A Publication of The Mississippi Department of Marine Resources

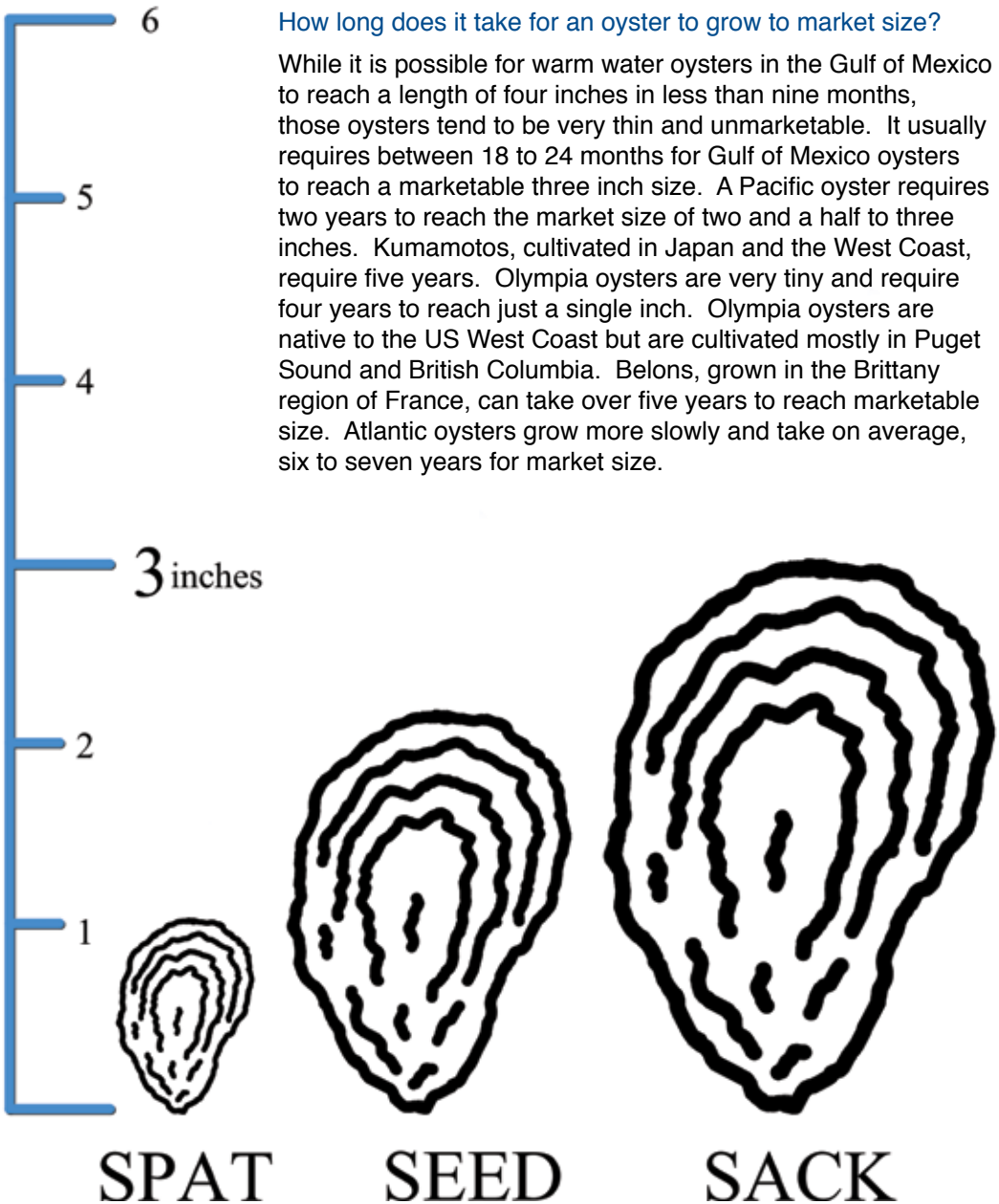
Oystermen's Guide to Mississippi Gulf Coast Oyster Reefs

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES

ENHANCE PROTECT CONSERVE

How long does it take for an oyster to grow to market size?

While it is possible for warm water oysters in the Gulf of Mexico to reach a length of four inches in less than nine months, those oysters tend to be very thin and unmarketable. It usually requires between 18 to 24 months for Gulf of Mexico oysters to reach a marketable three inch size. A Pacific oyster requires two years to reach the market size of two and a half to three inches. Kumamotos, cultivated in Japan and the West Coast, require five years. Olympia oysters are very tiny and require four years to reach just a single inch. Olympia oysters are native to the US West Coast but are cultivated mostly in Puget Sound and British Columbia. Belons, grown in the Brittany region of France, can take over five years to reach marketable size. Atlantic oysters grow more slowly and take on average, six to seven years for market size.



ENHANCE ★ PROTECT ★ CONSERVE

Oystermen's Guide to Mississippi Gulf Coast Oyster Reefs 2nd Edition

A publication of the
Mississippi Department of Marine Resources
Marine Fisheries – Shellfish Bureau
1141 Bayview Avenue
Biloxi, MS 39530
(228) 374-5000 or (800) 374-3449
dmr.ms.gov

For current oyster season information, call the 24-Hour Oyster Hotline at (228) 374-5167 or (800) 385-5902

Oystermen's Guide to Mississippi Gulf Coast Oyster Reefs

2020

A publication of the

Mississippi Department of Marine Resources

Marine Fisheries – Shellfish Bureau

Published and Printed in Mississippi

Copyright © 2020 Mississippi Department of Marine Resources

Funded by the Tidelands Trust Fund Program

This public document is not for sale and all rights to this publication are reserved to the MDMR. Copies may be made for educational purposes only.
For information about this book or to request a hard copy, call (228) 374-5000.

Source: Local History and Genealogy Department Image Collection, Biloxi Public Library, Harrison County Library System

Table of Contents

Introduction
A Message from Executive Director Joe Spraggins 02
Mississippi Department of Marine Resources 03
Introduction to the American Oyster 04

Mississippi Oyster Reefs
Mississippi Oyster Reefs 05
Definitions of Oyster Reef Classification 07
Mississippi Oyster Harvesting Locations 09
Map of Oyster Reefs 15
Oyster Aquaculture in Mississippi 19

Harvester Education
Shellfish Harvesting 21
MDMR State Rules and Regulations Title 22 Part 01 25
Water Sampling Program 29
Time and Temperature Regulations on Harvesting Oysters 31
Vibrio Management Flow Chart 32
Oyster Trip Ticket Program 33
Mississippi Oyster Tags 35
Notification Slip 37
Oyster Reef Cultch Planting 39
Mississippi Cultch Plant History 41
Oyster Reef Cultivation 43
Oyster Reef Relay 44
MS Gulf Coast's Most UNWANTED Plants and Animals 45

Biology of the Oyster
Anatomy of an Oyster 47
Oyster Life Cycle 49
Crystalline Style 50
The Southern Oyster Drill 51
Hooked Mussels 53
Oysters Parasitic Relationships 55
Dermo 57
Harmful Algal Blooms 59
What are Phytoplankton? 61
Vibrio Bacteria 63
Norovirus 65
Help Stop Aquatic Hitchhikers 67

Boating Safety

Boating Safety in Mississippi Waters 69
Weather Emergencies on the Water 73
Beaufort Wind Scale 75
Saffir-Simpson Hurricane Wind Scale 77
Wind Chill Chart 79
Heat Index Chart 81
Extreme Weather Information Sheet 83
Ropes, Knots and Splicing 87
Knot Glossary and Terms 98
Pump-Out Stations: Keeping Our Waters Clean 101

Biloxi Oyster Tongers harvesting oysters near Deer Island, 1935.

