

Impacts of Hurricane Ike on the Galveston Bay Fishing Community

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Introduction

The western Gulf of Mexico was hit with four named storms in 2008. Hurricane Gustav, Tropical Storm Edouard, and Hurricane Ike all impacted the fishing communities in Brazoria, Galveston, Harris, Liberty, and Chambers Counties. While spared damage in the first two events, the sheer size and magnitude of Hurricane Ike affected the entire Gulf of Mexico, but particularly the Galveston Bay Complex and the Sabine Lake area. Fishing communities, recreational marinas, and coastal wetlands were devastated by the large storm surge that scoured the low lying areas.

Already in decline for a number of economic reasons not to be discussed in this paper, the Texas commercial seafood industry was further crippled as a result of damage to vessels, docks, processors, and dealers. Boat owners able to fish immediately after the storm experienced problems with debris, lack of fuel and ice, and selling their products due to the destruction of the shore-side infrastructure. Recreational and charter anglers were also affected by damage to bait shops, marinas, and boat ramps. While the resiliency of fishermen in the Gulf of Mexico is well-documented, the devastation to the fishing communities is unprecedented and aid is needed to rebuild and sustain the infrastructure of this viable community.

Background study

A comprehensive report on the NOAA Fisheries study titled “Identifying Communities Associated with the Fishing Industry in Texas” was published just months after Hurricane Rita made landfall on the Texas/Louisiana border. The study included 67 communities in 18 coastal counties in Texas. The goal was to investigate and describe Gulf communities likely to exhibit some or all of the attributes of “fishing communities” as defined by the Magnuson-Stevens

Fishery Conservation and Management Act as Amended (the Magnuson Act; MSFCMA), and by National Standard 8 (NS-8).¹ That definition is listed below:

The term 'fishing community' means a community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors that are based in such communities. A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent services and industries (for example, boatyards, ice suppliers, tackle shops) (Section 300.345, part 3).

The NOAA report can serve as an important pre-assessment of the fisheries infrastructure prior to the 2008 hurricane season. The sole designated study community in Chambers County was Anahuac, although the researchers recognized there was extensive fishing-related activity in Oak Island and that the Smith Point area was particularly well known for its private-lease oyster beds. Anahuac had numerous recreational fishing opportunities and commercial shell fishing and seafood processing were locally significant.² Fishermen harvested oysters, shrimp, and crab in Trinity Bay and adjacent estuaries. Four processors based their operations in Anahuac in 2000, employing an average of 33 persons. These firms processed a total of 1,531,994 pounds of seafood in 2000, worth a total of \$6,128,005.³ Extensive shrimp and shellfish production occurred in the Oak Island area and field researchers noted extensive commercial fishing activity here at the time of the study. Many residents made their living by fishing, oyster harvesting, and/or boat manufacturing.⁴

The sole study community in Liberty County was the town of Liberty. Located some 20 miles inland along the banks of the Trinity River in south-central Liberty County, the town had a fishing pier and several public boat ramps along the river. A handful of bait and tackle/fishing

¹ NS-8 is a component of the Sustainable Fisheries Act, Public Law 104-297, prepared by the National Oceanic and Atmospheric Administration Office of General Counsel in 1997; the Standard provides guidance for addressing community issues in the course of federal management of fisheries along the U.S. coastline.

² Impact Assessment, Inc. 2005. *Identifying Communities Associated with the Fishing Industry in Texas*. La Jolla, California, p. 74.

³ *Ibid.*

⁴ *Ibid.* p. 78.

supply establishments and several retail seafood markets served the community. There were two wholesale dealers in the area at the time of this research.⁵

The study communities in Harris County were Baytown, Channelview, Highlands, Houston, Pasadena, and Seabrook. A small fleet of commercial shrimp trawl operators was based in Baytown in 2000. A commercial dock, several vessel repair facilities, and numerous retail and wholesale fish markets were located throughout the city. Various fishing piers, public boat ramps, bait and tackle stores, and recreation-oriented marinas facilitated recreational fishing in the area.⁶ There was a small commercial fleet active in Channelview in 2000. The majority of the small fleet pursued shrimp in the bays. Marine recreational fishing services and infrastructure were limited to small marinas and associated services along the channel. Some freshwater angling occurred in the San Jacinto River.⁷

In Highlands, the fishing-related businesses and services were limited to small seafood retailer/dealers, boat brokers and repair facilities, and a small marina. A fish hatchery was also located in the area.⁸ There were many fishing-related businesses and services located in the Houston area. Numerous commercial license and permit holders resided in or maintained post office boxes in the city. While there was extensive maritime trade and vessel movement around Houston, relatively little fishing occurred in the region's bayous and channels.⁹ There were numerous small marinas, boat builders and brokers, and retail seafood establishments in Pasadena. A small number of commercial fishery and charter operators resided here. But as with Houston, the tendency was to operate from the Galveston area.¹⁰

In Seabrook, the captains of a small commercial fleet were still active and moored at the commercial docking facility in town. There was also extensive boat building and sales activity here. Most fishing and shrimp trawl operations occurred in Galveston Bay. Local dealer landings figures in 2002 were led by shrimp, followed by oyster and crab. A seafood processor was based here, as were several wholesale and retail seafood dealers, and trucking operations. Recreational

⁵ *Ibid.* p. 84.

⁶ *Ibid.* p. 144.

⁷ *Ibid.* p. 148.

⁸ *Ibid.* p. 152.

⁹ *Ibid.* p. 156.

