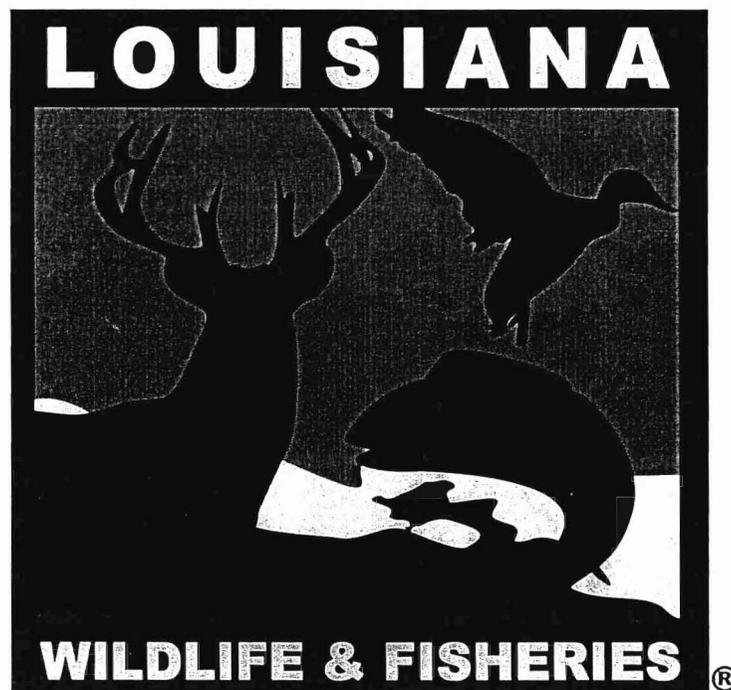


# Louisiana Department of Wildlife and Fisheries

*Marine Fisheries Division*



2008

## OYSTER STOCK ASSESSMENT REPORT

OF THE

## PUBLIC OYSTER AREAS IN LOUISIANA

SEED GROUNDS and SEED RESERVATIONS

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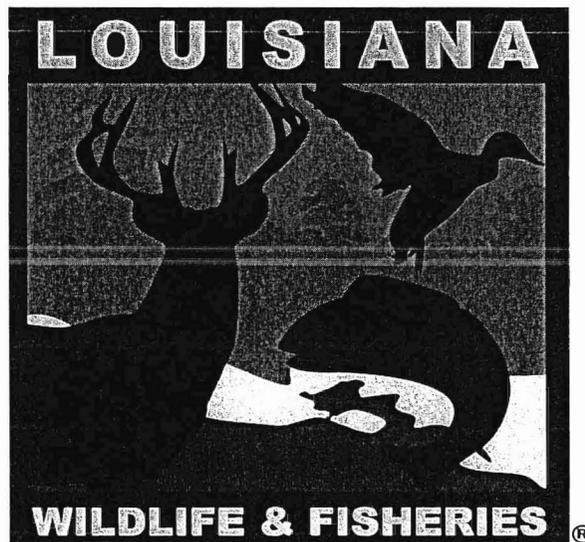
Oyster Data Report Series

No. 14

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# Statewide Overview - 2008 Oyster Stock Assessment

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## INTRODUCTION

The oyster resource in Louisiana is one of the largest and most valuable in the nation. Its value is derived from both the economic benefits it provides to the state and the ecological benefits it provides to the estuarine environment. Due to Louisiana's vast coastal wetland area, ample habitat exists where oysters thrive under a variety of environmental conditions. The Department of Wildlife and Fisheries (LDWF) is charged with managing the oyster resource on the public grounds by closely monitoring the size and health of oysters on nearly 1.7 million acres of public water bottoms. Oyster management on these public grounds includes activities such as setting oyster seasons, monitoring harvest levels, and cultch planting (reef building) projects (Figure 1).

Typically, the oyster industry utilizes the public oyster grounds as a source of seed oysters (< 3") for transplant to private leases. The public



Figure 1. Cultch planting (reef building) activities being performed in Mississippi Sound near Turkey Bayou (St. Bernard Parish) in early June 2007.

grounds, however, also yield a supply of sack-sized oysters ( $\geq 3''$ ) and these oysters may be taken directly to market. The manner in which both the public grounds and private leases are utilized in combination helps to keep Louisiana's industry as a national leader in oyster production with annual value well in excess of \$30 million worth of dockside sales.

Oysters also play an important ecological role in the estuarine ecosystem. Oyster reefs provide the majority of hard substrate required by other sessile invertebrate species such as barnacles, bryozoans, tunicates, and anemones. Reefs are also utilized as shelter and forage habitat for many species of crabs, worms, fish, and meiofauna. Estuarine water quality can be affected by the filter-feeding activities of oysters, and reefs may also play a role in stabilizing shorelines.

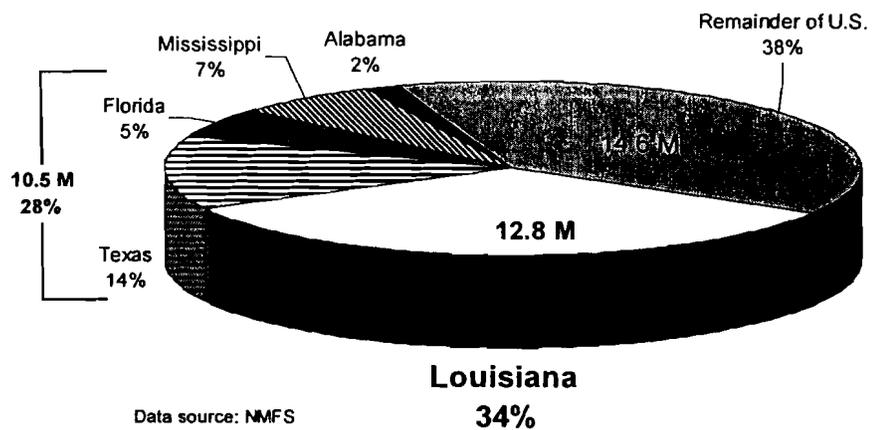
## LOUISIANA OYSTER LANDINGS

Louisiana regularly leads the nation in the production of oysters and accounted for an average of 34% of the nation's oyster landings from 1997-2006 (Figure 2). For the first time in over two decades, however, Louisiana was not the top producer of oysters, when, in 2006 the state of Washington produced approximately 12.2 million pounds of Pacific oysters (*Crassostrea gigas*)

and Louisiana produced approximately 11.4 million pounds of American oysters (*Crassostrea virginica*)<sup>1</sup>. Louisiana also consistently ranks #1 in landings among the states in the Gulf of Mexico, accounting for over 50% of all oysters landed.

Oysters have been a part of the Louisiana economy for many years; starting from meager beginnings and growing into a multi-million dollar industry. In 2007, the dockside value of oysters was the highest on record, totaling over \$40 million and harvest yielded approximately 12.8 million pounds of meat (LDWF Trip Ticket Data). This represents an 11% increase in value and a nearly 14% increase in landings versus 2006 levels.

The public oyster grounds can be considered the backbone of the Louisiana oyster resource. Those grounds are a valuable contributor to overall Louisiana oyster landings each year, while also supplying seed oysters transplanted to private leases for grow-out purposes. The trend from 1970 – 1992 showed the majority of Louisiana oyster landings came from private reefs. From 1992 to 2001, however, the public ground stock size increased, in general, and landings from the public grounds increased as well. Although the general trend since 1992 shows an increased reliance of



**Figure 2.** Average 1997 - 2006 oyster landings (all species combined, pounds of meat).

the oyster industry on the public grounds for sack-sized oysters, recent decreases in public ground oyster availability has lead to decreased harvest from the public grounds since 2002. In 2007, harvest levels increased on the public grounds over 2006 levels and the public grounds produced approximately 37% of all oyster landings for the calendar year (Figure 4). When comparing the price per pound on public grounds and private leases, those values are nearly identical in 2007 as public ground oysters sold for \$3.12 compared to \$3.13 per pound of oysters from private leases. This was the first year since 2001 that private lease oysters yielded a higher price per pound than public ground oysters.

### STATEWIDE OYSTER STOCK ASSESSMENT

Each summer, LDWF biologists from each Coastal Study Area (CSA) of the Marine Fisheries Division perform quantitative evaluation of the oyster resource on the public oyster areas. This biological evaluation includes using SCUBA to collect replicate oyster samples from within a square meter frame from multiple locations in each public oyster ground. Sampling that is

<sup>1</sup> Finalized 2007 landings data was not yet available for all states at the time of this publication.

undertaken as part of the annual stock assessment is also plays a valuable role in predicting the success of the upcoming oyster season, which generally opens in early September and runs through April of the following year (although the season may be closed or delayed if biological concerns or enforcement problems are encountered) Square-meter sampling is conducted each summer and used in conjunction with estimated reef acreage to estimate the stock size of the resource and to make recommendations to the Wildlife and Fisheries Commission for the setting of the oyster season. Although known reefs are estimated at approximately 38,000 acres, it is likely that additional reef acreage exists on the public oyster grounds. A recent project employing side-scan sonar technology to map water bottoms was completed in Drum Bay and Morgan Harbor (CSA I). Reef acreage in these areas was unknown until this year and related information is included in the CSA 1 stock assessment report on the following pages.

Most natural populations of species exhibit cyclical abundance distribution over time. Abundance of the oyster resource on the public areas in Louisiana also follows this general trend as periods of lower abundance were observed in the 1980's followed by a period of increasing abundance during the 1990's through 2001. Since 2001, however, the general trend of oyster abundance has been decreasing with small amounts of inter-annual variability in abundance since 2002. Although oyster stock size (abundance) over the past seven years has decreased from record levels in 2001, levels have not dipped to those observed between 1982 and 1990 and the stock size has shown relatively little change over the last three years (Figure 5).

Statewide oyster stock size in 2008 has shown a slight decrease of 3.3% compared to 2007 as approximately 2,177,788 barrels of oysters are available on the public oyster areas of Louisiana this year (figure 5). This decrease represents an approximate drop in total oyster availability of 74,415 barrels of oysters over 2007 levels. Seed stocks (oysters 1" to <3") dropped approximately 41% from

1,341,733 barrels in 2007 to 798,285 barrels in 2008 (Figure 3). The largest portion of the 2008 seed oyster stock is located in Calcasieu Lake, an area where harvest pressure is relatively low compared to other parts of the state and seed oyster harvest does not occur due to the lack of nearby private oyster leases (Table 1). The traditional public seeding

**Table 1.** Estimated statewide oyster stock size on the public oyster areas of Louisiana.

CSA	Seed (bbls)	Sack (bbls)	Total (bbls)
1	305,256	750,526	1,055,782
2	110,751	124,393	235,144
3	2,036	2,949	4,985
4	2,277	2,267	4,544
5	46,863	52,237	99,100
6	N/A	N/A	N/A
7	331,102	447,131	778,233
<b>Totals</b>	<b>798,285</b>	<b>1,379,503</b>	<b>2,177,788</b>

areas in CSA 2 (Black Bay, Gay Gardene, Bay Crabe, etc.) contributed most to the decrease in seed oyster stock size as availability in that area dropped over 340,000 barrels.

Market-size oysters ( $\geq 3$ " ), however, showed a large 52% increase in availability in 2008, jumping from a 2007 level of 910,470 barrels to 1,379,503 barrels (Figure 3). Although heavy harvest was noted on CSA I reefs during the 2007/2008 oyster season, a large supply of market-size oysters are estimated to remain in this area. Additionally, Calcasieu Lake also holds a significant portion of the statewide market-size oyster stock with approximately 447,131 barrels

of oysters available (Table 1). As with seed stock size, CSA 2 market-size oyster availability has dropped significantly from 2007 levels as only 124,393 barrels are estimated to be available compared to over 309,500 barrels last year.

**FACTORS AFFECTING THE 2008 OYSTER STOCK SIZE**

A variety of factors, both natural and anthropogenic, affect the oyster stock size on the public grounds in any given year. Natural threats to oyster survival include extreme low salinities caused by high river discharge and localized rainfall, as well as predation and disease. Harvest and construction activities (i.e. oil and gas production) can serve to reduce oyster abundance as well. In addition, the public oyster grounds were heavily inundated with freshwater during the first half of 2008 due to high river discharge, localized rainfall, and the opening of the Bonnet Carre' Spillway. The large decrease in seed stocks may be especially reflective of oyster mortality due to increases in freshwater inputs over the last several months as river discharge was especially high during the early part of 2008 (Figure 6). Field sampling of oyster resources on public oyster seed grounds between April and June 2008 showed mortality as high as 100% in CSA 6 and 84% in CSA 2 at selected sample locations.

Harvest pressure during the 2007/2008 oyster season served to reduce available oyster resources on the public grounds, especially in CSAs 1 and 2 where the substantial harvests were estimated for market-sized oysters (Table 2). During the 2008 stock assessment sampling, it was noted that most reefs sampled in CSA 2 comprised mostly of shell fragments rather than whole dead shell or live oysters, indicating that mechanical harvest may have had a significant impact on these reefs. Increased harvest pressure on reefs due to the Private Oyster Lease Rehabilitation (POLR) program (grant #NA06NMF4540319 to assist with the rehabilitation of Louisiana oyster resources heavily impacted by Hurricanes Katrina and Rita in 2005) also likely played a role in reducing the oyster stock size on the public grounds. The POLR program, funded by federal hurricane disaster monies, provided reimbursement assistance to leaseholders who performed qualifying rehabilitation work on their private leases. One such qualifying activity was the bedding of seed oysters and this reimbursement opportunity may have provided extra incentive during the past year to harvest more seed oysters than normal.

**Table 2.** Harvest estimates for the 2007/2008 oyster season on the public oyster grounds of Louisiana.

CSA	Seed Oysters (barrels)	Market Oysters (sacks)	Total (barrels)
1*	157,085	273,136	293,653
2	173,285	278,580	312,575
3	13,345	334	13,512
4	2,627	7,269	6,262
5	39,115	95,124	86,677
6	45,121	4,393	47,318
7	0	79,646	39,823
<i>Total</i>	<i>430,578</i>	<i>738,482</i>	<i>799,820</i>

\* Harvest totals include harvest from Morgan Harbor and Drum Bay, two areas in which oyster stock size information was unavailable prior to the 2008/2009 oyster season.

## RECENT LEGISLATION

The 2008 regular legislative session included eight bills filed with respect to oysters (Table 3). The most notable of the eight were Act 808 which set various procedures for the lifting of the oyster lease moratorium, and Act 922 which allowed for the creation of a Public Oyster Seed Ground Vessel Permit. Act 321 was also important as it allowed the Louisiana Wildlife and Fisheries Commission (LWFC) to develop an Oyster Cargo Vessel Permit. Oyster cargo vessels are anticipated to assist the industry in meeting new health regulations (5-hour limit from harvest to refrigeration) as well as helping to increase harvest efficiency by reducing the need for some vessels to return to the dock as often. The LWFC promulgated a Declaration of Emergency in June 2008 setting up the rules governing this new cargo vessel permit.

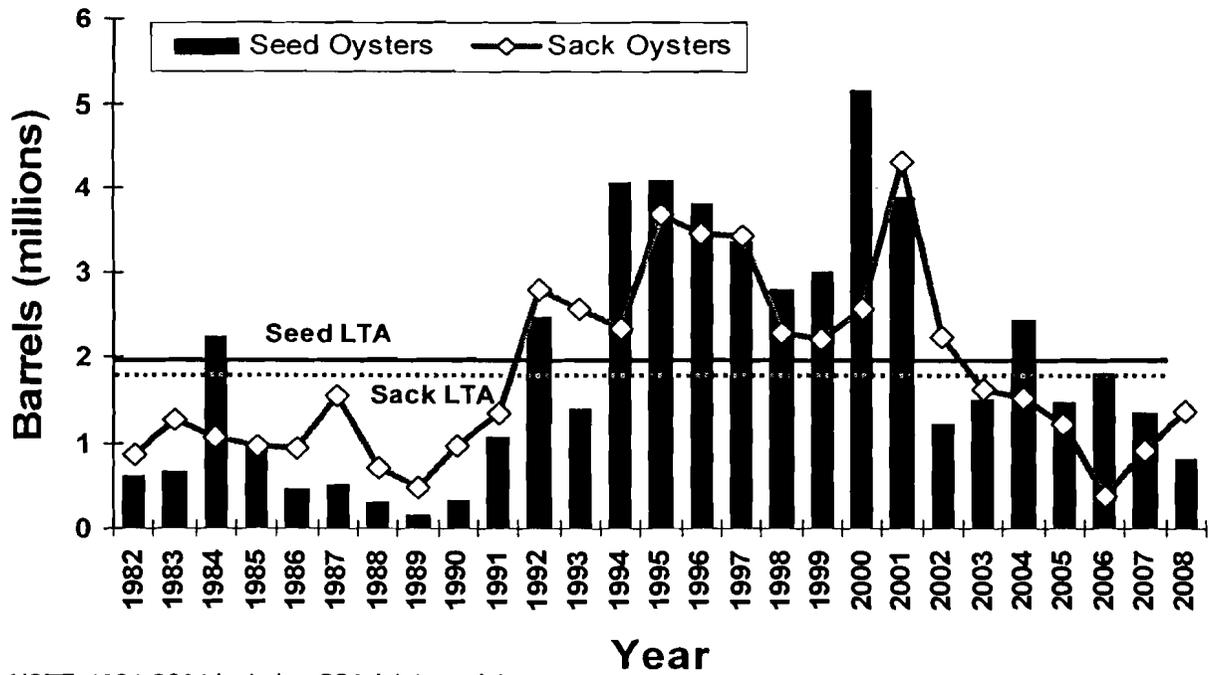
**Table 3.** Summary of oyster-related legislation of the 2008 Louisiana regular legislative session.

<b>Bill</b>	<b>Author(s)</b>	<b>Description</b>	<b>Passed?</b>	<b>Act</b>
HB171	Hutter	Authorizes expense reimbursements for OTF members	Yes	103
HB798	Hutter, Baldone	Procedure for lifting of the oyster lease moratorium	Yes	808
HB848	Hutter	Changes public ground season details and declares an additional sacking-only area	Yes	92
HB1142	St. Germain, Billiot, Henderson, Dupre	Authorizes the LWFC to develop an Oyster Cargo Vessel Permit.	Yes	321
HB1281	Wooton, Henderson	Restricts the taking of oysters from the public grounds to only Louisiana residents	No <sup>1</sup>	--
HB1284	Henderson, Wooton	Increases fees on dredge and oyster harvester license	No	--
HB1383	Wooton, Dupre	Creates a Public Oyster Seed Ground Vessel Permit	Yes	922
SB761	Crowe	Limits the issuance of new and renewal oyster dredge and oyster harvester license	No	--

<sup>1</sup>HB1281 was replaced with HB1383.

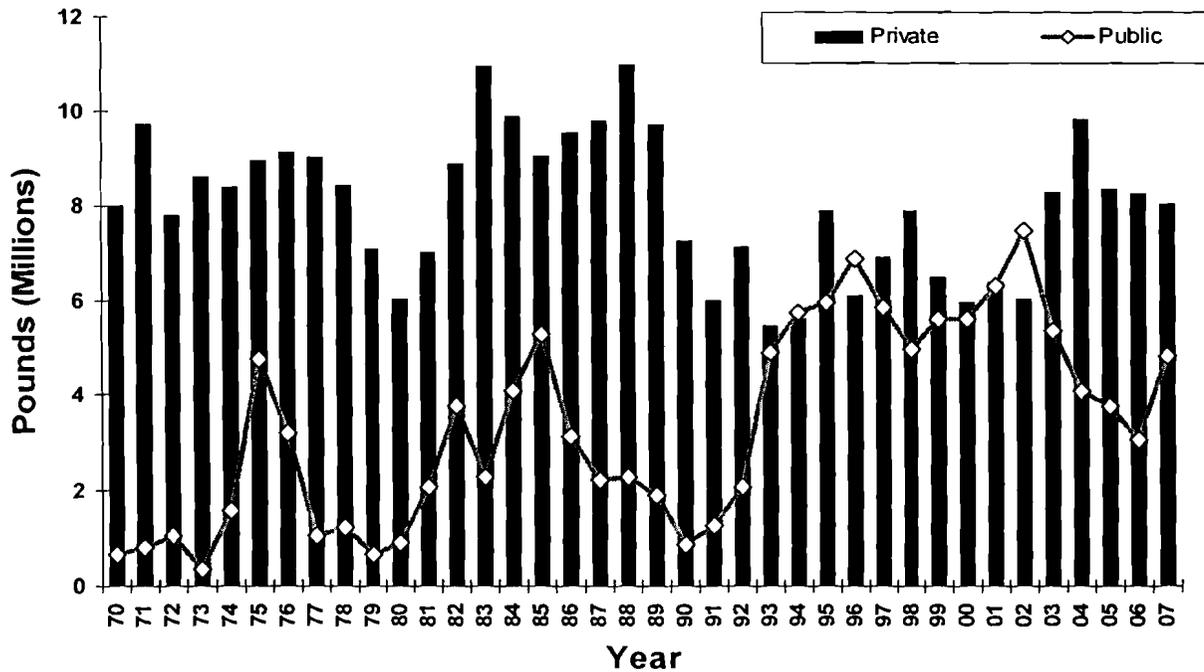
## CONCLUSION

The following report includes both biological stock assessment and historical oyster landings data from each CSA in Louisiana (CSA map depicted on page ix), as well as a brief report on the most recent oyster season in each area. Biological data was generated from quantitative square-meter sampling (see above) and landings data was generated from field boarding runs and trip ticket information. Countless hours were spent by the field staff of each CSA as well as by Oyster Program staff developing this state-wide oyster stock assessment, and that effort is greatly appreciated. Questions and/or comments can be directed to the individual CSA Biologist Managers (page x) or Patrick Banks at 225.765.2370 or [pbanks@wlf.louisiana.gov](mailto:pbanks@wlf.louisiana.gov).



NOTE: 1994-2004 includes CSA I data revision

**Figure 3.** Historical Louisiana oyster stock size on the public oyster areas (estimated based on square meter sample analysis). LTA denotes the long-term average of 1982 – 2007.



Note: Long-term average (LTA) for private landings is 8.032 million pounds. LTA for public landings is 3.003 million pounds.

**Figure 4.** Historical Louisiana oyster landings from the public oyster areas and the private oyster leases (LDWF and NMFS data).

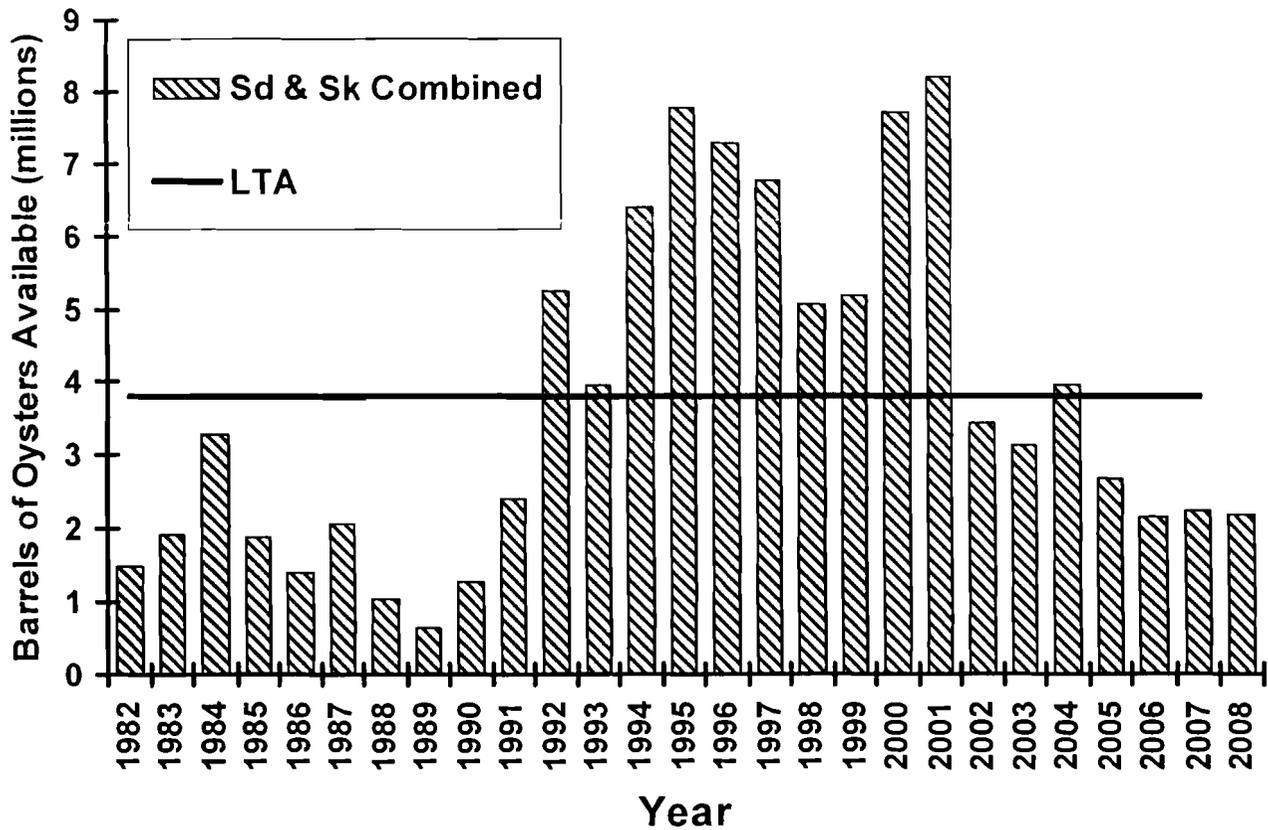


Figure 5. Historical estimated oyster stock size on the public oyster areas of Louisiana. 1994 – 2004 data includes CSA I data revision. LTA denotes long-term average.

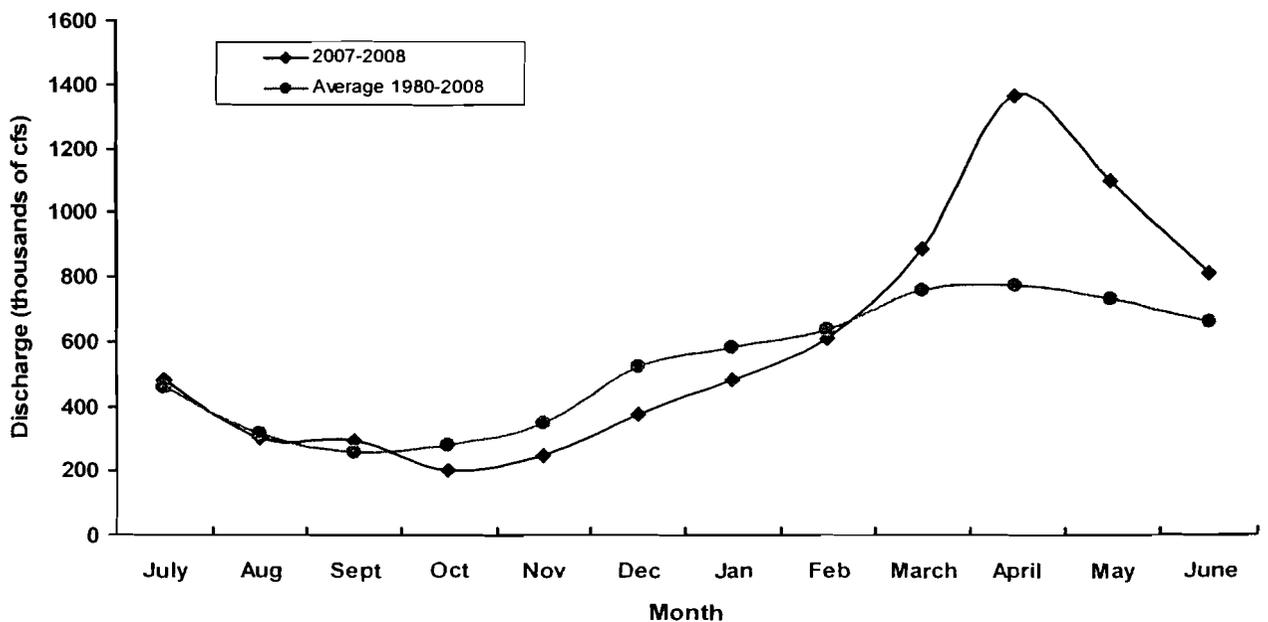
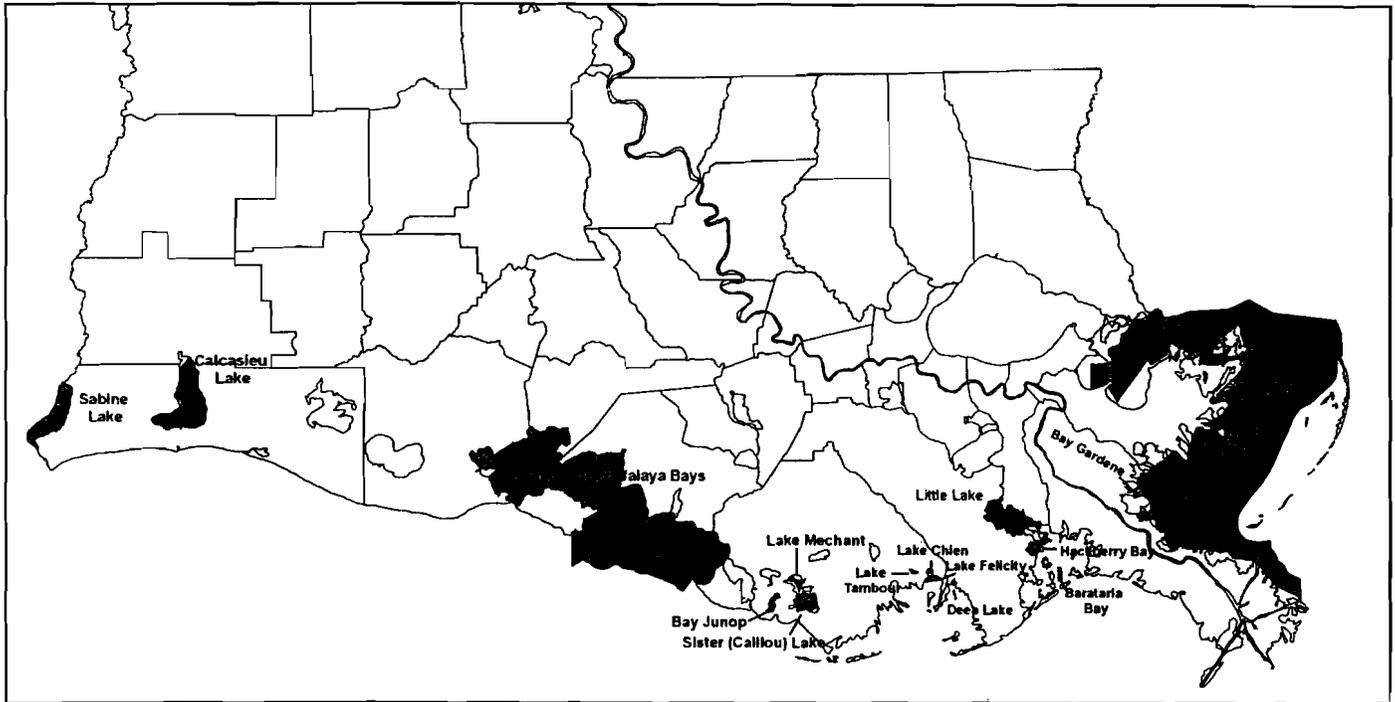


Figure 6. Comparison of average monthly Mississippi River discharge in 2007-2008 to the long-term.