Acknowledgements

2020 EDITION
For information about this book, please call (228) 374-5000

A special thanks to all those who contributed to this guide

Lead Author and Editor:
Kristina Broussard, *Biological Program Coordinator*

Contributing Authors:

Charlie Robertson,
Biological Program Coordinator

Andrew Barrett,
Marine Fisheries Scientist

Dylan Kessen,
Former Marine Fisheries Technician

Marty Jones,
Marine Fisheries Scientist

Michael Brochard,
Marine Fisheries Scientist

Rita Duvernay,
Projects Officer

Scott Gordon,
Former Shellfish Bureau Director

Lt. Patrick Levine,
Boat and Water Safety Supervisor

Ruth Posadas,
Seafood Tech. Bureau Director

Jessica Rankin,
Seafood Officer

Jeff Davis,
Seafood Officer

Dale Diaz,
Oyster Aquaculture Agent

Editors and Technical Review:

Nolan Broussard Sr.
Joe Jewell
Rick Burris

Erik Broussard
Jeff Davis
Charmaine Schmermund

Francesca Linthicum
Alicia Carron

Source: Local History and Genealogy Department Image Collection / Biloxi Public Library / Harrison County Library System

STATE OF MISSISSIPPI
Tate Reeves
Governor

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES
Joe Spraggins, Executive Director

Dear oyster harvesters, dealers and processors,

Mississippi's oyster resources and processing industry are both important assets to the state. The Mississippi Department of Marine Resources appreciates your hard work in protecting these valuable resources by being good stewards. This guide was developed to help those just starting out in the oyster business, as well as oystermen who have years of experience.

This guidebook is the second edition and we encourage your input on its usefulness, as well as any suggestions for improvement. We hope you will use this guide in your work harvesting and processing oysters, as well as a training tool for new deckhands to be smarter, safer workers.

The state of Mississippi and the MDMR pledge to work with you to give you the information and tools you need to be successful oystermen. Together we will protect the natural resources that allow so many Mississippians the opportunity to live and work on the Mississippi Gulf Coast.

In Appreciation,

Joe Spraggins, Executive Director
Mississippi Department of Marine Resources

1141 Bayview Avenue • Biloxi, MS 39530-1613 • Tel: (228) 374-5000 • dmr.ms.gov

Mississippi Department of Marine Resources

The Mississippi Department of Marine Resources (MDMR), created by the Legislature as a new state agency in 1994, manages Mississippi's coastal resources through the authority of the Commission on Marine Resources (CMR). The MDMR is dedicated to enhancing, protecting and conserving the marine interests of Mississippi for present and future generations. MDMR manages all marine life, public trust wetlands, adjacent uplands and waterfront areas for the long-term recreational, educational, commercial and economic benefit of everyone.

ENHANCE ★ PROTECT ★ CONSERVE

The MDMR and the CMR play an important role in administering Mississippi Seafood Laws, the Mississippi Coastal Wetlands Protection Act, the Public Trust Tidelands Act, the Boat and Water Safety Act, the Derelict Vessel Act, the Non-Point Source Pollution Act, the Magnuson Stevens Act, the Wallop-Breaux Sport Fish Restoration Act, Marine Litter Act and other state and federal mandates.

Joe Spraggins, Executive Director

Paul Mickle, PhD, Chief Scientific Officer

Joe Jewell, Director of the Office of Marine Fisheries

Commission on Marine Resources

Steve Bosarge, Commercial Fishermen, Jackson County

Mark H. Havard, II, Recreational Sports Fishermen, Jackson County

Natalie Guess, Nonprofit Environmental Organizations, Hancock County

Ronald Daniels, Charter Boat Operators, Harrison County

Richard Gollott, Commercial Seafood Processors, Harrison County

Introduction to the American Oyster

The American oyster, *Crassostrea virginica*, is one of the more valuable natural resources of the Mississippi Gulf Coast. It provides a livelihood for many oyster harvesters and satisfies many Gulf Coast appetites. The oyster is often grouped with shrimp and crabs under the term shellfish, but the oyster has no relation to either. It is a bivalve mollusk with two shell valves hinged together at one end and closed by a single, large muscle attached to the valves at the other end.

Oysters can be found in shallow, estuarine waters that rapidly change in temperature and salinity. The MDMR manages 17 natural oyster reefs. Historically, 97% of commercially harvested oysters in Mississippi came from oyster reefs in the western Mississippi Sound, primarily Pass Marianne, Saint Joe and Pass Christian reefs.

Before oystering, a recreational or commercial license must be purchased at the MDMR. Oysters are harvested by tonging or dredging. An oyster harvester uses a set of tongs to scoop oysters from the bottom of the Mississippi Sound. Tongs resemble two rakes attached by two 15-foot poles. They work like scissors and can catch as many as 40 oysters. An oyster dredge can be used to pick up several hundred oysters with one pull. A dredge is a heavy metal frame with a toothed bar on the lower lip and an attached bag to collect oysters. It is towed by boat over the reef and oysters are scraped off the bottom by the teeth on the bar, caught in the bag, and then hauled aboard by either a mechanical winch or by hand.

Oysters may be taken only from those waters approved safe for shellfish harvest by the MDMR and CMR. Harvesting, shucking, processing and selling oysters must conform to all state and federal regulations. Following heavy rainfall, oyster reefs may be temporarily closed to harvesting when poor water quality exists. Important information about the opening and closing of oyster reefs is available by calling the 24-hour MDMR oyster hotline found at the front of this guide.

Oysters are edible all year long but are in best condition and most tasty in the winter and early spring. No gutting or gilling is necessary to eat an oyster; the meat can be completely consumed. It is one of the few foods that can be eaten raw. This coast cuisine can be eaten on the half shell, fried, smoked, baked and broiled and can be found in stews, soups, gumbos, dressings and seafood casseroles and on the menus of most local seafood restaurants.

Mississippi Oyster Reefs

Oysters may be taken only from those waters approved for shellfish harvest by the Commission on Marine Resources. The harvesting, shucking, processing and sale of oysters must conform to all regulations specified by state statute and the regulations adopted by the CMR. Several natural reefs are located in approved waters. Approved waters along with all other defined areas are described in detail on the following pages.

The maps on the following pages of this book gives a closer look at the harvestable oyster reefs found in the Mississippi Sound.

Following a heavy rainfall, an increase in river stage or a pollution event, conditionally approved reefs may be temporarily closed to oystering when poor water quality conditions exist. Such closures are released to local newspapers, television and radio media and are posted on the MDMR website. Pertinent information about the opening and closing of reefs is available by calling the MDMR 24-hour toll-free oyster information hotline at (800) 385-5902. The hotline information may be updated daily during oyster season. Information on the current status of any shellfish growing waters in this state may be obtained from the MDMR.

METHODS OF TAKING OYSTERS

An oyster license is required for all methods of oyster harvest. During open season, oysters may be taken by hand, tong or dredge. Dredges for oystering may not exceed 115 pounds in weight nor may they have an excess of 16 teeth. Teeth on the dredge must be five inches or less in length. Restrictions on the maximum number of dredges carried or the maximum number of sacks that may be harvested daily are established seasonally by the CMR.

SPECIAL PROVISIONS

Both recreational and commercial oyster harvesters must purchase a license from the MDMR. Oysters taken from Mississippi waters must be tagged. These tags are issued by the MDMR at officially designated check stations. These stations will be identified in the opening order for each oyster season. Both commercial and recreational oyster harvesters must check in at the designated check station before going to reefs and must check out at the same station.

Tags are issued at the time of inspection. Each tag must be completed with the harvester's name, license number, harvest date, harvest area. If the oysters are to be sold, the tag must also include the shellstock dealer's name and identification number. Oysters taken for personal consumption must also be inspected and a tag will be issued for each sack. Such tags will identify that the contents are not to be sold. Tags must be affixed to the sacks with the fasteners provided by the MDMR. All harvesters are required to pay a shell retention fee to the MDMR on the day of harvest. Shell retention fees will be used to further oyster production within the state.

Each boat or vessel used to harvest or transport shellfish is required to have on board a functional, approved marine sanitation device (MSD), portable toilet or other approved sewage disposal receptacle to contain human sewage. In addition, harvest vessels must have an awning or similar covering above shellstock to provide protection from the sun during the summer months of May to September.

Any oysters taken from waters other than in Mississippi must be accompanied by a bill of landing indicating the point of origin. Oysters harvested outside of Mississippi waters and transported by water into the state must apply for a permit issued by the MDMR and comply with the provisions of the state. Oysters destined for interstate commerce must originate from a certified Mississippi dealer with a fixed cooler facility.

SEASONS

The opening and closing of oyster season is regulated by the CMR and notice thereof will be duly published in local newspapers and released to both the radio and television media. Oysters may be taken only during daylight hours.

LEGAL SIZE LIMITS

Oysters taken from Mississippi public waters must be at least 3 inches from hinge to bill. At times, however, the MDMR may adjust this limit upon public notice to that effect.

LEGAL CATCH LIMITS

Recreational catch limits, set by Statute §49-15-46 (4), and commercial catch limits, set by Statute §49-15-38, are set annually, and may be adjusted throughout the season by the CMR.

