Fishing for a Living is Dangerous Work

Fishing has consistently ranked as the most deadly occupation since 1992, when BLS started publishing fatality rates by occupation. Workers in this occupation face unique life-threatening hazards—vessel casualties, falling overboard, and diving incidents.

BY DINO DRUDI

Each year during the 19th century, Gloucester, Massachusetts typically lost to the sea about 200 men employed in fishing–4 percent of the town's population. Since 1650, the sea has claimed an estimated 10,000 Gloucester residents. Sometimes a storm would hit the Grand Banks and half a dozen fishing ships would go down—100 men lost overnight. On more than one occasion, Newfoundlanders awoke to find their beaches strewn with the storm-tossed corpses of those who toiled on New England fishing boats.[1]

While fishing, like almost all other occupations, has become less dangerous in recent years, the Bureau of Labor Statistics' Census of Fatal Occupational Injuries (CFOI), since its inception in 1992, has reported fishers as the single most deadly occupation.[2] Persons engaged in this work typically face a risk of suffering a fatal job injury 20 to 30 times greater than the risk for all occupations. For the years 1992 through 1996, the most recent year for which data are available, there were between 50 and 100 fishing fatalities annually. This translates into 140 fatalities per 100,000 workers engaged in the occupation for the 5-year period. (See table 1.) By contrast, the fatality rate for all occupations during this same period was 5 per 100,000.

Although in the 19th century more than 1 out of 25 Gloucester fishermen were killed on the job each year, for the period 1992 through 1996, the number of commercial fishing workers killed on the job annually averaged 1 out of 716. This translates into 61 fatal injuries per 1,000 workers over a 45-year fishing work lifetime.[3]

This article, discusses fatal occupational injuries to fishers for the period 1992-96 and does not include any analysis of their nonfatal occupational injuries and illnesses.

Vessel casualties

Commercial fishing vessels often travel a long way from their home ports in search of ever-dwindling fish stocks, and fish great distances from shore. Perils to fishing vessels include storms, which can produce "rogue waves"—also known as "freak seas" or "non-negotiable waves"—over 100 feet (30 meters) high, and fog which hinders safe navigation.

Rogue waves often are several ordinary waves that get "in step" to form veritable piles of water or they are left-over waves from earlier storms that circumnavigate the globe and strike in otherwise relatively calm seas. They

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Table 1. Fatal occupational injuries for fishing occupations, 1992-96[1]

Occupation[2]	1992		1993		1994		1995		1996		Total 1992-96	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Fishing occupations	92	156	91	154	67	131	58	103	72	153	380	140
Captains and other officers[3]	20	–	12	–	10	–	7	–	6	–	55	–
Fishers	72	141	79	154	57	136	51	113	66	178	325	144

[1] Rates represent the number of fatal occupational injuries per 100,000 employed workers and were calculated as: (N/W) x 100,000, where

N = the number of work injury fatalities to workers 16 years of age and older.
W = the number of employed workers 16 years of age and older.
100,000 = per 100,000 workers.

Employment figures are annual average estimates of employed civilians 16 years of age and older from the Current Population Survey, 1992-96.

[2] Based on the 1990 Occupational Classification System developed by the Bureau of the Census. Fishing occupations is an aggregate of fishers, and captains and other fishing vessel officers.

[3] Dashes indicate rates for captains and other fishing vessel officers do not meet publication standards.

have incredibly destructive power. To illustrate, in 1973, a 12,000-ton ship broke in half on her maiden voyage after being struck by a rogue wave. The following year, a 132,000-ton tanker fell into a huge trough caused by a rogue wave. A crew member remarked, "There was no sea in front of the ship, only a hole…." The ship then took an equally huge wave over her bow which crumpled a 1-inch (2½-centimeter) thick steel plate, twisted railroad-gauge I-beams into knots, and tore off the entire bow bulb! Rogue waves have the power to devastate a typical fishing boat.[4]

Rogue waves are not the only ocean peril that can sink or capsize ships. Ships might, for example, strike a submerged rock or collide with another vessel in the fog. Vessel casualties were the leading cause of fishing fatalities and often involved multiple deaths. From 1992 through 1996, half of fishing fatalities—197 cases—involved vessel casualties, such as sinkings, capsizings, or collisions. (See table 2.) Often the bodies of the deceased are never found, particularly if they go down with the ship, wash ashore in some remote place, or enter the food chain of higher-level marine life.