# Public Oyster Areas



## Public Seed Grounds

Lake Borgne

Chandeleur/Breton Sound

(Primary Seed Grounds)

Barataria Bay

Little Lake

Deep Lake

Lake Chien

Lake Felicity

Lake Tambour

Lake Mechant

Vermilion/Cote Blanche/Atchafalaya Bays

## Public Seed Reservations

Bay Gardene

Hackberry Bay

Sister (Caillou) Lake

Bay Junop

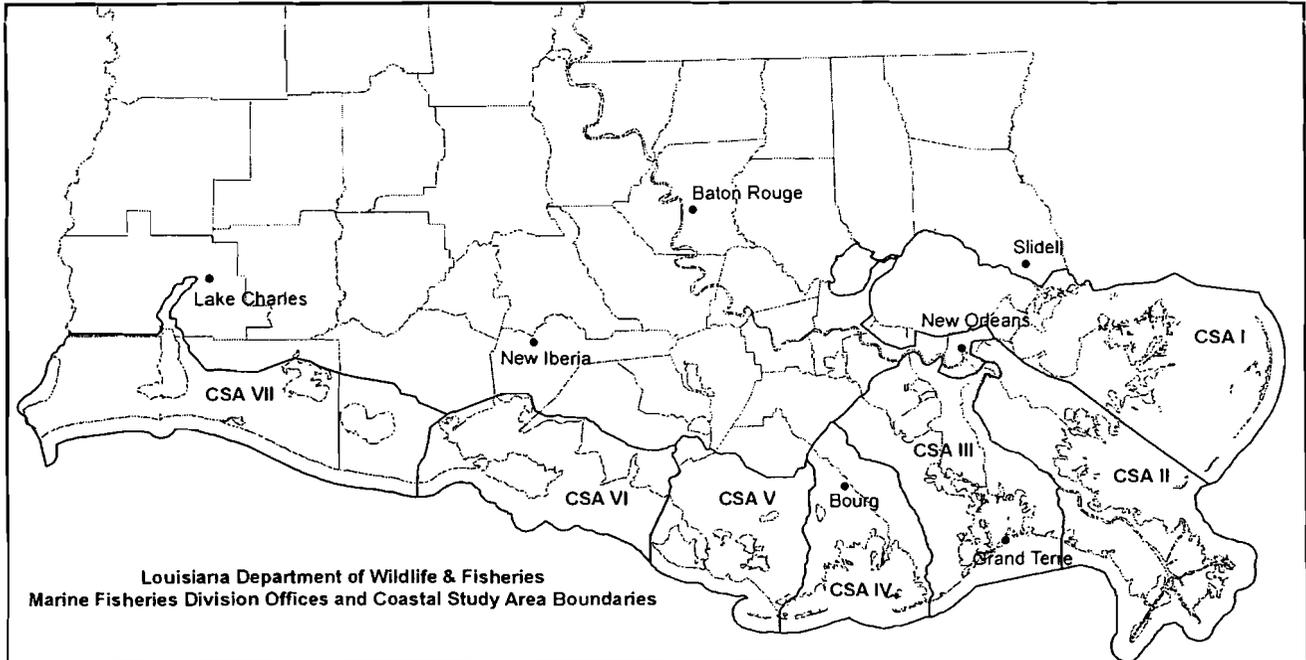
## Public Oyster Areas

Calcasieu Lake

Sabine Lake

\* Seed grounds are designated by the Wildlife and Fisheries Commission.  
Seed reservations, Calcasieu Lake, and Sabine Lake are designated by the state legislature.

# LDWF Marine Fisheries' Coastal Study Areas (CSAs)



<i>CSA</i>	<i>Biologist Manager</i>	<i>Address</i>	<i>Phone Number</i>	<i>FAX Number</i>
1	Brian Lezina	P.O. Box 1190 Lacombe, LA 70445	(985) 882-0027	(985) 882-0029
2	Keith Ibos	2021 Lakeshore Drive New Orleans, LA 70122	(504) 284-2030	(504) 284-5263
3	Jason Adriance	2021 Lakeshore Drive New Orleans, LA 70122	(504) 284-2030	(504) 284-5263
4	Vince Guillory	P.O. Box 189 Bourg, LA 70343	(985) 594-4139	(985) 594-7317
5	Steve Hein	P.O. Box 189 Bourg, LA 70343	(985) 594-4139	(985) 594-7317
6	Paul Cook	2415 Darnall Road New Iberia, LA 70560	(337) 373-0032	(337) 373-0032
7	Michael Harbison	1213 N. Lakeshore Drive Lake Charles, LA 70601	(337) 491-2573	(337) 491-2009

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# Coastal Study Area (CSA) 1 – Oyster Stock Assessment

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*LDWF Marine Fisheries Division*

*Lacombe Field Office, Lacombe, LA 70445*

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## Introduction

The public oyster areas within Coastal Study Area 1 (CSA1) consist of approximately 690,000 water bottom acres and are located in the Louisiana portion of Mississippi Sound, Lake Borgne, Chandeleur Sound and adjacent waters. These areas have historically been used by both Louisiana and Mississippi fisherman, and have recently been areas of high oyster production within the state of Louisiana.

Although managed as public oyster seed grounds by the state for many decades, the majority of this area was officially designated by Louisiana Wildlife and Fisheries Commission rule in 1988. Much of Lake Borgne was later added as a public oyster seed ground in 1995 and was expanded in 2004.

Currently, these areas are managed to balance the economic viability of the fishery with the biological sustainability of the resource. This management is contingent upon obtaining and utilizing the best fishery dependent and independent data available. This includes monitoring the harvest and resource availability throughout the fishing season and performing yearly stock assessments. The information these data provide allow resource managers to implement management changes to both protect the current resource as well as protect long term viability. This report will fulfill one of those data needs by providing estimates of the current stock size of the oyster resource within CSA1.

This stock assessment differs from previous with two major additions to the structure and knowledge of the Public Seed Grounds in CSA1. First, a cultch plant was constructed in June 2007. About 30,000 cubic yards of cultch material was placed on approximately 200 acres of water bottom in Mississippi Sound. Secondly, a large-scale water bottom classification survey was undertaken in portions of the Public Seed Grounds in Morgan Harbor and Drum Bay by a private water bottom assessment consultant (Bio-West, Inc.) under contract with LDWF. Side-scan sonar and traditional stock assessment techniques were used to delineate and assess 4,750 acres of oyster reef in these areas that will now become part of the yearly stock assessment. This bottom survey and the above cultch plant were funded by federal dollars allocated to the rebuilding of the States' oyster resources after hurricanes Ivan, Katrina, and Rita.

## Methods

Samples were taken between July 8 and July 10, 2008 using a one square-meter frame placed directly on the bottom. Divers removed all enclosed live and dead oysters, as well as shell, by hand. Live and dead oysters, spat, fouling organisms, and oyster predators were identified and enumerated. A total of 13 stations were visited with two square-meter replicates taken at each station except for the 2007 cultch plant, Drum Bay and Morgan Harbor. At the cultch plant five 0.25m<sup>2</sup> replicates were made. Within Drum and Morgan three replicates were taken on separate sections of selected reefs. The average of the replicates was then pooled within reef systems. This average density per reef system was multiplied by the total area of the reef systems. The resulting number was adjusted into a barrel unit of measure where one barrel equals 720 seed-sized oysters or 360 market-sized oysters. Seed oysters are those measuring between 25 and 74 mm with market oysters being greater than 74 mm. Spat oysters are those less than 24mm. The Lake Borgne Public Seed Ground was not sampled due to a lack of reef acreage information.

## Results and Discussion

### *Seed and Sack Stock*

The current stock size is estimated at 305,256 barrels (bbls) of seed-size oysters and 750,526 bbls of market-sized oysters. These numbers include the addition of the new cultch plant, and new reefs surveyed within Morgan Harbor and Drum Bay (Figure 1.1). Factoring out the new additions and comparing with last year's assessment, there was a 22% reduction in seed estimate and a 490% increase in the sack-size estimate. Oyster density and abundance was not evenly distributed among areas (Table 1.1) with the largest estimates of seed and sack oysters at the western Mississippi Sound and Three-mile reefs. It is important to note variability both within and among stations when comparing estimates. This variability is magnified when extrapolating low sample sizes to large areas.

The current estimate falls well below the previous ten years' average for seed and above the ten-year average for sack for both "historically" sampled areas and with the new additions (Figure 1.2). However, that long-term average is largely driven by availability in 2000 and 2001. Although there was a large amount of sack and seed harvest during the 2007/2008 season (See *further description of the 2007/2008 public season below*) the large increase in sack oysters is partially attributable to a strong spat set immediately after hurricane Katrina. However, low recruitment, high recent mortality, and heavy harvest pressure appear to have limited seed abundance.

### *Spat Production*

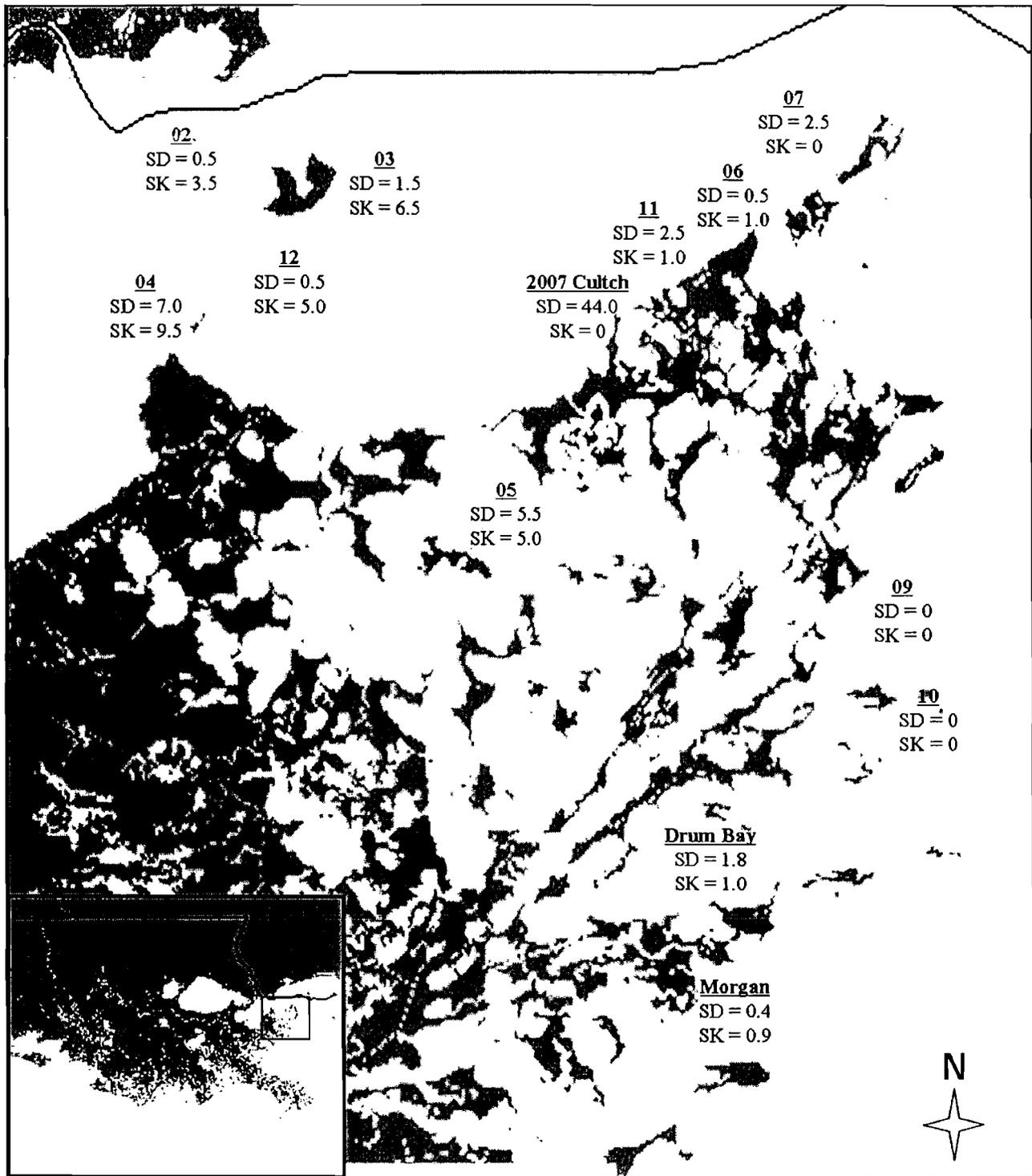
Live spat were not present in all samples containing a suitable substrate. Numbers ranged from 0 to 194.5 individuals/m<sup>2</sup>. Based on previous years' data, the square meter samples may have occurred between seasonal spawning events in some areas. While dredge and square meter data are used to compare spawning times and magnitude between reefs, it is important to note that spat numbers are biased by the amount of substrate collected in a given sample.

### *Fouling Organisms*

The hooked mussel, *Ischadium recurvum*, was present at four of the thirteen sample stations (data not yet available for Drum Bay and Morgan Harbor). Mussel densities ranged from 0 to 6 per square meter. The stations with the highest densities are located in the western portion of the Mississippi Sound and are in close proximity to the Pearl River system. These density estimates are extremely low; however, high densities of mussels have been noted at these stations and the Lake Borgne Area in previous years. Salinities were elevated throughout CSA1 (Figure 1.3) for the first half of the harvest season. These increased salinities may have limited the growth and survival of hooked mussels either through an increase in mussel predators or decrease of suitable environmental conditions. Although salinities were suppressed from February to June 2008, salinities are again increasing and may have not been suppressed long enough for mussel settlement and growth.

### *Oyster Predators*

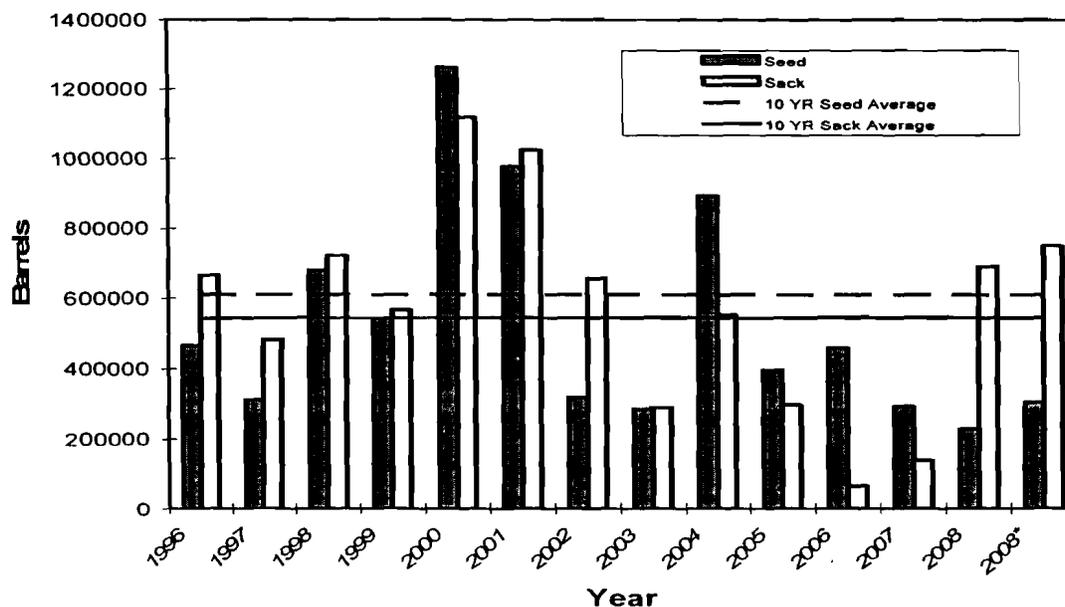
The southern oyster drill, *Stramonita haemastoma*, was collected at two of eleven stations with data available. Densities were low ranging from 0 to 1 animal per square meter. High numbers were reported during the harvest season (West Karako, leases around Morgan Harbor, etc.); however, reduced salinities may have limited abundance. Also, several of the higher density areas noted within the harvest season are not sampled for stock assessments. Mud crabs (*Xanthidae*, *et al.*) were found in each sample containing shell. However, these organisms are not identified to species and several "mud crabs" are not known oyster predators. There were no blue crabs (*Callinectes sapidus*), or gulf



**Figure 1.1.** Map showing Coastal Study Area 1 oyster stock assessment stations within the Mississippi and Chandeleur Sounds. Numbers below stations are average numbers of seed (SD) and sack (SK) oysters per m<sup>2</sup>.

**Table 1.1.** Mean densities of oysters collected at each station. \* - note – station temporarily suspended. Values in parenthesis are percent changes from the 2007 assessment

Station	Station Number	Reef Group Acreage	Seed Oysters per m <sup>2</sup>	Sack Oysters per m <sup>2</sup>	Number of seed oysters (bbls)	Number of sack oysters (bbls)
Grassy Is.	2		0.5	3.5		
Halfmoon Is.	3	6,850	1.5	6.5	115,511 (+200%)	500,548 (+975%)
Petit Is.	4		7.0	9.5		
Three-mile Bay	5	3,059	5.5	5.0	94,557 (-28%)	171,922 (+333%)
Grand Pass	6		0.5	1.0		
Cabbage Rf.	7	1,802	2.5	0	18,567 (-80%)	13,503 (-43%)
Turkey Bayou	11		2.5	1		
Martin Is.	9		0	0	0	0
Holmes Is.	10	4,156	0	0	(0%)	(0%)
2007 Cultch Plant	N/A	200	44	0	49,462	0
2000 Cultch Plant	12	70	0.5	5	197 (-98%)	3,935 (-68%)
Drum Bay	N/A	1,796	1.8	1.0	19,352	21,876
Morgan Harbor	N/A	2,954	0.4	0.9	7,610	38,742
Hospital Wall*	1	376				
<b>2008 Total</b>					<b>305,256</b>	<b>750,526</b>



**Figure 1.2.** Current and historical stock assessment values. Horizontal lines represent the ten-year seed and sack average. \* Values include new cultch plant and assessed areas

toadfish (*Opsanus beta*), collected. A description of Dermo (*Perkinsus marinus*) prevalence and infection on selected CSA1 reefs is provided at the end of the main document.

### *Mortality*

Mortality estimates were highly variable between size classes and stations (Table 1.2). Spat mortalities ranged from 2.4 to 67.4% with no clear trend in location. Seed mortalities ranged from 0.0 to 88.9%. Those stations with high seed mortalities were not all located adjacent to each other and in several cases were located in close proximity to lower mortality reefs. Sack mortalities were also highly variable and ranged from 0.0 to 53.3%. The highest mortalities were noted at Grand Pass, Halfmoon Island, and Morgan Harbor (33.3, 35.0, and 53.3%, respectively). These high sack mortalities also partially correlated with areas of high seed mortality. There is variability related to sampling design. However, at some of the stations it was apparent that large changes in salinity were occurring in a small time-frame. Also, strong salinity stratification was present at some of the northern stations during sampling, and therefore reduced dissolved oxygen concentrations may have stressed animals further. Table 1.2 shows the mortalities for the entire area as well as the salinity difference between surface and bottom readings.

### *Tropical and Climatic Events*

There were no major tropical events since the 2007 stock assessment. However, there were significant freshwater inputs into the system associated with Mississippi River flooding. A large amount of freshwater was introduced to the southern and eastern seed-ground areas from the Mississippi River. High Mississippi River stages at New Orleans prompted an opening of the Bonnet Carre' spillway on April 11, 2008. The Spillway discharges Mississippi River water through Lake Pontchartrain into Lake Borgne and the Mississippi Sound. The Spillway was closed on May 8, 2008 and was operated at an average discharge of about 85,000 cubic feet per second. While this opening was smaller in magnitude and duration to previous openings, the combination of high Mississippi and Pearl Rivers, and the Spillway opening, suppressed salinities for a time over the entire Study Area, particularly the areas within Lake Borgne and western Mississippi Sound. Mortalities were relatively low during the event, however lingering freshwater in the system is no doubt adding to the observed salinity stratification.

### 2007/2008 Oyster Season Summary

Several tools are used by research personnel to estimate harvest and assess the biological condition of the resource. Harvest estimates are obtained by monitoring the users and obtaining fishery dependent data. Fisherman are contacted while fishing and asked to provide estimates of current and past catch and effort as well as an estimate of future effort. These data are obtained weekly and are used to estimate harvest in a particular reef complex. Harvest data are also obtained via the trip ticket system in place for this fishery. However, these data are consolidated by geographic region, are considered preliminary until well after the season concludes, and provide a limited resolution.

Fishery independent methods are used to obtain the health and condition of the resource both prior to and during the final stages of the fishing season. Techniques used in these assessments are oyster dredging and visual census. It is important to note that both fishery dependent and independent sources are subject to several large biases and should be used in conjunction to provide a better estimate of the available resource.

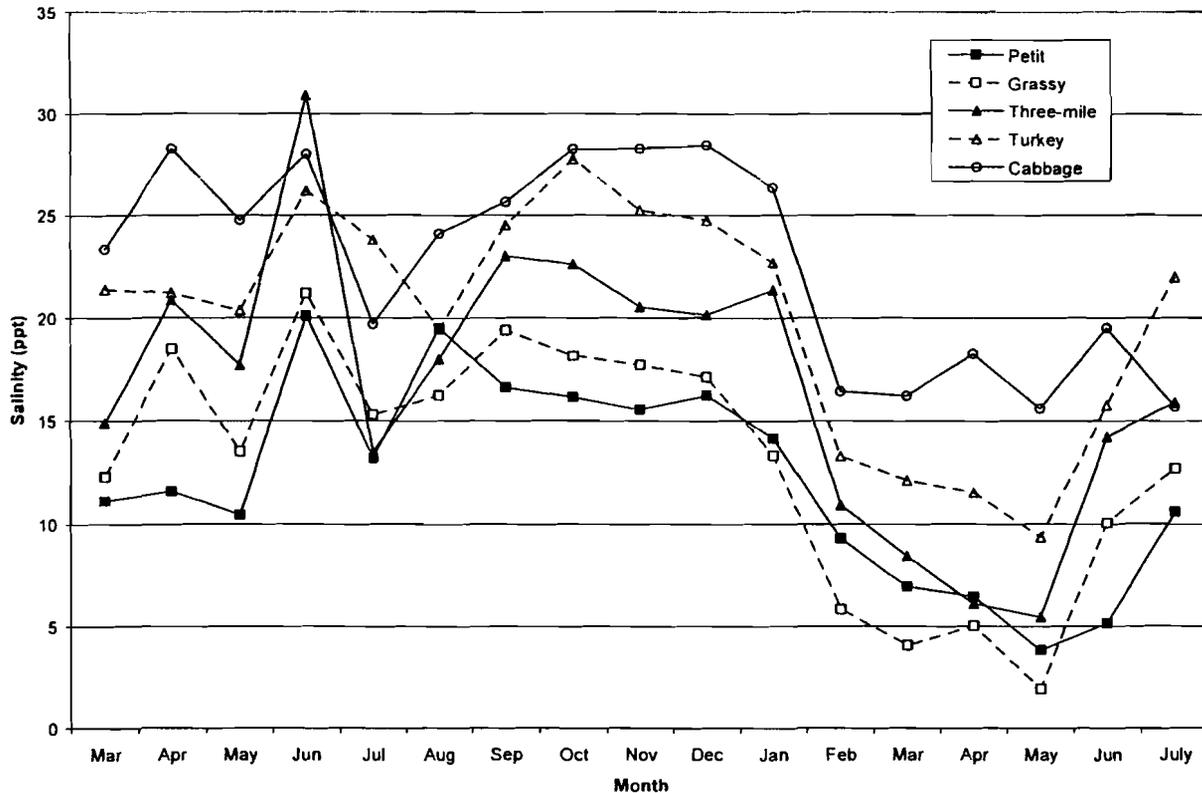


Figure 1.3. Mean monthly salinities for the northern CSA1 public seed grounds.

Table 1.2. Mean oyster mortality estimates from each sample station with differences in surface and bottom salinities. N/A – no live or dead oysters were collected for mortality estimates.

Station	Spat Mortality (%)	Seed Mortality (%)	Sack Mortality (%)	Salinity Difference (ppt)
Grassy Island	33.3	0.0	0.0	3.7
2000 Cultch Plant	3.4	88.9	9.1	12.1
2007 Cultch Plant	38.9	8.3	N/A	1.1
Petit Island	20.0	17.6	5.0	3.6
Half Moon Island	16.8	76.9	35.0	13.1
Three-Mile Bay	4.5	35.3	0.0	3.6
Turkey Bayou	67.4	37.5	0.0	11.5
Cabbage Reef	8.7	37.5	N/A	0.5
Grand Pass	23.1	83.3	33.3	5.3
Drum Bay	2.4	28.0	0.0	0.2
Morgan Harbor	59.4	81.4	53.3	0
Martin Island	N/A	N/A	N/A	0.1
Holmes Island	N/A	N/A	N/A	0.1

Coastal Study Area 1 public grounds were opened to harvest on September 5, 2007 and closed on September 21, 2007. The public grounds were reopened on November 12, 2007 and closed on April 1, 2008. As stated in stock assessment section above, the Bonnet Carre' Spillway was opened on April 11, 2007. In response to this opening an emergency declaration by LDWF Secretary Robert Barham reopened the public grounds within Louisiana Department of Health and Hospitals (LDHH) Harvest Areas 1-3. The grounds were reopened from April 13 to April 26, 2008.

Total harvest estimates for the grounds were 273,137 sacks of market-sized oysters and 157,085 bbls of seed-sized oysters for a combined total of 293,654 bbls. When harvest estimates within stock-assessed areas are compared with 2007 assessments, there was an estimated utilization of 71% of the sack resource, 39% of the seed resource, and 49% utilization overall. In general, this harvest was not spread evenly throughout the area (Table 1.3). The majority of the sack harvest was taken from the northern reefs, with only 22% taken from Drum Bay and Morgan Harbor. These two reef systems were responsible for 57% of the total harvest in the previous year. The majority of the seed harvest (96%) was taken from the reefs in the northern survey area. Of particular note was the taking of 13,060 bbls of seed and 32,531 sacks from the 2000 Cultch Plant. This is a reef with an area of only 70 acres. Both harvest estimates are well over the 2007 stock assessment for this reef. It is likely that this reef has been spread out over time due to harvest activities and natural growth and may now include preexisting reefs along the original perimeter.

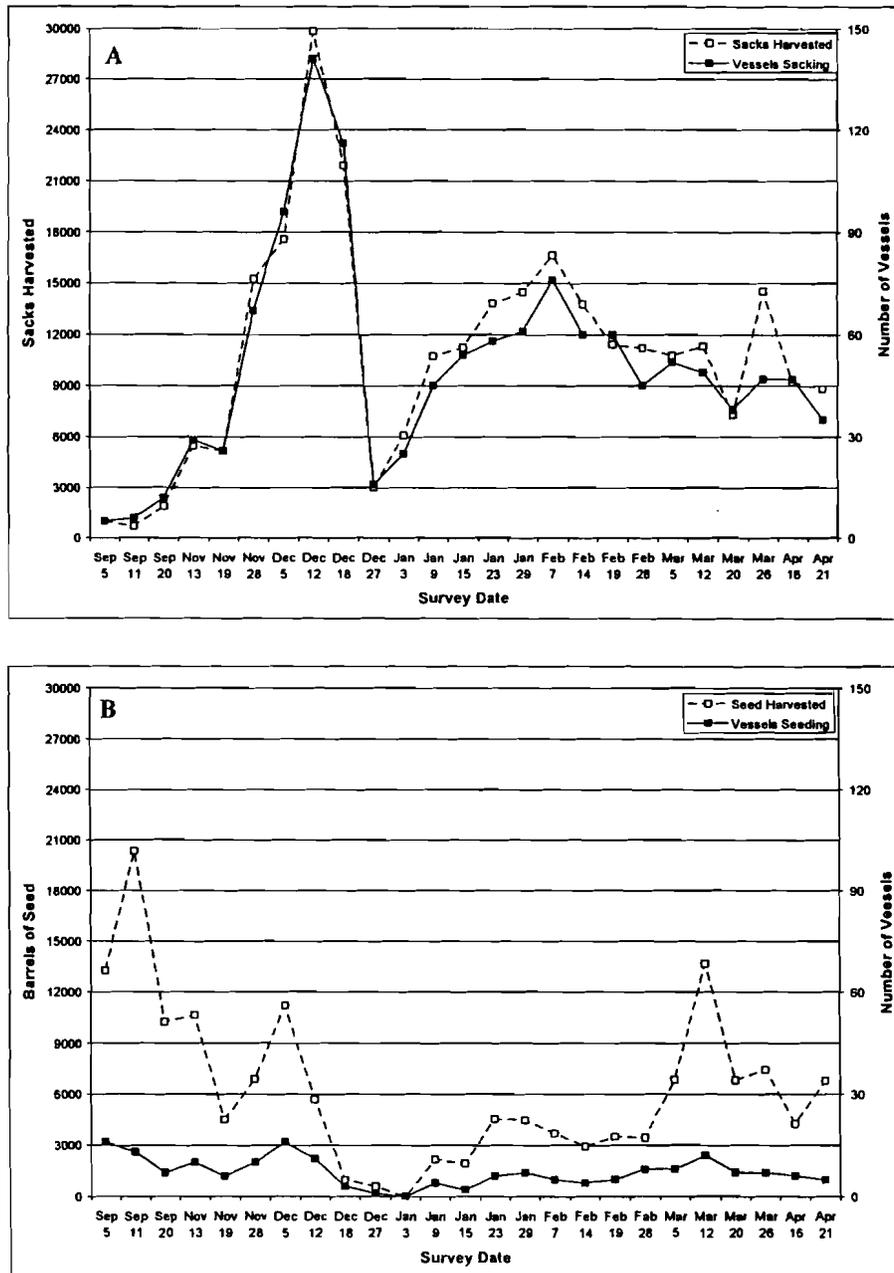
**Table 1.3** Harvest estimates from the 2007/2008 public season within CSA1

Station	Seed-size (bbls)	Market-size (sacks)
Grassy Island	200	320
Halfmoon Island	14,460	24,593
Petit Island	27,250	64,682
Lake Borgne	35,000	16,136
2000 Shell Plant	13,060	32,531
Grand Banks	11,410	4,754
Three-Mile Bay	3,310	7,786
Turkey Bayou	2,800	6,070
Grand Pass	25,765	18,795
Karako/ Boudreau	13,050	37,399
Cabbage Reef	3,900	0
Drum Bay	4,210	28,365
Morgan Harbor	2,670	31,706
<b>Total</b>	<b>157,085</b>	<b>273,137</b>

Harvest amounts and types, as well as total observed vessels, were not constant over time. Market oyster harvest reached a peak of 29,837 sacks week<sup>-1</sup> in mid-December with seed oyster harvest reaching a peak of 20,350 bbls week<sup>-1</sup> in mid-September. Similarly, the amount of vessels observed fluctuated, ranging from 17 to 152 (Figure 1.4). These effort levels and harvests are, in general, much higher than previous years and can be partially explained by several events.

In late November 2007, a red discoloration of oyster tissue was noticed in oysters harvested from reefs south of the Mississippi River Gulf Outlet (MRGO) within CSA 2. Although the cause of this discoloration is still undetermined, the marketability of the oysters was severely reduced and effort

spread away from those areas. This increased harvest within CSA1 dramatically, especially for sack-sized oysters. This effort decreased with a disappearance of the red coloration and a decrease in overall effort after the Christmas holiday.



**Figure 1.4.** Estimates of weekly harvest and number of vessels observed sacking (A) and seeding (B).

Beginning on December 21, 2007, the LDHH closed a portion of the CSA1 seed grounds in response to a norovirus outbreak traced back to oysters harvested within LDHH Harvest Area 3. This Harvest Area includes the reefs south of Mississippi Sound and north of the MRGO. This reduced pressure on those reefs, but increased pressure on the reefs in Lake Borgne and Mississippi Sound. The closed area was reopened on January 13, 2008.

Harvest would normally fall slightly with the progression of the season. This is usually attributable to decreased catch-per-unit-effort with reduced resource availability and a greater use of leased areas. However, after the large harvests during the CSA 2 oyster discoloration event, total harvest was relatively stable through the end of the season. This may be due, in part, to a movement of the fleet through the reef areas. The large effort placed within the area allowed the fleet to “find” areas of resource that had not been utilized in several years.

The Lake Borgne public grounds continued to show the effects of Hurricane Katrina. A lack of harvest and effort continued through most of the grounds. However, for the first time post-Katrina significant harvests were noted in extreme north and eastern portion of Lake Borgne. An estimated total of 16,136 sacks and 35,000 barrels of seed were harvested from two small areas. Although these areas are not part of the stock assessment, dredge surveys continue to show the presence of both seed and sack oysters.

