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Benedict C. Posadas
Mississippi State University
Coastal Research and Extension Center
Mississippi Sea Grant Extension Program

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INTRODUCTION

An economic assessment of the commercial marine fisheries harvesting sector was undertaken in Mississippi to determine the level of damage sustained as a result of Hurricane Katrina. The devastation by this hurricane has created an urgent and compelling need to complete damage assessments in the affected areas in as short a period as possible. Congress is developing damage assistance programs for the Gulf region. An accurate assessment of the damage created by this storm is needed to ensure that federal funds are adequate and allocated to the appropriate sectors and recipients.

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service and the Mississippi Department of Marine Resources had an urgent need to quickly assess the damage inflicted on the commercial fishing fleet in Mississippi by Hurricane Katrina. Unprolonged recovery is a key factor in reducing the adverse social and economic impacts of major disasters. Quick provision of necessary aid and assistance encourages quick recovery. This assessment aided in identifying critical relief, support, and rebuilding needs to assist the fishing fleet and associated communities in recovering their economic vitality. Our findings were an essential first step in providing the necessary aid to the affected businesses and communities. Providing the proper levels of assistance in a timely manner is crucial in helping reduce wasteful and inefficient assistance, ultimately reducing the cost to the government and the nation.

Table 1. Mississippi Commercial Fisheries Landing Values by Major Species.

Category	2004 Landing values ($)[1]	2005 Landing values ($)[1]
Shrimp	26,525,655	13,760,960
Oysters	6,074,285	1,447,132
Crabs	705,705	431,630
Finfish	10,484,909	7,809,130
All Species	43,790,554	23,448,852

[1]Source of raw data: National Marine Fisheries Service, Pascagoula Laboratory, Pascagoula, Mississippi.

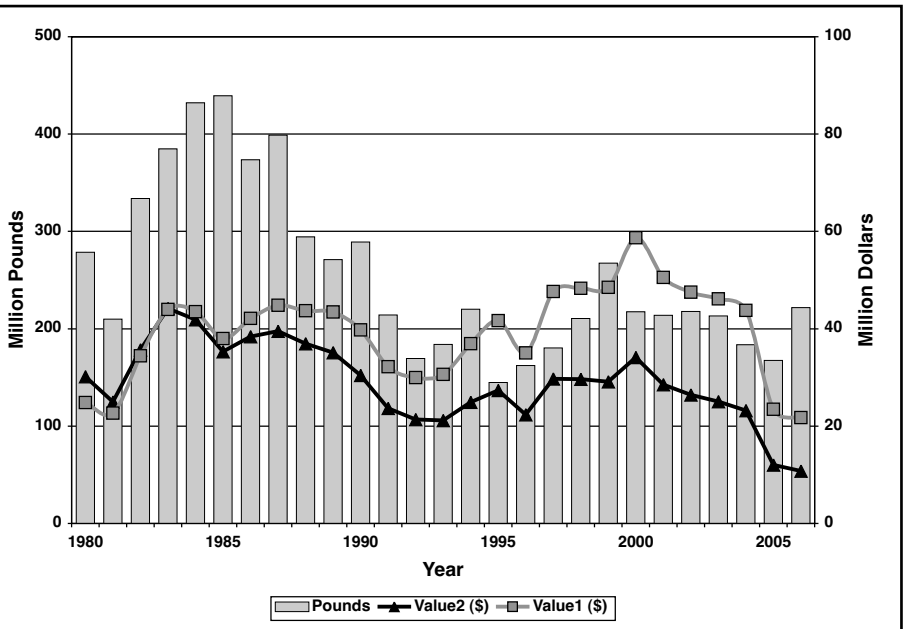

Figure 1. Mississippi commercial fisheries landings, in pounds and dollars at current (1) and deflated (2) prices. Source: NOAA Fisheries, Office of Science and Technology, Fisheries Statistics. Annual Commercial Landing Statistics. http://www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html (last verified March 14, 2008).

