

Natural and Manmade Disasters: Continuing Nemesis for Louisiana, Mississippi, and Alabama Fishing Communities Pre- and Post-Katrina

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Introduction

Gulf of Mexico (GOM) fisheries are among the nation's most productive and diverse. As long as people have inhabited the coastal areas of Texas, Louisiana, Mississippi, Alabama, and the west coast of Florida, fishermen have made their living and enhanced their families' diets through harvesting the abundant marine resources in the region's bayous and waterways. Today both commercial and recreational fishermen pursue diverse species including shrimp, e.g., *Penaeus* spp.; reef fish such as grouper, *Serranidae* spp.;

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red snapper, *Lutjanus campechanus*; black drum, *Pogonias cromis*; and amberjack, *Carangidae* spp.; Spanish, *Scomberomorus maculatus*, and king, *Scomberomorus cavalla*, mackerel; shark, e.g., *Carcharhinus* spp.; blue crab, *Callinectes sapidus*; oysters, *Crassostrea virginica*; and menhaden, *Brevoortia patronus*.

The GOM region is also a major source of the nation's oil and gas resources. According to the U.S. Energy Information Administration¹, in 2012 federally-leased GOM offshore leases accounted for 23% of U.S. crude oil production and 7% of total U.S. dry production. The region is also home to more than 40% of the total U.S. petroleum refining capacity and 30% of the total U.S. natural gas processing plant capacity.¹ The GOM petroleum and natural gas industries have been an important aspect of the region's overall

¹U.S. Energy Information Administration, Gulf of Mexico Factsheet, <http://www.eia.gov/special/gulfofmexico/>, accessed 16 August 2013.

economy and human and natural ecosystem for several decades beginning in Texas and Louisiana in the 1930's and moving east to include Mississippi and Alabama by the 1970's and 1980's. So far, Florida is not involved with the petroleum industry.

Fishermen also work in the petroleum industry, and petroleum workers often fish commercially and recreationally. Oil rigs can become aggregations of marine life, and they can also be the source of their destruction.

Likewise, the GOM is a high-risk region for damaging tropical storms and hurricanes. Major hurricanes in the last decade include Ivan in 2004; Dennis, Katrina, Rita, and Wilma in 2005; Gustav and Ike in 2008; and Isaac in 2012. The worst of these storms, Hurricane Katrina, damaged Florida, Alabama, Mississippi, and Louisiana, but its worst fury struck an area stretching from Lafourche Parish in eastern Louisiana west of New Orleans to Baldwin County in Alabama.

ABSTRACT—On 29 August 2005, Hurricane Katrina came ashore devastating coastal communities in the northern Gulf of Mexico. As the storm crossed the wetlands south of New Orleans boats were sunk, houses and businesses were destroyed, and lives were drastically changed. Hurricane Katrina happened at a time when the region's fishing industry was already facing economic hardship. It marked the beginning of a series of major calamities between 2007 and 2012 including three more hurricanes, a major Mississippi River flood, a major recession, and the Deepwater Horizon (DWH) oil spill that have continued to challenge the fishing industry in the Gulf of Mexico. The paper begins with a detailed examination of Hurricane Katrina's damage to fishing infrastructure in fishing communities in Lou-

isiana, Mississippi, and Alabama that were followed for nine months post-Katrina as part of a NMFS-funded social impact assessment (SLA). Next the paper highlights the major natural and manmade disasters that have affected marine fisheries in Louisiana, Mississippi, and Alabama between 2005–12. The impacts of this series of disasters are examined as they relate to 1) changes in population between 2000–10 in the fishing communities originally followed in the post-Katrina SLA, 2) changes in numbers of processing plants and processing plant employees between 2003–12, and 3) changes in pounds landed and their value as reported by NMFS for Louisiana, Mississippi, and Alabama during the same period. Although the area as a whole has lost population, some fishing communities have lost significantly more, particularly

Louisiana, while some, in Alabama and Mississippi, have gained. There has been an overall decline in both numbers of processors, wholesalers, and their employees during the period examined; the 2004–07 period coinciding with repeated hurricanes shows the sharpest declines. Pounds of fish landed, while impacted by hurricanes and the DWH oil spill, rebounded by 2011–12 to their highest level since 2003; their highest value occurs in 2011–12 as well. The fishing industry in these states as measured by pounds and value of landings has shown an ability to recover from the shock of hurricane damage and oil spill closures over the past decade, but the longer-term economic downward trends measured by numbers of processors, wholesalers, and their employees remain unchanged.

This paper first describes damage to commercial and recreational fishing infrastructure in a set of local fishing communities that received the greatest impact from Hurricane Katrina, comparing data on initial losses to their subsequent state of recovery nine months later in May 2006. It then highlights a series of natural and manmade disasters that have further impacted these areas between 2006 and 2012. We conclude with general observations on conditions in 2012—seven years after Katrina. To begin the story, an overview of the condition of the GOM fisheries prior to the storm will set the stage.

The GOM Fisheries Before Hurricane Katrina

The Gulf's commercial fishing industry has long been subject to international, national, and regional economic and social influences, and national and state regulatory impacts. It was in flux before Hurricane Katrina² (Ingles, 2008).

The steady rise in the cost of marine diesel fuel since 1970 was having a significant impact. Nationwide, the average price for marine diesel fuel increased from \$1.11 per gallon in 1995 to \$1.81 per gallon in 2004, a 61.3% increase in the decade prior to Katrina. Marine diesel fuel is the only fuel used to power commercial fishing vessels (IAI²:13; Travis and Griffin³: 3), and the rising price had increased the cost of harvesting the Gulf's marine resources.

With favorable loans from banks and boat manufacturers in the 1990's, some commercial fishermen bought large shrimp trawlers with electric

freezers taking on "...big notes for big boats...", as one fisherman in Grand Isle, La., commented.⁴ In 2005, a new shrimp trawler 80 ft in length with a steel hull could cost \$700,000–\$800,000, not including essential equipment. The price of the booms, nets, and electronics to outfit these new fishing vessels and refurbish others was also steadily increasing.

Imported, farm-raised shrimp have gained a significant market share in the domestic U.S. marketplace in the last two decades. By 1996, only 21.3% of the federally permitted U.S. supply of shrimp was caught in U.S. waters (NMFS, 2001:83). The percentage of U.S. caught shrimp continued to decline each year between 2000 and 2004, when it stood at 11.1% (NMFS, 2008:71). By 2005, a year later, it was only 9.8% of the U.S. supply of shrimp (NMFS, 2008:71).

Within the U.S. shrimp fishery, the GOM shrimp fishery was dominant. Slightly more than 82%, or 214.4 million lbs (heads on), of the domestic shrimp landed in the United States in 2005 were landed in the Gulf of Mexico. The value of the Gulf shrimp was over \$356 million.

The major season for Gulf shrimping is June through September, so it was nearing its end when Katrina struck in late August 2005 (Fig. 1). Competition from imported seafood began affecting the price paid at the dock for local seafood—a particularly serious problem in the shrimp fishery. Price competition from imported shrimp resulted in declining dock prices paid for wild shrimp (IAI²:10–12; Travis and Griffith³). In 2004, shrimpers commented during an interview that by the time they paid for fuel and other supplies, and paid their crew, they earned less than their total expenses.^{4, 5}

As dock prices for shrimp fell, it became harder for the owners of larger vessels to pay the bank notes and also afford the fuel for a long fishing trip. Throughout the Gulf, shrimp boats could be seen tied up at the docks, sometimes in groups of three, four, or five, no longer working. Banks began repossessing boats. By the summer of 2005, few banks were financing new commercial fishing boats or even providing loans for maintenance and repairs.⁶

To try to offset increasing costs and declining revenues, some boat owners began to limit or delay boat maintenance. They also began dropping boat insurance, whose cost had also been rising steadily during the same period (Travis and Griffith³:6). Some Louisiana shrimp dealers commented to an interviewer that some of those fortunate enough to own and operate smaller, more fuel-efficient boats that fished closer to shore were beginning to alter their fishing strategy by returning to the docks after only a few days instead of staying out for several days. Fishermen said they used this strategy so they could buy less fuel for each trip, requiring less cash output. They further commented that captains were also reducing the number of crew hired on their vessels and relying more on labor from family members. Despite these adaptations, many shrimpers recognized that no matter what cost saving measures they employed, the cost of fuel coupled with the low price paid for shrimp at the dock was going to eventually put many of them out of business.⁷

Management measures on all types of fishing in 2005 included marine protected areas that restricted fishing, gear restrictions such as the turtle exclusion devices for shrimp nets, re-

²The following description, unless otherwise noted, is based on the "Preliminary Assessment of the Impacts of Hurricane Katrina on Gulf of Mexico Coastal Fishing Communities," Final Tech. Rep. prepared for NMFS by Impact Assessment, Inc., released in 2007 (<http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/FINAL-PUBLIC-N.pdf>) accessed 9 Dec. 2013.

