

Social and Economic Impacts of Hurricane/Post Tropical Cyclone Sandy on the Commercial and Recreational Fishing Industries: New York and New Jersey One Year Later

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Changhua Weng, and Angela Silva



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
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Abstract

This report discusses impacts of Hurricane/Post Tropical Cyclone Sandy on fishing and fishing-related businesses in New York and New Jersey one year after landfall. It describes major factors leading to different levels of impact on different sectors and some reasons behind these different impact levels. Further examined are types of impediments to recovery, aids to recovery, and community impacts. It concludes with 1) two factors that can potentially improve response to, and lessen impacts of future natural disasters and 2) lessons learned by the researchers.

Executive Summary

This report examines how the commercial and recreational fishing industries in New York and New Jersey were affected by impacts from Hurricane/Post Tropical Cyclone Sandy (hereafter, Sandy) in the 12 months after it made landfall near Brigantine, New Jersey, on October 29, 2012. Results are primarily based on a voluntary survey of 958 fishing and fishing-related businesses: commercial and for-hire (charter and party) fishing vessel owners/permit or license holders; and seafood dealers; marina, bait and tackle store, and aquaculture facility owners or managers. Also included are pre- and post-storm analyses of National Marine Fisheries Service (NMFS) commercial landings and recreational angler activity data.

While the immediate impact of the storm on fishing communities in these states was profound and previously documented by NMFS, this report provides information on longer-term impacts to communities and businesses. The devastating impacts on coastal infrastructure meant that many businesses needed time to understand the full extent of damages. After a year had passed, they were better able to assess damages and were also able to assess impacts to revenues. Impacts on crew and employee jobs were clearer. Participants could also speak to impacts on their communities. Some fishermen and other business owners will never return to their previous occupations, while many have literally picked up the pieces and re-entered the industry. They are harvesting stocks that responded to the storm in a variety of ways and rebuilding their customer bases along with their places of business. Encouragingly, nearly three-quarters of those surveyed indicated they learned something from Sandy that would help them prepare for and react to future storms.

Based on the NMFS data, a number of fish and shellfish species commonly targeted by both commercial and for-hire fishermen had immediate decreases in landings after the storm, with decreased landings for some species lasting well into the post-storm year. However, it is not clear how much these changes (especially in the early months) are due to direct impacts on fish and habitat versus decreased fishing activity due to damaged docks and vessels or un-related regulatory changes or shifts in consumer demand. Recreational data also showed decreases in trips for shore-based and private-vessel anglers, but not for for-hire anglers. The changes (generally decreases) in commercial landings and some recreational angler activity occurred at the same time that fishermen and fishing-related businesses were coping with physical damages to businesses (and often homes), revenue losses, and logistical challenges. Whether or not documented changes in commercial landings were due solely to the storm, they would have had ripple effects beyond commercial and recreational fishermen to shoreside businesses such as bait and tackle stores, seafood dealers, marinas, and aquaculture facilities. Close to half of the respondents, for instance, saw changes to their community in the year following Sandy. Many affected communities were still rebuilding, a process that was complicated by changes in zoning, ordinances, and regulations that were attributed to Sandy.

The survey found that the vast majority of participants reported impacts, but that not all fishing and fishing-related business sectors were impacted equally or had the same needs for recovery. Commercial fishermen were most concerned about stock recovery and clean-up of marine debris. For-hire fishermen and fishing-related businesses were generally most concerned about rebuilding their customer base and repairing physical damages to facilities, boats, and docks. Commercial fishermen more frequently reported physical damages/losses than did for-hire fishermen, perhaps because of their greater use of fixed gear such as pots/traps that might have remained in the water. As might be expected, larger vessels (35+ ft, in a fleet with average length of 36 ft) had larger dollar amounts of damages/losses than smaller vessels. In terms of revenue change, however, smaller vessels had statistically significantly larger

proportional revenue losses (measured as a percentage of their annual revenue). About half of all fishing and fishing-related businesses reported obstacles to recovery. Among the obstacles reported, the most common was *time to get assistance*: (e.g., from FEMA or insurance companies). The post-Sandy difficulty in recovering was also due in part to so many damages/losses not being fully insured or insured at all.

Overall uninsured damages/losses estimates to fishing and fishing-related businesses totaled \$200 million in New York and \$250 million in New Jersey. Overall, percent revenue loss to these businesses in New York was 26% and 31% in New Jersey. Not only were vessel and fishing-related business owners impacted, so too were fishing crew and fishing-related business employees. For close to 20% of commercial and for-hire fishing vessel owners, crew size showed decreases that were statistically significant. For the majority of these, it had not returned to pre-storm levels after 12 months. Among the 30% of fishing-related businesses reporting a drop in number of employees, both marinas and bait and tackle stores had statistically significant decreases. Similar to fishermen and crews, the majority of these businesses were not back to their normal number of employees after 12 months. These crew and employees are likely to have been at least temporarily unemployed. For those whose previous employers had not re-hired them after 12 months, they may have been hired by others in the same industries (in New York and New Jersey or elsewhere) or found work in non-fishing or related industries. The latter possibility would likely have been especially hard for crew, based on the many studies that show fishermen's reluctance to leave the industry even in adverse economic circumstances (Smith and Clay 2010; Pollnac et al. 2014) and their frequent difficulty in adjusting to non-fishing jobs (Pollnac and Poggie 2008; Pollnac et al. 2014).

Two important results, however, point to ways to reduce impacts from future storms to commercial and recreational fishing industries, and coastal communities more broadly.

1. The role of social bonds in community recovery emerged from responses to questions on factors aiding recovery. Social bonds have been found elsewhere to be of key importance in both evacuation and recovery (Aldrich and Sawada 2014; AP-NORC 2014; Tompson et al. 2013; Aldrich 2011), and can be fostered as part of future disaster preparedness planning (FEMA 2013; Magsino 2009; Shellong 2007). This finding also supports a U.S. goal of building community resilience to environmental hazards from climate change (CCPR 2014:34).
2. On a personal level, close to three-quarters of respondents said they learned something from Sandy that will help them prepare for future natural disasters of a similar nature. These lessons included how to best safeguard their vessels, make their infrastructure more resistant to future damage, have appropriate supplies and equipment on hand in advance, and pay closer attention to weather reports and evacuation orders.

Finally, lessons learned by the researchers are the importance of keeping baseline data and sample frames up to date. These two factors will facilitate and improve the ability to quickly and accurately assess impacts to future disasters, as well as to conduct impact assessments for regulatory changes.

Introduction

This report examines how the commercial and recreational fishing industries in New York and New Jersey were affected by impacts from Hurricane/Post Tropical Cyclone Sandy (hereafter, Sandy) in the 12 months immediately following its landfall near Brigantine, New Jersey, on October 29, 2012.

Commercial and recreational fishing industries are mainstays of the economic, social and cultural lives of many residents of coastal communities in New York and New Jersey. Economic impacts examined are physical damages and/or losses¹ and revenue changes. Social and community impacts examined are changes in employment, impediments to and supports for recovery, and lessons learned by those impacted.

The economic impacts of Sandy in the United States have been estimated to exceed \$50 billion (Neria and Shultz 2012), making the storm second only to Hurricane Katrina as the costliest natural disaster in the nation's history. Winds of 80 mph and a landfall in northern New Jersey, along with record storm surge flooding, caused the most deaths and property damage along the New York and New Jersey coastlines (NWS 2013). Three-quarters of the 117 U.S. deaths attributed to Sandy occurred in these two states (CDC 2013). Two weeks after the storm, on November 16, 2012, the Secretary of Commerce determined that a catastrophic regional fishery disaster had occurred in these two states due to the natural disaster (NOAA 2012). The fishery disaster declaration required NOAA's National Marine Fisheries Service (NMFS) to conduct an impact assessment within 60 days (NMFS 2013:1). The 60-day assessment (NMFS 2013) began within two weeks of Sandy's landfall and was based on survey and interview data. The assessment found that the immediate impacts of Sandy on the fishing and related industries included structural damage to docks, marinas, buildings, and boats; lost gear and equipment; and loss of customer base due to physical damages (NMFS 2013:29-33). Some fishermen and fishing-related business owners had also lost or had severe damage to their homes.

Although the immediate social and economic impacts of Sandy on the fishing industries of New York and New Jersey were staggering, natural disasters of this magnitude can have serious long-lasting effects as well. To meet the NMFS' obligations under National Standard 8 that support sustained participation of fishing communities and help minimize any adverse economic impacts, NMFS conducted a survey from February through March of 2014 about conditions of fishing and fishing-related businesses 12-months after the storm. This provided adequate time to fully assess the extent of the storm's impacts. The survey gathered social and economic data critical to the Agency's ability to understand the longer-term social and economic impacts of Hurricane Sandy on commercial and recreational fishing industries and communities. Those results form the core of this report. Respondents were able to provide information on financial impacts based on the actual replacement value and/or professional estimates. They were also able to provide information on revenue changes and discuss the process of recovery. This information was not available earlier, in part, because many people were waiting to hear from insurance companies and reconstruction had not yet begun. More details are provided in the sections below.

¹ Damages can be repaired; losses must be replaced.

Background

The impacts of a major natural disaster are due partly to the force of the disaster itself and partly to the vulnerability of the people and places affected (Cutter et al. 2009, 2010; Manyena et al. 2013; see Clay and Olson 2008 for a fisheries-specific perspective). Locations on the coast, especially near the point of storm landfall, are highly vulnerable. Fishing businesses and other fishing infrastructure are usually on the coast or even in the water, leaving them particularly exposed to high winds and storm surges. Previous hurricanes have resulted in extensive damage to fishing vessels and onshore fishing infrastructure, as well as immediate and sometimes dramatic declines in recreational and commercial fish landings (NMFS 2007:2; Ingles 2008).

Commercial and recreational fishing industries play important roles in the local economy and the social and cultural fabric of many communities along the coasts of New York and New Jersey (see Figure 1 and Figure 2). People in fishing and fishing-related businesses can have both their homes and their entire livelihoods devastated by such storms. Fishing communities everywhere must adapt as fishery stock abundance, business conditions, and fishing rules change. Some Northeastern fishing communities struggle with this more than others. Where scarce fish and the accompanying management restrictions are driving social and economic adversity, a natural disaster compounds the downward trend. As noted by Acting Secretary of Commerce, Rebecca Blank, in her fisheries disaster declaration (NOAA 2012), “We are taking action because of the storm’s devastating impact on the people who live and work in coastal communities that were hit hard by Sandy. Many of these hardworking Americans depend on a robust fishing industry to support their families and local economies.”

a. New York and New Jersey Fishing Industries and Coastal Communities

To evaluate impacts of Sandy, it is important to understand the longstanding economic, social, and fisheries conditions in New York and New Jersey. Both states have commercial and recreational fishing industries that support vibrant fishing communities and contribute to the broader coastal and state economies (NMFS 2013:1-2). This section provides background information on the importance of commercial and recreational fishing to the two states in 2012. Indicators of fishing community dependence on commercial and recreational fishing are mapped to illustrate the geographic range and importance of these industries in both states. A comparison is then provided between average monthly commercial landings for the 5-year period prior to Sandy (November 2007 through October 2012) and the 12-month post-storm period (November 2012 to October 2013). A pre- and post-storm comparison is also made for trips by recreational anglers.

i. Importance of Fishing and Seafood Industries to the State Economies

Commercial and recreational fishing are important economic drivers of the New York and New Jersey state economies as can be seen in Table 1.

Table 1. Fishing Industry Economic Impacts in New York and New Jersey (commercial numbers are without imports) (data from NMFS 2014)

	Sales	Contributions to GSP*	Jobs	Contributions to State Income
New York				
Commercial	\$144 million	\$70 million	3,100	\$50 million
Recreational	\$381 million	\$241 million	3,000	\$151 million
New Jersey				
Commercial	\$717 million	\$342 million	8,800	\$238 million
Recreational	\$1.9 billion	\$1.1 billion	13,100	\$711 million

*GSP is Gross State Product

ii. Community Dependence on Commercial and Recreational Fishing

Coastal towns and cities in New York and New Jersey depend on fisheries to different degrees. Although this report will concentrate on evaluations of overall and state-level impacts, people experience these impacts differently according to where they live. This variation by place can be shown through evaluations of community dependence on fishing. Indices of commercial and recreational fishing activity are used to compare the relative levels of fishing dependence in New York and New Jersey coastal communities (Jepson and Colburn 2013). The indices were developed using NMFS data (see Table 2). For example, an index of commercial fishing engagement is based on NMFS data for total dollar value of landings, total weight of landings in pounds, and numbers of seafood dealers and federal fishing permits. To create an index of commercial fishing reliance, the commercial fishing engagement variables were divided by the population size of a community, creating a per capita measure. Recreational fishing engagement was calculated using NMFS Marine Recreational Information Program (MRIP) data on shore-based, private vessel, and for-hire (charter and party) vessel angler activity. Recreational fishing reliance was then calculated by taking into account community population size, resulting in a per capita measure.

Communities were then given scores of high, moderate, or low for commercial and recreational fishing dependence based on the fishing engagement and reliance indices (Table 2). Figures 1 and 2 illustrate the geographic distribution and importance of both commercial and recreational fishing sectors in New York and New Jersey. Some communities have both high commercial and recreational engagement and/or reliance (e.g., Freeport, Hampton Bays/Shinnecock, and Montauk in New York and Belford, Barnegat Light, and Cape May in New Jersey). Other communities are more dependent on one fishing sector only.

Table 2. The Variables used in Fishing Dependence Indices (Source: Jepson and Colburn 2013: Table 3)

Fishing Dependence Indices	
Recreational Fishing Reliance Index	Recreational Fishing Engagement Index
Per capita for-hire vessel angler activity	For-hire vessel angler activity
Per capita private vessel angler activity	Private vessel angler activity
Per capita shore-based angler activity	Shore-based angler activity
Commercial Fishing Reliance Index	Commercial Fishing Engagement Index
Per capita value of landing	Dollar value of commercial landings
Per capita number of commercial fishing permits	Number of commercial fishing permits
Per capita number of dealers with landings	Dealers with landings
Percent of community jobs in agriculture, forestry and fishing	Pounds of commercial landings

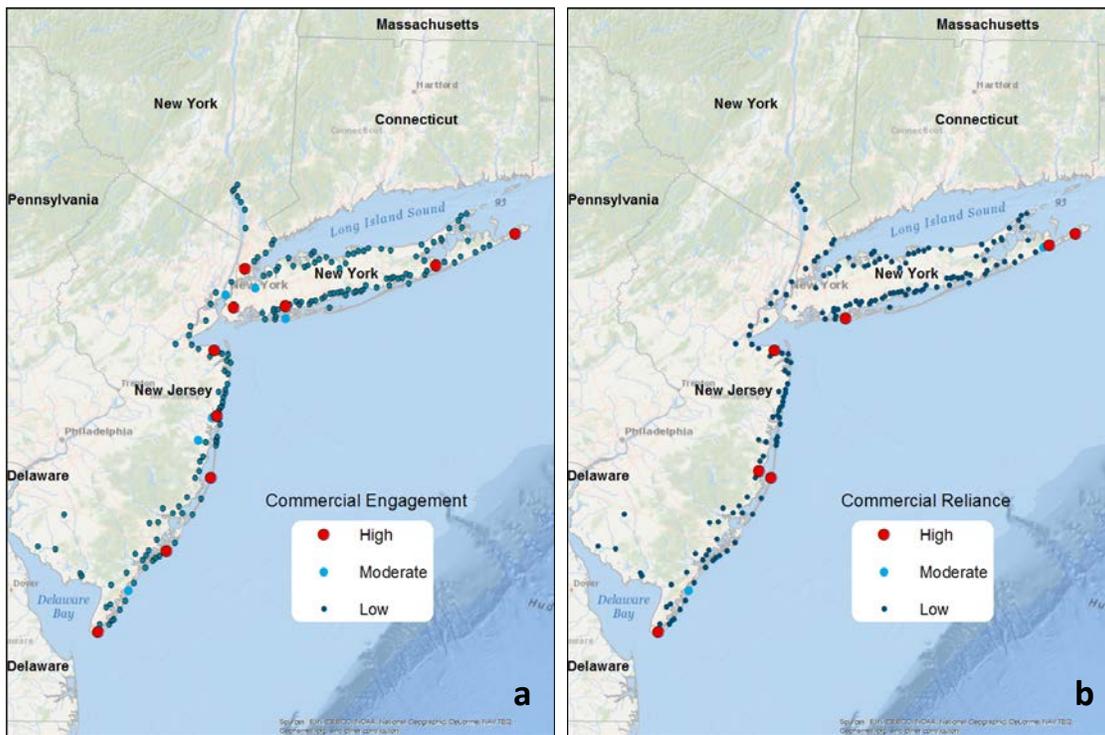


Figure 1. Commercial Fisheries Dependence in New York and New Jersey (map *a* – Commercial Engagement; map *b* – Commercial Reliance)

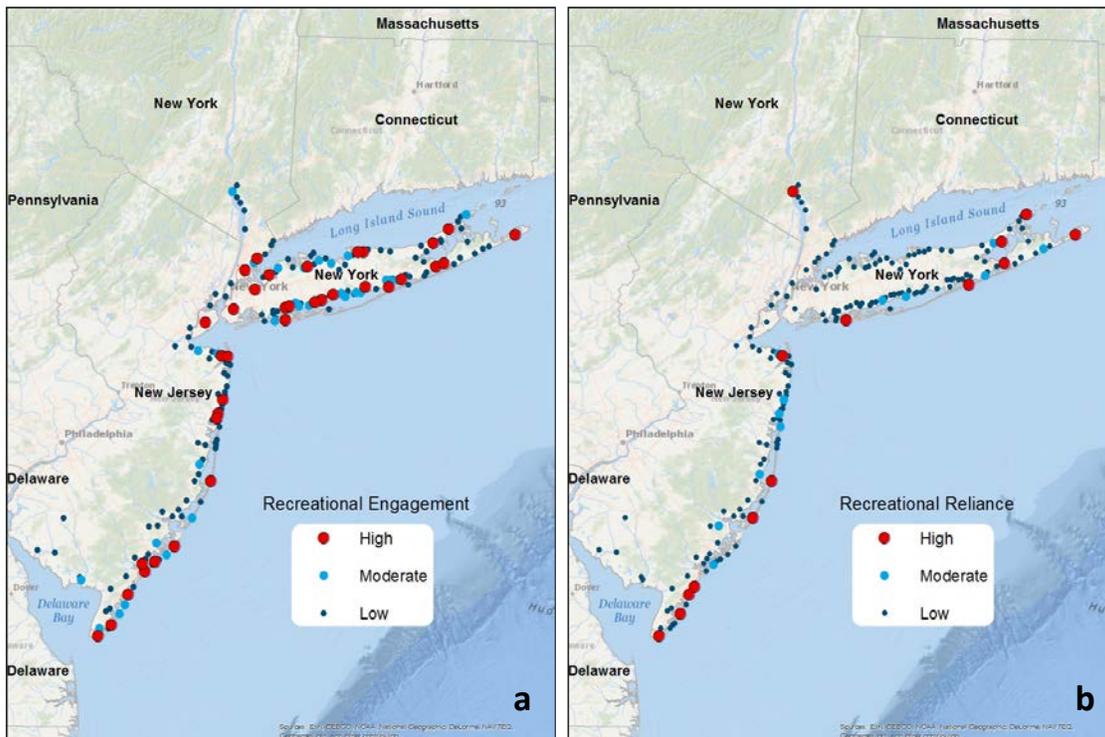


Figure 2. Recreational Fisheries Dependence in New York and New Jersey (map *a* – Recreational Engagement; map *b* – Recreational Reliance)

iii. Commercial Fisheries Landings Data Analyses

Assessments of trends in commercial landed weight in pounds and recreational angler activity can be used to evaluate impacts on fishing-dependent communities. For instance, there was a reduction in landings for some commercial species in New York and New Jersey immediately after the storm. This reduction is similar to what occurred after Hurricane Katrina and other large hurricanes in the United States (NMFS 2007:2). At this point, however, it is impossible to know whether the post-storm changes are due to the storm alone. Post-storm changes in fishing for individual species may also be due to normal annual landings variability, shifts in consumer demand, changes in fisheries regulations, long-term environmental changes or some combination of factors. Damaged fishing and shoreside infrastructure that limited access and the need to rebuild homes may also have played some role in reduced landings immediately after the storm.