Table 2. 2005 Licensed Resident Mississippi Commercial Fishing Units Net of Multiple Licenses.[1]

County	Number	Percent	Average number of licenses per fishing unit	Average length of fishing units (ft)
Hancock	220	21	2	39
Harrison	418	41	2	53
Jackson	326	32	2	39
Other Counties	66	6	1	20
All Counties	1,030	100	2	47

[1]Source of raw data: Mississippi Department of Marine Resources-Data Management Office, Biloxi, Mississippi.

The assessment, to the extent possible, identified all commercial fishing boats and vessels in the affected areas that existed before the hurricane, identified original physical characteristics and production levels for these fishing units, and provided an estimate of the cost of rebuilding or repairing the fishing units to their pre-disaster state so that seafood harvesting could resume (Figure 1 and Table 1). The damage assessment included the following information about the commercial fishing units: (1) inventory of fishing units that existed at each port or community; (2) original capital investment made in the fishing units; (3) estimate of physical damages to fishing units and the dollar value of that damage by community; (4) estimate of the replacement cost of the capital needed to rebuild the commercial fishing fleet; and (5) current level of insurance presently existing for the commercial fleet, and the capital debt remaining to be paid off. Similar economic assessments of the damages on seafood processors and dealers (Posadas, 2006a; 2007), charter boats for hire, marinas and live bait dealers (Posadas, 2006c) and recreational boats (Posadas, 2006d) were also conducted in Mississippi and Alabama (Chang, et al., 2006), Louisiana (Caffey, et al., 2006) and Florida (Adams and Gregory 2006).

In 2005, the licensed resident commercial fleet in Mississippi numbered 1,030 fishing units, which averaged 47 feet in length and were licensed to harvest an average of two species per fishing boat or vessel. Most of the fishing units (94%) were located in the three coastal counties (Table 2). In Hancock County, the average length of the fishing units was 39 feet, and each unit had an average of two fishing licenses; in Harrison County, the average was 53 feet long and two fishing licenses; and in Jackson County, the average was 39 feet long and two fishing licenses. In other counties, the average unit length was 20 feet, and each unit had at least one fishing license. Less than two-thirds (64%) of the licensed fishing units were engaged in shrimping. Most of the shrimping units (92%) were located in the three coastal counties of Hancock (18%), Harrison (45%), and Jackson (29%) (Table 3).

Table 3. 2005 Licensed Resident Mississippi Commercial Shrimping Units.[1]

County	<30 ft	30-45 ft	>45 ft	Total	Percent
Hancock	50	49	23	122	18
Harrison	47	80	168	295	45
Jackson	47	72	76	195	29
Other Counties	35	10	5	50	8
All Counties	179	211	272	662	100

[1]Source of raw data: Mississippi Department of Marine Resources Data Management Office, Biloxi, Mississippi.

METHODS

Data Collection

Assessing the impacts of Hurricane Katrina on Mississippi's commercial fishing fleet included all the 1,030 resident fishing units licensed by the Mississippi Department of Marine Resources Office of Management Operations (DMR) in 2005. Data were collected from survey questionnaires (Appendix A) mailed in November and December 2005 to all the resident commercial fishing units licensed by DMR. Personal interviews with commercial fishermen who needed assistance in completing the survey were conducted in four coastal locations by personnel of the Mississippi Department of Marine Resources Seafood Technology Bureau (DMR-STB) and the Mississippi State University Coastal Research and Extension Center (CREC) in November and December 2005. The interview centers were at the Pass Christian Harbor, CREC main office in Biloxi, DMR temporary trailer office in Biloxi, and DMR check station in Pascagoula.