¹⁰ *Ibid.* p. 161.

fishing and boating were also supported here and many residents hold saltwater recreational licenses. Three charter operators lived or were based in the area, and several fishing piers, a public boat ramp, and recreation-oriented marinas provided angling opportunities for residents and visitors alike. There was increasing involvement in marine eco-tourism activities and opportunities in the area.¹¹

The study communities in Galveston County were Crystal Beach, Port Bolivar, Galveston, Texas City, La Marque, Bacliff, San Leon, Dickinson, Friendswood, League City and Kemah. In the commercial fishing industry, employment in the harvest sector diminished between 1990 and 1995, while the number of jobs in the remaining sectors increased during the period. Commercial, charter, and recreational fishing continue to be important aspects of life in the Galveston area at the beginning of the 21st century.¹²

Table 1. Galveston County Employment in Marine Fisheries¹³

| Sector | 1990 Employment | 1995 Employment | Percent Change |
|-----------------------|-----------------|-----------------|----------------|
| Commercial Harvesting | 2,133 | 1,549 | -27.4 |
| Processing | 118 | 147 | 24.6 |
| Wholesale | 75 | 141 | 88.0 |
| Retail | 809 | 1,035 | 27.9 |

Commercial fishing and tourism were the primary industries on the Bolivar Peninsula. Crystal Beach was primarily a resort community, with privately owned homes that serve as rentals to summer tourists. Operations for a range of processors, net makers, fishing gear and supply stores, and retail and wholesale seafood markets were based in Crystal Beach. There were over 100 commercial fishing vessels moored here at the time of the study.¹⁴ Recreational fishing was increasingly important to Port Bolivar. Scores of commercial fishing vessels were also moored here, as captains and crew from around the region took advantage of close proximity to the bays and Gulf. Commercial shrimpers and other commercial fishermen offloaded at local dealers in Port Bolivar, as well as in Galveston, Crystal Beach, Gilcrest, and High Island.¹⁵

¹¹ *Ibid.* p. 165.

¹² *Ibid.* p. 88.

¹³ *Ibid.*

¹⁴ *Ibid.* p. 96.

¹⁵ *Ibid.* p. 126.

The City of Galveston, located on Galveston Island, was home to both commercial and recreational fishing services and infrastructure. Eight public boat ramps provided convenient access to the Gulf and back bays, and several docks and marinas, ocean sightseeing tours, and charter fishing services provided amenities for visitors. A highly productive shrimp and bottom fish fleet was also based here, with numerous commercial fishing vessels mooring along the waterfront. A number of seafood dealers and retailers, boat builders and brokers were located in Galveston as well.¹⁶

Bacliff had a significant commercial fishing fleet. Most fishermen harvested fish, shrimp, and crab in Galveston Bay and/or the Dickinson Bayou area. They also harvested local oysters. There were various fishing-related businesses and services in the area, including a number of seafood dealers. Local dealer landings figures in 2002 were led by shrimp and crab.¹⁷ Both recreational and commercial fishing contributed to the economy of San Leon by employing numerous residents. There were several recreational docks, marinas, and fishing piers located here. A popular recreational fishing destination, local catch included redfish, speckled trout, and flounder. A productive commercial fleet of some 40 vessels was also based here. Oysters and shrimp were often harvested near the Houston Ship Channel.¹⁸

A productive fleet of commercial fishing vessels was moored in the Texas City area. Shellfish were harvested extensively. The local fleet was between 50 and 75 commercial vessels at the time of the study. Several retail seafood markets and seafood restaurants were based in Texas City, as well as a fish processing facility and wholesale fish house.¹⁹ There were relatively few fishing-related businesses located in La Marque, although there was a boat brokerage based here, and recreational anglers could enjoy a local public boat ramp and several marinas.²⁰

Some Dickinson residents remained active in commercial fishing and seafood processing. The local fleet was especially productive in shrimp and oysters. In 2000, three seafood processors in Dickinson employed 54 persons on average. Collectively, these companies processed 1,119,841

¹⁶ *Ibid.* p.108.

¹⁷ *Ibid.* p. 92.

¹⁸ *Ibid.* p. 130.

¹⁹ *Ibid.* p. 136.

²⁰ *Ibid.* p. 118.

pounds of seafood for a total of \$8,821,750.²¹ Friendswood had some limited fishing-related infrastructure in the immediate area and a small contingent of federal permit and state license holders resided there at the time of the study.²²

League City had a large recreational fishing contingent, but relatively little involvement in commercial fishing or associated industries (with the exception of boatbuilding). There were three fishing piers in the community, one dockside inn, three recreational docks and marinas, and many public boat ramps.²³ Kemah had significant recreational fishing services and opportunities here. A small but productive commercial fleet was also based here, though there are close relationships with the fleet in Seabrook and it was difficult to clearly attribute landings to residents of either town. In any case, a wide variety of species were taken by the fleet(s) and in relatively high volumes. Shrimp was the primary species of landing in 2000.²⁴

The study communities in Brazoria County were Alvin, Brazoria, Clute, Freeport, Lake Jackson, Pearland, and Sweeny. With the exception of the retail sector, 1990 to 1995 was a period of declining employment in commercial fisheries in Brazoria County.

Table 2. Brazoria County Employment in Marine Fisheries²⁵

| Sector | 1990 Employment | 1995 Employment | Percent Change |
|-----------------------|-----------------|-----------------|----------------|
| Commercial Harvesting | 593 | 452 | -23.8 |
| Processing | 103 | 0 | -100 |
| Wholesale | 48 | 28 | -41.7 |
| Retail | 472 | 515 | 9.1 |

A small contingent of commercial fishery participants was based in Alvin, and two charter operators either reside in or hold post office boxes here. Most local fishing-related businesses and services in Alvin supported recreational fisheries. These included several vessel and engine sales and repair services, and bait and tackle suppliers. There were also several seafood retail markets and restaurants in the area.²⁶ In Brazoria, freshwater fishing opportunities were available in the Brazos River to fish, where there are numerous piers, a marina, and docking facilities.

²¹ *Ibid.* p. 100.

²² *Ibid.* p.104.

²³ *Ibid.* p. 122.

²⁴ *Ibid.* p.113.

²⁵ *Ibid.* p. 171.

²⁶ *Ibid.* p. 175.