Species that are expected to experience the heaviest impacts from the storm surge and coastal waves of an intense storm such as Sandy are the benthic (deep water) shellfish (e.g., scallops), demersal finfish (bottomfish such as flounders, cod, and monkfish), and inshore estuarine species (e.g., crabs, lobster, croaker, and spot) (scientific names available in Appendix A). This is because the impacts of hurricanes on habitat are more severe in coastal and estuarine areas. However, severe storms can also create conditions where offshore species are displaced. Further, fishery productivity may be affected by storm impacts on recruitment and reproduction of shellfish populations. Severe storms may also influence water temperature and nutrient availability in the days to weeks after a storm, causing some nearshore finfish to move to new areas (HSS 2013; Greening et al. 2006).

A monthly five-year pre-storm average was calculated from NMFS landings data (in pounds and value) for November 2007 through October 2012 for 57 categories² of species important to New York and New Jersey (see Appendix A for full list). These monthly averages were compared to actual monthly landed pounds/value for each of the first 12 months of the post-storm year (November 2012 through October 2013). The pattern in monthly post-storm pounds/value for all analyzed species combined differs from the pre-storm averages in both states, but with some important differences (Figure 3 and Figure 4). The post-storm landings were depressed from November 2012 through March 2013 (5 months after the storm) in both states. After March 2013 the landings improved, but more strongly in New York than in New Jersey. Pre- and post-storm analysis of the dollar value of landings followed a similar pattern to pounds landed in each state.

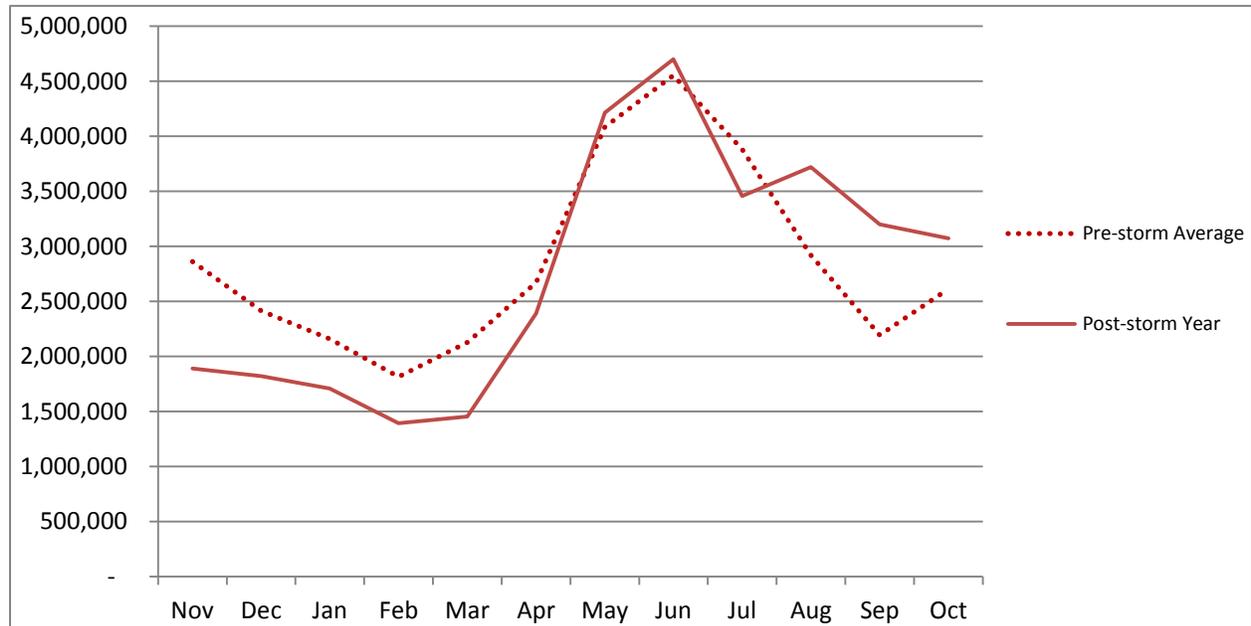


Figure 3. Graph comparing weight in pounds landed in the state of New York between the pre-storm five-year average and the post-storm year

² Of these 57 categories, 55 are individual species, one is a combined group of silver hake/offshore hake, and one is a grouping of various species of skates. The complete list is found in Appendix A. For those landings for which only the year is recorded, these landings were allocated across months proportional to the percentage of total annual catch of that species landed each month.

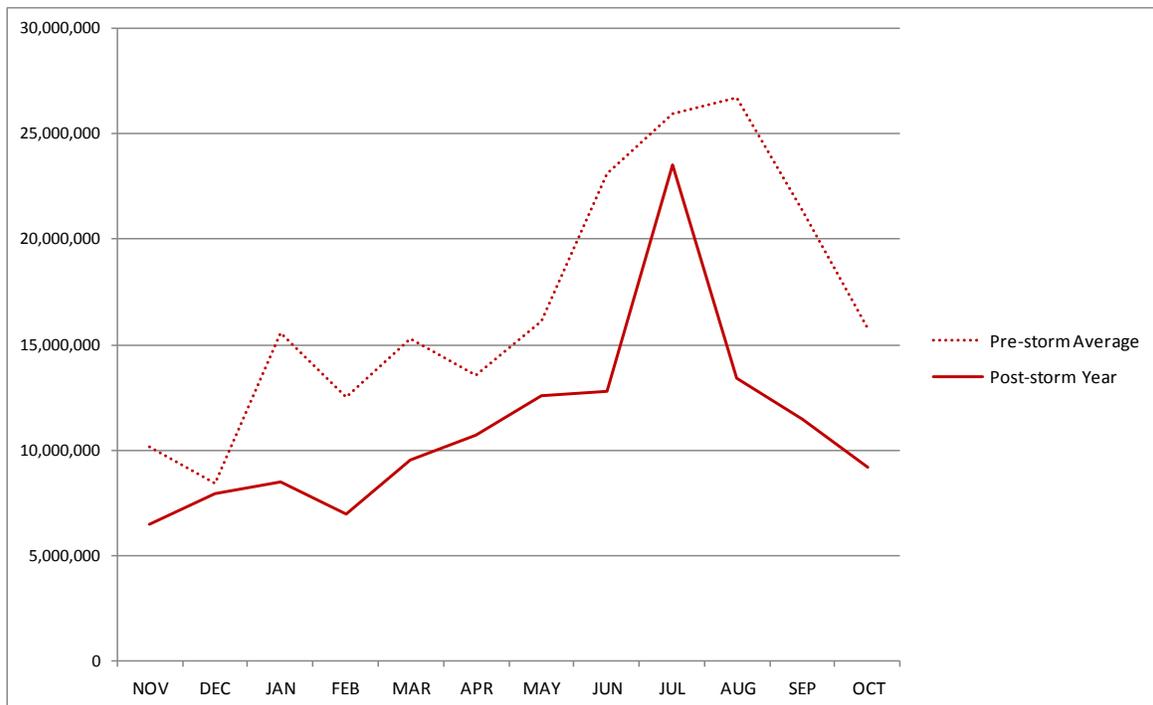


Figure 4. Graph comparing weight in pounds landed in the state of New Jersey between the pre-storm five-year average and the post-storm year

Additional analyses identified the individual species with statistically significant differences between the landings pre- and post-storm.³ In New York nine species were identified, seven of which decreased. The monthly landings patterns of the five species with greatest differences in each state are presented below. We cannot clearly attribute these changes to Sandy in all cases, as noted above. However, no matter the cause or causes, these decreases in landings would mean less income as individuals and businesses were recovering from the storm.

New York

Total New York post-storm landings were near five-year averages in May, June, and July and higher than five-year averages in August to October 2013 (Figure 3). However, the higher landings in August to October depended largely on species that had no post-storm declines (e.g., bluefish, skates, horseshoe crabs, and *Loligo* squid). Three of the species with the greatest differences in landings between pre- and post-storm had a dramatic shift in landings for the entire post-storm year (Figure 5). Atlantic surfclam landings drastically decreased after the storm and had not reached pre-storm levels by October 2013. Atlantic sea scallop and Atlantic mackerel landings were much lower in the spring and summer of 2013

³ The term “statistical significance” refers to the likelihood that a relationship being tested is caused by something other than chance alone. The “*p* value” obtained as a result of a statistical test represents the probability that random chance could explain the result. More precisely, the *p* value is the calculated probability of rejecting the null hypothesis, i.e., rejecting the idea that there is no difference between the groups being compared, when such hypothesis is in fact true. The smaller the *p* value the stronger the significance of the differences observed between the groups being compared. Conventionally, a *p* value must be less than 0.05 (a probability of less than 5%) to be considered statistically significant. *P* values for statistically significant relationships are usually presented as less than 0.05, less than 0.01, and less than 0.001, meaning that the probability of rejecting the null hypothesis when such hypothesis is true is 1 in 20, 1 in 100, and 1 in 1,000, respectively.

than the five-year average. Sand dab flounder (windowpane flounder) and white hake had much smaller changes in landings, but a similar pattern (Figure 5). The same five species with statistically significant changes between the pre- and post-storm periods also showed the greatest changes in dollar value of landed pounds.

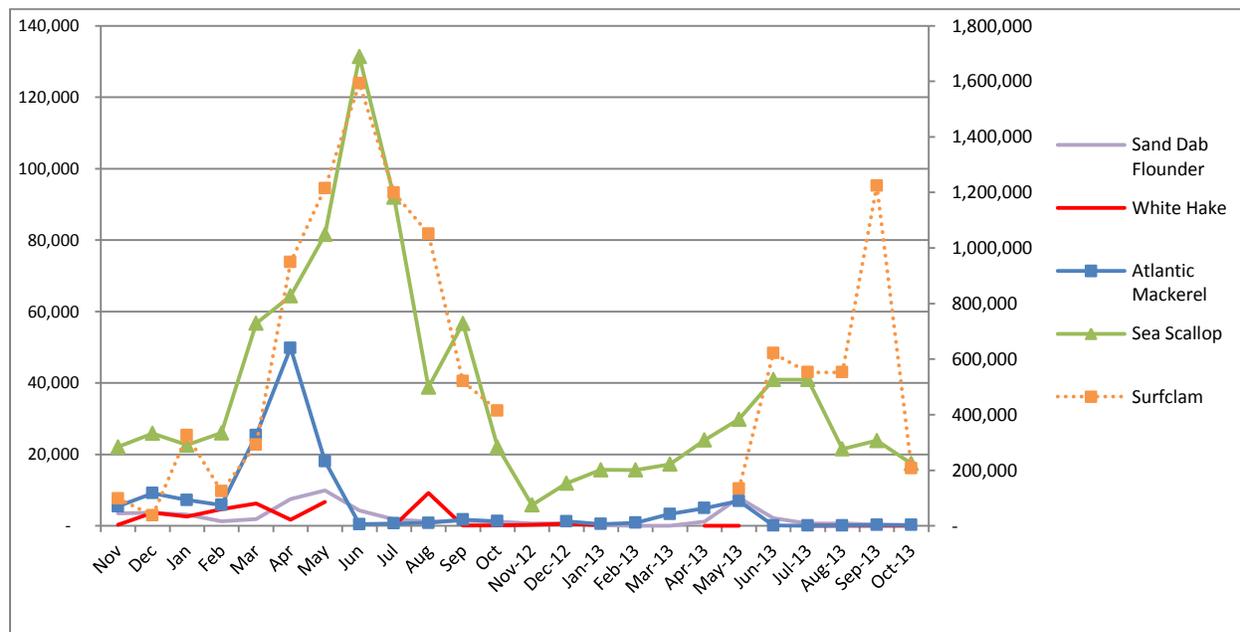


Figure 5. New York - Top five species showing a change in pounds landed between the pre-storm five-year average and post-storm actual landed pounds

* Note: Atlantic surfclam landings are plotted on a secondary axis (on the right) to improve visualization (change in scale).

New Jersey

New Jersey landings overall were nearly restored to five-year averages in July by a surge in Atlantic menhaden landings. However, landings were substantially below five-year averages in all other months (Figure 4). Of the species having statistically significant changes in landed pounds, the five species with the greatest difference in pounds landed after Sandy are graphed in Figure 6. Atlantic surfclam landings were consistent through all months pre-storm, yet dropped nearly in half immediately after Sandy and remained depressed for the whole post-storm year. *Illex* squid and Atlantic menhaden had peak landings in June to September pre-storm, but never reached those levels in the post-storm year. Peak landings of *Illex* squid in July and August post-storm were between one-third and one-half of the pre-storm peak. Atlantic menhaden landings exceeded pre-storm levels in July 2013, but landings in June, August, September and October were well below pre-storm levels. Atlantic sea scallop in New Jersey had a pattern similar to New York with a depression of landings in February to September 2013. Atlantic mackerel landings in the five-year pre-storm period peak in January to March but did not reach even 10% of pre-storm levels in any month in 2013. Four of five species that showed the most dramatic changes in dollar value of landed pounds were the same as above. The fifth was goosfish (monkfish), replacing Atlantic menhaden. Again, we cannot clearly attribute these changes to Sandy in all cases. However, no matter the cause or causes, these decreases in landings would mean less income as individuals and businesses were recovering from the storm.

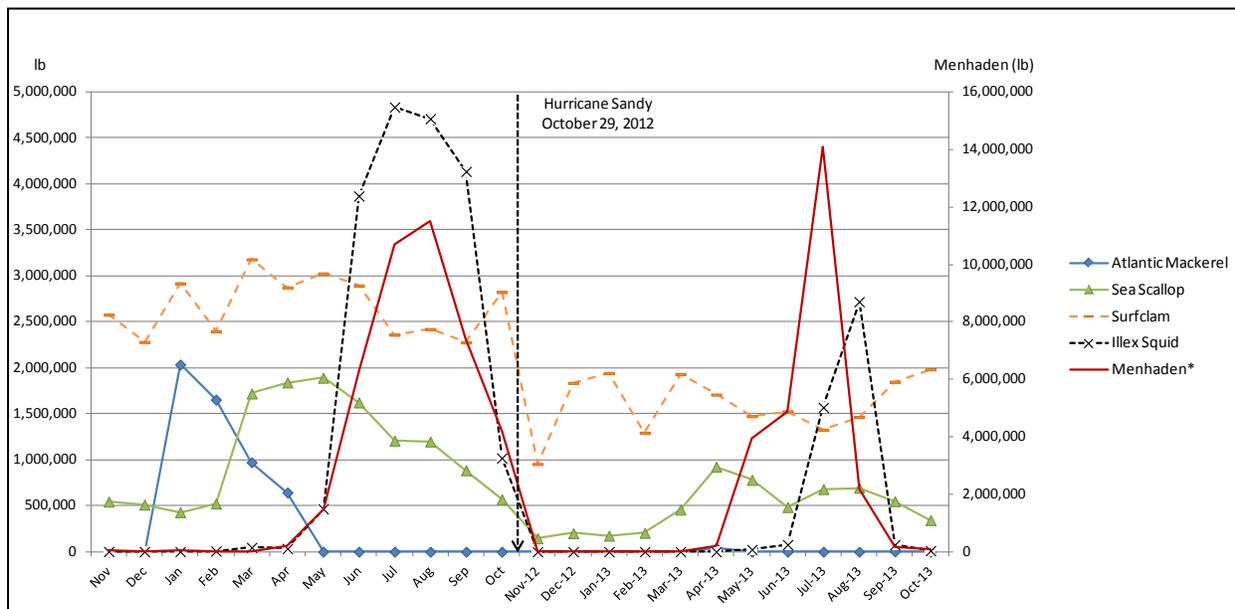


Figure 6. New Jersey - Top five species showing a change in pounds landed between the pre-storm five-year average and post-storm actual landed pounds

*** Note: Pounds of Atlantic menhaden are plotted on a secondary axis (on the right) to improve visualization (change in scale).**

iv. Recreational Fisheries Angler Activity Analyses

A bi-monthly five-year pre-storm average was calculated from NMFS Marine Recreational Information Program (MRIP) data (in number of angler trips by two-month period) for November 2007 through October 2012 for shore-based, private vessel, and for-hire vessel anglers in New York and New Jersey. These bi-monthly averages were compared to bi-monthly total numbers of angler trips for the first 6 two-month periods of the post-storm year (November 2012 through October 2013).

New York

Shore-based angler trips declined from November–December to March–April, but returned to pre-storm levels by May–June (Figure 7). Many shoreside businesses reported that even after this period customers were slow to return, believing that the shoreline had not been rebuilt (see Results, below). In the summer, activity partially rebounded but was still lower in July–August than the pre-storm average. September–October post-storm was finally close to the pre-storm average. Angler trips by *private vessels* in New York notably decreased between pre- and post-storm from November–December to July–August, but regained pre-storm levels by September–October 2013. Trips by *for-hire (charter and party) vessels* were initially similar to the five-year average in the post-storm year but then showed an increase between May and October.

