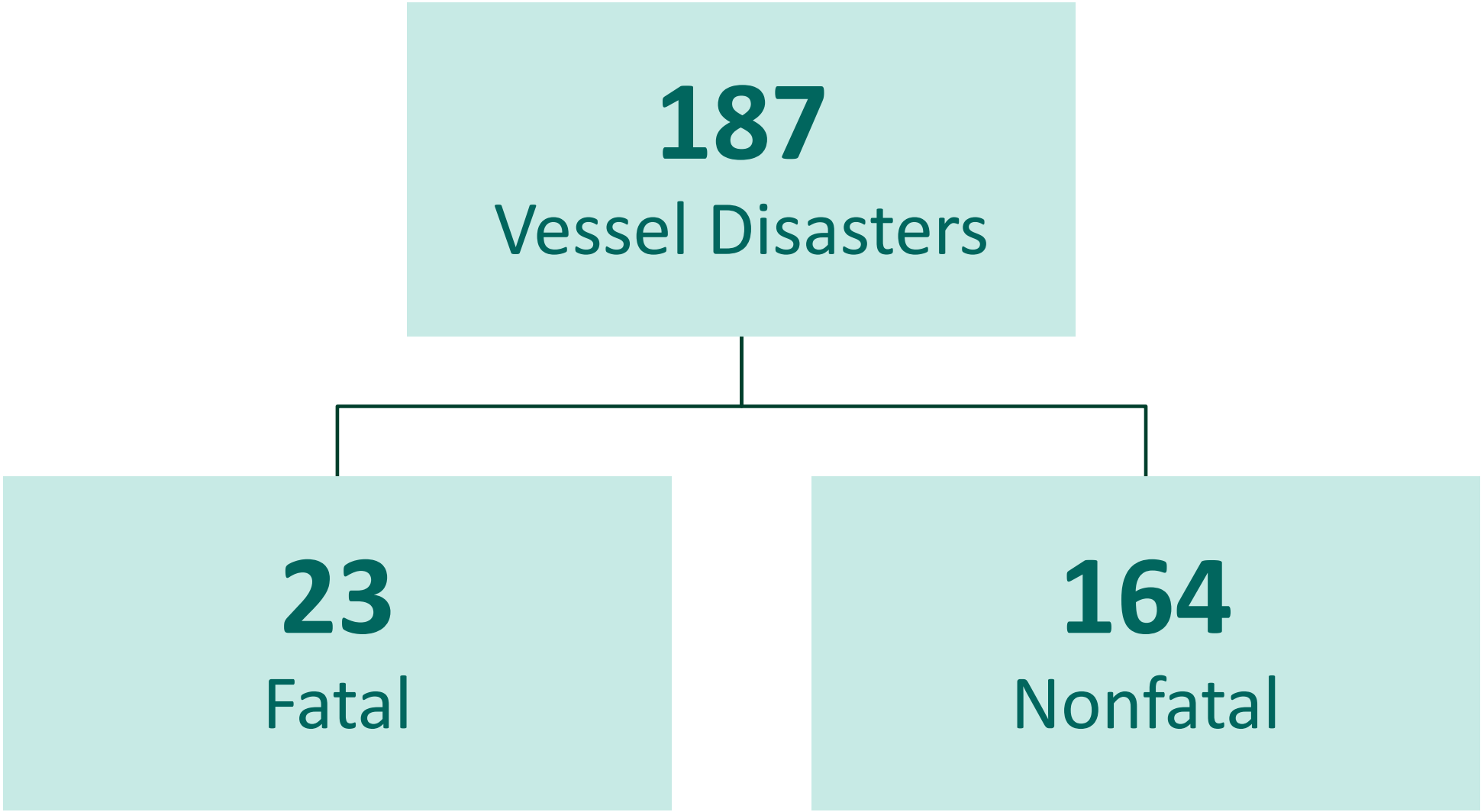
Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

Potential Survival Factors

Crewmember	Immersion suit worn	Yes / No
	Life raft used	Yes / No
	Marine safety training history	Yes / No
	Job position	Officer / Deckhand / Processor / Other*
Event	Distance from shore	≤ 3 miles / > 3 miles
	Weather-related	Yes / No
	Region of Alaska	Southwest / Southcentral / Southeast
	Season	Summer / Winter
Vessel	Length	< 50’ / ≥ 50’
	Age	< 25 years / ≥ 25 years
	Hull material	Fiberglass / Aluminum / Steel / Wood