"Person overboard!"

It isn't only rogue waves that are capable of washing fishers overboard or tilting the deck enough to cause them to slip into the water. Lesser waves also wash fishers overboard. But wave action is not the only way a fisher can go overboard, as the following accounts demonstrate:

> A fisherman on board a 113-foot (34-meter) crabbing vessel was thrown overboard when a crab pot line he was straddling suddenly tightened.[5]

> Baiting has all the glamour of a factory shift and considerably more of the danger. The line is spooled on a big drum. It crosses diagonally over the deck, passes through an overhead block, and then bends straight back toward the stern. A steel ring guides it over the rail and into the water. That's where the baiters stand. There's a bait table on top of the stern rail–basically a wooden well with squid and mackerel [baitfish] in it–and a leader cart on either side. The leader carts are small drums spooled with hundreds of lengths of seven-fathom line called gangions. Each gangion has a #10 hook at one end and a stainless steel snap on the other…. The baiter reaches behind him and takes a gangion from his back-up man, who's peeling them off the leader cart one at a time. The baiter impales a squid or mackerel onto the hook, snaps the gangion onto the mainline, and throws the whole thing over the side. The hook is easily big enough to pass through a man's hand, and if it catches some part of the baiter's body or clothing, he goes over the side with it…. The crew's looking the other way, the hook's got you, and suddenly you're down at the depth where swordfish feed….[6]

Going overboard as a consequence of slipping on a wet or icy deck, being pulled overboard when lines wrap around one's legs, being washed overboard by a wave, pulled overboard by a hook, or flung overboard by a line suddenly tightening are examples of incidents which are classified as "falls from ship or boat." These types of falls accounted for 70 fatalities—almost one-fifth of the total during the 1992-96 period. (See table 2.)

Fishers who go overboard into very cold water are at risk of hypothermia—the cooling of the core body temperature. This condition causes shivering, loss of muscle coordination, unconsciousness, and even death.[7] Unless wearing a survival suit or a personal flotation device (life jacket), a fisher could not withstand more than 6 or 7 minutes immersed in very cold water before succumbing.

Diving–an emerging hazard

Diving fatalities are beginning to be recognized as an emerging hazard in the fishing industry.[8] Sometimes crewmembers with little formal diving training or experience are called on to dive below water to untangle nets or lines that have snagged on the ocean floor or in the boat's propellers. Even experienced, certified scuba[9] divers hired to dive for sea cucumbers and other aquatic life often face numerous hazards such as adverse sea and weather conditions,[10] murky water, unexpected shifts in underwater cur-

Table 2. Fatal events or exposures for fishing occupations, 1992-96

Fatal event or exposure	Number	Percent
Vessel casualties[1]	197	52
Fall from ship or boat	70	18
Drowning, submersion	60	16
Other events or exposures	53	14

[1]Sinkings and capsizings accounted for 154 of the 197 vessel casualties. The remaining 43 vessel casualties resulted from collisions, vessel explosions and fires, and all other water vehicle incidents except falls from ship or boat.

rents, entanglement of air lines, scuba equipment malfunction, decompression problems, and encounters with dangerous marine life.[11] The 60 drownings that occurred during 1992-96 accounted for one-sixth of fishing fatalities. (See table 2.) Most of these drownings involved diving activities.

A variety of other hazards that tend to be more typical of workplaces generally–such as electrocutions, being caught in winches and other machinery, homicides, and aircraft crashes–accounted for the remaining fishing fatalities.

