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Crew Injuries and Fatalities, Employment Estimates, and Casualty Rates in the Gulf of Mexico Commercial Fisheries

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I. Introduction

This technical memorandum describes and characterizes injuries and fatalities in the commercial fisheries of the Gulf of Mexico (GOM). Commercial fisheries have the highest rate of occupational fatality in the U.S. Also, Florida and Louisiana are ranked among the states with the highest commercial fishing fatalities, only after Alaska and Massachusetts (Janocha, 2012). Therefore, studies of commercial fishery accidents and fatalities could have significant policy implications. Yet little research is conducted addressing this issue, especially for the GOM. For example, the institution of the individual fishing quota (IFQ) program eliminates the traditional seasons, especially the short seasons, and prevents fishing derbies, which are associated with fishing accidents. In fact, reduction in the rate of injuries is one of policy objectives of the federal government in instituting the IFQ program.

In this report, first the review of the literature provides a background for studies of occupational injuries in the commercial fishing industry. Then, the status of occupational injuries and fatalities in commercial fishery is explained. Next, historical data on the number of accidents in the commercial fishery in the GOM are presented followed by the construction of the full-time equivalent (FTE) employment for selected groups of fisheries. Based on these data, the historical rates of fatal injuries are calculated. Concluding remarks end this technical memorandum.

II. Literature Review

A summary of the economic literature on the topic provides guidance in understanding occupational accident risks and modeling the decision process by fishermen. Since the pioneering work of Oi (1974), there has been much research conducted in the area of occupational injuries in other industries. However, our survey of economic analysis of commercial fishery accidents shows that this industry has only recently been the subject of a few studies. Bergland and Pedersen (1997) focus on a theoretical model, distinguishing transferable and non-transferable quota regimes in Norway. The authors examine the interaction between safety and fishery regulation and explores the moral hazard effects of public safety measures. Bergland and Pedersen argue that the owner, captain, and crew can influence the probability of accidents they face based on investment decisions (shape and size of vessels), and operating decisions (when and where to fish, what kind and how much fishing tackle, number of crew and hours on duty). Also, public services supplied to the operating vessel (navigation and communication systems), weather forecasts and navigational charts, and setting standards (stability of the vessels, obligatory survival suits, rescue services), can play an important role in the risk fishermen face.

Jin et al. (2002) applies a vessel accident probability model to data from the fisheries off the north-eastern U.S. The authors use the number of accidents per fishing day (a division of the number of accidents by the number of vessel days) as the dependent variable. The results show that wind speed, vessel size, spring season, and proximity to the shore line affect the probability of fishing accidents. Later, Jin and Thunberg (2005) examine the probability of a commercial fishing vessel accident in the same area. In this study, the authors also use a similar list of explanatory variables. Their empirical analyses for the accident probability model find similar results to the 2002 study. However, an additional finding is that neither changes in fishery management nor the fishing revenues influence the accident rate. Their second empirical model looks at the decision to go fishing using the ratio of total number of vessels fishing to total (maximum) number of vessels count as the dependent variable. The authors find a higher probability of going fishing, if expected revenue (average for fleet) is higher, weather condition is good, and the vessel is large.

Smith and Wilen (2005) address the common assumption that, since commercial fishermen face both high financial as well as physical risk, the risk preference among commercial fishermen is inherently high. The authors use panel data from the California sea urchin dive fishery to test the risk attitude among fishermen. Weather condition and prevalence of great white sharks in the area are used as proxies for physical risk. Their findings did not support the idea that commercial fishermen are inherently risk-lovers. A few other earlier studies also have discovered that fishermen, in spite of their chosen occupation, are risk-averse (e.g., Bockstael and Opaluch, 1983; Mistiaen and Strand, 2000; and Eggert and Martinsson, 2004). If indeed fishermen are risk averse, while the industry has the highest rate on occupational injuries, assuming that fishermen are rational, one would expect significantly higher earnings for fishermen than other industries, all else being equal. It is also likely that fishermen are not aware of the level of risk in their occupation. A recent survey of perception of occupational risk among Maine commercial fishing vessel captains and fishermen, especially among state registered vessels, shows that they downgrade the level of their occupational risk. As a result, they are more likely not to comply with safety regulations (Davis, 2012). Davis also points out that there is a high level of self-employment in the industry and that fishermen are economically vulnerable as price of catches vary causing significant level of financial uncertainty. He also argues that risk-averse fishermen earn significantly less than the risk takers. In fact, the self-employed workers tend to have a higher rate of occupational fatalities than the salary workers. For example, Pegula (2004) shows that, in 2001, although the self-employed made up only 7.4% of the U.S. civilian workforce, they suffered approximately 20% of the occupational fatalities. Of course, occupational fatalities vary among industries and occupations. However, Pegula shows that the disproportionate rate of occupational fatalities among the self-employed occurs even in the same industry or occupation (Pegula, 2004).

Estimating the value of statistical life is common in the occupational injury and fatality research. Schnier et al. (2009) use data from Alaskan red king crab and snow crab fishermen to estimate the value of statistical life in that fishery. Weather conditions and policy variables are used as instruments in their estimation to arrive at an approximately four million dollars value. This estimate is significantly higher than the estimated value of statistical life in general. For example, Ashenfelter (2006) in his study of speed limit regulations estimates the value of statistical life at 1.03 to 1.64 million dollars (1997 dollars).

III. Vessel Accidents and Crew Injuries and Fatalities in Commercial Fisheries

Commercial fishing is one of the most dangerous occupations in the U.S. because of labor-intense work, difficult working conditions including harsh weather, and long hours. The fatality rates in the commercial fishing industry are significantly above the average U.S. occupational fatality rate. For fishers and related fishing workers, the rate is 116.0 deaths per 100,000 FTE workers, while the national average is 3.5 per 100,000 FTE workers (BLS, 2011). A Center for Disease Control (CDC) report by Lincoln and Lucas (2011) shows that, during 1992-2008, 23% of the U.S. commercial fisheries related deaths occurred in the GOM, where harvesters of shrimp, oysters, crab, and snapper and grouper species had the highest number of fatalities.