* “Other” includes cook, engineer, and fishery observer

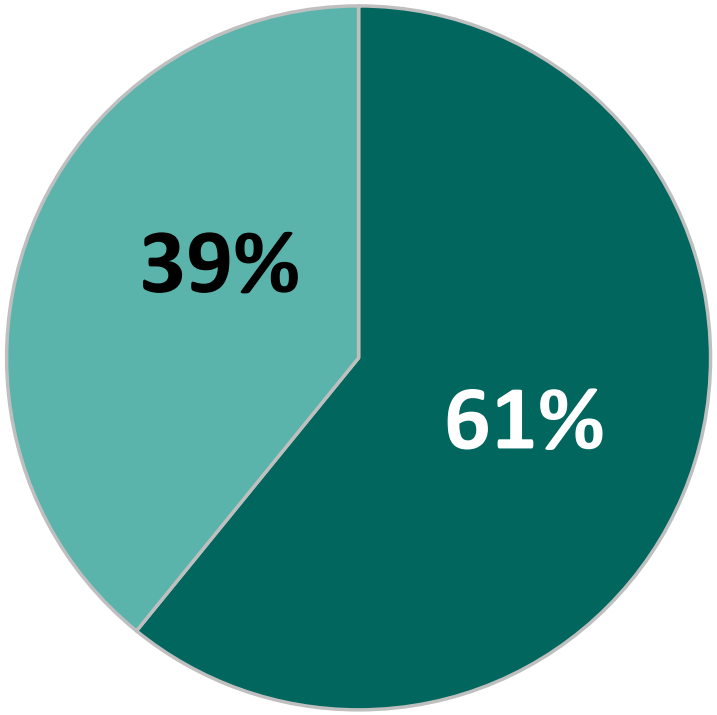
Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.



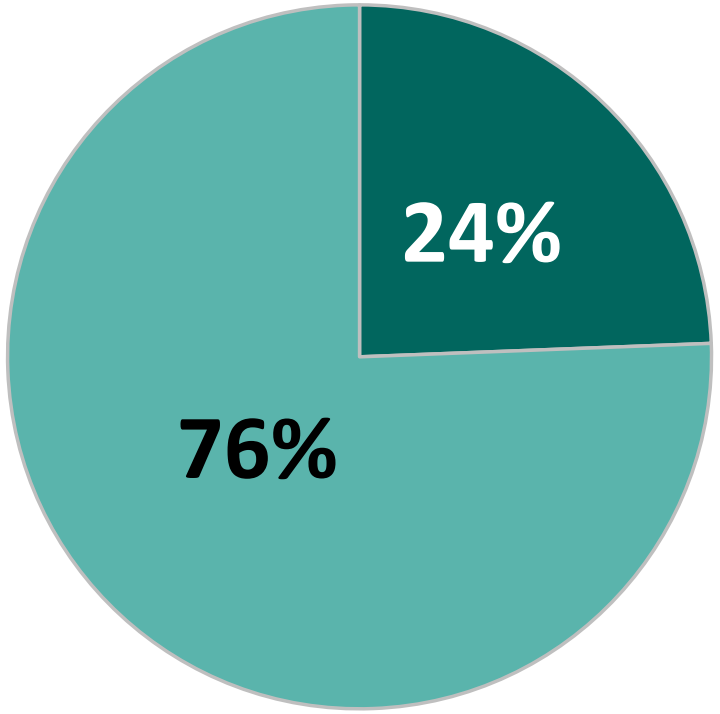
Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

