NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

# Commercial Fishing Safety Research

## BACKGROUND

The National Institute for Occupational Safety and Health (NIOSH) is responsible for conducting research to improve safety and health of workers. NIOSH is not a regulatory agency, but a research organization.

There is a core group of 6 people at NIOSH who currently work on improving safety in the fishing industry. This efficient team has produced solid, helpful products and scientific information regarding commercial fishing safety. They are committed to being very practical and tailor their products for specific fisheries, regions, or hazards. The team includes fishermen in every step of their research and is held in high regard by fishing companies, fishermen, and marine safety advocates.

Commercial fishing is one of the most dangerous occupations in the United States. Many commercial fishing operations are characterized by hazardous working conditions, strenuous labor, long work hours and harsh weather. During 1992-2008, an annual average of 58 deaths occurred (128 deaths per 100,000 workers), compared with an average of 5,894 deaths (4 per 100,000 workers) among all U.S. workers . In 2008, over 8 billion pounds of seafood was harvested in the United States earning over $4.4 billion. There are approximately 115,000 harvesters in the United States using a variety of different fishing gear and vessels.

## SURVEILLANCE

NIOSH created and maintains the Commercial Fishing Incident Database (CFID), a surveillance system for workplace fatalities in the commercial fishing industry in the United States. A review of the data from 2000-2009 found that (see Figure 1):

- 504 commercial fishermen died while fishing in the United States
- More than half of all fatalities (261, 52%) occurred after a vessel disaster
- Another 155 (31%) fatalities occurred when a fisherman fell overboard
- Another 51 (10%) fatalities resulted from an injury onboard
- The remaining 37 (7%) fatalities occurred while diving or from onshore injuries

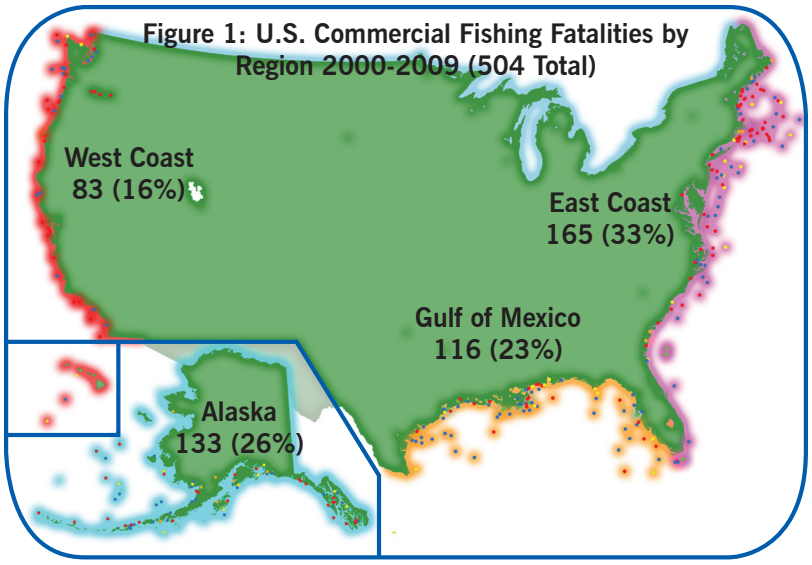


**Figure 1: U.S. Commercial Fishing Fatalities by Region 2000-2009 (504 Total)**

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The review of commercial fishing fatalities from 2000-2009 also identifies the most hazardous fishing regions and fisheries around the U.S. NIOSH divides commercial fishing activities into four major fishing regions: Alaska, West Coast, East Coast, and the Gulf of Mexico. Based on the overall number of fatalities during the past decade, the East Coast (Northeast, Mid and South-Atlantic) has the most fatalities followed by Alaska, the Gulf of Mexico, and the West Coast (see Figure 1).