Commercial operators and saltwater anglers generally traveled to the Freeport area. Fishing-related goods and services were limited.²⁷ Pearland had several retail fish markets and a small store that sells fishing gear, but few other fishing-related businesses or services. A small fleet of commercial operators was based here, but sell their products to dealers near Galveston.²⁸

The study data on residents in Sweeny showed they were minimally involved in commercial marine fisheries, or charter operations. Numerous residents did hold recreational saltwater fishing licenses.²⁹ Clute had a small but active contingent of commercial fishery participants and charter operators. The commercial landings figures for local dealers in 2000 were led by snapper. Most participants moored their vessels closer to the Gulf, in or east of Freeport.³⁰ There were some limited fishing-related businesses and services in Lake Jackson. These tended to serve recreation-oriented clientele. Commercial fishermen landed their products in Clute and Freeport. Local recreational saltwater anglers often fished from ramps along the nearby coastal zone.³¹

Freeport had many businesses and services that support both commercial and recreational fishing. A large seafood processor was located here, and there were commercial docking facilities, vessel repair facilities, and recreation-oriented marinas. A large and productive shrimp trawl fleet was based in Freeport. There was a much smaller local pelagic fleet, but an extensive charter fleet operates from the area. As many as 22 charter operators were living in or held post office box addresses in Freeport in 2000, and numerous others were residing in adjacent town and cities such as Clute and Lake Jackson.³²

Additionally, in this study, fishing communities were grouped into basic categorical types in relation to their economic and social attributes. Of the twenty-six cities/towns studied in the Galveston Bay area, six were labeled as primarily-involved. Ten communities were considered to be secondarily-involved and ten were rated as tangentially-involved.³³

²⁷ *Ibid.* p. 179.

²⁸ *Ibid.* p. 196.

²⁹ *Ibid.* p. 200.

³⁰ *Ibid.* p. 183.

³¹ *Ibid.* p. 192.

³² *Ibid.* p. 188.

³³ *Ibid.* p. 401.

In summarizing their three year study, Impact Assessment, Inc. ranked the 68 studied towns and cities by total landings and total commercial permits and licenses held by residents to identify the 20 most active in Texas’s marine fisheries. The Galveston Bay fishing communities studied were ranked as follows:

Table 3. Community Rankings for Total Landings, Ex-Vessel Value, and Dealer Permits

| Rank | Total Landings and Value (based on all address types) | | | | Dealer Permits | |
|------|-------------------------------------------------------|--------------|--------------|-------------|----------------|-----------|
| | Community | Total Pounds | Community | Total Value | Community | # Permits |
| 1 | » | » | » | » | Galveston | 54 |
| 3 | » | » | » | » | Houston | 30 |
| 4 | Freeport | 7,445,090 | Freeport | 22,597,464 | Freeport | 28 |
| 6 | San Leon | 5,579,065 | | | | |
| 7 | Galveston | 5,491,872 | Galveston | 13,476,895 | Anahuac | 22 |
| 8 | » | » | Port Bolivar | 11,225,877 | | |
| 9 | » | » | Houston | 10,809,458 | | |
| 10 | Port Bolivar | 4,025,006 | San Leon | 10,120,558 | Texas City | 18 |
| 11 | Anahuac | 3,054,738 | Anahuac | 5,374,862 | San Leon | 17 |
| 12 | » | » | » | » | Crystal Beach | 16 |
| 13 | Kemah | 1,861,321 | | | | |
| 14 | » | » | Kemah | 3,752,503 | | |
| 15 | Seabrook | 1,678,344 | Seabrook | 3,136,986 | Dickinson | 15 |
| 16 | » | » | » | » | Port Bolivar | 15 |
| 18 | » | » | Texas City | 1,697,162 | | |
| 19 | » | » | » | » | Seabrook | 13 |
| 20 | » | » | » | » | Baytown | 12 |

Modified from Table 3.19-2 Community Rankings for Total Landings, Ex-Vessel Value, and Dealer Permits³⁴

³⁴ *Ibid.* p. 396.

Table 4. Community Rankings for Licenses and Permits

| Rank | State License Holders 2000* | | Federal Permit Holders 2000* | | Gulf Shrimp Permits 2003 | | Recreational Licenses 2000 | |
|------|-----------------------------|-----------|------------------------------|-----------|--------------------------|-----------|----------------------------|-----------|
| | Community | # License | Community | # License | Community | # License | Community | # License |
| 1 | Houston | 132 | Houston | 47 | » | » | Houston | 63,379 |
| 2 | » | » | Freeport | 19 | | | | |
| 3 | » | » | Galveston | 19 | » | » | Pasadena | 5,285 |
| 4 | » | » | » | » | Freeport | 70 | | |
| 5 | » | » | » | » | » | » | Pearland | 3,457 |
| 8 | Galveston | 56 | » | » | » | » | Alvin | 3,105 |
| 9 | Bacliff | 54 | Lake Jackson | 5 | Bacliff | 8 | Friendswood | 3,077 |
| 10 | » | » | Pearland | 5 | Houston | 8 | Galveston | 2,551 |
| 11 | » | » | Seabrook | 4 | | | | |
| 12 | Dickinson | 37 | Dickinson | 4 | » | » | League City | 2,371 |
| 13 | Freeport | 33 | Kemah | 4 | | | | |
| 14 | San Leon | 32 | » | » | » | » | Lake Jackson | 2,148 |
| 15 | » | » | » | » | » | » | Texas City | 2,093 |
| 17 | Baytown | 23 | » | » | » | » | Brazoria | 1,589 |
| 18 | » | » | » | » | Dickinson | 3 | | |
| 19 | » | » | » | » | Galveston | 3 | Dickinson | 1,452 |
| 20 | » | » | » | » | League City | 3 | Channelview | 1,431 |

*The rankings were based on physical address data only. Modified from Table 3.19-3 Community Rankings for Licenses and Permits³⁵

Initial Assessments

An accurate assessment of the damage created by Hurricane Ike was needed to ensure that federal funds were both adequate and allocated to the appropriate sectors and recipients. In addition to the resource information available from Texas Parks and Wildlife Department (TPWD) and National Marine Fisheries Service (NMFS), the Texas Sea Grant Extension Program (TXSGEP) took the task of estimating the damages to the area’s fisheries infrastructure and lost revenues brought about by the hurricane. The assessment covered commercial seafood processors and dealers, the commercial fishing fleet, live-bait dealers, marinas, and for-hire charter boats. Data were collected from survey questionnaires mailed to a sample of the commercial license holders with resident addresses in the affected counties and surveys passed out to interested parties at public meetings held in January. Personal interviews with fishermen and site visits of facilities were conducted in various coastal locations by county extension personnel to ground truth responses.