Event Characteristics: Weather-Related

Fatal



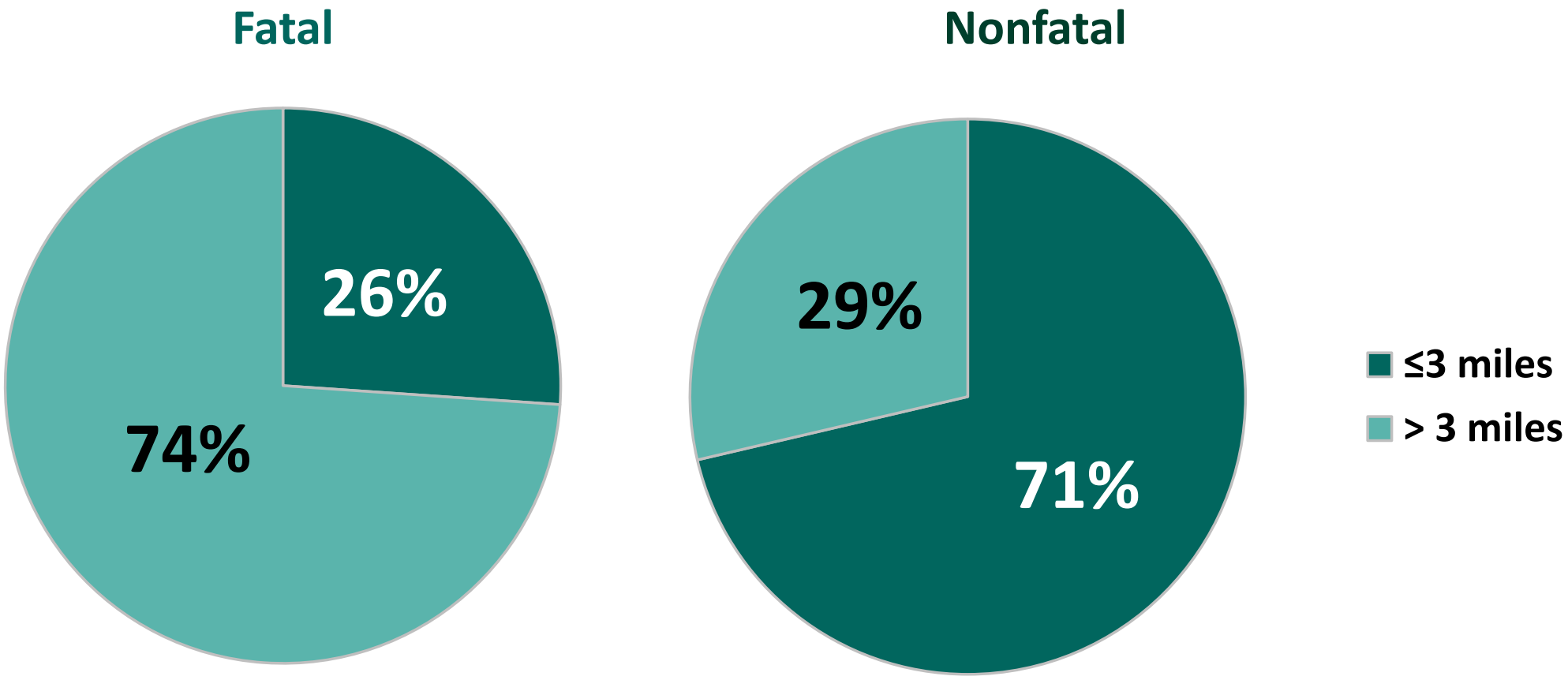
Nonfatal



Yes
No

Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

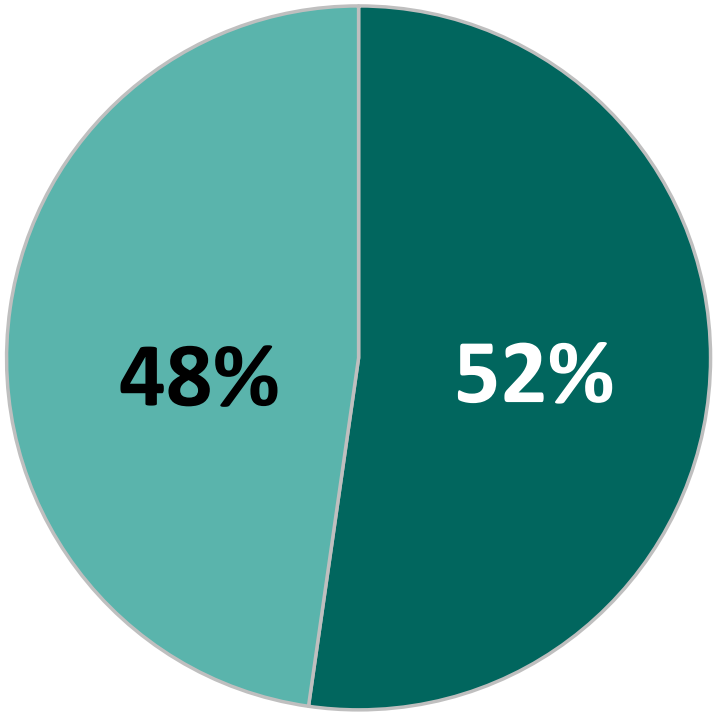
Event Characteristics: Distance from Shore



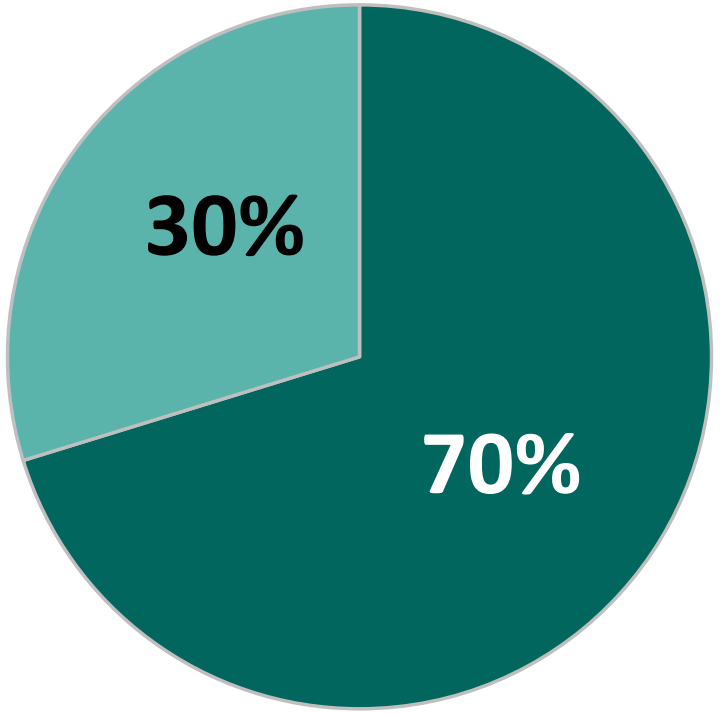
Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