The most hazardous fisheries based on overall number of fatalities from 2000-2009 are:

- Gulf of Mexico shrimp fishery with 55 fatalities
- Atlantic scallop fishery with 44 fatalities
- Alaska salmon fishery with 39 fatalities
- Northeast Multispecies ground fish fishery with 26 fatalities
- Alaska Cod fishery with 26 fatalities
- West Coast Dungeness crab fishery with 25 fatalities
- Alaska Sole fishery with 21 fatalities

NIOSH has contracted with the Natural Resource Consultants, Inc. to establish workforce estimates (Full Time Equivalents, FTE) for individual fisheries across the US when data are available to make these estimates. The most hazardous fisheries based on fatality rates are:

- Northeast multispecies groundfish fishery, 600 fatalities per 100,000 FTEs
- Atlantic scallop fishery, 425 fatalities per 100,000 FTEs
- West Coast Dungeness crab fishery, 310 fatalities per 100,000 FTEs

These data illustrate that occupational risk factors vary by region and fishery. Intervention programs should focus on fleet-specific hazards that lead to injuries. Interventions need to be tailored to specific fisheries, with an emphasis on the prevention of vessel disasters in the Northeast multispecies groundfish fishery, the Northeast scallop fleet, and the West Coast Dungeness crab fleet. Additional efforts also need to focus on preventing falls overboard particularly among Gulf of Mexico shrimp fishermen and increasing PFD usage. For more detail on these findings please refer to the attached report summarizing fishing fatalities for the country as well as the regional summaries that describe the unique risk factors, and recommendations for each region.

NIOSH is consulted regularly for data regarding high-risk fisheries and regional hazards. These requests come from other national organizations (US Coast Guard, National Marine Fisheries Service, National Transportation Safety Board); coastal state governments (Oregon, Washington, Alaska, Maine); marine safety advocates (Alaska Marine Safety Education Association, North Pacific Fishing Vessel Owners Association, US Marine Safety Association).

NIOSH provides input on national and regional policy decisions as well. NIOSH has influenced the development of national policies that affect commercial fishing safety by providing the necessary data and evidence to show successful intervention efforts and effects on safety. NIOSH provided congressional testimony in April 2007, which led to some of the safety recommendations found in the US Coast Guard Authorization Act of 2010. This Act contains instructions to the US Coast Guard to prevent vessel loss, falls overboard, and severe injuries in the commercial fishing industry and to improve safety training. NIOSH also participated in the National Transportation Safety Board Commercial Fishing Safety Form in Oct. 2010. NIOSH served on three expert panels, providing data to help identify practical safety issues in the industry and to identify strategies for preventing injuries and reducing the industry's unacceptably high injury and fatality rate.


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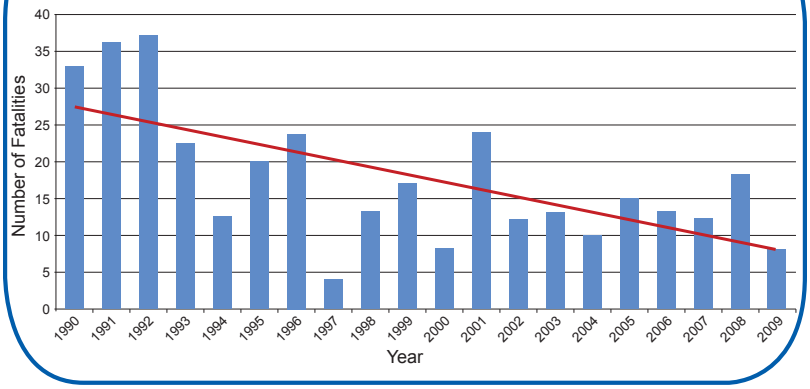
## SAFETY EVALUATION

NIOSH conducts research on particular hazards and evaluates interventions that have been established to improve safety in the industry. For instance, research in the 1990's focused on the Alaska region. While the work-related fatality rate for commercial fishermen in Alaska is still very high, it has decreased by 42 percent since the early 1990's (see Figure 2). Safety improvements in Alaska occurred as a result of a combination of activities including safety regulations, and fishery-specific interventions focusing on unique hazards of each fishery.