³⁵ *Ibid.* p. 396.

Built Environment

In November, Governor Perry's Office released a report assessing preliminary damages incurred across the state during the 2008 Hurricane season. The need to rebuild waterfront areas damaged or destroyed by Hurricane Ike was noted as a funding issue for local governments. More than 80% of the business community suffered a devastating impact according to Galveston Island officials. Additionally, the Bolivar Peninsula lost practically its entire economic base. Of the 82 businesses located on the Peninsula, only four suffered minor damage while 47 were severely damaged and 31 were a total loss.³⁶ Many of these were fisheries related. Damaged homes and lack of housing was an additional blow to these fishing communities since most fishermen live near their vessels and shops which by their very nature are in the most vulnerable areas for storm surge.

Natural Environment

The entire U.S. Gulf Coast was affected by higher than normal water levels as Hurricane Ike grew in size and approached Galveston Bay. The highest storm surge occurred on the Bolivar Peninsula and in parts of Chambers County, roughly between the Galveston Bay entrance and just northeast of High Island.³⁷ Many sensors in this area failed due to saltwater intrusion and large wave action so complete tide gauge data is unavailable. FEMA ground assessment teams determined the highest water mark was 17.5 feet, located approximately 10 nm inland in Chambers County.³⁸ Hurricane landfall and associated elevated water levels, waves, and currents can lead to severe coastal change through erosion and re-deposition. The most extreme coastal change regime is associated with inundation, when storm surge exceeds the elevation of the primary dune or beach berm and the entire beach system is submerged.³⁹ The saltwater intrusion into wetlands and other natural habitats creates ecological upheaval and the disruption of the recreation, leisure and ecotourism uses for these areas.⁴⁰ Oyster beds, fishing grounds, and other

³⁶ Governor's Office. 2008. *Texas Rebounds: Helping our communities recover from the 2008 hurricane season*. Section 6, p. 15.

³⁷ Berg, R. 2009. Hurricane Ike. Tropical Cyclone Report. National Hurricane Center. p. 6. http://www.nhc.noaa.gov/pdf/TCR-AL092008_Ike.pdf retrieved 2/24/09.

³⁸ *Ibid.*

³⁹ <http://www.usgs.gov/newsroom/article.asp?ID=2020> retrieved 2/11/09.

⁴⁰ FEMA, 2008. Hurricane Ike Impact Report. p. 3

ecosystems affected by sediment and debris in Galveston Bay could have lasting impacts for decades.⁴¹ Devastating long-term impacts of marsh loss on fisheries includes production levels of species like blue crab, white shrimp, and redfish.⁴² The exact amount of damages and its environmental consequences might not be known for several years.

Recreational Fishing Industry

Recreational fishing is an economically significant industry in Texas. In 2006, Texas was ranked second in the U.S. by total expenditures, which includes trip and durable goods, with \$3.2 billion. Texas was also ranked second by total trip expenditures of \$915 million and ranked fourth with \$2.3 billion in terms of durable good expenditures alone.⁴³

Galveston Bay and Sabine Lake account for approximately \$356 million in retail sales each year for fishing expenditures which equates to \$650 million in economic impact to the state when indirect expenditures such as lodging, meals, and general merchandise purchases are added.⁴⁴ The estimated average percentage of recreational fishing pressure for Galveston Bay for 2005-2007 was 29.9% of the state total.⁴⁵ If this percentage is used with Gentner and Steinbeck's recently released report on the economic contribution of marine (aka saltwater) anglers, the recreational fishing industry contributes over 3,720 jobs to the area. When expenditures, output, value added, and income are combined, the percentage for Galveston Bay equals \$1,020,431.

⁴¹ *Ibid.*

⁴² *Ibid.* p. 42.

⁴³ Gentner, Brad, and Scott Steinback. 2008. The Economic Contribution of Marine Angler Expenditures in the United States, 2006. U.S. Dep. Commerce, NOAA Tech. Memo. NMFSF/SPO-94, pp. 21-22.

⁴⁴ *Ibid.*

⁴⁵ *Ibid.*

Table 5. Total Economic Impacts Generated in Texas from Marine Recreational Fishing Trip Expenditures by Resident Status and Mode in 2006 (in thousands of dollars except employment is total jobs)⁴⁶

| TX | | Expenditures (\$1,000) | Output (\$1,000) | Value Added (\$1,000) | Income (\$1,000) | Employment (Jobs) |
|----------------|-----------------|------------------------|------------------|-----------------------|------------------|-------------------|
| Fishing Mode | Resident Status | \$104,907 | \$176,561 | \$98,459 | \$55,762 | 1,927 |
| | Party/Charter | | | | | |
| | Non-Resident | \$10,352 | \$17,544 | \$9,737 | \$5,560 | 186 |
| | Total | \$115,259 | \$194,106 | \$108,196 | \$61,322 | 2,113 |
| Private/Rental | Resident Status | \$434,337 | \$642,548 | \$343,173 | \$193,323 | 5,576 |
| | Resident | | | | | |
| | Non-Resident | \$18,597 | \$29,999 | \$16,230 | \$9,473 | 279 |
| | Total | \$452,934 | \$672,547 | \$359,403 | \$202,796 | 5,855 |
| Shore | Resident Status | \$317,954 | \$457,473 | \$247,159 | \$140,707 | 4,195 |
| | Resident | | | | | |
| | Non-Resident | \$21,671 | \$33,344 | \$17,844 | \$10,099 | 292 |
| | Total | \$339,625 | \$490,817 | \$265,002 | \$150,806 | 4,487 |
| Total | Resident Status | \$857,198 | \$1,276,582 | \$688,790 | \$389,792 | 11,698 |
| | Resident | | | | | |
| | Non-Resident | \$50,620 | \$80,888 | \$43,810 | \$25,132 | 757 |
| | Total | \$907,818 | \$1,357,470 | \$732,601 | \$414,924 | 12,456 |