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# Coastal Study Area (CSA) 2 – Oyster Stock Assessment

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## INTRODUCTION

The Primary Public Oyster Grounds located in Coastal Study Area 2 include the area south of the MRGO to the Mississippi River, and from the “Red Line” (most eastern extent of privately leased areas) out to The Breton National Wildlife Refuge. This area encompasses approximately 300,000 of the 880,000 total acres of Primary Public Oyster Grounds east of the Mississippi River and includes a Sacking Only Area in Lakes Fortuna and Machias, as well as the Bay Gardene Public Oyster Seed Reservation. Historically this area has provided seed stock and market oysters for oyster fishermen both east and west of the Mississippi River.

Hydrology in the area is affected at high Mississippi River stages by discharge through gaps in the levee south of Pointe a la Hache and also from discharge from the Caernarvon and Bayou Lamoque freshwater diversion structures as well as the siphon at White’s Ditch.

In May 2007, 32,235 cubic yards of size #57 limestone were spread over approximately 200 acres in Black Bay just northeast of Lonesome Island. This project was funded by the National Oceanic and Atmospheric Administration (grant # NA06NMF4540319) through the Gulf States Marine Fisheries Commission as part of a \$53 million federal fisheries rehabilitation appropriation for Louisiana in the wake of hurricanes Katrina and Rita (2005). This was the latest in a long history of oyster reef building/rehabilitation projects (cultch plantings) that have taken place within CSA 2. Numerous cultch plants have been performed throughout the area since 1917 in places such as Bay Gardene, Bay Crabe, and California Bay.

The Private Oyster Lease Rehabilitation Program (POLR) was implemented at the beginning of the 2007/2008 season to provide reimbursement assistance to oyster leaseholders during their efforts to rehabilitate private oyster leases. A portion of this program reimburses oyster fishermen for expenses associated with bedding oysters from the public grounds to private leases. Consequently, the public oyster grounds in CSA 2 received considerable pressure from bedding operations.

## METHODS

Personnel from Coastal Study Area 2 began meter square samples on June 23, 2008 and all samples were completed by June 26, 2008. Samples were collected by randomly placing aluminum square meter frames on known reef substrate at 27 stations located throughout CSA 2 in areas such as Lake Fortuna, Bay Gardene, Bay Crabe, Black Bay, California Bay and

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Battledore Reef in Breton Sound (Figure 2.11). All live and dead oysters as well as shell in the upper portion (exposed) of the substrate were removed by SCUBA divers. Live and dead oysters, spat, fouling organisms, and oyster predators were identified and counted. Oysters were measured in 5 millimeter (mm) size groups and divided into three categories: spat (<25mm), seed (25-74mm) and sack (75mm and larger). The average of two or more replicates at each station was used in conjunction with estimated reef acreage to estimate current oyster stock availability.

One extra station in Black Bay was sampled and may be added to future assessments. This station is not included in this year's stock assessment.

Five replicate 1/4 meter square samples were taken at random locations on the 2007 cultch plant at Lonesome Island. All live and dead oysters as well as limestone in the frame were removed by SCUBA divers. Live and dead oysters, spat, fouling organisms, and oyster predators were identified and counted. Oysters were measured and categorized by size.

Dermo (*Perkinsus marinus*) samples were taken at seven locations throughout the study area. Twenty seed and twenty sack oysters are collected at each site for analysis by Dr. John Supan of LSU.

## RESULTS AND DISCUSSION

### *SEED AND SACK STOCK*

Oyster stock for the area is estimated at 110,751 barrels of seed oysters and 124,393 barrels of market sized oysters for a total of 235,144 barrels of overall stock. Overall availability is down 69% from last year, down 88% from the 10 year average of years 1998 thru 2007, and down 86% from the long term yearly average since 1982. Seed oyster stock is down 75 % from last year, 91% below the past 10 year average, and 89% less than the long term yearly average since 1982. Sack oyster stock is down 60% from 2007, is 84% below the average for the past ten years, and 82% less than the long term yearly average since 1982. (Table 2.1)

The highest numbers of sack oysters were found in Bay Crabe and Black Bay.

The highest seed numbers were found in Black Bay. Thirty-three percent of seed oysters (not available for bedding) are located in what has historically been designated as the Lake Fortuna sacking only area. (Table 2.1). A portion of a new law passed during the 2008 Regular Legislative Session designated an additional sacking-only area in the American Bay area. Two stations lie just east of the new sacking only area and may give an indication of available resource there. Station 14 averaged 1 live seed and 1.5 live sack oyster per meter square frame while station 16 averaged 1 live seed oyster and 2 live sack oysters per frame.

Seed oysters averaged 1.74 inches overall with approximately 69% in the 1-2 inch size range. Most of these animals are not expected to reach market by the end of the season. Sack oysters averaged 3.7 inches overall with approximately 74% in the 3-4 inch size range.

The decrease of stock this season is likely due in to the increased utilization level of seed stock last year in response to the implementation of the Private Oyster Lease Rehabilitation (POLR) program (Figure 2.8), combined with mortalities in seed and sack stock associated with low salinities across the area due to high Mississippi River levels and an increased flow at Caernarvon. (Figure 2.9).

### *SPAT PRODUCTION*

Live spat were observed at 18 stations including the new 2007 cultch plant at Lonesome Island. Overall occurrence was very light (Table 2.1). Sixty-five percent of spat measured were less than one half inch in length and will not reach seed size by the start of the season.

### *MORTALITY*

The 2008 assessment shows an increase in recent mortalities over last year, most evident in seed oysters. Recent spat mortalities in meter square samples ranged from 0-100% with an average of 22% (24% in 2007). Recent seed mortalities from 0-100% with an average of 23% (5.2% in 2007), and recent sack mortalities from 0-15% with an average of less than 1% (0% in 2007).

Mortalities attributed to high Mississippi River levels were first observed in May dredge samples. Extra samples were taken in the area and on the 2007 cultch plant in order to better assess the river's effect. Seed mortalities throughout the area ranged from 3.2-65.4% with an average mortality of 32.8%. Sack mortalities ranged from 0-84.2% with an average sack mortality of 29.9%.

Highest mortalities were observed in Bay Crabe, Bay Gardene, Elephant Pass (Northwest California Bay), and the 2007 cultch plant.

Mortalities attributed to High Mississippi River levels were also observed in meter square samples. Highest mortalities were observed in areas subjected to longer periods of salinities below 5ppt.

Combined recent and older mortalities in meter square samples ranged from 0-100% for seed oysters with an overall average of 40%. Sack oyster mortalities ranged from 0-87.5% with an overall sack mortality of 33%.

Highest (combined recent and older) mortalities in meter square samples were observed in stations in Bay Gardene, Bay Crabe, Northwest California Bay, Lonesome Island and Jessie's Island.

### *FOULING ORGANISMS*

Hooked mussel (*Ischadium recurvum*) densities in the area have remained low since 2005 and may be due in part to the higher salinities throughout the area after Hurricane Katrina. This year mussels occurred in 20 stations. Densities were low and should not be a problem to harvesters except at isolated locations.

### *OYSTER PREDATORS/DISEASE*

No southern oyster drills (*Stramonita haemastoma*) or egg casings were found in any of the meter square or dermo samples. This is probably due to the low salinities throughout the area. Two small stone crabs (*Mennipe adinia*) were collected, one at Jessie's Island (Station 2), and one at Bayou Lost (Station 5). No blue crabs (*Callinectes sapidus*) or gulf toadfish (*Opsanus beta*) were observed in the samples.

Results of Dermo (*Perkinsus marinus*) tests are included in a later section.

### *TROPICAL AND CLIMACTIC EVENTS*

The Mississippi River began to rise around work week 7 (February) at approximately 3.5 feet as measured at the Carrolton Gauge. The Corps of Engineers opened the Bonnet Carre Spillway in week 15 (April 11), which reduced the discharge of river water downstream. The River peaked at approximately 16.8 feet in work week 18 (April). Average salinities as measured at twenty-three isohaline stations throughout the area showed a corresponding drop. Readings at Bay Gardene, Bay Crabe, and Sunrise Point showed extended periods where salinities were below 5ppt., Bay Gardene from work weeks 8-23, Bay Crabe from work weeks 8-21, and Sunrise Point from work weeks 10-19. Readings below 5ppt were observed at Stone Island in weeks 17-19, and in Lake Fortuna in weeks 18,19,and 23.(Figure 2.10). Average water temperatures remained above 20° C starting with work week 17. Mortalities were first observed in work week 22 dredge samples. Prolonged low salinities (below 5ppt) combined with high water temperatures can be fatal to oysters. The highest oyster mortalities observed were in areas of prolonged periods of low salinity and occurred as water temperatures rose above 20° C.

## 2007/2008 SEASON SUMMARY

### METHODS

Harvest totals are estimated by obtaining fisheries dependent data from the monitoring of users. "Board Runs" are conducted weekly during the season. Biologists survey the entire area observing fishermen, recording locations, and making harvest estimates for each vessel for that day. This estimate is projected over the amount of "fishable days" for the week and a total harvest of seed and market oysters for the week is made. Vessels collecting seed are often boarded to determine if excessive amounts of culch (non-living reef material) are being removed from area reefs.

## RESULTS AND DISCUSSION

The Primary Public Oyster Grounds in CSA2, including the sacking only area and Bay Gardene Public Oyster Seed Reservation, opened September 5, 2007 and closed on September 21, 2007. The public grounds were reopened on November 12, 2007 and closed on April 1, 2008. The 2007 culch plant at Lonesome Island remained closed.

Harvest estimates for market sized oysters in 2007/2008 on the public grounds were 52% higher than last season. The number of boats observed sacking was up 18% from last season. (Figure 2.4). Harvest in 2007/2008 was estimated at 278,580 total sacks of market sized oysters. This represented a 45% utilization of the market stock available. The majority of the sack harvest was from California Bay (38%) and Black Bay (36%) followed by 15% from Bay Crabe, 10% from Lake Fortuna, and 1% from Bay Gardene.(Figure 2.2). These percentages show an 18% increase in sack harvest from California Bay as compared to last season.

Harvest estimates for seed in 2007/2008 on the public grounds were 57% higher than last season. There was a 30% increase in the number of boats observed taking seed (Figure 2.3). Seed harvest in 2007/2008 was an estimated 173,585 barrels which represented a 38.5% utilization of the seed available. The majority of seed harvest was from California Bay at 59%, followed by Bay Crabe at 22%, Black Bay at 12% and Bay Gardene at 7%. (Figure 2.2). These percentages show a shift of 20% harvest from California to Bay Crabe as compared to last season.

Harvest estimates for seed and sack combined in 2007/2008 were 55% higher than in 2006/2007. Totaled combined harvest was 312,875 barrels of stock representing a 41.1% utilization of available resource.

Thirty vessels were boarded by CSA2 biologists and checked for the percent culch in seed stock harvested. Percentages of culch taken ranged from 15-60% with an overall average culch take of 33% per bedding load.

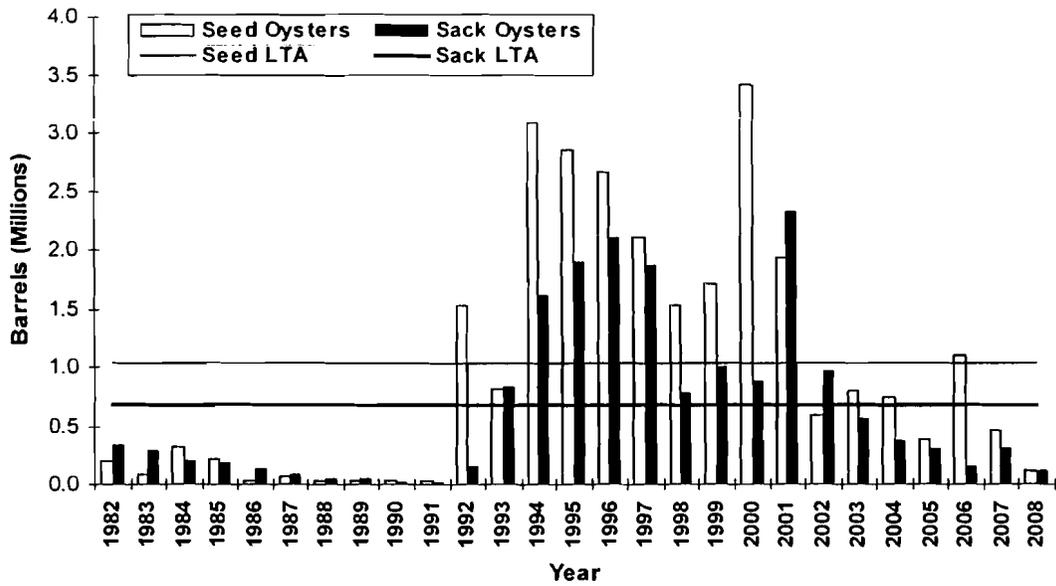
In early December 2007 reports of "red" tinted oysters were reported from the Black Bay area. Boats were reportedly leaving the area and moving north of the MRGO into Karako Bay, Three Mile, and Grand Bay as they were having trouble selling these oysters. Samples taken by CSA2 showed some oysters to have a pinkish tint limited solely to the gills. Samples in mid December showed the tinting was not as pronounced and no tinting was evident by late January. Efforts to determine the cause of the coloration were unsuccessful.

**Table 2.1** 2008 Square meter sample results for Coastal Study Area 2

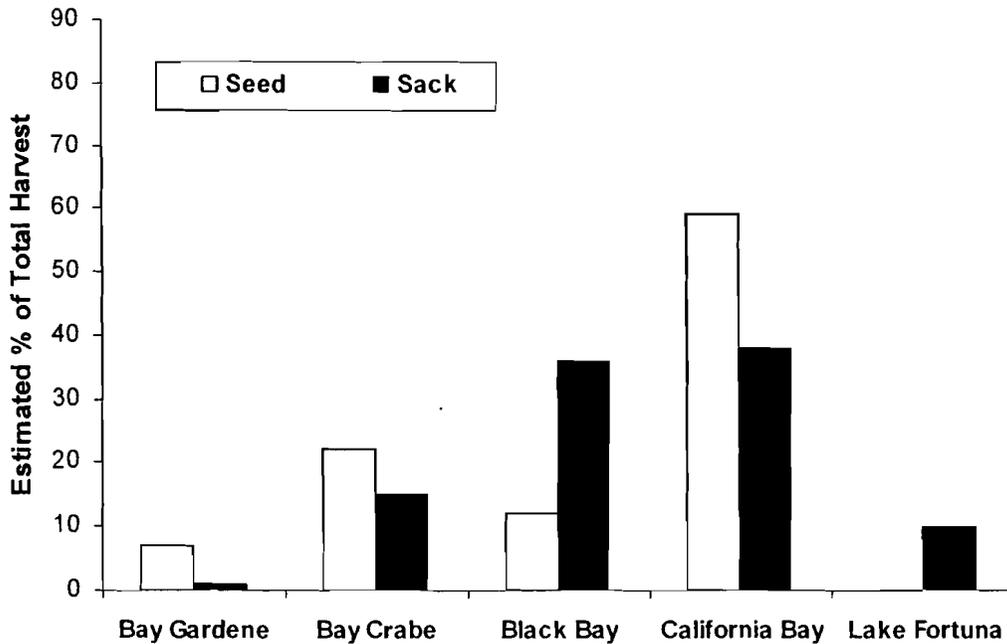
Stations	Grids	Approx. Reef Acres	Square Meters	Average # of Live Seed Oysters/m <sup>2</sup>	Average # of Live Sack Oysters/m <sup>2</sup>	Barrels of Seed Oysters Available	Barrels of Sack Oysters Available	Hooked Mussels/m <sup>2</sup>	Oyster Spat/m <sup>2</sup>	Drill Presence	Spat Percent Mortality	Seed Percent Mortality	Sack Percent Mortality	Seed & Sack Percent Mortality
1	Snake	506	2,047,782	0.7	0.3	1,877	1,877	18.3	0.0		na	33.3	0	25
2	Jessie	59	283,773	1.5	0.5	591	394	31.5	0.5		66.7	50	0	42.9
3	N. Lonesome	896	3,626,112	0.3	0.7	1,662	6,749	8.3	0.7		0	66.7	0	40
5	Bayou Lost	118	477,546	4.8	<b>2.8</b>	3,150	3,648	2.3	3.3		0	9.5	15.4	11.8
6	Lonesome	516*	2,088,252	0.0	0.5	0	2,900	75.5	0.5		0	na	0	0
	Shell plant	200*	809,400	25.6	0.0	28,779	0	3.2	14.4		25	15.8	na	15.8
7	Black Bay	301	1,218,147	1.0	0.5	1,692	1,692	22.0	13.5		0	0	0	0
8	W. Bay Crabe	501	2,027,547	1.0	<b>5.5</b>	2,816	30,976	3.0	0.5		50	33.3	0	7.1
9	Stone	461	1,865,667	1.0	2.0	2,591	10,365	12.5	0.5		0	0	0	0
10	S. Black Bay	145	586,815	1.0	0.5	815	815	0.0	0.5		0	33.3	0	25
11	Elephant	339	1,371,933	0.7	0.0	1,277	0	0.0	0.0		na	0	na	0
12	Curfew	425	1,719,975	1.0	<b>2.0</b>	2,389	9,555	73.0	0.5		0	0	0	0
13	N. California	109	441,123	2.5	1.0	1,532	1,225	175.0	0.5		0	0	0	0
14	California	7	28,329	1.0	1.5	39	118	75.0	0.5		0	50	0	28.6
16	Sunrise	174	704,178	1.0	2.0	978	3,912	6.0	1.0		0	33.3	0	14.3
17 SKIP		659	2,666,973			private leases discontinued								
19	Mangrove	937	3,792,039	1.0	0.0	5,267	0	14.0	0.5		50	0	na	0
20	W. Pelican	293	1,185,771	0.5	1.5	823	4,941	372.0	2.5		0	50	0	20
21	Bay Crabe	659	2,666,973	1.0	4.0	3,704	29,633	34.5	0.0		na	0	0	0
22	E. Bay Crabe	122	493,734	1.5	1.0	1,029	1,371	32.0	0.0		100	0	0	0
23	E. Gardene	28	113,316	1.0	0.0	157	0	1.0	1.0		0	33.3	na	33.3
24	Bay Gardene	69	279,243	0.5	0.0	194	0	0.0	0.0		na	50	na	50
4,26	N. Black Bay	315	1,274,805	0.3	0.0	443	0	0.0	0.3		75	0	na	0
15	Telegraph	127	513,969	0.0	1.0	0	1,428	64.0	0.5		0	na	0	0
18	E. Pelican	1,528	3,164,754	0.0	0.0	0	0	22.5	0.0		na	100	na	100
26 SKIP	see 4,26					combined data								
25	Ballledore	1419	5,742,693	0.0	0.0	0	0	0.0	0.0		na	na	na	na
27	L Fortuna	4288	17,353,536	1.5	0.0	36,153	0	0.0	1.0		0	0	0	0
28	Wreck	2276	9,210,972	1.0	0.5	12,793	12,793	0.0	0.0		100	0	0	0
<b>Sub Total</b>						<b>110,751</b>	<b>124,393</b>							
<b>ALL TOTAL</b>						<b>235,144</b>								

Large bold numbers in seed and sack columns represent an increase in number over last season  
 \*Acreage at station 6 reduced 200 acres attributed to the 2007 Cultch Plant

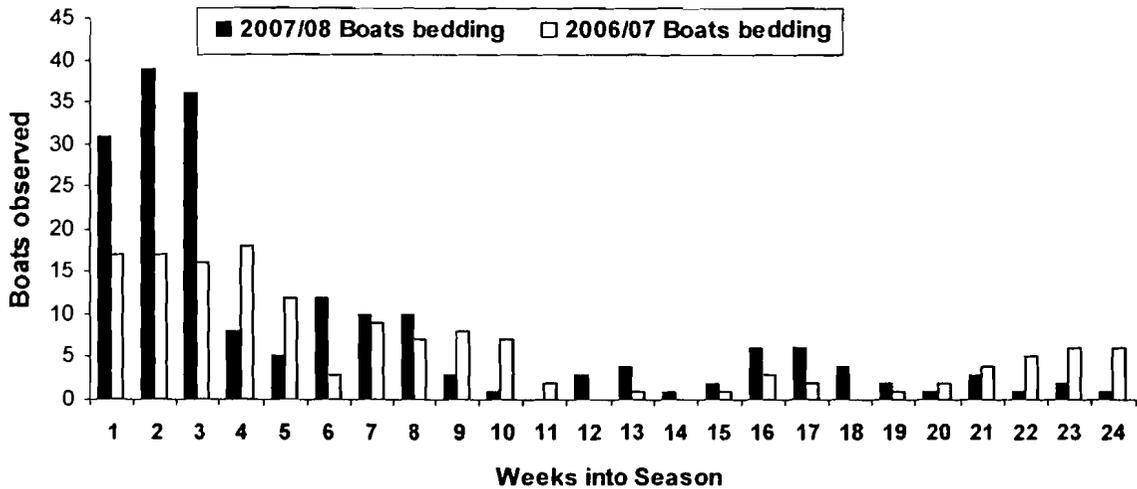
	2007	2008	% Change
<b>Seed</b>	451,034	110,751	-75%
<b>Sack</b>	309,562	124,393	-60%
<b>Total</b>	760,596	235,144	-69%



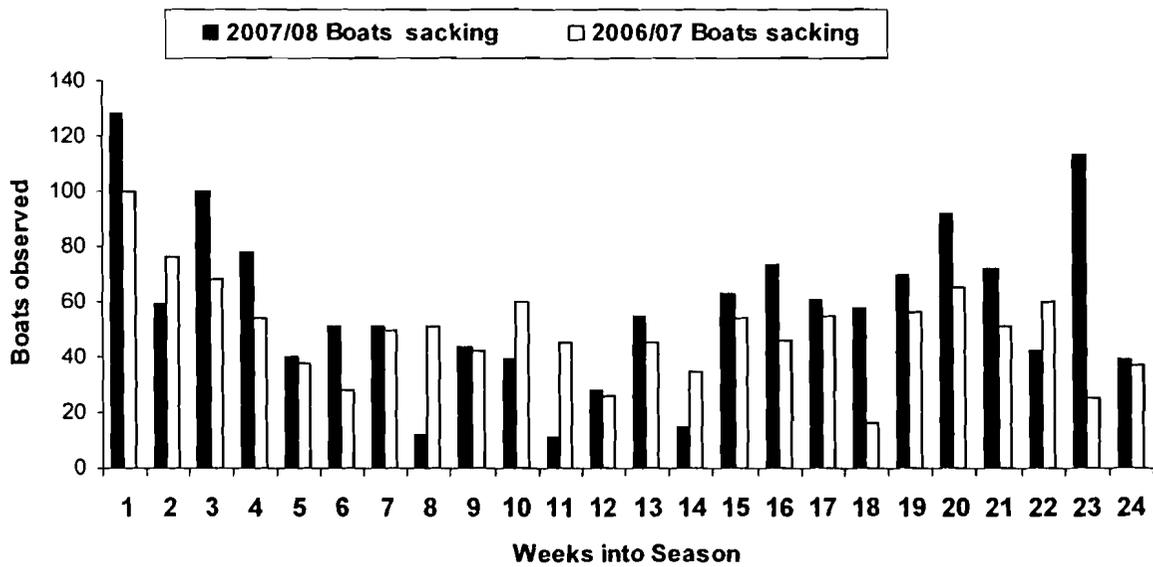
**Figure 2.1** Historical Coastal Study Area 2 oyster stock size (estimates based on square meter sample analysis).



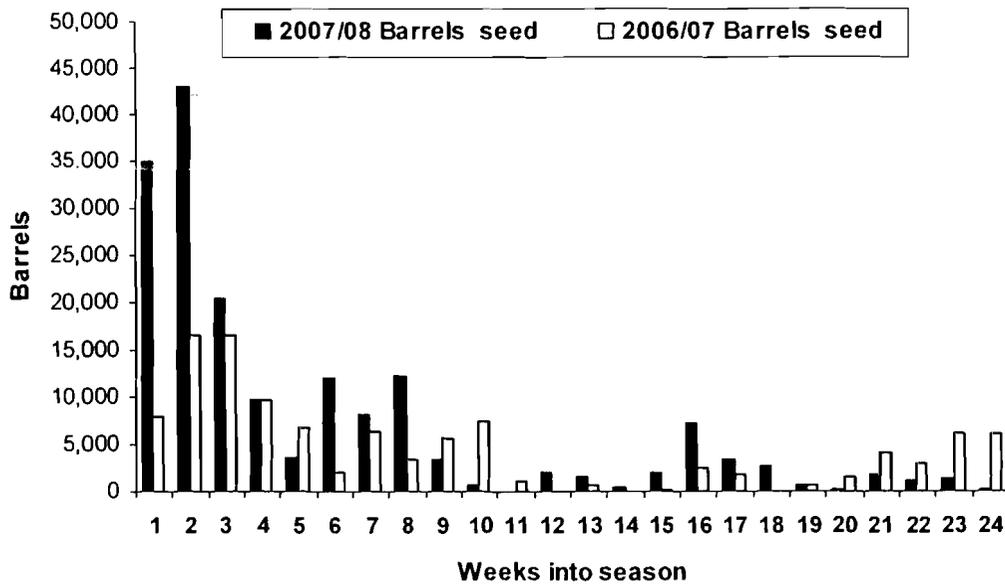
**Figure 2.2** 2007/2008 percent of estimated total harvest by bay system within CSA2.



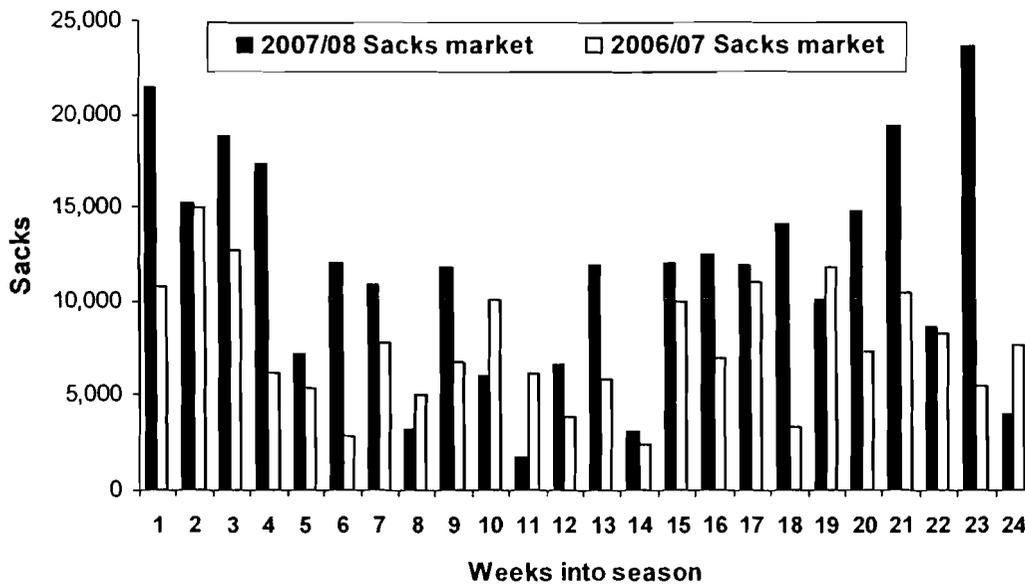
**Figure 2.3** Comparison of the number of boats bedding in the 2007/08 and 2006/07 seasons. 2007/2008 weeks 1-3 are September dates, 2006/2007 weeks 1-4 are September dates.



**Figure 2.4** Comparison of the number of boats sacking in the 2007/08 and 2006/07 seasons. 2007/2008 weeks 1-3 are September dates, 2006/2007 weeks 1-4 are September dates.



**Figure 2.5** 2007/08 vs 2006/07 estimated seed utilization by season week.  
 2007/2008 weeks 1-3 are September dates, 2006/2007 weeks 1-4 are September dates.



**Figure 2.6** 2007/08 vs 2006/07 estimated sack harvest by season week.  
 2007/2008 weeks 1-3 are September dates, 2006/2007 weeks 1-4 are September dates.

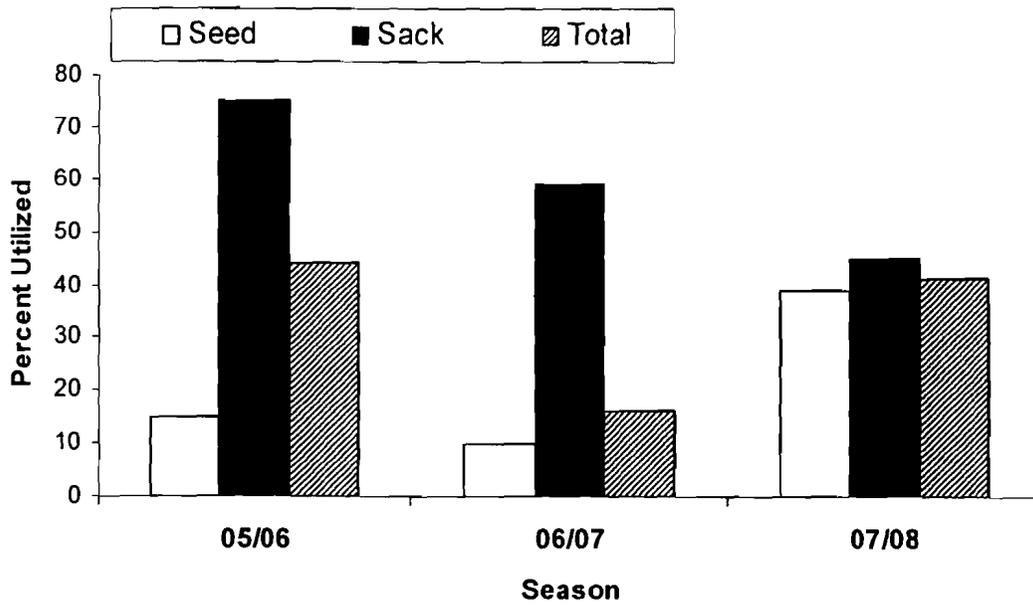


Figure 2.7 Percent of available resource utilized by season.