Elsewhere, a U.S. Coast Guard (USCG) report by Dickey (2011) on lost fishing vessels and crew-member fatalities indicates that, during the 1992-2010 period, 2,072 fishing vessels were lost causing 1,055 crew-member fatalities- an average of 56 fatalities per year. While commercial fishing vessels were ranked first with 38 percent of the total casualties, the recreational fishing was a distant seventh with only 3% of the total marine casualties. Interestingly, 62% of fishing vessel losses occurred while the vessel was engaged in non-fishing operations. Flooding and fire account for 56% of vessel losses. In 91% of the incidents, fatalities numbered only one or two. The data also show that fatalities peaked during the months of October through January. Water exposure (drowning) is the leading cause of fatality at 77%. Dickey shows that weather is clearly a factor in fatal marine accidents. The fatality rate per vessel lost is the lowest in the warm waters of the GOM and the highest in the cold waters off the West coast and Alaska. According to the USCG, an injured person can survive much longer in warmer waters. The current USCG regulations focus more on preventing fatal casualties than loss of vessels. As a result, Dickey maintains that the correlation between loss of lives and fishing vessels is very low. According to Dickey, age of the vessel also seem to influence the likelihood of being involved in a fatal fishing accident, where the greatest loss was suffered by vessels age between 11 and 30.

The rate of fishing vessel fatalities shows a downward trend for both the U.S. and the GOM, presumably due to the enforcement of the 1991 Commercial Fishing Industry Vessel Regulations. However, increasing use of the quota system to deal with overfishing in the GOM caused a 'fishing derby' and is likely to have increased the number of accidents before the quota was reached each year (Waters, 2001).

The Commercial Fishing Industry Vessel Safety Act of 1988 was the first legislation dealing specifically with commercial fishing vessel safety. A more recent legislation, the Coast Guard Authorization Act of 2010, imposes stronger regulations requiring training of commercial fishing vessel operators as well as design, construction and maintenance standards for new vessels. The USCG uses several strategies to mitigate safety risks of commercial fishery, which include training, vessel structural considerations, operational factors, and equipment issues. The Occupational Safety and Health Administration (OSHA) recognizes that the commercial fishing safety, or risk, varies by vessel type, fishery gear, species fished, and geographic region (Hughes and Woodley, 2010-2011). A study of the commercial fishing industry in Maine shows that more than 40% of the vessels were non-complaint with vessel safety regulations and the lack of safety training was common. Also, interviews with the vessel captains with respect to their risk preference revealed that they were risk-lovers (Backus and Davis, 2011).

There are three observer programs in the Southeast region targeting vessels harvesting pelagic fish, reef fish, and shrimp. The observer programs are designed to ensure the safety of the observers travelling on the commercial fishing vessels. Observers receive about 2 weeks of training before they begin their work and half of the training usually focuses on vessel safety issues. Every three years, observers get refresher training. Before each trip, observers inspect the vessel to make sure that it meets the USCG regulations. Otherwise, an observer will not travel with the vessel and will report it for violations. However, an observer cannot stop the vessel from taking the fishing trip without the observer. Also, observers do not take the trip, if the vessel does not have a valid Commercial Fishing Vessel Safety Examination certificate. This exam is mandatory once the vessel is selected to participate in the observer program. The National

Observer Program has been in existence since the mid-1990s. Observers are not NOAA employees but are hired by contractors. Annually, only 8% of the randomly selected trips have observers on the board. Observers rarely are injured, because they do not operate the fishing gear. Although the safety concerns in the observer programs seems to be for the observers, their presence by design is likely to improve fishermen's safety as well. Interestingly, many items in the 2010 reauthorization act have not been implemented, because of lack of funds. For example, the act requires that at least one person on board each vessel receive safety training.

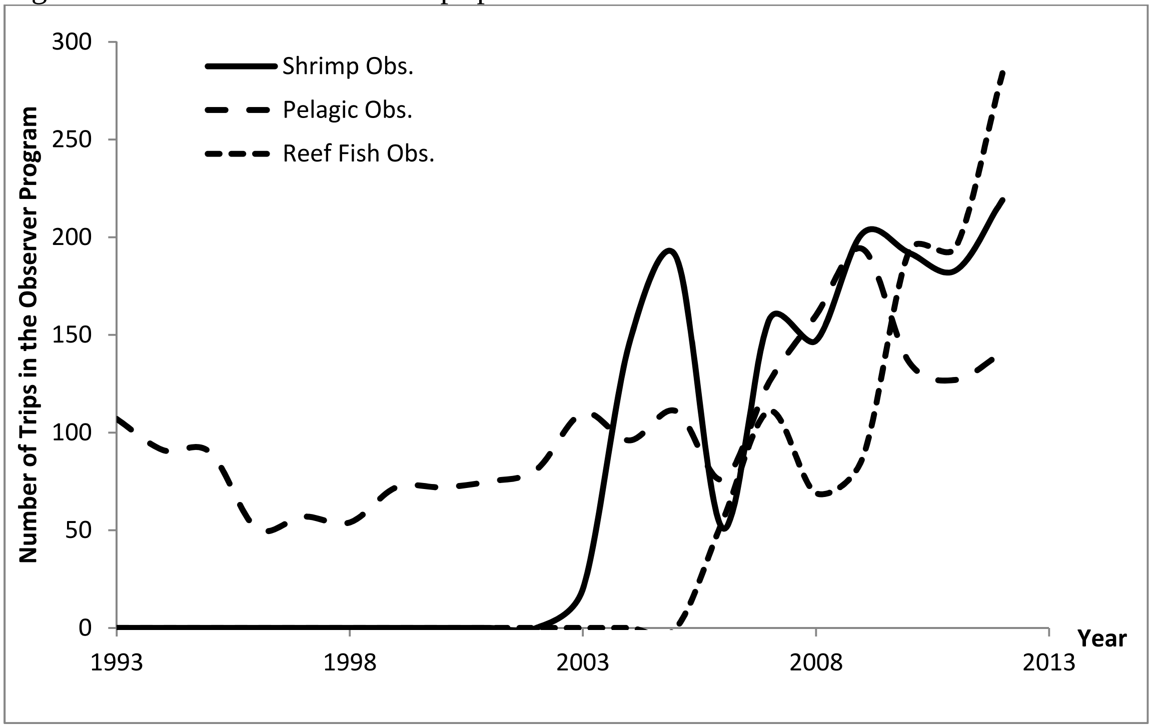
The number of observer program trips can be used to represent the level of activity and possibly its effect on commercial fishing accidents. Table 1 presents the annual number of trips in the pelagic, reef fish and shrimp observer programs since their inceptions, while Figure 1 depicts the trend. The pelagic fish observer program has the longest history. Since a small fraction of the commercial vessels targeting pelagic fish are observed each year, the effect of the program on safety of the fishery is uncertain.