Boat Ramps

Fishery infrastructure was devastated by Hurricane Ike. Many of the damaged boat ramps will require major repairs to become operational. In October, TPWD's assessment of the boat ramps located in Galveston Bay showed 60 of 127 were closed and these 60 ramps accounted for 13% of private boat fishing effort coast wide in 2006-2007.⁴⁷ Based on early 2007 estimates received from Jefferson County for repairs to ramps in the Sabine Lake area after Hurricane Rita, it is reasonable to estimate an average of \$125,000 per boat ramp.⁴⁸

Marinas

Many coastal marinas have little left to show for what was once a prospering business except for a few piers and piles of rubbles. Area marinas are struggling to put their businesses back together for the recreational and commercial boating public that was also decimated. In updating the marina directory for 2009, several responses from marinas in the Ike storm damage area were received with conflicting data when compared to feedback from some operators and ground reports from agents in the field. The new directory saw the loss of 6 marinas, all from the damaged area, and an additional 5 are listed as closed, making the operational marinas in the Galveston Bay area down to 28 from 39 pre-storm.

⁴⁶Gentner and Steinback. 2008, p. 244

⁴⁷ TPWD. 2008. Hurricane Ike: Preliminary Analysis of Economic Damages to Texas Coastal Fisheries.

⁴⁸ *Ibid.*.

Table 6. Marina facilities on the Texas Gulf Coast affected by Hurricane Ike.

| | Recreational Marinas | Wet Slips | Dry Storage | Marina ramps |
|------------------------------------|----------------------|-----------|-------------|--------------|
| Total on Texas Coast ⁴⁹ | 107 | 13,282 | 4,542 | 113 |
| Galveston Bay | 39 | 8,227 | 2,088 | 31 |
| % of coastal total | 36.4 | 61.9 | 45.9 | 27.4 |
| % damaged in storm ⁵⁰ | 100 | 22 | 37 | 35 |

The cost of rebuilding marinas is high, and not all can afford the price. For those that can afford to rebuild, they have the opportunity to upgrade their facilities, possibly with the help of grant funds. The Texas Clean Marina Program can work with marinas through ongoing damage assessment and rebuilding. While the affected counties may never be the same as they were before Hurricane Ike, this challenging opportunity can be taken to rebuild the boating infrastructure to even higher standards.

Private Vessels

According to boat registration statistics obtained from Texas Parks and Wildlife, Chambers County had 1,263 vessels. Most are 26 feet or smaller, made of fiberglass or aluminum and gasoline powered. Commercial use was designated for 75 vessels, and 1,179 vessels were registered as pleasure craft. Liberty County had 3,734 vessels. Most are 26 feet or smaller, made of aluminum or fiberglass and powered by gasoline. Commercial use was designated for 40 vessels and 3,689 were registered as pleasure craft. Harris County had 61,386 vessels registered. Again, most are 26 feet in length or smaller, the majority is made of fiberglass and gasoline powered. Commercial use was designated for 556 vessels, and 60,711 vessels for pleasure. Galveston County had 12,721 vessels. Most are 26 feet or less, made of fiberglass, and gasoline powered. Commercial use designated for 440 vessels and 12,207 pleasure vessels. And lastly, Brazoria County had 10,074 vessels registered. Most 26 feet and smaller, made of fiberglass or aluminum, and powered by gasoline. Commercial use was designated for 145 vessels and there

⁴⁹ Hollin, D.2008. Texas Marina Facilities & Services Directory, Texas Sea Grant Program.

⁵⁰ Percentages based on comparison of 2008 & 2009 Texas Marina Facilities & Services Directory data and feedback.

were 9,905 pleasure vessels.⁵¹ According to BoatUS, nearly 15,000 boats in Texas were affected by the storm, totaling approximately \$175 million in damage.⁵² Additional numbers are probably available from other companies that underwrite boat insurance.

Charter Boats

The gray area between recreational fishing and commercial fishing is the for-hire sector, which includes guides, charters and headboats. Galveston Bay had 126 licensed guides⁵³ listing addresses in the affected counties and 134 federal permits⁵⁴ are held by this group. Surveys were mailed to each guide service to gather data on their economic losses. Of the 126 fishing guides surveyed, only 21 forms (16.7%) were returned from Galveston Bay. Responses were only received from guide/six-pack operators. No multi-passenger or headboats returned their surveys. Reported lost trips were 690 with a loss in gross revenue of \$386,980. Lost income for the coming year for these businesses was estimated at \$362,863.⁵⁵ With such a small sample reporting, it is difficult to ascertain the true economic impact of the storm. Damages incurred by vessels that did not participate in the survey are not included in the estimates of storm related losses. Therefore, this study underestimates actual losses to the entire charter fleet because an unknown amount of industry-wide losses was not reported.

The major impediments to the local for-hire sector are the high price of fuel, lack of tourism, and damaged infrastructure. Much of the hotel space is occupied by displaced residents, FEMA workers, contractors, and insurance agents. The loss of income for this sector primarily comes from cancelled trips and lack of travel to the region. Most charter fishing guides are successful, hardworking small business owners. All who returned surveys stated they planned on staying in business. Many people outside of the industry may not understand the significance of lost trips. The majority of these vessels operate with a high overhead on a limited budget. A few missed trips can mean the difference between survival and the need for an operating loan. Although the gross fee associated with a lost trip would include such expenses as fuel, which obviously would

⁵¹ TPWD. 2009. Boat Registration Statistics County Report, retrieved 2/1/09.