**Figure 2: Commercial Fishing Fatalities by Year, Alaska, 1990-2009 (N=353)**





Safety regulations in commercial fishing largely began with the passing of the Commercial Fishing Industry Vessel Safety Act (CFIVSA) in 1988. This gave authority to the United States Coast Guard to develop basic lifesaving regulations for commercial fishing vessels, including requirements to carry emergency equipment such as life rafts and immersion suits. NIOSH evaluated the impact of CFIVSA on fatalities in Alaska and found that the safety requirements contributed to 94% of the commercial fishermen surviving vessel sinkings/capsizings from 1997-1999, in comparison to a 77% survival rate in 1991-1993. The survival rate from 1991-1999 steadily improved following the implementation of CFIVSA. NIOSH has also evaluated the effectiveness of emergency equipment and survival training required by US Coast Guard regulations and found that victims who died were 7 times more likely not to have worn an immersion suit and 15 times more likely not to have used a life raft.

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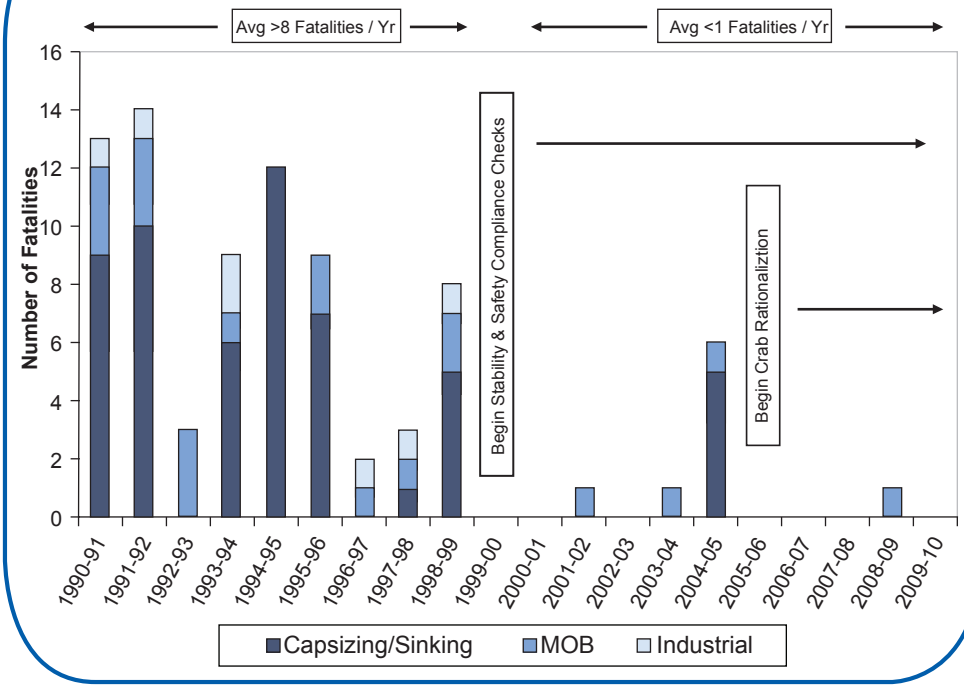
# REDUCING RISK FOR CRAB FISHERMEN

In October 1999, the US Coast Guard developed Dockside Stability and Safety Checks for the Bering Sea Aleutian Island (BSAI) crab fleet after NIOSH data revealed this fishery was the most dangerous in Alaska. This program was targeted to identify and correct stability hazards that led to most fatalities in the fishery. Since the program's inception in 1999, only one vessel has been lost resulting in the loss of 5 lives (Figure 3).

In addition, there have been 4 fatal falls overboard since implementation. Further evaluation by NIOSH found that the average number of fatalities dropped from more than 8 per year to less than 1 per year after its implementation. The fatality rate among BSAI crab fishermen declined by 60% after implementation of the program.