³Travis, M. D., and W. L. Griffin. 2004. Update on the economic status of the Gulf of Mexico commercial shrimp fishery. April 5, 2004. Rep. SERO-Econ-04-01, NMFS Southeast Reg. Off., St. Petersburg, Fla., 13 p. (<http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/EconUpdateGulfShrFinal.pdf>) accessed 9 Dec. 2013.

⁴Notes from interviews conducted by Palma Ingles (bunnypevas@hotmail.com) for NMFS with fishermen and processors in Grand Isle, La., August 2006.

⁵Also see Travis and Griffith (footnote 3) who corroborate the general decline in the commercial shrimp industry.

⁶Notes from interviews conducted by Palma Ingles (bunnypevas@hotmail.com) for NMFS with fishermen and processors in Grand Isle and Empire-Venice, La., August 2006. Travis and Griffith (footnote 3) point out the particular problems of high-operating-cost larger vessels.

⁷Notes from interviews conducted by Palma Ingles (bunnypevas@hotmail.com) for NMFS with fishermen and processors in Grand Isle and Empire-Venice, La., August 2006.



Figure 1.—Commercial shrimp vessels, Grand Isle, La., before Hurricane Katrina, July 2004. Photo: Palma Ingles.

duced trip limits, and closed seasons. The cumulative effects of these restrictions added hurdles for Gulf commercial fishermen. Individual fishermen's ability to switch from one fishery to another as an adaptation to changes in management regime was also becoming more difficult due to new regulations, though historically this had been a common coping strategy among commercial fishermen.

The Gulf's processing sector handles a combination of fish harvested locally and from other U.S. regions, as well as imported fish. The Gulf processing sector supplies the U.S. domestic table, some export trade, and they produce fish oils and fishmeal from menhaden, *Brevoortia patronus*. This sector was also undergoing change throughout this period.

The number of processors of all sizes⁸ in Louisiana, Mississippi, and Alabama declined 28.5% from 239 in 1998 to 171 in 2004. Employment

⁸This figure excludes catfish, *Ictalurus punctatus*, processors.

declined 8.3%, from 6,761 to 6,200 persons, reflecting the smaller number of processors (NMFS, 2000:95; 2005:82). The total value of processed products was similarly patterned. In 2004 the value of processed seafood products for Louisiana, Mississippi, and Alabama combined was \$860 million, 12% lower than the 1998 value of \$980 million.⁹

In contrast to the commercial fishing sector, the saltwater recreational fishing sector was steadily expanding over the same period as part of the area's vibrant recreational industry. Saltwater recreational fishing trips increased 79% in Louisiana, 32% in Mississippi, and 111% in Alabama between 1998 and 2004. The number of non-resident anglers increased 68% in Louisiana and 247% in Alabama, while Missis-

⁹NMFS Processed Product Annual Survey (unpubl. data); all values are calendar year values. Data available from NMFS Office of Science and Technology, Division of Fisheries Statistics, 1315 East West Hwy., Silver Spring, Md. 20910 (<http://www.st.nmfs.noaa.gov/commercial-fisheries/index>).

sippi attracted fewer out of state marine anglers, their numbers declining 33%.^{9,10}

Finally, the population along the GOM coast from Terrebonne Parish west of New Orleans, La., to Baldwin County, Ala., on the Florida state line, had increased about 9% between 1990 and 2004. The greatest growth occurred in the contiguous areas stretching from St. Tammany Parish, La., on the Mississippi state line, through Baldwin County, Ala. Estimated population increases during this period were 48% for St. Tammany Parish, 16% for Mississippi's Hancock, Harrison, and Jackson Counties combined, and 14% for Mobile and Baldwin Counties combined in Alabama.¹¹

¹⁰The long decline in the number of out of state saltwater anglers visiting the Mississippi coast may reflect the expansion of the gaming industry as the more important draw to this section of the Gulf coast. Saltwater anglers are picking other destinations in increasing numbers.

¹¹U.S. Census estimated population tables (<http://www.census.gov/popest/data/historical/index.html>).

Gentrification pressures were also beginning to turn real estate previously dedicated to commercial fishing uses into real estate for vacationers, retirees, and others who wanted to live near the water with easy access to recreational docks and marinas, shopping, dining, and other forms of entertainment. This further squeezed the commercial fishing industry. The area of greatest population growth was coterminous with Katrina's zone of worst damage.

GOM Topography and the Threat of Hurricanes

Fishing communities develop in areas where there is easy access to marine resources. As a consequence, in the GOM this inevitably exposes fishing communities to hurricanes because the topography that characterizes most coastal regions of the Gulf is low-lying. The continuing loss of barrier islands, sand dunes, and wetlands in the GOM region has left many coastal communities even more vulnerable to hurricanes' triple threats of hurricane-generated storm surges, rain-caused flooding, and high winds. Extensive levee systems were erected over many decades to try to reduce the risk to local communities from the surrounding water during storms. Attachment to an ecologically distinctive place, often generations-deep with dense social networks, and easy access to some of the best fishing grounds in the country entice local residents to continue living in these coastal areas despite the obvious risk posed by severe storms.¹²

Fishermen who have grown up along the GOM coast tell stories about big hurricanes in the past. The unnamed hurricane that struck Galveston in 1900 killed at least 8,000 people, Hurricane Audrey killed 390 in 1957, Hurricane Betsy killed 75 in 1965, and Hurricane Camille killed 143 in 1969.

¹²See Tootle (2007) for a similar discussion of the social and cultural factors keeping long-term residents of southwest Louisiana attached to place, following traditional wetlands occupations in the context of describing that part of Louisiana's recovery from Hurricane Rita's devastation three weeks after Katrina.

Everyone understood that a hurricane of Katrina's magnitude could eventually hit the northern GOM.

Research on Gulf Communities

The NMFS Southeast Regional Office (SERO) began conducting preliminary research to identify communities associated with the fishing industry in all five states that border the GOM—Texas, Louisiana, Mississippi, Alabama, and Florida's west coast in 2002.¹³ The final set of fishing community reports for Louisiana, Mississippi, and Alabama had just been completed as Katrina began to form in the Atlantic.¹⁴ Additional in-depth research was also being conducted during the same period in a subset of these communities by one of the authors, Palma Ingles, then a SERO staff anthropologist (Ingles and McIlvaine-Newsad, 2007; Ingles, 2008).

After Hurricane Katrina completed its destruction, NMFS immediately hired contractors to return to 38

¹³NMFS conducts sociocultural and socioeconomic research on Gulf of Mexico fishing communities to comply with National Standard 8 of the Magnuson Stevens Act (MSA). The MSA requires fishery managers to consider the social and economic impacts on fishing communities when considering new regulations. The NMFS Southeast Regional Office has been conducting research as part of NS 8 requirements since 2002. One goal of this research is improved understanding of the role that commercial, recreational, and subsistence fishing play within the communities. Documenting the effects of Hurricane Katrina on the fishing industry was part of this work.

¹⁴IAI. 2005a. Identifying communities associated with the fishing industry in Louisiana. Final Tech. Rep. prep. for the NMFS Southeast Reg. Off. under Contr. WC133F-02-SE-0297, 617 p. (<http://sero.nmfs.noaa.gov/sf/SocialSciencePublications.htm>) accessed 9 Dec. 2013; IAI. 2005b. Identifying communities associated with the fishing industry in Mississippi and Alabama. Final Tech. Rep. prep. for the NMFS Southeast Reg. Off. under Contr. WC133F-02-SE-0297, 274 p. (<http://sero.nmfs.noaa.gov/sf/SocialSciencePublications.htm>) accessed 9 Dec. 2013; IAI. 2005c. Identifying communities associated with the fishing industry along the Florida Gulf Coast. Final Tech. Rep. prep. for the NMFS Southeast Reg. Off. under Contr. WC133F-02-SE-0298, 695 p. (<http://sero.nmfs.noaa.gov/sf/SocialSciencePublications.htm>) accessed 9 Dec. 2013; IAI. 2005d. Identifying communities associated with the fishing industry in Texas. Final Tech. Rep. prep. for the NMFS Southeast Reg. Off. under Contr. WC133F-03-SE-0603, 413 p. <http://sero.nmfs.noaa.gov/sf/SocialSciencePublications.htm>, accessed 9 Dec. 2013.

of the communities that they had just profiled in the affected areas of Louisiana, Mississippi, and Alabama to conduct a preliminary assessment of storm impacts on fishing infrastructure (IAI²). Three visits were made to each community over nine months through May/June 2006 to document the recovery of fishing infrastructure and the fishing industry. Subsequently, additional visits were made to Grand Isle, Jefferson Parish, and the Empire-Venice area of Plaquemines Parish, La.; to the Gulfport-Biloxi area, Miss.; and to Bayou La Batre, Ala., by SERO researchers to continue to follow recovery efforts in these communities. The following assessment is drawn from this research.