⁵² BoatUS. 2008. News release. http://www.boatus.com/news/PR_Full.asp?ID=323 retrieved 1/29/09.

⁵³ TPWD LY 2009 data for residents listing Jefferson or Orange county as a place of residence.

⁵⁴ Compiled from data on <http://sero.nmfs.noaa.gov/foia/readingrm.htm> retrieved 2/24/09.

⁵⁵ Texas Sea Grant loss assessment (2009) conducted by Rhonda Cummins.

not be expended, most expenses such as dock rent, tackle, insurance, etc. are fixed and have to be paid whether the owner receives payment for a trip or not.

The total losses to the recreational fishing industry will depend on the length of time that recreational fishing in the area is reduced or eliminated by the area's condition. Rebuilding or repairing infrastructure including, but not limited to, marinas, boat ramps, hotels, bait shops, and the infrastructure that supports those businesses will ultimately determine the overall impact to this vital economic sector.

Seafood Industries

The Galveston Bay seafood industry took a hard hit when Hurricane Ike came ashore. A total of 293 businesses were directly impacted in the commercial fisheries of Galveston Bay and Sabine Lake based on license and trip ticket reporting.⁵⁶ The most severely damaged were the many seafood processors and dealers throughout the bay which were inundated by the high storm surge. According to the National Marine Fisheries Service (NMFS), Texas has four of the 89 major U.S. ports for commercial fishery landings. In 2007, Galveston was ranked 18th by dollars with \$40.1 million.⁵⁷ When ranked by landings in pounds, Galveston was 38th with 19.2 million pounds.⁵⁸

According to the Texas Parks and Wildlife Department (TPWD), Galveston Bay and Sabine Lake make up approximately 37% of the inshore waters on the Texas coast, and accounts for approximately 55% of the ex-vessel value of commercial landings, and 36% of the total recreational fishing. In annual terms, this region accounts for approximately \$16 million in sales each year for bait, shellfish, and finfish.⁵⁹ "The economic impact of these ex-vessel sales conservatively creates⁶⁰ a total of \$25 million in economic impact to the state of Texas."⁶¹

⁵⁶ Governor's Office. 2008. *Texas Rebounds: Helping our communities recover from the 2008 hurricane season*. Section 8, p. 21.

⁵⁷ http://www.st.nmfs.noaa.gov/pls/webpls/MF_LPORT_YEARP.RESULTS retrieved 2/23/2009.

⁵⁸ http://www.st.nmfs.noaa.gov/pls/webpls/MF_LPORT_YEARP.RESULTS retrieved 2/23/2009.

⁵⁹ TPWD. 2008. Hurricane Ike: Preliminary Analysis of Economic Damages to Texas Coastal Fisheries.

⁶⁰ Tanyeri, Jones, and Jiang. 1998. Economic Impacts of Recreational Activities and Commercial Fishing on the Texas Gulf Coast.

⁶¹ TPWD. 2008. Hurricane Ike: Preliminary Analysis of Economic Damages to Texas Coastal Fisheries.

Trip tickets are a mandatory record-keeping system that requires commercial fishermen and seafood dealers to report detailed records on any seafood landed at a port in Texas.⁶² The records include information on the type of species caught, the amount of volume and price received for the catch.

Table 7. Ex-vessel value (\$) of each species landed commercially from the Galveston Bay Complex⁶³

| Species | 2005 | 2006 | 2007 | Total | 3-yr. Average |
|---------|------------|------------|------------|------------|---------------|
| Finfish | 222,756 | 253,326 | 370,126 | 846,208 | 282,069 |
| Shrimp | 5,441,125 | 2,229,038 | 2,750,947 | 10,421,110 | 3,473,703 |
| Crab | 301,255 | 239,192 | 812,600 | 1,353,047 | 451,016 |
| Oyster | 10,671,496 | 10,540,688 | 9,993,286 | 31,205,470 | 10,401,823 |
| Bait | 1,123,177 | 874,021 | 13,560,532 | 15,557,730 | 5,185,910 |
| Total | 17,759,809 | 14,136,265 | 27,487,491 | 59,383,565 | 19,794,521 |

As noted after other devastating coastal storms, the value of damaged infrastructure supporting the seafood industry is difficult to quantify. Infrastructure losses can be characterized as lost or damaged vessels, docks, ice plants and processing facilities but could also include roads and bridges, trucking, cold storage facilities, boat ramps, launches, marinas, bait and tackle shops. Due to the wide-spread displacement of local residents, labor shortages often limit the ability of infrastructure to quickly recover and repair and/or re-build.⁶⁴ While some shrimp boats were sunk, tossed onto shore, or otherwise damaged, most came through the storm and were ready to fish. Storm debris has been, and continues to be, a major problem for shrimp nets, especially in Trinity Bay, East Bay and behind the Texas City Dike.⁶⁵

Seafood Dealers

All 110 active seafood dealers in the area were closed after the storm with most destroyed or partially destroyed. The 16 seafood dealers who responded (21.6%) owned and maintained 31 commercial vessels. Only 3 vessels (9.7%) were reported without damage. Eleven vessels (35.5%) were reported to have minor damage. Another 4 vessels (12.9%) were substantially

⁶²TPWD began collecting commercial trip ticket records in 2005. These data can be formulated and applied for revenue estimated purposes.

⁶³ Bohannon. 2008. TPWD Commercial Landings Trip Ticket Program.

⁶⁴ Louisiana Department of Wildlife and Fisheries. September 7, 2005. Preliminary Analyses of Economic Losses Caused by Hurricane Katrina to Louisiana's Fisheries Resources. p. 5.

⁶⁵ Personal conversations with veteran commercial fishermen 2008.

damaged, and 8 vessels (25.8%) were lost or destroyed. The remaining 5 vessels were reported by one owner who did not designate a damage category. If all 31 vessels were replaced, some \$3.39 million would be required. The estimated cost to repair or replace vessels amounted to \$314,000, and represents a 9.3% survey wide casualty loss to the respondents. The expected time horizon to return their damaged vessels to service varied but roughly half of the vessels were hoped to be operational by August 2009.