Crewmember Characteristics: Immersion Suit Use

Victims



Survivors



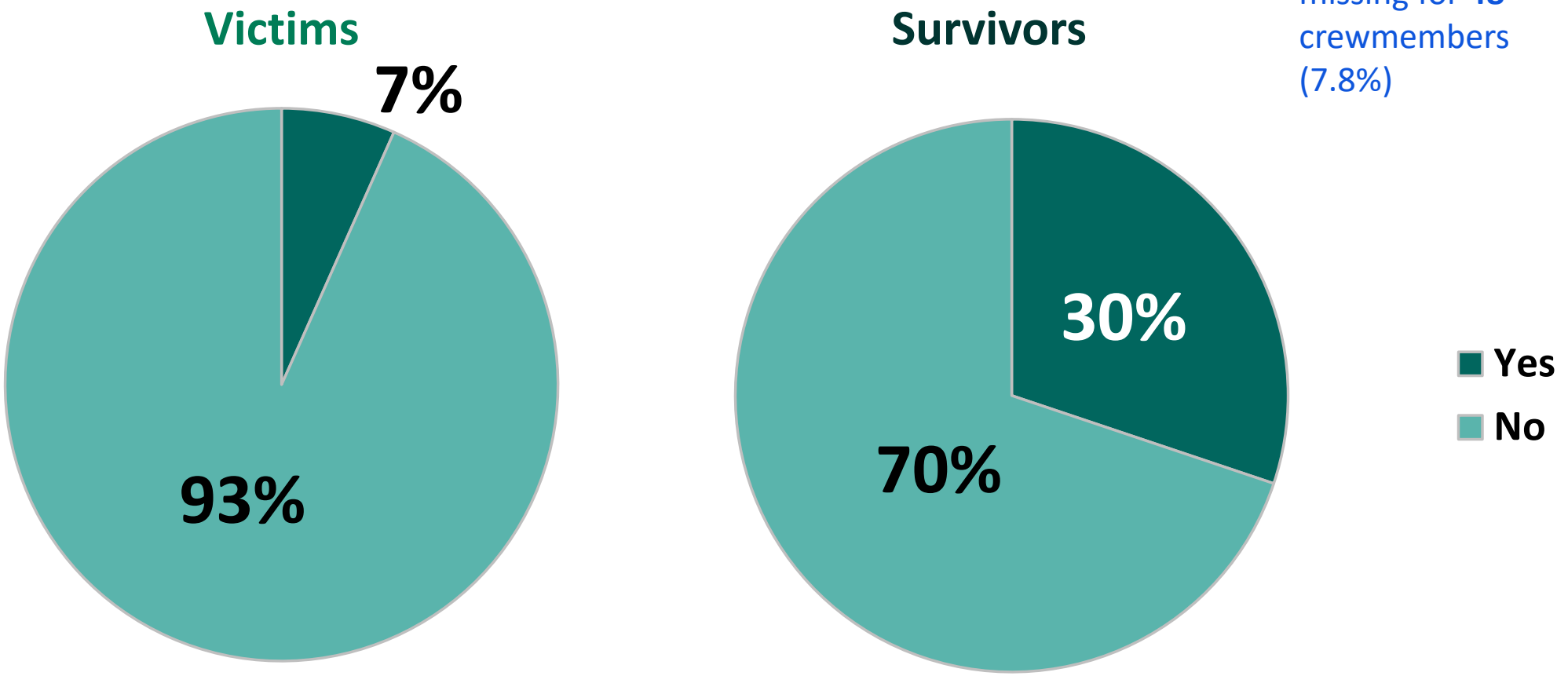
Immersion suit use missing for **368** crewmembers (59.6%)