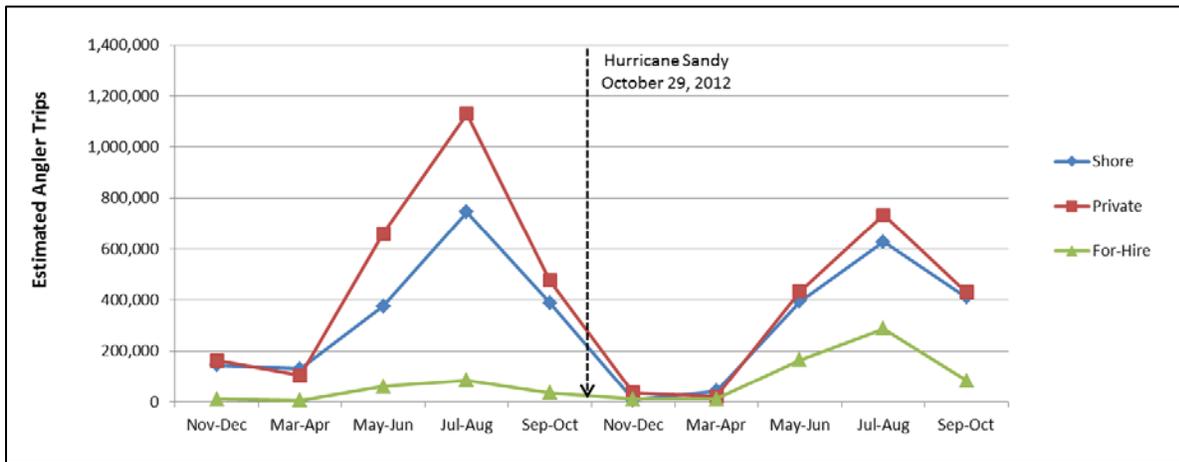


Figure 7. Pre- and post-storm changes in recreational angler activity in New York

New Jersey

Shore-based fishing in New Jersey also decreased in November–December and March–April but rebounded in the summer (Figure 8). However, summer shore-based angler trips for May to October 2013 never reached the levels they had pre-storm. *Private vessel* angler trips also notably declined in November–December and March–April and rebounded somewhat in the summer, but to lower levels than pre-storm. Trips by *for-hire vessels* in New Jersey showed an increase between May and October for the post-storm year.

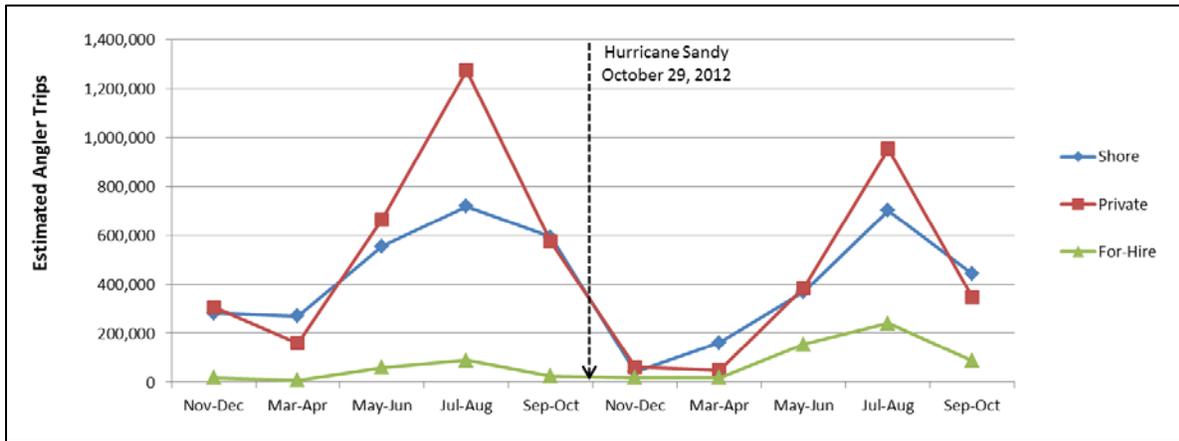


Figure 8. Pre- and post-storm changes in recreational angler activity in New Jersey

The above changes (generally decreases) in commercial landings and recreational angler activity occurred at the same time as commercial and for-hire fishermen were coping with physical damages to businesses and often homes, revenue changes, and logistical challenges (described below). Whether or not the landings and angler activity changes were due to the storm or other factors discussed previously, losses of income and social activity associated with the hurricane likely complicated community and industry recovery. The remainder of this report presents the results of a survey focused on understanding the condition of the fishing and fishing-related businesses in New York and New Jersey one year after the storm.

Research methods

A voluntary confidential survey was designed to collect information on impacts from Sandy 12 months after landfall. Information was collected on general demographics, business impacts, community recovery, individual well-being (including views on preparedness for future natural disasters), and views on climate change. The survey was presented in three different versions (Appendix B) to better address each of the three specific focus populations: commercial fishermen, recreational for-hire fishermen, and fishing-related businesses (bait and tackle stores, marinas⁴, seafood dealers, and aquaculture facilities). The three questionnaires were comparable, with minor changes in wording adapted to address each population appropriately. NMFS contracted with CIC Research, Inc., a survey research firm with commercial and recreational fishing industry data collection experience. NMFS pre-tested the survey nine times before formal implementation in February through March of 2014.

a. Survey Design

This research was designed to obtain information from different business sectors involved in commercial and recreational fishing and related industries that might have been affected by Sandy in the states of New York and New Jersey. The survey was organized in five defined sections: 1) general demographics, 2) business impacts, 3) community recovery, 4) individual well-being and preparedness for future natural disasters, and 5) views on climate change.

Demographic information on position held in the business and respondent's age was requested in all surveys. Surveys directed at commercial and recreational for-hire fishermen included questions specific to the respondent's current fishery activity such as number of vessels owned, length of principal vessel, and primary target species. This demographic information was requested to allow us to better understand the unique characteristics of the fishing industry participants in New York and New Jersey.

Business impacts covered physical damages and/or losses, revenue changes, impediments to recovery, and aids to recovery. *Community recovery* focused on changes to the respondent's community since the storm, reasons for these changes, and perceptions of potential changes in the future. *Preparedness for future natural disasters* focused on lessons learned that may improve the response to natural disasters in the future. Select questions from these sections are covered in this report. Two additional sections on *personal well-being* and *climate change* will be discussed in future publications.

b. Sampling Frame and Target Sample

The sampling frame⁵ consisted of 4,926 commercial fishing, recreational for-hire fishing, and fishing-related businesses operating in New York and New Jersey.

⁴ Some marinas have their own bait and tackle stores. In these cases the business was grouped under marinas.

⁵ The contact lists were based on the best and most comprehensive available data considered appropriate for the objectives of the survey. Therefore, the sampling frame may also be considered the survey population, i.e., the universe.

Table 3 shows the sampling frame and target sample size by sector and state. The target sample of 1,158 interviews was calculated based on a 5% confidence interval and a 95% confidence level.⁶ Because there is no single source of contact information on fishing and related industry participants, the sampling frame was assembled from multiple sources including NMFS fishing permit files, state fishing license files, marine industry organizations, the internet, and key informants. The number of federally permitted commercial and for-hire vessels was drawn from NMFS permit files. Information on commercial and for-hire fishermen with state permits was drawn from state license files. To reflect pre-storm conditions, 2012 permit and license databases were used. Seafood dealers were identified from NMFS and state agency databases.⁷ The number of marinas and bait and tackle stores was estimated based on marine trade association membership lists and internet searches. Aquaculture facilities were identified via shellfish association membership lists and key informants.

The databases were screened for duplicate individuals with multiple permit types, including any combination of commercial fishing, recreational for-hire fishing, and/or seafood dealer permits. Recognizing that it is common for fishermen to hold some combination of commercial, recreational, and/or dealer permits, these instances were evaluated on a case-by-case basis to determine to which sector the individual would be assigned for the survey. Participants could be contacted in three possible ways: mail, phone, or in-person. Participants were selected for the mail survey using a stratified (by sector) random sample approach. The sample frame for the telephone survey consisted of both non-respondents from the mail survey and others who were not selected for the mail survey but had a telephone number. A small number of in-person interviews were conducted with respondents who had not completed the survey by mail or telephone, especially if they had participated in the 60-day assessment (see Dillman 2009 on multi-mode surveys).

Table 3. Frequencies of potential frame of participants (universe) and target sample size for each sector total and by state

SECTOR	TOTAL		NY		NJ	
	Universe	Target	Universe	Target	Universe	Target
Fishing-Related Businesses	2,054	559	1,093	284	961	275
Commercial Fishermen	1,661	360	772	205	889	155
For-Hire Fishermen	1,211	239	281	77	930	162
Total	4,926	1,158	2,146	566	2,780	592

⁶ Confidence interval and confidence level are used in statistics as measures of the reliability of an estimate. A confidence interval of 5% means that the true results range between minus or plus 5% of the results obtained and a confidence level of 95% means that the results obtained are true 95% of the time. Sample sizes were calculated to achieve these standards.

⁷ New Jersey state dealer permits are only required for lobster, summer flounder, and sea bass caught in state waters. Because of this, the sampling frame may under-represent New Jersey state-only dealers who do not buy these species and are thus not required to hold a state license. This is in contrast to the state of New York, where anyone who buys food fish or crustacea from a harvester, operates a facility for packing and shipping, or traffics in food fish or crustacea is required to have a state license.

c. Implementation

Nine hundred fifty-eight commercial and for-hire fishing vessel owners/permit or license holders, seafood dealers, and owners/managers of marinas, bait and tackle stores, and aquaculture facilities completed the survey. CIC Research, Inc., mailed 2,278 pre-survey notification packages to owners/representatives of federal commercial and for-hire permitted vessels, commercial and for-hire state license holders, federal and state permitted dealers, and owners of marinas, bait and tackle stores, and aquaculture facilities. The introductory package included a cover letter describing the survey⁸ and a list of frequently asked questions (FAQs) with answers about the survey (Appendix C). This was followed one week later by a survey package that included an introduction letter, questionnaire, and business reply envelope. A reminder postcard⁹ was mailed approximately seven days later. These postcards served two purposes: 1) to thank the respondent for participating and 2) to remind those who had not yet completed the survey, but intended to do so. A toll-free number was provided in all correspondence to aid respondent efforts to complete the survey. The deliverable rate was 88.1% overall for the mail survey. Less than 4.5% of surveys mailed to commercial and for-hire fishermen were undeliverable, while non-delivery for fishing-related businesses was higher at 17.7%. While not directly comparable, a current NMFS survey of bait and tackle stores *only* had a non-delivery rate of 20% in New York and 23% in New Jersey. The mail survey yielded a response rate of 21%. Overall, 83% of the targeted number of respondents completed the mail survey.

The mail survey was followed by a telephone survey effort. Each of the 4,038 potential respondents was called at least once during this portion of the survey. The refusal rate for the telephone survey was less than 10%. Appendix D, Table E1 shows the dialing results for the telephone segment. At the completion of the phone survey effort, a small number of face-to-face interviews were conducted with a subset of people who had not responded to either the mail or telephone surveys. In-depth ethnographic information, useful in the interpretation of the survey results, was also collected during the in-person survey administration. The geographic distribution of survey results showed good coverage across both states. In some cases contact information for fishermen and seafood dealers, only, was for an inland community and differed from the coastal community from which they kept their boat or operated (Figure 9).

⁸ Copies of the cover letter will be available online at [the Social Sciences Branch of the Northeast Fisheries Science Center](#).

⁹ Copies of the postcard will be available online at [the Social Sciences Branch of the Northeast Fisheries Science Center](#).

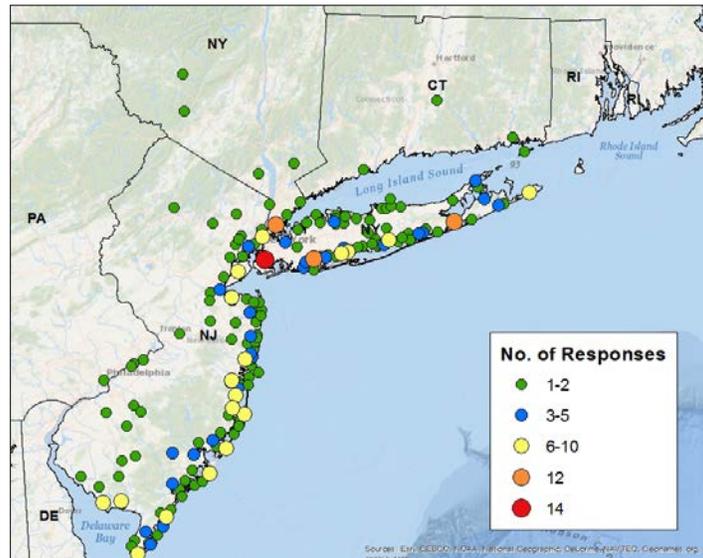


Figure 9. Geographic distribution of survey results at the community level

Survey Results

This section presents results from analyses of the survey data. It is divided into two major sections: *Characteristics of the Sample* (descriptive demographic and business data) and *Impacts from Sandy* (economic and social). Economic impacts covered are physical damages and/or losses and revenue changes. Social impacts covered are employment changes, factors impeding/aiding recovery, perceptions of community changes since the storm, and lessons learned. Each major section describes, in turn, fishermen (commercial and for-hire sectors) and fishing-related business sectors (marinas, bait and tackle stores, seafood dealers, and aquaculture facilities). Results are generally reported by number of responses (frequencies) and percentages, or as averages¹⁰ (arithmetic means). When appropriate, various statistical tests were conducted to assess whether certain variations between groups were meaningful (statistically significant). Any such meaningful variations are noted, along with the level of statistical significance (represented by the *p* value¹¹). Where there are no meaningful differences among fishermen or among fishing-related businesses, results are usually presented as group data, though tables or figures breaking out data by sector are often provided.

a. Characteristics of the Sample

i. Commercial and For-Hire Fishermen

A total of 522 commercial and for-hire fishermen were interviewed. They were chosen based on holding state fishing licenses from New York and/or New Jersey and/or holding federal fishing permits that were linked to addresses in New York or New Jersey. Overall, the average age of fishermen interviewed was

¹⁰ Averages are reported with standard deviations. Standard deviation (SD) is used to indicate the amount of variation of the data from the mean. A low SD indicates that the distribution of a variable is very close to the mean, while a high SD indicates that the values are spread apart.

¹¹ See *fn* 3.

55 (SD = 11.8) and their average length of fishing experience was 28 years (SD = 15.4). There were no statistically significant differences between commercial and for-hire fishermen for either age or experience ($p > 0.05$ ¹²). Table 4 provides the frequency (N) and percent of fishermen interviewed for each fishing sector by state.

Table 4. Frequency of fishermen interviewed by fishing sector

FISHERY SECTOR	NY		NJ		NY&NJ	
	N	%	N	%	N	%
Commercial	135	69.2	157	48.0	292	55.9
For-Hire	60	30.8	170	52.0	230	44.1
Total	195	100.0	327	100.0	522	100.0

Fishing is an important source of income in New York and New Jersey, as noted in the introduction. The majority of commercial fishermen interviewed for this survey (64%) listed fishing as their primary source of income, while the majority of for-hire fishermen (76%) listed it as a secondary source of income. From a different angle, of all fishermen (commercial and for-hire) with primary sources of income other than fishing (54% of the total), about 20% were retired, with the rest being employed elsewhere (mainly in non-fishing industries). Over 90% of both commercial and for-hire fishermen owned only 1 (most common) or 2 vessels. More than half of all vessels were 35 ft or less in length (Table 5), and the average vessel length was 36 ft (SD = 18.7).

Table 5. Primary vessel length for commercial and for-hire fishermen combined

VESSEL LENGTH CATEGORY	NY		NJ		NY&NJ	
	N	%	N	%	N	%
35 ft or less	115	59.8	202	62.3	317	61.6
36-55 ft	54	27.8	78	24.1	132	25.6
56 ft or more	24	12.4	44	13.6	66	12.8
Total	193	100.0	324	100.0	515*	100.0

*Data on vessel length was not provided by seven of the 522 respondents.

The two most commonly used gear types overall were lines (includes rod and reel, hook and line, handline, longline, and trolling) and pots/traps (for finfish, crustaceans, and mollusks¹³). These were distributed somewhat differently by fishing sector and by state. In both New York and New Jersey, for-hire fishermen in the sample used almost exclusively “lines” (Table 6). Among commercial fishermen, both lines and pots/traps were used most frequently. New Jersey fishermen, however, favored pots/traps, while lines were somewhat more common in New York (Table 6, Figure 10).

¹² T test statistic.

¹³ See Table 10 and Table 11, and accompanying footnotes for individual primary target species reported.

Table 6. Distribution of primary gear types for commercial and for-hire fishermen

GEAR TYPE	COMMERCIAL				FOR-HIRE			
	NY		NJ		NY		NJ	
	N	%*	N	%*	N	%*	N	%*
Lines ^A	54	33.1	17	9.3	60	100.0	164	95.3
Pots and traps ^B	39	23.9	95	52.2	--	--	--	--
Stationary nets ^C	20	12.3	22	12.1	--	--	--	--
Dredges ^D	11	6.7	24	13.2	--	--	--	--
Non-stationary nets ^E	21	12.9	10	5.5	--	--	1	0.6
Other ^F	18	11.0	14	7.6	--	--	7	4.1

*Percentage of responses. Some respondents provided more than one answer per survey and therefore percentages were calculated based on the total number of responses.

^A Includes rod and reel, hook and line, handline, longline, and trolling.

^B Includes any pots and traps designed to catch finfish, crustaceans, and mollusks.

^C Includes all types of gillnet, pound, fyke nets, and weirs.

^D Includes scallop, hydraulic, and crab dredges.

^E Includes all types of trawlers and seine nets.

^F Includes all other gear types for which frequency of overall responses were below 5%.

Groundfish is the species group most often targeted by fishermen overall (Figure 10 and Figure 11), but especially in New York. Bass species (mostly striped bass) were important as well, especially among for-hire fishermen in both states. Highly migratory species such as tunas, wahoo, and swordfish accounted for over 20% of responses from for-hire fishermen in New Jersey and 8% in New York. Among commercial fishermen, New York followed the broader pattern, most often targeting groundfish. But in New Jersey, the most reported target species for commercial fishermen were shellfish (such as scallops, clams, and quahogs) and crustaceans (such as lobsters and crabs). Appendix F, Table F1 shows detailed frequencies for species targeted by commercial and for-hire fishermen interviewed in New York and New Jersey.