Most of the docks and finger piers available to commercial fishermen around the Galveston Bay Complex are privately owned and maintained.⁶⁶ Of the 18 seafood dealers who responded to the survey, 14 (78%) owned docks and/or bulkheaded areas and all owners reported some level of damage. Collectively, 26,424 linear feet of bulkhead were owned and 6,948 linear feet (26%) sustained damage. The majority of the bulkheads (76.2%) were primarily made of treated wood, and the estimated repair/replacement cost of \$216/ft seems low. The reported replacement cost for the entire system of bulkheaded shoreline was \$1,499,880. Ten of the fourteen bulkhead owners also owned finger piers which extend out from the bulkheaded areas to increase the number of vessels that can be moored within the confines of a marina. Collectively 9,905 feet were owned and 71% (5,558) sustained some level of damage. The reported replacement cost of the damaged piers was \$452,500 or \$81.41/ft. which also seems low.

Eight firms indicated owning a collective total of 63,000 square feet of privately-funded roads and parking areas. Approximately 75% (47,400 sq.ft.) were damaged, with most areas (42,200) being unusable until required repairs were made. Respondents estimated repairs at around \$31,700. Eight firms also reported owning a fuel storage facility; seven of which were damaged or destroyed. The repair/replacement estimates for the fuel storage facilities total \$90,700.

Seventeen dealers owned buildings when Hurricane Ike made landfall. The other respondent rented space at the Galveston Yacht Basin and his business was destroyed by fire from the dry storage building next door the day before. All 62,720 sq. ft. of building space was damaged or destroyed with an estimated repair/replacement value of \$2,543,042. Processing equipment was

⁶⁶ Haby, M. G., R. J. Miget, and L. L. Falconer. 2009. *Hurricane Damage Sustained by the Oyster Industry and the Oyster Reefs Across the Galveston Bay System and Recovery Recommendations*. A Texas AgriLife Extension Service/Sea Grant Extension Program Staff Paper prepared by faculty in the Departments of Agricultural Economics and Wildlife & Fisheries, 51 pp. (June, 2009).

one of the hardest hit areas with a \$3,617, 606 in replacement cost for equipment. Roughly 35% of the dollar damages fell into the “*Significant – major repairs needed to be operational*” category and nearly 63% were classified as “*Destroyed – replacement required*”. Processing equipment and office facilities fared badly during the hurricane because of the significant flooding of the storm surge. Naturally, inventories held in these facilities were also devastated and the reported replacement cost was \$2,637,107.

Table 8. Estimated Losses and Costs to Repair or Replace All Damaged or Destroyed Assets of Active Seafood Dealers in the Galveston Bay Complex Who Responded to Survey⁶⁷

| Asset Class | Dollars | Percent |
|--------------------------------------|-------------------|----------------|
| Vessels | 314,000 | 2.8 |
| Docks & Piers | 1,952,380 | 17.4 |
| Roads & Parking | 31,700 | 0.3 |
| Fuel Systems | \$90,700 | 0.8 |
| Building & Equipment | 6,160,648 | 55.1 |
| Inventories | 2,637,107 | 23.6 |
| Total Repair/Replacement Cost | 11,186,535 | 100 |

Survey questions also asked about employment and payroll impacts for the twelve months just prior to the storm and the twelve months afterwards. Respondents provided information about the number of employees and their payroll. From September through December 2007, these dealers employed an average of 141 workers a month with a payroll value of \$584,797. After Hurricane Ike, data reported for September through December 2008 showed an average of 66 workers employed per month with a payroll of \$391,164. In short, employment of workers decreased by 53.5% and payroll declined 33.1%.

Galveston Bay Fishermen

Another survey was sent to fishermen with bay and bait licenses that worked on Galveston Bay. Additional surveys were distributed at public meetings held by Texas Sea Grant in Dickinson, Anahuac, and Port Arthur. In total, 436 surveys were distributed to the fishermen and 114 responded (26.1%). Collectively, these Galveston Bay fishermen annually spent 7,351 days fishing for bait shrimp, 3,441 days fishing for table shrimp, 5,350 days harvesting oysters, and

⁶⁷ Survey conducted by Calhoun County Extension Agent Rhonda Cummins, December 2008 thru February 2009. Results compiled by Extension Specialist Mike Haby, June 2009.

3,494 days fishing for crabs. A total of 198 vessels were owned by 113 respondents. The vessels were broken down by license type with the majority being shrimp (69) and oyster (60) boats. Forty-two vessels were listed as a combination license (shrimp & oyster); 14 vessels were licensed as commercial crabbers; 2 vessels were licensed for fishing (i.e. black drum, flounder, etc.); and the question was not answered on the other 11 vessels.

Vessel damage was classified by severity with only 9% (16 vessels) reporting “*no damage*”; 34% (64 vessels) reported “*minor damage*”; 39% (73 vessels) reported “*substantial damage*” with hull or engine repair needed; and 18% (33 vessels) were classified as “*destroyed or lost*” and replacement would be required. Twelve of the vessels were unaccounted for due to the owner(s) failure to answer this particular question on the survey. Overall, the fleet-wide casualty loss was calculated at 12.7%. While 132 of the surveyed vessels (71%) were expected to be operational by August 2009, another 37 vessels (19.9%) were listed as taking an unknown amount of time to repair or replace. Roughly 1 of 5 commercial fishing vessels had an undetermined future and could quite possibly never fish again depending on a wide range of factors for the owners not covered in the study.