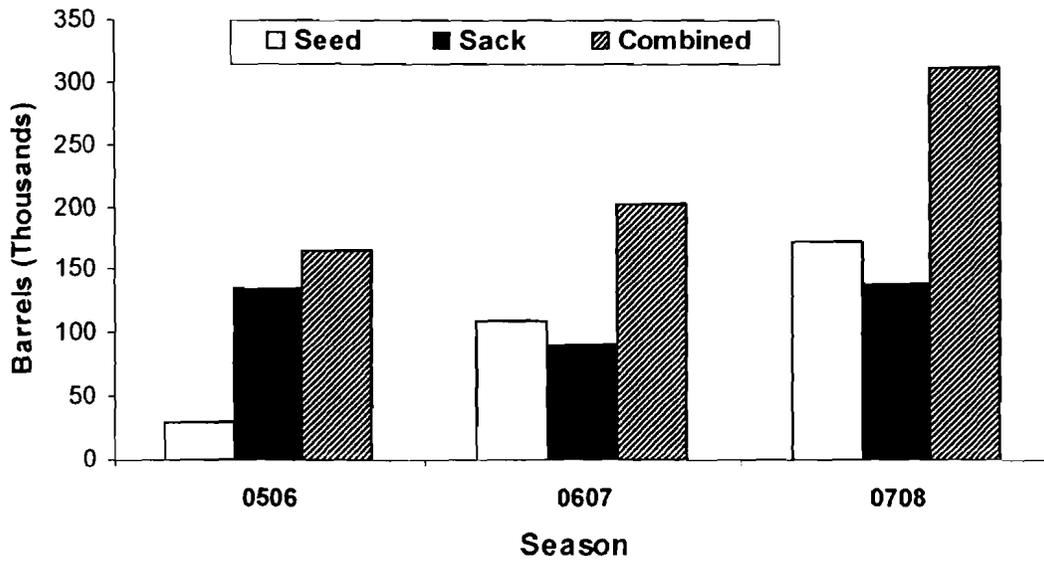
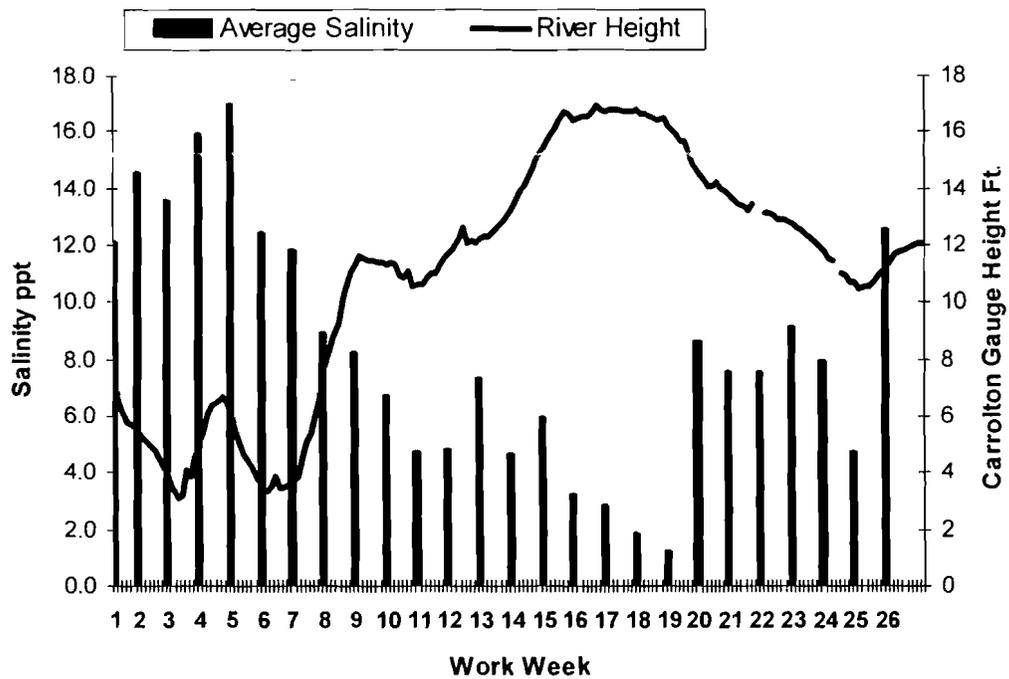
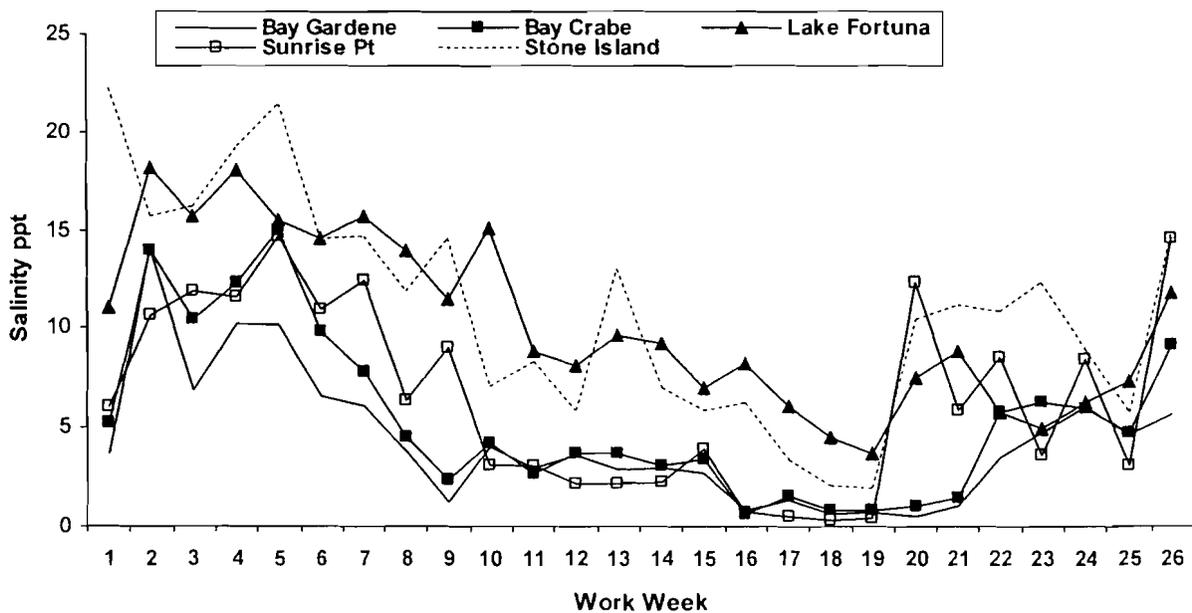


Figure 2.8 Estimated total harvest by season



**Figure 2.9** Average salinity of twenty-three isohaline stations across the public grounds vs Mississippi River gauge height at the Carrolton gauge.



**Figure 2.10** 2008 Weekly isohaline station salinities at selected stations.

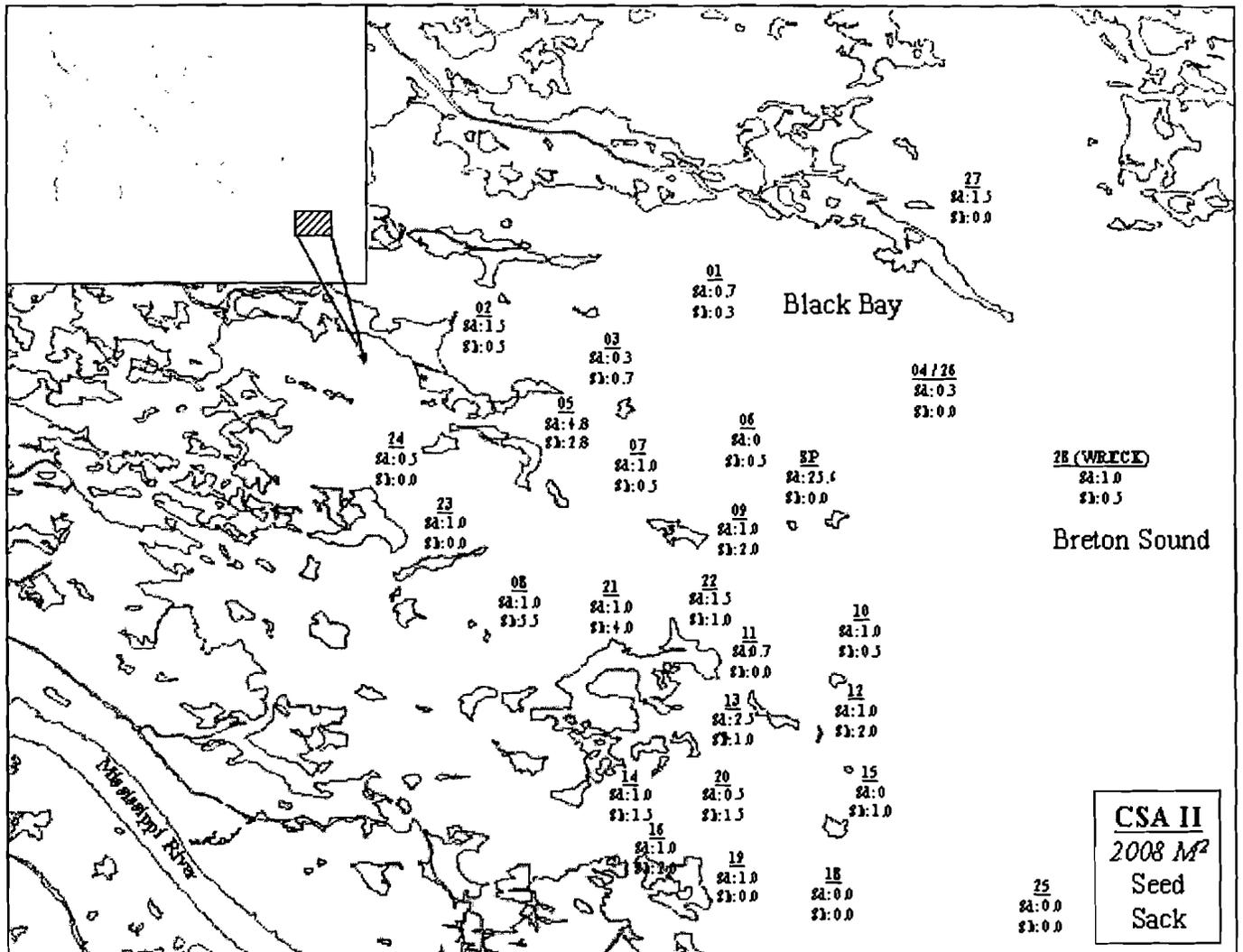


Figure 2.11 CSA2 square meter stations and results. Numbers below stations are average numbers of seed (Sd) and sack (Sk) oysters per square meter.

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## Coastal Study Area (CSA) 3 – Oyster Stock Assessment

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### Introduction

Coastal Study Area 3 (CSA 3) has historically monitored three sampling sites for oyster assessment. These sites are all located in the Hackberry Bay Public Oyster Seed Reservation (Jefferson Parish, La). Hackberry Bay is an approximately 8,000 acre euryhaline lake with a mostly silt and clay bottom. The three historical sampling sites within Hackberry Bay are the upper, middle, and lower Hackberry sampling sites. The middle Hackberry site is the only site located over historical existing reefs, the upper and lower sites are over former cultch plants placed on historical reefs. The upper Hackberry sampling site was the result of a 1994 cultch plant using federal disaster funds from Hurricane Andrew in 1992. The 1994 cultch site was comprised of six different sections of substrate. The substrates were crushed concrete, shucked shell, reef shell, mixed shell, Kentucky limestone, and Bahamian limestone. The lower Hackberry sampling site is on a reef that was part of a 1973 cultch plant.

In 2004 two more cultch plants were placed in Hackberry Bay and one in southern Barataria Bay using federal funds dedicated to the 2002 Hurricane Lilly impacts. The northern Hackberry Bay cultch plant, 10 acres, was planted near the old 1994 cultch plant on May 10, 2004 using approximately 2,322 cubic yards of #57 limestone. The southern Hackberry Bay cultch plant, 25 acres, was planted between May 10<sup>th</sup> and 12<sup>th</sup> 2004 using approximately 4,005 cubic yards of #57 limestone. The 40 acre cultch plant that was planted in southern Barataria Bay is comprised of approximately 7,536 cubic yards of crushed concrete. The southern Barataria Bay cultch plant was placed onsite from May 6 to 8, 2004 and is located in the northeast section of the Barataria Bay Public Oyster Seed Ground.

On February 1, 2007 the Wildlife and Fisheries Commission created the Little Lake Public Oyster Seed Ground. This area had been utilized in the past as a temporary natural reef area, last in 2004. The Little Lake Public Oyster Seed Ground will allow oyster farmers and harvesters more access to seed and sack oysters in the Barataria Bay basin, especially following the devastation of Hurricanes Katrina and Rita.

In 2008 a new cultch plant was placed in the northeastern portion of Hackberry Bay using federal funds dedicated to the impacts of Hurricanes Katrina and Rita. The 2008 cultch plant is approximately 50 acres in size and was planted between May 20 and 25, 2008 using approximately 75% #57 limestone, 15% crushed concrete, and 10% cleaned oyster shell. The total amount of material was approximately 10,171 cubic yards weighing approximately 13,223 tons.

## Materials and Methods

Square meter samples were collected by CSA 3 staff on July 1st, 2008. All samples were taken using a one square-meter frame placed randomly on the bottom at each sampling location. All live and dead oysters, as well as shell, were removed from the area enclosed in the frame by divers. Live and dead oysters, spat, fouling organisms, and oyster predators were identified and enumerated. All oysters were measured in 5 millimeter work groups and divided into size groups of spat (0-24mm), seed (25-74mm), and sack oyster (75mm and greater). Combined Hackberry Bay Public Oyster Seed Reservation and Barataria Bay Public Oyster Seed Ground estimates are adjusted for the percentage of reef acreage of the cultch plants and the historical reefs. A total of six stations were visited with three replicate square meter samples taken at each station. The average of the three samples at each station was used, in combination with reef acreage, to estimate the current oyster availability for CSA 3. The Little Lake Public Oyster Seed Ground was not sampled due to lack of reef acreage information. On June 26, 2008 oysters from dredge samples, divided by sack and seed, were collected and transported to Dr. John Supan (L.S.U. Cooperative Extension Service) for an analysis for *Perkinsus marinus* (Dermo). Results of the Dermo analysis are presented later in this assessment.

## Results and Discussion

The Hackberry Bay Public Oyster Seed Reservation (Hackberry Bay POSR) sample sites, including the 2004 cultch plants, averaged 14.7 spat oysters per square meter, 26.0 seed oysters per square meter, and 14.7 sack oysters per square meter (Figure 3.1, Figure 3.2). Spat oyster estimates in the Hackberry Bay POSR were higher in 2008 than the previous six years and 29% above the 2001 to 2007 average of 11.4 per square meter. Seed oyster estimates in the Hackberry POSG are not as high as last year but are still well above the 2001 to 2007 average of 12.7 per square meter. Sack oyster estimates in the Hackberry POSG averaged 14.7 per square meter, placing this year's sack-oyster estimates higher than the previous eight years and are above the 2001-2007 average of 3.6 per square meter.

Using reef acreage, oyster availability estimates can be extrapolated from the average number of oysters sampled per square meter. For the Hackberry POSR there are an estimated 2,036 barrels (bbls) of seed oysters available for harvest (Figure 3.3, Table 3.1). This estimate is below the five and ten year averages of 2,514 bbls and 2,310 bbls respectively. The Hackberry POSR also contains an estimated 2,949 bbls of sack oysters available for harvest (Figure 3.3, Table 3.1), which is well above the five and ten year averages of 767 bbls and 891 bbls respectively.

The Barataria Bay Public Oyster Seed Ground (Barataria Bay POSG) sample sites averaged 0.0 spat, 0.0 seed, and 0.0 sack oysters per square meter. The Barataria POSG has only produced oysters in 2005 when an estimated 899.3 seed oysters were available.

The Little Lake Public Oyster Seed Ground was not sampled due to lack of information on reef acreage.

Salinities in the Hackberry Bay POSR, according to the United States Geologic Survey (USGS) constant data recorder located in the bay, averaged 3.5 ppt for the month of June in 2008 which is well below the 2001 to 2007 average of 12.1 ppt. June temperatures averaged 29.9 degrees C in 2008 which is 0.6 degrees C above the 2001 to 2007 average of 29.2 degrees C. June averages of constant recorder data is presented in Figure 3.4. Freshwater input into the Barataria system has been of some concern this year with record levels of Mississippi River flow and increased flow out of the Davis Pond diversion structure. Despite increased freshwater flows from the Mississippi River and the Davis Pond diversion no major mortality events were noted in 2007 or the first half of 2008. However, some oyster mortalities were noted near the southern portion of the Little Lake seed ground in shallow areas as early as February 2008. These mortalities were most likely a result of lower salinities and temperatures in the Barataria Basin during the spring.

The Hackberry Bay POSR (Figure 3.5) has more sack oyster availability this year than in the previous twelve years and more seed availability than six of the past seven years. Part of the increased availability of sack oysters in the Hackberry Bay POSR can be directly attributed to the 2004 cultch plants as well as a resurgence of available oysters on the historic reefs. For 2008 the historic reefs in the Hackberry Bay POSR contain the highest number of available sack oysters since 2001 when 1,896 bbls were available. The southern Hackberry Bay cultch plant had rebounded from the hurricanes of 2005, with an estimated 10,356 bbls of seed being available in 2007. However, in 2008 the southern cultch plant is estimated to only contain 604 bbls of available seed oysters. The southern Hackberry Bay cultch plant did however increase in availability of sack oysters, with an estimated 1,601 bbls of sack oysters available this year. This year the northern Hackberry Bay cultch plant contains an estimated 747 bbls of available seed oysters. The amount of seed oysters available on the northern Hackberry Bay cultch plant is 12 times greater than 2007, but not as high as 2005 (9,757 bbls) or 2006 (854 bbls). The northern Hackberry Bay cultch plant also contains an estimated 259 bbls of sack oysters, which is the highest availability of sack oysters on the northern Hackberry cultch plant since it was planted in 2004. Estimated numbers of spat per square meter in the Hackberry Bay POSR are at their highest levels since 2001. These high spat estimates are a result of high numbers of spat sampled at the northern Hackberry Bay cultch site. The Barataria Bay POSG has not produced oysters since the first year after planting when an estimated 899.3 bbls of seed oysters were available. The location of the Barataria Bay POSG (Figure 3.6) hinders productivity until salinity regimes in the basin change due to natural forces or coastal restoration efforts. The Barataria Bay POSG is close to the coast and has a higher average salinity than the Hackberry POSR. This higher salinity regime makes it more vulnerable to predators such as oyster drills and stressors (i.e. Dermo) associated with higher salinities.

2007 and early 2008 have produced no tropical or hurricane activity near the Hackberry Bay POSR or the Barataria Bay POSG which can greatly affect oyster availability.

Hooked mussels per square meter averaged 2.7 on the Hackberry POSR and 0.0 per square meter on the Barataria POSG. The average number of hooked mussels per square meter on the Hackberry

POSR is well below the 2002-2007 average of 12.7 per square meter. No oyster drills were noted in any samples.

#### 2007/2008 Oyster Season Summary

The 2007/2008 oyster season yielded only minor fishing effort on the public oyster areas in CSA 3. Both the Hackberry Bay POSR and the Little Lake POSG were opened from September 5, 2007 to September 21, 2007 and Little Lake reopened from November 12, 2007 to April 1, 2008. The Barataria Bay POSG remained closed for the entire season.

Total harvest from the public oyster areas in CSA 3 during the 2007/2008 season was estimated at 976 sacks of marketable oysters and 13,930 barrels of seed oysters (Table 3.2). The Hackberry Bay POSR, including the 2004 cultch plants, produced an estimated 642 sacks of marketable oysters and 2,775 barrels of seed oysters harvested. The Little Lake POSG produced an estimated 334 sacks of marketable oysters and 11,155 barrels of seed oysters harvested. This represents an approximate 14% increase in seed harvest and an approximate decrease of 17 times in sack harvest from the 2006/2007 season. The majority of the decrease in sack harvest compared to last season is due to the large number of marketable sacks that were taken from the Little Lake POSG last season compared to this season.

The 2006/2007 oyster season yielded approximately 6,091 sacks of marketable oysters and 12,190 barrels of seed oysters from the Hackberry Bay POSR and the Little Lake POSG (Table 3.2). Last season the Hackberry Bay POSR, including the 2004 cultch plants, yielded an estimated at 271 sacks of marketable oysters and 900 barrels of seed oysters while the Little Lake POSG yielded an estimated 5,820 sacks of marketable oysters and 11,290 barrels of seed oysters. The Barataria Bay POSG was closed during the 2006/2007 oyster season.

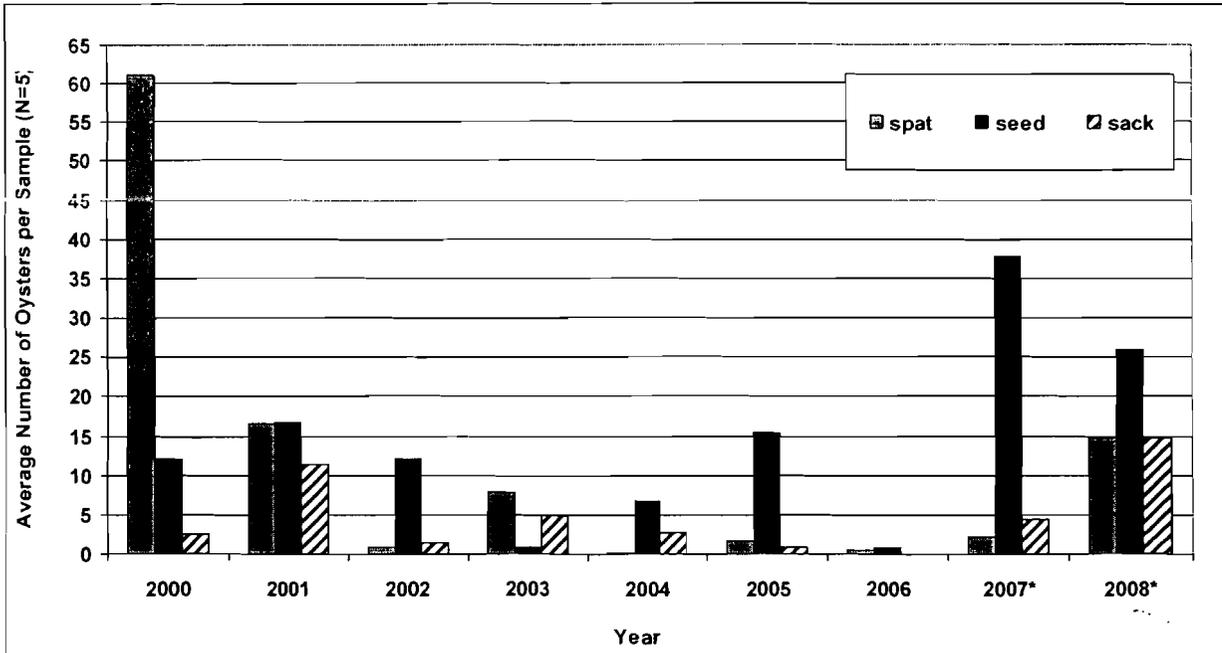


Figure 3.1 Average number of spat, seed, and sack oysters in the Hackberry Bay Public Oyster Seed Reservation square meter samples from 2000-2008. \*includes the 2004 cultch plants.

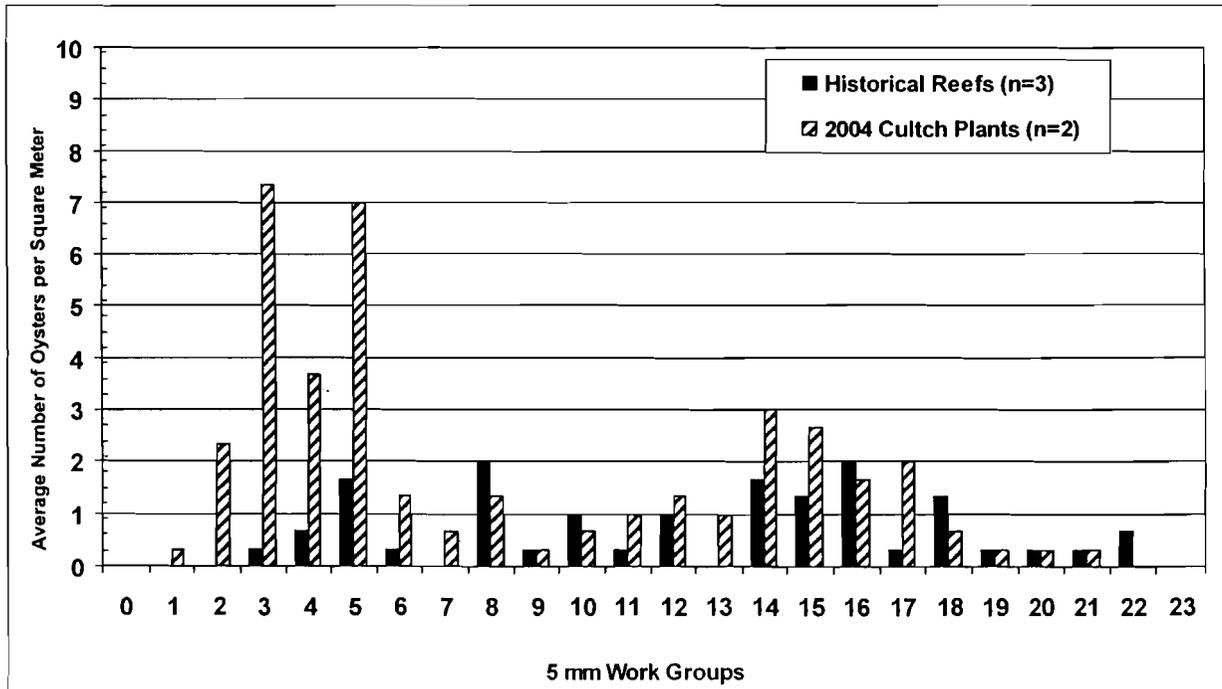
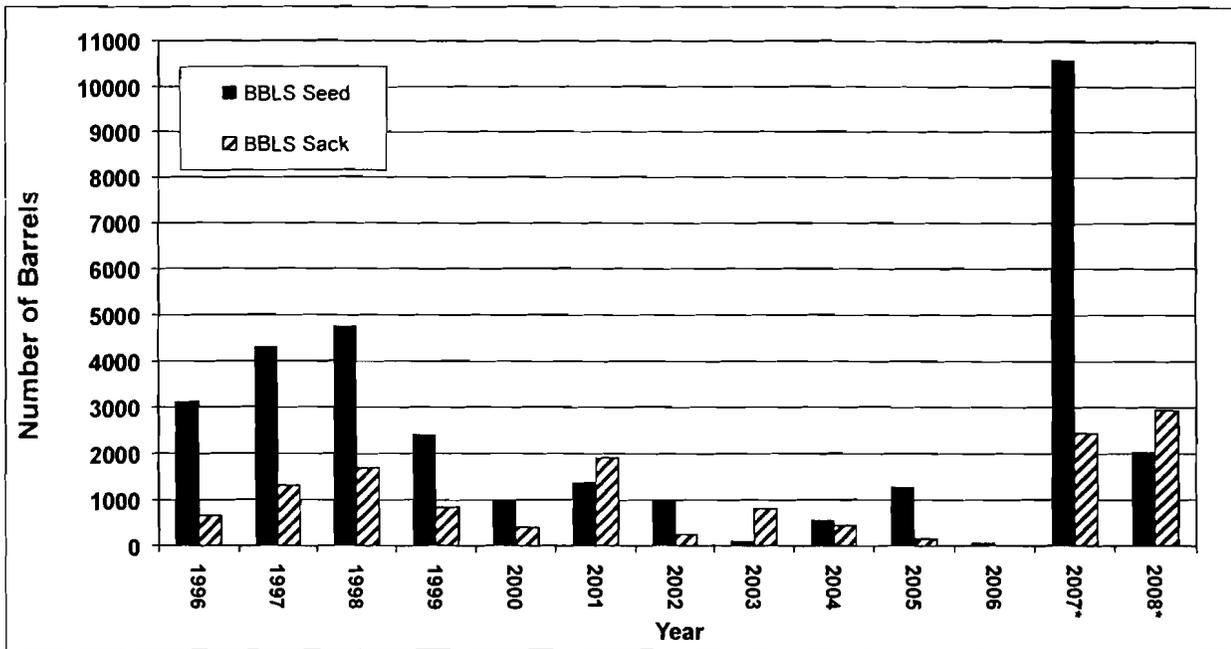
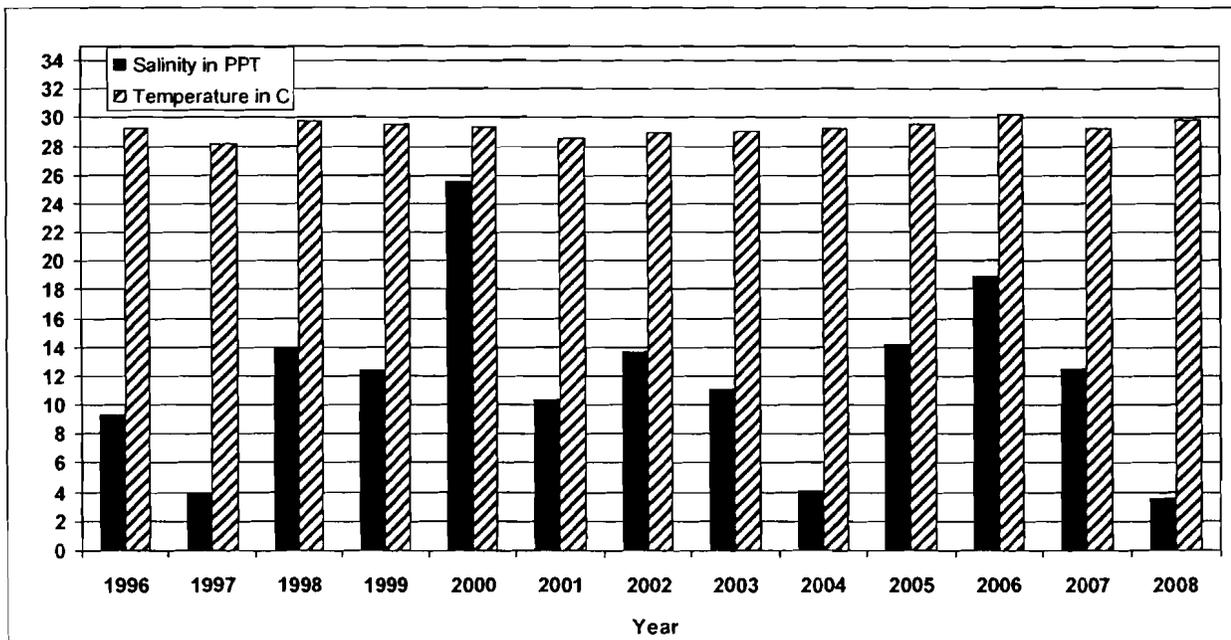


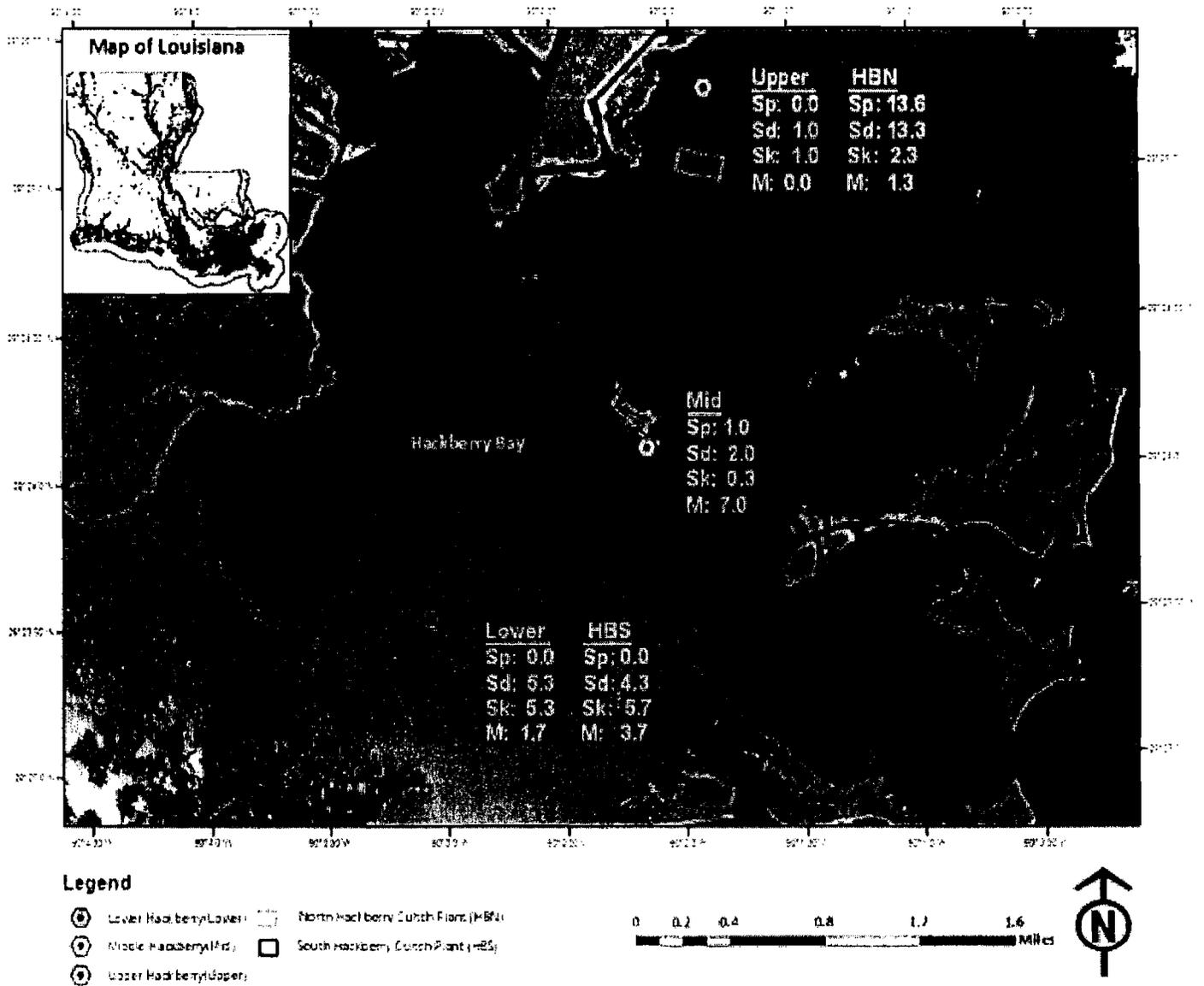
Figure 3.2 Oyster Size Distribution by 5 mm Work Groups in square meter samples collected from the Hackberry Bay Public Oyster Seed Reservation during 2008.