Estimation Procedures

The total damages associated with the hurricane to the licensed resident commercial fishing fleet were estimated by using the following formulas:

Total reported damages = damages to boats/vessels and engines **+** damages to fishing gear and other accessories **+** cleaning, removal and disposal costs

Total projected damages = average total damages reported by sample units **x** total number of fishing units

The net damages to the licensed resident commercial fishing fleet were estimated as follows:

Net reported damages = total reported damages **–** total insurance payments received

Net projected damages = average net damages reported by sample units **x** total number of fishing units

The total initial investment on the licensed resident commercial fishing fleet was estimated by using the following formulas:

Total reported initial investment = investment on boats/vessels and engine **+** investment on fishing gear and other accessories

Total projected initial investment = average initial investment reported by sample units **x** total number of fishing units

Once fully recovered to pre-Katrina levels, the total annual gross sales of licensed resident commercial fishing fleet that would be lost due to lost market channels were estimated by using the following formulas:

Total projected annual gross sales = average 2004 annual gross sales reported by sample units **x** total number of fishing units

Total projected annual gross sales lost due to lost market channels = average percent of annual gross sales that would be lost due to lost market channels **x** total projected annual gross sales

The total outstanding loans of the licensed resident commercial fishing fleet were estimated by using the following formulas:

Total reported outstanding loans = outstanding loans from Small Business Administration (SBA) **+** outstanding loans from other sources

Total projected outstanding loans from SBA = average outstanding loans from SBA reported by sample units **x** total number of fishing units

Total projected outstanding loans from other sources = average outstanding loans from other sources reported by sample units **x** total number of fishing units

Results and Discussion

Participating Fishing Units

A total of 511 mailed and personal interviews with resident Mississippi commercial fishermen were completed between November 2005 and February 2006, representing an average response rate of 50% (Table 4). Of the 1,030 questionnaires mailed to these fishing establishments, 62 survey forms were returned as undeliverable to the last known or forwarding addresses; one commercial fisherman was reported as deceased. Excluding the 62 returned survey forms, the net response rate to the mail and personal survey was 53%. In computing the final values of all the variables describing the fishing industry, however, the total population (N=1,030 vessels and boats) of commercial fishing boats and vessels was used.

There were 105 commercial fishermen located in Hancock County who responded to the mail survey or participated in the interviews at the Pass Christian or Biloxi stations. In Harrison County, 280 commercial fishermen responded to the mail survey or were interviewed at the Biloxi stations. In Jackson County, 120 commercial fishermen completed the mail surveys or visited the interview station in Pascagoula.

Table 4. Number of Participating Resident Licensed Mississippi Commercial Fishing Units.

County	Total number of fishing units	Number of participating units	Response rate (%)	Percent of units without damages
Hancock	220	105	48	10
Harrison	418	280	67	10
Jackson	326	120	37	18
Other Counties	66	6	9	100
All Counties	1,030	511	50	13

Total Damages

The total estimated damages to the resident Mississippi commercial fishing fleet exceeded $35 million (Table 5). These damages represent 27% of the total initial investment in the commercial fishing fleet. The damages to boats, fishing gear, and other accessories contributed 97% of all reported damages. Damages reported by commercial fishermen ranged from no damage up to $600,000. Only 13% of all commercial boats or vessels were undamaged by Hurricane Katrina. Harrison County reported most of the damages, a total of $18.6 million. Damages to fishing units reached $5.6 million in Hancock County and $6.4 million in Jackson County.

Table 5. Estimated Total Damages to Resident Licensed Mississippi Commercial Fishing Units.

County	Number of units	Percent of boats damaged	Average damages ($/unit)	Total damages ($)
Hancock	220	90	25,523	5,615,106
Harrison	418	90	44,557	18,624,956
Jackson	326	82	19,626	6,398,340
Other Counties	66	0	0	0
All Counties	1,030	87	34,268	35,296,545

Net Damages

Net damages to the commercial fishing establishments reached $33.6 million (Table 6). These net damages accounted for 95.1% of total damages, which indicates that insurance payments covered 4.9% of total damages. Several of these fishing units (97.4%) did not carry any insurance coverage or were not expecting any insurance payments for damages. The net damages to fishing units located in Harrison County were $17.5 million; Hancock County, $5.6 million; and Jackson County, $6.2 million.