As previously noted, most docks and finger piers available to commercial fishermen are privately owned. Sixteen of the vessels owners surveyed (14%) owned their own docks when Ike made landfall. Of those, 15 owners sustained damage, and one did not. Approximately 7,307 linear feet of bulkhead was reported with 93% (6,821 ft.) reported to have some level of damage. Most (96.6%) of the damaged bulkhead was severe/destroyed requiring replacement to be useable. The estimated price for said repairs for treated wood seems low at \$1,291,000 or \$189/ft. A resounding two-thirds of the respondents had no estimated time for repairs to become operational. The other 34% expected to have repairs/replacements completed by February 2010. Nineteen of the bulkhead owners also had finger piers and 15 of those had piers damaged or destroyed. Of the 4,063 linear feet of piers owned, 71% (2,893 ft) sustained some level of damage. Again, a low estimate was given for the repair/replacement of the treated wood piers at only \$26/ft for a total of \$75,500. It is quite possible that the vessel owners were unable to obtain actual estimates and badly guessed at what they thought might be a price. It is also likely that

many would do their own repairs with salvaged lumber or simply not repair/replace the structure at all.⁶⁸ Most of the piers (78%) were expected to be operational by February 2010.

Table 9. Estimated Losses and Costs to Repair or Replace All Damaged or Destroyed Assets of the Galveston Bay Fishermen Who Responded to Survey⁶⁹

| Asset Class | Dollars | Percent |
|--------------------------------------|------------------|----------------|
| Vessels | 2,416,757 | 61.0 |
| Docks & Piers | 1,366,000 | 34.5 |
| Fuel Systems | 179,000 | 4.5 |
| Total Repair/Replacement Cost | 3,961,757 | 100.0 |

Survey questions also asked about employment and payroll impacts for the twelve months just prior to the storm and the twelve months afterwards. Respondents provided information about the number of employees and their payroll. From September through December 2007, these fishermen employed an average of 178 workers a month with a payroll value of \$1,533,973. After Hurricane Ike, data reported for September through December 2008 showed an average of 77 workers employed per month with a payroll of \$442,249. In short, employment of workers decreased by 56.7% and payroll declined 71.2%. This was due in part to their inability to fish because of issues with marine debris. Eighty-six of the fishermen responded to the question *“Have you encountered problems with storm debris?”* with 80 answering “yes”. Another factor affecting the employment of fishermen was the availability of dockside processors, ice and fuel supplies. With the level of damaged experienced by the seafood dealers, it was of no surprise that the fishermen were so adversely affected.

⁶⁸ Personal communications with several vessel owners during the weeks following the storm.

⁶⁹ Survey conducted by Calhoun County Extension Agent Rhonda Cummins, December 2008 thru February 2009. Results compiled by Extension Specialist Mike Haby, June 2009.

Combined and Projected losses

Over \$11.1 million in losses were reported by the active seafood dealers in the survey. An additional \$3.9 million in losses were reported by the Galveston Bay fishermen. With less than 25% of the fishing community responding to the surveys, the total loss was still estimated at over \$15.1 million. These surveys were Texas Sea Grant's first attempt to gather such post-storm data, and were quite remarkable considering the level of devastation experienced by the participants in all areas of their lives. From their responses, it could be possible to extrapolate greater economic loss numbers for the industry. Based on simple mathematics alone, the overall economic loss to the fisheries infrastructure could possibly be estimated as high as \$71.7 million.

Table 10. Combined Estimated Losses and Costs to Repair or Replace All Damaged or Destroyed Assets of the Galveston Bay Fishermen and Seafood Dealers Who Responded to Survey and Projected losses estimated on simple mathematics for the population that did not respond.⁷⁰

| Asset Class | Dealers Dollars | X 5 ⁷¹ | Fishermen Dollars | X 4 ⁷² | Total Reported | Total Projected |
|----------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Vessels | 314,000 | 1,570,000 | 2,416,757 | 9,667,028 | 2,730,757 | 11,237,028 |
| Docks & Piers | 1,952,380 | 9,761,900 | 1,366,000 | 5,464,000 | 3,318,380 | 15,225,900 |
| Roads & Parking | 31,700 | 158,500 | » | » | 31,700 | 158,500 |
| Fuel Systems | 90,700 | 453,500 | 179,000 | 716,000 | 269,700 | 1,169,500 |
| Building & Equipment | 6,160,648 | 30,803,240 | » | » | 6,160,648 | 30,803,240 |
| Inventories | 2,637,107 | 13,185,535 | » | » | 2,637,107 | 13,185,535 |
| Total Repair / Replacement Cost | 11,186,535 | 55,932,675 | 3,961,757 | 15,847,028 | 15,148,110 | 71,779,703 |

Conclusion

Long-term recovery has been defined as a rebuilding process to bring back economic activities to the level of pre-disaster as soon as possible.⁷³ The commercial and recreational fishing industries of Galveston Bay are of no less importance in this regard than any other business, housing, or infrastructure project currently under consideration. Generations of families have operated fishing boats, seafood processing facilities, boat yards and support industries. Such water-dependent industries have tremendous economic impacts for the area and the state. Fisheries

⁷⁰ Survey conducted by Calhoun County Extension Agent Rhonda Cummins, December 2008 thru February 2009. Results compiled by Extension Specialist Mike Haby, June 2009.

⁷¹ Roughly 1 of 5 active seafood dealers responded to the survey (21.6%).

⁷² Roughly 1 of 4 commercial fishermen responded to the survey (26.1%).

⁷³ Erlambang. 2008. Estimating the Economic Impacts of Hurricane Damage on Coastal Fishing Infrastructure. p. 11

infrastructures (fishing vessels, docks, ice houses, processing facilities, warehouses and marinas) were directly damaged by Hurricane Ike thus limiting the access, docking, and support services needed by these water-dependent industries. When they are unable to operate, related businesses also suffer. In addition to economic losses, the traditional community culture and character could be lost as the working waterfronts disappear. In rural areas, disasters not only affect economic activities, but may also culminate in hunger and poverty if severe damage is caused to the agriculture and natural resource sectors such as fisheries. Indirect impacts from the storm came through destruction of coastal wetland habitat which provides multiple functions including recreation, leisure and ecotourism. Complete recovery of these areas could take several years. Aid is needed to rebuild and sustain the infrastructure of this area's viable fishing community.

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