**Figure 3.3** Oyster Availability in the Hackberry Bay Public Oyster Seed Reservation from 1996 to 2008.  
\* includes the 2004 cultch plants.



**Figure 3.4** Average of daily June salinity (in ppt) and temperature (in degrees C.) readings from the United States Geological Survey (USGS) constant data recorder located in Hackberry Bay from 2001-2008.



**Figure 3.5.** 2008 Hackberry Bay POSR sample results as an average per square meter (Sp=Spat, Sd=Seed, Sk=sack, and M=Mussels) and map of sample locations.

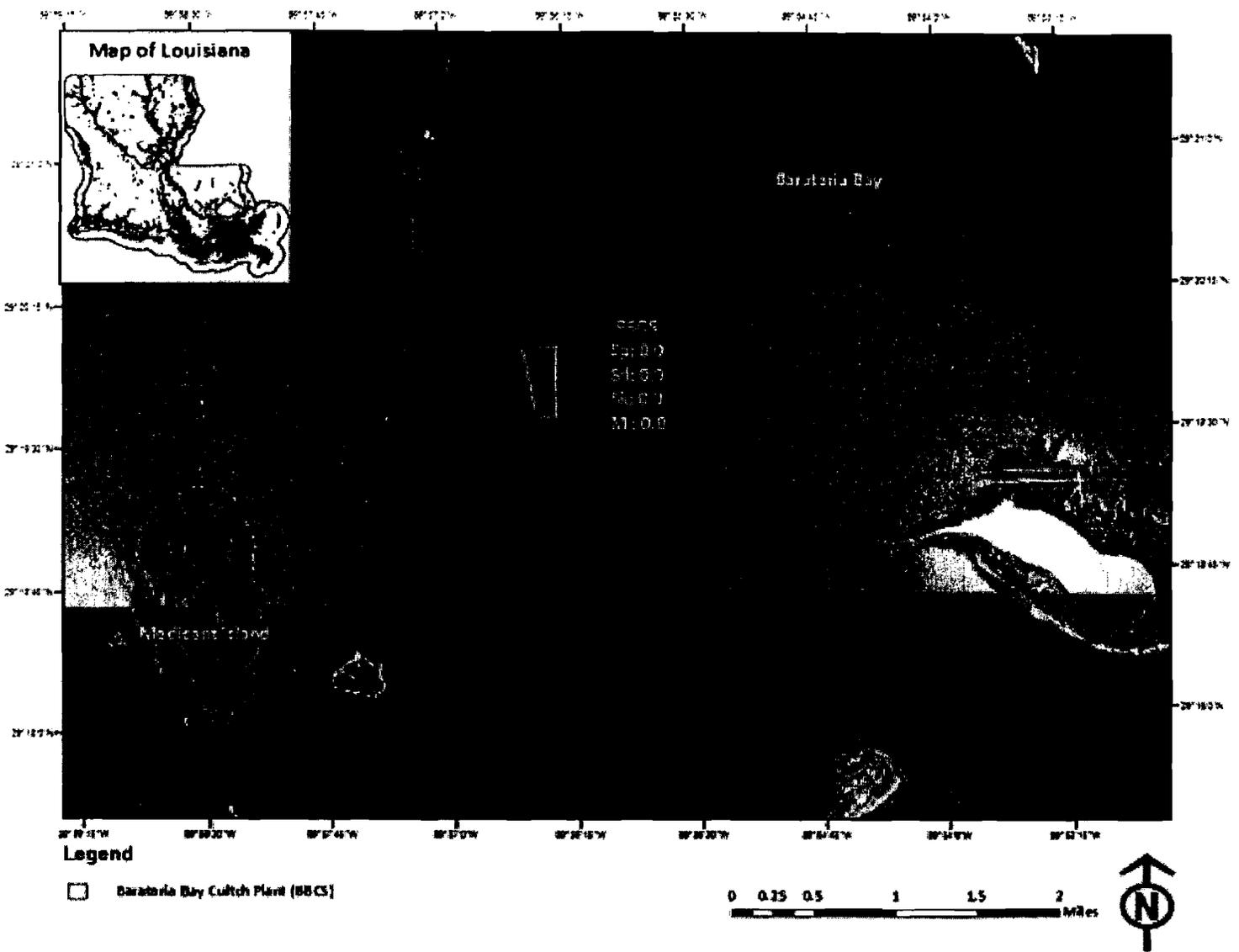


Figure 3.6. 2008 Barataria Bay POSG sample results as an average per square meter (Sp=Spat, Sd=Seed, Sk=sack, and M=Mussels) and map of sample locations.

**Table 3.1.** 2008 oyster availability on the public oyster areas in Coastal Study Area (CSA) III.

Public Oyster Area	Reef Acreage	Square Meters	Seed Oysters Per M <sup>2</sup>	Sack Oysters Per M <sup>2</sup>	Seed Oysters (BBLs)	Sack Oysters (BBLs)
Barataria Bay (2004 Cultch Plant)	40.0	161,875	0.0	0.0	0.0	0.0
Hackberry Bay (2004 North Cultch Plant)	10.0	40,469	13.3	2.3	747.5	258.6
Hackberry Bay (2004 South Cultch Plant)	25.0	101,172	4.3	5.7	604.2	1,601.9
Hackberry Bay (Existing Reefs)	14.7	59,380	8.3	6.6	684.5	1,088.6
Little Lake	Unknown	Unknown	Unknown	Unknown	--	--
<b>2008 CSA 3 Totals</b>					<b>2,036.2</b>	<b>2,949.1</b>
<b>2007 CSA 3 Totals</b>					<b>10,507.3</b>	<b>2,410.0</b>

**Table 3.2.** Estimates of oyster harvest from the public seed grounds in Coastal Study Area 3 for the 2007- 2008 season.

Public Oyster Area	Seed Oysters Harvested (BBLs)	Sack Oysters Harvested (Sacks)
Hackberry Bay POSG	2,775	642
Little Lake POSG	11,155	334
Barataria Bay POSG	0	0
<b>2007/2008 CSA 3 Totals</b>	<b>13,930</b>	<b>976</b>
<b>2006/2007 CSA 3 Totals</b>	<b>12,190</b>	<b>6,091</b>

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# Coastal Study Area (CSA) 4 – Oyster Stock Assessment

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## INTRODUCTION

The upper portion of Lake Felicity was used as a public oyster seed ground during the 1940s and early 1950s, but was discontinued because salinities were usually too high for oyster production. Four public oyster seed grounds (Lake Tambour, Lake Chien, and Lake Felicity in Terrebonne Parish and Deep Lake in Lafourche Parish) were later established in CSA 4 in 2001. Two cultch deposition projects using size number 57 limestone were performed in the Lake Felicity (Figure 4.1) and Lake Chien (Figure 4.2) seed grounds in the summer of 2004. Approximately 6,000 cubic yards were deposited on 15.5 acres in Lake Chien and approximately 9,000 cubic yards on 40 acres in Lake Felicity. The seed grounds were first opened to harvest in 2005 and have been reopened each year thereafter.

## MATERIALS AND METHODS

Square meter samples were taken from two stations each on the Lake Felicity and Lake Chien cultch plants on July 2, 2008. The aluminum square meter frame was tossed randomly over the cultch plant. All live and dead oysters within the top portion of the bottom were removed by SCUBA divers. Oysters collected in each sample were measured in 5-mm size classes and divided into three groups: spat (<25 mm), seed (25-74 mm), and sack (>74 mm).

In conjunction with the square meter oyster samples, bottom water temperature and salinity data were also taken. Oysters were also collected from each reef for “Dermo” (*Perkinsus marinus*) analysis.

## RESULTS

### *Salinity*

Average salinities associated with 2008 square meter samples were 13.8 ppt on the Lake Felicity cultch plant and 13.2 ppt on the Lake Chien cultch plant. These salinities were the lowest measured since square meter samples began in 2004.

Salinity recordings were also made monthly on the Lake Felicity and Lake Chien seed grounds from 2000 to 2005. Annual mean salinities were above 15 ppt except for Lake Chien in 2005.

### *Spat, Seed, and Sack Oysters*

The average number of live oysters per square meter in 2008 was 115.5 spat, 8.0 seed, and 9.5 sack oysters for the Lake Felicity cultch plant and 21.0 spat, 5.5 seed, and 1.5 sack oysters for the Lake Chien cultch plant (Table 4.1). Average percent mortalities at the Lake Felicity and Lake Chien cultch plants were 5.8% and 15.4% for seed oysters and 0% and 0% for sack oysters respectively (Table 4.1).

Recruitment as measured by spat numbers were higher in 2008 than for the two previous years but lower than numbers seen immediately after cultch plant deposition. Numbers of seed and sack oysters in Lake Felicity were higher in 2008 than in 2007 while numbers of seed and sack oysters in Lake Chien have declined steadily since earlier peaks in 2005 and 2006.

### *Resource Availability*

A total of 2,277 barrels of seed oysters and 4,533 sacks of sack oysters for both cultch plants are estimated for 2008 (Table 4.2). Estimated resource availability for the Lake Felicity and Lake Chien cultch plants for all years are found in Figures 4.3 and 4.4 respectively. The standing crop for seed oysters is higher than in 2007 while the sack oyster standing crop is the highest ever recorded.

### 2007 OYSTER SEASON SUMMARY

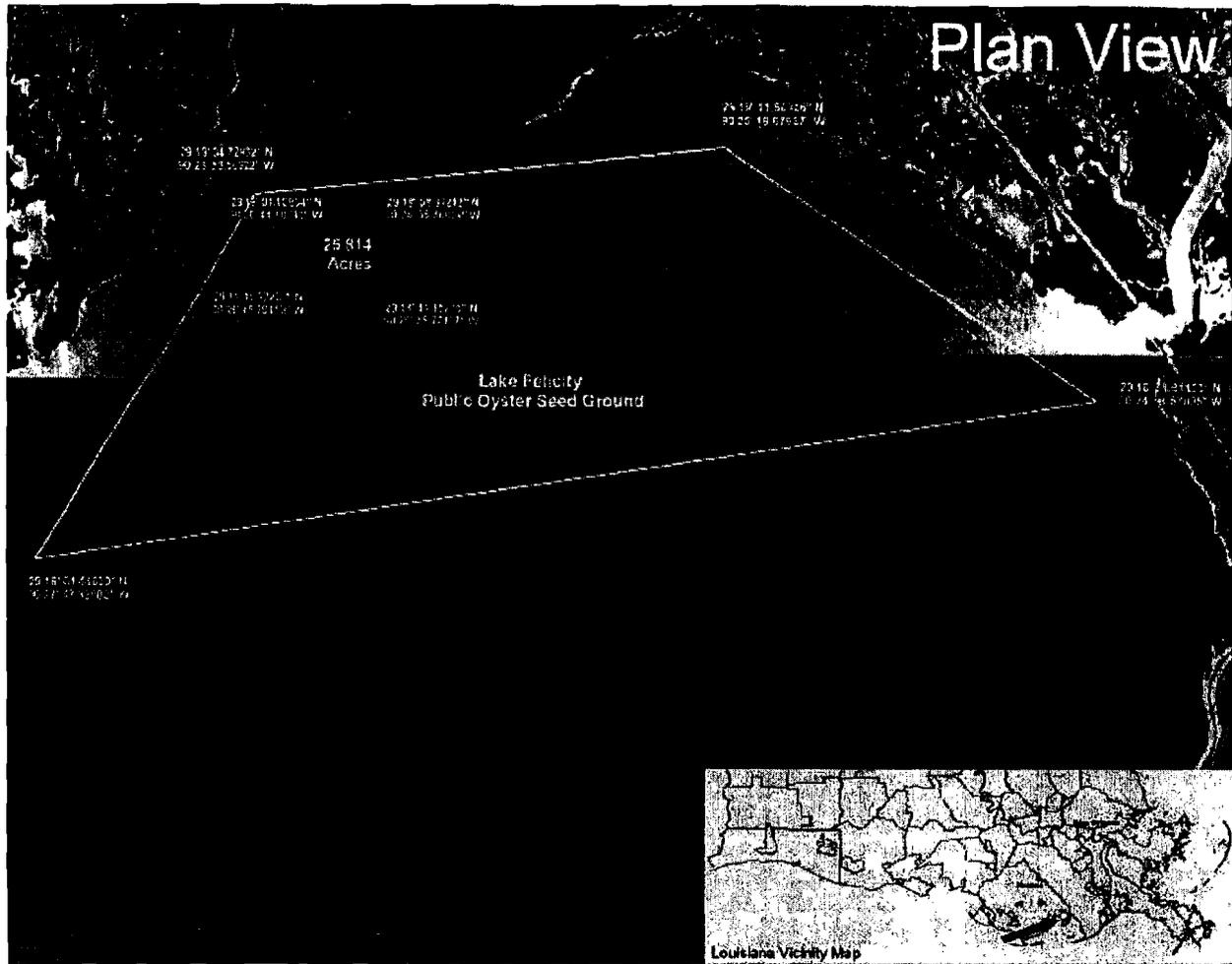
Overall harvest and effort for the 2007 oyster season (October 24 through October 26) was 7,269 sacks of sack oysters and 2,627 barrels of seed oysters and 72 vessel-days (Table 4.3). In contrast to earlier years, the oyster harvest on the Lake Felicity cultch plant was higher than on the Lake Chien cultch plant. As in previous years, the only oyster vessels observed on the seed grounds were on the Lake Felicity and Lake Chien cultch plants.

The commercial fishery has changed since 2004 (Table 4.3). Fishing effort in vessel-days and overall harvest has increased each year. Only seed oysters were harvested the first two years, while in 2007 the harvest of sack oysters was almost three times greater than the seed harvest.

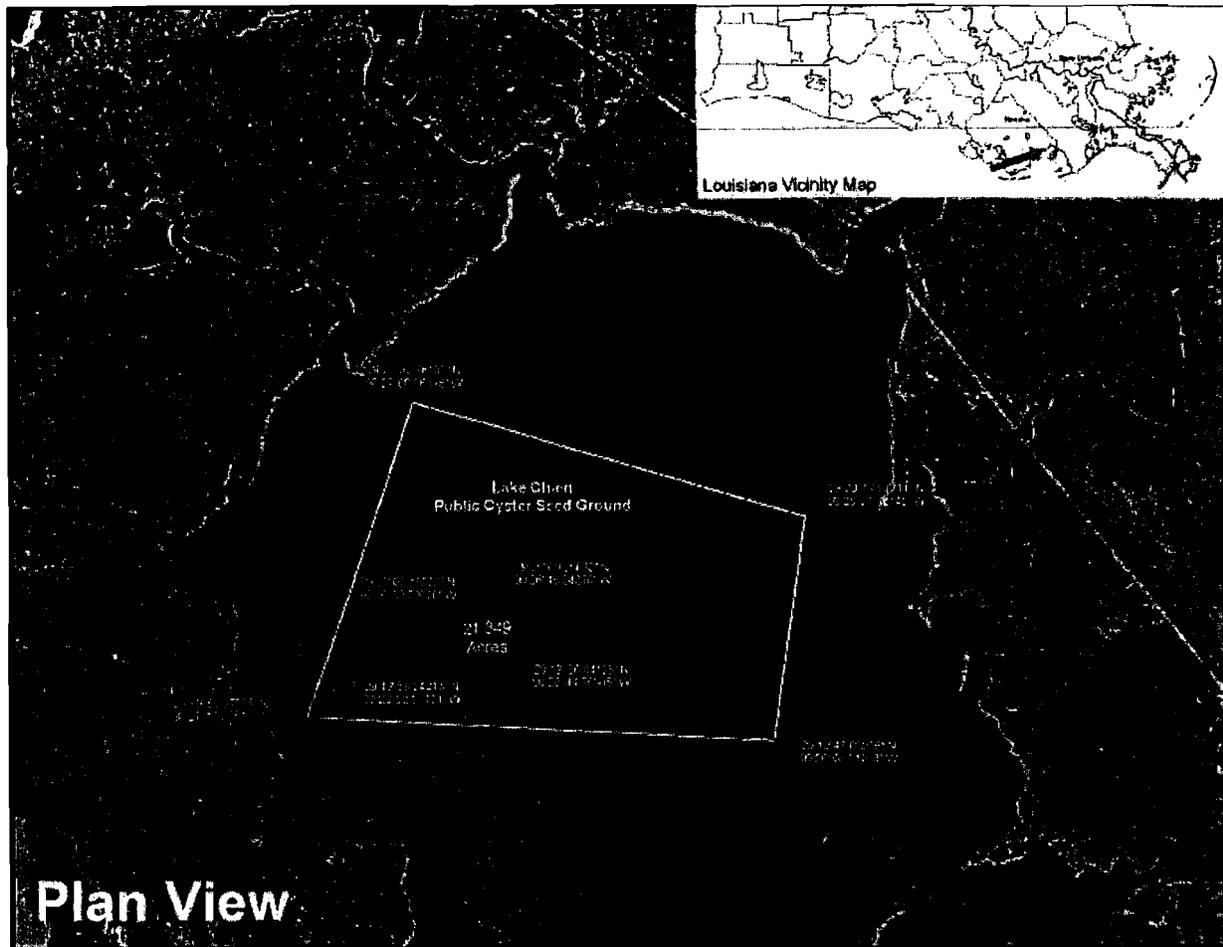
### DISCUSSION

Estimated availability of seed and sack oysters has declined on the Lake Chien cultch plant since the peak of seed oysters in 2005 and of sack oysters in 2006; both of these followed a very successful spat set in 2004 following cultch plant deposition. However, estimated resource availability of sack oysters on the Lake Felicity cultch plant was the highest ever recorded. The relatively low salinities in 2008 and the eventual removal of portions of the silt overburden on the Lake Felicity associated with Hurricanes Cindy and Rita in 2005 may have contributed to the potential increased production on the Lake Felicity cultch plant.

Most of Timbalier-Terrebonne estuary is in the high-salinity zone (where oyster populations are primarily intertidal because of extensive predation) or wet zone (where subtidal oysters may be found when salinities are suppressed) (Melancon et al., 1994). The productive wet-dry zone (where subtidal oysters may be consistently found) lies to the north of the current Lake Felicity and Lake Chien public seed grounds.



**Figure 4.1** The Lake Felicite Public Oyster Seed Ground and the approximate location of the 2004 cultch plant.



**Figure 4.2** The Lake Chien Public Oyster Seed Ground and the approximate location of the 2004 cultch plant.

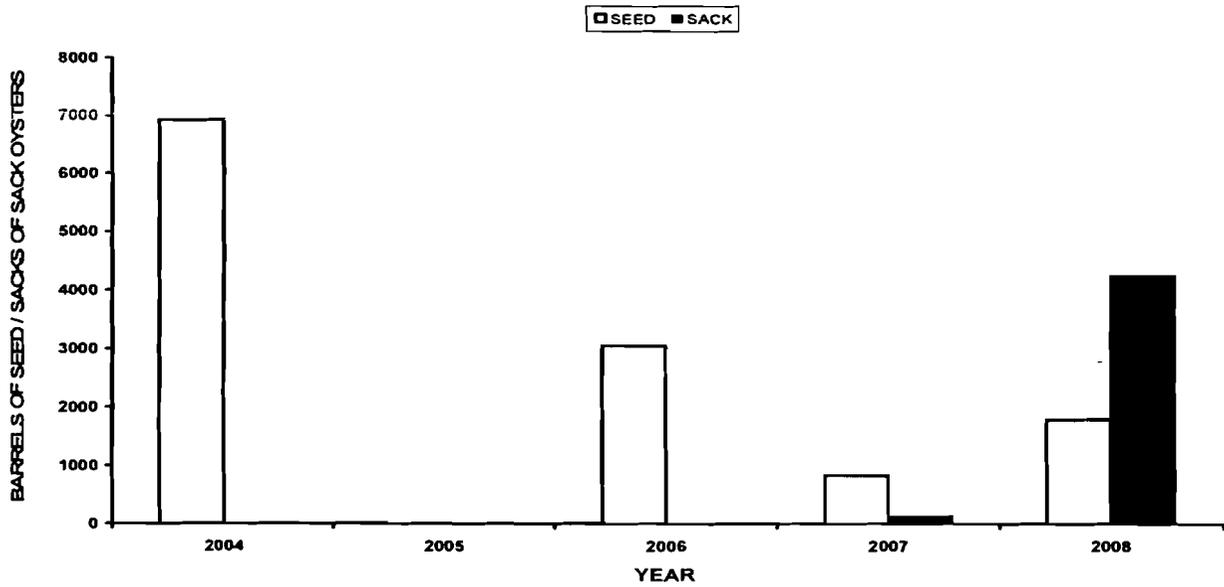


Figure 4.3 Estimated resource availability of seed and sack oysters, Lake Felicity cultch plant.

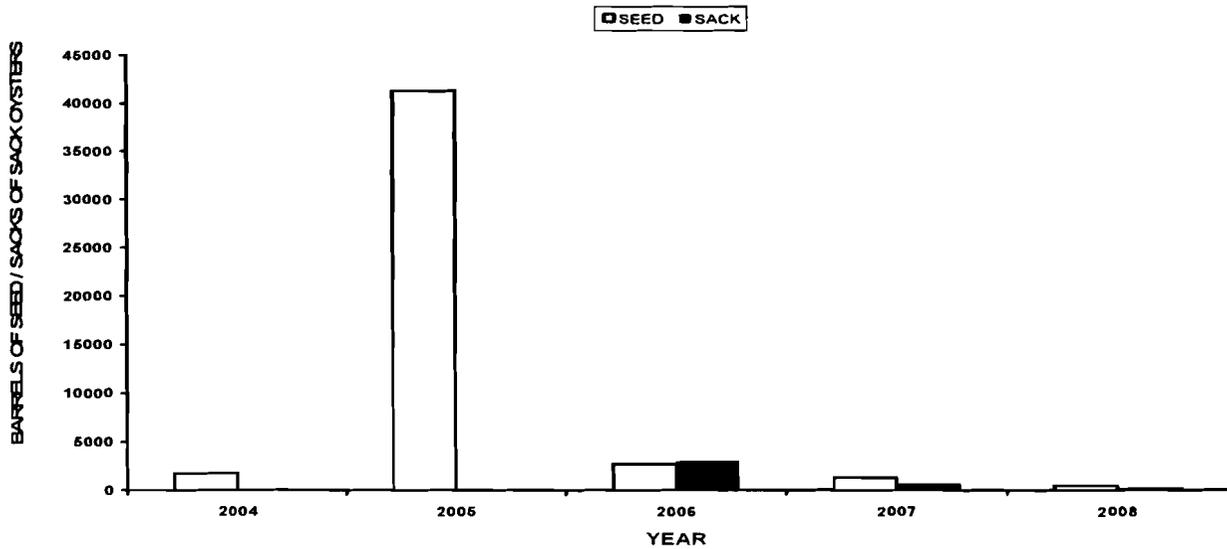


Figure 4.4 Estimated resource availability of seed and sack oysters, Lake Chien cultch plant.

**Table 4.1** Numbers per sample of live spat, seed, and sack oysters and percent mortalities from square meter samples, July 2008.

CULTCH PLANT	SAMPLE	NUMBER/SAMPLE			PERCENT MORTALITY		
		SPAT	SEED	SACK	SPAT	SEED	SACK
Lake Felicity	1	214	14	18	0	6.7	0
	2	17	2	1	0	0	0
	Mean	115.5	8.0	9.5	0	5.8	0
Lake Chien	1	12	7	2	0	17.6	0
	2	30	4	1	3.2	11.1	0
	Mean	21.0	5.5	1.5	2.3	15.4	0

**Table 4.2** Estimated annual standing crops of seed and sack oysters on the Lake Chien and Lake Felicity cultch plants based on 2008 square meter samples.

CULTCH PLANT	ESTIMATED RESOURCE	
	SEED (Barrels)	SACK (Sacks)
Lake Felicity	1,799	4,272
Lake Chien	479	261
Total	2,277	4,533

**Table 4.3** Commercial effort and harvest data for 2005, 2006, and 2007 from the Lake Chien and Lake Felicity cultch plants.

DATES	PARAMETER	LAKE	LAKE	OVERALL
Dec 12-15, 2005	Effort	1	9	10
	Seed Oyster Harvest	15	252.5	267.5
	Sack Oyster Harvest	0	0	0
Nov 13-15, 2006	Effort	0	11	11
	Seed Oyster Harvest	0	1,940	1,940
	Sack Oyster Harvest	0	0	0
Oct 24-26, 2007	Effort	24	48	72
	Seed Oyster Harvest	470	2,157	2,627
	Sack Oyster Harvest	4,830	2,439	7,269
TOTAL	Effort	25	68	93
	Seed Oyster Harvest	485	4,349.5	4,834.5
	Sack Oyster Harvest	4,830	2,439	7,269

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## Coastal Study Area (CSA) 5: 2008-2009 Oyster Stock Assessment

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### INTRODUCTION

One of seven coastal study areas established in 1965, CSA 5 lies within the Terrebonne Basin and is located in southwest Terrebonne Parish. Within the nearly half million acres (Gaidry and White 1973) of euryhaline coastal marshland are three Public Oyster Seed Reservations (POSR)/Grounds (POSG):

Sister Lake (Caillou Lake) was designated as a POSR in 1940 and is comprised of 7,752 acres of waterbottoms (Barrett 1970). The first known cultch deposition projects were established in Terrebonne Parish between 1906 and 1909 by the U.S. Bureau of Fisheries. Subsequent plantings by the State of Louisiana began in Sister Lake in 1917 (Mackin and Hopkins 1962) totaling 24 projects with 4,112 acres of cultch materials. The most recent Sister Lake cultch deposition project was a 67-acre site in 2004.

Bay Junop POSR was established in 1948 and consists of approximately 2,448 acres of waterbottoms. Due to the shallow water depth of the bay and inability of barges and tugs to enter for cultch deposition, no reef-building projects have been implemented in this area to augment natural oyster reef production.

Lake Mechant is the most recently designated seed ground area (2001) with approximately 2,131 acres of waterbottoms. In 2004, approximately 30-acres of the Lake Mechant POSG was planted with size 57 limestone to establish a cultch plant.

In 2007 the Lake Mechant POSG was expanded to include approximately 500-acres of unleased waterbottoms between the existing grounds and private oyster leases. This increased the POSG waterbottoms to 2,631 acres. This expanded area was unavailable for harvest during the 2007-2008 season.

### MATERIALS AND METHODS

Coastal Study Area 5 square meter field samples were completed on July 1, 2008. Samples were collected using an aluminum square meter frame tossed randomly over known reef substrate at sites located in the Sister Lake and Bay Junop POSR's and the Lake Mechant POSG. Replicate samples were taken at each station and the average of the two was used to estimate oyster stock availability at each station. All live and dead oysters and shell within the upper portion of substrate was removed by SCUBA divers. Live and dead oysters, spat, oyster predators, and hooked mussels (*Ischadium recurvum*) were collected, identified and tallied. Oysters were measured in 5 millimeter (mm) size groups and then divided into three categories: spat (<25 mm), seed (25-74 mm) and sack (75 mm and larger) oysters. Results from these samples were then extrapolated using known reef acreage to yield an estimated stock size throughout the entire POSR or POSG.

A total of 31 samples were collected at 15 locations including 20 samples in Sister Lake, eight in Bay Junop, and three in Lake Mechant (Figures 5.1, 5.2 and 5.3). Sites include the 2004 Sister Lake

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(MS218) and Lake Mechant (MS300) cultch plants (Figures 5.1 and 5.3). Additionally, four dredge samples were collected from Sister Lake and Bay Junop for “Dermo” (*Perkinsus marinus*) analysis.

## RESULTS AND DISCUSSION

*Sister Lake:* Estimated oyster availability for 2008-2009 is 42,168 Barrels of seed and 49,641 Barrels of sack oysters (Table 5.1). This represents an overall decline of 56% from last year’s assessment, with a decline in 8 out of 10 stations. Sack oysters decreased 60% and seed oysters decreased 49% from the 2007 assessment (Figure 5.4). The seed to sack ratio increased from 0.7:1.0 last year to 0.9:1.0 (Table 5.4).

Known reef acreage in Sister Lake increased 45% from 1,566 to 2,279 acres based upon a side scan sonar survey conducted in May 2005. This acreage increase was calculated into availability estimates beginning in 2006, thus 2007 and 2008 resource estimates are comparable only to those of 2006. The 2008 square meter samples had no sack mortality and a seed mortality of 9.9%, resulting in an overall seed/sack mortality of 6.2%. Overall oyster mortality in the 2007 assessment was 1.8%. Spat counts were 23% below the five year average (17.8) with an average of 13.7 spat per station but represent a 22% increase from the previous assessment.

Seed and sack oyster availability from the 67-acre 2004 cultch plant are included in Sister Lake seed/sack availability totals. In 2007, this cultch plant contributed 12% of the overall oyster availability (9,863 Barrels seed and 20,822 Barrels sack) in the lake. In 2008, seed oysters declined 97% (274 Barrels) while sack oysters declined 95% (1,096 Barrels), reflective of heavy fishing pressure during the 2007-2008 season.

Significantly larger numbers of available seed and sack oysters are located in the northern end of Sister Lake. Four sites (stations 200, 202, 213, and 216) account for 88% of seed and 76% of sack oyster availability. Two of these sites are above the traditional November-February Department of Health and Hospitals (DHH) seasonal reclassification line within the lake and contribute 71% of available seed and 55% of available sack oysters (Figure 5.1).

During this year’s assessment, up to 5” of overburden was recorded at 3 of 10 sample sites suggesting a lingering negative impact from 2005 hurricanes Katrina and Rita. All of these sites (Stations 214, 215, and 217) are located south of the DHH reclassification line within the lake (Figure 5.1). Of these more southerly locations, 5 of the 10 sites are relatively unproductive, only contributing 10.5% of total sack availability and less than 5% of total seed availability.

*Bay Junop:* The 2008-2009 Bay Junop estimated stock availability is 2,115 Barrels of seed oysters and 2,370 Barrels of sack oysters; these estimates rank 27<sup>th</sup> for seed and 25<sup>th</sup> for sack, since 1980 (Tables 5.2 ). This is a 16% decrease in seed availability and 37% increase in sack availability from 2007 (Figure 5.4). Seed to sack ratio has decreased from last year’s assessment of 1.5:1.0 to 0.9:1.0 (Table 5.4). The overall average seed/sack mortality of 7.4% in Bay Junop indicates an increase in oyster mortality from last year’s assessment. Spat sets averaged 8.9 spat per station which is 40% less than the five-year average of 15.0 spat/site. Sack oysters remained low at two of three sites with the most significant increase being at the northern end of the bay above the traditional November-February DHH line.

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*Lake Mechant:* The 2008 assessment of the approximate 30-acre site included estimates of 2,580 Barrels of seed oysters and 226 Barrels of sack oysters available (Table 5.3), which represented a 79% decrease of seed and a 60% decrease of sack availability from 2007 (Figure 5.4). Although additional resources are available on these grounds, lack of known reef locations and amount of productive reef acreage presently prevent an accurate population assessment of this lake. Efforts are underway to attain a more complete suitable oyster substrate assessment of this POSG.