Economic and demographic characteristics

Commercial fishing vessels travel on long voyages far from shore in search of ever-dwindling fish stocks. These large boats, often capable of hauling a catch weighing many tons, and sometimes having on-board processing facilities, require a crew with a wide range of specialized skills. As a prerequisite, fishers must be in good health, and possess physical strength and coordination. They must also possess the mechanical aptitude to operate, maintain, and repair on-board machinery and fishing gear, and the perseverance to perform strenuous outdoor work and endure long hours at sea often under difficult conditions.[12]

Often the proceeds from the fish catch are apportioned among the crew based on the market price the catch brings when landed in port—an elaborate kind of piecework pay scheme. The pay can be quite rewarding—$4,000 or more per month. Many of the individuals employed in fishing, such as college students taking fishing jobs during the summer to meet high tuition bills,[13] are highly motivated to face these risks and withstand these rigors because the pay is so attractive. Others are highly motivated because they find themselves unemployable in other lines of work and they end up in fishing as a last resort, while still others fall in love with fishing as a line of work and a way of life.[14] These factors may work in tandem to produce a workforce more motivated and able to push limits that would dissuade or disable workers in other industries.

Fishing in cold waters is inherently riskier because of hypothermia. Alaska, with one of the Nation's smallest workforces, accounted for the largest number of fishing fatalities during the 1992-96 period. (See table 3.) Moreover, some specific Alaska fishing activities are particularly hazardous. For example, harvesting most commercial crab species in Alaska takes place during the winter when air and water temperatures are colder; high winds, snow, sleet, and ice are more prevalent; daylight hours shorter; and high seas are more common.[15]

Other cold-water States—such as Massachusetts, Oregon, Washington, and Maine—also had disproportionately high numbers of fishing fatalities.

Industry analysis suggests that persons engaged in commercial shellfishing are more at risk of dying on the job than those engaged in commercial finfishing.[16] During 1992-96, shellfishing, with 160 fatalities, accounted for one-third more deaths than finfishing with 119 fatalities, despite the fact that the shellfishing industry employed only three-fifths as many workers as the finfishing industry[17] and the weight for the commercial shellfish catch was less than one-sixth that for finfish. The commercial dollar value of the shellfish catch, however, is nearly equal to that of the finfish catch, in part, as a consequence of the greater risk involved in shellfishing.[18] In addition, there were 16 commercial fishing fatalities in the miscellaneous marine products industry (sea cucumbers, sponges, seaweed,

Table 3. Fishing occupation[1] fatalities by State, 1992-96

State	Number	Percent
Total	380	100
Alaska	112	29
Massachusetts	32	8
Texas	31	8
Florida	26	7
Oregon	21	6
California	21	6
Washington	20	5
Louisiana	18	5
North Carolina	18	5
Maine	17	4
Hawaii	14	4
Other[2]	50	13

[1] Includes fishers, captains, and other fishing vessel officers.

[2] These 50 fishing fatalities are distributed over the remaining 39 States and the District of Columbia, and also include 7 fatalities occurring outside any State's territorial waters. None of these States accounted for more than 5 fishing fatalities.

sea urchins, etc.), and 55 in general commercial fishing. Miscellaneous amusement and recreation services, which includes fishing guides, accounted for 10 fatalities. The remainder were scattered over various industries.

While Current Population Survey data show self-employed individuals comprise at least three-fifths of employment in fishing occupations, they accounted for just over a third of the fatalities during this period. This may be due to a variety of factors, such as self-employed fishers being limited by economies of scale to more familiar local waters. Moreover, because some types of fish can only be taken at certain times of the year, many self-employed fishers engage in fishing on a part-time basis.