Definitions of Oyster Reef Classification

An **APPROVED AREA** is the classification of a state shellfish growing area, which has been approved by the MS Dept of Marine Resources (MDMR) for growing or harvesting shellfish for direct marketing. The classification of an approved area is determined through a sanitary survey conducted by the MDMR. An approved shellfish growing area may be temporarily closed when a public health emergency such as a hurricane or flooding is declared.

A **CONDITIONALLY APPROVED AREA** is the classification of a state shellfish growing area determined by the MDMR to meet approved area criteria for a predictable period. The period is conditional upon established performance standards specified in a management plan. A conditionally approved shellfish growing area is closed by the MDMR when it does not meet the approved growing area criteria.

RESTRICTED AREAS are state waters that have been classified by the MDMR as an area from which shellfish may be harvested only by permit from the MDMR and are subjected to suitable and effective treatment through relaying.

PROHIBITED AREAS are growing waters where there is no current sanitary survey or where the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, deleterious substances, marine toxins or radionuclides may reach this area in excessive concentrations. The taking of shellfish for any human food purposes from such areas is prohibited.

UNCLASSIFIED AREAS are waters that are presently unclassified and from which the harvest of shellfish is prohibited pending classification based on a sanitary survey of the area.

The areas of the Mississippi Sound are defined in greater detail on the following pages of this book according to their classification for harvesting oysters.

Definitions are from the National Shellfish Sanitation Program's "Guide for Control of Molluscan Shellfish."

MDMR Scientist measuring dredged oysters during a reef assessment

Oyster spawn or "Spat" settlement on an oyster shell

Mississippi Oyster Harvesting Locations

http://www.dmr.ms.gov/dmr-information/regulations

Mississippi oyster harvesting locations are identified by sections and harvesting conditions. Harvestable oyster reefs are divided into two sections: tonging grounds and dredging grounds. Tonging grounds are intended for taking oysters by tong harvesting methods only. Dredgers are prohibited from dredging on tonging grounds. However, dredging grounds may be harvested by both tonging and dredging. Harvestable oyster locations are further divided into the following five harvesting conditions: approved, conditionally approved, restricted, prohibited, and unclassified.

The following information describes oyster harvesting areas in greater detail. This information was taken directly from Title 22 Part 1: Oyster Growing and Harvesting Regulations for the State of Mississippi. These regulations are subject to change at any time. For more information and to find a copy of the most up-to-date regulations, please visit the MDMR website at www.dmr.ms.gov or request a printed copy by calling (228) 374-5000 or (800) 374-3449. Refer to the maps on the following pages of this book for the locations of the oyster reefs in the Mississippi Sound.

I. Harvesting by Tonging only

Tonging Line

The tonging line for harvesting oysters runs across the entire Mississippi coastline. The tonging line begins at a point on the western, southern shore of the mouth of Bayou Caddy and proceeds to a point one nautical mile due east. From here, the one mile distance meanders north along the shoreline of Waveland and Bay St. Louis. The tonging line maintains one nautical mile off the CSX railroad bridge and proceeds easterly following the meandering shoreline one nautical mile from the shoreline. The tonging line continues through the following points:

- Longitude 89°15.139’W.
- Proceeding due south to a point at Latitude 30°17.138’N, Longitude 89°15.139’W.
- Proceeding due east to a point at Latitude 30°17.138’N, Longitude 89°14.340’W.
- Proceeding due north to a point at Longitude 89°14.340’W one nautical mile from the shoreline.
- The tonging line continues easterly, following the meandering of the shoreline one nautical mile from the shoreline to the intersection of the Alabama State line.

II. Harvesting by Tonging and/or Dredging

Approved Harvesting Waters

Approved waters are a classification of a state shellfish growing area which has been approved by the MDMR for growing or harvesting shellfish for direct marketing. The

classification of an approved area is determined through a sanitary survey conducted by the MDMR. An approved shellfish growing area may be temporarily closed when a public health emergency, hurricane or flooding is declared.

AREA II APPROVED

Area II Approved includes the public oyster reefs known as Telegraph Reef, Buoy Reef, and the Shell Keys referred to as Pelican Reef, Fletcher's Reef, Umbrella Reef, and the southern portion of Pass Marianne reef. Area II Approved boundaries are as follows:

- Area II approved boundary line begins at a point on the boundary line between Mississippi and Louisiana at Longitude 89°20.000'W, and runs easterly along the state line to a point due south of the westernmost tip of Cat Island.
- Due north to the westernmost tip of Cat Island.
- North to northwesterly along a line drawn between the westernmost tip of Cat Island and a point 700 feet seaward of the southernmost point on the mainland shoreline due south of Menge Avenue in Pass Christian, MS.
- Continuing along the line to a point of intersection with the Mississippi Intracoastal Waterway.
- Southwesterly to Mississippi Sound Marianne Channel Lighted Buoy 3 (Fl G 4s 4M "3").
- Westerly to Mississippi Sound Pass Marianne Buoy 2P.
- Westerly to Mississippi Sound Pass Marianne Light 4P (Fl R 2.5s 17ft 3M "4P").
- Southwesterly to Mississippi Sound Pass Marianne Buoy 6P.
- Westerly to the Mississippi Sound Pass Marianne Merrill Shell Bank Light (Fl W 6s 30ft. 4M).
- Southwesterly to Mississippi Sound Pass Marianne Buoy 12P.
- Southwesterly to Mississippi Sound Pass Marianne Light 15P (Fl G. 4s 17ft. 5M "15P").
- From Pass Marianne Light 15P running southwesterly along a line drawn through Mississippi Sound Pass Marianne Light 4P and Pass Marianne Light 15P to a point of intersection with Longitude 89°20.000'W.
- Southerly along Longitude 89°20.000'W to a point on the boundary line between Mississippi and Louisiana, this point being the point of beginning.

AREA II Approved shall be further sub-divided as follows:

- **AREA II "H"** is made up of those waters of Area II Approved that are WEST of Longitude 89°15.000' W.
- **AREA II "I"** is made up of those waters of Area II Approved that are EAST of Longitude 89°15.000' W.

Conditionally Approved Harvesting Waters

Conditionally approved waters are the classification of a state shellfish growing area determined by the MDMR to meet approved area criteria for a predictable period. The period is conditional upon established performance standards specified in a management plan. When a conditionally approved shellfish growing area does not meet the approved growing area criteria, it is temporarily closed by the MDMR.

The western Mississippi Sounds consists of five conditionally approved waters including:

- Area I "B"
- Area II "A"
- Area II "B"
- Area II "C" (Subdivided into Areas II "E", II "F", II "G")
- Area II "D".

The boundaries for these areas are explained below. Refer to the map on page 14 and 15 of this book for a look at the locations of these areas.

Area I "B" Conditionally Approved Waters

Area I "B" boundaries are as follows:

- The line begins on a point at Mississippi Intracoastal Waterway St. Joe Pass Light 3 and runs easterly along the Mississippi/Louisiana State line boundary, to Longitude 89°20.000'W.
- Continues northerly along Longitude 89°20.000' W to a point of intersection with a line drawn due east from the most seaward point on the south shore of the mouth of Bayou Caddy.
- Westerly along said line of intersection to a point on the south shore of the mouth of Bayou Caddy.
- South to southwesterly along and following the meanderings of the mainland shoreline around Point Clear and Point St. Joseph to the westernmost point of Heron Bay Point.
- South to Mississippi Intracoastal Waterway St. Joe Pass Light 3 which is the point of beginning.

AREA II "A" Conditionally Approved Waters

Area II "A" includes portions of the public oyster reefs known as Henderson Point and Pass Christian. Area II "A" boundaries are as follows:

- The line commences at a point on the CSX Railroad Bridge across St. Louis Bay at the center of the swing span.
- Runs easterly along the bridge to a point 700 feet seaward of the eastern end of the bridge.
- South-southeastwardly, parallel to and remaining 700 feet seaward of the mainland shoreline around Henderson Point following the meanderings of the mainland shoreline 700 feet, running easterly and remaining 700 feet seaward of the prohibited waters of Pass Christian Municipal Harbor to a point 700 feet seaward of the southernmost point on the mainland shoreline due south of Menge Avenue in Pass Christian.
- South-southeastwardly along a direct line drawn between the previously stated point to the westernmost tip of Cat Island, to a point one nautical mile from the mainland

shoreline.