Katrina's Devastation

Hurricane Katrina came ashore on 29 August 2005, in Louisiana obliterating or severely damaging coastal communities from 70 miles west of New Orleans, La., to Mobile Bay, Ala. (Fig. 2). Katrina ended lives and destroyed homes, churches, schools, hospitals, and doctors' offices, grocery stores, and other businesses, as well as roads and bridges, water and sewage systems, and phone and power distribution infrastructure leaving behind debris piled 30 ft high in places where people once lived and worked. Entire forests far inland were killed, leaving trees smashed and dying in pooling water from the hurricane's heavy rains.¹⁵

The Gulf's oil and gas industry's refining and pumping capacity were seriously damaged, affecting both the national price and availability of gasoline and diesel. Hundreds of thousands of people evacuated from their coastal homes, many temporarily relocating to other communities within the region. Many former residents did not return. As of 2014, Katrina remains the most costly hurricane in U.S. history, re-

¹⁵Research by Chambers et al. (2007) documents the loss of vast forest tracks in Mississippi and Alabama to the combined effects of Katrina and Rita, characterized by Kaufman (2007) as the "largest single forestry disaster on record in the nation...that killed or severely damaged about 320 million trees."

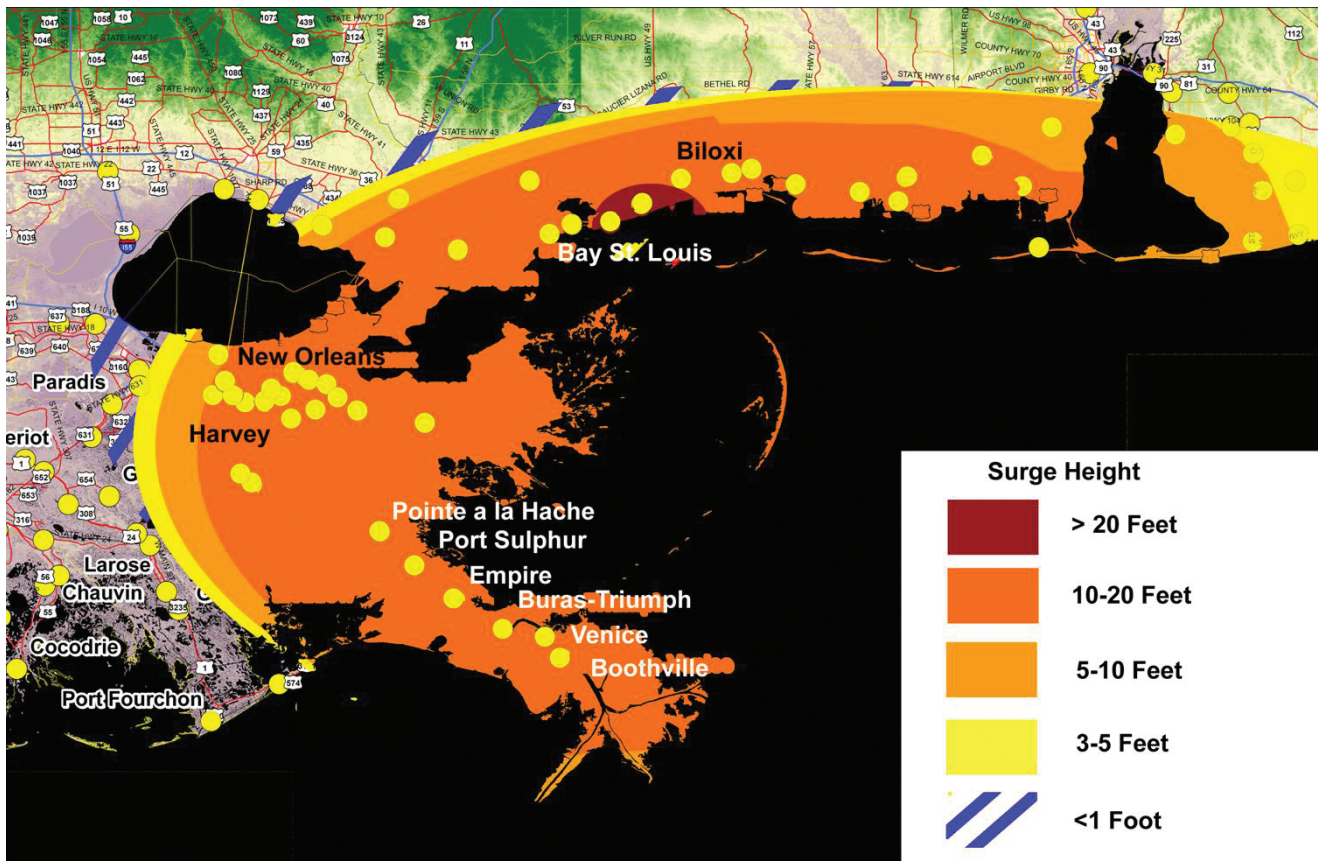


Figure 2.—Katrina tidal surge and flood elevations, and community locations (dots). Map: IAI graphic.

sulting in the largest loss in the entire history of the insurance industry with more than \$41.1 billion paid by private companies across six states and the government to settle claims (Fig. 3).¹⁶

Hurricane Katrina severely crippled the commercial fishing industry in the most heavily impacted areas in the storm's path, leading the U.S. Department of Commerce to issue a "fishery failure and fishery resource disaster declaration" for the GOM.¹⁷ The storm had sunk, stranded, or damaged thousands of boats of all sizes and descriptions—from commercial and recreational fishing boats to tug-

boats and barges that blocked waterways and roads, lay on levees, or were washed into surrounding marshes and bayous. Sunken boats and storm debris choked waterways making marine navigation difficult.

Many fish processing plants were severely damaged or completely destroyed along with ice plants, commercial docks, gear repair and supply businesses, ship building and repair facilities, and all the other support business that the commercial fishing industry needs to operate. Oyster beds were destroyed in Mississippi and damaged in other areas.

Everyone worried about pollutants that may have escaped into marine waters from the oil industry, industrial chemicals, and untreated sewage, further damaging marine resources. Surviving commercial vessels began shifting their effort to the east and to

the west, to less damaged areas, to find support services, including fuel, and places to off-load their catch.

Businesses and infrastructure that supported recreational fishing met a similar fate (Fig. 4). Recreational marinas, docks, and fishing piers were washed away in some areas. In the worst hit areas, the only hotels still able to operate immediately after the storm soon filled with emergency and construction workers supplanting salt-water anglers and other tourists, while destroyed restaurants were replaced with canvas-covered feeding stations handing out military Meals Ready to Eat (MRE's). As the nation began to recognize the extent of the devastation, trip cancellations poured in, even though many charter boat operators had been able to protect their boats by moving them out of harm's way before the storm hit.

¹⁶Insurance Information Institute, Top 10 Most Costly Hurricanes in the United States (thru 2014) (<http://www.iii.org/fact-statistic/hurricanes>) accessed 27 Oct. 2015.

¹⁷Announced 9 Sept. 2005. See <http://www.publicaffairs.noaa.gov/releases2005/sep05/noaa05-112.html>, accessed 16 Aug. 2013.



Figure 3.—Stairway to nothing is all that remains of a once substantial home in the Long Beach area of coastal Mississippi after Katrina, Oct. 2005. Photo: Palma Ingles.



Figure 4.—Destroyed equipment, Back Bay area, Biloxi, Miss., Oct., 2005. Photo: Palma Ingles.

The next three sections present a detailed examination of Katrina’s impact on fishing infrastructure in Louisiana, Mississippi, and Alabama.

Louisiana

Louisiana has 397 miles of coastline, the longest of the three most affected states. In 2004, the volume of commercial landings by pounds ranked second in the nation with only Alaska reporting more landings, while the dollar value of the landings ranked fourth (NMFS, 2005). In 2006 Louisiana still retained its relative position for both landings and value of landings despite the extensive hurricane-generated infrastructure damage detailed below (NMFS, 2007b). Louisiana also has a substantial recreational fishing industry.