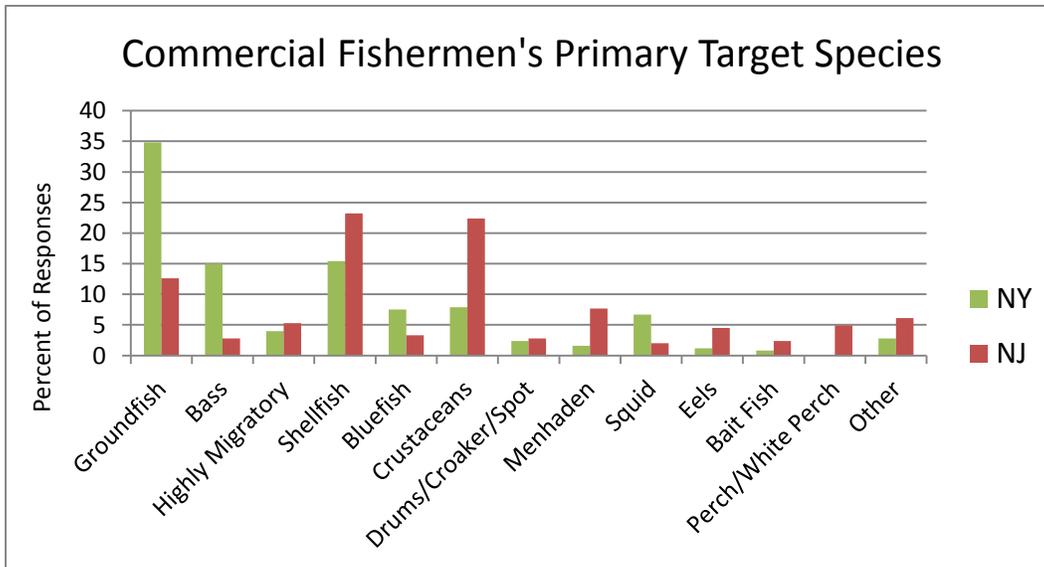


Figure 10. Frequency of primary species targeted by commercial fishermen¹

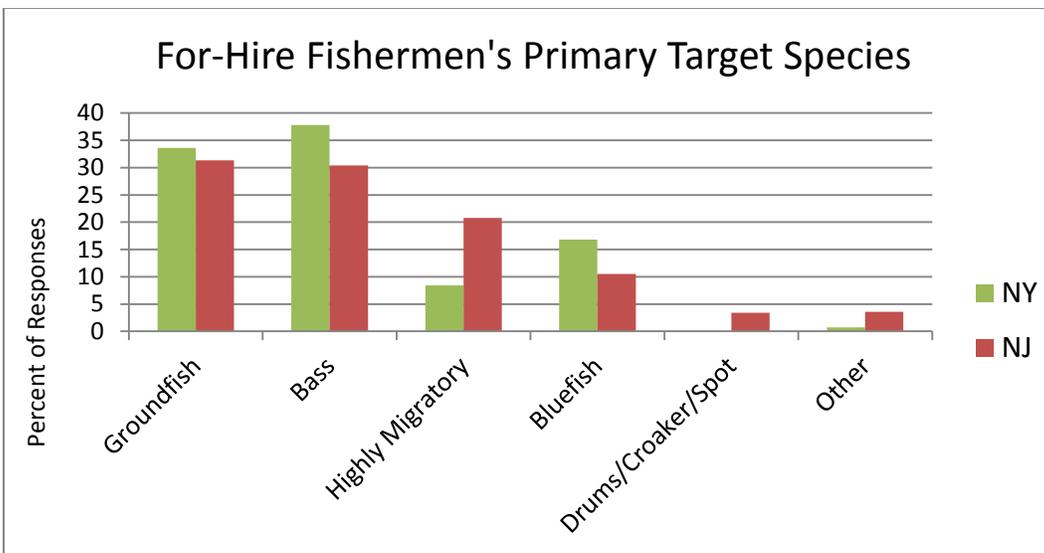


Figure 11. Frequency of primary species targeted by for-hire fishermen²

¹ Percentage of responses (not respondents) is reported, as some respondents provided more than one answer. Groundfish includes fluke/summer flounder, goosetongue, scup, skates, butterfish, tautog, sea robins (*Peprilus triacanthus*), tilefish, silver hake/whiting, and Atlantic cod, as well as the general responses “groundfish” and “bottomfish.” Bass includes striped bass and the general response “bass.” Highly migratory includes tunas (*Thunnini*), wahoo (*Acanthocybium solandri*), swordfish (*Xiphias gladius*), sharks (*Selachimorpha*), marlin (*Istiophoridae*), and Atlantic dolphinfish (*Coryphaena hippurus*). Shellfish includes scallops, clams (*Mercenaria mercenaria*; *Mya arenaria*), conch (*Strombidae*), whelk (*Buccinum undatum*), oysters (*Crassostrea virginica*), and the general response “shellfish.” Crustaceans includes American lobster (*Homarus Americanus*) and crabs. Squid includes *Loligo* squid and the general response “squid.” Baitfish includes “minnows” and the general response “bait fish.” Perch/White perch includes *Morone americana* and related species. Other includes all other species for which total frequency of responses overall was below 5%. Note: If the scientific name for any species is not listed here, it can be found in Appendix A.

² See *fn* 14.

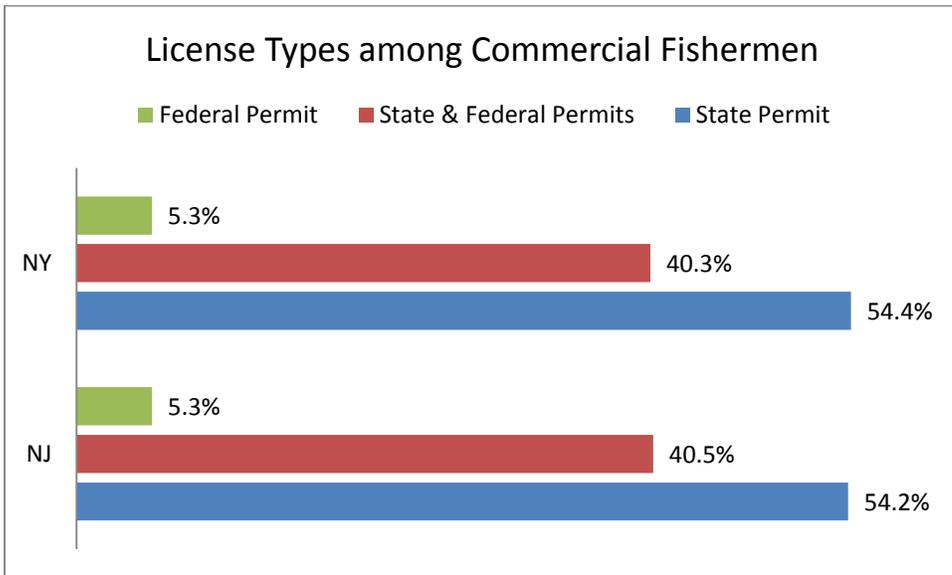


Figure 12. Frequency of permit types among commercial fishermen

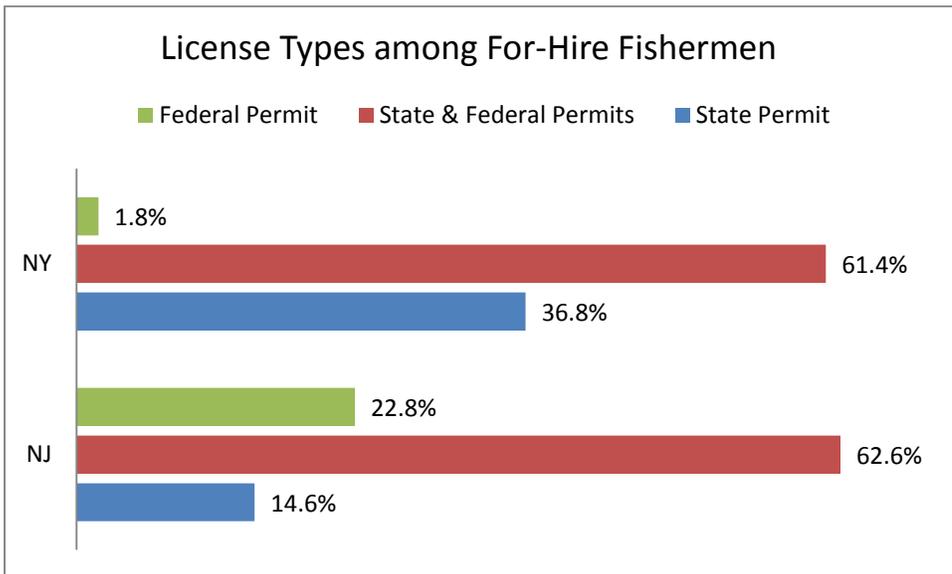


Figure 13. Frequency of permit types among for-hire fishermen

ii. Fishing-Related Businesses

A total of 430 fishing-related businesses with facilities and/or licenses to operate in New York and New Jersey were surveyed. Table 7 provides the distribution of businesses surveyed for each sector by state. Average age of respondents from all fishing-related business sectors combined was 54 (SD = 12) and average years of experience in the business was 25.7 (SD = 15.2). Owners, CEOs, or presidents constituted 70% of respondents, followed by managers (21%), employees in non-management positions (7%), and “other” positions¹⁶ (1%).

Table 7. Distribution of surveyed fishing-related businesses by sector

FISHING-RELATED BUSINESS SECTOR	NY		NJ		NY&NJ	
	N	%	N	%	N	%
Marinas*	94	47.0	141	62.4	235	54.6
Bait & Tackle Stores	44	21.5	50	22.1	94	21.9
Seafood Dealers	59	28.3	28	12.4	87	20.3
Aquaculture Facilities	7	3.2	7	3.1	14	3.2
Total	204	100.0	226	100.0	430	100.0

*Consists of marinas (including some that also have bait and tackle stores), yacht clubs, boat ramps (public or private), and boat yards.

Overall, the majority of respondents reported their respective fishing-related businesses as their primary source of income. Eighty percent of responses for most sectors reported their fishing-related business as primary, except for bait and tackle stores from New Jersey that were statistically significantly less likely to report this (only 66%, $p < 0.05$ ¹⁷). Of the overall responses¹⁸ listing a different primary source of income (14%), the majority reported being self-employed or employed elsewhere, almost exclusively in non-fishing-related businesses.

b. Impacts from Sandy

To be classified as *not* impacted required negative responses to all three of the following overarching questions: 1) Did you have to stop operating at all due to Sandy? 2) Did your fishing business experience physical damages/losses¹⁹ due to Sandy? and 3) Was your revenue affected by Sandy during the 12 months following the storm? Of the 522 commercial and for-hire fishermen surveyed, 90% reported experiencing some type of impact from Hurricane Sandy. Among fishing-related businesses, 95% out of the 430 businesses surveyed reported experiencing impacts. By sector, 90% each of commercial and for-hire fishermen, 97% each of marinas and bait and tackle stores, 87% of seafood dealers, and 93% of aquaculture facilities reported being impacted.

¹⁶ All “other” positions were reported by respondents from the sector “marinas.” Positions were: Member of Board of Directors, Village Trustee, Commodore, and Director of Public Works.

¹⁷ Chi-square statistic.

¹⁸ Some respondents provided multiple responses regarding primary source of income.

¹⁹ See *fn1*.

i. Economic impacts

Fishermen and fishing-related businesses were asked for the value of various physical damages/losses to business-related property during the 12 months following the storm.²⁰ They were also asked about percentage change in revenue due to the storm in that same time period. This section describes: 1) the average estimated value of physical damages/losses and percentage not insured and 2) the average estimated percentage change to total revenue. These values are provided first for commercial and for-hire fishermen and then for fishing-related businesses. Then statewide total values are provided for both damages/losses that were not insured and percent revenue change.

Commercial and For-Hire Fishermen

There were no statistically significant differences for value of physical damages/losses between New York and New Jersey ($p < 0.05$ ²¹). Thus only combined New York and New Jersey results are presented.

Table 8 provides a summary of the total estimates for damages/losses from Sandy experienced by commercial and for-hire fishermen interviewed. The majority of fishermen said their value calculations were either personal estimates or based on repair/replacement costs (78% of responses). Only 17% had a professional estimate (e.g., by an insurance company). However, separate categories of physical infrastructure damage (docks, vessels, buildings, etc.) are often insured differently (with some not insured at all). This means that for any individual business there will be a mixture of professional estimates and personal estimates/repair or replacement costs. Further, the difference in average value of damages between professional estimates and personal estimates/repair or replacement costs is not statistically significant. Commercial and recreational fishermen who experienced physical damages/losses reported comparable dollar amounts ($p > 0.05$), but statistically significantly more commercial fishermen than for-hire fishermen reported damages/losses ($p < 0.01$ ²²). Detailed level data, by item damaged/lost and by state for each fishing sector, can be found in Appendix F, Tables F1 through F6.

Table 8. Fishermen responses on average total costs for physical damages/losses

FISHING SECTOR	Physical Damages/Losses		Average Value of Damages/Losses (SD)	Average Insurance Coverage* (SD)
	Yes	No	\$	%
Commercial	166 (57.2%)	124 (42.8%)	39,888 (93,040)	8.8 (6.42)
For-Hire	102 (44.3%)	128 (55.7%)	29,803 (62,872)	17.8 (16.9)
Total**	268 (100%)	252 (100%)	35,979 (82,675)	13.3 (12.8)

* Based on average insurance coverage for each item listed in Appendix F.

** Total sums for counts and overall mean values.

²⁰ Total value of damages/losses was calculated by summing the individual item costs listed by respondents. A very small number of respondents (less than 5%) did not provide a breakdown of costs by item, but instead gave only an estimate of the total value. For those, the total amount provided was used.

²¹ Mann-Whitney U statistic was used for all mean value comparisons between two independent groups involving total value of physical damages/losses and percent revenue lost. Comparisons involving multiple groups were conducted using Kruskal-Wallis one-way analysis of variance. Non-parametric tests were chosen in order to account for non-normality of data distribution and the presence of outliers.

²² Chi-square statistic.

Turning to revenue, the majority of all fishermen who reported revenue changes as a result of Sandy indicated a decrease. No commercial fishermen reported an increase, and only two for-hire fishermen did. These two fishermen were from New Jersey and reported revenue gains of 10% and 20%. The gains were due to an increase in business because other for-hire vessels had more damage/losses and were unable to operate. Because the percentage of fishermen who reported increases in revenue was so small, the analyses below involving revenue change are based on only the 99% who reported revenue losses or no change. The majority of fishermen in this group (72%) reported revenue losses during the 12 months following Sandy (i.e., 28% reported no change). When the 72% were compared in terms of percentage revenue lost, commercial and for-hire fishermen reported similar values ($p>0.05$); that is, they lost proportionally about the same amount of revenue (Table 9).

Table 9. Responses from fishermen interviewed regarding occurrence of changes in revenue associated with Sandy and percentage of revenue loss (the two instances of income gain are not included)

FISHING SECTOR	Revenue Losses		Average Percent of Revenue Lost (SD)
	Yes	No	%
Commercial	209 (72.6%)	79 (27.4%)	45.2 (28.9)
For-Hire	167 (73.2%)	61 (26.8%)	45.6 (30.1)
Total*	376 (73%)	140 (27%)	45.4 (29.4)

*Total sums for counts and overall mean values.

Commercial fishermen most often reported revenue loss due to the option *a decrease in the availability of fish* (27%). They often reported in supplementary comments²³ that the “bottom” was moved around so the usual fish migrated elsewhere. One fisherman said: “Blue crab got up and moved offshore when the storm came,” and many others noted crabs “were gone.” Other reported changes in fish patterns included: “Seasons do not coincide with past fishing seasons due to habitat changes” and “Species not seen much before like croaker are now appearing.” As noted earlier, it is not possible to directly connect these impacts to Sandy, or to the storm alone. However, decreases in landings after hurricanes have been previously documented (NMFS 2007). For-hire fishermen most often reported that revenue was affected by the option *a decrease in business and/or customer base* (32% of responses). One for-hire operator added: “Not a lot of our customers knew we were sailing. It was an issue into the spring.” Both commercial and for-hire fishermen also frequently reported revenue losses from having to end the fishing season early or start the following season late (24% of commercial and 28% of for-hire responses). For these fishermen, interruption of the normal fishing season was related to damages/losses to their own equipment or to other businesses that they depend on. As one commercial fisherman noted: “My fuel, bait, and ice suppliers were out of business till the next season.” In addition, some fishermen had to see to their personal recovery, including damaged or destroyed homes.

Two other possible factors affecting revenue are time fishermen were unable to fish and/or unable to access critical fishing-related infrastructure. Overall, they reported being unable to fish for 94 days on average (SD = 122.6) and unable to access infrastructure for 73 days on average (SD = 100.1).

²³ The comments, also referred to as quotations, used in this report were drawn from responses to open ended questions. Each comment was content analyzed and coded to identify high frequency categories of responses. Specific comments from high frequency categories were then selected for inclusion in this report to provide contextual depth for the interpretation of the statistical results.

Differences between commercial and for-hire fishermen were not statistically significant ($p>0.05^{24}$). Specific issues included damaged docks or damaged and/or lost vessels and gear. Shellfish beds were closed due to pollution and presence of debris in the water. In some areas, built-up silt in the water blocked access to docks and required dredging. Some fishermen reported at the time of the interviews (early 2014) that they were still unable to fish or had gone out of business completely or for an indefinite period of time. One commercial fisherman permanently stopped because he “[...] lost everything: all the traps that I had, all my conch pots and crab pots.” A for-hire fisherman who “never started [fishing] again” simply said he is “no longer in business due to storm damages.” Another for-hire fisherman said: “I stopped completely, I lost my boat.” Although these responses represented a small percentage of the total fishermen interviewed (4% of commercial and 6% of for-hire), they illustrate the types of severe impacts that Sandy had on the fishing industry of New York and New Jersey.

Because large and small vessels can be differently impacted, due to range and sometimes species caught, damages/losses and percent lost revenue were also analyzed by vessel size. Because there were fewer vessels in the categories “medium” and “large” (see Table 5) than in “small”, for this analysis medium and large vessels were grouped together as “large.” This created two distinct size categories: 35 ft or less and more than 35 ft . Smaller vessels reported losing a statistically significantly higher percentage of their revenue ($p<0.001$) (Table 10), in other words, a greater proportional impact. One small-vessel fisherman, for instance, stated: “Before the storm I fished with approximately 1,350 traps. I now fish with about 900. This decrease of about 450 in gear and losing 6 months of work was a real disaster.” Another said: “[I’m] still trying to rebuild [my] trap count to profitable level with fish pots, instead of developing further in other parts of the business. It consumes energy/time/money, leaving not enough of each for progressing forward.”