Yes
No

Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

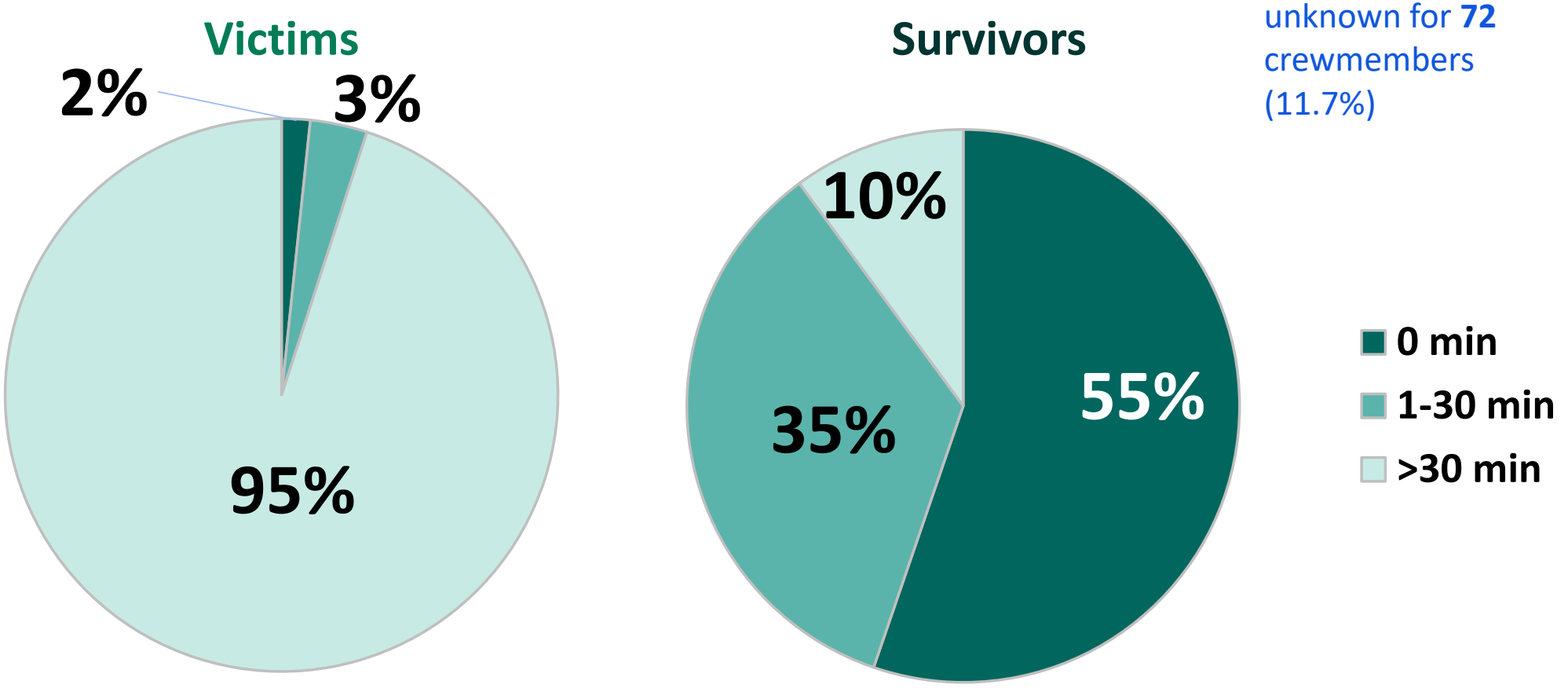
Crewmember Characteristics: Life Raft Use

Life raft use missing for **48** crewmembers (7.8%)



Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

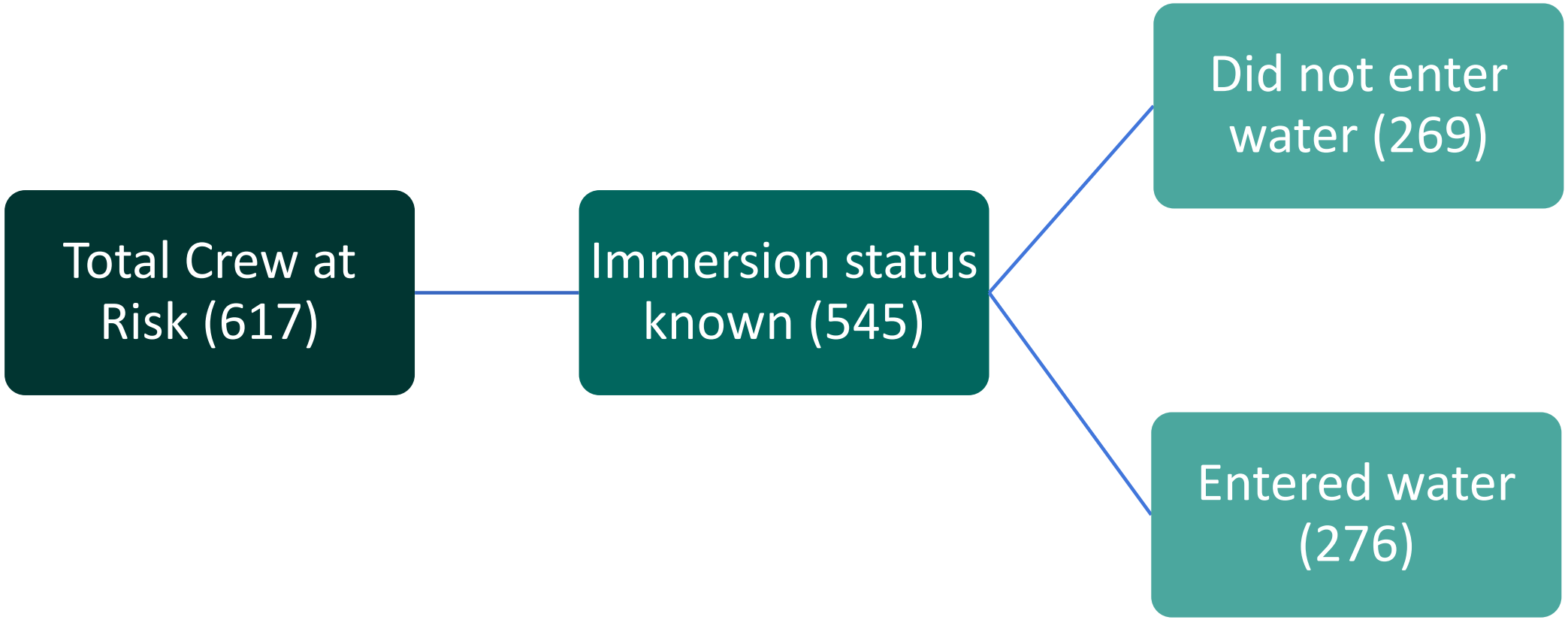
Crewmember Characteristics: Time in Water



Time in water unknown for **72** crewmembers (11.7%)

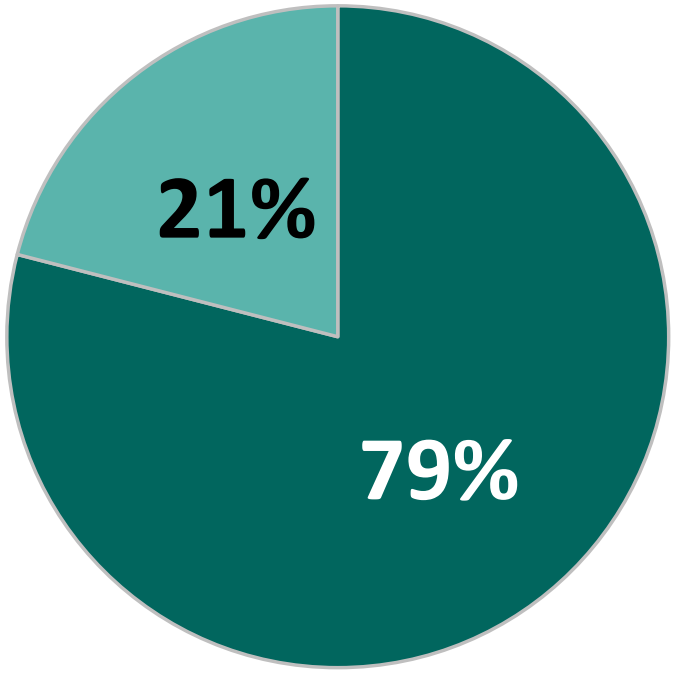
Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