Louisiana’s fishing infrastructure was devastated in the worst hit areas in Terrebonne Parish west of New Orleans through St. Tammany Parish on the Mississippi state line; other areas further to the west received less damage.¹⁸ Sixty-six percent of Louisiana’s shrimp fishermen lived in areas affected by Hurricane Katrina. Eighty-three percent of Louisiana’s seafood processors and all eight seafood canning factories were also located in these areas (IAI²).

Table 1 shows the baseline counts of different categories of commercial and recreational fishing infrastructure and services observed in specific fishing communities in the worst hit areas by field teams in October 2004 as part of NMFS’ fishing community profiling work. Initial post-storm visits to these communities about one month after Hurricane Katrina revealed the total or near-total loss of everything from commercial docks, processors, and ice houses to recreational docks and marinas—very little was left.

Commercial and for-hire vessel operators with operational fishing vessels were able to resume fishing or begin working for federal contractors to help

¹⁸Hurricane Rita’s damage to western Louisiana and eastern Texas are not included in this paper. See footnote 12.

clear blocked waterways shortly after the storm had passed. Many had been able to protect their vessels from the storm by moving into the state's extensive bayou system as the storm approached. Those who could resume fishing soon after the storm passed usually moved their vessels further west to places such as Houma, Terrebonne Parish, where off-loading and other support facilities were still available. As offloading docks were rebuilt by early spring of 2006 in places such as Grand Isle and Venice, fishermen began returning to their original homeports to unload their catch.

By May 2006, recovery efforts were underway throughout the area. Two-thirds of the boat yards were back in some degree of operation, often serving as staging areas for salvaged boats waiting for repair or destruction, and about 25% of the area's commercial docks were available for use; only 3 ice houses out of 18 were operating, constituting a serious problem for commercial fishermen who required ice to preserve their catch. By mid-June 2006 the state's three menhaden processing plants were all operating again, helping to sustain the state's relative rank in commercial landings (NMFS, 2005, 2007a, 2007b).¹⁹

By July/August of 2006, less damaged communities such as Grand Isle were further along in the recovery process than those that had been nearly totally obliterated. Parts of Venice had remained under water for a month after the storm, and in the summer of 2006 the community still looked little different than it had in October 2005, a few months after the storm.

Insurance covered few of the hundreds of commercial fishing boats that were lost (Fig. 5), and according to some local dealers many fishermen began using their own resources to recover and repair their boats or buy new ones so they could reenter

¹⁹The three plants are located in Empire, Abbeville, and Cameron. The Cameron plant was damaged by Hurricane Rita (http://www.st.nmfs.noaa.gov/st1/market_news/menhaden_forecast_2007.pdf) p. 1-2, accessed 11 Feb. 2013.

Table 1.—Louisiana¹ fishing infrastructure damage 2004–06.²

Infrastructure or Service	Count			Loss	
	2004 Oct	2005 Oct	2006 May	% Loss Oct 2005 from 2004 baseline	% Loss May 2006 from pre-storm baseline
Boat yards/boat builders (recreational/commercial)	9	3	6	-66.7%	-33.3%
Commercial docks /off loading facilities (in LA includes dealers who own the dock)	53	2	13	-96.2%	-75.5%
Net makers	13	0	0		
Fishing gear, electronics, welding, other repair	14	0	0		
Fish processors, wholesale fish house	7	0	0		
Ice houses	18	0	3		-83.3%
Seafood transport/trucking operations	29	0	0		
Fishing pier	4	0	0		
Recreational docks/marinas/boat ramps	45	1	8	-97.8%	-82.2%
Bait & tackle/fishing supplies	20	1	3	-95.0%	-85.0%
Seafood retail markets	15	0	0		

¹Grand Isle, Boothville, Buras-Triumph, Empire, Venice, Pointe à la Hache, Port Sulpher, Chalmette, Delacroix, Hopedale.

²Data source: Preliminary assessment of the impacts of Hurricane Katrina on Gulf of Mexico coastal fishing communities. DOC/NOAA/NMFS, Mar. 2007. <http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/FINAL-PUBLIC-N.pdf>, accessed 8 Dec. 2013.



Figure 5.—Smashed commercial fishing boats pinned against the Empire, La., bridge, still unmoved Aug., 2006. Photo: Palma Ingles.

the fishing industry.^{7,20} Recreational fishing tournaments had resumed and infrastructure was being rebuilt to support the recreational and charter fishing industry in some communities, such as Grand Isle and Venice. Recreational saltwater anglers could stay in New Orleans where hotels were becoming available, and then drive to a

²⁰Also see IAI (footnote 2), p. 128–130, for a description of local response and adaptation to Katrina's impact.

recreational marina or dock in other communities that had yet to rebuild their hotels and restaurants.⁷ Nonetheless, recreational fishing trips decreased by 11% in Louisiana between September 2005 and August 2006 (NMFS, 2007c:43).

Some shrimp dock owners reported in June 2006 that they were having difficulty selling the shrimp that was being brought in because so many Louisiana shrimp processors had been

destroyed. Some processors were still trying to rebuild, but others had not reopened by summer of 2006. One dock owner interviewed in Grand Isle, La., in June 2006 said that he was sending shrimp to Biloxi, Miss., to be processed by one of the few processors there that had rebuilt. He believed that because so much shrimp were being sent to the Biloxi processor, shrimp prices were further depressed affecting both dealers and fishermen. Despite good catches of shrimp, the adverse economics of the industry continued to impact the surviving fishermen.²¹

By the end of 2006, total pounds of fish products processed in the state had decreased 13% to 401.7 million lbs from their 2004 level of 463.9 million lbs, while the overall value of these products had increased 4% from \$353 million to \$366 million. The increase in value, despite the reduction in total poundage, is likely due to the reduction of menhaden processing in Louisiana while those plants were being repaired.²² The overall value of processed fish products in 2006 (\$366 million) was 8% less than the 1998 value of \$396 million, and the total pounds processed in 2006 was 9% less than the 443.4 million lbs processed in 1998.⁹

Mississippi

Mississippi's three coastal counties share a 44 mile coastline. A substantial fish processing industry had concentrated major facilities in the Gulfport/Biloxi/D'Iberville area prior to 2005, sharing the limited coastal area with an expanding gambling industry, which was required by state law to be off shore on floating facilities. Gulfport, west of Biloxi, is a major shipping container port, while the state's oyster reefs and oyster processing facilities were concentrated further to the west toward the Louisiana state

²¹Notes from interviews conducted by Palma Ingles (bunnypevas@hotmail.com) for NMFS with fishermen and processors in Bayou La Batre, Ala., October 2005, and Grand Isle and Empire-Venice, La., 2006; see also IAI (footnote 2), p.118–122

²²Menhaden are a high volume, low value fish used to make products such as fish meal and fish oil.

Table 2.—Mississippi¹ fishing infrastructure damage 2004–06.²

Infrastructure or Service	Count			Loss	
	2004 Oct	2005 Oct	2006 May	% Loss Oct 2005 from 2004 baseline	% Loss May 2006 from pre-storm baseline
Boat yards/builders (commercial/ recreational)	6	0	1		-83.3% ^b
Commercial docking/off loading facilities	16	5	8	-68.8%	-50.0%
Net makers	2	0	1		-50.0%
Fishing gear & electronics/welding/other repair	9	0	4		-55.6%
Fish processors/wholesale fish house	44	3	14	-93.2%	-68.2%
Seafood transport/trucking operations	2	1	1	-50.0%	-50.0%
Fishing piers	14	2	2	-85.7%	-85.7%
Recreational docks/marinas/boat ramps	26	9	13	-65.4%	-50.0%
Bait & tackle/fishing supplies	13	0	0		
Seafood retail markets	18	1	4	-94.4%	-77.8%

¹Waveland, Bay St. Louis, Pass Christian, Long Beach, Gulfport, Biloxi, D'Iberville.