- Westerly, parallel to and following the meanderings of the mainland shoreline, maintaining a distance of one nautical mile, to a point one nautical mile south of the CSX Railroad Bridge across St. Louis Bay, on a line drawn between the Mississippi Square Handkerchief Shoal Light 2 (FL R 4s 17ft 4M “2”) and a point on the CSX Railroad Bridge across St. Louis Bay at the center of the swing span.
- Northeasterly following said line to a point on the CSX Railroad Bridge across St. Louis Bay at the center of the swing span, said point being the point of beginning.

AREA II “B” Conditionally Approved Waters

Area II “B” includes the public oyster reefs known as St. Stanislaus and Waveland Reef. Area II “B” boundaries are as follows:

- The line begins at a point at the center of the swing span on the CSX Railroad Bridge across St. Louis Bay.
- Running southwesterly along a direct line to Mississippi Sound Square Handkerchief Shoal Light 2 (FL R 4s 17ft 4M “2”), on the western edge of the Square Handkerchief Shoal.
- West from the Mississippi Sound Square Handkerchief Shoal Light 2 to Longitude 89°20.000’W.
- Southerly along 89°20.000’W, to a point of intersection with a line drawn due east from the most seaward point of the south shore mouth of Bayou Caddy.
- West along said line to a point at Longitude 89°24.000’W.
- North to a point 700 feet seaward from the mainland shoreline.
- North-northeastward parallel to and remaining 700 feet seaward from the mainland shoreline to a point 700 feet seaward and east of the west end of the CSX Railroad Bridge across the St. Louis Bay.
- Eastward along the CSX Railroad Bridge to a point at the center of the swing span, said point being the point of beginning.

AREA II “C” Conditionally Approved Waters

Area II “C” includes the northern portion of Pass Marianne reef and southern portion of the Pass Christian Reef. Area II “C” boundaries are as follows:

- The line begins at a point one nautical mile from the mainland shoreline on a direct line drawn between a point 700 feet seaward of the southernmost point on the mainland shoreline due south of Menge Avenue in Pass Christian, to the westernmost tip of Cat Island.
- Runs westerly, parallel to and following the meanderings of the mainland shoreline, maintaining a distance of one nautical mile, to a point one nautical mile south of the CSX Railroad Bridge across St. Louis Bay, on a line drawn between the Mississippi Square Handkerchief Shoal Light 2 (FL R 4s 17ft 4M “2”) and a point on the CSX Railroad Bridge across St. Louis Bay at the center of the swing span.
- West from said Mississippi Sound Square Handkerchief Shoal Light 2 to Longitude

89°20.000'W.

- Southerly along Longitude 89°20.000'W to a point of intersection with a line drawn through Mississippi Sound Pass Marianne Light 4P (Fl R 2.5s 17ft 3M "4P") and Mississippi Sound Pass Marianne Light 15P (Fl G. 4s 17ft. 5M "15P").
- North-northeasterly from said Pass Marianne Light 15P.
- Northeasterly to the Mississippi Sound Pass Marianne Buoy 12P.
- Northeasterly to the Mississippi Sound Pass Marianne Merrill Shell Bank Light (Fl W 6s 30ft. 4M).
- Northerly to Mississippi Sound Pass Marianne Buoy 6P.
- Northeasterly to the Mississippi Sound Pass Marianne Light 4P (Fl R 2.5s 17ft 3M "4P").
- Easterly to Mississippi Sound Pass Marianne Buoy 2P.
- Easterly to Mississippi Sound Marianne Channel Lighted Buoy 3 (Fl G 4s 4M "3").
- Northeasterly from said Marianne Channel Lighted Buoy 3 to a point of intersection on the Mississippi Intracoastal Waterway with a line drawn north-northwesterly from the westernmost tip of Cat Island and a point 700 feet seaward of the southernmost point on the mainland shoreline due south of Menge Avenue in Pass Christian.
- North-northwesterly along said line to the point of beginning.

AREA II "C" shall be further sub-divided as follows:

- **AREA II "E"** is comprised of those waters of Area II "C" that are WEST of Longitude 89°16.000'W and north of Latitude 30°15.500'N.
- **AREA II "F"** is comprised of those waters of Area II "C" that are EAST of Longitude 89°16.000'W and north of Latitude 30°16.300'N.
- **AREA II "G"** is comprised of those waters of Area II "C" that are SOUTH of Area II "E" and Area II "F".

AREA II "D" Conditionally Approved Waters

Area II "D" boundaries are as follows:

- The line begins at a point 700 feet from the western shoreline of the St. Louis Bay on the CSX Railroad Bridge.
- Easterly along the CSX Railroad Bridge to a point 700 feet from the eastern shoreline of St. Louis Bay.
- Northerly 700 feet from the mainland shoreline following the meanderings of the mainland shoreline 700 feet from the mainland shoreline to a point 700 feet from the eastern shoreline of St. Louis Bay on the U.S. Highway 90 bridge.
- Westerly along the U.S. Highway 90 Bridge to a point 700 feet from the western shoreline of the St. Louis Bay on the U.S. Highway 90 Bridge.
- Southerly 700 feet from the mainland shoreline following the meanderings of the mainland shoreline 700 feet from the mainland shoreline, to the point of beginning on the CSX Railroad Bridge.

Area V "A" Conditionally Approved Waters

Area V "A" includes Biloxi Bay Reef and is enclosed by the following described line:

- Starting at a point 750 feet east of the eastern most point of shoreline at Point Cadet Marina;
- Then running north easterly along the most direct line to a point (Latitude 30.402081 Longitude -88.842577)
- Then running southeasterly along the southernmost boundary of the Biloxi East Access Channel, to a point (Latitude 30.368859 Longitude -88.801177) Channel 24 Marker 17;
- Then southwesterly to the southernmost tip of Deer Island;
- Then following the northern shoreline of Deer Island, to a point due south of the beginning point 750 feet east of the eastern most shoreline at Point Cadet in Biloxi Bay;
- Then running due north to said point, the point of beginning.

Area VI "B" Conditionally Approved Waters

Area VI "B" is enclosed by the following described line:

- The line commences at the northwestern most point (Latitude 30.327367 Longitude -88.698183);
- Then running east to a point (Latitude 30.322604 Longitude -88.583315);
- Then proceeding southeasterly to a point (Latitude 30.277430 Longitude -88.544702);
- Then running west to a point (Latitude 30.284142 Longitude -88.698114);
- Then running north to the point of beginning

Restricted Waters

Restricted waters include state waters that have been classified by the MDMR as an area from which shellfish may be harvested only by special permit from the MDMR and are subjected to suitable and effective treatment through relaying.