Crewmembers Involved in Fishing Vessel Sinkings

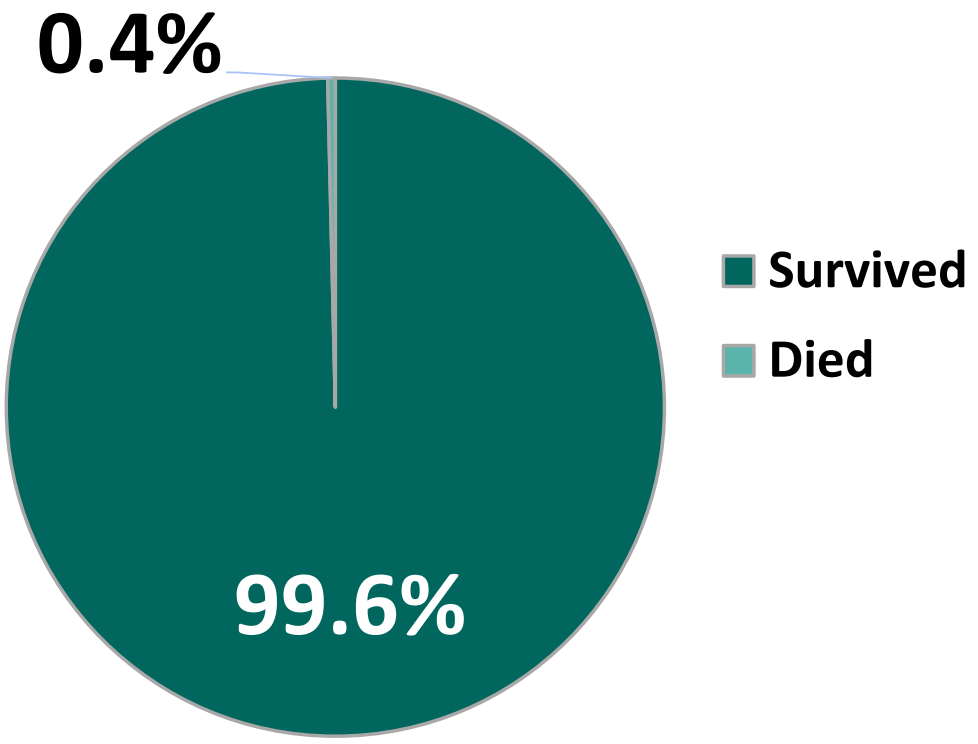


Crewmembers Involved in Fishing Vessel Sinkings

Entered the water (n=276)



Did not enter the water (n=269)



Crewmembers who entered the water…

- Were **17x more likely** to survive if they were able to enter a **life raft**

- Were **6x more likely** to survive if the sinking was **not related to heavy weather**

Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

Crewmembers who were in the water for 30 minutes or longer…

- Were **26x more likely** to survive if the sinking was **not related to heavy weather**