Table 10. Vessel size categories comparisons for mean values of physical damages/losses and percentage revenue loss

	Average Value of Damages/Losses (SD)	Average Percent of Revenue Lost (SD)
VESSEL SIZE CATEGORY	\$	%
Small (≤ 35 ft)	19,817 (43,587)	50.3 (31.3)
Large (>35 ft)	61,102 (116,426)	37.6 (24.3)

Fishing-Related Businesses

Among fishing-related sectors, the value of damages/losses was not statistically significantly different between states nor between most sectors ($p>0.05$). Thus, results will generally be provided for all fishing-related businesses in both New York and New Jersey combined. The majority of fishing-related businesses interviewed (79%) experienced physical damages/losses from Sandy. The same was true for each sector individually. Nonetheless, the percents by sector were sometimes statistically significantly different from one another ($p<0.001^{25}$). For instance, for marinas the yes/no split is 92%/8% but for seafood dealers it is 55%/45% (Table 11). Average estimated damages/losses by sector are also found in Table 11. The majority of businesses reported that their value calculations were either personal estimates

²⁴ T test statistic.

²⁵ Chi-square statistic.

or based on repair/replacement costs (72% of responses). Only 27% had a professional estimate (e.g., by an insurance company). As for fishermen, separate categories of physical infrastructure damage (docks, buildings, etc.) are often insured differently (with some not insured at all). This means that for any individual business there will be a mixture of professional estimates and personal estimates/repair or replacement costs. The difference in average value of damages between professional estimates and personal estimates/repair or replacement costs is not statistically significant ($p>0.05$). Data by item damaged/lost and by state for each fishing-related sector can be found in Appendix F, Tables F1 through G6.

Table 11. Fishing-related business sector responses on average total costs for physical damages/losses

FISHING-RELATED BUSINESS SECTOR	Physical Damages/Losses		Average Value of Damages/Losses	Average Insurance Coverage*
	Yes	No	\$	%
Marina	217 (92.3%)	18 (7.7%)	391,631 (SD = 664,077)	17.9 (SD = 10.3)
Seafood Dealer	48 (55.2%)	39 (44.8%)	124,782 (SD = 254,489)	9.2 (SD = 11.1)
Bait & Tackle	61 (64.9%)	33 (35.1%)	76,446 (SD = 93,307)	8.5 (SD = 7.5)
Aquaculture	12 (85.7%)	2 (14.3%)	60,950 (SD = 70,283)	21.2 (SD = 18.7)
Total**	338 (78.6%)	92 (21.4%)	218,298 (SD = 504,206)	14.3 (SD = 12.6)

*Based on average insurance coverage for each item listed in Appendix F.

** Total sums for counts and overall mean values.

Only 4% of fishing-related businesses reported an increase in revenue as a result of Sandy. The majority of these businesses were marinas: seven in New York and five in New Jersey. One bait and tackle store from New Jersey and two from New York, as well as two seafood dealers each from New York and New Jersey, also reported increases in revenue. For the marinas, reasons were generally related to an increase in customer base due to damage to surrounding marinas (similar to the two New Jersey for-hire businesses described in the previous section), increases in repair and sales services, and insurance money associated with damages/losses to customers' boats. Only one bait and tackle store explained the revenue increase, stating it was due to an increase in business because fishermen had to replace items lost during the storm. Seafood dealers with increases mentioned reasons not necessarily associated with Sandy, such as an expansion of the business and hard work. Because the percentage of businesses who reported increases in revenue was so small, the analyses below involving revenue change are based on only the 96% who reported revenue losses or no change.

Overall, most fishing-related businesses in this group (81%) reported revenue losses during the 12 months following Sandy (i.e., 19% reported no change). This was also true by sector (see Table 12). Businesses were compared in terms of percentage of lost revenue by sector and results showed no statistically significant differences ($p>0.05$). Revenue losses were essentially the same, proportionally, across all fishing-related business sectors.

Table 12. Responses from fishing-related businesses interviewed regarding changes in revenue associated with Sandy and percentage of revenue loss (the few instances of income gain are not included)

FISHING-RELATED BUSINESS SECTOR	Revenue Losses		Average Percent of Revenue Lost (SD)
	Yes	No	%
Bait & Tackle	81 (86.2%)	13 (13.8%)	37.1 (25.9)
Seafood Dealer	65 (75.6%)	21 (24.4%)	32.5 (27.5)
Marina	190 (81.2%)	44 (18.8%)	34.9 (22.2)
Aquaculture	10 (71.4%)	4 (28.6%)	30.5 (24.0)
Total*	346 (80.8%)	82 (19.2%)	34.9 (24.2)

*Total sums for counts and overall mean values.

Fishing-related businesses as a whole most often reported that revenue losses were caused by the options *a decrease in business and/or customer base* (43% of responses) and *physical damages* (24%). One marina owner explained: “A lot of people who lost their boats cannot afford to fix them; they are fixing houses not boats.” A bait and tackle store owner similarly reported: “Damage to docks, boats, and physical damages to homes and property kept recreational fishermen from going fishing. Some have still not recovered.” *Decrease in business and/or customer base* was also the most common response chosen by individual sector (about 45% of responses), except aquaculture. The decrease in customer base may be due in part to the decreases in shore-based angler and private vessel angler trips (see tables 7 and 8), as those anglers would have been customers for bait and tackle stores and, in some cases, marinas. The option *physical damages* (35%) was most important for aquaculture facilities. The second most common response chosen by sector was *decrease in the availability of fish* for bait and tackle stores and seafood dealers, *physical damages* for marinas, and *pollution and/or presence of debris in the water* for aquaculture.

Overall, fishing-related businesses reported being unable to operate for an average of 62 days (SD = 86). For most businesses, inability to operate was related to damages/losses and lack of utilities such as electricity and water. Some seafood dealers reported a lack of product being delivered since fishermen were unable to fish. By sector, statistically significant differences in time closed for business were only found between seafood dealers and marinas (45 days, SD = 74.7 and 75 days, SD = 99.7, $p<0.05$ ²⁶). Fishing-related businesses were unable to access infrastructure (docks, facilities, etc.) for 17 days on average (SD = 34.5), mainly due to flooded streets and the presence of debris, fallen trees, and sand on the streets. Differences between fishing-related business sectors for the option *time unable to access*

²⁶ T test statistic.

infrastructure were not statistically significant ($p>0.05$ ²⁷). In addition, some fishing-related business owners had to see to their personal recovery, including damaged or destroyed homes.

Total state damages/losses

Above, the report described results of economic impacts for the specific business owners/managers interviewed in various fishing and fishing-related businesses who experienced physical damages/losses as a consequence of Sandy. Here results are used to estimate total impacts for each state (New York and New Jersey).²⁸ Estimated total value of physical damages/losses was calculated for each fishing and fishing-related business sector in New York and then New Jersey. For example, if average physical damages/losses in New York for sector “A” were \$100 per business and 10 businesses were in that sector, the total physical damages/losses for the sector in New York would be \$1,000. If the combined percent insurance coverage for all items was 15% for that sector, then the total insured damages/losses would be 15% of \$1,000, or \$150. The total damages/losses not insured, or the amount the sector businesses were responsible for, would be \$1,000 minus \$150, or \$850. Total estimates to the studied populations for physical damages/losses for New York and New Jersey are presented in Tables 13 and 14.

Table 13. Estimation of total value of physical damages/losses for all sectors in New York

PHYSICAL DAMAGES/LOSSES – NEW YORK					
SECTOR	Average Loss*	Universe	Total Loss Estimate	Average % Insured	Total Uninsured Loss
Commercial Fishermen	\$25,141	1,295	\$32,558,204	9.5	\$29,449,937
For-Hire Fishermen	\$2,482	358	\$888,735	20.8	\$704,085
Seafood Dealers	\$76,836	429	\$32,962,468	5.9	\$30,986,496
Bait & Tackle Stores	\$40,624	225	\$9,140,368	10.2	\$8,207,932
Marinas	\$312,325	534	\$166,781,550	21.9	\$130,115,794
Aquaculture Facilities	\$56,143	9	\$505,286	14.6	\$431,598
Total	--	2,850	\$242,836,611	--	\$199,895,842

*See footnote 28 for important information on calculation of average values.

²⁷ T test statistic.

²⁸ Total state damages/losses estimates are calculated using the average value of physical damages/losses for the entire sample obtained from each state and not solely for those who experienced physical damages/losses and/or revenue losses as presented in tables 8, 10 and 11 for the two states combined. This was done in order to account for the portion of each state’s target population that did not experience any physical damages/losses when estimating total state losses, i.e. to avoid overestimation of values. Since the sample obtained in this study is considered a representative sample of the target population, the portion of respondents who stated that they did not experience physical damages/losses can be used as a fair representation of the portion of the target population at the state level who did not experience physical damages/losses from Sandy.

Table 14 Estimation of total value of physical damages/losses for all sectors in New Jersey

PHYSICAL DAMAGES/LOSSES – NEW JERSEY					
SECTOR	Average Loss*	Universe	Total Loss Estimate	Average % Insured	Total Uninsured Loss
Commercial Fishermen	\$18,524	1,049	\$19,431,812	8.1	\$17,860,022
For-Hire Fishermen	\$16,655	985	\$16,405,480	18.0	\$13,448,319
Seafood Dealers	\$42,282	95	\$4,016,837	12.5	\$3,513,687
Bait & Tackle Stores	\$58,300	336	\$19,588,860	9.7	\$17,685,029
Marinas	\$377,842	618	\$233,506,628	16.1	\$195,993,671
Aquaculture Facilities	\$60,200	23	\$1,384,600	18.7	\$1,124,987
Total	--	3,106	\$294,334,219	--	\$249,625,715

*See footnote 28 for important information on calculation of average values.

Total State Percent Revenue Losses

Above, the report described results of revenue impacts for the specific business owners/managers interviewed in various fishing and fishing-related businesses that experienced revenue loss as a consequence of Sandy, i.e. only those whose revenue was affected by the storm. Here results from the overall sample are used to estimate total impacts for each state (New York and New Jersey).²⁹ Estimated total value of percent revenue loss was calculated for each fishing and fishing-related business sector in New York and then New Jersey (Tables 15 and 16).

²⁹ Total state percent revenue loss is calculated using the average percent revenue loss for the entire sample obtained from each state and not solely for those who experienced revenue losses as presented in tables 9, 10 and 12 for the two states combined. This was done in order to account for the portion of each state's target population that did not experience any revenue loss when estimating total state percent loss, i.e. to avoid overestimation of values. Since the sample obtained in this study is considered a representative sample of the target population, the portion of respondents who stated that they did not experience revenue loss can be used as a fair representation of the portion of the target population at the state level who did not experience revenue loss from Sandy. In other words, for each state if, for example, 70% of the sample (those who responded to the survey) had revenue losses and 30% did not, then it is important to take both groups into account when calculating the average that will be used to represent revenue losses for each state as whole. This is different from looking just at the sample and the level of impact for those who did experience revenue loss, as in tables 9, 10 and 12.

Table 15. Frequency of yes/no responses and average percentage revenue loss reported for the entire sample for all sectors in New York

SECTOR	Revenue Losses		Average Percent of Revenue Lost (SD)*
	Yes	No	%
Commercial Fishermen	72%	28%	27% (30.7)
For-Hire Fishermen	70%	30%	25% (29.5)
Bait & Tackle	89%	11%	34% (28.6)
Seafood Dealer	73%	27%	19% (26.2)
Marina	77%	23%	22% (23.7)
Aquaculture	86%	14%	25% (25.9)
Total	75%	25%	26% (28.2)

*See footnote 29 for important information on calculation of average values.

Table 16. Frequency of yes/no responses and average percentage revenue loss reported for the entire sample for all sectors in New Jersey

SECTOR	Revenue Losses		Average Percent of Revenue Lost (SD)*
	Yes	No	%
Commercial Fishermen	73%	27%	32% (32.6)
For-Hire Fishermen	75%	25%	35% (33.4)
Bait & Tackle	84%	16%	26% (26.2)
Seafood Dealer	81%	19%	27% (29.3)
Marina	84%	16%	28% (24.8)
Aquaculture	57%	43%	14% (22.9)
Total	77%	23%	31% (30.4)

*See footnote 29 for important information on calculation of average values.

ii. Social Impacts

Social impacts covered here are employment changes, factors impeding/aiding recovery, perceptions of community changes since the storm, and lessons learned. These are factors that may influence community and/or individual resilience and vulnerability in the face of natural disasters. Evaluating changes in the number of fishing vessel crew members and fishing-related business employees aids in understanding the effects of the storm on job security. Obstacles to recovery, factors contributing to recovery, and respondents' views about community changes resulting from the storm were evaluated to better understand community recovery. Finally, had respondents learned anything from the storm that would help them prepare for future natural disasters? If so, these lessons learned might help other individuals and communities.

Some fishermen (17%) said their crew size changed (decreased) from an average of 4 (SD = 2.8) to an average of 2 (SD = 2.4), a statistically significant difference ($p < 0.001$ ³⁰). Of those whose crew size had changed, 86% said their crew size had not yet returned to pre-storm levels after 12 months. Among fishing-related businesses, 33% reported the number of their employees changed as a consequence of Sandy. Of those who reported that their number of employees had changed, 80% said that the number was not yet back to normal after 12 months. The same was true by sector. For those fishing-related businesses that reported a change in the number of employees, only bait and tackle stores and marinas reported changes that were statistically significant, in both cases decreases. Bait and tackle stores' average number of employees before Sandy was 4 (SD = 4.0) and after was 3 (SD = 3.3) ($p < 0.001$). The average number of marina employees pre-storm was 9 (SD = 15.6) and after was 8 (SD = 14.7) ($p < 0.001$). One marina owner explained: "After clean-up I was forced to lay off my only employee until spring." Of the bait and tackle stores that reported changes to their number of employees, 87% said that the number was not yet back to normal after 12 months. The same was true for 83% of marinas that reported changes to their number of employees as a consequence of Sandy.

Most commonly, both fishermen (63%) and fishing-related businesses (39%) who reported impacts from Sandy did not report any obstacles to recovery. Among those who *did* report obstacles, the most commonly chosen option was *time to get assistance* (13% of fishermen and 21% of fishing-related business responses). Specific examples provided included bureaucratic difficulties and delays and difficulty finding material and people to do the labor because "they had too many jobs lined up." Many people mentioned problems with FEMA. Some respondents specifically attributed assistance delays to "slow payments from insurance" or "waiting for insurance checks to start all the repairs."

Most frequently mentioned as contributing to recovery was the option *family, friends, and community* (22% of responses by all fishermen and 28% by fishing-related businesses), an indicator of social bonds.³¹ By sector, only for-hire fishermen did not choose *family, friends, and community* as their top answer. Although *family, friends, and community* were also important to for-hire fishermen (20%), their most common choice was *no contributing factors* to their recovery (34% of responses). One for-hire fisherman expressed this general frustration: "I'm waiting on state money. I'm maxed out on debt. I'm at the bitter end; have no more resources." On the other hand, many fishermen and fishing-related businesses expressed a sense of community by talking in more detail about the "dedication of crew," "faithful customers," and "hard-working and willing-to-help people." One seafood dealer said his recovery was due to "customer loyalty and local fishermen." The options *employees* (16% of overall responses) and *personal effort/work* (15%) were also chosen by fishing-related businesses. One quote by a marina owner was emblematic of the majority of the responses chosen: "[t]he hard work and dedication of my employees and family."

Because all sectors (fishing and fishing-related) had almost identical answers to the question "Have there been any major changes to the community where your fishing/fishing-related business is located since Sandy?" these results are presented on an overall basis. Just over half of the respondents (58%) observed no major changes to the community where their business is located in the year following Sandy. For the remaining 42%, the most common responses were *changes in zoning, ordinances, and regulations* (17%),

³⁰ Paired sample t-test statistic was used in all analyses comparing number of crew and employees before and after Sandy.

³¹ This is comparable to the measure *friends, family, and neighbors* used in Sandy studies by AP-NORC (2014) and Tompson et al. (2013) that show the importance of social bonds to preparedness and recovery.

rebuilding and redevelopment (15%), *community still recovering/rebuilding* (13%), and *raising the height of homes located in floodplains* (12%). A couple of comments highlight key community changes of concern to residents. According to one respondent, “Many homes in the area were damaged or destroyed. Many cannot rebuild due to building regulations changing since the storm.” Another described gentrification and population loss: “People are leaving houses abandoned, less people full-time. Some lower income individuals are gone from the area. Wealthier folks setting up vacation homes, fewer year-round residents.”

A majority of all respondents (73%) said they learned something from Sandy that will help them prepare for future natural disasters of similar nature. The most frequently mentioned change people would make was *move and secure equipment and/or vessels* (29% of responses). For instance, people planned to “remove all gear from the water before a storm like this” and had learned “boats in the water fared better than boats out.” They also planned to *improve physical structures* (e.g., raising buildings per the new floodplain maps, increasing the height of banks) and *obtain mitigation supplies and/or equipment* (including generators, food, and freezers). Together *improve physical structures* and *obtain mitigation supplies and/or equipment* made up 18% of responses. The more general *improve storm readiness and prepare earlier* was similar at 14%. One respondent had learned “the importance of preparedness, having a contingency plan.” Another said he would “take evacuation seriously.” A smaller group echoed responses above regarding the importance of community, friends, and family, saying, for instance: “We learned that sticking together as fishermen and securing our vessels saved us from a major disaster” and “Most likely during an event like Sandy, the people (friends, family) right [by] you are most likely the ones who will help each other get through these storms/disasters.”