Table 1. Annual Count of the Trips in the Observer Programs in the GOM

Year	Shrimp Obs.	Pelagic Obs.	Reef Fish Obs.
1993	0	107	0
1994	0	91	0
1995	0	90	0
1996	0	51	0
1997	0	57	0
1998	0	54	0
1999	0	72	0
2000	0	72	0
2001	0	75	0
2002	0	81	0
2003	20	110	0
2004	146	96	0
2005	190	111	0
2006	51	76	55
2007	158	126	111
2008	147	160	69
2009	202	194	87
2010	192	136	193
2011	183	127	195
2012	219	141	284
Total	1508	2027	994

Source: NOAA Pelagic Observer Program

Figure 1. Number of Observer Trips per Year



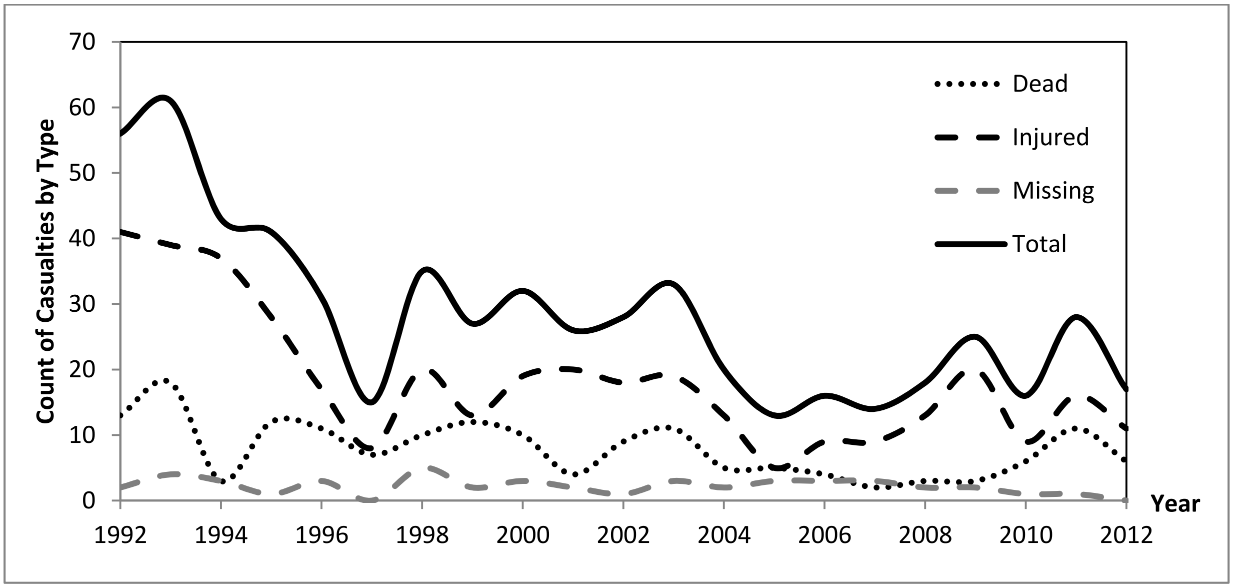
Source: NOAA Pelagic Observer Program

IV. Fatality and Injury Data

There are three data sources available for commercial fishing injuries and fatalities. They differ substantially in design and in total injury counts.

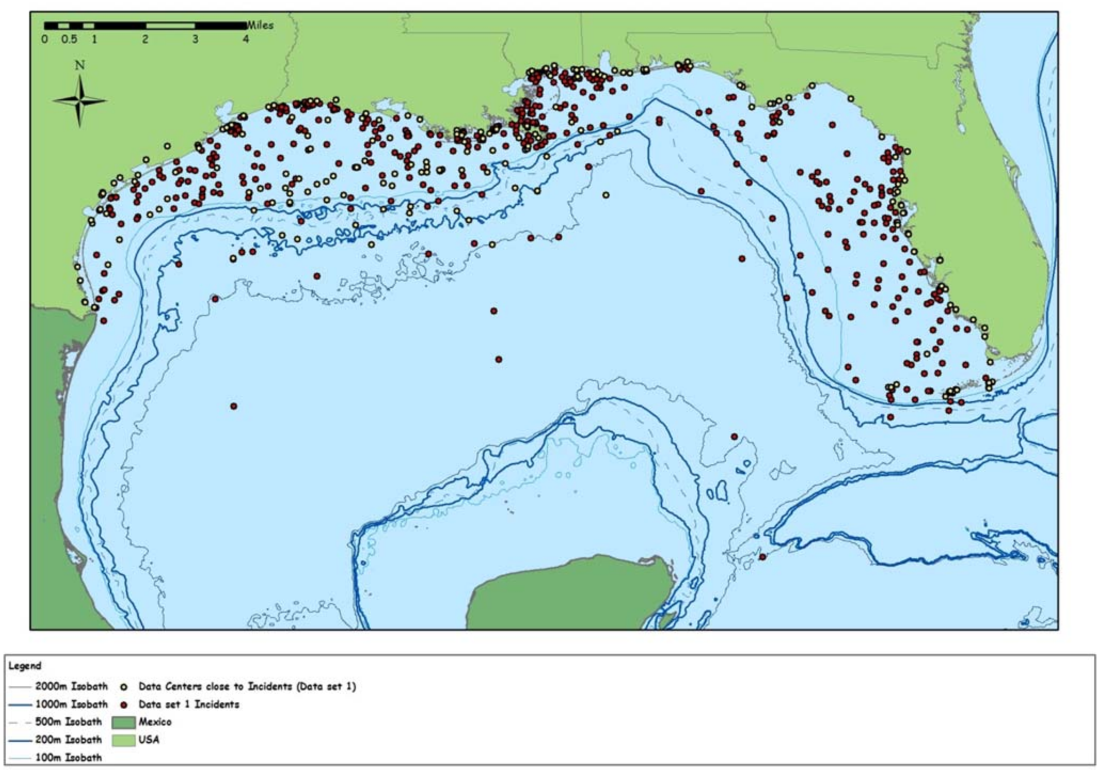
a. The U.S. Coast Guard (USCG) uses accident report form #2692 to collect data on fatal, nonfatal injury, and missing person cases. The USCG form collects data on several variables related to the accidents including time of the accident, casualty type (i.e., injury, fatality, and missing), vessel name, vessel ID, year built, vessel type, gross tons, vessel length, fishery type, accident latitude, and longitude. However, not all information elements on the questionnaires are consistently recorded. As a result, only partial data are available for some variables such as vessel length or gross tons. For other variables, such as fishery type, the available data is very limited. Figure 2 shows annual number of fatalities, injuries and missing fishermen in the GOM according to the USCG (Table 2 shows the annual numbers in table format). The geographic distribution of these casualties since 1992 is mapped in Figure 3.