Table 6. Estimated Net Damages to Resident Licensed Mississippi Commercial Fishing Units.

County	Number of units	Average damages ($/unit)	Total damages ($)
Hancock	220	25,457	5,600,439
Harrison	418	41,786	17,466,352
Jackson	326	19,127	6,235,340
Other Counties	66	0	0
All Counties	1,030	32,619	33,597,148

Initial Investment Requirements

Rebuilding the damaged commercial fishing fleet would require new private investments to replace or repair boats/vessels, equipment, and other accessories. Total initial investments on these fishing units amounted to $131.8 million, which consisted primarily of boats/vessels and engines (Table 7). To encourage new private investments, new infrastructure would be required, including but not limited to, access to loading, unloading, ice and fuel, and repair facilities. Needless to say, these fishing units would need safe access to the state and federal fishing waters without undue risks and uncertainties associated with debris brought by the hurricane.

Table 7. Estimated Initial Investment on Resident Licensed Mississippi Commercial Fishing Units.

County	Number of units	Average investment ($/unit)	Total investment ($)
Hancock	220	55,395	12,186,827
Harrison	418	167,313	69,936,997
Jackson	326	98,709	32,179,216
Other Counties	66	13,825	912,450
All Counties	1,030	127,926	131,763,883

Revenues Foregone Because of Lost Market Channels

In addition to damaged boats/vessels, engines, fishing gear, and other accessories, the fishing units would also incur revenue losses associated with lost markets of their catch. The fishing units estimated that they would lose 72.3% of their markets for seafood products (Table 8). The magnitude of the seafood markets could be measured by the total ex-vessel value of commercial fisheries landings and the total gross annual sales reported by commercial fishing units. As reported by the participating resident fishermen, the estimated total gross annual sales in 2004 totaled $85.5 million — an average of $83,054 per fishing unit. The total ex-vessel value of the commercial fisheries landings was $43.8 million in 2004 and $23.4 million in 2005 (Table 1). Using the 2004 annual gross sales as benchmark, the commercial fishing businesses could lose more than $61.8 million because of lost seafood markets. When considered on a regional basis, these lost market channels have a considerable impact on economic activity, income generation, employment creation, and tax collections. The number of crew members employed by the fishing units decreased by 78.6% from 1,905 fishermen before Hurricane Katrina — an average 1.85 fishermen per fishing unit (Table 8).

Table 8. Gross Sales Lost Due to Lost Market Channels and Reduction in Crew Members of Resident Licensed Mississippi Commercial Fishing Units.

County	Number of units	Percent of gross sales lost	Percent of crew members lost
Hancock	220	83.6	-90.3
Harrison	418	72.8	-75.4
Jackson	326	63.0	-76.8
Other Counties	66	36.0	-66.7
All Counties	1,030	72.3	-78.6

Outstanding Loans

These fishing establishments reported total outstanding loans amounting to $48.2 million (Table 9). The U.S. Small Business Administration (SBA) made $31.1 million of these outstanding loans. SBA loans accounted for 64.4% of the total outstanding loans the commercial fleet held when the hurricane hit. Estimated loans from other sources (e.g., private banks) amounted to $17.2 million or 35.6% of total outstanding loans owed. Harrison County fishing units had total outstanding loans of $31.8 million, which were mostly from SBA (66.9%). Hancock County commercial fishermen had outstanding loans of $700,000 million, which were mostly from sources other than SBA (74.9%). Outstanding loans among Jackson County fishermen reached $6.1 million, which were from SBA (46%) and other sources (54%).

Table 9. Estimated Outstanding Loans of Resident Licensed Mississippi Commercial Fishing Units.

