



Fatality Rates in the Alaska Commercial Fishing Industry

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About This Publication

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The Institute of Social and Economic Research is preparing a report on the effects of fisheries management on safety in the Alaska commercial fishing industry, with partial funding from the Alaska Sea Grant College Program. As part of this research effort, we have developed a data base on accidents in the Alaska commercial fishing industry. This paper is first in a series reporting on preliminary analyses of these data.

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Summary

This study calculates fatality rates for the Alaska commercial fishing industry for the years 1981-1984. During this period, the number of fatalities in the Alaska commercial fishing industry almost equaled that for all other Alaska industries combined. The fatality rate for the Alaska commercial fishing industry was more than 20 times as high as the average for all other Alaska industries, and more than twice as great as the rate for the next most dangerous industry group (the lumber and wood products industry).

Fatalities, Employment, and Fatality Rates in Alaska, 1981-1984

	Commercial Fishing	All Other Industries	Lumber and Wood Products Industry
Average number of fatalities per year	25.8	28.3	2.8
Average annual employment (worker years)	8,057	187,203	1,945
Fatality rate (deaths per 100,000 worker years)	320	15	141

Introduction

Commercial fishing safety is of major national concern, partly because of well-publicized losses of crews and vessels, as well as high commercial fishing insurance costs.^{1, 2} In 1988 the U.S. Congress enacted legislation establishing minimum safety standards for commercial fishing vessels.³

Given the current level of concern over commercial fishing safety, it is important to develop data on how dangerous commercial fishing actually is. A crude measure of danger is provided by fatality rates, or the number of deaths per worker year. This paper presents estimates of fatality rates in Alaska commercial fisheries for the years 1981-1984.

We begin by reviewing previous estimates of commercial fishing fatality rates and comparisons with other industries. Next, we present data on fatalities in the Alaska commercial fishing industry and other Alaska industries. We then calculate fatality rates by dividing the number of fatalities by estimated employment in commercial fishing and other industries.

Previous Estimates of U.S. Commercial Fishing Fatality Rates

The primary problem in calculating fatality rates for commercial fishermen is the almost total lack of reliable data on commercial fishing employment. Most fishermen are considered self-employed, and are thus not included in data collected and published for wage and salary employment. Perhaps due to this problem, there has been relatively little analysis of commercial fishing fatality rates.

Frequently cited is a 1984 U.S. Coast Guard statistic that the death rate for fishermen is seven times the national average for all industry groups. As shown in Table 1, the Coast Guard study estimated a commercial fishing fatality rate of approximately 85 per 100,000 worker years, compared with a rate of 12 per 100,000 for all industry groups.⁴ This rate was 50 percent higher than for the mining and quarrying industry.

¹Incidents in Alaska commercial fisheries that received national attention included the loss of the *Western Sea* in August 1985, with the loss of six lives, and the capsizing of the *Altair* and the *Americus* in February 1983, each of which resulted in the loss of seven lives.

²For a discussion of the fishing vessel insurance crisis, see Dennis W. Nixon, Recent Developments in U.S. Commercial Fishing Vessel Safety, Insurance, and Law, *Journal of Maritime Law and Commerce*, Vol. 17, No. 3 (July 1986).

³The Commercial Fishing Industry Vessel Safety Act of 1988, public law 100-424.

⁴Statement of John E. DeCarteret, Chief, Marine Safety Division, District Thirteen, United States Coast Guard, before the House Committee on Merchant Marine and Fisheries, Subcommittee on

Table 1. Estimated U.S. Occupational Fatality Rates, 1981-1982 (Fatalities per 100,000 Worker Years).

	1981	1982
Commercial fishing	86	83
Other industries	12	11
Mining and quarrying	55	55
Construction	40	40
Government	10	10

Sources: Tony E. Hart and Frank Perrini, Analysis of U.S. Commercial Fishing Vessel Losses, 1970-1982. Photocopy (1984). ISER file FATAL1.WK1.

The denominator or employment estimate used for the Coast Guard calculation was based on multiplying an estimate of the number of commercial fishing vessels by an estimate of the number of persons per boat.⁵ A recent review of this study concluded:

Coast Guard and Navigation and the Subcommittee on Fisheries, Wildlife Conservation and the Environment, July 27, 1985. Cited in National Transportation Safety Board, Safety Study: Uninspected Commercial Fishing Vessel Safety, NTSB/SS-87/02 (1987), page 3.