Figure 2. Annual Number of Casualties in the GOM (1992-2012)



Source: USCG.

Figure 3. Map of Commercial Fisheries Casualties in the GOM (1992-2011)



Source: USCG.

Note: The casualties include fatal and non-fatal injuries as well as the missing cases.

Table 2. Comparison of Commercial Fishing Accidents Data from USCG, CDC, and BLS

	USCG			CDC	BLS*
Year	Fatality	Injured	Missing	Fatality	Fatality
1992	13	41	2	NA	NA
1993	18	39	4	NA	NA
1994	3	37	3	NA	NA
1995	12	28	1	NA	NA
1996	11	17	3	NA	NA
1997	7	8	0	NA	NA
1998	10	20	5	NA	NA
1999	12	13	2	NA	NA
2000	10	19	3	19	NA
2001	4	20	2	11	NA
2002	9	18	1	16	NA
2003	11	19	3	15	14
2004	5	13	2	12	7
2005	5	5	3	12	14
2006	4	9	3	7	10
2007	2	9	3	6	10
2008	3	13	2	9	12
2009	3	20	2	9	10
2010	6	9	1	10	10
2011	11	16	1	12	16
2012	6	11	0	7	NA
Total	165	384	46	145	103

Sources: USCG, CDC, and BLS (SOII).

* FL includes West Florida, East Florida and Florida Keys areas.

b. The Center for Disease Control (CDC) focuses only on fatalities in commercial fishing accidents. To collect data, the CDC combines several data sources including the USCG database, death certificates, media reports, and local police reports to generate its own data base. While the CDC data have a limited scope, they are more comprehensive than the USCG data in the list of associated variables, especially species fished at the time of the accident. Table 2 compares annual casualties from commercial fishing accidents in the GOM based on data sources from the USCG and the CDC. The CDC reported number of fatal injuries cases is typically larger than the numbers reported by the USCG perhaps because of a large number of data sources used by CDC, which allows follow up on the non-fatal injury and missing cases.

Because of the variations in the size of fisheries, gears used, and fishing locations, there are variations in the number of fatal injuries by species. Table 3 presents number of fatalities by species (as reported by CDC) during 2000-2012. The shrimp fishery, at 76 fatalities, tops the list, followed by the oyster, crab, and snapper/grouper fisheries. Availability of species in different geographic areas, weather patterns, and the length of the coast line affect distribution of fatal injuries among the states. Distribution of the number of commercial fishing fatalities by state is presented in Table 4. Louisiana fishermen have experienced the highest number of fatalities, followed by Florida and Texas. Dominance of shrimp harvesting in Texas and Louisiana is likely the main reason for the high prevalence of fatalities in these state.

Table 3. Number of Fatalities (CDC) in the GOM by Species (2000-2012)

Fish Species	Number of Fatalities
Amberjack	2
Crab	10
Gulf Menhaden	1
Lobster	1
Menhaden (Shad)	6
Mullet	3
Oyster	13
Shark	1
Shrimp	76
Snapper/Grouper	10
Sponges	1
Swordfish	2
Tuna	2
Unknown	17
Grand Total	145

Source: CDC.

Table 4. Number of Fatalities (CDC) in the GOM by State

Year	AL	FL*	LA	MS	TX
2000	0	9	4	1	5
2001	1	2	3	0	5
2002	0	5	4	1	6
2003	3	4	4	1	3
2004	0	3	6	0	3
2005	0	4	2	3	3
2006	1	2	3	0	1
2007	0	1	3	0	2
2008	1	1	5	1	1
2009	1	0	5	0	3
2010	0	4	3	1	2
2011	0	2	7	3	0
2012	1	0	4	0	2
Total	8	37	53	11	36

Source: CDC.
* FL includes only West Florida and Florida Keys.

c. The Bureau of Labor Statistics (BLS) has two data sources for occupational injuries and fatalities. First, the Survey of Occupational Injuries and Illnesses (SOII) publishes estimates of nonfatal occupational injuries and illnesses. BLS produces accident reports for various cases, such as injuries involving at least two days away from work, by industry and by occupation. Annual data is available by state. More information on SOII, including how the data are collected, can be found on Page 5, Chapter 9, of the BLS Handbook of Methods at http://www.bls.gov/opub/hom/pdf/homch9.pdf. However, the level of industry aggregation in the data is high. The most detailed data is for agriculture, forestry, fishing and hunting. Also, the duration of SOII data is limited and it excludes the self-employed segment of the work force because the 1970 OSHA act does consider them employees.