#### WATER TEMPERATURE AND SALINITY

Water temperatures in Sister Lake, Bay Junop and Lake Mechant were at or close to the long term average (LTA) for May and June with the greatest deviance being 0.8 degree Centigrade (°C) (Table 5.5). Salinities in Sister Lake, Bay Junop and Lake Mechant were all below their respective LTA (Figure 5.5, Table 5.6). Lake Mechant salinity for May [0.4 parts per thousand (ppt)] and June (0.5 ppt) were below the LTA of 5.8 ppt and 5.2 ppt respectively. Periodic locally heavy spring rainfall combined with high river stages decreased salinity levels throughout the entire area but was accentuated in Lake Mechant through a north-south dispersal (Figure 5.5).

#### PREDATORS/DISEASE/FOULING

Biofouling of hooked mussels in Sister Lake has decreased from last year's assessment with two stations (213 and 216) accounting for 81% of the total hooked mussels observed. The number at the remaining eight stations ranged from 0-2 hooked mussels per station. Biofouling rates of hooked mussels in Bay Junop have decreased from 48 in the 2007 assessment to 18 this year with the largest number (14) of mussels located at Buckskin Bayou. Samples from Lake Mechant contained no predatory species and an average of 6 hooked mussels/sample. This represents a decrease of 117 in 2007 to 19 in 2008 or a decline of 83%.

*Perkinsus marinus* ("Dermo") samples were collected during square meter sampling and delivered to Nicholls State University for analysis. Results indicate "disease levels below the threshold of significant oyster mortalities" (Personal Communications, Dr. Tom Soniat).

No evidence of oyster drills (*Stramonita haemastoma*) was present in square meter samples. Other potential predators included a total of 43 unidentified mud crabs recorded from 15 stations. Stone crab (*Menippe adina*), blue crabs (*Callinectes sapidus*), and Gulf toadfish (*Opsanus beta*) were not present in samples.

#### 2007/2008 OYSTER SEASON SUMMARY

During this season's Lake Mechant and Sister Lake opening, the commercial fleet was monitored on a daily basis for estimated seed and sack harvests. These efforts, along with post season trip ticket reports are utilized to determine overall harvest. However, due to the time lag in receiving post season trip ticket reports; there is a need to closely monitor ongoing harvests. This allows measures to be taken to protect the remaining resource should problems arise.

*Sister Lake:* The 2007-2008 Sister Lake POSR opened for harvest on November 12, 2007. One hundred fifty-six different vessels participated in the harvest for a total of 660 boat days of effort. Total lake harvest in the abbreviated eight day season was 38,217 Barrels of seed and sack oysters. Of this total, 21,257 Barrels were sack and 16,960 Barrels were seed oysters which represents 17% and 21% respectively of the estimated availability. Sacking vessels averaged 74 sacks/day while bedding

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vessels averaged 200 Barrels of spat/seed/sack and non-living cultch/day. This represented the highest bedding efforts by industry since at least the early 1970's and was most likely associated with the Private Oyster Lease Rehabilitation Program (POLR) inducements.

Vessels observed on the 2004 cultch plant recorded 69 boat days of effort with 32 present on opening day. Of the lake's total oyster availability, this cultch plant produced 3,958 sack and 5,150 Barrels of seed oysters for a total of 7,129 Barrels or 10% and 52% of estimated sack and seed availability respectively.

The second split of the 2007-2008 Sister Lake commercial oyster harvest season lasted the entire 19-day recommended period of February 11-29. With the exception of the 2004 Sister Lake cultch plant and a DHH designated closure area in the northern portion of the lake near Grand Pass (Figure 5.1), the remaining portion of the lake was open to harvest. Industry requested and received a 50 sack daily limit during this split.

Harvest totals of 38,908 sacks and 2,490 Barrels of seed were taken during this split for a total production of 21,944 Barrels. Ninety-five different vessels participated during this harvest and contributed 870 boat days for sack oysters and averaged 45 sacks/boat/day. An additional 19 boat days were attributed to bedding loads with an average of 131 Barrels/boat/day.

Including the first split (November 12-19, 2007), the combined 2007-2008 harvest encompassed 27 days and produced 81,421 sack and 19,450 Barrels of seed oysters for a total production of 60,161 Barrels of oysters (Table 5.7). Sack harvest accounted for 1,445 boat days and averaged 56 sacks/boat. Bedding boat days totaled 104 and averaged 187 Barrels/boat/day with average Barrels per boat much greater during the first split than the second, 200 Barrels and 131 Barrels respectively.

No unusual post harvest sack oyster mortalities were noted following the two splits (1.2% and 2.4% respectively.) Seed mortality was slightly higher for the two splits (5.2% and 6%) while spat mortality sharply increased from 6.4% for the first split to 23% following the second split.

Although the cultch plant was closed during the second split of the season, mortality was continuously monitored as prior samples indicated a large portion of the reef was removed with much of the remaining reef buried during harvest operations of the first split. Freshly blackened and buried oysters were plentiful as oyster mortality was 16%, 51%, and 65% for sack, seed and spat oysters respectively. This suggests that relatively small cultch plants such as this one (approximately 60 acres) cannot withstand the amount of fishing pressure expended by the modern commercial fleet during a relatively short eight day season. Although the resource was large and healthy on opening day, it was quickly decimated by cultch and oyster removal with the lingering effects of diminished reef area for spat set, buried reef and dead/dying oysters.

Bedding effort was much higher than in the previous three lake openings—85 boat days or 13% of total effort--and was principally attributed to the POLR program. Throughout the season, area personnel collected 34 samples from bedding loads to determine the percentage of non-living reef material being removed along with seed and sack oysters. An estimated season total of 2,689 cubic yards (cu yds) of reef was removed of which 825 cu yds was non-living materials. Non-living reef materials averaged 31%/vessel with some loads containing as much as 72% of non-living reef

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substrate. Due to the method utilized to determine living vs non-living material, these percentages should be considered very conservative values.

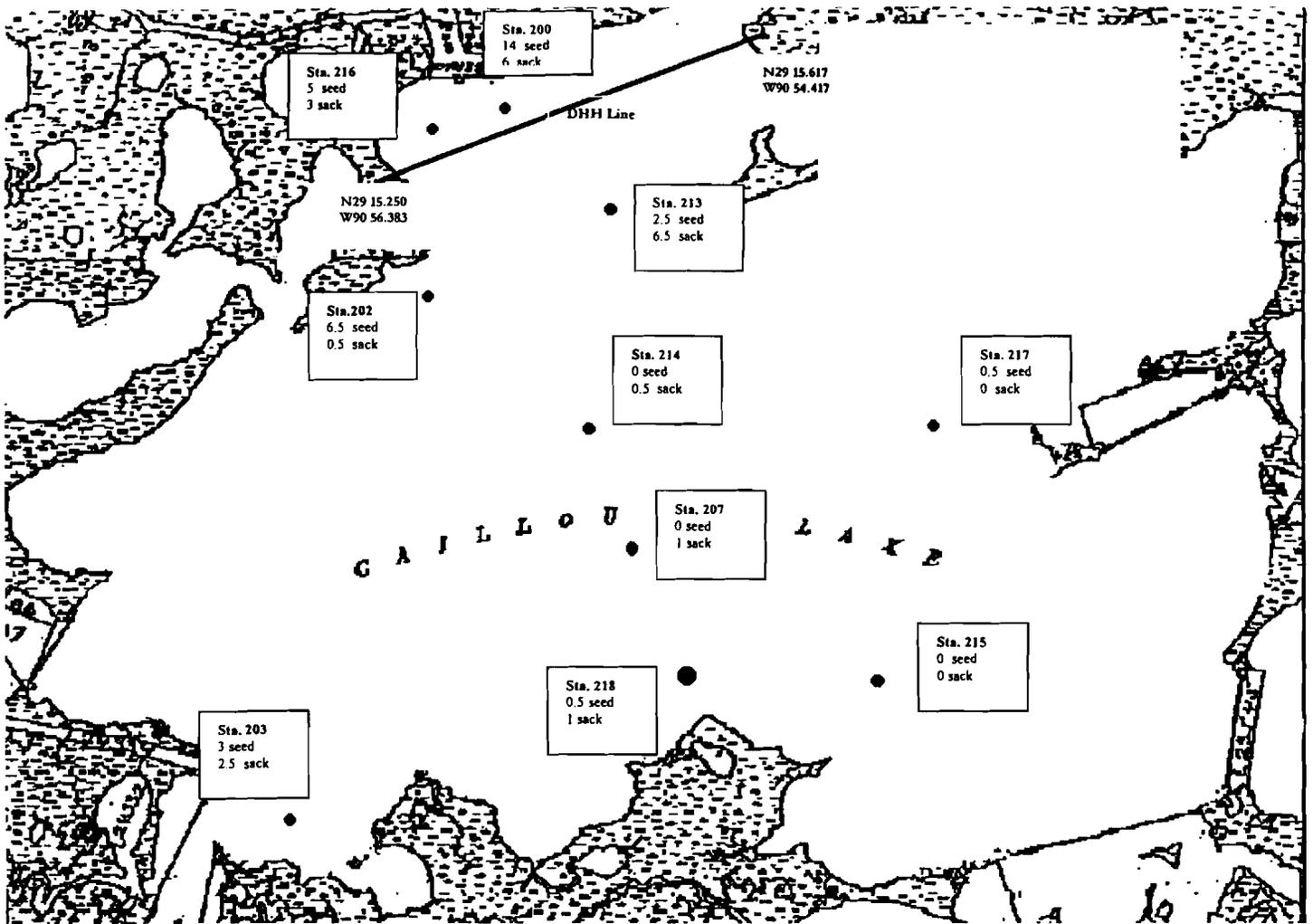
Although this was the fourth shortest (27 days) season on record for the Sister Lake POSR it had the highest bedding effort since the 1999-2000 season and the highest amount of barrels of seed harvest during the last four openings (Table 5.7).

*Lake Mechant:* In an abbreviated six day oyster harvest season (October 24-29, 2007) on the Lake Mechant POSG, 13,703 sacks and 19,665 Barrels of seed oysters were harvested for a total estimated production of 26,517 Barrels. Ninety-one vessels participated for a total of 350 boat days. On opening day 71 vessels were recorded working the area and averaged 54 sacks or 506 Barrels of seed/vessel. By day six only 46 boats were still working and averaged 43 sacks or 206 Barrels of seed/vessel. Some of the reduction in seed loads could be due to the passage of a cold front which dropped water levels in the lake.

The high bedding effort of oysters from this POSG was primarily due to two factors: The POLR Program added incentive to bed oysters this year along with the presence of large numbers of small oysters and spat. As indicated through earlier fishery independent samples, the overall crop consisted primarily of undersize (<3") oysters and only a small percentage (4.5%) of sack oysters.

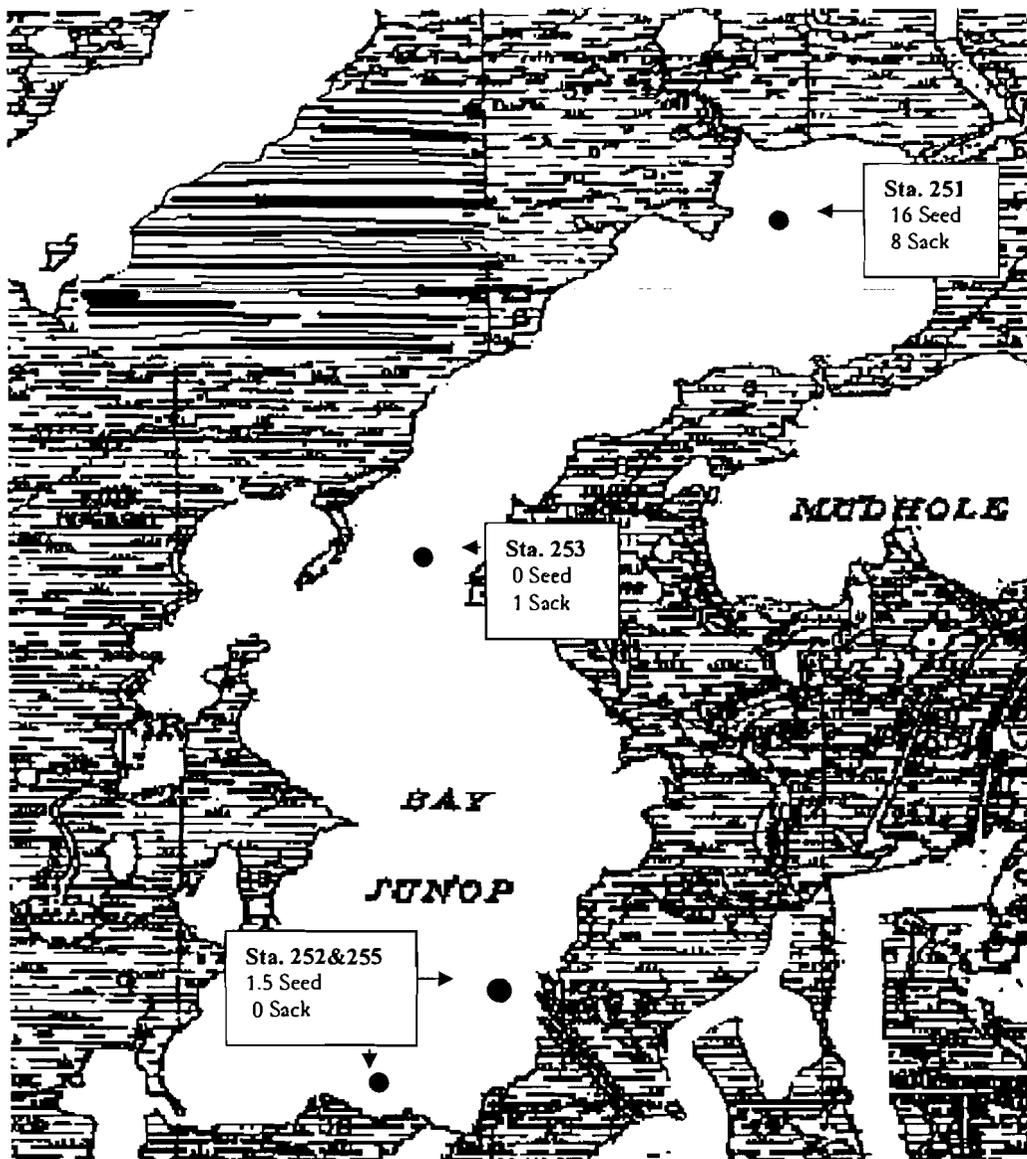
#### NEW PROJECTS FOR CSA 5

- (1) The Department of Natural Resources Lake Mechant land bridge restoration project located on the northern shoreline of the lake just north of the 2004 cultch plant is scheduled to begin in August 2008 and completion by October 2009.
- (2) As part of the POSG rehabilitation effort under the Supplemental Appropriation Louisiana Tasks (SALT) grant, portions of two cultch plants (1984 and 1995) are tentatively slated to be re-planted with approximately 30,000 cubic yards of reef materials during the fall of 2008.
- (3) Monitoring of living vs. non-living reef material in commercial bedding loads.
- (4) Attempts to quantify reef acreage on the Lake Mechant POSG are underway.



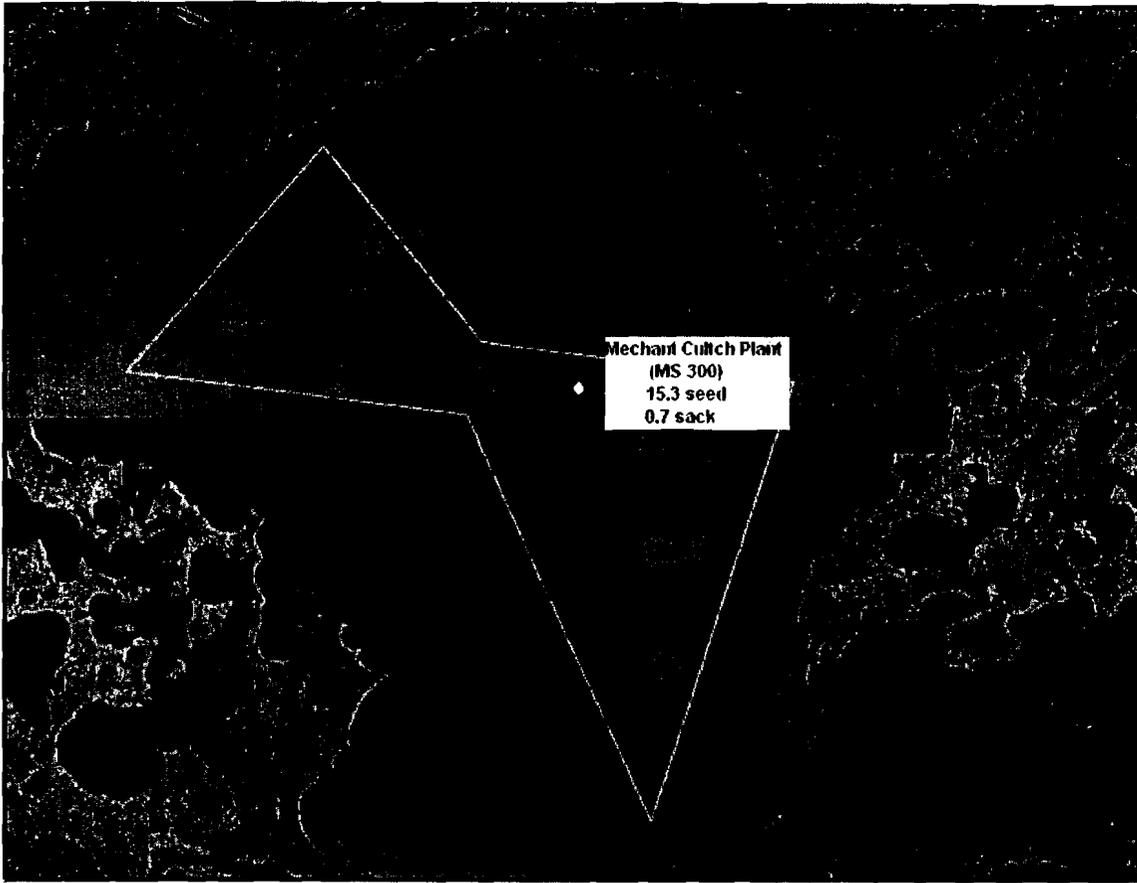
Stn. #	Stn. Name	North Lat.	West Long.	Depth
200	Grand Pass	29°15'28.5"	90°55'45.5"	10'
202	Walkers Pt.	29°14'50.9"	90°56'16.9"	6'
203	Old Camp	29°12'58.2"	90°56'40.2"	4'
207	Mid Sister Lake	29°14'00.1"	90°55'14.7"	6'
213	N '94 Shell Plant	29°15'02.9"	90°55'30.9"	6'
214	Mid '94 Shell Plant	29°14'16.5"	90°55'33.8"	6'
215	S '94 Shell Plant	29°13'14.1"	90°53'53.6"	5'
216	N '95 Shell Plant	29°15'25.1"	90°56'10.1"	5'
217	Camp '95 Shell Plant	29°14'21.8"	90°54'18.3"	5'
218	2004 Culch Plant	29°13'24.6"	90°54'54.3"	5'

Figure 5.1 Map of the Sister Lake Public Oyster Seed Reservation showing the location of the 2008 meter square sample stations(average # of seed and sack oysters at each station).



Stn. #	Stn. Name	North Lat.	West Long.	Depth
251	Buckskin Bayou	29°15'56.1"	91°01'45.1"	6'
252	Rat Bayou	29°13'06.6"	91°02'52.6"	3'
253	Mid Bay Junop	29°14'43.7"	91°03'08.6"	5'
255	Bayou deWest	29°12'38.4"	91°03'18.2"	4'

**Figure 5.2** Map of the Bay Junop Public Oyster Seed Reservation showing the location of the 2008 meter square sample stations (average # of seed and sack oysters at each station).



**Figure 5.3** Map of the Lake Mechant Public Oyster Seed Ground showing the location of the 2008 meter square sample station (average # of seed and sack oysters at each station).

**Table 5.1** 2008 oyster availability at sample stations within Sister Lake

METER <sup>2</sup> STATION	HISTORICAL REEF ACREAGE	ADJUSTED REEF ACREAGE****	#METER <sup>2</sup>	#SEED OYSTERS	#SACK OYSTERS	BARRELS SEED OYSTERS	BARRELS SACK OYSTERS
200	221.58	322	1,304,748.35	14	6	25,370.11	21,745.81
202	81.93	119	482,435.38	6.5	0.5	4,355.32	670.05
203	151.31	220	890,971.53	3	2.5	3,712.38	6,187.30
207	185.72	270	1,093,590.86	0	1	0	3,037.75
213*	96	140	565,284.96	2.5	6.5	1,962.80	10,206.53
214*	129	188	759,601.67	0	0.5	0	1,055.00
215*	81	118	476,959.19	0	0	0	0
216**	115	167	677,164.28	5	3	4,702.53	5,643.04
217**	438	637	2,579,112.63	0.5	0	1,791.05	0
218***	67	97	394,521.80	0.5	1	273.97	1,095.89
<b>TOTAL</b>		<b>2,279.32</b>	<b>9,224,390.64</b>	<b>32</b>	<b>24</b>	<b>42,168.16</b>	<b>49,641.38</b>

\* 1994 Shell Plants

\*\* 1995 Shell Plants

\*\*\*2004 Sister Lake Culch Plant newly added dredge/meter square site for 2007

\*\*\*\*2005 Side Scan Sonar Survey conducted in May 2005 measured Sister Lake reef acreage to be 2,279 acres. This is an increase of 45.5% over prior years' estimates. Beginning in 2007, individual site acreage has been adjusted accordingly to reflect this increase.

**Table 5.2** 2008 oyster availability at sample stations within Bay Junop

METER <sup>2</sup> STATION	REEF ACREAGE	#METER <sup>2</sup>	#SEED OYSTERS	#SACK OYSTERS	BARRELS SEED OYSTERS	BARRELS SACK OYSTERS
251	17.20	69,608.40	16	8	1,546.85	1,546.85
252*	67.36	272,605.92	1.5	0	567.93	0
253	73.26	296,483.22	0	1	0	823.56
<b>TOTAL</b>	<b>157.82</b>	<b>638,697.50</b>	<b>17.5</b>	<b>9</b>	<b>2,114.78</b>	<b>2,370.42</b>

\* Stations 252 and 255 are combined

**Table 5.3** 2008 oyster availability at sample stations within Lake Mechant

METER <sup>2</sup> STATION	REEF ACREAGE	#METER <sup>2</sup>	#SEED OYSTERS	#SACK OYSTERS	BARRELS SEED OYSTERS	BARRELS SACK OYSTERS
300	30	121,410.00	15.3	0.67	2,579.96	225.96

**Table 5.4 CSA 5 Historic meter square Seed to Sack Ratios**

Year	Sister Lake	Bay Junop	Lake Mechant
1980	4.1-1.0	0.8-1.0	
1981	1.0-1.0	1.5-1.0	
1982	0.8-1.0	0.3-1.0	
1983	0.3-1.0	0.6-1.0	
1984	1.4-1.0	----	
1985	0.8-1.0	3.0-1.0	
1986	1.5-1.0	1.1-1.0	
1987	9.2-1.0	0.5-1.0	
1988	0.7-1.0	2.8-1.0	
1989	0.4-1.0	0.9-1.0	
1990	3.0-1.0	1.3-1.0	
1991	3.0-1.0	0.8-1.0	
1992	0.8-1.0	1.5-1.0	
1993	2.2-1.0	1.6-1.0	
1994	7.1-1.0	0.7-1.0	
1995	0.6-1.0	0.6-1.0	
1996	1.5-1.0	0.5-1.0	
1997	1.0-1.0	0.6-1.0	
1998	0.9-1.0	0.6-1.0	
1999	1.5-1.0	2.2-1.0	
2000	3.2-1.0	0.6-1.0	
2001	0.9-1.0	0.9-1.0	
2002	0.6-1.0	0.7-1.0	
2003	0.9-1.0	0.3-1.0	
2004	2.4-1.0	0.5-1.0	
2005	1.3-1.0	2.8-1.0	n/a
2006	2.5-1.0	1.1-1.0	16.5:1
2007	0.7-1.0	1.5-1.0	21.3:1
2008	0.9-1.0	0.9-1.0	11.5:1
Average ratios (1980-2008)	1.9-1.0	1.1-1.0	16.4-1.0

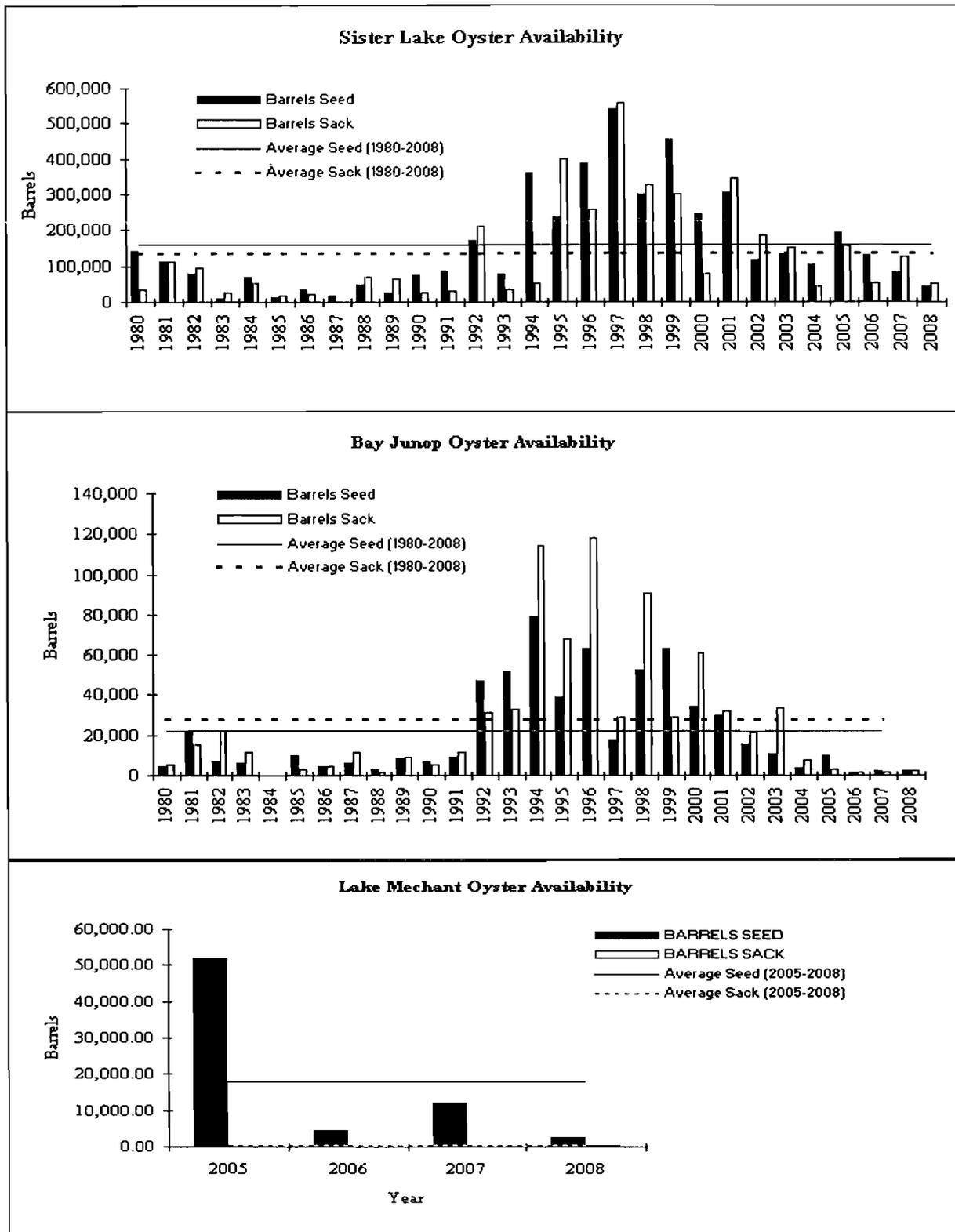
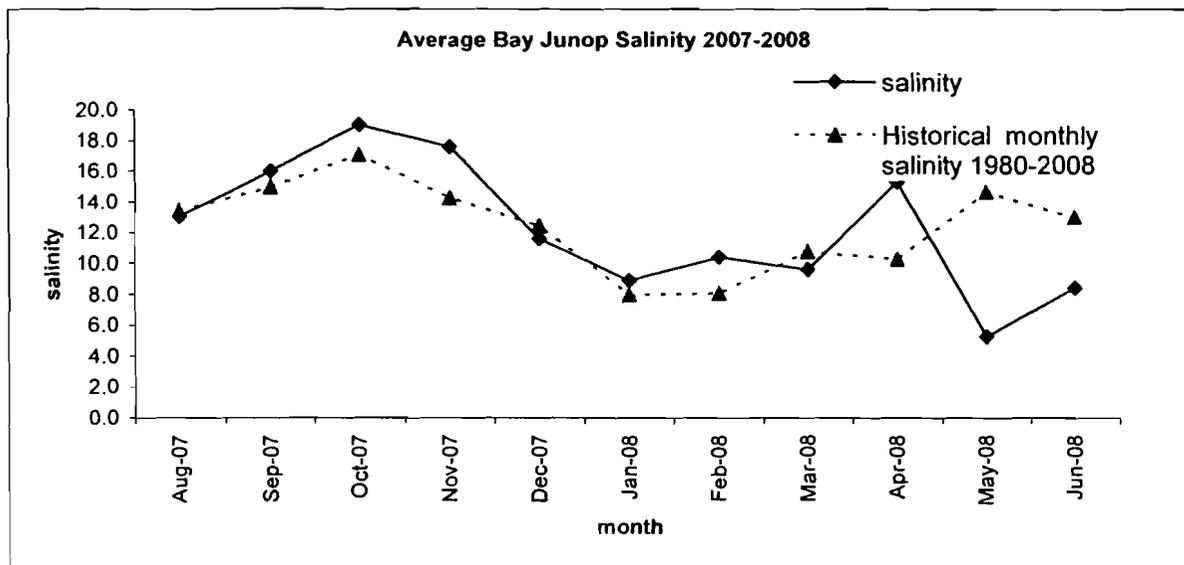
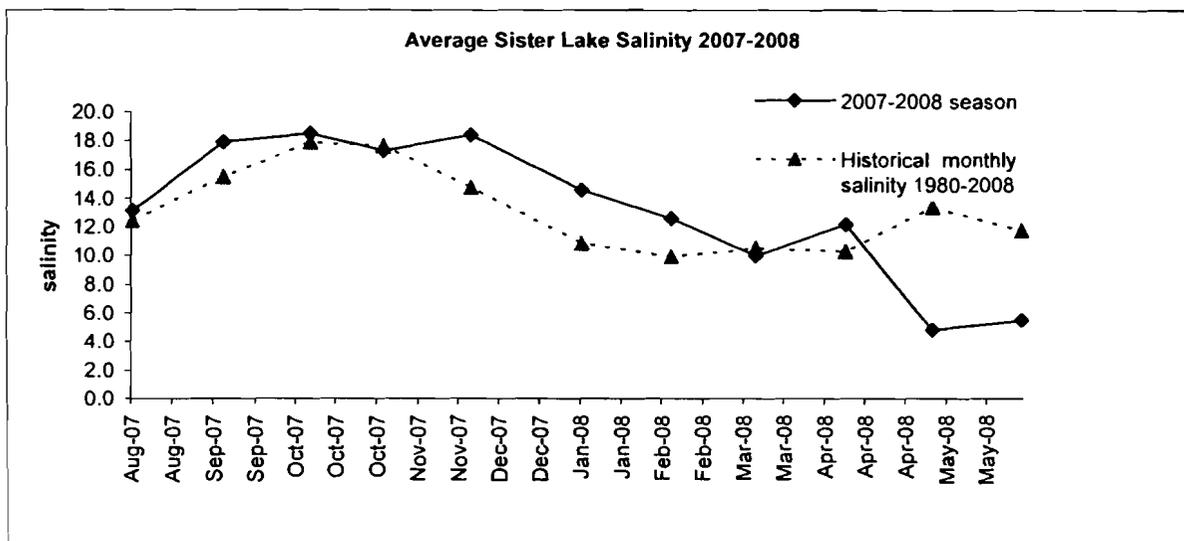
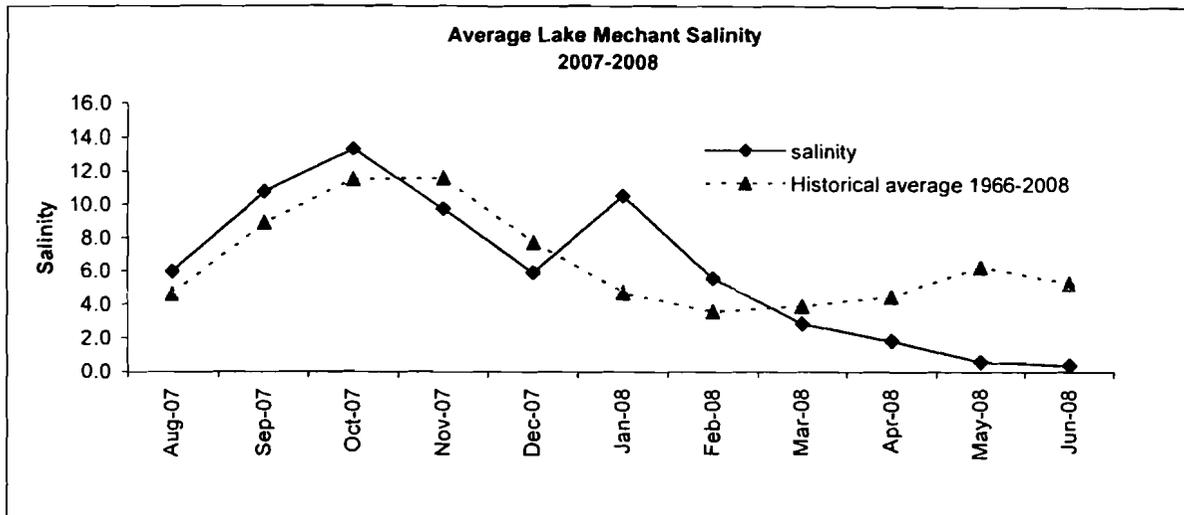


Figure 5.4 CSA 5 Historic Oyster Availability Estimates



\*Salinity averages calculated from fisheries independent finfish, shellfish and oyster samples taken in respective lakes.