**Figure 3: Bearing Sea / Aleutian Island Crab Fishery Fatalities (1990-2010)**




In October 2005, the BSAI crab fishery was rationalized, which means that each vessel owner was awarded the rights to catch a certain set quota of crab and the traditional derby style management was eliminated. NIOSH reviewed the safety impacts of this program and found that it resulted in the consolidation of the fleet, sidelining less efficient and arguable less safe vessels. The change also resulted in a slower paced fishery indicated by a drop in the number of pots pulled per vessel day.

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## IMPROVING PFD USE AMONG COMMERCIAL FISHERMEN

There are many types and styles of PFDs available, with several styles to fit the needs of commercial fishermen, including several lightweight, inflatable PFDs that are worn like suspenders and PFDs that are integrated into raingear. NIOSH has conducted a field study in Alaska with commercial fishermen to test the available PFDs to identify the PFDs with the features that fishermen like and will use. Results of this study will be published in 2011, and NIOSH will partner with the Coast Guard, US Marine Safety Association, and PFD manufacturers to promote the use of PFDs based on the findings. NIOSH is also supporting a similar study with fishermen on the West Coast, in partnership with the University of Washington. NIOSH recently released Man Overboard Prevention & Recovery, a safety awareness DVD designed to help crew members be more aware of how to prevent and respond to man overboard events.


## ENGINEERING DESIGN

In addition to surveillance and safety evaluations, NIOSH works with industry to develop effective engineering solutions to common hazards.

**E-Stop for Capstan Winches**

NIOSH worked with purse seine fishermen on the design and testing of an emergency stop (e-stop) switch that stops the deck winch if someone becomes entangled. The e-stop system allows the winch to be stopped by a worker, even if the worker is caught in the winch. The system was successfully tested on vessels during the 2005-2007 fishing seasons and is now commercially available as a retrofit-kit from Kolstrand Marine.

**Sea-testing a Hatch and Door Monitoring System**

NIOSH is developing a hatch and door monitoring system for commercial fishing vessels that is inexpensive, easy to install, robust, and able to be retrofitted on existing vessels. NIOSH engineers have installed and evaluated such a system on two fishing vessels, F/V Lilli Ann and F/V Gladiator, which are working in Alaskan waters. The results from sea-testing these prototypes will be used to refine the systems and make recommendations for its installation on commercial fishing vessels.

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**Developing a Flood-Rate Monitoring System**

Two contributing factors in many vessel disasters is the uncontrolled flooding of watertight compartments or the free-surface effect of partially filled holds. Most flood alarms found in commercial fishing boats prompt pumps to operate, but do not indicate the status of the flooding. They do not tell if the pumps are keeping up with the in-rush of water. NIOSH engineers have developed a Flood-Rate Monitor that not only triggers the pumps, but also shows the relative flood level and the rate of its increase or decrease. A variant of the Flood-Rate Monitor was developed after NIOSH engineers were alerted by fishermen that traditional float-style switches used to sense tank levels were unreliable due to their propensity to foul. A fish hold or tank that is not completely full or empty is referred to as a "slack tank" and dangerously reduces a ship's stability. A Slack-Tank Monitor using pressure transducers to sense tank levels was designed to reduce the chances of mechanical failure due to fouling from machine oil, grease, fish slime, or debris. The Slack-Tank Monitor System was installed on the F/V Epic Explorer in January 2011 for testing in the Bering Sea.


## SUMMARY

The NIOSH Commercial Fishing Safety Research program strives to understand the safety problems in the commercial fishing industry and works with industry to develop practical ways of addressing the hazards to save lives. The program maintains the only system that identifies high-risk fisheries and regions and is seen as a valuable resource for these types of data when forming regional and national policies. NIOSH is also respected by the industry as an effective research organization committed to improving safety.

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