The second BLS data source is the Census of Fatal Occupational Injuries (CFOI), which reports fatal occupational injuries and attempts to complement the SOII by including self-employed workers and government employees. To identify and substantiate fatal occupational injuries in the U.S., the BLS, similar to the CDC, uses many data sources, including death certificates, media reports, and federal government reports, such as reports from the OSHA and USCG. The BLS also utilizes state government reports, such as coroner and medical examiner reports (http://www.bls.gov/news.release/pdf/cfoi.pdf). The annual fatalities in the commercial fisheries of the GOM are presented in Table 2 based on North American Industry Classification System (NAICS) industrial classification. The numbers of fatal occupational injuries collected by BLS are often higher than those of either USCG or CDC. Inability to break down the BLS fatality data for Florida into east and west explains some of the variations among data sources. Table 5 breaks out the BLS fatalities by state.

Table 5. Number of Fatalities (BLS) in the GOM by State

Year	AL	FL*	LA	MS	TX
2003	0	9	0	0	0
2004	0	0	0	0	0
2005	0	7	0	0	3
2006	0	6	4	0	0
2007	0	3	5	0	0
2008	0	0	5	0	0
2009	0	0	6	0	0
2010	0	4	0	3	3
2011	1	1	5	0	4
Total	1	30	25	0	10

Source: BLS.

* FL includes West Florida, East Florida and Florida Keys areas.

Note: Due to confidentiality, some of the BLS state level fatality data are withheld.

Comparing the three sources of data for statistical analysis of commercial fishing accidents in the GOM, the BLS SOII data are less suitable because of high degree of aggregation in defining the industry and in geographical identification. For the BLS CFOI fatality data, the industrial classification has changed from Standard Industrial Classification (SIC) to NAICS in 2003. Also, the BLS data is available only in annual form and contain no detail information on individual accidents. Among the other two data sources, the CDC data is a preferred source of data for the fatal commercial fishing accidents in the GOM, because it contains more details about the vessel, fishery type, and fishers. However, the information on the targeted species does not match well with the NOAA fisheries landings data based on specific species (source: coastal logbook data, which is available at http://www.sefsc.noaa.gov/data/pelagiclogbook.htm). While the NOAA uses biological species to group landings, CDC appear to be using non-standard fishery descriptions in reporting accidents. This apparent discrepancy could also be due to the fact that during a trip fishermen are likely to change gears and target different species. Finally, it is notable that the USCG is the only data source for non-fatal injuries and missing fishermen in commercial fishing accidents.

The fatality data tends to be more reliable than the injuries data because injuries are more likely to go unreported than fatalities. Fatalities cases are usually high profile and are believed to be more accurately recorded. Also, due to various reasons, including the exclusion of the self-employed in some occupational injuries data, we find discrepancies between USCG, BLS and CDC data.

V. FTE Construction

Computing FTE employment in fisheries is a challenging task because of the nature and duration of commercial fishing trips. Commercial fishing work does not follow the 40 hour-per-week standard. In principle, to construct FTE employment, the number of days at sea for each trip is multiplied by the number of crew to arrive at crew days per trip. Then, the number of crew days per trip is summed annually across vessels and trips. The sum is multiplied by 24 to arrive at the total number of crew hours per year for the fishery based on the belief that fishermen are exposed to injury risk during the entire trip. Finally, to produce the annual FTE employment, the total number of crew hours is divided by 2000, which is the normal annual work hours for non-seasonal jobs with two weeks of vacation (Schnier, 2009).

To calculate the rate of injuries, we need consistency between the injuries data and the relevant size of the workforce. We focused on the fatality data because of its reliability. Among the three data sources, only the CDC data makes a distinction between fishery types. However, the species resolution at single fishery level is poor. Our construction of FTE employees in the commercial fishery of the GOM in turn requires consistency between the geographic delineation of the fishing activities and fishery type. Also, FTE data have limitations due to data availability and the multi-species nature of most fisheries in the GOM. Therefore, we select three groups of fisheries for which we intend to calculate fatality rates.

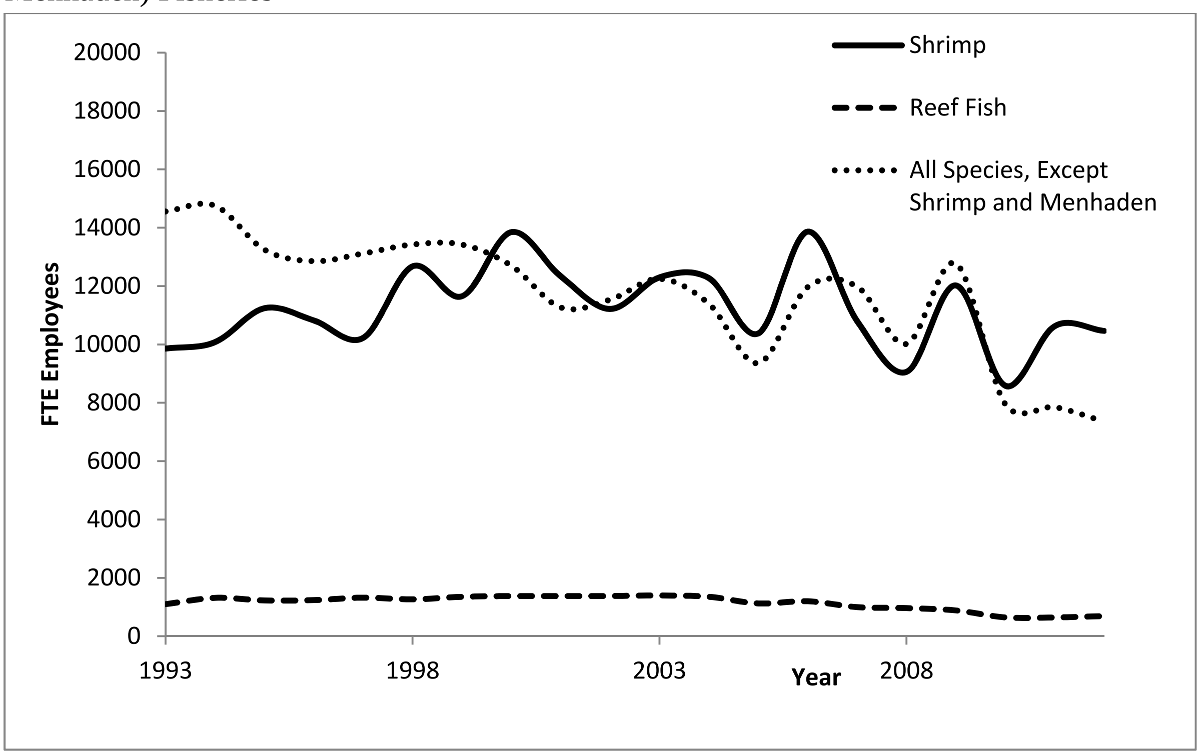
The first group is the Federal reef fish fishery, consisting primarily of snapper and grouper species. The number of crew days is available for each trip since 1993 from the NOAA logbook, which we use to calculate the relevant FTE measure.