²Data source: Preliminary assessment of the impacts of Hurricane Katrina on Gulf of Mexico coastal fishing communities. DOC/NOAA/NMFS, Mar. 2007 (<http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/FINAL-PUBLIC-N.pdf>) accessed 8 Dec. 2013.

line. Recreational marinas, fishing piers, and docks were located along most of the coastline and up its rivers and inlets. Katrina pushed storm surges, estimated at as much as 30 ft high, inland along the western half of Mississippi's coast. The worst hit areas were scoured clean of structures, leaving only pilings of docks and bridges and twisted metal for processing facilities. High winds and flooding from the storm's deluge of rain added to the damage further inland.²³

Table 2 provides the baseline counts of infrastructure types and service categories in assessed fishing communities for October 2004, as well as the post storm counts in October 2005. Devastation similar to Louisiana's was observed by the field teams. The area experienced an 85–100% loss of commercial and recreational boat yards, commercial and recreational gear and repair services, seafood processing plants of all sizes, fishing piers, and retail outlets depending on location (Fig. 6). Very heavy losses, ranging from 50% to nearly 70%, occurred to seafood transport/trucking operations, commercial docking and off-loading facilities, and recreational docks, marinas, and boat ramps.

By May 2006, some rebuilding was occurring; 50% of the commercial and recreational docks and off-loading fa-

²³Kieper, M. 2005. Blog. Katrina's Storm Surge (sixteen part series). Weather Underground (http://www.wunderground.com/education/Katrina_surge_contents.asp) accessed 23 Nov. 2013.

cilities and seafood trucking operations had resumed operation, and some of the other services such as boat and equipment repair and retail seafood markets were beginning to reopen. But other infrastructure and support services for the charter and recreational fishing sector such as fishing piers, boat ramps, and bait and tackle shops were yet to be repaired or replaced.

Some of the coastal land that had supported fishing infrastructure before the storm in the Gulfport and Biloxi area was being sold to developers who were beginning to rebuild and expand the casino industry, helped by a post-storm change in Mississippi state law permitting construction of gambling facilities up to 800 feet inland from the shoreline. By summer 2006, just over 30% of Mississippi's processors and wholesale fish houses were again operating, but not necessarily in the same locations. In some cases these businesses shared facilities that survived the storm in a shift arrangement negotiated among them. Large increases in land values, particularly in areas that the gambling industry and other property developers desired, were raising an economic barrier against rebuilding commercial fishing infrastructure in their pre-storm locations.²⁴

By the end of 2006, total fish products processed had increased 2.6% to 129.3 million lbs from their 2004 lev-

²⁴See footnote 2, p. 193–196, for a description of fishermen's, processors', and dealers' response and adaptation to Katrina's devastation through May/June 2006.



Figure 6.—Destroyed recreational boats and recreational boat storage facility, Biloxi, Miss., Oct., 2005. Photo: Palma Ingles.

el of 126 million lbs, while the value dropped from \$376 million to \$321 million. This reflected the shift of Louisiana catch to surviving Mississippi processors while Louisiana processors worked to restore their own processing capacity. For example, vessels from the Cameron, La., menhaden plant were assigned to the Moss Point, Miss., menhaden plant until the Cameron plant was reopened in mid-June 2006. The volume of fish processed in 2006 was 16% less than the 1998 figure of 154.7 million lbs, while the overall value of these products was 23% less in 2006 (\$321 million) than it was in 1998 (\$417 million).⁹

Alabama

Alabama's two coastal counties, containing 53 miles of coastline, are home to a substantial commercial fishing industry and an active recreational saltwater fishing industry with Bayou La Batre often referred to as Alabama's seafood capital. Major ship building businesses have been located in Mobile and Bayou La Batre for decades.

This area of the Gulf was furthest from the storm's center so the state's coastal areas were not as severely damaged as its neighbors further west. Nonetheless, commercial and recreational fishing infrastructure in some areas also sustained significant damage. Another factor affecting Alabama coastal areas was their incomplete recovery from Hurricane Ivan that had hit in September 2004, one year before Katrina. Many individuals and businesses had exhausted their financial resources in Ivan's aftermath and were not yet fully recovered (IAI²:232–233).

Immediately post storm, over 60% of the commercial docking and off-loading facilities were out of operation, and just over 47% of seafood processors and wholesale fish houses were either destroyed or too badly damaged to operate in Bayou La Batre, Coden, Mobile, and Bon Secour. Other types of infrastructure and support service losses ranged between 40% for net makers to 0% for seafood transport and trucking operations (Table 3). Many of the shrimp boats

in Bayou La Batre were lost or stranded in the marsh by Hurricane Katrina. Bayou waters rose as much as 16 feet during the storm, and 60% of the commercial shrimp boats in Bayou La Batre were destroyed (IAI²).

By May 2006, some commercial infrastructure had been restored or was otherwise operational and more services were available, e.g., more commercial docks and off-loading facilities were available, and the number of net makers and gear and related repair businesses had fully recovered and surpassed the number that existed in these areas prior to the storm possibly increasing to meet needs of less recovered areas to the west in Mississippi or even Louisiana. Nevertheless, the commercial fishing industry in Bayou La Batre faced an uncertain future.

Some Bayou La Batre offloading docks and processors had decided not to reopen. Labor for the processing plants continued in short supply. According to one processor, the continued lack of cold storage capacity since the storm remained a sig-

Table 3.—Alabama¹ fishing infrastructure damage 2004–06.²

Infrastructure or Service	Count			Loss	
	2004 Oct	2005 Oct	2006 May	% Loss Oct 2005 from 2004 baseline	% Loss May 2006 from pre-storm baseline
Boat yards/builders (commercial/recreational)	19	18	18	-5.3%	-5.3%
Commercial docking/off loading facilities	34	13	19	-61.8%	-44.1%
Net makers	5	3	6	-40.0%	20.0%
Fishing gear/electronics, welding/other repair	18	16	21	-11.1%	16.7%
Fish processors/wholesale fish houses	63	33	42	-47.6%	-33.3%
Seafood transport/trucking operations	8	8	8	0.0%	0.0%
Recreational docks/marinas/boat ramps	10	9	9	-10.0%	-10.0%
Bait & tackle/fishing supplies	6	5	6	-16.7%	0.0%
Seafood retail markets	28	26	27	-7.1%	-3.6%

¹Bayou La Batre, Coden, Mobile, Bon Secour. Post-Katrina 2005 and 2006 counts for category Boat Yards/Builders were not available for Bayou LaBatre/Coden and BonSecour for 2005 and 2006.

²Data source: Preliminary assessment of the impacts of Hurricane Katrina on Gulf of Mexico coastal fishing communities. DOC/NOAA/NMFS, Mar. 2007. (<http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/FINAL-PUBLIC-N.pdf>).

nificant problem ramifying throughout the commercial sector of the industry (IAI²:218–221). Lack of funding and increased construction costs were constraining reconstruction of Bayou La Batre’s commercial dock facilities (IAI²:225).

Finally, local industry participants commented that developers had their eyes on land that housed the city-owned marina for commercial fishing boats.²⁵ Mobile and Bon Secour seafood dealers and processors reported in May 2006 that they were trying to absorb product displaced from Bayou La Batre and areas as far west as Biloxi, Miss., but were having a difficult time doing so.

Seafood retailers were reporting that they had to source seafood products as far away as Texas because so few local fishermen in the northern GOM were fishing. Many local fishermen with smaller vessels found work clearing debris clogging the waterways, while others were waiting for fuel prices to drop and prices paid for their catch to increase before they would resume fishing (IAI²:233–236).

By the end of 2006, total pounds of seafood products processed had decreased 6% to 41.2 million lbs from their 2004 level of 43.9 million lbs, and the overall value of these products had declined 2% from \$131 million to \$128 million continuing a longer term trend. The overall value of pro-

cessed seafood products in 2006 (\$128 million) was 23% less than the 1998 value of \$167 million, and the total pounds processed in 2006 was 68% less than the 128.2 million lbs processed in 1998.⁹

Recreational charter boat operators incurred losses from trip cancellations up to several months following the storm according to one study (Chang et al., 2006). Many owner/operators were able to take their vessels out of harm’s way before the storm, thus avoiding that kind of loss; however recreational marinas throughout the area had some damage requiring some to close for repairs. Loss of recreational docks and marinas to other forms of development had become a worry since Hurricane Ivan in September 2004 (IAI²:225, citing Chang et al., 2006).²⁶

2007 to 2012: More Disasters and New Emergencies

Following Hurricane Katrina, Hurricanes Ike and Gustav pummeled Alabama, Mississippi, and Louisiana in 2008. Both were declared major disasters by the Federal Emergency Management Agency (FEMA). Hurricane Isaac, also declared a major disaster, hit the area in 2012.