Summary

This report examines the condition of fishing and fishing-related industries in New York and New Jersey one year after Sandy. While the immediate impact of the storm on fishing communities in these states was profound and previously documented, this report provides information on longer-term impacts to communities and businesses. The devastating impacts on coastal infrastructure meant that in many cases it was weeks or months before commercial or for-hire fishermen and owners of fishing-related businesses were able to assess or describe their losses in detail. Analyses of NMFS data show that a number of fish and shellfish species commonly targeted by both commercial and for-hire fishermen had immediate decreases in landings after the storm, with negative impacts for some species lasting well into the post-storm year. However, it is not clear how much these changes (especially in the early months) were due to direct impacts to fish and habitat versus decreased fishing activity due to damaged docks and vessels, or even shifts in consumer demand or changes in regulations. In addition to the impacts on business owners and their families, crew and employees have been affected by lost work time or, in some cases, lost employment altogether. Some fishermen and other business owners will never return to their previous occupations, while many have literally picked up the pieces and re-entered the industry, harvesting stocks that responded to the storm in a variety of ways and rebuilding their customer bases along with their places of business. Encouragingly, nearly three-quarters of those surveyed indicated they learned something from Sandy that would help them prepare for and react to future storms, regulations, and other hazards. Also worth noting is the degree to which social bond with friends, family, community, and employees made a difference in people’s recovery.

a. Impacts of Sandy

i. Economic Impacts

The vast majority of participants in the study reported impacts, but not all fishing and fishing-related business sectors were impacted equally. Commercial fishermen were most concerned about stock recovery (analyses of NMFS landings data confirm decreases in landings, though precise attribution to Sandy cannot be made) and clean-up of marine debris (see NMFS 2007:43 on the similar impact of Katrina-related marine debris on Gulf Coast fishermen post-storm). For-hire fishermen and fishing-related businesses were generally most concerned about rebuilding their customer base and repairing physical damages to facilities, boats and docks. Although the initial NMFS assessment (2013:30) found that conditions steadily improved over the 4-week period following the storm (re. DOC 2013:4), this assessment found that many fishing and fishing-related businesses were still in the process of recovery after 12 months. A U.S. Department of Commerce (DOC) report on Sandy impacts on economic activity (DOC 2013:24) also found many businesses struggling a year later. Ingles (2008) reported the same for two fishing communities in Louisiana one year after Hurricane Katrina. Certainly the post Sandy difficulty in recovering was due in part to so many damages/losses not being fully insured (re. NMFS 2013:30; DOC 2013:8).

From another perspective, commercial fishermen more frequently reported physical damages/losses than did for-hire fishermen (statistically significant difference) (Table 13). Larger vessels (more than 35 ft) had larger dollar amounts of damages/losses than smaller vessels (35 ft or less) (statistically significant difference), in large part due simply to the greater initial cost of larger vessels and the larger amounts of gear and other equipment needed to operate them. In terms of revenue, however, smaller vessels had larger *proportional* percent loss than larger vessels (statistically significant difference).

Overall uninsured damages/losses estimates totaled \$200 million in New York and \$250 million in New Jersey.³² Turning to revenue, 75% of fishermen and fishing-related businesses from New York, and 77% of fishermen and fishing-related businesses from New Jersey stated that their revenue was affected by Sandy in the 12 months following the storm. In terms of overall percentage revenue lost, in New York respondents reported a 26% loss and in New Jersey respondents reported a 31% loss. Those in all sectors whose primary source of income came from fishing or a related business may have been especially hard hit by the lost time and revenue, as well as the cost of repairs and replacements. For those whose fishing/fishing-related business was a secondary source of income, however, whether they were less hard hit would have depended on impacts to their primary source of income.

Further, commercial and for-hire vessels were unable to fish for an average of three months, meaning they had to end their season early or start the following season late. They were also unable to access

³² The larger physical damage/loss numbers in this survey are due to multiple factors: 1) This survey had a larger number of respondents (60% more than in the 60-day assessment); 2) The mandated 60-day assessment, due to time constraints in formulating the sample, was able to acquire information only on fishermen with federal permits, while the population of this survey includes those with state permits (in fact, the largest group of fishermen interviewed have only state permits); 3) With more time, respondents to this survey were able to formulate a fuller estimate of all damages and had a better idea of what their insurance companies would cover; and 4) Damage caused by the storm limited access during the 60-day assessment to some of the hardest hit communities and thus potential survey respondents (among them some of the hardest hit).

infrastructure essential to their operations for an average of two and one-half months. Fishing-related businesses were unable to operate for an average of two months and to access infrastructure for just over two weeks on average. Given the importance of shoreside infrastructure (e.g., marina docks, bait and tackle stores) to fishermen, impacts to shoreside businesses would have impacted the ability of commercial and for-hire fishermen to work and private boat and shore-based anglers to pursue their recreational activities. Shore-based and private vessel angler trips were low for six months, four months longer than fishing-related businesses themselves were unable to operate. This helps to explain why marinas and bait and tackle stores reported *decrease in business and/or customer base* as the most important reason for revenue decreases.

ii. Social Impacts

Not only were vessel and fishing-related business owners impacted, so too were fishing crew and fishing-related business employees. For approximately 20% of vessel owners, crew size had decreased by a statistically significant amount and generally not returned to pre-storm levels after 12 months. Among the approximately 30% of fishing-related businesses reporting a decrease in number of employees, both marinas and bait and tackle stores had statistically significant decreases, and their employee numbers had similarly not returned to pre-storm levels a year later. DOC (2013:4) reported that unemployment claims rose substantially immediately post-storm and were not back to pre-storm levels for four weeks. Thus, crew and employees who were let go would be expected to have been at least temporarily unemployed. That their previous employers had not re-hired them after 12 months does not mean they were still unemployed. However, crew would have had difficulty taking non-fishing jobs, given the many studies that show fishermen's reluctance to leave the industry even in adverse economic circumstances (Smith and Clay 2010, Pollnac et al. 2014) and their frequent difficulty in adjusting to non-fishing jobs (Pollnac and Poggie 2008, Pollnac et al. 2014).

Turning to recovery, most businesses reported no obstacles to recovery. Where there were obstacles, the most common was *time to get assistance* (e.g., from FEMA or insurance companies). For aids to recovery, the most frequent response was *family, friends, and community*, an indicator of social bonds (re. Hawkins and Maurer 2010 on impact of social bonds on New Orleans residents' recovery after Katrina). Oberg et al. (In Press)³³ also found in a case study that New Jersey fishermen in one port severely impacted by Sandy attributed their recovery to strong social bonds (re. Chamlee-Wright and Storr 2011 on the importance of narratives of social bonds in shaping recovery strategies). This also aligns with statistical studies showing that social capital/bonds are more important than economic capital, infrastructure, or level of damage in predicting levels of recovery (Aldrich 2011). Recent research in Japan also showed that social bonds were more important than seawalls in predicting full evacuation (Aldrich and Sawada 2014). Other research on Sandy (AP-NORC 2014; Tompson et al. 2013) has showed that communities and neighborhoods with stronger social bonds generally prepared better and recovered more quickly and completely. These results point to the need for further research on the role of social bonds in the resilience of fishing communities (re. CCPR 2014:34 on the importance of building community resilience to environmental hazards from climate change). Further, social bonds can be fostered as part of future disaster preparedness planning (FEMA 2013; Magsino 2009; Shellong 2007).

³³ This work is based on results of the Rutgers-NMFS grant "Weathered Storms and Following Seas: Fisheries Recovery in the Wake of Hurricane Sandy." National Science Foundation RAPID Grant, Award No. BCS-1318074. Bonnie McCay, Patricia M. Clay and Lisa Colburn, co-PIs.

It is also interesting that close to half of the respondents saw changes to the community where their fishing or fishing-related business is based in the year following Sandy. Many affected communities were still rebuilding, a process that was complicated by changes in zoning, ordinances, and regulations that respondents attributed to Sandy. In some cases communities were experiencing a shift away from year round residency to an increase in second home ownership. Especially since fishing communities on average have higher poverty rates than the national average (NMFS 2009:4), this has the potential to displace essential commercial and recreational fishing infrastructure (Colburn and Jepson 2012: 291). Petterson et al. (2006) found that gentrification increased in the immediate aftermath of Hurricane Katrina, with fishing industries and communities losing coastal land and infrastructure to tourism and second homes for wealthier individuals.

Further, close to three quarters of respondents said they learned something from Sandy that will help them personally to prepare for future natural disasters of a similar nature: how to best safeguard their vessels, make their infrastructure more resistant to future damage, have appropriate supplies and equipment on hand in advance, and pay closer attention to weather reports and evacuation orders. This is a very encouraging result that can be built upon in the future, in part through strengthening social bonds.

Conclusions

Major factors leading to different levels of impact on different fishing industry sectors in New York and New Jersey were: source of primary income, level of insurance coverage, and, in some cases, size of operation. Degree of impact was also driven by the relative dependence on and impacts to: the ocean (e.g., changes in fish stocks and debris in the water), infrastructure, and customer base. At the community level, a factor worth noting was that impacts to one business could cause ripple effects that led to greater overall community impacts (e.g., a downturn in for-hire or other recreational fishing means fewer customers for a bait and tackle store). The most chosen option for aid to recovery was *family, friends, and community* or social bonds. Social bonds were not a primary focus of the survey. However, the importance of social bonds in improving individual and community resilience has been shown in other disasters, though few such studies target fishing communities. The frequency of the response on social bonds in this survey indicates that more work will be important in the future to establish the exact relationship of strength of social bonds to level of recovery in fishing communities. In terms of modes of recovery, many respondents reported new building regulations in their communities after Sandy (e.g., new requirements from the National Flood Insurance Program). Although these changes will make communities safer in the long run, they will require financial outlays for home owners and businesses. After a hurricane, lower income individuals and industries are at risk due to increased rates of gentrification. Some fishing and fishing-related waterfront infrastructure is therefore expected to be repurposed, more so than would have occurred without the storm. Nonetheless, despite the severe impacts, or perhaps even because the severity brought them face-to-face with their own vulnerability, many individuals feel they have learned from Sandy how to better prepare for and react to future storms and other disasters and hazards. This may ultimately be a key factor in reducing impacts from future storms to commercial and recreational fishing industries, and coastal communities more broadly. Finally, lessons learned by the researchers are the importance of keeping baseline data and sample frames up to date. These two factors will facilitate and improve the ability to quickly and accurately assess impacts to future disasters, as well as to conduct impact assessments for regulatory changes.

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Appendix A

Table A1. Species common and scientific names for commercial fisheries landings data analyses

<i>Common Name(s)</i>	<i>Scientific Name</i>
American eel	<i>Anguilla rostrate</i>
American lobster	<i>Homarus americanus</i>
American plaice/dabs	<i>Hippoglossoides platessoides</i>
American shad	<i>Alosa mediocris</i>
Atlantic bluefin tuna	<i>Thunnus thynnus</i>
Atlantic cod	<i>Gadus morhua</i>
Atlantic halibut	<i>Hippoglossus hippoglossus</i>
Atlantic herring	<i>Clupea harengus</i>
Atlantic mackerel	<i>Scomber scombrus</i>
Atlantic menhaden	<i>Brevoortia tyrannus</i>
Atlantic Pollock	<i>Pollachius virens</i>
Atlantic salmon	<i>Salmo salar</i>
Atlantic sea scallop	<i>Placopecten magellanicus</i>
Atlantic sturgeon	<i>Acipenser oxyrhynchus</i>
Atlantic surfclam	<i>Spisula solidissima</i>
Atlantic wolffish	<i>Anarhichas lupus</i>
black sea bass	<i>Centropristis striata</i>
black tip shark	<i>Carcharhinus limbatus</i>
blacknose shark	<i>Carcharhinus acrontus</i>
bluefish	<i>Pomatomus saltatrix</i>
butterfish	<i>Peprilus triacanthus</i>
coastal shark	<i>Chondrichthyes</i>
cobia	<i>Rachycentron canadum</i>
croaker	<i>Micropogonias undulates</i>
deep sea red crab	<i>Chaceon quinquedens</i>
goosefish/monkfish	<i>Lophius americanus</i>
haddock	<i>Melanogrammus aeglefinus</i>
horseshoe crab	<i>Limulus Polyphemus</i>
<i>Illex</i> squid	<i>Illex illecebrosus</i>
king mackerel	<i>Lutjanus synagris</i>
<i>Loligo</i> squid	<i>Doryteuthis (Amerigo) pealeii</i>
ocean pout	<i>Zoarces americanus</i>
ocean quahog	<i>Arctica islandica</i>
offshore hake	<i>Merluccius albidus</i>
skates	<i>Rajidae</i>
oyster toadfish	<i>Opsanus tau</i>
red drum	<i>Sciaenops ocellatus</i>
red hake	<i>Urophycis chuss</i>
redfish	<i>Sebastes fasciatus</i>

windowpane flounder/sand dab	<i>Scophthalmus aquosus</i>
sandbar shark	<i>Carcharhinus plumbeus</i>
scup	<i>Stenotomus chrysops</i>
shortfin mako shark	<i>Isurus oxyrinchus</i>
silver hake/whiting	<i>Merluccius bilinearis</i>
Spanish mackerel	<i>Scomberomorus maculatus</i>
spiny dogfish	<i>Squalus acanthias</i>
spot	<i>Leiostomus xanthurus</i>
striped bass	<i>Morone saxatilis</i>
summer flounder/fluke	<i>Paralichthys dentatus</i>
tautog	<i>Tautoga onitis</i>
tilefish	<i>Lopholatilus chamaeleonticeps</i>
weakfish/drum	<i>Cynoscion regalis</i>
white hake	<i>Urophycis tenuis</i>
winter flounder	<i>Pseudopleuronectes americanus</i>
witch flounder	<i>Glyptocephalus cynoglossus</i>
yellowfin tuna	<i>Thunnus albacares</i>
yellowtail flounder	<i>Limanda ferruginea</i>

**A Survey on
HURRICANE SANDY'S IMPACT
ON FISHING-RELATED BUSINESSES**



We want to learn about how you were affected
by Hurricane Sandy during the year following the storm.
Participation in this survey is voluntary.

Your Response is Important!



Sponsored by
NOAA Fisheries Service
Social Sciences Branch
Northeast Fisheries Science Center
Woods Hole, MA

Please address any questions you have regarding this survey to Lisa Colburn, Principal Investigator, at:
Phone: 401-782-3253/Fax: 401-782-3201/Email: lisa.l.colburn@noaa.gov

All answers in this survey should reflect *YOUR OWN* perceptions of the long-term impacts of Hurricane Sandy on your fishing-related business or activity, based on your personal experience and knowledge.

THANK YOU FOR YOUR TIME AND PARTICIPATION!

The information you provide will remain strictly **CONFIDENTIAL**.
You will not be identified with your answers.

SECTION A – IMPACT OF HURRICANE SANDY ON BUSINESS

This section will help us understand the impacts of Hurricane Sandy on businesses like yours and the level of recovery achieved so far.

1. Type of business (Please check all that apply):
 Bait & tackle Seafood dealer Marina Aquaculture
 Other business (please specify): _____
2. What is your position in the business? _____
3. What is your age? _____
4. How many years have you been involved in this business? _____
5. Is this business your primary source of income? Yes (If yes, go to question 6) No
 - 5.1. If no, what other jobs/businesses do you currently have? _____

6. Did this business close due to Hurricane Sandy? Yes No (If no, go to question 6.2)
 - 6.1. If yes, how long? _____
 - 6.2. If no, was the normal business schedule affected by Sandy? Yes No (If no, go to question 7)
 - 6.2.1. If yes, how? _____

7. Were you prevented from accessing your business? Yes No (If no, go to question 8)
 - 7.1. If yes, how long? _____
8. *If applicable:* Has the business returned to a normal schedule since the storm?
 Yes (If yes, go to question 8.2) No Not applicable
 - 8.1. *If no*, what percent is it to normal? (Circle one:) 75% 50% 25% 10% 0%
 - 8.2. *If yes*, how long did it take for it to return to a normal schedule? _____
9. Average number of people employed annually before Hurricane Sandy: _____
 - 9.1. Changes due to the storm, if any: increased or decreased (Check one) to: _____ No. of employees
 - 9.2. *If applicable:* has the number of employees gone back to what it was before the storm?
 Yes No (If no, go to question 10) Not applicable (If not applicable, go to question 10)
 - 9.2.1 *If yes*, how long did it take for it to go back? _____

10. Did this business experience physical damages or losses due to Hurricane Sandy?

- Yes No (If no, go to question 11)

10.1. If yes, and indicate the value of damages or losses and percentage insured for all that apply:

Item	Damages/ Losses	% Insured - Circle one answer per item					
		100%	75%	50%	25%	10%	0%
Buildings	\$	100%	75%	50%	25%	10%	0%
Floating docks	\$	100%	75%	50%	25%	10%	0%
Bait	\$	100%	75%	50%	25%	10%	0%
Product (fresh fish or bait)	\$	100%	75%	50%	25%	10%	0%
Merchandise	\$	100%	75%	50%	25%	10%	0%
Gear (nets, pots, traps, etc.)	\$	100%	75%	50%	25%	10%	0%
Vessel(s)	\$	100%	75%	50%	25%	10%	0%
Other (specify) _____ _____	\$	100%	75%	50%	25%	10%	0%

10.2. What is the total estimated value of physical damages or losses to your business before insurance?

\$ _____

10.3. Where are you getting your calculation? (for example, Insurance Company) _____

11. Was your revenue affected by Hurricane Sandy during the 12 months following the storm?

- Yes No (If no, go to question 12)

11.1. If yes, how? (Compare to the 12 months prior to Sandy)

Increased by % _____ or Decreased by _____ %

11.2. If yes, describe why your revenue was affected:

- Business was/is down
- Closed early for the season
- No fish
- Physical damages
- Other (please specify) _____

11.3. What is the estimated value of lost revenue for the 12 months following Sandy? \$ _____

12. Do you attribute any changes in your business to Hurricane Sandy?

- Yes No (if *no*, go to question 13)

12.1. If *yes*, describe: _____

13. Are there other factors affecting your business?

- Yes No (if *no*, go to question 14)

13.1. If *yes*, describe: (Please check all that apply)

- Weather
 Economy
 Market prices
 Fuel prices
 Pollution
 Climate Change
 Regulations
 Other (specify) _____

14. Did you relocate your business operation due to the storm?

- Yes (if *yes*, go to question 14.2) No

14.1. If *no*, do you plan to relocate your business?

- Yes No (if *no*, go to question 15)

14.2. If *yes*, why? _____

15. What, if any, impediments to recovery did you experience? (Please check all that apply)

- Building permits
 Zoning, ordinances, etc.
 Time to get assistance
 Other: _____
 None

16. If affected by Hurricane Sandy, what do you credit your level of recovery to? (Please check all that apply)

- Family, friends, church, community groups, etc.
- Bank loan
- Unemployment benefits
- FEMA
- SBA
- Other: _____
- Not applicable/Not affected

17. Would you say that Hurricane Sandy had any positive impacts on your business?

- Yes No (If *no*, go to question 18)

17.1. If yes, what? _____

SECTION B – COMMUNITY RECOVERY

This section helps understand how communities may have been affected by Hurricane Sandy as well as perceptions of potential changes to the communities in the future.