Shrimp is the second group, and includes all shrimp harvesting activities in both federal and state waters. For this fishery, crew data is only available for the federally-permitted segment of the GOM shrimp fishery and only available since 2005 (and somewhat patchy in early years). To estimate FTE numbers for the entire fishery, we must extrapolate the available FTE numbers to the inshore (non-federally permitted) fleet and back in time. For the federally permitted segment, we divide the total annual landings by total annual FTE employment—itself calculated as average crew number times days at sea for each vessel to arrive at an average productivity of labor. Then, we divide the annual landings of the entire fishery by the mean of this productivity measure to obtain the total number FTE employees. This method assumes that labor productivity in shrimp harvesting has not changed over time.

The third group includes all species, except shrimp and menhaden and uses a method similar to the one for shrimp to extrapolate from the federal reef fishery FTE numbers to the entire GOM fishery, except shrimp and menhaden. It is notable that, because some fisheries such as oysters, lobster, and crab take place mostly in the state waters, they are under state management. Therefore, these fisheries are not surveyed by NOAA and relevant historical data is not available for the construction of FTE employment. Because of similarity in production process (gears used) and labor intensity among this group of species and the reef fish species, we apply average labor productivity in reef fish fishing to the annual landings of all species (except shrimp and menhaden) to calculate the FTE level of employment for this broad group of species. We exclude a) shrimp because the FTE results above (group 2) are more precise, and b) menhaden because it is an industrial reduction fishery (not for human consumption) with an extremely different production process.

Figure 4 presents the annual FTE employees for three groups of fisheries: shrimp, reef fish, and all species (except shrimp and menhaden) in the GOM. Table 6 also reports the same annual FTE data along with the appropriate count of fatal injuries.

Figure 4. FTE Employment in the GOM Shrimp, Reef Fish, and All Species (Except Shrimp and Menhaden) Fisheries



Source: NOAA, Logbook Data

Table 6. Annual FTE Employees and Fatality Counts in Commercial Fisheries in the GOM

	FTE			Fatality Count			
Year	Shrimp	Reef Fish	All Species, Except Shrimp and Menhaden	Shrimp	Reef Fish	All Species, Except Shrimp and Menhaden-1*	All Species, Except Shrimp and Menhaden-2**
1993	9,859	1,098	14,556	NA	NA	NA	NA
1994	10,077	1,316	14,753	NA	NA	NA	NA
1995	11,241	1,226	13,246	NA	NA	NA	NA
1996	10,821	1,236	12,854	NA	NA	NA	NA
1997	10,224	1,323	13,117	NA	NA	NA	NA
1998	12,676	1,265	13,424	NA	NA	NA	NA
1999	11,649	1,352	13,423	NA	NA	NA	NA
2000	13,848	1,376	12,698	7	3	8	12
2001	12,335	1,377	11,266	4	2	4	7
2002	11,215	1,378	11,534	5	0	7	11
2003	12,299	1,396	12,249	11	0	2	4
2004	12,272	1,352	11,392	6	2	6	6
2005	10,377	1,125	9,357	6	2	6	6
2006	13,864	1,200	11,963	4	1	1	3
2007	10,803	997	11,980	3	0	2	3
2008	9,058	965	10,017	6	1	3	3
2009	12,022	885	12,774	3	1	2	2
2010	8,583	646	7,953	7	0	2	3
2011	10,626	644	7,851	7	0	2	2
2012	10,464	691	7,360	7	0	2	2

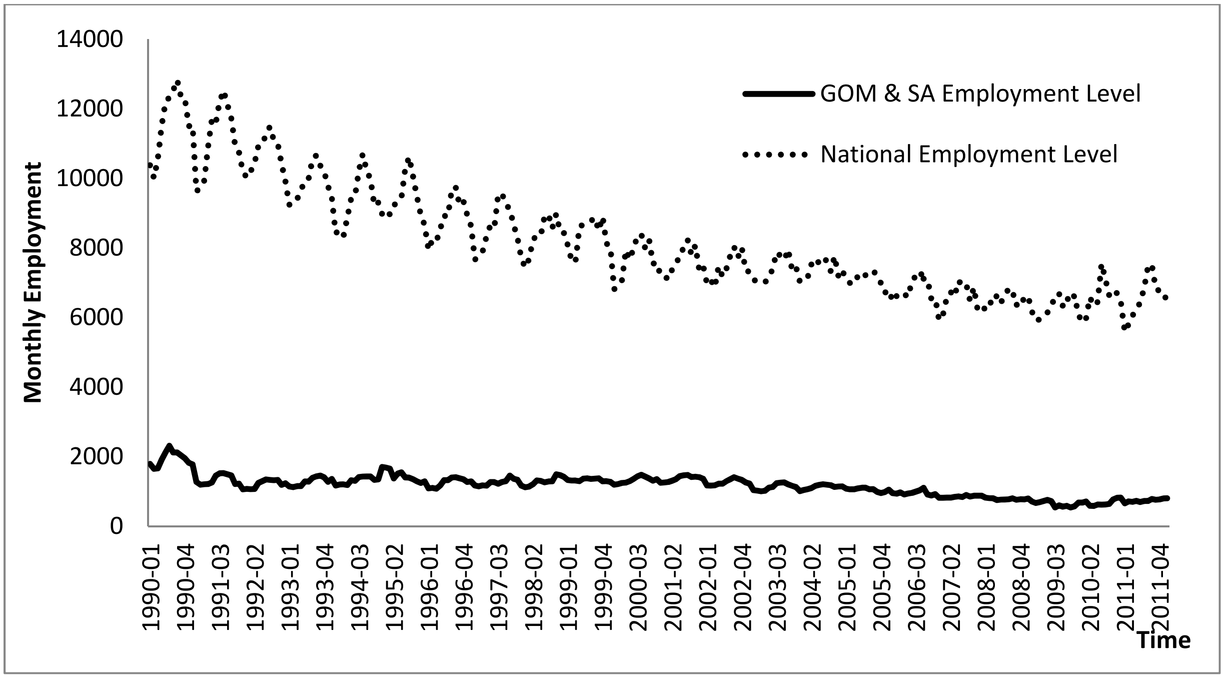
Sources: NOAA is the source of FTE data and CDC for the fatality data.