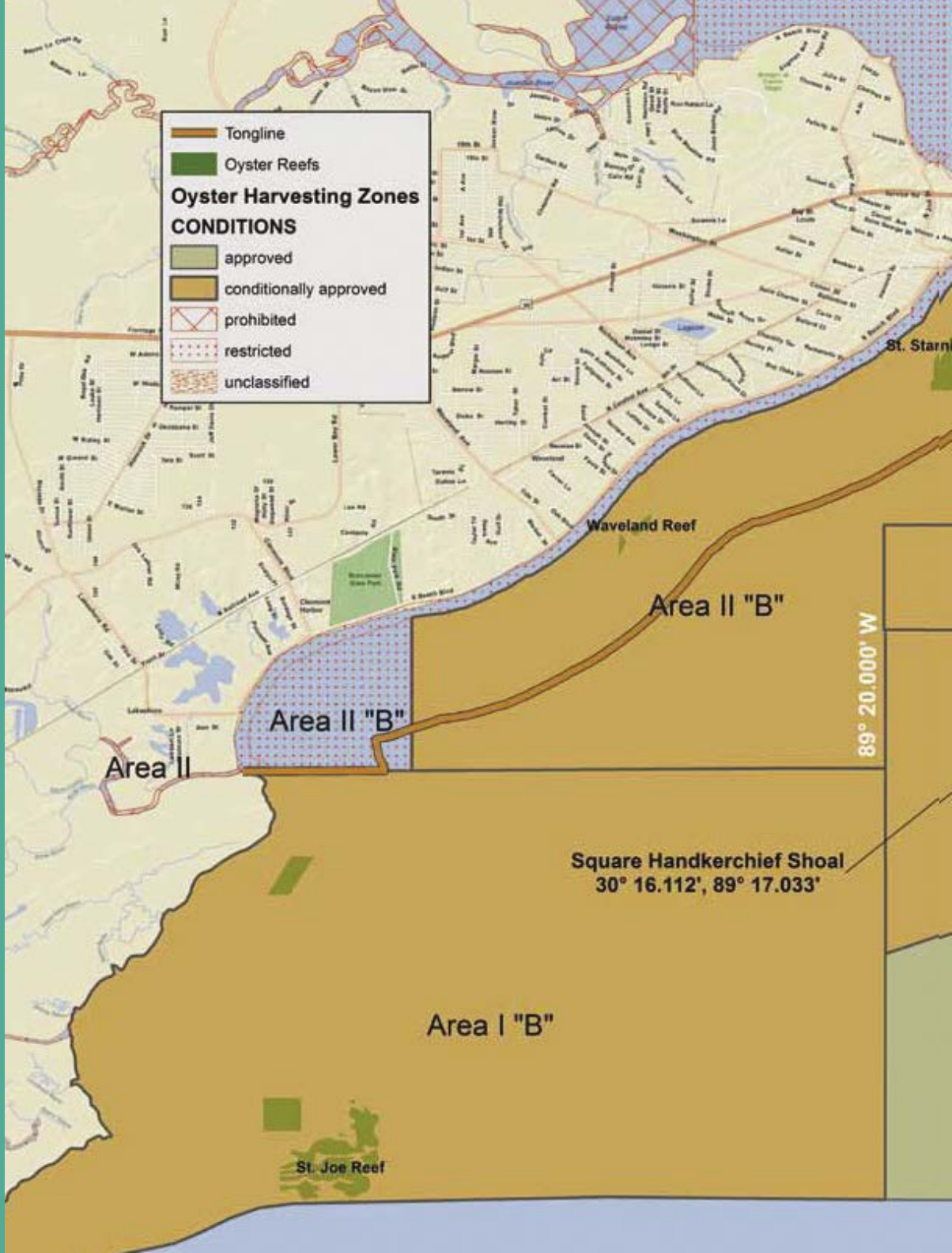
Prohibited Waters

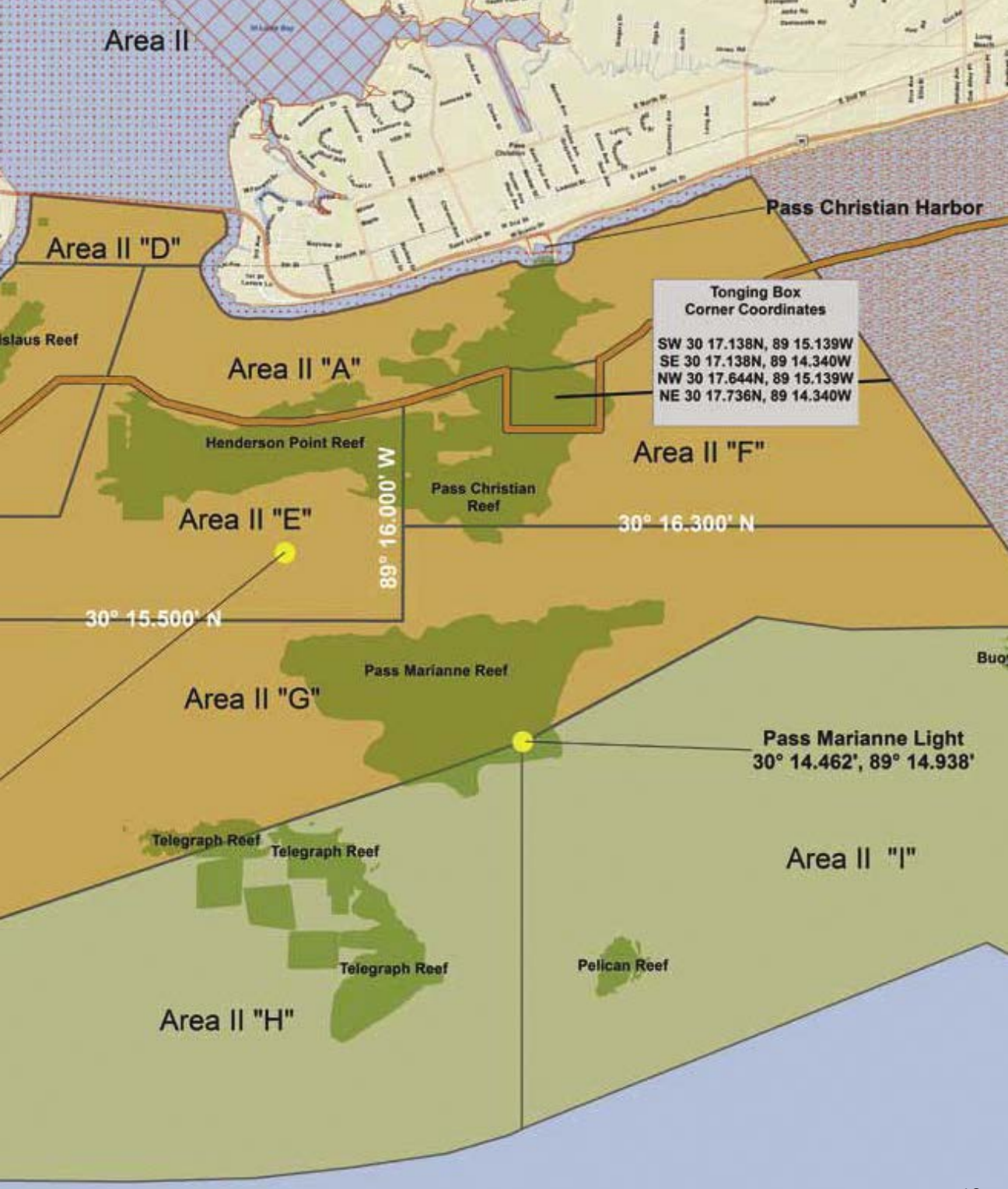
Prohibited waters are growing areas where there is no current sanitary survey or where the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, poisonous or deleterious substances, marine toxins or radionuclides may reach this area in excessive concentrations. The taking of shellfish for any human food purposes from such areas is strictly prohibited.

Unclassified Waters

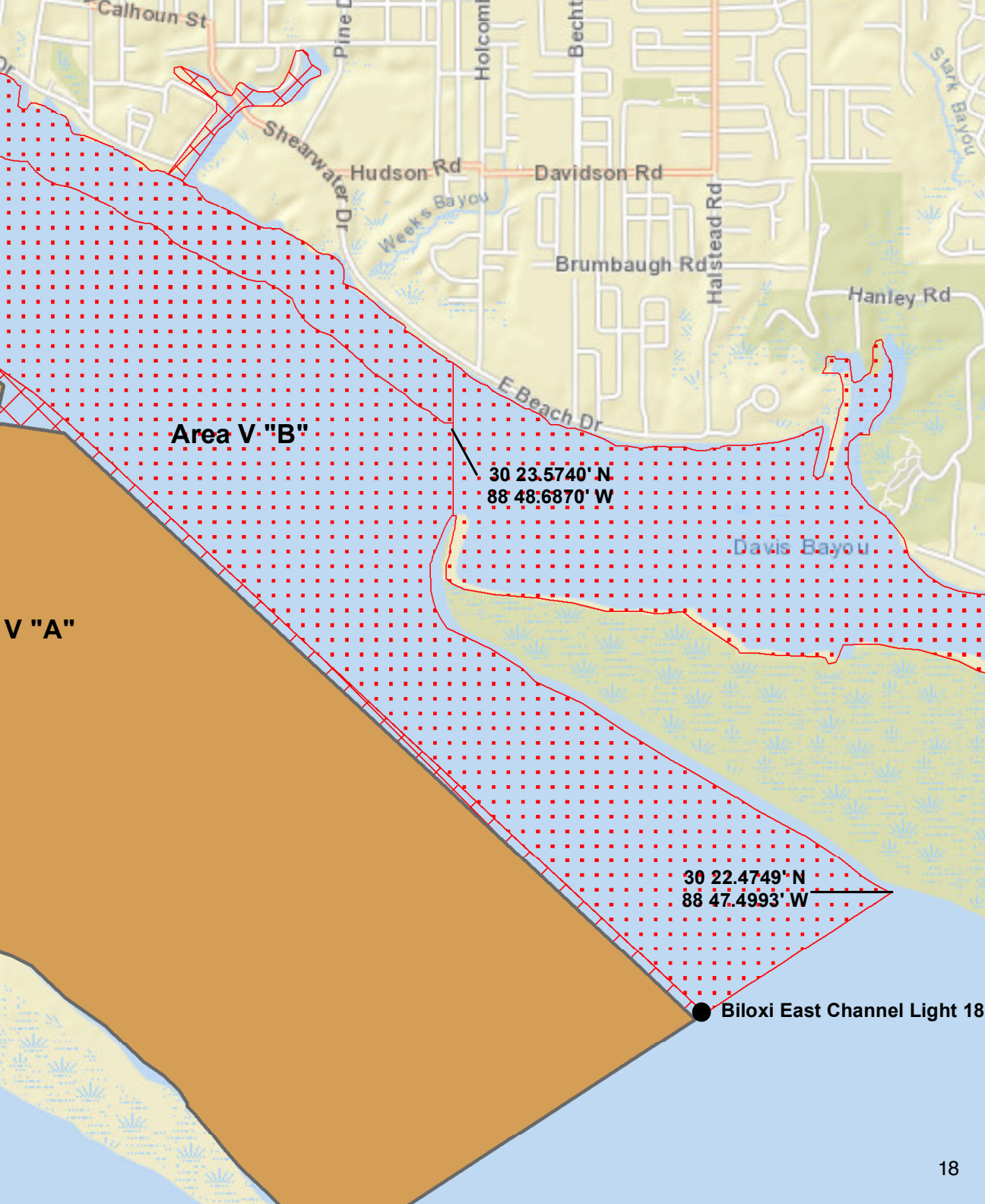
Unclassified waters are presently unclassified as one of the previous four classifications and from which the harvest of shellfish is prohibited pending classification based on a sanitary survey of the area. Permission must be granted to harvest shellfish from unclassified waters in accordance with the respective classification by the CMR and MDMR.