18. Have there been any major changes to the community where your business is located *since* Hurricane Sandy?

- Yes No (If *no*, go to question 19)

18.1. If yes, what? (for example, zoning, ordinances, redevelopment, etc.): _____

19. What, if any, changes *do you foresee* for this community as a result of Hurricane Sandy? _____

SECTION C – WELL-BEING

This section is intended to capture the ability of the participant to be prepared for and cope with change in general and in relation to natural disasters.

20. Please tell us how much you agree with each of the statements below.

Statements	Your opinion – check one box for each statement				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. I have other options available if I decide to no longer be in my current occupation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am confident that I could get work elsewhere if I needed to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I would be nervous trying something outside of my current occupation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I have planned for my financial security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Every time there is a change I plan a way to make it work for myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I am more likely to adapt to change compared to others in this business.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I do not think I am competitive enough to continue in this business much longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I am confident things will turn out well for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. If there are any more natural disasters on the scale of Hurricane Sandy I will not be able to continue in this business much longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. I can cope with impacts to my business due to natural disasters such as Hurricane Sandy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. I am interested in learning new skills outside my current occupation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION D – PERCEPTIONS & LEARNING

This section is intended to capture lessons learned from Hurricane Sandy that will help in future preparedness and adaptation to natural disasters.

21. Do you think Hurricane Sandy was caused by climate change (either natural or man-made)?

- Yes No I don't know (If *do not know*, go to question 22)

21.1. If yes or no, why or why not? _____

22. Would you say you learned anything from Hurricane Sandy that will help you prepare for future natural disasters?

- Yes No

22.1. If yes, what did you learn? _____

A Survey on HURRICANE SANDY'S IMPACT ON COMMERCIAL FISHING INDUSTRIES



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All answers in this survey should reflect *YOUR OWN* perceptions of the long-term impacts of Hurricane Sandy on your fishing business or activity, based on your personal experience and knowledge

THANK YOU FOR YOUR TIME AND PARTICIPATION!

**The information you provide will remain strictly CONFIDENTIAL.
You will not be identified with your answers.**

SECTION A –IMPACTS OF HURRICANE SANDY ON BUSINESS

This section will help us understand the impacts of Hurricane Sandy on businesses like yours and the level of recovery achieved so far.

1. What is your position on the boat? (Check all that apply):

- Vessel Owner (Shore Captain)
- Owner Operator
- Captain
- Crew
- Other: _____

2. What is your age? _____

3. Do you own a fishing vessel? Yes No (If *no*, go to question 4)

3.1. If *yes*, how many fishing vessels do you own? _____

4. What is the primary gear type used on the vessel you primarily fish on or receive the most income from? _____

5. What is the length of the vessel you primarily fish on or receive the most income from? _____

6. What is the primary species caught from the vessel you primarily fish on or receive the most income from? _____

7. What is your homeport? _____

8. Do you fish ...? (check all that apply) inshore off shore

9. Do you have...? (check all that apply) federal fishing permits state fishing permits

10. How many years of fishing experience do you have? _____

11. Is fishing your primary source of income? Yes (If *yes*, go to question 11) No

11.1 If *no*, what other jobs/businesses do you currently have? _____

12. Did you have to stop fishing at all due to Hurricane Sandy? Yes No (If *no*, go to question 11.2)

12.1 If *yes*, how long? _____

12.2 If *no*, was your normal fishing schedule affected by Sandy? Yes No (If *no*, go to question 12)

12.2.1 If *yes*, how? _____

13. Were you prevented from accessing the docks, vessel or other infrastructure indispensable for your fishing activity?

Yes No (If *no*, go to question 13)

13.1. If *yes*, how long? _____

14. If applicable: Has your fishing activity returned to a normal schedule since the storm?

Yes (If *yes*, go to question 14.2) No Not applicable

14.1. If *no*, what percent is it to normal? (Circle one:) 75% 50% 25% 10% 0%

14.2. If *yes*, how long did it take for it to return to a normal schedule? _____

15. Average crew size before Hurricane Sandy: _____

15.1. Changes due to the storm, if any, increased or decreased (Check one) to: _____ No. of crew

15.2. If applicable: has the crew size gone back to what it was before the storm?

Yes No (If *no*, go to question 16) Not applicable (If *not applicable*, go to question

16)

15.2.1. If *yes*, how long did it take for it to go back? _____

16. Did your fishing business experience physical damages or losses due to Hurricane Sandy?

Yes No (If *no*, go to question 17)

16.1. If *yes*, indicate the value of damages or losses and percentage insured for all that apply:

Item	Damages/ Losses	% Insured - Circle one answer per item					
Bait	\$	100%	75%	50%	25%	10%	0%
Product (for example: fresh fish)	\$	100%	75%	50%	25%	10%	0%
Gear (for example: nets, pots, traps)	\$	100%	75%	50%	25%	10%	0%
Vessel(s)	\$	100%	75%	50%	25%	10%	0%
Other (specify) _____	\$	100%	75%	50%	25%	10%	0%

16.2. What is the total estimated value of physical damages or losses to your fishing business before insurance?

\$ _____

16.3. From where are you getting your calculation? (for example, Insurance Company) _____

17. Was your revenue affected by Hurricane Sandy during the 12 months following the storm?

- Yes No (If *no*, go to question 18)

17.1. If *yes*, how? (Compare to the 12 months prior to Sandy)

Increased by _____% or Decreased by _____%

17.2. If *yes*, describe why your revenue was affected:

- Business was/is down
 Ended season early
 No fish
 Physical damages
 Other (please specify) _____

17.3. What is the estimated value of lost revenue for the 12 months following Sandy? \$ _____

18. Do you attribute any changes in your fishing business to Hurricane Sandy?

- Yes No (If *no*, go to question 19)

18.1. If *yes*, describe: _____

19. Are there other factors affecting your fishing business?

- Yes No (If *no*, go to question 20)

19.1. If *yes*, describe: (Please check all that apply)

- Weather
 Economy
 Market prices
 Fuel prices
 Pollution
 Climate Change
 Regulations
 Other (specify) _____

20. Did you relocate any aspect of your fishing operation (for example: homeport, fishing grounds) due to the storm?

- Yes (If *yes*, go to question 20.2) No

20.1. If *no*, do you plan to relocate your business?

- Yes No (if *no*, go to question 20)

20.2. If *yes*, why? _____

21. What, if any, impediments to recovery did you experience? (Please check all that apply)

- Building permits
- Zoning, ordinances, etc.
- Time to get assistance
- Other: _____
- None

22. If affected by Hurricane Sandy, what do you credit your level of recovery to? (check all that apply)

- Family, friends, church, community groups etc...
- Bank loan
- Unemployment benefits
- FEMA
- SBA
- Other: _____
- Not applicable/Not affected

23. Would you say that Hurricane Sandy had any positive impacts on the fishery?

- Yes No (If no go to question 23)

23.1. If yes, what? _____

SECTION B – COMMUNITY RECOVERY

This section helps understand how communities may have been affected by Hurricane Sandy as well as perceptions of potential changes in the communities in the future.

24. Have there been any major changes to the community where your fishing business is located *since* Hurricane Sandy?

- Yes No (If no, go to question 25)

24.1. If yes, what? (for example, zoning, ordinances, redevelopment, etc.): _____

25. What, if any, changes *do you foresee* for this community as a result of Hurricane Sandy? _____

SECTION C – WELL-BEING

This section is intended to capture the ability of the participant to be prepared for and cope with change in general and in relation to natural disasters.

26. Please tell us how much you agree with each of the statements below.

Statements	Your opinion – check one box for each statement				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. I have other options available if I decide to no longer be a fisherman.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am confident that I could get work elsewhere if I needed to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I would be nervous trying something outside the fishery.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I have planned for my financial security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Every time there is a change I plan a way to make it work for myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I am more likely to adapt to change compared to other fishermen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I do not think I am competitive enough to be a fisherman much longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I am confident things will turn out well for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. If there are any more changes due to natural disasters such as Hurricane Sandy, I will not be able to continue to be a fisherman much longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. I can cope with impacts to the fishery due to natural disasters such as Hurricane Sandy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. I am interested in learning new skills outside the fishery.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION D – PERCEPTIONS & LEARNING

This section is intended to capture lessons learned from Hurricane Sandy that will help in future preparedness and adaptation to natural disasters.

27. Do you think Hurricane Sandy was caused by climate change (either natural or man-made)?

- Yes No I don't know (If *do not know*, go to question 28)

27.1. If yes or no, why or why not? _____

28. Would you say you learned anything from Hurricane Sandy that will help you prepare for future natural disasters?

- Yes No (If *no*, go to the back page of the survey)

28.1. If yes, what did you learn? _____

28.2. What, if any, different measures will you take in the future to prepare for natural disasters such as Hurricane Sandy?

29. Date this survey was completed: _____

I would like to be notified when the final report is available. My email address is:

_____ @ _____

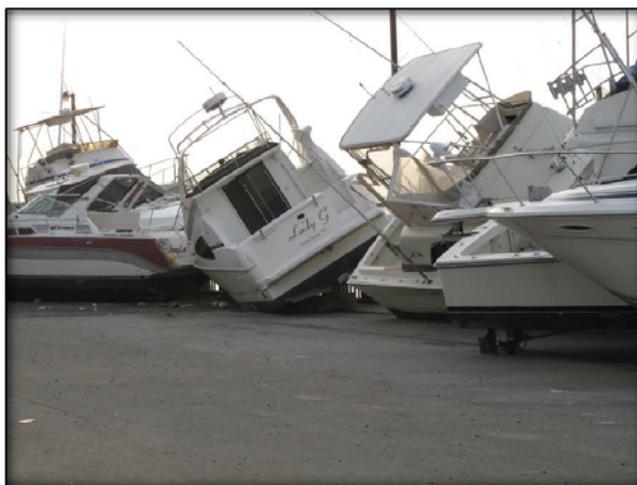
THANK YOU FOR PARTICIPATING IN THIS SURVEY!

Please feel free to provide comments below regarding the survey or anything else you would like us to know about your experience with Hurricane Sandy.

OMB Control No. 0648-0686. Expiration Date: 12/31/2016

Public reporting burden for this collection of information is estimated to average 25 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other suggestions for reducing this burden to Lisa L. Colburn, 28 Tarzwell Dr., Narragansett, RI 02882. Email: lisa.l.colburn@noaa.gov

**A Survey on
HURRICANE SANDY'S IMPACT ON
RECREATIONAL FISHING INDUSTRIES**



We want to learn about how you were affected by Hurricane Sandy during the year following the storm. Participation in this survey is voluntary.

Your Response is Important!



Sponsored by
NOAA Fisheries Service
Social Sciences Branch
Northeast Fisheries Science Center
Woods Hole, MA

Please address any questions you have regarding this survey to Lisa Colburn, Principal Investigator, at:
Phone: 401-782-3253/Fax: 401-782-3201/Email: lisa.l.colburn@noaa.gov

All answers in this survey should reflect *YOUR OWN* perceptions of the long-term impacts of Hurricane Sandy on your fishing business or activity, based on your personal experience and knowledge

THANK YOU FOR YOUR TIME AND PARTICIPATION!

The information you provide will remain strictly **CONFIDENTIAL**.
You will not be identified with your answers.

SECTION A –IMPACTS OF HURRICANE SANDY ON BUSINESS

This section will help us understand the impacts of Hurricane Sandy on businesses like yours and the level of recovery achieved so far.

1. What is your position on the boat? (Check all that apply):

- Vessel Owner (Shore Captain)
- Owner Operator
- Captain
- Crew
- Other: _____

2. What is your age? _____

3. Do you own a fishing vessel? Yes No (If *no*, go to question 4)

3.1. If yes, how many fishing vessels do you own? _____

4. What is the primary gear type used on the vessel you primarily fish on or receive the most income from? _____

5. What is the length of the vessel you primarily fish on or receive the most income from? _____

6. What is the primary species caught from the vessel you primarily fish on or receive the most income from? _____

7. What is your homeport? _____

8. Do you fish . . . ? (check all that apply) inshore off shore

9. Do you have . . . ? (check all that apply) federal fishing permits state fishing permits

10. How many years of experience on the party/charter business do you have? _____

11. Is the party/charter business your primary source of income? Yes (If *yes*, go to question 12) No

11.1 If *no*, what other jobs/businesses do you currently have? _____

12. Did you have to stop operating at all due to Hurricane Sandy? Yes No (If *no*, go to question 12.2)

12.1. If *yes*, how long? _____

12.2. If *no*, was your normal business schedule affected by Sandy? Yes No (If *no*, go to question 13)

12.2.1. If *yes*, how? _____

13. Were you prevented from accessing the docks, vessel or other infrastructure indispensable for your party/charter activity?

Yes No (If *no*, go to question 14)

13.1. If *yes*, how long? _____

14. If applicable: Has your business returned to a normal schedule since the storm?

Yes (If *yes*, go to question 14.2) No Not applicable

14.1. If *no*, what percent is it to normal? (Circle one:) 75% 50% 25% 10% 0%

14.2. If *yes*, how long did it take for it to return to a normal schedule? _____

15. Average crew size before Hurricane Sandy: _____

15.1. Changes due to the storm, if any: increased or decreased (Check one) to: _____ No. of crew

15.2. If applicable: has the crew size gone back to what it was before the storm?

Yes No (If *no*, go to question 16) Not applicable (If *not applicable*, go to question 16)

15.2.1. If *yes*, how long did it take for it to go back? _____

16. Did your party/charter business experience physical damages or losses due to Hurricane Sandy?

Yes No (If *no*, go to question 17)

16.1. If *yes*, indicate the value of damages or losses and percentage insured for all that apply:

Item	Damages/ Losses	% Insured - Circle one answer per item					
		100%	75%	50%	25%	10%	0%
Bait	\$						
Product (for example: fresh fish)	\$						
Gear (for example: nets, pots, traps)	\$						
Vessel(s)	\$						
Other (specify) _____	\$						

16.2. What is the total estimated value of physical damages or losses to your party/charter business before insurance?

\$ _____

16.3. From where are you getting your calculation? (for example, Insurance Company) _____

17. Was your revenue affected by Hurricane Sandy during the 12 months following the storm?

Yes No (If *no*, go to question 18)

17.1. If yes, how? (Compare to the 12 months prior to Sandy)

Increased by _____% or Decreased by _____%

17.2. If yes, describe why your revenue was affected:

- Business was/is down
- Ended season early
- No fish
- Physical damages
- Other (please specify) _____

17.3. What is the estimated value of lost revenue for the 12 months following Sandy? \$ _____

18. Do you attribute any changes in your party/charter business to Hurricane Sandy?

- Yes
- No (If no, go to question 19)

18.1. If yes, describe: _____

19. Are there other factors affecting your party/charter business?

- Yes
- No (If no, go to question 20)

19.1 If yes, describe: (Please check all that apply)

- Weather
- Economy
- Market prices
- Fuel prices
- Pollution
- Climate Change
- Regulations
- Other (specify) _____

20. Did you relocate any aspect of your party/charter operation (for example: marina, fishing grounds) due to the storm?

- Yes (If yes, go to question 20.2)
- No

20.1. If no, do you plan to relocate your business?

- Yes
- No (if no, go to question 21)

20.2. If yes, why? _____

21. What, if any, impediments to recovery did you experience? (Please check all that apply)

- Building permits
- Zoning, ordinances, etc.
- Time to get assistance
- Other: _____
- None

22. If affected by Hurricane Sandy, what do you credit your level of recovery to? (check all that apply)

- Family, friends, church, community groups etc...
- Bank loan
- Unemployment benefits
- FEMA
- SBA
- Other: _____
- Not applicable/Not affected

23. Would you say that Hurricane Sandy had any positive impacts on the party/charter business?

- Yes No (If no, go to question 24)

23.1. If yes, what? _____

SECTION B – COMMUNITY RECOVERY

This section helps understand how communities may have been affected by Hurricane Sandy as well as perceptions of potential changes in the communities in the future.

24. Have there been any major changes to the community where your business is located since Hurricane Sandy?

- Yes No (If no, go to question 25)

24.1. If yes, what? (for example, Zoning, ordinances, redevelopment, etc.): _____

25. What, if any, changes do you foresee for this community as a result of Hurricane Sandy? _____

SECTION C – WELL-BEING

This section is intended to capture the ability of the participant to be prepared for and cope with change in general and in relation to natural disasters.

26. Please tell us how much you agree with each of the statements below.

Statements	Your opinion – check one box for each statement				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a. I have other options available if I decide to no longer be in my current occupation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am confident that I could get work elsewhere if I needed to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I would be nervous trying something outside the occupation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I have planned for my financial security.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Every time there is a change I plan a way to make it work for myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I am more likely to adapt to change compared to other in this business.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I do not think I am competitive enough to continue in this business much longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I am confident things will turn out well for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. If there are any more changes due to natural disasters such as Hurricane Sandy, I will not be able to continue in this business much longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. I can cope with impacts to my business due to natural disasters such as Hurricane Sandy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. I am interested in learning new skills outside my current occupation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION D – PERCEPTIONS & LEARNING

This section is intended to capture lessons learned from Hurricane Sandy that will help in future preparedness and adaptation to natural disasters.