During 1992-96, fishing fatalities tracked age group employment fairly closely, except that the 25- to 34-year-old age group experienced a disproportionately high share of the fatalities, while the 55- to 64-year-old age group experienced a slightly lower share. Non-Hispanic persons from racial categories other than white and black—such as Asians, Pacific Islanders, American Indians, Eskimos, and Aleuts—comprise 7 percent of fishing employment, but at least 16 percent of fishing fatalities.[19]

Conclusion

This article builds on the research undertaken by the National Institute for Occupational Safety and Health (NIOSH), which has published several special studies, most of which have focused on the fishing industry in Alaska.[20] Census of Fatal Occupational Injuries (CFOI) data supplement the NIOSH studies and provide information on hazards facing those engaged in commercial fishing occupations throughout the United States.

Because fish are believed to have various dietary benefits, per capita fish consumption in the United States has increased by 20 percent over the past two decades. Overall per capita fish use–which includes both food consumption and industrial fish products such as fishmeal and crushed oyster shells–has increased 30 percent.[21]

Although the United States is still a net importer of fish, exports of edible fish products have tripled in weight and doubled in dollar value during the past decade, while imports have remained stable. During this time, exports of industrial fish products increased nearly 60-fold to over $5 billion, while the dollar value of industrial fish product imports barely doubled.[22]

Fishing employment has declined from an estimated 59,000 in 1992 to 47,000 in 1996.[23] This decline, which has taken place in the face of an increased demand for fish, is a consequence mainly of the declining supply of fish due to overfishing. But, as the demand for fish grows, and meeting that demand requires ever longer voyages and greater efforts, these factors working in tandem have the potential to increase the hazards of fishing occupations and negate any fatality decreases that stricter safety regulation may have afforded. Indeed, in 1996, when the CFOI all employment fatality rate reached its lowest level since the program began, the rate for fishers jumped to 178 fatalities per 100,000 employment—the highest it has been since the CFOI program began collecting data in 1992. In 1996, the rate for fishing occupations, which includes fishers, and captains and other fishing vessel officers, reached its highest level in 3 years.

Technical note

The lifetime risk for a specific industry or occupation was calculated using an equation proposed by the Occupational Safety and Health Administration in 1995: WLTR = $[1 - (1 - R)^y] \times 1{,}000$ where: WLTR = working lifetime risk; R = probability of a worker having a work-related fatal injury in a given year; $1 - R$ = probability of a worker not having a work-related fatal injury in a given year; y = years of exposure to work-related injury; $(1 - R)^y$ = probability of surviving y years without a work-related fatal injury; $1 - (1 - R)^y$ = probability of having a work-related fatal injury over y years of employment.

In this study, y was set at 45 years. This assumes workers are exposed to work-related injury hazards for approximately 45 years, starting at age 20.

The formula is then multiplied by 1,000 to derive the number of fatal occupational injuries per 1,000 workers, as follows:

$R = 0.0014 = 140$ fatalities per 100,000 employment = a 0.14 percent probability of a worker having a work-related fatal injury in a given year;

$1 - R = 1 - 0.0014 = 0.9986$ = a 99.86 percent probability of a worker not having a fatal occupational injury in a given year;

$(1 - R)^{45} = 0.9986^{45} = 0.9389$ = a 93.89 percent probability of surviving 45 years without having a work-related fatal injury;

$1 - (1 - R)^{45} = 1 - 0.9389 = 0.0611$ = a 6.11 percent probability of having a work-related fatal injury over 45 years of employment.

While it is tempting to view the inverse of 0.0611 (1:16) as the probability a worker faces of suffering a fatal occupational injury over a theoretical 45-year fishing career, because of such factors as turnover, the risk should be expressed on a per 1,000 worker basis, as follows:

$[1 - (1 - R)^{45}] \times 1{,}000 = 0.0611 \times 1{,}000 = 61$ fatalities per 1,000 employment over a 45-year period comprising a working lifetime.

—*ENDNOTES*—

[1] Sebastian Junger, *The Perfect Storm*, W.W. Norton, New York, 1997, pp. 44-45.

[2] For 1996, the occupation with the next highest rate is timber cutters at 157, followed by airplane pilots (88), structural metal workers (85), and extractive occupations (67).