⁵Tony E. Hart and Frank Perrini, Analysis of U.S. Commercial Fishing Vessel Losses, 1970-1982, Photocopy (1984). The numerator for the calculation of fatality rates was the number of fatalities on documented marine fishing vessels in 1981 and 1982, as reported to the Coast Guard under federal regulations. Hart and Perrini described the calculation of the denominator, or employment estimates, as follows:

In order to develop fatality rates, statistics on the number of persons engaged in commercial fishing are needed. Unfortunately, these statistics are lacking in sufficient detail. In this analysis, fatality rates for 1981 and 1982 were developed by estimating the total number of fishermen using casualty reports received by the Coast Guard. The number of persons on board the vessel at the time of the casualty was noted along with the size of the vessel involved. Using this method, the number of fishermen on board documented vessels was estimated to be approximately 83,000 for 1981 and 1982. From this is estimated that the fatality rate for fishermen was approximately 86 per 100,000 persons in 1981 and 83 per 100,000 in 1982.

Although the precise method by which the estimate of the number of fishermen was calculated is unclear, several problems are apparent. It appears that the estimate of participation was developed by multiplying an estimate of the total number of documented vessels by estimates of the number of fishermen per vessel. These were in turn obtained by counts of the number of persons on board vessels for which casualty reports were received by the Coast Guard.

4 **Fatality Rates in the Alaska Commercial Fishing Industry**

The 1984 Coast Guard estimate of the commercial fishing industry fatality rate is a crude estimate, is likely inaccurate and is certainly outdated. If a reliable fatality rate is to be determined, comprehensive data on the total number of fishermen in the industry is needed. Until such data can be collected, or until an accurate means of extrapolating such data can be formulated, the calculation of any fishing industry fatality rate will be seriously flawed.⁶

We are not aware of any other calculations of fatality rates for the U.S. commercial fishing industry. A commercial fishing fatality rate of 137 fatalities per 100,000 worker years has been estimated for Norway, or 60 percent higher than the 1984 Coast Guard estimate for the United States (Table 2). As in the estimates for the United States, fatality rates in the Norwegian commercial fishing industry were higher than for any other industry, and more than nine times the average for "industry on land."

Occupational Fatalities in Alaska, 1981-1984

Table 3 presents figures for occupational fatalities in Alaska during the years 1981 through 1984. The figures for commercial fishing fatalities are based on Coast Guard marine accident reports for this period. A full list of the incidents resulting in fatalities during this period is presented in Appendix Table A-1. The figures for fatalities in other industries are based on reports filed with the Alaska Division of Workers' Compensation.

The average number of commercial fishing fatalities was 25.8 per year during this period, compared with an average of 28.3 for all other industries combined.

One problem with this method is that vessels for which casualty reports were received are not necessarily representative of the commercial fishing fleet. A more significant problem is that the number of persons on board a vessel at a given time is not necessarily a good indicator of the total hours worked in a given year on the vessel. Not all vessels or fishermen fish year-round. However, while they are fishing, some fishermen work far longer hours than persons employed in other industries. Typically a full-time job is assumed to represent 2000 hours of work per year (50 weeks x 40 hours/week). Depending on whether a vessel fishes year-round or not, full-time equivalent employment per vessel may be less than or greater than the number of persons on board the vessels when it is fishing.

Hart and Perrini recognized these problems, stating that "a more accurate means of determining the number of fishermen that work on documented fishing vessels need to be developed in order to generate more accurate fatality rates." They also noted that "work in other areas needs to be done such as the identification of losses based on geographic areas and specific fisheries."

⁶Kristin L. Vehrs and Kathy Van Olst, Examination of the Death Rate for Fishermen. Prepared for the National Council on Fishing Vessel Safety and Insurance (February 1988).

Table 2. Norwegian Occupational Fatality Rates, Selected Industries (Fatalities per 100,000 Worker Years).

Commercial fishing	137
Industry on land	15
Mining	100
Shipping	100
Supply vessels	36
Construction/civil engineering	25

Sources: Cited in National Transportation Safety Board, Safety Study: Uninspected Commercial Fishing Vessel Safety, NTSB/SS-87/02 (1987), page 4. Original source was Agenda Item 8, Safety of Fishing Vessels, Including Possible Revision of the Torremolinos Convention for the Safety of Fishing Vessels, 1977, submitted by Norway to the Maritime Safety Committee, International Maritime Organization, January 14, 1987. ISER file FATAL1.WK1.