The center of Hurricane Gustav hit the Louisiana coast near Cocodrie, La., on 1 September 2008, and Ike arrived two weeks later on Galveston

Island, Tex., on 13 September. Both produced coastal tidal surges, torrential rains, and winds that affected the Louisiana, Mississippi, and Alabama coasts. Estimates vary: Ike is either the second (Blake et al., 2011:9) or third²⁷ costliest hurricane after Katrina. Estimated insurance losses to property for the two storms combined also vary, ranging between \$27.5 billion²⁸ and \$34.1 billion (Blake et al., 2011:9). Finally, in late August 2012, Hurricane Isaac lashed coastal Louisiana, Mississippi, and Alabama making landfall near the mouth of the Mississippi River. A state of emergency was again declared in all three states. Insured losses from Isaac are estimated at \$1 billion²⁹ to \$2.55 billion.³⁰

In 2011, a major flooding of the Mississippi River brought its own havoc. Drought followed by torrential rains in the Midwest and Southeast in 2011 disrupted a range of Mississippi River economic activities. To relieve pressure on the levee systems protecting Baton Rouge and New Orleans and their environs, the U.S. Army Corps of Engineers opened the Morganza Spillway for the first time in 38 years³¹; they also opened the Bonnet Carré Spillway.³² Vast quantities of fresh water emptied into the waters where Louisiana’s and Mississippi’s oysters live, damaging production.³³

²⁷Gussman, Phil: Sandy set to be 3rd costliest hurricane, but storms of the past offer perspective (<http://www.propertycasualty360.com/2013/03/22/sandy-set-to-be-3rd-costliest-hurricane-but-storms>) accessed 25 Nov. 2013.

²⁸<http://www.iii-insurancematters.org/insurance-and-disasters/facts/index.cfm>, accessed 25 Nov. 2013.

²⁹<http://www.eqecat.com/catwatch/hurricane-isaac-pounds-louisiana-2012-08-29/>, accessed 25 Nov. 2013.

³⁰Berg, Robbie, Presentation. National Hurricane Conference, New Orleans, La., 28 Mar. 2013. U.S. Dep. Comm., NOAA Natl. Weather Serv./Natl. Hurricane Cent. (<http://www.nhc.noaa.gov/outreach/presentations/Isaac2012.pdf>) accessed 23 Nov. 2013.

³¹<http://earthobservatory.nasa.gov/IOTD/view.php?id=50623>, accessed 25 Nov. 2013.

³²http://www.nola.com/weather/index.ssf/2011/05/bonnet_carre_spillway_opening.html, accessed 25 Nov. 2013.

³³“The Army Corp of Engineers (sic) report also said that the flood affected the estuarine system and the oyster industry in Mississippi Sound,

²⁵Notes from interviews conducted by Palma Ingles (bunnypevas@hotmail.com) for NMFS, with fishermen and processors in Bayou La Batre, Ala., October 2005.

²⁶Walker et al. (2006) provides additional information on recreational fishing industry losses and post storm prospects based on a National Association of Charterboat Operator’s study.

The spillways were closed by the end of June 2011.

The Great Recession

The official dates for the worst U.S. recession in more than 75 years are December 2007 through June 2009³⁴; the recession has been followed by a sluggish recovery. The recession increased state poverty rates in a region that already had generally high poverty rates (Gabe, 2013). According to one recent report, the recession also caused "... the largest collapse in state revenues on record" and as of the first quarter of 2012, they remained 5.5% below their prerecession levels (Olliff et al., 2012). Unemployment also increased dramatically, spreading broadly through several sectors of the economy, effectively eliminating all the jobs gained in the previous expansion (Goodman and Mance, 2011). The local economies of the coastal areas of Mississippi, Louisiana, and Alabama were all significantly affected while struggling to overcome widespread property damage and loss from previous and recent hurricanes.

Deepwater Horizon Oil Spill

Just as the northern GOM fishing industry was beginning to show some recovery from Hurricanes Gustav and Ike and the recession, the largest accidental marine oil spill to occur to date in the United States began on 20 April 2010 in the GOM. The Deepwater Horizon drilling platform, located about 41 miles off the Louisiana coast, exploded, killing 11 people and discharging over 210 million gallons of oil before the well was capped 87 days later (NOAA, 2013). The spill extensively damaged marine and wildlife habitat, impacting the fishing and tourism industries in the northern Gulf. Chemical dispersants were used on a massive scale to try to control the oil.

Lake Borgne, and Breton Sound, La. Economic losses to the oyster industry in Mississippi alone in 2011 were approximately \$60 million, according to the report." Cited in A. Sainz (2013).

³⁴Business Cycle Dating Committee, U.S. Business Cycle Expansions and Contractions National Bureau of Economic Research (<http://www.nber.org/cycles.html>) accessed 4 Dec. 2013.

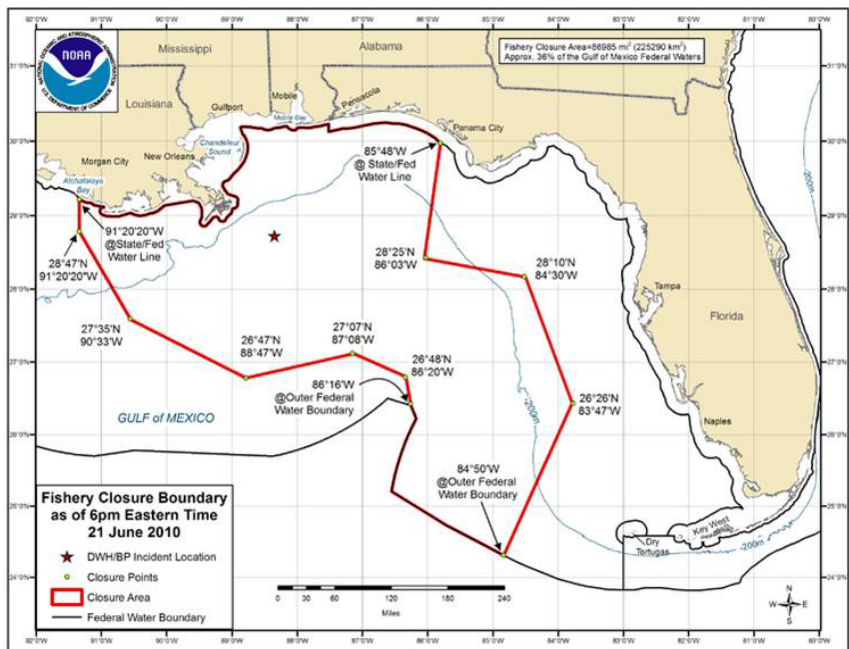


Figure 7.—Gulf of Mexico fishery boundary closure 21 June 2010. Source: NMFS/NOAA.

The affects of the dispersants on marine life when used in such large quantities remain a concern (Silliman et al., 2012). In July 2013, BP estimated its bill to date for cleanup and compensation was in excess of \$42.4 billion dollars (Gosden, 2013).

Following the explosion, more than 80,000 mi² of commercial and recreational fishing grounds were closed (Fig. 7) because of concern about the safety for human consumption of the seafood harvested in the area of the spreading spill³⁵, and the Federal Government began a large program sampling and testing GOM waters and seafood for contaminants (Ylitalo et al., 2012). This resulted in many fishermen and seafood processors being temporarily put out of business, some permanently. Joseph Jewell, Administrator for the Mississippi Department of Marine Resources, summarized oil spill impacts on Mississippi shrimpers this way:

³⁵See NOAA Deepwater Horizon Archive for historical data on seafood safety and fisheries closures at <http://www.noaa.gov/deepwaterhorizon/>, accessed 10 Dec. 2013.