**Figure 5.5** 2007-2008 CSA5 average salinities in Lake Mechant, Bay Junop, and Sister Lake.

**Table 5.5** Sister Lake, Bay Junop, and Lake Mechant historic May/June average water temperature (°C)

YEAR	SISTER LAKE		BAY JUNOP		LAKE MECHANT	
	MAY	JUNE	MAY	JUNE	MAY	JUNE
1995	27.3	29.0	29.3	29.3		
1996	27.2	29.5	28.4	30.3		
1997	27.1	30.0	26.4	28.6		
1998	27.8	30.1	28.0	28.9		
1999	25.0	28.8	25.0	28.8		
2000	27.3	28.8	28.3	29.7		
*2001	24.9	29.3	26.0	30.1		
*2002	28.4	28.7	28.4	28.5	25.6	28.2
*2003	27.8	30.0	27.6	30.2	27.1	29.6
*2004	27.8	29.5	27.5	29.2	26.0	29.5
2005	26.5	30.1	26.2	30.2	25.8	29.2
2006	27.1	30.6	25.7	30.9	26.6	30.1
2007	25.9	29.3	25.9	29.0	29.0	29.3
2008	26.7	29.4	26.3	29.5	26.8	29.4
<b>mean</b>	<b>26.9</b>	<b>29.5</b>	<b>27.1</b>	<b>29.5</b>	<b>26.7</b>	<b>29.3</b>

\*OYSTER DREDGE SAMPLES

**Table 5.6** Sister Lake, Bay Junop, and Lake Mechant historic May/June average salinity (ppt)

YEAR	SISTER LAKE		BAY JUNOP		LAKE MECHANT	
	MAY	JUNE	MAY	JUNE	MAY	JUNE
1995	14.5	8.8	23.3	12.6		
1996	15.8	7.4	24.3	12.2		
1997	4.1	3.4	10.6	10.7		
1998	6.6	4.8	14.4	8.6		
1999	17.7	12.4	19.4	13.0		
2000	22.0	20.5	25.5	27.7		
*2001	17.6	8.2	18.4	9.8		
*2002	14.2	11.1	16.6	15.9	3.1	2.4
*2003	15.4	7.2	18.2	8.9	7.5	2.4
*2004	17.2	12.2	18.9	18.6	4.5	3.1
2005	15.3	17.0	16.9	20.0	2.1	7.2
2006	16.9	18.5	21.3	15.4	10.7	10.3
2007	20.5	18.2	21.8	18.2	12.5	10.4
2008	6.3	6.4	5.7	5.6	0.4	0.5
<b>mean</b>	<b>14.6</b>	<b>11.2</b>	<b>18.2</b>	<b>14.1</b>	<b>5.8</b>	<b>5.2</b>

\*OYSTER DREDGE SAMPLES

**Table 5.7** Historic oyster harvest (production) in Sister Lake (1944-2008)

Season	Boat Days	Seed (BBLs)	Sack (BBLs)	Total Production (BBLs)	Season Length (days)	Catch/Effort (BBLs)
1944 & 1945	--	--	--	108550 (two years)	--	0
1946 & 1947	--	--	--	217100 (two years)	--	0
1948	--	--	--	no data	--	0
1949	--	--	--	4884	--	0
1950	--	--	--	20677	--	0
1951	closed	--	--	--	--	0
1952	closed	--	--	--	--	0
1953	--	--	--	91588	190	0
1955 (tonging only)	no data	--	--	--	--	0
1956	--	--	--	20000	--	0
1957	--	--	--	11000	45	0
1958-1959	4500 (tonging only) 15000 (tong & dredge)				131	0
1959-1960	closed	--	--	--	--	0
1960-1961	--	--	--	90000	--	0
1961-1962	closed	--	--	--	--	0
1962-1963	--	--	--	50000	292	0
1963-1964	closed	--	--	--	--	0
1964-1965	--	44623	4365	48988	292	0
1965-1966	closed	--	--	--	--	0
1966-1967	--	120614	9848	130462	292	0
1967-1971	no data	--	--	--	--	0
1971-1972	953	36082	16414	52496	260	1.8
1974-1975	204	35683	862	36545	258	0.6
1976-1977	1268	45101	20028	65129	254	1.9
1978-1979	1191	33649	21218	54867	116	2.2
1980-1981	1031	38067	11517	49584	210	2.1
10/12-10/31/81	365	21780	4404	26184	19	1.4
1982-1983	1838	45965	44092	90057	67	2.0
1984-1985	1552	53911	15292	69203	181	2.2
1986-1987	1644	58095	13079	71174	102	2.3
1988-1989	661	26371	7152	33523	197	2.0
1990	780	30427	6751	37178	9	2.1
1992-1993	1203	11215	14873	26088	204	4.6
1993-1994	448	6901	4203	11104	115	4.0
1995-1996	2173	51160	48824	99984	236	2.2
1996-1997	1854	20055	40019	60074	149	3.1
1997-1998	2341	31668	43727	75395	208	3.1
10/5/98-10/12/98	767	15228	16510	31738	12	2.4
1999-2000	3153	29934	47586	77520	255	4.1
2001-2002	1428	18183	34060	52243	196	2.7
2003-2004	1453	11840	51872	63712	30	2.3
2005-2006	2102	3900	61408	65308	42	3.2
2007-2008	1549	19450	40711	60161	27	2.6

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## Coastal Study Area (CSA) 6 – Oyster Stock Assessment

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### INTRODUCTION

Oyster reefs found in Vermilion/East and West Cote Blanche/Atchafalaya Public Oyster Seed Ground generally fall within the boundaries of Coastal Study Area 6 (CSA6). The inside oyster seed ground, promulgated by the Louisiana Wildlife and Fisheries Commission in 1990, consists of that portion of state water bottoms found in inside waters from the western shore of Vermilion Bay and Southwest Pass eastward to Point Au Fer. The outside area, designated in 1988, consists of Louisiana State Territorial Waters from the private oyster lease boundary near Mound Point/Marsh Island eastward to Point Au Fer. Since 1986 (prior to the official designation of these areas as seed grounds) LDWF has managed the oyster resources found on local state water bottoms in a manner similar to present seed ground protocols. This allowed limited harvest/relays from the Vermilion Bay area when hydrological conditions and oyster abundance and distribution permitted.

An overall Vermilion Bay area stock assessment is not possible at this time, as figures relative to oyster reef sizes are not available. However, data collected from this year's sampling program will be compared to previous years, with a look at hydrologic conditions, marine fouling, and oyster predators on sampled reefs. The effects of extended high Atchafalaya River levels during the period of February through July of 2008 will be addressed. In addition, information regarding the 2007/2008 oyster season harvest estimates on the Vermilion Bay area seed grounds will be presented.

### MATERIALS & METHODS

Square meter field sampling at historically-designated sites on the inside and outside areas of the Vermilion, East and West Cote Blanche and Atchafalaya Bays Public Oyster Seed Ground was completed on July 3, 2008. A total of 5 (five) stations (Figure 6.1) were sampled with two replicate samples collected at each station. Upon reaching the designated site the square meter frame was randomly thrown onto the oyster reef. A SCUBA diver removed all oysters, associated macroscopic organisms, and loose surface shell within the frame. All live oysters and shells from recently dead oysters greater than 25 mm were counted, measured in 5 mm intervals, then classified as spat (<25 mm), seed (25 mm to < 75mm), or sack oysters (>75mm). Shells from dead oysters were defined as "box" (both valves attached) or "valve" (one valve). Oyster size was determined by measuring the "straight-line" distance from the hinge to the apex of the shell. Live predators and fouling organisms were counted. Cultch type and reef condition were noted.

### RESULTS & DISCUSSION

*Spat, seed, and sack oysters:* No live spat were present in any of the square meter samples, in spite of the presence of suitable substrate at all sites. One seed oyster was taken in sample replicates at three of the five sample sites. No sack size oysters were found during the 2008 assessment (Figure 6.1). Low production years associated with extended periods of high

Atchafalaya River output are not uncommon on the seed grounds of this bay system. Near 100% mortality on the grounds was noted as recently as 2003 and 2004 (Table 6.1).

*Fouling organisms:* The hooked mussel, *Ischadium recurvum*, was present at all 5 sample stations, but in very low numbers compared to previous years (Table 6.2). These low numbers were unexpected as low salinity conditions are usually conducive to mussel productivity. Barnacle (*Balanus spp.*) fouling at the Big Charles station was especially dense.

*Oyster predators:* The southern oyster drill, *Stramonita haemastoma*, was not collected at any station, probably due to the extremely low salinity conditions found on the seed grounds. Several mud crabs (*Xanthidae*, et al.) were found at the Bayou Blanc and Big Charles sample sites, but these organisms were not identified to species and several “mud crabs” are not known oyster predators. There were no blue crabs (*Callinectes sapidus*), or gulf toadfish, (*Opsanus beta*) collected. Live oysters were not present in sufficient numbers for analysis of distribution/abundance of the “dermo” parasite *Perkinsus marinus*.

*Mortality:* The Vermilion/Cote Blanche/Atchafalaya Bays Complex is a large, primarily open-water brackish system with the area seed grounds consisting of approximately 541,787 water bottom acres. Primary influences on the bays highly dynamic salinity regime are the Gulf of Mexico, Atchafalaya River and the adjacent Wax Lake Outlet, and the Vermilion River. The oyster resource found in the area is highly vulnerable to low salinity/high turbidity conditions often seen as a result of extended freshwater conditions associated with high river discharge. Independent of local rainfall, rising water levels at the Butte La Rose gauge can generally be tied to falling salinity levels in the Vermilion Bays complex. This correlation was documented for the fall/winter of 2007 and spring/early summer of 2008 (Figure 6.2), with its effects on local oysters noted in this year’s assessment.

Dredge samples taken in August 2007 following last year’s assessment found oysters healthy, with seed and sack size oysters relatively abundant. Atchafalaya River levels were below five feet at the Butte La Rose gauge and salinities throughout CSA6 were conducive to oyster productivity. No mortality was noted through the end of the 2007 sampling period. January 1, 2008 saw the Atchafalaya River at 10.3 feet, a level which has historically caused salinity readings to decline in the Atchafalaya/Cote Blanche/Vermilion Bays Complex. The river rose to 14.8 feet on March 1 and crested at 20.0 feet on April 23, 2008, driving salinity levels below 2 ppt (parts per thousand) throughout the system. No mortality was noted at this time, probably due to relatively low water temperatures. The first sign of significant mortality was seen in mid May, with recently dead seed and sack oysters reaching 18% at Bayou Blanc on the eastern shore of Marsh Island. Salinity levels were below 1 ppt and water temperature had reached 30° C in the affected area. By the first week in June, the mortality event had expanded to the outside area at South Point and later to the inside reefs north of Southwest Pass. By the end of June, 2008, mortality was virtually 100% at all sample sites. The July 2008 square meter assessment found that salinity ranged from 0.3 ppt at South Pt to 1.8 ppt at Big Charles while water temperature averaged 29.2 C across all sampled stations.

*Tropical & Climatic events:* There have been no tropical events that directly affected the Vermilion Area seed grounds since the 2007 assessment. However, high Atchafalaya River levels and associated freshwater conditions since February 2008 have had dramatic effects that produced near 100% mortality on sampled seed ground reefs.

#### 2007/2008 OYSTER SEASON SUMMARY

*Methods:* Roving clerk surveys on portions of the seed grounds with “OPEN” designation under DHH’s classification system and areas under DHH relay permit are made to obtain fishery dependent data. Fishermen working the seed ground are surveyed and asked to provide estimates of past and current catch rates as well as an estimate of future fishing effort. These data are summarized weekly to maintain a cumulative estimate of harvest for specific reef complexes.

*Results & Discussion:* Total harvest estimates for the Vermilion area public grounds (both the inside and outside portions) were 4,393 sacks of market oysters and 45,121 barrels of seed (Table 6.3). This represents a 75% decrease in sacks and a 25% decline in barrels of seed oysters from last years numbers. Harvest was probably depressed due to the low salinity conditions prevalent beginning in February 2008. Marketability of oysters from these low salinity areas suffered (oysters were fresh and in some cases barnacle encrusted) while lease holders were wary of transplanting resource that was low-salinity stressed.

#### Inside seed ground/sacking

Reefs within the Southwest Pass area, designated “OPEN” by DHH during the entire season, had an estimated 1494 sacks harvested. The reef area north of Southwest Pass in Vermilion Bay was under “OPEN” classification only during March 2008, with an estimated 1902 sacks harvested. This brought the season total for the inshore portion of the seed ground to an estimated 3396 sacks.

#### Inside seed ground/bedding

An estimated 1500 barrels was harvested for bedding purposes from Southwest Pass for the 2007/2008 season. The area of reefs north of Southwest Pass in Vermilion Bay were classified “OPEN” for the short period of March 1 through April 1, 2008. During this time, an estimated 11,926 barrels were harvested to bring the inshore seed ground bedding total to 13,426 barrels.

#### Outside seed ground/sacking

A small portion of the offshore portion of the seed ground fell under “OPEN” classification during the entire season. This area between South Point and the private lease boundary near Mound Pt./Marsh Island saw an estimated harvest of 997 sacks, with effort concentrated during the 2 weeks prior to Christmas 2007. It should also be noted that a small area of reef east of Mound Pt. was under “CLOSED” classification during March 2008.

#### Outside seed ground/bedding

The area from the lease line at Mound Pt./Marsh Island east to South Pt. and south to the Territorial Seas line was under “OPEN” classification throughout the entire 2007/2008 season (with the exception of a small area of reef east of Mound Pt. that closed during March 2008). An

estimated 5710 barrels was harvested for bedding purposes from this “OPEN” area during the season.

The offshore portion from South Pt. to Point Au Fer remained “CLOSED” throughout the 2007/20808 season. However, a DHH permitted relay during the period December 1 – 14, 2007 saw an estimated 25,985 barrels harvested. This brought the total estimated offshore bedding harvest to 31,695 barrels.

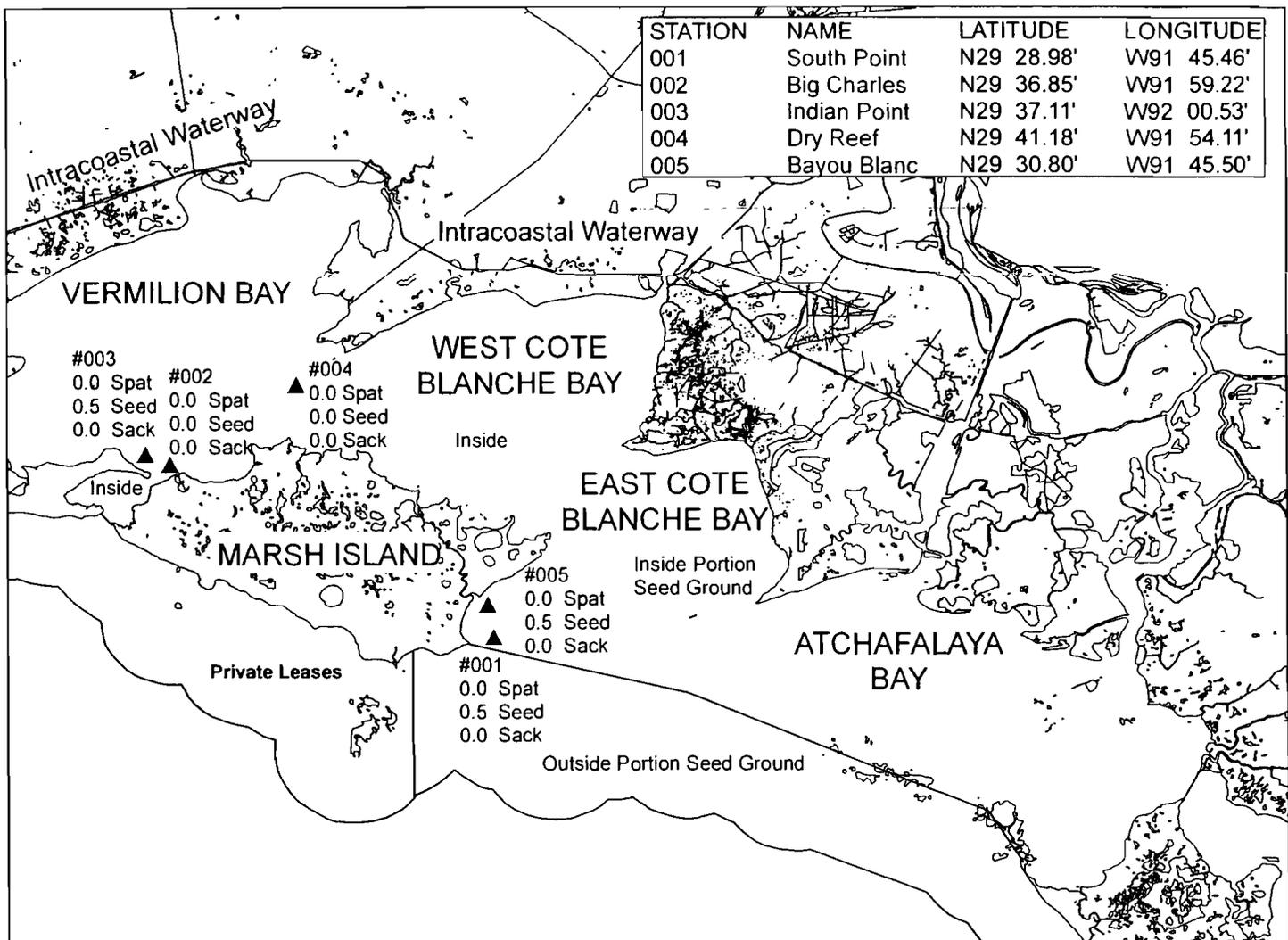


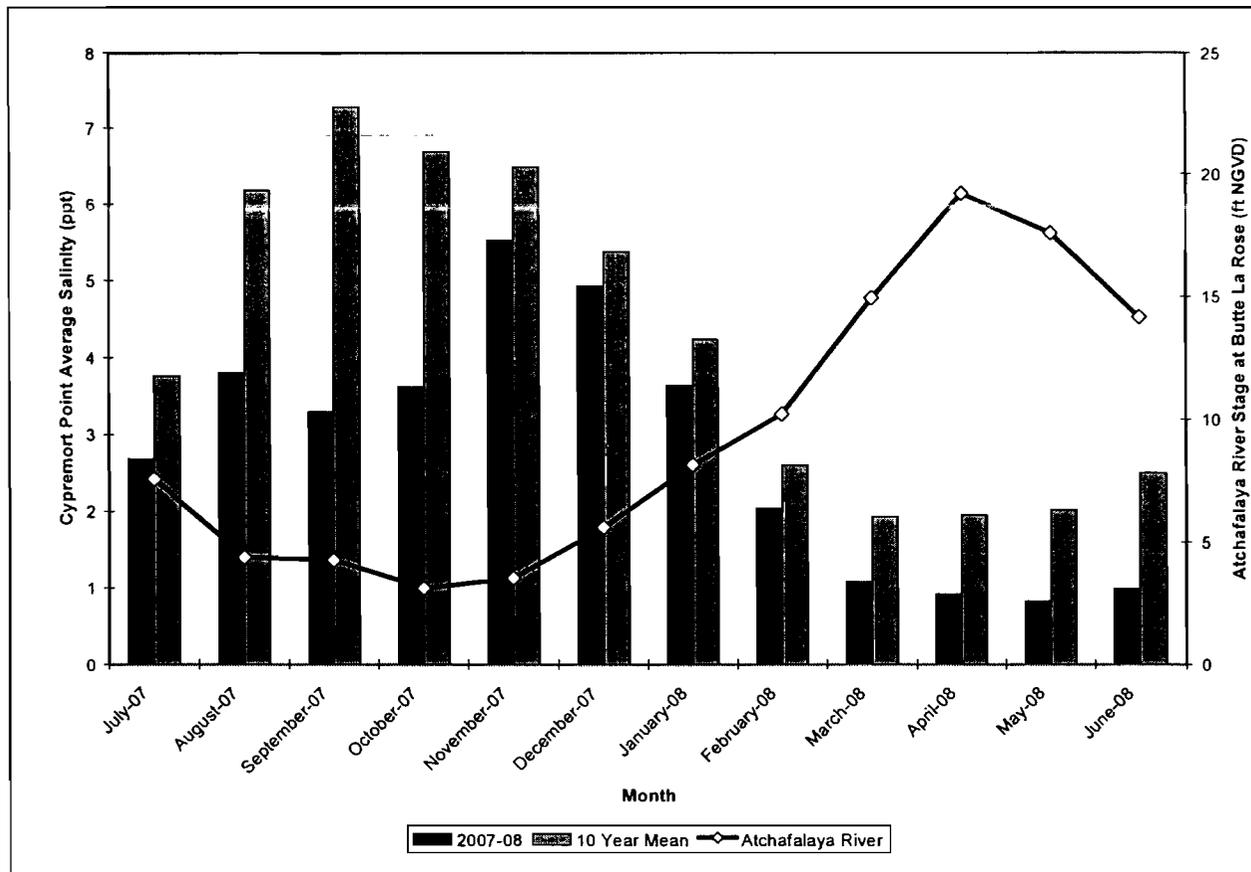
Figure 6.1. Map designating CSA 6 2008 oyster stock assessment stations on the Vermilion, East and West Cote Blanche and Atchafalaya Bays public oyster seed ground. Data below station numbers represent average spat, seed and sack oysters per square meter sample.

**Table 6.1** Mean density of live oysters collected in CSA6 square meter samples (by year)

Year	mean density seed/sample	mean density sack/sample	seed/sack ratio
1998	2.70	0	No Sack Oysters
1999	5.50	0.20	27.5:1
2000	81.40	3.30	24.7:1
2001	28.80	4.80	6.0:1
2002	2.25	0.25	9.0:1
2003	1.20	0	No Sack Oysters
2004	4.30	0	No Sack Oysters
2005	14.80	0	No Sack Oysters
2006	16.10	0.5	32.2:1
2007	11.60	0.8	14.5:1
2008	0.30	0.0	No Sack Oysters

**Table 6.2** Mean density of the hooked mussel, *Ishadium recurvum*, recorded at each CSA6 square meter station (by year)

station no.	station name	2004	2005	2006	2007	2008
001	South Pt./Marsh Island	34	28	16	26.0	1.0
002	Big Charles	45	12.5	17	16.0	2.5
003	Indian Point	92	43	9	33.5	0.5
004	Dry Reef	23	8.5	0	0	2.0
005	Bayou Blanc	33	9.5	7	18.5	2.5



**Figure 6.2** Graph depicting monthly Atchafalaya River levels at Butte La Rose gauge and monthly average salinity for Cypremort Point, LA during the period from August 2007 through June 2008.

**Table 6.3** Harvest estimate for 2007/2008 season – Vermilion Area Seed Grounds (CSA6)

area	market (sacks)	seed (barrels)
Southwest Pass	1,494	1,500
Indian Pt./Box Car Reef (Vermilion Bay)	1,902	11,926
Mound Pt./Marsh Island	997	5,710
South Pt./Marsh Island	0	25,985
Total	4,393	45,121

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## **Coast Study Area (CSA) 7 – Oyster Stock Assessment**

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### INTRODUCTION

Louisiana Department of Wildlife and Fisheries' Coastal Study Area 7 is located in Southwest Louisiana, from the Louisiana/Texas state line to Freshwater Bayou in Vermilion Parish. It is comprised of Calcasieu and Mermentau River basins and the eastern portion of the Sabine River Basin.

Calcasieu Lake is located at the southern end of the basin in Calcasieu and Cameron parishes. It consists of approximately 58,260 water bottom acres with healthy oyster reefs located throughout the lake, especially in the southern end.

Oyster seasons occurred prior to 1967, but were closed from 1967-1975. Oyster harvesting resumed in 1975 with only taking by hand or tongs allowed. In 2004, legislation was passed allowing for the use of hand oyster dredges of three feet wide or less in Calcasieu Lake.

For assessment purposes, Calcasieu Lake has always been split into two areas – Eastside and Westcove (the Calcasieu Ship Channel being the dividing line). In 1992, Louisiana Department of Health and Hospitals (LDHH) also split the lake into two separately managed areas – Calcasieu Lake Conditional Managed Area (CLCMA) and West Cove Conditional Managed Area (WCCMA), (Figures 7.1 and 7.2). When this change occurred the two areas were also managed for health related closures based on the river stage of the Calcasieu River at Kinder, LA. CLCMA would close when the river stage reached to 12 feet and the WCCMA would close when the river stage reached 7 feet. Once the river fell below these levels for 48 hours the LDHH would reopen the areas for harvest. LDHH changed the CLCMA river stage threshold in 1998 to 13.5 feet. In 2004 LDHH changed CLCMA to Growing Area (GA) 29 and WCCMA to GA 30.

LDHH also limited the amount of acreage available to oyster harvest on the Eastside due to water quality standards. Oysters can only be harvested in the southern portion of the area where water quality meets minimum standards. The total area has been changed several times over the years with the current acreage being approximately 14,743 water bottom acres. WCCMA has remained the same at approximately 9,248 acres.

Historical reef acreage for all of Calcasieu Lake is 1,690.95. West Cove consists of 726.98 acres and the Eastside consists of 963.97 acres. The reef acreage on the Eastside is made up of reefs that fall both within and outside of the conditional managed area. Therefore, assessments of current stock sizes are based on total reef acreage within the lake and not just that portion of reef acreage that lies within areas accessible to commercial fishing.

There have been five cultch plants placed in Calcasieu Lake in the last year and a half. Cheniere Energy placed four totaling approximately 16 acres and Coastal Conservation Association (CCA) placed one of approximately one acre. The cultch plants were placed to cultivate oysters and to attract

fish. Three of the Cheniere cultch plants were placed very close to each other in the Southeastern portion of GA 30. These cultch plants totaled approximately 10 acres. The other Cheniere cultch plant was placed in the center of Calcasieu Lake off Commissary Point and was approximately 6 acres. The CCA cultch plant was placed in the Northern part of Calcasieu Lake on the south side of Turner's Bay Island.

## METHODS

The oyster assessment for Calcasieu Lake was derived by taking "meter square" samples on July 8, 2008. The frame is randomly tossed in the very near vicinity of the sample station located on a known oyster reef. There are two replicate samples taken by a SCUBA diver at each station and there are three stations each in each portion of Calcasieu Lake (Figures 7.1 and 7.2). The diver removes all live and dead oysters and shell on the top portion of the reef substrate. Any live and recent dead oysters are measured in five millimeter (mm) groups and divided into three categories – spat (<25mm), seed oysters (25mm – 74mm) and sack oysters (75mm and larger). Oyster predators and Hooked mussels (*Ishchadium recurvum*) that were collected are identified and tallied. As no bedding (seeding) operations occur in Calcasieu Lake and all harvest is for direct market, the results of data collected are reported in sacks rather than barrels (two sacks equals one barrel).

## RESULTS

### Eastside

The oyster assessment for the Eastside indicates 752,062 sacks of sack oysters and 449,720 sacks of seed oysters available. Sack oysters showed a considerable increase over the 2007 assessment of 548,333 sacks. The availability of seed oysters dropped slightly from the 2007 assessment of 598,182 sacks to 449,720 sacks (Table 7.1 and 7.6). The increase in the sack oysters offset the decline in seed oysters for an overall increase in oyster by 4.8% over the short term average (Table 7.2).

### West Cove

The oyster assessment for West Cove indicates 142,200 sacks of sack oysters and 212,483 sacks of seed oysters available. Sack oysters showed an increase over the 2007 assessment of 114,414 sacks. The availability of seed oysters dropped from the 2007 assessment of 337,567 sacks to 212,483 sacks (Table 7.1 and 7.6). Though there was an increase in sack oysters from the 2007 assessment both the sack and seed oysters remains below the short term average by 13.0% (Table 7.2).

## DISCUSSION

### Sack Oysters

The overall assessment is up slightly from the short term average, the increase in the Eastside sack oysters of 23.8% offset the below average of 32.3% sack oysters in West Cove (see Table 7.2). Even with the below average assessment of the West Cove sack oysters the population continues to be healthy. If the harvest levels continue as they have in the short term there should be no detriment to the population.

Harvest levels continue to be low in comparison to the oysters that are available (Figure 7.4). This is in part because a portion of the reef acreage on the Eastside is not in the LDHH conditional managed area and that West Cove harvest pressure is low and is very susceptible to rainfall with the low closure level of 7.0 feet at Kinder.

#### Seed Oysters

The gains in seed oysters of 7.6% in West Cove wasn't enough to offset the below average of 16.7% of Eastside seed oysters (Table 7.2). Though there was a decrease in the overall assessment of seed oysters, the population continues to be healthy and should provide good levels of recruitment during the coming year.

#### Hydrology

Average water temperatures for May and June were 24.8°C and 29.6°C respectively and averaged above the average of the long term average (LTA), with the maximum deviation of 4.8°C (Table 7.4). The average water temperature during the oyster assessment was 30.6°C which is also above the LTA.

Average salinities (in parts per thousand - ppt) for May and June were 10.2ppt and 9.7ppt respectively; this is below the LTA with a maximum deviation of 1.2ppt (Table 7.4). The average salinity during the oyster assessment was 15.9ppt which is above the LTA.

#### Disease, Fouling Organisms, and Predators

Oysters from Station 2 and Station 5 were delivered to Dr. Tom Soniat at Nicholls State University to sample for *Perkinsus marinus* ("DERMO"). The results are available in a separate section of the statewide stock assessment report.