Alaska Commercial Fishing Industry Employment Estimates

In Alaska, as in other states, most commercial fishermen are considered self-employed, and are not included in the regular employment statistics published by the Alaska Department of Labor. However, for years prior to 1985 the Alaska Department of Labor has estimated average monthly commercial fishing employment by multiplying the number of vessels making landings each month by "crew factors," or estimated crew sizes based on surveys for vessels in each size class and fishery. These estimates represent the best available measure of participation in commercial fishing for purposes of comparison with other industries, and make it possible to estimate fatality rates for the Alaska commercial fishing industry for years prior to 1985.^{7, 8}

Occupational Fatality Rates in Alaska, 1981-1984

Table 4 presents figures for average annual employment or worker years in Alaska during the years 1981 through 1984. Average annual employment in commercial fishing was 8,000, compared with 187,000 in all other industries. Thus the total number of worker

⁷Total worker years in the Alaska commercial fishing industry are less than the number of persons working at some time during the year as commercial fishermen. Many people may participate in only one fishery, such as the salmon fishery or the halibut fishery, and may actually work on only a few days or during a few weeks of the year. However, while they are fishing they may work long or irregular hours.

⁸The Alaska Department of Labor has not estimated commercial fishing industry employment for years after 1984.

Table 3. Occupational Fatalities in Alaska by Industry, 1981-1984.

	1981	1982	1983	1984	Average 1981-84
Commercial fishing	29	17	46	11	25.8
Other Alaska industries	39	30	21	23	28.3
Mining	1	3	3	2	2.3
Construction	7	6	5	9	6.8
Manufacturing	9	5	2	2	4.5
Transportation and public utilities	13	7	4	4	7.0
Wholesale trade	1	-	-	1	0.5
Retail trade	2	3	1	1	1.8
Finance, insurance and real estate	-	-	2	-	0.5
Services	5	2	2	3	3.0
State and local government	1	4	2	1	2.0
Ten Alaska industries with highest fatality rates (by two-digit SIC code)	29	20	10	13	18.0
Lumber and wood products (24)	6	1	2	2	2.8
Metal mining (10)	1	1	-	1	0.8
Transportation by air (45)	11	6	1	1	4.8
Special trade contractors (17)	4	4	3	5	4.0
Building materials and garden supplies (52)	-	2	1	-	0.8
Trucking and warehousing (42)	-	1	2	1	1.0
Water transportation (44)	2	-	-	-	0.5
Transportation services (47)	-	-	-	1	0.3
Heavy construction contractors (16)	2	1	1	2	1.5
Food and kindred products (20)	3	4	-	-	1.8

Sources: Fish harvesting: U.S. Coast Guard (see Tables A-1 and A-2). Other industries: Alaska Department of Labor, Occupational Injury and Illness Information, 1984, page 73. "Other industries" does not include agricultural industries (one fatality in 1981 and one fatality in 1982) or federal government. ISER file FATAL. WK1. SIC is Standard Industrial Classification.

Table 4. Average Annual Employment in Alaska by Industry, 1981-1984.

	1981	1982	1983	1984	Average 1981-84
Commercial fishing	7,869	8,255	7,988	8,115	8,057
Other industries	167,295	182,004	195,092	204,419	187,203
Mining	8,565	8,965	8,181	8,702	8,603
Construction	12,941	16,780	20,770	20,336	17,707
Manufacturing	13,965	12,679	11,891	11,289	12,456
Transportation and public utilities	18,279	18,320	18,572	18,893	18,516
Wholesale trade	6,492	7,222	8,013	8,673	7,600
Retail trade	26,731	30,438	33,395	35,769	31,583
Finance, insurance and real estate	8,301	9,048	10,169	11,095	9,653
Services	32,275	35,730	37,950	40,836	36,698
State and local government	38,335	40,817	44,032	46,411	42,399
Ten Alaska industries with highest fatality rates (by two-digit SIC code)	31,319	33,314	35,730	34,843	33,802
Lumber and wood products (24)	2,179	2,060	1,841	1,701	1,945
Metal mining (10)	547	570	559	461	534
Transportation by air (45)	5,783	5,590	5,819	6,064	5,814
Special trade contractors (17)	4,707	6,735	7,958	8,594	6,999
Building materials and garden supplies (52)	1,239	1,635	1,879	2,043	1,699
Trucking and warehousing (42)	2,402	2,415	2,145	2,265	2,307
Water transportation (44)	1,410	1,322	1,345	1,351	1,357
Transportation services (47)	599	669	852	995	779
Heavy construction contractors (16)	4,345	5,349	6,994	5,609	5,574
Food and kindred products (20)	8,108	6,969	6,338	5,760	6,794