This information was derived from Mississippi State Rules and Regulations Title 22 Part 01: Oyster Growing and Harvesting. For a complete copy of Title 22, please visit the following link: http://www.dmr.ms.gov/ dmr-information/regulations.


Tongline
Oyster Reefs
Oyster Harvesting Zones
CONDITIONS
approved
conditionally approved
prohibited
restricted
unclassified
St. Starni
Waveland Reef
Area II "B"
Area II "B"
Area II
89° 20.000' W
Square Handkerchief Shoal
30° 16.112', 89° 17.033'
Area I "B"
St. Joe Reef


Area II
Pass Christian Harbor
Area II "D"
Tonging Box
Corner Coordinates
SW 30 17.138N, 89 15.139W
SE 30 17.138N, 89 14.340W
NW 30 17.644N, 89 15.139W
NE 30 17.736N, 89 14.340W
Area II "A"
Henderson Point Reef
Area II "F"
Pass Christian
Reef
Area II "E"
89° 16.000' W
30° 16.300' N
30° 15.500' N
Pass Marianne Reef
Area II "G"
Pass Marianne Light
30° 14.462', 89° 14.938'
Telegraph Reef
Telegraph Reef
Area II "I"
Telegraph Reef
Pelican Reef
Area II "H"

Bayview Ave
Division St
Oak St
Howard Ave
Pine St
Cedar St
90
Beach Blvd
Front Beach
30 24.3865' N
88 50.2865' W
30 24.1249' N
88 50.5546' W
30 23.4499' N
88 51.2474' W
88 51.2621' W
Area
Deer Island
Oyster Harvesting Zones
CONDITIONS
conditionally approved
prohibited
restricted


Calhoun St
Pine D
Holcomb
Bechtel
Stark Bayou
Shearwater Dr
Hudson Rd
Davidson Rd
Weeks Bayou
Brumbaugh Rd
Halstead Rd
Hanley Rd
E Beach Dr
Area V "B"
30 23.5740' N
88 48.6870' W
Davis Bayou
V "A"
30 22.4749' N
88 47.4993' W
Biloxi East Channel Light 18

Oyster Aquaculture in Mississippi

The Mississippi Department of Marine Resources (MDMR) received RESTORE-Act funding to teach an Off-Bottom Oyster Aquaculture Program that aims to train potential and current commercial oyster farmers in all aspects of off-bottom oyster farming appropriate to the local area.

Off-bottom oyster aquaculture is the cultivation of oysters in baskets, bags or cages that are kept above the sea floor. These oysters are typically hatchery-reared seed oysters instead of the oysters found in the wild. When properly operated, the containers provide protection from predators and eliminate burial in sediment, allowing oysters to be cultured in areas where oysters would not normally survive on the bottom. Oysters produced using off-bottom culture techniques are typically sold to the premium half-shell market. Off-bottom oyster aquaculture requires significant investments of time, labor and money, but has the potential to provide a consistent supply of premium high-quality oysters for the half-shell market.

This project was paid for, in part, with federal funding from the Department of the Treasury under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act).

One strategy that the MDMR is using to help jump start off-bottom oyster aquaculture in Mississippi is to permit large areas that allow commercial off-bottom oyster aquaculture. This helps oyster farmers avoid the time and expense involved of pursuing individual permits. To be eligible to lease acreage inside one of the pre-permitted areas, oyster farmers must complete the MDMR's Off-Bottom Oyster Aquaculture Program. One example of a MDMR Commercial Aquaculture Park is the Deer Island site shown here.

Shellfish Harvesting: *The Safe Handling of Shellstock, Overboard Discharge and No-Discharge Zones*

Excerpts taken from a publication of the Interstate Shellfish Sanitation Conference (ISSC) – in cooperation with the Gulf of Mexico Program

Shellfish Harvesting

Oysters, clams and mussels are seafood delicacies that are enjoyed by millions of consumers. Broiled, baked, steamed, fried, or raw on the half-shell, shellfish have been a seafood favorite around the world for thousands of years.

When oysters are feeding, molluscan shellfish (oysters, clams, and mussels) filter large quantities of water, entrapping plankton and other materials from the water as it passes over the gills. Mollusks have the ability to accumulate concentrations of bacteria and chemicals up to 1,000 times that of surrounding waters. The primary contaminant is usually human sewage. When consumed raw, the contaminants are consumed as well, and can result in illnesses ranging from mild discomfort to severe illness and even death.

Consumption of shellfish from polluted waters may result in illness outbreaks. Some of these outbreaks, however, occur from shellfish harvested in approved waters. In most of these cases overboard discharge of human feces or vomitus has been cited as the cause. When illnesses do occur, harvesting areas may be closed and the entire shellfish industry loses sales due to adverse publicity. The message is simple: always harvest shellfish from approved or open waters and do not discharge waste overboard.

In state waters, molluscan shellfish can only be harvested from approved or open waters. To ensure that only safe shellfish are consumed by the public, shellfish control agencies conduct sanitary surveys and classify all shellfish growing areas. These shellfish growing areas are then patrolled by state shellfish control authorities who provide law enforcement to prevent harvesting from closed areas.

Onboard the Vessel

Harvesters must be licensed from the state authority before they harvest any shellfish. Harvesters are legally liable for illnesses and deaths that might occur from their disregard for proper harvesting and handling practices. Boats used to harvest and transport shellstock must be properly constructed, operated and maintained to prevent contamination and decay of shellstock.

Decks, storage bins and bilge pumps must be kept clean, well drained and appropriately located to prevent polluted water from touching shellstock. Effective covers can shield shellstock from the hot sun and birds.

The most important concern is overboard discharge. It is critical that human sewage not be discharged overboard while boats are in growing areas or in no-discharge zones. Pathogens transmitted through overboard discharge may sicken many people. This

often leads to losses in sales. Harvesters who ignore safe harvesting and handling practices are ultimately hurting themselves.

From 1977 to 2006, 1,274 illnesses within the United States were traced to overboard discharge of human sewage containing viruses which were consumed by the oyster and then eaten by unsuspecting patrons. To deal with the issue of overboard discharge, approved marine sanitation devices (MSDs) are required. Approved devices include MSDs, portable toilet or other sewage disposal containers. These containers must be secured to prevent spillage, must be used ONLY for sewage, and must only be emptied into a sewage disposal system such as a toilet or a pump-out facility.

No-Discharge Zones

To further protect waters, including shellfish growing areas, states can have all or portions of their waters designated as no-discharge zones for vessel sewage. These designations can protect public health by providing pump-out facilities or dump stations.

Mississippi regulation Title 22 Part 01 states that "It shall be unlawful for any person, firm or corporation to discharge solid or human waste overboard any boat or vessel while said boat or vessel is in any public or private marine waters of the State of Mississippi." Similar to Mississippi, Rhode Island and New Hampshire have all of their waters designated as no-discharge zones. Others states, including: California, Florida, Texas, Georgia, Maryland, Virginia, Massachusetts, New Jersey, New York and North and South Carolina have certain bays and estuaries protected.