Even though Hooked mussel numbers were higher than the two previous years, they still remain low for this year averaging 68.1 per station. There was an average in 2007 and 2006 of 35.2 and 10.3 respectively. The continued low numbers of Hooked mussels this year and the past few years may be attributed to dredging; Station 3 had the highest amount of Hooked mussels, but appeared to have had very little dredging as it had high numbers of oysters.

There were no Oyster drills (*Stramonita haemastoma*) present in the meter square samples. There was a total of 63 unidentified mud crabs found in the samples. No other species of concern were found.

#### 2007-08 OYSTER SEASON

This was the third attempt in as many years at opening West Cove earlier than the Eastside. This year the season in West Cove did not close because of river levels as it did last year; most fishermen continued shrimping until the Eastside opened in November (Tables 7.5 and 7.7). This was attempted in order to get more oyster fishermen to utilize the resource in West Cove.

This was also the second year that mechanical retrieval systems were allowed to assist with dredging.

This was one of the best seasons relating to closures as the Eastside was open 91% of the available days and West Cove was open 66% of the available days (Table 7.5). It also showed in the landings, as

preliminary trip-ticket data shows landings were up from the 28,341 sacks landed in 2006-07 season to the 49,529 sacks were harvested from Calcasieu Lake during the 2007-08 season (Table 7.6).



Figure 7.1 – Map indicating Growing Area 29 boundary and Meter Square Station locations.



Figure 7.2 – Map indicating Growing Area 30 boundary and Meter Square Station locations.

Table 7.1 – Calcasieu Lake 2008 Oyster Stock Assessment

CALCASIEU LAKE OYSTER STOCK ASSESSMENT									
JULY 2008									
OYSTER NUMBERS									
CALCASIEU LAKE EASTSIDE					WEST COVE				
SIZE	STATION			AVE.	SIZE	STATION			AVE.
	1	2	3			4	5	6	
≥3"	7	88	113	34.7	≥3"	26	8	18	8.7
1-<3"	29	134	86	41.5	1-<3"	54	77	25	26.0
OYSTER PRODUCTION AREA									
CALCASIEU LAKE EASTSIDE					WEST COVE				
3,901,185.57 SQ. METERS					2,942,076.67 SQ. METERS				
PRODUCTION OF ≥3" OYSTERS									
CALCASIEU LAKE EASTSIDE					WEST COVE				
OYSTERS:	135,371,139.279				OYSTERS:	25,595,988.729			
SACKS:	752,061.9				SACKS:	142,199.9			
TOTAL SACKS OF ≥3" OYSTERS:					894,261.8				
PRODUCTION OF 1 - < 3" OYSTERS									
CALCASIEU LAKE EASTSIDE					WEST COVE				
OYSTERS:	161,899,201.155				OYSTERS:	76,493,993.420			
SACKS:	449,720.0				SACKS:	212,483.3			
TOTAL SACKS OF 1-<3" OYSTERS:					662,203.3				
TOTAL PRODUCTION									
TOTAL OVERALL POTENTIAL OF OYSTERS (SACKS):					1,556,465.1				

Table 7.2 – Calcasieu Short Term Assessments and Percentage Change

ASSESSMENTS BY CONDITIONAL MANAGED AREA						
YEAR	SACK OYSTERS (≥ 3")			SEED OYSTERS (< 3")		
	EASTSIDE	WESTCOVE	TOTAL	EASTSIDE	WESTCOVE	TOTAL
2003	786,739.1	383,257.5	1,169,996.6	393,369.5	137,296.9	530,666.4
2004	927,615.2	171,621.1	1,099,236.3	1,102,084.9	267,238.6	1,369,323.5
2005	632,859.0	282,766.3	915,625.3	446,469.0	179,793.6	626,267.6
2006	140,876.1	98,069.2	238,945.3	159,298.4	65,379.5	224,677.9
2007	548,333.3	114,414.1	662,747.4	598,181.8	337,566.5	975,748.3
<b>AVERAGE</b>	<b>607,284.5</b>	<b>210,025.6</b>	<b>817,310.2</b>	<b>539,880.7</b>	<b>197,455.0</b>	<b>745,336.7</b>
2008	752,061.9	142,199.9	894,261.8	449,720.0	212,483.3	662,203.3
% CHANGE FROM AVE.	+23.8	-32.3	+9.4	-16.7	+7.6	-11.2

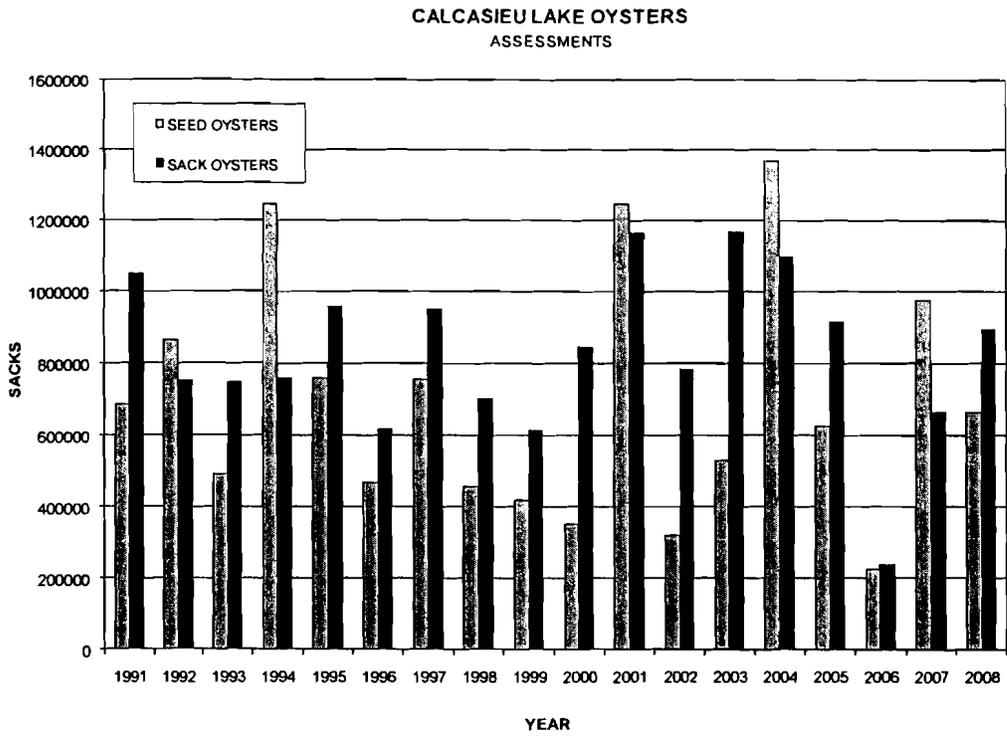


Figure 7.3 – Calcasieu Lake Available Seed and Sack Oysters

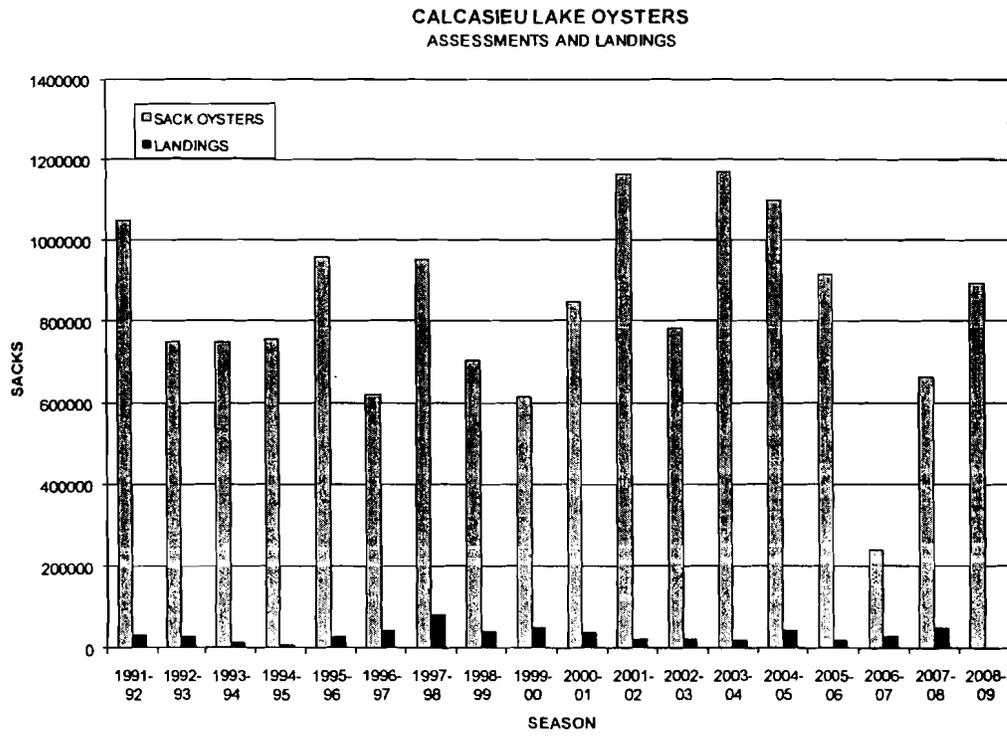


Figure 7.4 – Calcasieu Lake Available Oysters and Landings

Table 7.4 – Calcasieu Lake Salinity and Temperature

CALCASIEU LAKE HYDROLOGY						
	2008		LONG TERM		2008 OY. ASSESSMENT	
MONTH	AV. SAL.	AV. TEMP	AV. SAL.	AV. TEMP.	AV. SAL.	AV. TEMP.
MAY	10.2	24.8	10.5	25.5		
JUNE	9.7	29.6	10.9	28.3		
JULY					15.9	30.6

Table 7.5 – Calcasieu Lake Percent of Season Days Open

SEASON	TOTAL DAYS	LOWER CALCASIEU LAKE CMA		WEST COVE CMA OPEN	
		OPEN DAYS	PERCENTAG	OPEN DAYS	PERCENTAG
1991-92	199	114	57	114	57
1992-93*	165	137	83	76	46
1993-94	181	146	81	84	46
1994-95	181	90	50	9	5
1995-96	188	175	93	115	61
1996-97	197	149	76	114	58
1997-98	197	139	71	96	49
1998-99	197	135	69	120	61
1999-00	197	197	100	182	92
2000-01	198	180	95	106	53
2001-02	198	158	80	61	31
2002-03	198	146	74	66	33
2003-04	199	172	87	126	63
2004-05	198	168	85	68	34
2005-06	LCLCMA	198	187	11	
	WCCMA	205		165	40
2006-07	LCLCMA	181	118	65	
	WCCMA	197		70	35
2007-08	LCLCMA	182	165	91	
	WCCMA	199		131	66

\* 92-93 SEASON STARTED USING CALCASIEU RIVER GAUGE AT KINDER FOR DHH CLOSURES.

Table 7.6 – Historical Stock Assessments and Landings (in sacks)

CALCASEIU LAKE STOCK ASSESSMENT AND HARVEST ESTIMATES			
SEASONS	STOCK ASSESSMENT		ESTIMATED SACKS HARVESTED
	MARKETABLE	TOTAL	
1963	-	-	210,160
1967-74	-	-	NO COMMERCIAL LANDINGS
1975-76	142,726	441,183	40,000
1976-77	694,420	869,475	100,000
1977-78	483,673	621,885	141,976
1978-79	-	-	75,000
1979-80	676,333	979,613	125,000
1980-81	355,664	705,117	150,000
1981-82	608,110	988,575	-
1982-83	-	-	50,000-75,000
1983-84	-	-	150,000
1984-85	125,407	644,788	-
1985-86	315,160	537,760	27,400
1986-87	589,940	1,217,959	200,000
1987-88	796,950	2,703,647	125,000
1988-89	463,331	1,036,580	50,000
1989-90	172,046	640,892	40,000
1990-91	408,961	1,268,962	50,000
1991-92	1,048,882	1,731,367	31,383 <sup>1</sup>
1992-93	749,915	1,612,736	27,328
1993-94	748,281	1,238,783	12,818
1994-95	756,525	1,246,480	6,134
1995-96	956,926	1,298,379	29,082
1996-97	618,767	1,083,866	43,441
1997-98	950,979	1,706,510	80,735
1998-99	702,371	1,160,115	39,202 <sup>2</sup>
1999-00	614,145	1,032,117	50,592 <sup>3</sup>
2000-01	846,176	1,197,311	35,881
2001-02	1,163,750	2,409,482	21,297
2002-03	781,676	1,100,257	21,386
2003-04	1,169,997	1,700,663	18,196
2004-05	1,099,236	2,468,560	44,293
2005-06 <sup>4</sup>	915,625	1,541,893	19,327
2006-07 <sup>5</sup>	238,945	463,623	28,341
2007-08	662,747	1,638,496	49,529
2008-09	894,262	1,556,465	

1 – STARED USING DEALER REPORTS FOR LANDINGS.

2 – THE 1999 PORTION OF THE LANDINGS WAS DERIVED FROM PRELIMINARY TRIP TICKET DATA.

3 – TRIP TICKET DATA WAS UNAVAILABLE, CALLED DEALERS FOR LANDINGS.

4 – HURRICAN RITE MADE LANDFALL ON 9/23/05 IN CAMERON PARISH, DELAYING SEASON OPENING, LIMITING THE NUMBER OF FISHERMEN AND BUYERS.

5 – A SEWAGE LINE BREAK IN BAYOU D'INDE CLOSED THE SEASON IN FOR THE ENTIRE MONTH OF APRIL, LIMITING THE LANDINGS.

Table 7.7 – Calcasieu Lake Oyster Season Dates

CALCASIEU LAKE OYSTER SEASONS

SEASON	REGULAR SEASON								EXTENDED SEASON								TOTAL DAYS IN SEASON
	DATES			DHH HEALTH CLOSURES					DATES			DHH HEALTH CLOSURES					
	OPEN DATE	CLOSE D DATE	TOTAL DAYS	CAL. L. CMA		WEST COVE CMA			OPEN DATE	CLOSE D DATE	TOTAL DAYS	CAL. L. CMA		WEST COVE CMA			
			DAYS OPEN	DAYS CLOSE D	DAYS OPEN	DAYS CLOSE D	DAYS OPEN	DAYS CLOSE D				DAYS OPEN	DAYS CLOSE D	DAYS OPEN	DAYS CLOSE D		
1989-90	11-15	3-15	121	79	42	79	42	3-16	4-30	46	40	6	40	6	165		
1990-91	11-15	3-1	147	95	52	95	52	3-30	4-20	34	20	0	0	0	181		
1991-92	10-15	3-1	139	69	70	69	70	3-2	4-30	60	45	15	15	15	199		
1992-93 <sup>1</sup>	10-15	3-1	138	123	15	76	62	3-8	4-3	27	14	13	13	27	165		
1993-94	11-1	3-1	121	94	27	61	60	3-2	4-30	60	52	8	8	7	181		
1994-95 <sup>2</sup>	11-1	3-1	121	69	52	9	112	3-2	4-30	60	21	39	39	60	181		
1995-96	10-16	3-1	138	125	13	80	58	3-2	3-31	30	30	0	0	0	-		
								4-11	4-30	20	20	0	0	15	188		
1996-97	10-16	5-1	197	149	48	83	114	-	-	-	-	-	-	-	197		
1997-98	10-16	4-30	197	139	58	101	96	-	-	-	-	-	-	-	197		
1998-99 <sup>3</sup>	10-16	4-30	197	135	62	77	120	-	-	-	-	-	-	-	197		
1999-00	10-16	4-30	197	197	0	182	15	-	-	-	-	-	-	-	197		
2000-01	10-15	4-30	198	180	18	106	92	-	-	-	-	-	-	-	198		
2001-02	10-15	4-30	198	158	40	61	137	-	-	-	-	-	-	-	198		
2002-03	10-15	4-30	198	146	52	66	132	-	-	-	-	-	-	-	198		
2003-04	10-15	4-30	199	172	27	126	73	-	-	-	-	-	-	-	199		
2004-05	10-15	4-30	198	168	30	68	130	-	-	-	-	-	-	-	198		
2005-06	LCLCMA	10-15	4-30	198	187	11		-	-	-	-	-	-	-	198		
	WCCMA	10-8	4-30	205			165	40	-	-	-	-	-	-	205		
2006-07	LCLCMA	11-1	4-30	181	118	63		-	-	-	-	-	-	-	181		
	WCCMA	10-16	4-30	197			70	127	-	-	-	-	-	-	197		
2007-08	LCLCMA	11-1	4-30	182	165	17		-	-	-	-	-	-	-	182		
	WCCMA	10-15	4-30	199			131	68	-	-	-	-	-	-	199		

- 1 - STARTING WITH THE 92-93 SEASON CALCASIEU LAKE WAS SPLIT INTO TWO UNITS: CAL. LAKE CMA (W/ RIVER STAGE CLOSURE @ 12 FT.) AND WEST COVE CMA (W/ RIVER STAGE CLOSURE @ 7 FT.).
- 2 - DHH CLOSED THE CAL. LAKE CMA (FROM 11/1-12/10/94) AND WEST COVE (FROM 11/1-1/28/95) WITH A PRECAUTIONARY (POSSIBLE LEAD CONTAMINATION) CLOSURE.
- 3 - DURING THIS SEASON THE RIVER LEVEL CRITERIA IN THE CAL. LAKE CMA CHANGED FROM 12 TO 13.5 FT.

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**Levels of the oyster parasite *Perkinsus marinus*  
from Louisiana oysters west of the Mississippi River:**

**Summer 2008**

by

Thomas M. Soniat, Ph.D.

18 July 2008

Among the most significant causes of oyster mortality is the parasite *Perkinsus marinus* (formerly *Dermocystidium marinum*), which is responsible for annual mortality rates that exceed 50% in most populations of adult eastern oysters, *Crassostrea virginica*. *Perkinsus marinus* was described in 1950 by John Mackin, Malcom Owen and Albert Collier as *Dermocystidium marinum* – hence the common name “Dermo” which is still in use (Mackin et al. 1950).

The discovery of the parasite was the result of investigations (funded by a consortium of oil companies and directed by Texas A&M University) of the impact of oil and gas activities on the Louisiana oyster industry (Mackin and Hopkins, 1962). Extensive studies were conducted on the effects of crude oil, bleedwater, natural gas, drilling mud and seismographic surveys. It was ultimately realized that none of these pollutants or activities explained the widespread mortalities of oysters that were observed. It is now known that the parasite is a major cause of oyster mortality from Maine to Mexico (Soniati, 1996).

The critical environmental factors which favor the proliferation of the parasite are high water temperatures and high salinities. Thus infections are more intense in the late summer, on the seaward side of estuaries and during droughts. Drought conditions on the Gulf Coast are associated with the La Niña phase of El Niño Southern Oscillation, however increases in prevalence (PI) precede sharp increases in intensity (WI) and epizootics of Dermo in Louisiana can lag La Niña events by about 6 months (Soniati et al., 2005). Management techniques to minimize disease and increase oyster harvest include moving infected oysters to lower salinity, early harvest of infected populations, and even freshwater diversion into high-salinity estuaries. Because of the key role of Dermo as a cause of oyster mortality, the success of oyster farming depends on the ability to manage oyster populations in the presence of high levels of disease (Soniati and Kortright, 1998).

The standard assay for determining the level of parasitism is the fluid thioglycollate method (Ray, 1966). The length of ten oysters is measured and a small piece of tissue is removed and assayed for disease after incubation in fluid thioglycollate and antibiotics for one week. *P. marinus* intensity is scored using a 0-to-5 scale developed by Mackin (1962), where 0 is no

infection and 5 is an infection in which the oyster tissue is almost entirely obscured by the parasite. Calculations are made of percent infection (PI) and weighted incidence (WI), which is the sum of the disease code numbers divided by the total number of oysters in the sample. A WI of 1.5 could be considered a level at which disease-related mortalities are occurring. For example, Mackin (1962) claims: “a population of live oyster with a weighted incidence of 2.0 contains an intense epidemic, and more than half of the population may be in advanced stages of the disease, with all of the individuals infected.”

Oysters for the summer 2008 study were collected from 8 sites west of the Mississippi River. Samples were taken from one site in Lake Felicity (LF), one site in Lake Chien (LC), two sites in Sister Lake, two sites in Bay Junop, and two in Lake Calcasieu. (Two sites in Vermilion Bay which are normally sampled did not have sufficient oysters. Apparently, Vermilion Bay has been having a high freshwater input.) The Sister Lake sites were Grand Pass (GP) and Old Camp (OC). The Bay Junop sites were Bayou DeWest (DW) and Buckskin Bayou (BS). The Lake Calcasieu sites were Little Washout (LW) and Northeast Rabbit Island (NR).

Mantle tissue was removed from each of 10 oysters, incubated at room temperature in fluid thioglycollate for about a week, and assayed according to the standard Ray (1966) technique. The level of infection (disease code) was scored from 0 to 5, where 0 is no infection and 5 is near total coverage of the oyster tissue by the parasite. Weighted incidence (WI) was calculated by summing the disease code values and dividing by 10, the number of oysters in the sample.

Weighted incidence and percent infection results are shown in Table 1. WI values were 0.200 (DW), 0.030 (BB), 0.030 (GP), 0.300 (OC), 0.070 (LC), 0.270 (LF), 0.770 (LW), and 0.430 (NR). WI levels from the summer 2008 samples are lower than those in the summer of 2007. With the exception of OC, that in 2007 had a WI of 0.270, 2008 values at all other stations were of equal or lower magnitude. All of the WI values are below critical levels, but there is some cause for concern at LW in Lake Calcasieu where prevalence is 100%.

Table 1. Collection, environmental, oyster and disease data for oysters sampled from west of the Mississippi River: Summer 2008.

Station	Date collected	Salinity (ppt)	Temperature (°C)	Oyster size range(mm)	Percent infection	Weighted incidence
Bayou DeWest	7/1/08	10.4	29.9	86-125	40%	0.200
Buckskin Bayou	7/1/08	8.3	29.4	90-114	10%	0.030
Grand Pass	7/1/08	9.6	29.9	85-105	10%	0.030
Old Camp	7/1/08	12.9	29.9	82-108	60%	0.300
Indian Point	No oysters					
South Point	No oysters					
Lake Chien	7/2/08	13.2	29.6	76-87	20%	0.070
Lake Felicity	7/2/08	13.7	29.7	79-92	50%	0.270
Little Washout	7/8/08	16.9	30.8	80-101	100%	0.770
NE Rabbit Island	7/8/08	14.4	30.1	76-93	90%	0.701

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**Project Title:** *Perkinsus marinus* evaluation for managing Louisiana's public and private oyster grounds.

**Principal Investigator:** Dr. John Supan  
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## **Background and Motivation**

Louisiana's public oyster grounds, particularly east of the Mississippi River, are the source of seed oysters for private leaseholders. Louisiana generally leads the nation in oyster production, with up to 80% produced on private leases historically. Therefore, the condition and productivity of the public seed grounds sets the pace for private production; when seed is lacking, so is private production (Berrigan et al. 1991).

During past seasonal openings of the public grounds during September, harvesters noticed increasing mortality in sizes greater than two inches. Collaborative efforts between the Department of Wildlife and Fisheries and the Louisiana Sea Grant College Program have identified Dermo. (*Perkinsus marinus*) as the potential cause of oyster mortality (LDWF, 1996) and initiated an annual Dermo Advisory Program for oyster leaseholders.

Results of successive samplings on nine stations east of the river and in Hackberry Bay showed high infection intensity and prevalence at most stations during drought years and lower infection during wet years. Although past population density surveys conducted by LDWF have revealed high concentrations of oysters at sampling stations east of the river, they are predominantly in the seed-size range of less than two inches. Many leaseholders have experienced high mortalities of bedded seed concurrent with high salinities and temperatures on their bedding grounds.

Therefore, the latest year-class of seed oysters available for bedding on leases set among existing oysters that are highly infected with *Perkinsus* will exhibit high mortalities with rising temperature and salinity during the following summer. It is safe to say that more losses will occur during future bedding operations.

## **Objectives**

The objectives of this project are:

- (1) to conduct *Perkinsus* analyses on sack and seed oysters collected from LDWF sampling stations during their annual population density evaluations; and,
- (2) to develop a database for assisting in the management of the public grounds by LDWF and to develop and continue a Dermo Advisory Program for oyster leaseholders.

## Approach

Seed and sack oysters were collected by LDWF personnel from ten stations during the annual sampling of the public grounds, including nine stations east of the river and Hackberry Bay. Samples were taken to the Sea Grant Oyster Hatchery for subsequent analyses.

*Perkinsus* assays were conducted using oyster rectal tissue in Ray's Fluid Thioglycollate Media (RFTM) with a 7-14 day incubation period (Ray, 1966), and ranked according to intensity of infection by a 0-5 evaluation scale (Mackin 1962).

Final laboratory results were forwarded to LDWF for incorporation into its database for oyster management decision making and for the continuation of the Dermo Advisory Program.

## Results

The Dermo infection intensity (weighted incidence) and percent prevalence at the ten stations during July 2008 are listed in Table 1. Table 2 lists the 2007 data for comparison. Generally, Dermo infections remain reasonably low. A weighted incidence valued at 1 or greater, which is considered a dangerous or lethal value for any given oyster population, was not found in size classes from any of the ten stations, but high intensity (>2) was found in some individual market-size oysters from South Black Bay, Telegraph Point and Three-Mile Pass.

**As always, oyster farmers are advised to harvest seed oysters for bedding from areas with the lowest Dermo infection levels. These levels can increase with bedding into higher salinity and oyster mortality could increase the following summer in such locations as water temperature increases.**

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**Table 1**  
**2008 DERMO RESULTS**  
**EAST OF RIVER & HACKBERRY BAY**

	Seed		Market	
	Prevalence	Weighted Incidence	Prevalence	Weighted Incidence
Bay Gardene	93%	0.5	80%	0.4
Lonesome I.	73%	0.4	40%	0.2
Mozambique Pt.	26%	0.1	20%	0.1
N. Black Bay	21%	0.1	13%	0.2
S. Black Bay	46%	0.2	53%	0.6
Bay Crabe	53%	0.3	86%	0.6
Telegraph Pt.	86%	0.4	85%	0.4
Cabbage Reef	33%	0.3	26%	0.1
Three-Mile Pass	26%	0.2	60%	0.6
Hackberry Bay	35%	0.2	20%	0.1

**Table 2**  
**2007 DERMO RESULTS**  
**EAST OF RIVER & HACKBERRY BAY**

	Seed		Market	
	Prevalence	Weighted Incidence	Prevalence	Weighted Incidence
Bay Gardene	26%	0.1	53%	0.3
Lonesome I.	6%	0.03	20%	0.1
Mozambique Pt.	13%	0.1	20%	0.1
N. Black Bay	13%	0.1	20%	0.1
S. Black Bay	14%	0.2	26%	0.2
Bay Crabe	28%	0.2	33%	0.4
Telegraph Pt.	33%	0.5	40%	0.5
Cabbage Reef	7%	0.03	20%	0.1
Three-Mile Pass	0%	0.0	33%	0.3
Hackberry Bay	13%	0.1	13%	0.1

**Mackin Scale used to determine incidence**

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## ***Standing Stock Compared To Stocks Potentially Available For Harvest***

*LDWF Marine Fisheries Division*

*Baton Rouge, LA 70806*

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Data gathered for the 2008/2009 Oyster Stock Assessment was presented to the Oyster Task Force in an open public meeting held on July 28, 2008 in Baton Rouge, Louisiana. The data included estimates of the total standing stock contained within the assessed portions of the public oyster areas of Louisiana. The Oyster Task Force requested that LDWF provide a report of that portion of the standing stock which would potentially be available for harvest. LDWF utilized information concerning any harvest access issues including Department closed seasons, relevant legislation, and Department of Health and Hospitals (DHH) concerns. It was determined that while DHH seasonal closures might impact the harvest of oysters, it did not preclude harvest altogether. The majority of the seasonal closures were not active until November 1 and some harvest is possible before that date. In addition, resource within DHH closures is also potentially available via the DHH Relay Permit program. The information below, organized by CSA, gives values for oyster resource that may be unavailable to the oyster industry throughout the entire public oyster season. A summary table is also provided to show the comparison when those potentially unavailable resources are removed.

### *Coastal Study Area I*

It has been recommended by the Department and the Oyster Task Force that the 2007 Cultch Plant in Mississippi Sound remain closed. This will result in an estimated 49,462 barrels (bbls) of seed oysters not available for harvest. There were no sack oysters found on this reef. A very small portion of the seed ground will close with DHH seasonal closure in November. However, it is very likely that the resource will be available for both seed and sack for at least several weeks during the season and will also be available via DHH relay.

**Total Potentially Unavailable: 49,462 bbls of seed**

### *Coastal Study Area II*

As in CSAI, the 2007 Cultch Plant in Black Bay will remain closed. This will result in an estimated 28,779 bbls of seed not available for harvest. There were no sack oysters found on the reef. The Lake Fortuna sacking only area had an estimated 36,153 bbls of seed that will not be available for harvest, although some of this seed resource may grow into market-size resource by the end of the oyster season. The Bay Gardene complex will not be opened for the 2008/2009 season. There are an estimated 351 bbls of seed and no sack oysters. There will be a new sack only area in Long Bay for the 08/09 season, however this area is not currently assessed by the Department. A very small portion of the seed grounds are affected by DHH seasonal closures in November, but this seed and sack resource will be available for some portion of the season.

**Total Potentially Unavailable: 65,283 bbls of seed**

### *Coastal Study Area III*

Although Barataria Bay will be closed for the 2008/2009 season, there were no assessed resources reported. The 2008 cultch plant in Hackberry Bay will remain closed, with no reported assessed resource. All of the other assessed resources will be available within the season.

### *Coastal Study Area IV*

All assessed resource will be available during proposed seasons.

### Coastal Study Area V

Information contained here is assuming that only the northern portion of Sister Lake will be opened for the 2008/2009 season. In addition it is assumed that this area will be only open during a seed only season. The scheduled open area is located north of the DHH November seasonal closure line. Given the assumption above, and assuming assessed reefs do not cross the closure line, about 12,096 bbls of seed and 22,252 bbls of sack located south of the line may not be available for harvest. An estimated 27,389 bbls of sack oysters will not be available north of the closure line. All other assessed resource will be available during the proposed season or via DHH relay permit.

**Total Potentially Unavailable: 12,096 bbls of seed; 49,641 bbls of sack**

### Coastal Study Area VI

Stock assessments are not conducted within this area due to a lack of reef acreage information.

### Coastal Study Area VII

With sack restrictions and legal issues concerning characterization of the harvest areas the total assessed resource of 331,102 bbls of seed oysters may not be available for harvest. In addition, a portion of the resource is located outside the classified DHH Harvest Areas. To determine industry resource availability the water-bottom acreage of the "East Cove" area located outside of the DHH Harvest Area 29 was divided by the total water-bottom acreage of the "East Cove" area. Of the total water-bottom acreage, 65.5% fell outside of the growing area. Therefore 65.5% of the 376,031 total sack bbls would result in 246,300 bbls of sack oysters potentially unavailable to the industry. This value assumes a uniform distribution of oysters throughout the entire acreage of the "Eastside". In actuality, although the area outside the DHH Harvest Area is included in assessments, there are no sample stations outside of the Harvest Area.

**Total Potentially Unavailable: 331,102 bbls of seed, 246,300 bbls of sack**

**Table 9.1.** Amount of estimated standing stock of oysters on the public oyster areas of Louisiana compared to the estimated portion that is potentially available for harvest.

Area	Standing Stock Seed (bbls)	Standing Stock Sack (bbls)	Potentially Available Seed (bbls)	Potentially Available Sack (bbls)
CSA I	305,256	750,526	255,794	750,526
CSA II	110,751	124,393	45,468	124,393
CSA III	2,036	2,949	2,036	2,949
CSA IV	2,277	2,267	2,277	2,267
CSA V	46,863	52,237	34,767	2,596
CSA VI	N/A	N/A	N/A	N/A
CSA VII	331,102	447,131	0	200,831
<b>Total</b>	<b>798,285</b>	<b>1,379,503</b>	<b>340,342</b>	<b>1,083,562</b>