Sources: Fishing employment: Rick Focht, *Employment and Gross Earnings in Alaska's Commercial Fisheries*, CFEC Report No. 8608 (Juneau, Commercial Fisheries Entry Commission, 1986), page 27. Wage and salary employment: Alaska Department of Labor, *Occupational Injury and Illness Information*, 1984, page 32. Original source, Alaska Department of Labor, *Statistical Quarterly*. Employment data for "metal mining" and "transportation services" obtained from ISER MAP database of *Statistical Quarterly* data. "Other industries" does not include agricultural industries or federal government. ISER file FATAL.WK1.

years in other industries was more than 20 times as great as in commercial fishing.

Table 5 shows occupational fatality rates for commercial fishing and other industries calculated from the fatality and employment figures in Tables 2 and 3. The fatality rate in commercial fishing was 320 per 100,000 worker years, compared with a rate of 15 per 100,000 worker years for all other industries. Thus the fatality rate in commercial fishing was more than 20 times the average rate for all other industries.

The fatality rate for the Alaska commercial fishing industry was more than twice as high as for the next most dangerous industry groups, "lumber and wood products" and "metal mining," and almost four times as great as the rates for any other industry groups.⁹

The fatality rate for the Alaska commercial fishing industry was nearly four times as high as that estimated by the U.S. Coast Guard for the U.S. commercial fishing industry for 1981 and 1982, and more than twice as high as that which has been estimated for Norway.

The fatalities and employment data sources used in estimating the fatality rates for commercial fishing differ from the data sources for other industries. It is difficult to determine the extent to which these differences in data sources may bias the comparison of rates between industries. However, it is unlikely that any bias would be so great as to change the fundamental result that fatality rates in the Alaska fishing industry are very high.

Conclusions

The estimated fatality rate for the Alaska commercial fishing industry is extremely high in comparison with other Alaska industries and in comparison with other estimates of commercial fishing fatality rates. Commercial fishing accounted for almost half of all occupational fatalities in Alaska between 1981 and 1984.

⁹Industry groups were defined in terms of two-digit SIC (Standard Industrial Classification) codes.

**Table 5. Occupational Fatality Rates in Alaska by Industry, 1981-1984
(Fatalities per 100,000 Worker Years).**

	1981	1982	1983	1984	Average 1981-84
Fish harvesting	369	206	576	136	320
Other Alaska industries	23	16	11	11	15
Mining	12	33	37	23	26
Construction	54	36	24	44	38
Manufacturing	64	39	17	18	36
Transportation and public utilities	71	38	22	21	38
Wholesale trade	15	0	0	12	7
Retail trade	7	10	3	3	6
Finance, insurance and real estate	0	0	20	0	5
Services	15	6	5	7	8
State and local government	3	10	5	2	5
Ten Alaska industries with highest fatality rates (by two-digit SIC code)	93	60	28	37	53
Lumber and wood products (24)	275	49	109	118	141
Metal mining (10)	183	175	0	217	140
Transportation by air (45)	190	107	17	16	82
Special trade contractors (17)	85	59	38	58	57
Building materials and garden supplies (52)	0	122	53	0	44
Trucking and warehousing (42)	0	41	93	44	43
Water transportation (44)	142	0	0	0	37
Transportation services (47)	0	0	0	101	32
Heavy construction contractors (16)	46	19	14	36	27
Food and kindred products (20)	37	57	0	0	26

Sources: Calculated from Tables 3 and 4. ISER file FATAL.WK1.

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Appendix

Table A-1. Fatalities on Alaska Commercial Fishing Vessels, 1981-1985.