Time and Temperature Controls

The second line of defense to ensure the safe handling of shellstock is the dealers and distributors. Pathogens such as *Vibrio parahaemolyticus*, and *Vibrio vulnificus* occur naturally in seawater, but can sicken consumers and, in some cases, result in death to high-risk individuals. These pathogens are affected by temperature. Pathogen levels can double in shellfish in as fast as eight to nine minutes at 98.6°F (37°C). Moderate levels can increase to high in as short as two to three hours at 68° - 95°F (20° - 35°C). Temperature control is critical to product safety. Cooling after abuse will only slow reproduction. Refrigeration cannot be relied upon to kill the bacteria. States set time limits for harvesting to lessen the growth of *Vibrio* pathogens and keep the product as cool as possible.

Once the shellstock begins to warm, *Vibrio* rapidly reproduces and the possibility of causing illness in consumers increases. To maintain the quality of the product, shellstock should be washed with approved water and cooled as soon as possible. Minimize exposure of harvested shellstock to heat. Place shellstock in a refrigerated environment as soon as possible following harvest. Consult your state regulatory and licensing agency to determine proper time and temperature controls for your area.

Conclusion

Through observation and enforcement of safe harvesting and handling practices, harvesters can help to protect public health, the shellfish industry, and ultimately their own livelihood. Harvesters play the most critical role in ensuring that shellfish are safe to consume. Because of their unique nature in accumulating pathogens, shellfish must only be harvested from approved waters. Shellfish harvested from contaminated waters can lead to serious illness when consumed. Even shellfish harvested from safe waters can be quickly contaminated by the discharge of human waste from onboard boating vessels. Do not dump human waste overboard in harvesting waters or in areas designated as "no-discharge-zones." Once harvested, handle and store shellfish according to storage time and temperature regulations determined by your state.

Excerpts of this article are taken from a publication of the Interstate Shellfish Sanitation Conference (ISSC) – in cooperation with the Gulf of Mexico Program. For a copy of this publication, please visit the ISSC website or call toll-free: Interstate Shellfish Sanitation Conference, (803)788-7559, www.issc.org.

SHELLFISH HARVESTING

The Safe Handling of Shellstock, Overboard Discharge and No-Discharge Zones

The Interstate Shellfish Sanitation Conference
In cooperation with
The Gulf of Mexico Program

MDMR State Rules and Regulations
Title 22 Part 01: Oyster Growing and Harvesting

The following are segments from MDMR Rules and Regulations Title 22, Part 01: Oyster Growing and Harvesting. This section is NOT intended to be comprehensive. Portions of each chapter are described below in an effort to give a brief narrative. For a full version of Title 22, Part 01, contact the MDMR.

Chapter 01: Introduction

"This section establishes the minimum requirements necessary to regulate the intrastate and interstate commerce of molluscan shellfish and to establish a program to protect the public health of consumers by assuring the sale or distribution of shellfish from safe sources and assuring shellfish have not been adulterated during landing, unloading, transporting, processing, buying, selling, opening and other shellfish-related activities in the state."

Chapter 02: Justification and Authority

"The Mississippi Commission on Marine Resources (CMR) has determined that it is in the best interest of the State of Mississippi and necessary for the protection, conservation, and propagation of all shellfish in the waters under the territorial jurisdiction of the State of Mississippi to regulate the harvesting, landing, unloading, transporting, processing, buying, selling, opening, relaying, and other shellfish related activities in the state, and the leasing of waters within the area under the territorial jurisdiction of the State of Mississippi."

Chapter 03: Definitions

Terms defined in this chapter include: Adulterated, Approved Area, Conditionally Approved Area, Illegal Moluscan Shellfish, Landed, Misbranded, Prohibited Area, Restricted Area, Sanitary Survey, Shall, Shellfish, Shellstock, Should, Unclassified Area.

Chapter 04: Legally Harvested and Properly Tagged Shellfish

"It shall be unlawful for any person, firm, or corporation to harvest, possess, land, handle, unload, open, sell or offer for sale or transport any shellfish taken from the waters under the territorial jurisdiction of the State of Mississippi except those shellfish taken legally and properly tagged from an area declared open to shellfish harvesting by public order of the CMR or as hereby authorized by the MDMR, its Executive Director, Director of Marine Fisheries, Bureau Director, Program Coordinator or other MDMR designee in accordance with the procedures outlined in this Part and its document parts."

Chapter 05: Possession of Illegal (Molluscan) Shellfish

"It shall be unlawful for any person, firm or corporation to sell or possess any illegal (molluscan) shellfish as defined in Mississippi Code Annotated §49-15-3 and as provided for in §49-15-44."

Chapter 06: Shellfish Harvesting Requirements/Specifications

"Except for oysters legally harvested on private lease sites, it shall be unlawful for any person, firm or corporation to take from the reefs of this state any oysters that measure less than three (3) inches from end to end."

Chapter 07: Dredge Specifications

"It shall be unlawful for any person, firm or corporation to take or attempt to take any oysters from the waters under the territorial jurisdiction of the State of Mississippi by the use of a dredge having a weight in excess of one hundred fifteen (115) pounds and the tooth bar cannot have more than sixteen (16) teeth and the teeth on the tooth bar cannot exceed five (5) inches unless otherwise permitted by the CMR or as hereby authorized by the MDMR."

Chapter 08: Shellfish Area Openings and Closings

"The CMR shall set the opening date of oyster season in an opening order at a regularly scheduled meeting."

Chapter 09: Harvester License and Check Stations

"It shall be unlawful for any person, firm, or corporation to take or attempt to take any oysters from the waters under the territorial jurisdiction of the State of Mississippi without first having obtained a license as specified in Mississippi Code Annotated §49-15-29, as amended."

Chapter 10: Resident, Recreational and Non-Resident Requirements

"No nonresident recreational harvest will be permitted in the State of Mississippi."

Chapter 11: Closed Shell or Cultch Plant Areas

"It shall be unlawful for any person, firm, or corporation to place or cause to be placed any material or gear used in the catching or taking of saltwater fish, shrimp, crabs or shellfish, with the exception of crab traps or pots, or hook and line fishing or cast nets on any public reef area that has been planted with shells or other cultch material that has not been released or opened to harvest by the CMR or the MDMR."

Chapter 12: Adulterated, Misbranded, or Unlabeled Shellfish and Products

"It shall be unlawful for any person within the State of Mississippi to produce, harvest, provide, purchase, sell, offer, possess, or expose for sale, or have in possession with intent to sell, any raw shellfish and shellfish products which are adulterated, misbranded, or unlabeled and no person shall hold or pack shellfish under conditions whereby the shellfish may become adulterated."

Chapter 13: Transportation of Shellstock by Vessel

"Boats or vessels transporting shellstock legally harvested and legally transported from waters outside the State of Mississippi into Mississippi unrefrigerated shall:

- Before entering Mississippi territorial waters, apply to the MDMR for a transport permit.
- Comply with all permit conditions required by the Department.
- Properly tag shellstock as described in this Part.
- Mechanically refrigerate shellstock within four (4) hours after landing such that the product is maintained at 45°F (7.2°C) or less.
- The Executive Director is hereby authorized to establish earlier checkout times, additional tagging requirements and additional time to temperature requirements of shellstock as may be required or necessary."

Chapter 14: Tonging Line

For a detailed description of the tonging line, see the previous pages of this book.

Chapter 15: Marine Sanitation Devices

"It shall be unlawful for any person, firm or corporation to discharge solid or human waste overboard any boat or vessel while said boat or vessel is in any public or private marine waters of the State of Mississippi. Each boat or vessel used in the harvest or transport of shellfish is required to have onboard a functional approved marine sanitation device (MSD), portable toilet or other sewage disposal receptacle to contain human sewage."

Chapter 16: Management Documents Associated with This Part

"The MDMR shall manage and maintain a management plan for shellfish growing waters and harvesters' operations according to the relevant specifications stated in the current National Shellfish Sanitation Program (NSSP) of the Interstate Shellfish Sanitation Program (ISSP), according to CMR Titles and Parts and requirements that are not in conflict with these specifications and according to the applicable statutes of the State of Mississippi."

Chapter 17: Management Plan for Shellfish Growing Waters

"All Areas classified as prohibited are closed to the harvesting of shellfish at all times. All Areas classified as restricted are closed to the direct harvesting of shellfish. All Areas classified as approved and conditionally approved may be open to the direct harvesting of shellfish from the time the CMR adopts as the opening date of oyster season provided the area is open pursuant to this Part and its subsequent revision and until that area is officially closed.