"And then as you know, all of the state waters were closed for a short period of time, just under two months, and that may seem small to most people, but that period of time was right during the height and the most productive part of the shrimping season. That's when most of the shrimp are typically in the Mississippi Sound. That's when most of the shrimpers make their most profits, their largest catches, and they were unable to get out and shrimp during that time."³⁶

³⁶Joseph Jewell, Administrator, Mississippi Department of Marine Resources, Interview 10/12/11, NOAA's Deepwater Horizon Oil Disaster Oral History Project (<http://www.st.nmfs.noaa.gov/voicesfromthefisheries/dwhJJewell.html>) accessed 12 Dec. 2013. Social Impact and Resiliency in the Wake of the Deepwater Horizon Industrial-Environmental Disaster: Development of Well-being Indicators and Collection of Oral Histories: Component Two -Oral Histories. Susan Abbott-Jamieson, National Marine Fisheries Service, Principal Investigator and Louis M. Kyriakoudes, Center for Oral History and Cultural Heritage, The University of Southern Mississippi, Co-Principal Investigator. Funded by a grant from National Marine Fisheries Service, National Oceanographic and Atmospheric Administration through the Northern Gulf Institute. Interviews conducted along the North-

One owner of an Alabama seafood processing plant reported a steep drop in his company's production:

"Well, actually for 2010 our production was off somewhere around 80%, and so it was pretty devastating. We lost quite a few customers because we couldn't supply them, and it's not the easiest thing in the world to get a customer back after you've lost them because they feel that, 'These other people helped me when you couldn't.' And it's hard to get them back."³⁷

Some fishermen found short-term work for BP helping to clean up the oil spill; others did not. Because many fishermen operate on a cash basis, their inability to document their actual earnings meant many were not compensated for their true losses. Navigating the claims process was also difficult, particularly for the Vietnamese fishermen who did not have the paperwork and negotiation skills or the skills to deal with the claims process hierarchy.^{38,39} First-person accounts reflecting a variety of experiences in the aftermath of the oil spill are included in the Deepwater Horizon Oil Disaster Oral History Project Collection that can be

ern Gulf Coast, 2011–2012. Original interviews are housed at the Center for Oral History and Cultural Heritage, The University of Southern Mississippi (<http://www.usm.edu/oral-history>) accessed 10 Feb. 2014. The interviews can be accessed by the public through NOAA's Voices from the Fisheries website (<http://www.st.nmfs.noaa.gov/voicesfromthefisheries/>) accessed 10 Feb. 2014. They constitute the Deepwater Horizon Oil Disaster Oral History Collection.

³⁷Ladnier, Greg. Owner, Sea Pearl Seafood Processing Plant, Bayou La Batre, Ala.. NOAA's Deepwater Horizon Oil Disaster Oral History Project, Interviewed 25 Jan. 2012 (<http://www.st.nmfs.noaa.gov/voicesfromthefisheries/gregladnier.html>) accessed 2 Dec. 2013. See footnote 36.

³⁸Vietnamese interviews, NOAA's Deepwater Horizon Oil Disaster Oral History Project (<https://www.st.nmfs.noaa.gov/voicesfromthefisheries/dwhimpactvietnam.html>) accessed 5 Dec. 2013. See footnote 42.

³⁹Abbott-Jamieson, S. 2013. Gulf of Mexico Working Waterfronts and Ethnic Patterns of Disaster Vulnerability and Resilience. Presentation. National Working Waterfronts and Waterways Symposium, March 25–28, Tacoma, Wash. (http://wsg.washington.edu/mas/pdfs/nwwws/B4/B4_Abbot_Jamieson.pdf) accessed 5 Dec. 2013.

accessed on NOAA's Voices from the Fisheries Project website.⁴⁰

After the Gulf was fully reopened to fishing, sales of Gulf seafood continued to decline. Consumer's beliefs that seafood coming from the Gulf might not be safe were fueled by continuing reports of new discoveries of more oil columns and oil mats along the affected Louisiana, Mississippi, Alabama, and Florida coasts.⁴¹ A growing literature is available examining the health of oil spill workers and residents living in the affected areas (Diaz, 2011; Goldstein et al., 2011; Levy and Nassett, 2011; Osofsky et al., 2011). According to some studies, it could take decades for the deep sea to recover from the oil spill (Finn, 2013).⁴²

The BP oil spill added yet another set of challenges for both the commercial and recreational fishing sectors that were already struggling to rebound from a general decline in marine resources, a series of hurricanes that devastated the Gulf, and a long and deep recession.

The Impacts

Unable to return to the original set of Katrina-damaged fishing communities to repeat the survey that was done in 2005–06 by IAL, the authors identified three indicators with available data to help them understand how these disasters have impacted fishing communities and aspects of the fishing industry. These indicators are 1) population change between 2000 and 2010 as reported by the U.S. Census Bureau in the communities surveyed

⁴⁰The Deepwater Horizon Oil Spill Oral History Collection is available online at <http://www.st.nmfs.noaa.gov/voicesfromthefisheries/>, accessed 3 Dec. 2013. Original interviews are housed at the Center for Oral History and Cultural Heritage, The University of Southern Mississippi (<http://www.usm.edu/oral-history>) accessed 5 Dec. 2013.

⁴¹See NOAA Deepwater Horizon archive for historical data on oil columns and related information (<http://www.noaa.gov/deepwaterhorizon/>) accessed 10 Dec. 2013.

⁴²The NOAA Central Library hosts a publically accessible compilation of bibliographic resources on the DWH oil spill; new references are added continuously (<http://www.lib.noaa.gov/researchtools/subjectguides/dwh.html>) accessed 10 Dec. 2013.

Table 4.—Total Fishing community population change by state 2000–10.^{1,2}

State	2000	2010	N	Difference	% Loss
Alabama	204,349	201,926	2,423	-11.5%	
Mississippi	168,161	156,433	11,728	-7.0%	
Louisiana	46,192	23,586	22,606	-51.1%	
Total	418,702	381,945	36,757	-8.8%	

¹Limited to communities surveyed as part of "Preliminary assessment of the impacts of Hurricane Katrina on Gulf of Mexico coastal fishing communities," Final Technical Report prepared for NMFS, by Impact Assessment, Inc., 2007 (<http://sero.nmfs.noaa.gov/sf/socialsci/pdfs/FINAL-PUBLIC-N.pdf>).

²Data source: U.S. Census SF 1 Tables (<http://www.census.gov/census2000/sumfile1.html>) accessed 17 Feb. 2014; (<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>) accessed 17 Feb. 2014.

in 2005–06, and for the states of Alabama, Mississippi, and Louisiana for 2003–12; 2) changes in the number of processing and wholesale plants, and the number of employees in those plants; and 3) changes in pounds landed and their value as reported in annual NMFS fisheries statistics reports (NMFS, 2003–2013). Although we cannot claim the events we described in the previous section have caused the changes we next describe, we can point out patterns of association they have with these events.

For the fishing communities surveyed in Alabama, Mississippi, and Louisiana after Hurricane Katrina, overall population declined 8.8% during the 10-year period between 2000 and 2010 (Table 4). The states differ among themselves, however, ranging from a low of 1.2% in Alabama to a high of 51.1% in Louisiana. Four communities were surveyed in Alabama; losses occurred only in Coden (15.6%), while the other three communities gained population, two substantially—Bon Secour (74.4%) and Bayou La Batre (10.6%). Bayou La Batre is home to several processors who handle domestic and imported seafood.

Of Mississippi's seven surveyed communities, five lost population and two gained. The average loss was 22.3%. The heaviest loss was in the adjacent Long Beach (14.6 %)/Pass Christian (29.9%) area. D'Iberville gained 24.7% and Bay St. Louis gained 12.8%. D'Iberville is adjacent to Biloxi—the center of the area's gaming industry.

Table 5.—Processors, wholesalers, and employment 2003–12: Alabama, Mississippi, Louisiana combined.¹ Light gray background = high value. Dark gray background = low value.

Year	Processing		Wholesale		Total		Significant Events ^{2, 3}
	Plants	Employment	Plants	Employment	Plants	Employment	
2003	194	6077	171	1283	365	7360	
2004	171	6200	188	1257	359	7458	Hurricane Ivan
2005	148	7450	178	1041	326	8491	Hurricanes Dennis, Katrina, Rita
2006	141	6970	162	807	303	7777	
2007	134	6692	149	851	283	7543	Recession officially begins Dec 2007
2008	134	6330	143	823	277	7153	Recession continues; Hurricanes Gustav and Ike
2009	129	6557	140	797	269	7384	Recession officially ends June 2009
2010	125	6104	142	741	267	6845	DWH oil spill closures
2011	118	5614	140	950	258	7496	Mississippi River floods
2012	116	5450	138	1015	254	6465	Hurricane Isaac

¹Processor and wholesaler data 2003–10 from Fisheries of the U.S. online editions for each year. (<http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/index>) accessed 11 Jul. 2013. Years 2011 and 2012 from Bureau of Labor Statistics, 2012 preliminary data (<http://data.bls.gov/cgi-bin/srgate>) accessed 18 Jul. 2013

²Major disaster data from FEMA tables for individual states. Only those that were declared major disasters are included (<http://www.fema.gov/disasters>) accessed 11 Jul. 2013.

³Recession dates from the National Bureau of Economic Research (<http://www.nber.org/cycles/sept2010.html>) accessed 11 Jul. 2013.

All eight surveyed communities or community complexes in Louisiana lost population with Grand Isle losing the least (15.9%), and Delacroix the most (72.6%). The others ranged between 43.5% and 65.4% with an average population loss of just under 44%. Population loss in Louisiana’s surveyed fishing communities has been dramatic. Louisiana’s fishing communities are heavily involved in shrimping.