* Seventeen fatal accidents from unknown fisheries are not included.

** Seventeen fatal accidents from unknown fisheries are included.

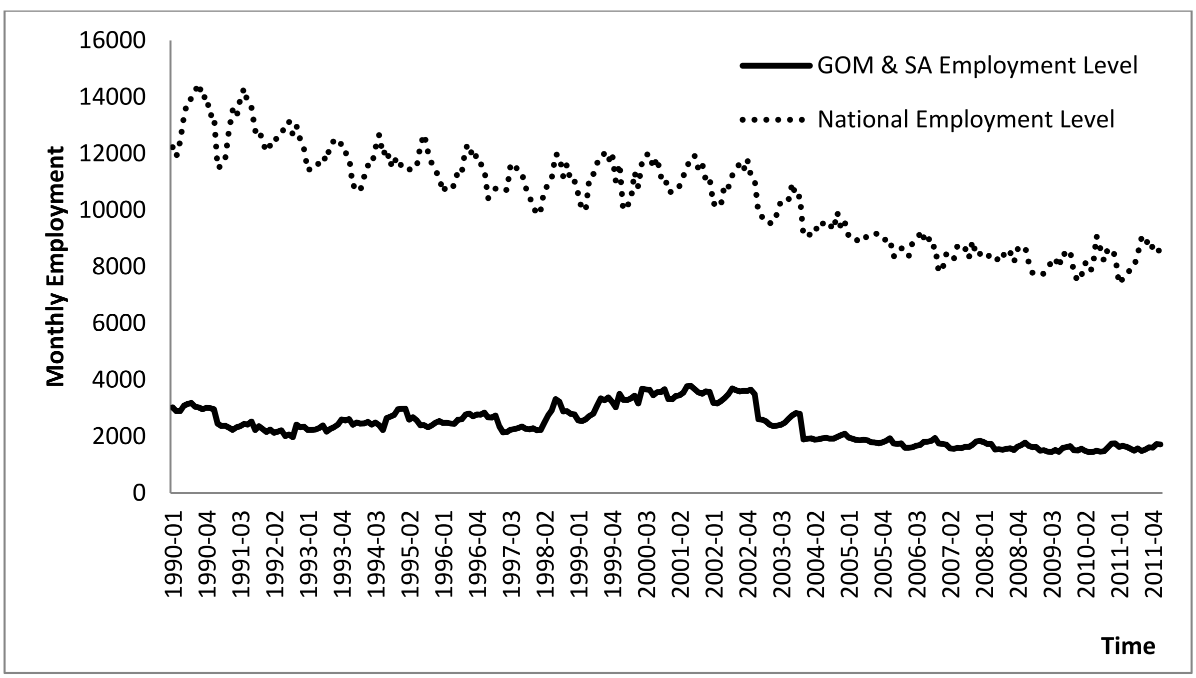
In addition to the FTE measures calculated for various fisheries based on the NOAA data, the BLS reports monthly employment figures for various aggregation levels of the economy. The most narrowly defined NAICS classification relevant to fishery is 1141, which focuses on fishery only. The next level of industry aggregation is 114, which includes fishing, hunting, and trapping. The level of employment in the industry for the GOM and South Atlantic (SA), combined, vs. the U.S., based on these aggregation levels are presented in Figures 5 and 6, respectively. The BLS also reports the employment levels by state. Since the data for Florida is not separated into east and west, the employment level for the GOM cannot be presented separately. According to the BLS, the level of self-employment in fishery (NAICS 1141) has been approximately 20% more than all private establishments in the U.S. and the gap seems to be expanding in recent years (Figure 7).

Figure 5. Monthly Employment Level in Fishing Industry (NAICS 1141)- GOM and SA vs. National