Coast Guard Case Number	Date (Yr/Mo/Dy)	Vessel Name	Number of Fatalities	Vessel Length (feet)	Primary Nature of Incident
2431SEA81	81/01/16	<i>Sigfried K</i>	1	81	
5114ANC81	81/01/22	<i>Karen Lynn</i>	1	114	Victim fell into water
9454ANC81	81/03/09	<i>Courageous</i>	1		
5646ANC81	81/03/31	<i>Discovery</i>	1		Victim fell into water
5115ANC81	81/05/08	<i>Sadie Ann</i>	1	28	Victim fell into water
5123ANC81	81/05/08	<i>Enterprise</i>	1	130	Victim hit by falling object
3943VAL81	81/06/19	(Unnamed)	1	10	Skiff capsized
6088ANC81	81/08/08	(Unnamed)	1		Victim fell into water
2223ANC81	81/08/20	<i>Northern King</i>	2	96	Vessel capsized
5162VAL81	81/10/20	<i>Rocket</i>	2	32	Vessel capsized
5929UN81	81/10/30	<i>Gem</i>	1	54	Vessel ran aground and sank
5802AND81	81/11/08	<i>Golden Pisces</i>	1	194	Victim fell into water
5134VAL81	81/11/10	<i>Orca</i>	1	42	Victim fell into water
6103JUN81	81/11/15	<i>Commander</i>	4		
5662ANC81	81/11/29	<i>Saint Patrick</i>	10	138	Crew abandoned vessel
0012ANC82	82/02/09	<i>Pacific Invader</i>	1	82	Victim fell into water
0022ANC82	82/04/14	<i>Virgo</i>	1	93	Victim fell into water
0010VAL82	82/05/21	<i>Camelot</i>	1	29	Vessel capsized
0012VAL82	82/05/22	<i>Nasty Habit</i>	1	26	Vessel capsized
0105ANC82	82/05/29	(Unknown)	1	32	Victim fell into water
0073ANC82	82/06/11	<i>Fort Yukon</i>	1	197	Victim slipped and fell
0061ANC82	82/06/30	<i>Miss Demptha</i>	1	32	Victim fell into water
0037JUN82	82/07/15	<i>Captain Nemo</i>	1	36	
0008ANC82	82/08/14	<i>Teddy</i>	1	152	Victim fell into water
0007ANC82	82/08/16	<i>Terry J</i>	1	29	Victim fell into water
0132ANC82	83/08/23	<i>Dave Randy</i>	1	28	Victim fell into water
0106ANC82	82/09/01	<i>Smaragd</i>	1	85	Victim fell into water
0031JUN82	82/09/16	<i>Barbie I</i>	2	42	Vessel swamped and sank
0099ANC82	82/10/06	<i>Lady Ann</i>	1	106	
0118ANC82	82/11/17	<i>Commodore</i>	1	93	
0412ANC82	82/12/29	<i>Dawn</i>	1	37	
0006JUN83	83/01/24	<i>White Gull</i>	3	43	Vessel sank
0031ANC83	83/02/27	<i>Flyboy</i>	1	48	Vessel sank
0038ANC83	83/03/12	<i>Sea Hawk</i>	1	68	Vessel capsized
0209ANC83	83/03/12	<i>Magnum Force</i>	1	51	Victim fell into water
0002HQS82	83/03/14	<i>Americus</i>	7	123	Vessel capsized and sank
0002HQS82	83/03/14	<i>Altair</i>	7	123	Vessel capsized and sank
0009JUN83	83/04/16	<i>Aloha</i>	3	58	Vessel sank
0165JUN83	83/05/16	<i>Noreen Ann</i>	2	35	Vessel sank
0096LOS83	83/07/10	<i>Thomas S</i>	1	32	

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Table A-1. Fatalities (continued).