[3] For a good explanation of the methodology used to derive this statistic, see David E. Fosbroke, Suzanne M. Kisner, and John R. Myers, "Working Lifetime Risk of Occupational Fatal Injury," *American Journal of Industrial Medicine*, Vol. 31, Wiley-Liss, Inc., 1997, pp. 460-61. See Technical note at the end of this article.

[4] Junger, *The Perfect Storm*, pp. 114-15, 123, 150.

[5] *NIOSH Alert: Request for Assistance in Preventing Drownings of Commercial Fishermen*, National Institute for Occupational Safety and Health, Publication No. 94-107, April 1994, p. 4.

[6] Junger, *The Perfect Storm*, pp. 52, 70.

[7] *NIOSH Alert: Request for Assistance*, p. 2.

[8] *Commercial Fishing Fatalities in Alaska: Risk Factors and Prevention Strategies*, National Institute for Occupational Safety and Health, Current Intelligence Bulletin 58, September 1997, p. 12.

[9] Scuba is an acronym for self-contained underwater breathing apparatus.

[10] *Commercial Fishing Fatalities in Alaska*, p. 12.

[11] *Occupational Outlook Handbook*, 1998-99 Edition, Bureau of Labor Statistics, Bulletin 2500, January 1998, p. 417.

[12] *Ibid.*, pp. 416-18.

[13] *NIOSH Update: College Students May be Risking Their Lives on Fishing Vessels: Working in the Alaska Fishing Industry is one of the Nation's Most Hazardous Jobs*, National Institute for Occupational Safety and Health, Publication No. 94-111, April 1994.

[14] For a fuller discussion, see Junger, *The Perfect Storm*, pp. 15, 48-49.

[15] *Commercial Fishing Fatalities in Alaska*, pp. ix, 2.

[16] Shellfish include cephalopods such as squid, crustaceans such as lobster and shrimp, and univalve and bivalve mollusks such as abalone and clams, whereas finfish–such as shark, tuna, and salmon–are all vertebrates. Some of the hazards confronting shellfishers are different from those confronting finfishers. For example, shellfishing for king crab is done using cages called "pots"–some weighing over 700 pounds (318 kilograms)–which are stored on the deck where they might fall on someone, whereas finfishers do not use pots. Many types of finfishing, such as long-lining, however, make use of numerous hooks, which can puncture and pull a fisher overboard.

[17] Industry employment figures are from the Covered Employment and Wages (also known as the ES-202) program. See the annual publication *Employment and Wages, Annual Averages*, for the years 1992 through 1996.

[18] *Fisheries of the United States, 1996*, National Marine Fisheries Service, Current Fishery Statistics No. 9600, July 1997, pp. iv, 10-13. Weights for all fish are reported in round weight (defined as weight of fish as taken from the water, the complete or full "live" weight when caught), except for univalve and bivalve mollusks which are reported in meat weight (excluding the shell).

[19] Employment data for race and age are derived from the Current Population Survey.

[20] See Fosbroke, Kisner, and Meyers, "Working Lifetime Risk;" Richard D. Kennedy and Jennifer M. Lincoln, "Epidemiology of Fatal Injury in the U.S. Commercial Fishing Industry," *Safety and Health in Agriculture, Forestry, and Fisheries*, Government Institutes, Inc., Rockville, Maryland, 1997, pp. 557-70; Patricia G. Schnitzer, Deborah D. Landen, and Julie C. Russell, "Occupational Injury Deaths in Alaska's Fishing Industry, 1980 through 1988," *American Journal of Public Health*, Vol. 83, No. 5, May 1993, pp. 685-88; *NIOSH Alert: Request for Assistance; Commercial Fishing Fatalities in Alaska*; *NIOSH Update: College Students May be Risking Their Lives.*

[21] *Fisheries of the United States*, pp. 125, 127.

[22] *Ibid.*, pp. 98, 106.

[23] Employment data are derived from various sources including the Current Population Survey; the *Occupational Outlook Handbook*, p. 417; and CFOI.