County	Number of units	Average SBA loan ($/unit)	Total SBA loans ($)	Average loan from other sources ($/unit)	Total loans from other sources ($)	Total loans ($)
Hancock	220	846	186,153	2,527	555,867	742,020
Harrison	418	50,869	21,263,154	25,174	10,522,753	31,785,907
Jackson	326	8,540	2,783,975	10,035	3,271,465	6,055,440
Other Counties	66	0	0	0	0	0
All Counties	1,030	30,152	31,056,828	16,670	17,169,873	48,226,701

Summary and Implications

The tasks involved in estimating the economic damages to the Mississippi commercial fishing fleet associated with Hurricane Katrina were extremely difficult and time-consuming. Most of the commercial fishermen, however, were extremely cooperative in providing the economic information required in conducting a fairly exhaustive assessment. When the hurricane hit, there were 1,030 licensed resident commercial fishing vessels and boats in Mississippi. Results of the assessment indicated massive devastation of the state commercial fishing fleet. Approximately 87% of the commercial fishing fleet reported damages associated with Hurricane Katrina. Total damages amounted to $35.3 million, which primarily consisted of damages to vessels or boats, engines, and fishing gear. Only about 4.9% of the reported damages were covered by insurance because approximately 97.4% of the commercial fishing fleet did not carry any insurance coverage or were not expecting any insurance payments for damages incurred as a result of Hurricane Katrina.

This information on hurricane damages has been transmitted to local, state, and federal agencies responsible for managing, regulating, and assisting the commercial fishing industry. The primary short-term needs included removing debris in fishing grounds and waterways, creating storm shelters for boats/vessels in safe inland waters, and rebuilding docking, repair, fuel and ice facilities. Economic recovery of this industry depends on the timing and magnitude of the response to the devastation from public agencies and the private sector.

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APPENDIX A

SURVEY OF DAMAGES FROM HURRICANES KATRINA AND RITA ON MISSISSIPPI COMMERCIAL FISHING FLEET

1. BOAT/VESSEL LICENSE NUMBER OR NAME: _____

2. LENGTH OF BOAT/VESSEL (IN FEET): _____

3. CITY BOAT/VESSEL IS LOCATED: _____

4. FISHING LICENSES (Please check all that applies to the boat):
   - ☐ Crab
   - ☐ Oyster ☐ Tonging ☐ Dredging
   - ☐ Shrimp
   - ☐ Fish
   - ☐ Menhaden
   - ☐ Livebait

   ESTIMATE OF BOAT/VESSEL LOSS

5. Please describe the type, size and initial investment on the boat/vessel, engine, gear and other accessories of your boat/vessel before Katrina:

Category	Description	Number	Initial investment ($)
Boat/Vessel			
Engine			
Gear			
Other accessories			
Total			

6. If your boat/vessel was damaged, what are your best estimates of the costs of the damages to your boat, engine, gear and accessories that you need to restore to pre-Katrina level? (IF NONE, ANSWER 0)

Category	Estimated costs of the damages to restore to pre-Katrina level ($)	Estimated costs of towing, cleanup, and disposal ($)	Amount already spent to restore ($)
Boat & engine			
Gear & accessories			
Total			

INSURANCE AND LOANS ON BOAT/VESSEL (IF NONE, ANSWER 0)

7. What is the amount of insurance coverage you expect for the damages?
   $_____

8 What is the amount of outstanding loan you have on the boat/vessel?
   Loans from Small Business Administration $_____
   Loans from other sources $_____

ESTIMATION OF LOST REVENUES AND MARKETING OPPORTUNITIES

9. What were your gross annual sales in 2004 (before H. Katrina)? $_____

10. How many crew members did you employ in 2004 (before H. Katrina)? _____

11. How many crew members are you employing now (after H. Katrina)? _____

12. Once fully recovered, what is your best estimate of the pre-Katrina level of total sales that you will lose due to lost market channels? _____ percent

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