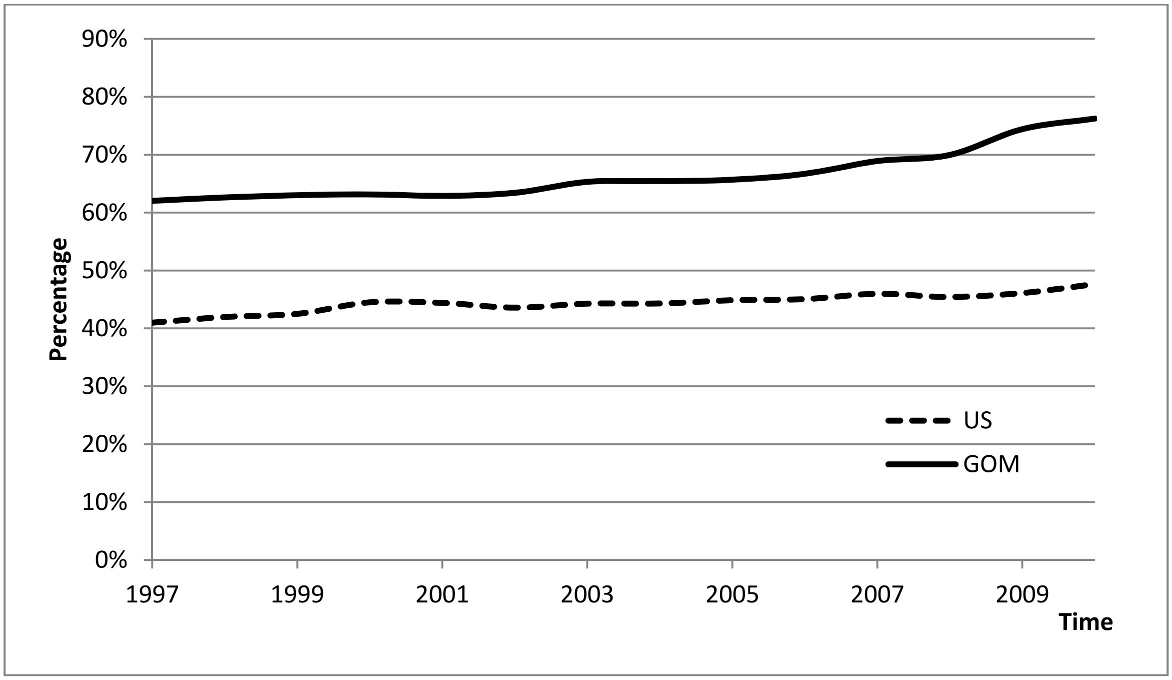
Source: BLS

Figure 6. Monthly Employment Level in Fishing, Hunting and Trapping Industry (NAICS 114)- GOM and SA vs. National



Source: BLS

Figure 7. Percentage of Self-employed in Fishery (NAICS 1141)- All Private Establishments



Source: BLS

VI. Fatality Rates Construction

The prevalence of injuries or fatalities is typically measured by the ratio of the number of injuries or fatalities over the total FTE employees in a particular industry. Often this ratio turns out to be very small, especially for the fatality rate. For scaling purposes, the prevalence statistics are usually reported as 'per 100,000 FTE employees.' We calculate the rate of fatal occupational injuries in commercial fisheries in the GOM for different groups for the 2000-2012 period (Table 7). For comparison, selected statistics from a CDC report on fatal occupational injuries in fisheries in other parts of the U.S. are included. In the GOM, it appears that the highest rate of fatal injuries is among reef fish fishermen, followed by shrimp harvesters. Commercial fishery fatality rates in the North Atlantic Ocean and Alaska are higher than those in the GOM. Cold water and air temperatures are clearly contributing factors.

Table 7. Comparison of Fatalities, Employments Size, and Fatal Injuries Rates in the Commercial Fisheries in the GOM and in Other Parts of the U.S. Waters

Fishery	Fatalities	FTE Employees	Annual Fatality Rate per 100,000 FTE Employees
Gulf of Mexico (2000-2012):			
Shrimp	76	224,312	34
Reef Fish	12	22,849	53
All Species, Except Shrimp and Menhaden-1*	45	233,768	19
All Species, Except Shrimp and Menhaden-2*	62	233,768	27
Other Geographic Areas (2000-2009):†			
Northeast Multispecies Groundfish	26	13,020	200
Atlantic Scallop	44	31,152	141.7
Alaska Halibut	10	22,557	43
Alaska Cod	26	63,981	40
Atlantic Snapper/Grouper	6	10,866	56.7
Alaskan Salmon	39	102,861	38

* Seventeen fatal accidents from unknown fisheries are excluded in 1, but included in 2.

† Selected statistics from Center for Disease Control, 2010. For consistency with our method, the CDC's FTE employee figures are multiplied by three and the fatal injury rates are adjusted accordingly. In other word, the original FTEs from the CDC are three times lower than those presented here and the fatality rates are three times higher.

The risk of fatal occupational injuries in commercial fishing industry is significantly higher than other industries in the U.S. The USCG, for example, reports 124 fatalities in the commercial fisheries in the U.S. between 2000 and 2010, compared with only 4 for all U.S. workers (http://www.cdc.gov/niosh/topics/fishing/). Although the fatality data collection process is not consistent between the USCG and BLS, comparisons of the level of magnitude of fatal injuries among industries are meaningful. In 2012, for example, the rate of fatal occupational injuries per 100,000 workers for all U.S. workers was only 3.2 relative to 21.2 for agriculture, forestry, and fishery. The rate of occupational fatal injuries in other high risk industries are 15.6 in mining, 13.3 in transportation, and 9.5 in construction (http://www.bls.gov/news.release/pdf/cfoi.pdf).

VII. Conclusion

We attempt to assemble data to examine the prevalence of injuries and fatalities in the commercial fishing industry in the GOM. First, data sources for commercial fishing accidents are identified from three government agencies including USCG, CDC, and BLS. However, the BLS Survey of Occupational Injuries and Illnesses is reported in annual form with a high level of industry and geographic aggregation, and its Census of Fatal Occupational Injuries detailed data requires confidential data access. Also, the BLS Survey of Occupational Injuries and Illnesses appear to be significantly below the number of fatal injuries reported by the two other data sources. Therefore, depending on the objective of the study, either the USCG or the CDC data are more likely to be suitable. We found that the GOM shrimp fishery has the highest number of fatalities and LA is the state with the highest number of fatal injuries, which generally mirrors the magnitude and area of landings in the GOM.

To calculate fatality rates, FTE employment estimates need to be constructed. We found building a measure of FTE employment in commercial fishery to be challenging because of the unusual work schedule of fishermen. Our measure of FTE is based on the availability of data in the fisheries of the GOM. We use days at sea and number of crews per vessel to arrive at total number of crew days per year. Assuming that fishermen are exposed to the risk of injuries in their entire trip, we calculated the total number of hours of work and then the FTE number of employees in each fishery. When faced with sample data on days at sea and crew number, labor productivity is used to extrapolate the number of FTE employees to the entire fishery. It turned out that reef fish fishermen are at the highest risk of fatal injuries in the GOM, followed by the shrimp harvesters. Expectedly, data shows that commercial fishery in the GOM is far less risky than in the cold waters of Alaska or North Atlantic, though still riskier than the average U.S. occupation.

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