Coast Guard Case Number	Date (Yr/Mo/Dy)	Vessel Name	Number of Fatalities	Vessel Length (feet)	Primary Nature of Incident
0167JUN83	83/08/13	<i>Providence</i>	3	26	Vessel sank
0177JUN83	83/07/17	<i>Pamela Rae</i>	1	49	Victim hit by falling object
0023VAL83	83/07/24	<i>Alaskan Swede</i>	1	49	Vessel caught fire
0088ANC83	83/08/14	<i>Ocean Grace</i>	4	98	Vessel sank
0053SEA83	83/08/24	<i>Saint Peter</i>	1	68	
0095ANC83	83/09/01	<i>Golden Viking</i>	2	97	Vessel capsized
0198JUN83	83/09/04	<i>Katrina Marie</i>	1	26	Victim fell overboard
0097ANC83	83/09/23	<i>Endeavor</i>	4	81	Vessel sank
0106ANC83	83/10/31	<i>Enterprise</i>	1	130	Victim fell into water
0038JUN83	83/12/03	<i>Spirit</i>	2	30	Vessel sank
0002JUN84	84/01/22	<i>Mary Lou</i>	2	90	
0016ANC84	84/04/12	<i>Friedrich</i>	1	304	Victim fell into water
0158JUN84	84/04/15	<i>Thelma</i>	1	40	
0051ANC84	84/07/13	<i>Lisa Ann</i>	1	47	Victim fell into water
0036VAL84	84/08/26	<i>Five O</i>	1	27	Victim fell into water
0059ANC84	84/09/21	<i>Lady C</i>	1	30	Vessel sank
0083ANC84	84/09/30	<i>Curlew</i>	3	41	Vessel sank
MC84000101	84/11/20	<i>Dotty G</i>	1	31	Vessel capsized
MC85000852	85/01/15	<i>K Jo</i>	1	34	
MC83001630	85/02/14	<i>Alert</i>	5	70	Vessel capsized and sank
MC85002053	85/03/07	<i>Ocean Bounty</i>	1	132	Victim fell into water
MC85002628	85/04/02	<i>Vestfjord</i>	1	75	Victim fell into water
MC85002780	85/04/11	<i>Northern G</i>	1	201	Victim hit by falling object
MC85003563	85/05/16	<i>Anna-O</i>	1	31	Vessel sank
MC85003572	85/05/20	<i>Kimberly</i>	1	101	Vessel sank
MC85005598	85/06/12	(Unnamed)	1	18	Skiff sank
MC85004818	85/07/16	<i>Pandad</i>	1	65	Victim fell into water
MC85006132	85/08/16	(Unnamed)	1	22	Victim fell into water
MC85005381	85/08/20	<i>Western Sea</i>	6	49	Vessel sank
MC85006601	85/10/28	<i>Sundowner</i>	1	68	Victim fell into water
All Incidents			124		

Notes: The primary data source for this table was the Coast Guard CAS data tape summarizing Coast Guard marine accident reports for District 17 (Alaska waters) for which the vessel service was coded as "fishing." The table includes incidents listed on the PCAS (personal casualty) file resulting in fatalities or missing persons as well as incidents on the CAS (vessel casualty) file involving fatalities, and other incidents located in Coast Guard accident reports in which fatalities occurred in association with commercial and recreational fishing. In order to exclude incidents related primarily to recreational fishing, only incidents involving vessels more than 25 feet in length were included, unless the incident was specifically known to be related to commercial fishing. Some incidents may be included that were not related to commercial fishing; however, some commercial fishing incidents may have been excluded. Where "primary nature of incident" is left blank, no information is available as to the nature of the incident. The authors would appreciate any information about commercial fishing fatalities not included in this table, incidents included in the table that were not related to commercial fishing and should not be included, and any other corrections or additions to the table. ISER data file PCAS02.WK1.

Table A-2. Overview of Alaska Commercial Fishing Vessel Incidents Involving Fatalities, 1981-1985.

	Number of Incidents	Number of Fatalities	Percentage of Incidents	Percentage of Fatalities
All incidents	70	124	100	100
Year				
1981	115	29	21	23
1982	16	17	23	14
1983	19	46	27	37
1984	8	11	11	9
1985	12	21	17	17
Primary nature of incident				
Victim fell into water	25	28	36	23
Victim hit by falling object	3	3	4	2
Vessel capsized or sank	26	64	37	52
Other or unknown	16	29	23	23
Number of fatalities resulting from incident				
1	51	51	73	41
2	7	14	10	11
3	4	12	6	10
4	3	12	4	10
5 or more	5	35	7	28
Vessel length				
Less than 25' ^a	3	3	4	2
25' to 49'	30	45	43	36
50' to 74'	9	15	13	12
75' to 99'	10	19	14	15
100' or greater	14	35	20	28
Unknown	4	7	6	6

Source: See Table A-1. ISER data file PCAS03.WK1.

^aNumber may be understated. See notes to Table 1.