27. Do you think Hurricane Sandy was caused by climate change (either natural or man-made)?

- Yes No I don't know (If *do not know*, go to question 28)

27.1. If yes or no, why or why not? _____

28. Would you say you learned anything from Hurricane Sandy that will help you prepare for future natural disasters?

- Yes No (If *no*, go to the back page of the survey)

28.1. If yes, what did you learn? _____

28.2 What, if any, different measures will you take in the future to prepare for natural disasters such as Hurricane Sandy? _____

29. Date this survey was completed: _____

I would like to be notified when the final report is available. My email address is:

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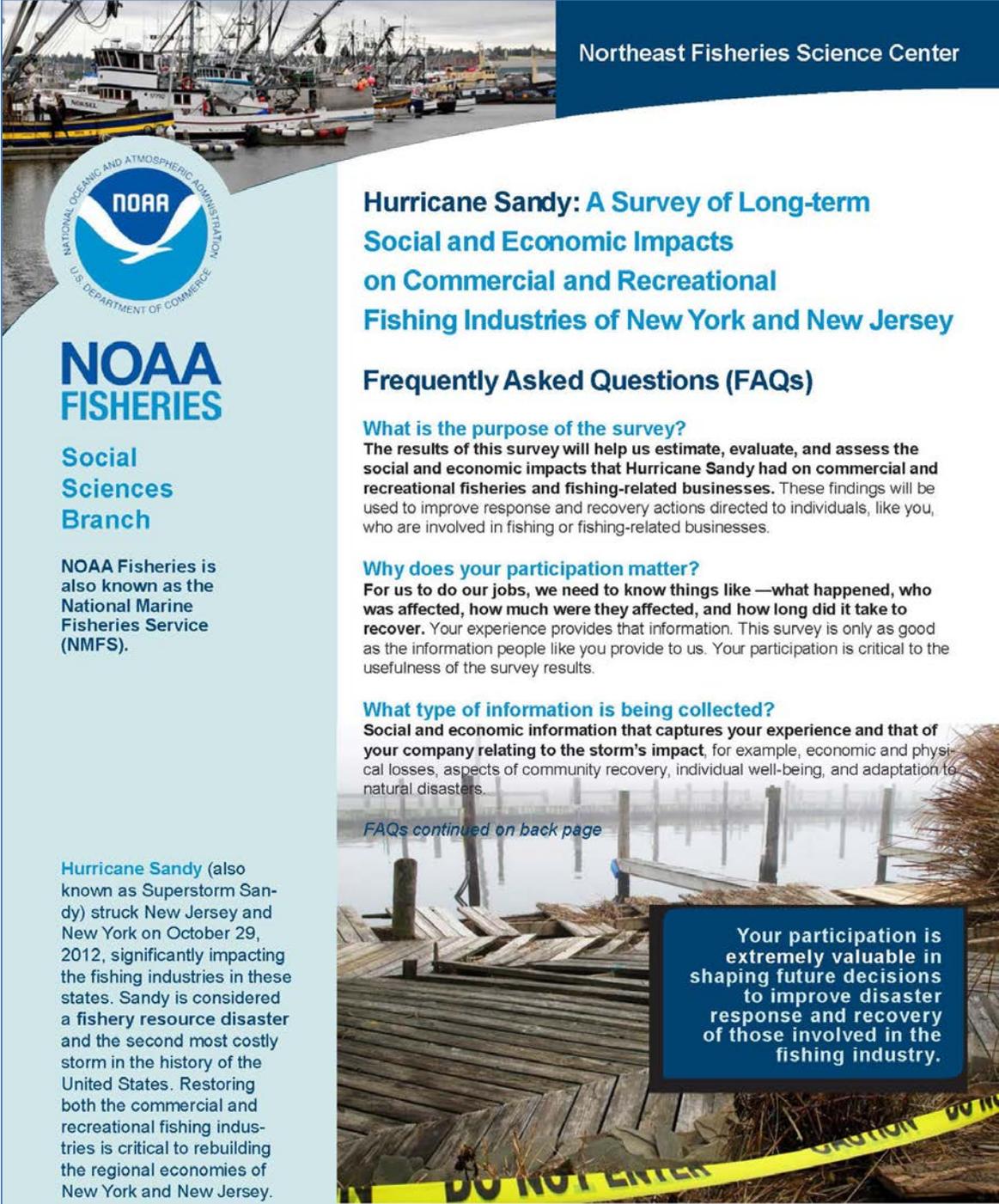
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Appendix C

FAQ Sheet



Northeast Fisheries Science Center



**NOAA
FISHERIES**

**Social
Sciences
Branch**

NOAA Fisheries is also known as the National Marine Fisheries Service (NMFS).

Hurricane Sandy (also known as Superstorm Sandy) struck New Jersey and New York on October 29, 2012, significantly impacting the fishing industries in these states. Sandy is considered a fishery resource disaster and the second most costly storm in the history of the United States. Restoring both the commercial and recreational fishing industries is critical to rebuilding the regional economies of New York and New Jersey.

Hurricane Sandy: A Survey of Long-term Social and Economic Impacts on Commercial and Recreational Fishing Industries of New York and New Jersey

Frequently Asked Questions (FAQs)

What is the purpose of the survey?

The results of this survey will help us estimate, evaluate, and assess the social and economic impacts that Hurricane Sandy had on commercial and recreational fisheries and fishing-related businesses. These findings will be used to improve response and recovery actions directed to individuals, like you, who are involved in fishing or fishing-related businesses.

Why does your participation matter?

For us to do our jobs, we need to know things like —what happened, who was affected, how much were they affected, and how long did it take to recover. Your experience provides that information. This survey is only as good as the information people like you provide to us. Your participation is critical to the usefulness of the survey results.

What type of information is being collected?

Social and economic information that captures your experience and that of your company relating to the storm's impact, for example, economic and physical losses, aspects of community recovery, individual well-being, and adaptation to natural disasters.

FAQs continued on back page

Your participation is extremely valuable in shaping future decisions to improve disaster response and recovery of those involved in the fishing industry.

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service



Who are we asking to participate?

People engaged in **commercial and for-hire fishing and fishing related businesses**, including seafood dealers, bait and tackle stores, marinas, and aquaculture facilities.

Who is conducting this survey?

The **Social Sciences Branch of NOAA Fisheries Northeast Fisheries Science Center (NEFSC)** is conducting this survey. We conduct applied economic and sociocultural research on the management of commercial and recreational fisheries. It is our commitment to perform independent, relevant, and accessible research aimed at providing useful input to the decision making process in fisheries management.

When is this survey being conducted?

This survey will begin in **February 2014** and last approximately two months.

How long will this survey take?

The survey will take **approximately 25 minutes** to complete. However, times may vary.

How do I benefit from participating?

You become part of the solution. The information you provide is very important and valuable in improving our understanding of **fishery** industry recovery and disaster responses.

How will I be sure my data is confidential?

Data collected will be kept confidential as required by section 402(b) of the Magnuson-Stevens Act and NOAA Administrative Order 216-100, Confidentiality of Fisheries Statistics, and will not be released for public use except in aggregate statistical form without identification as to its source. That means that no one else can know if you participated in this study and no one else can find out what your answers were. Participation or lack of participation in the survey will remain confidential. **Participation is entirely voluntary.**

Who will see the information I give?

The information you provide will be combined with responses from other participants and analyzed. The analysis of the data will be added to reports or publications and available for anyone who is interested in the research.

How can I get a copy of the final report?

A copy of the final report will be available this summer on the Social Sciences Branch website at: <http://www.nefsc.noaa.gov/read/socialsci/>.

If you have any questions, concerns or would prefer to complete the survey over the phone, contact:

Lisa Colburn
 Northeast Fisheries Science Center
lisa.l.colburn@noaa.gov
 401-782-3253

Appendix D

Table D1. Results of the telephone survey dialing effort.

Telephone Survey Dialing Results		All Sample		Business		Commercial		For-Hire	
		N	%	N	%	N	%	N	%
Unable to Reach Respondent	No answer	477	11.80	135	28.30	143	10.70	199	18.40
	Answering machine	1233	30.50	278	6.90	454	34.10	501	46.30
	Busy number	27	0.70	11	0.70	11	0.80	5	0.50
	Callback	269	6.70	121	7.50	107	8.00	41	3.80
Contacted but Incomplete	Refusal	334	8.30	195	12.00	85	6.40	54	5.00
	Mid-term terminate	17	0.40	8	0.50	6	0.50	3	0.30
	Refusal-little or no impact	30	0.70	15	0.90	14	1.10	1	0.10
	Mail survey preferred	86	2.10	46	2.80	28	2.10	12	1.10
	Not a fishing-related business	174	4.30	45	2.80	94	7.10	35	3.20
	Communication issue	33	0.80	28	1.70	2	0.20	3	0.30
	Company policy against surveys or no longer with company	15	0.40	13	0.80	2	0.20	0	0.00
Unable to Contact	Respondent never available	117	2.90	88	5.40	21	1.60	8	0.70
	Number not in service	593	14.70	372	22.90	157	11.80	64	5.90
	Wrong number	152	3.80	90	5.50	42	3.20	20	1.80
Completed Surveys		481	11.90	179	11.00	165	12.40	137	12.70
Total Sample Used		4,038	100.00	1,624	100.00	1,331	100.0	1,083	100.0
Response Rate			55.80		45.10		61.10		70.30
Refusal Rate			9.40		13.40		7.90		5.40

Appendix E

Table E1. Distribution of primary target species.

TARGET SPECIES	COMMERCIAL				FOR-HIRE			
	NY		NJ		NY		NJ	
	N	%*	N	%*	N	%*	N	%*
Groundfish ^a	88	34.8	31	12.6	48	33.6	140	31.3
Bass ^b	38	15.0	7	2.8	54	37.8	136	30.4
Highly migratory ^c	10	4.0	13	5.3	12	8.4	93	20.8
Shellfish ^d	39	15.4	57	23.2	--	--	3	0.7
Bluefish	19	7.5	8	3.3	24	16.8	47	10.5
Crustaceans ^e	20	7.9	55	22.4	--	--	4	0.9
Drums/croakers/spot	6	2.4	7	2.8	--	--	15	3.4
Atlantic menhaden	4	1.6	19	7.7	1	0.7	--	--
Squid ^f	17	6.7	5	2.0	--	--	--	--
Eels	3	1.2	11	4.5	--	--	--	--
Bait fish ^g	2	0.8	6	2.4	--	--	--	--
Perch/white perch	--	--	12	4.9	--	--	--	--
Other ^h	7	2.8	15	6.1	--	--	9	2.0

* Percentage of responses. Some respondents provided more than one answer per survey and therefore percentages were calculated based on the total number of responses.

^A Includes flounders, fluke, monkfish, scup, skates, butterfish, tautog, sea robin, tilefish, whiting, and cod as well as the general responses 'groundfish' and 'bottomfish.'

^B Includes striped bass and the general response 'bass.'

^C Includes tunas, wahoo, swordfish, sharks, marlin, and dolphinfish.

^D Includes scallops, clams, conch, whelk, oysters, and the general response 'shellfish.'

^E Includes lobster and crabs.

^F Includes *Loligo* squid and the general response 'squid.'

^G Includes minnows and the general response 'bait fish.'

^H Includes all other species for which total frequency of responses overall was below 5%.

Appendix F

Table F1. Mean of estimated value per item and average percentage insured for damages/losses to Commercial fishing.

ITEMS	NEW YORK			NEW JERSEY		
	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)
Gear	27,706 (81,453)	61.2 (51)	7.0 (22.4)	15,450 (31,225)	78.6 (66)	7.1 (22.9)
Vessel	26,059 (88,989)	37.8 (31)	24.0 (37.9)	37,239 (90,558)	27.4 (23)	23.3 (40.8)
Bait	3,780 (9,759)	31.7 (26)	3.6 (19.8)	3,610 (8,475)	19.0 (16)	4.2 (17.7)
Product	35,406 (100,544)	29.6 (24)	8.6 (24.2)	18,470 (24,342)	20.2 (17)	7.9 (26.0)
Docks	3,342 (5,208)	8.5 (7)	11.1 (20.2)	30,146 (40,885)	10.7 (9)	8.3 (28.9)
Equipment	2,950 (2,417)	4.9 (4)	8.3 (20.4)	8,255 (9,169)	10.7 (9)	0.0 (0.0)

*Mean value and standard deviation of damages reported by commercial fishermen for each item listed.

**Percentage from the total number of commercial fishermen who reported physical damages/losses for each item listed. Total does not equal 100% because one respondent could report physical damages/losses for more than one item per survey. Number of cases who reported physical damages/losses is presented in parentheses.

Table F2. Mean of estimated value per item and average percentage insured for damages/losses to For-Hire fishing.

ITEMS	NEW YORK			NEW JERSEY		
	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)
Vessel	10,291(9,374)	63.1 (12)	62.4 (47.0)	30,037 (48,618)	77.1 (64)	57.5 (44.3)
Bait	318 (233)	42.1 (8)	3.1 (8.8)	1,243 (1,858)	38.5 (32)	11.0 (30.4)
Gear	3,760 (6,356)	26.3 (5)	15.0 (33.5)	7,500 (15,845)	41.0 (34)	22.3 (38.4)
Equipment	1,350 (1,866)	15.8 (3)	0.0 (0.0)	4,457 (5,759)	19.3 (16)	0.0 (0.0)
Docks	--	--	--	28,950 (33,200)	9.6 (8)	9.1 (23.1)
Product	--	--	--	321 (147)	8.4 (7)	11.1 (33.3)

*Mean value and standard deviation of damages reported by for-hire fishermen for each item listed.

**Percentage from the total number of for-hire fishermen who reported physical damages/losses for each item listed. Total does not equal 100% because one respondent could report physical damages/losses for more than one item per survey. Number of cases who reported physical damages/losses is presented in parentheses.

Table F3. Mean of estimated value per item and average percentage insured for damages/losses to Marinas.

ITEMS	NEW YORK			NEW JERSEY		
	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)
Buildings	157,461 (214,343)	62.8 (59)	38.7 (40.8)	251,056 (714,699)	60.7 (85)	33.7 (38.9)
Docks	143,123 (279,712)	55.3 (52)	20.1 (37.0)	180,818 (411,998)	48.6 (69)	21.3 (34.1)
Merchandise	90,275 (126,883)	41.5 (39)	28.6 (37.9)	79,496 (103,339)	37.1 (52)	18.7 (29.6)
Equipment	45,454 (57,965)	23.4 (22)	11.8 (27.8)	52,694 (81,796)	27.9 (39)	12.4 (26.4)
Vessel	102,000 (190,926)	21.3 (20)	41.1 (44.2)	107,034 (233,773)	20.7 (29)	26.5 (40.4)
Bait	3,800 (3,653)	10.6 (10)	2.9 (12.1)	4,869 (10,450)	12.9 (18)	4.5 (16.7)
Product	17,277 (23,330)	9.6 (9)	8.3 (19.5)	33,014 (56,036)	10.0 (14)	11.2 (27.9)
Gear	28,033 (36,602)	6.4 (6)	19.2 (37.0)	15,568 (25,983)	5.7 (8)	3.1 (8.5)

*Mean value and standard deviation of physical damages/losses reported by Marina owners or managers for each item listed.

**Percentage from the total number of Marina owners or managers who reported physical damages/losses for each item listed. Total does not equal 100% because one respondent could report physical damages/losses for more than one item per survey. Number of cases who reported physical damages/losses is presented in parentheses.

Table F4. Mean of estimated value per item and average percentage insured associated with physical damages/losses to Seafood Dealers.

ITEMS	NEW YORK			NEW JERSEY		
	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)
Product	105,321 (260,959)	23.7 (14)	8.3 (22.5)	6,035 (7,998)	17.8 (5)	16.7 (35.3)
Buildings	94,150 (118,091)	16.9 (10)	27.1 (41.9)	99,800 (113,182)	17.8 (5)	18.9 (34.4)
Gear	68,000 (75,547)	8.4 (5)	0.0 (0.0)	13,800 (11,630)	32.1 (9)	0.0 (0.0)
Merchandise	5,120 (4,364)	8.4 (5)	12.5 (35.3)	40,583 (51,946)	10.7 (3)	45.8 (51.0)
Bait	2,925 (4,728)	6.8 (4)	0.0 (0.0)	1,066 (1,250)	10.7 (3)	0.0 (0.0)
Equipment	64,333 (108,831)	5.0 (3)	20.0 (44.7)	2,666 (2,020)	10.7 (3)	12.5 (30.6)
Docks	10,000 (7,071)	3.4 (2)	0.0 (0.0)	56,500 (92,442)	14.3 (4)	0.0 (0.0)
Vessel	--	--	--	1,971 (1,001)	10.7 (3)	0.0 (0.0)

*Mean value of physical damages/losses reported by Seafood Dealer business owners or managers for each item listed.

**Percentage from the total number of Seafood Dealer business owners or managers who reported physical damages/losses for each item listed. Total does not equal 100% because one respondent could report physical damages/losses for more than one item per survey. Number of businesses who reported physical damages/losses is presented in parentheses.

Table F5. Mean of estimated value per item and average percentage insured for physical damages/losses to Bait & Tackle Stores.

ITEMS	NEW YORK			NEW JERSEY		
	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)
Bait	11,776 (19,325)	38.6 (17)	6.2 (25.0)	6,094 (12,036)	34.0 (17)	13.1 (33.2)
Buildings	53,923 (79,260)	29.5 (13)	8.5 (21.2)	40,000 (56,055)	38.0 (19)	22.8 (35.3)
Merchandise	25,818 (25,040)	25.0 (11)	2.3 (7.5)	64,500 (110,572)	34.0 (17)	7.5 (20.0)
Product	12,933 (20,792)	34.1 (15)	6.7 (25.8)	23,427 (44,409)	22.0 (11)	3.6 (9.1)
Equipment	10,257 (14,331)	29.5 (13)	1.8 (6.7)	13,700 (20,577)	10.0 (5)	25.0 (46.3)
Docks	23,700 (20,819)	11.4 (5)	15.0 (33.5)	18,000 (16,970)	4.0 (2)	37.5 (47.9)
Gear	18,400 (27,471)	6.8 (3)	0.0 (0.0)	3,000 (1,802)	6.0 (3)	0.0 (0.0)
Vessel	3,000 (--)	2.3 (1)	--	17,000 (13,527)	6.0 (3)	0.0 (0.0)

*Mean value and standard deviation of physical damages/losses reported by Bait & Tackle store owners or managers for each item listed.

**Percentage from the total number of Bait & Tackle owners or managers who reported physical damages/losses for each item listed. Total does not equal 100% because one respondent could report physical damages/losses for more than one item per survey. Number of businesses who reported physical damages/losses is presented in parentheses.

Table F6. Mean of estimated value per item and average percentage insured for physical damages/losses to Aquaculture Facilities.

ITEMS	NEW YORK			NEW JERSEY		
	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)	Average Value \$ (SD)*	% Reported (N)**	Average % Insured (SD)
Gear	27,600 (20,032)	71.4 (5)	12.5 (25.0)	30,500 (41,719)	28.6 (2)	33.3 (57.7)
Buildings	50,000 (35,355)	28.6 (2)	0.0 (0.0)	23,833 (35,694)	42.8 (3)	0.0 (0.0)
Product	22,500 (3,535)	28.6 (2)	0.0 (0.0)	126,500 (174,655)	28.6 (2)	0.0 (0.0)
Equipment	100,000 (--)	14.3 (1)	--	3,000 (--)	14.3 (1)	--
Merchandise	10,000 (--)	14.3 (1)	--	15,000 (--)	14.3 (1)	--
Vessel	10,000 (--)	14.3 (1)	--	--	--	--
Bait	--	--	--	400 (--)	14.3 (1)	--

*Mean value of physical damages/losses reported by Aquaculture Facilities owners or managers for each item listed. Standard deviations were not reported for aquaculture due to the small sample size for most items.

**Percentage from the total number of Aquaculture Facilities owners or managers who reported physical damages/losses for each item listed. Total does not equal 100% because one respondent could report physical damages/losses for more than one item per survey. Number of cases who reported physical damages/losses is presented in parentheses.