Communities that have suffered the most damage tend to have been the slowest to recover. Lack of adequate insurance in the first instance, and an inability to afford dramatically more expensive insurance after hurricane damage, have meant that many have not attempted to rebuild in their home communities. Destruction of large areas that included working waterfronts servicing commercial fisheries has also included the loss of moderately priced housing for people working in the fishing industries. This has cleared the way for increased gentrification in areas adjacent to newly expanding gaming industry facilities, particularly in the Biloxi-D’Iberville, Miss., area. Competition among casinos and other developers for desirable waterfront and near-shore property in both Biloxi’s Back Bay area as well as in nearby D’Iberville has significantly increased property values and raised taxes. This has led many of the area’s commercial and recreational fishing industry businesses to move to new locations,

often inland. This is paired with the development of higher value housing for those who want to be near the water and have sufficient means to purchase it. At the same time, the recreational fishing industry has been provided new opportunities from expanding tourism tied to the casinos in Mississippi, as well as new residents with means and an interest in recreational and sport fishing. These patterns have been noted by others (Pettersen et al., 2006).

Information on the number of processing and wholesale plants, and employees in those plants is found in Table 5. Between 2003 and 2012, the overall trend is for a decline in both the number of processing and wholesale plants, and an associated decline in the number of employees. The three states together lost 30.4% (N=111) of their processing and wholesale plants combined during this period.

Losses have been greater for processing plants however than for wholesale plants. There were 40.2% (N=78) fewer processing plants in 2012 than there were in 2003, and 26.6% (N=50) fewer wholesale plants. The peak year for employment overall was 2005, and the lowest employment overall is reported in 2012. There were 2,026 fewer employees for a loss of 23.9%.

Turning now to examine the relationship between the major natural and man-made disasters and plant closures during a period of steady decline overall, the largest year-on-year losses occurred between 2004 and 2007 when

76 plants of all kinds closed. During this period there were four major and devastating hurricanes that impacted the area. The number of plant closings is testament to the cumulative damage to fisheries infrastructure.

Between 2008 and 2009, another 14 plants closed. This period saw two more damaging hurricanes and the economic trough of the Great Recession. Another nine plants closed during 2010–11, when the Deepwater Horizon oil spill resulted in major fisheries closures in the GOM, and though the recession was officially over, the economy remained sluggish. There is some evidence that the DWH oil spill may have contributed to a dip in processing and wholesale plant jobs (539 fewer employees reported for 2010), but those jobs were recovered during 2011, only to be lost again in 2012 with the continued decline in number of plants. Four more plants closed in 2012 when Hurricane Isaac, the seventh since 2003, hit the area.

The amount of seafood landed in the GOM has ebbed and flowed over the 2003–12 period shown in Table 6.⁴³ Shrimp and menhaden are the two primary species harvested in northern GOM federally managed waters and the amount harvested of each of these varies year by year. The table shows that the pounds of seafood landed were the lowest in Louisiana in 2005, the year Hurricane Katrina and

⁴³Table 6 does not include landings of finfish and shellfish harvested in state waters.

Table 6.—Pounds landed, value, and significant events 2003–12: Alabama, Mississippi, Louisiana Combined.¹ Light gray background = high value. Dark gray background = low value.

Year	Alabama		Mississippi		Louisiana		Significant Events ^{2, 3}
	Pounds	Value	Pounds	Value	Pounds	Value	
2003	25,344	39,521	213,116	45,508	1,189,448	294,011	
2004	26,559	37,036	183,762	43,791	1,096,590	275,014	Hurricane Ivan
2005	23,614	39,209	167,646	23,451	847,172	253,037	Hurricanes Dennis, Katrina, Rita
2006	34,151	49,185	221,832	21,741	899,428	255,269	
2007	29,322	48,333	228,137	39,983	951,240	259,564	Recession officially begins Dec 2007
2008	24,534	44,234	201,822	43,697	915,956	272,857	Recession continues; Hurricanes Gustav and Ike
2009	27,633	36,961	230,284	37,998	1,000,815	280,691	Recession officially ends June 2009
2010	14,408	27,140	111,242	21,913	1,004,774	247,948	DWH oil spill closures
2011	26,041	50,764	278,056	30,207	1,515,571	339,296	Mississippi River floods
2012	24,677	43,065	263,678	49,276	1,214,194	327,952	Hurricane Isaac

¹Landings and value data 2003–2010 from Fisheries of the U.S. online editions for each year (<http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/index>) accessed 11 Jul. 2013.

²Major disaster data from FEMA tables for individual states. Only those that were declared major disasters are included (<http://www.fema.gov/disasters>) accessed 11 Jul. 2013.

³Recession dates from the National Bureau of Economic Research (<http://www.nber.org/cycles/sept2010.html>) accessed 11 Jul. 2013.

two other hurricanes hit.⁴⁴ Mississippi landings were also impacted that year; Alabama's less so. In 2008, the recession hit its trough and two more major hurricanes hit the area. The drop in landings from 2007 to 2008 was 16.4% for Alabama, 11.5% for Mississippi, and 3.7% for Louisiana.⁴⁵ During 2009, landings bounced back in all three states. The official end of the recession was in June of that year, and there were no major hurricanes.

The lowest weight by pounds landed for Alabama and Mississippi was in 2010, the year of the DWH oil spill, which was also the year for the lowest landings by value for Louisiana. Alabama reported a 47.9% drop in landings compared to the previous year, while Mississippi's landings dropped 26.6%. Louisiana's landings held steady, but dropped in value. Excluding other species for the years 2009–12, the quantity of shrimp and menhaden landed was the lowest in 2010 (NMFS, 2011). This suggests that both of these fisheries were impacted in 2010 by the DWH oil spill's extensive closures and the public's fear of possible contamination of Gulf

⁴⁴Analysis of the relationship between loss of infrastructure in hurricane-damaged communities and subsequent pounds landed would be valuable. This should include both state and federal marine fisheries. We do not have the data to do this analysis.

⁴⁵See Gulf States Marine Fisheries Commission Report (Miller and Isaacs, 2011) for an analysis of the economic condition of Gulf of Mexico state waters shrimping fleet's economic condition based on data collected in 2008. Their findings are similar to those reported for the federally permitted shrimpers.

seafood and resultant refusal of consumers to buy it. The Mississippi River floods of 2011 impacted Mississippi and Louisiana oyster beds in inshore waters but did not impact federally managed fisheries so those losses are not reflected in these data.

With the enforced closures ended, 2011 produced the highest weight by pounds landed since 2003 in Mississippi and Louisiana, followed in 2012 by the second highest landings by pounds for these states. The highest value for pounds landed also occurs in 2011 for Louisiana and Alabama, and in 2012 for Mississippi. These data suggest stability in these marine resources for the 2003–2012 period, coupled with a remarkable ability of the remaining commercial fishermen to capture those resources despite the sometimes horrific damage to their homes, their fishing communities, and the infrastructure they require to support their fishing effort.⁴⁶

Summary and Conclusions

In the past decade, GOM commercial and recreational fishermen and others in the fishing industry have faced many obstacles to continuing in business. The unfolding nemesis we have attempted to describe combines natural and manmade events, in an ongoing process with no satisfactory end in sight for traditional fishing communities.

⁴⁶The literature review included in VanderKooy (2012), p. 10–1–10–12 provides a good discussion of factors affecting Gulf fishing communities.

Although the area as a whole has lost population, some fishing communities have lost significantly more, particularly in Louisiana, while some have gained in Mississippi and Alabama. Mississippi's gains appear to be related to the expansion of the gaming industry in areas previously devoted to fishing support, while Alabama's gains are located in processing centers such as Bayou La Batre.

There has been an overall decline in both numbers of processors, wholesalers, and their employees during the period examined; the 2004–07 period coinciding with repeated hurricanes shows the sharpest declines. Pounds of fish landed, while impacted by hurricanes and the DWH oil spill, rebounded by 2011–12 to their highest level since 2003; their highest value occurs in 2011–12 as well. The fishing industry in these states as measured by pounds and value of landings has shown an ability to recover from the shock of hurricane damage and oil spill closures over the past decade, but the longer-term economic downward trends as measured by numbers of processors, wholesalers, and their employees continues.

Other factors we have not discussed include increasing operating costs and the increasing age of commercial fishermen; changes in marine fisheries management regimes; relative health of the fish and shellfish stocks; price competition from imported farmed seafood; environmental degradation from agricultural runoff in the Mississippi River drainage and associated al-

gal blooms; loss of wetlands from new coastal development; future effects of regional oil and gas drilling and re-refining; and future effects of climate change and population growth. There are productive subjects here for future research.

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