- Were **12x more likely** to survive if they entered a **life raft**

- Were **6x more likely** to survive if they wore an **immersion suit**

Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

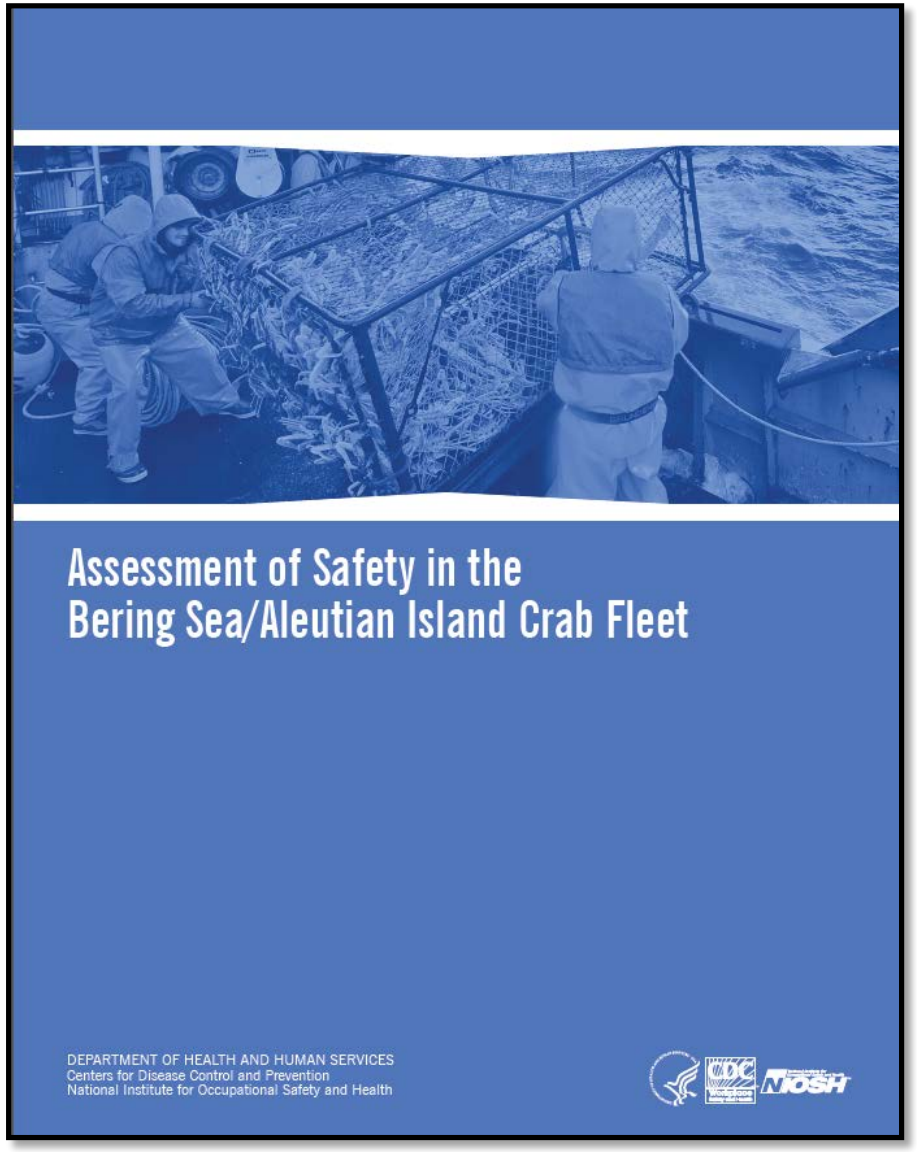
Conclusions

- **Avoiding cold water immersion** is best (e.g., helicopter, life raft)
  - Early recognition and communication of emergencies
- Use of **life rafts** and **immersion suits** saves lives
  - Highlights need for safety training and drills
  - Equipment must be easily accessible and well-maintained
- **Heavy weather** can impact chances of survival
  - May contribute to the disaster occurring
  - May hinder search and rescue

Lucas, D. L., Case, S. L., Lincoln, J. M., & Watson, J. R. (2018). Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. *Safety science*, *101*, 190-196.

Overview

- Fatalities in the Alaska Fishing Industry
- Safety Focus: BSAI Crab Fishery
- NIOSH Key Research: vessel disasters and survival factors
- **Safety recommendations**



Study of reported marine casualties, BSAI crab fleet, 2005/06 – 2012/13

Citation: BSAI Crab Safety Assessment

https://www.cdc.gov/niosh/docs/2016-112/pdfs/2016-112.pdf

To prevent vessel disasters and other serious vessel casualties

1. Participate in the USCG "At-the-Dock Stability and Safety Compliance Check" program prior to each crab season.

2. Periodically consult a naval architect to refresh knowledge of safe loading limits and adhere to stability instructions.

3. Update and formalize maintenance procedures for propulsion, power, steering, and other critical systems, and closely follow the established schedule.

4. All crewmembers should take an 8-hour marine safety class at least every five years to maintain the skills needed in an emergency.

NIOSH Policy

- ***Recommendation #1: A requirement for periodic stability reassessment and vessel inspection of all vessels should be seriously considered, as equipping and retrofitting can substantially affect the stability of vessels.***

1997– Current Intelligence Bulletin:
https://www.cdc.gov/niosh/pdfs/fishcib3.pdf

Fisheries Management Considerations

- **Many factors may influence operational decisions** related to weather conditions, including fishery management policies.
- **Economic pressures generated by certain fishery management policies** can play an important role in the decisions made by vessel operators to fish in severe weather conditions (FAO, 2016).
  - Also anticipated changes in policies– “race for catch history”
- When creating or modifying fishery management policies, **policy makers should consider the potential safety repercussions** of those policies and make efforts to enact policies that mitigate hazards.

FAO. (2016). International Commercial Fishing Management Regime Safety Study: Synthesis of Case Reports. FIRO/C1073 (En.) FAO Fisheries and Aquaculture Circular. ISSN 2070-6065

Alaska Regional Summary, 2009-2014

- **Recommendations:**
  - Maintain proper watch-- watchkeeping
  - Vessel owners and operators should create fatigue management policies and use watch alarms to prevent groundings and collisions

Adapted from: United States Army. (2020, October 8). Holistic Health and Fitness Manual

Key Resources on Fatigue

- USCG – Fishing, Fatigue, and Crew Endurance Management System
  http://www.fishsafewest.info/PDFs/Fatigue1.pdf

- NIOSH – Work Schedules: Shift Work and Long Hours
  https://www.cdc.gov/niosh/topics/workschedules/

- National Safety Council, Fatigue – You're More Than Just Tired
  https://www.nsc.org/work-safety/safety-topics/fatigue

Hands-on Marine Safety Training

Additional Key USCG Safety Programs

- **Alternate Safety Compliance Programs (ASCPs)**: safety standards for vessels >50’ and >25 years
- **Dockside Examinations**: Now mandatory for vessels operating >3 nautical miles offshore
- **Commercial Fishing Safety Training Grants**: Provides funding to help bring safety training to commercial fishing ports nationally
- **Commercial Fishing Safety Research Grants**: Provides funding focused on reducing risk in the industry

Considerations

- Prioritize understanding existing hazards for specific fleets
- Review and update of U.S. Coast Guard Vessel Stability Regulations and Guidance (2019)
- Use authority to incorporate training mandates for emergency drills, stability, first aid, navigation.
- Prioritize collecting information about fatigue
- Prioritize collecting information about safety training
- Develop strategy to engage the industry to make it easy for them to adopt safety management systems and new technology

Acknowledgements

USCG D17

Chris Woodley, CAPT (retired), US Coast Guard

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TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.