All unclassified areas are closed to the harvest of shellfish pending classification of the area as prohibited, restricted, conditionally approved, or approved based on a sanitary survey of the area and granting of permission to harvest shellfish in accordance with the respective classification by the CMR or as authorized in this Part: by the MDMR, its Executive Director, Director of Marine Fisheries, Bureau Director or Biological Program Coordinator."

Chapter 18: Classification and Description of Shellfish Growing Area Waters

This section gives a detailed explanation of the classification of shellfish growing waters including: prohibited areas, unclassified areas, restricted areas, conditionally approved areas and approved areas.

Chapter 19: Regulations for Relaying Activities

This section describes all regulations imposed during relaying events.

Chapter 20: Penalties

"Any unlawful act under this Part committed by any person, firm, or corporation shall be deemed a violation of the provisions of this Part and shall constitute a misdemeanor and upon conviction shall be punished in accordance with Mississippi Code Annotated § 49-15-63, as amended, unless a penalty is specifically provided elsewhere in the Mississippi Code Annotated of 1972, as amended.

Any person, firm, or corporation convicted of taking shellfish from leased land or from closed waters as described in Chapter 17 of this Part shall, upon conviction thereof, be subject to all the penalties provided under Mississippi Code Annotated § 49-15-27, as amended. Violations of more than one chapter or subchapter of this Part or Part thereof shall be considered separate offenses and punished as such.

Any person in possession of shellfish in violation of any chapter of this Part shall be subject to confiscation and disposal of such shellfish by direction of any designated Marine Patrol Officer of the MDMR."

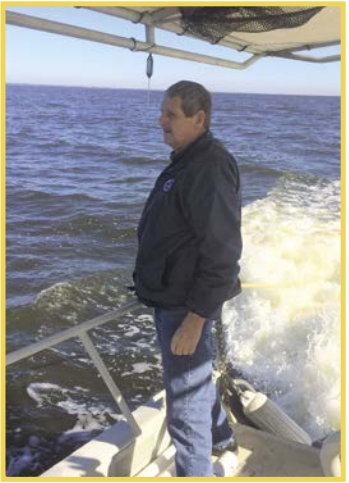
Chapter 21: Chapters and Subchapters Declared Separable

"Each chapter and subchapter of this Part is hereby declared separable, and if any chapter or subchapter or Part thereof shall be held invalid or unconstitutional, the balance of said Title 22 Part 01 shall remain in full force and effect. Violations of more than one chapter or subchapter of this Part or Part thereof shall be considered separate offenses and punished as such."

Chapter 22: Administrative Procedures Act

"Pursuant to the amendments to the Administrative Procedures Act, § 25-43-1.101, et seq., of the Mississippi Code Annotated of 1972, as amended, and the rules and regulations promulgated pursuant thereto by the Secretary of State; the former Ordinance 1.016 has been modified and the CMR and MDMR have adopted the terminology and numbering system developed by the Secretary of State. Therefore, references to "ordinance" or to "Part" appearing in these regulations or the underlying statutes are used interchangeably and refer to the same instrument."

Water Sampling Program

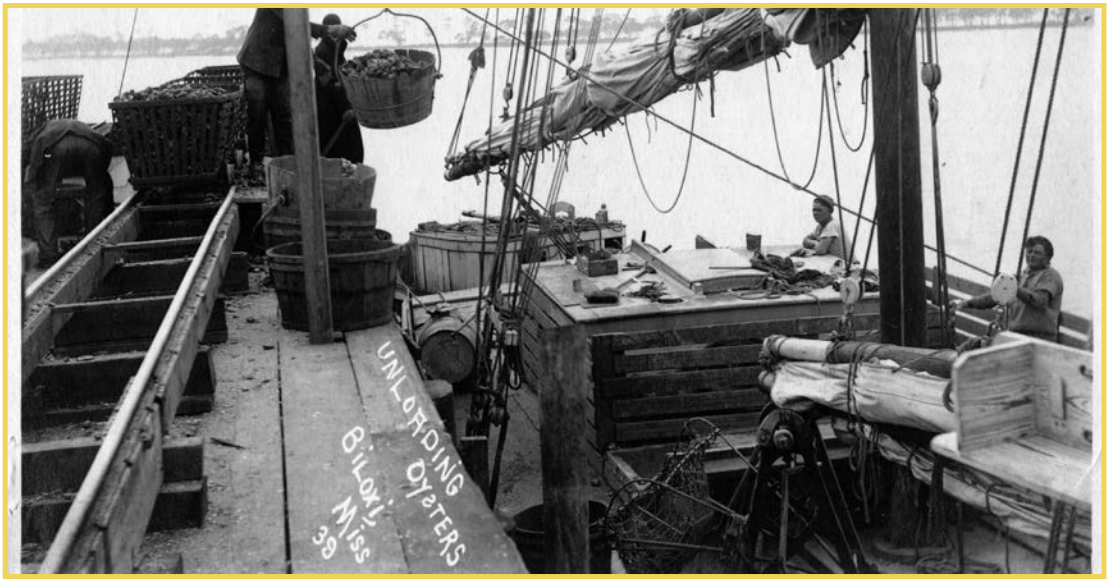


The MDMR Shellfish Bureau performs routine water quality analyses for the presence of fecal coliforms. Fecal coliform bacteria are indicators of potential water contamination from human and animal waste. These results allow MDMR to monitor contamination within harvestable areas. In addition, water sample results are used to properly classify oyster growing waters as approved areas, conditionally approved areas, or restricted areas.

Fecal coliform bacteria are an indicator organism. Oysters are filter feeders and concentrate substances that have been filtered from the surrounding water. Oysters are often consumed raw; therefore, good water quality is imperative to oyster harvest where the product is meant for raw consumption. Areas are closed if the conditional criteria are exceeded. Areas may be opened or reopened after acceptable sample results are received. In addition to water sampling, MDMR Marine Scientists use various weather stations across the Mississippi Gulf Coast to monitor the river stages, total rainfall amounts and water temperature on a daily basis when oyster season is open for harvest.

MDMR has designated 8 shellfish growing zones known as 'Areas' across the MS Sound. These special zones begin with Area 1 at the MS/Louisiana state line and end with Area 8 at the MS/Alabama state line. Within each area there are compliant water sample stations that are sampled for fecal coliform to ensure the area maintains safety compliance for human consumption of shellfish. Sample stations are located between the actual or potential pollution source (shoreline, river, etc.) and the oyster reefs. There is a total of 170 water sample stations: 57 are primary stations (aka. compliance stations) and 113 are secondary stations. MDMR conducts between 1,500 to 2,000 water samples per year.

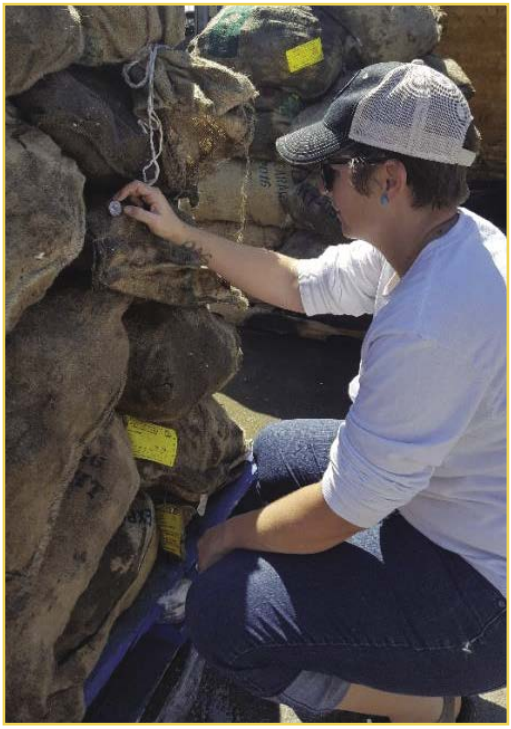
MDMR maintains compliance of harvest zones by using the standards set forth by the Interstate Shellfish Sanitation Conference's (ISSC's) National Shellfish Sanitation Program (NSSP) Model Ordinance. All compliance water sample stations from each of the eight (8) areas must have a minimum of five (5) samples collected while the area is opened to harvest, generally from October to April of each year. In addition, compliance stations are monitored during open harvest to ensure good water quality.



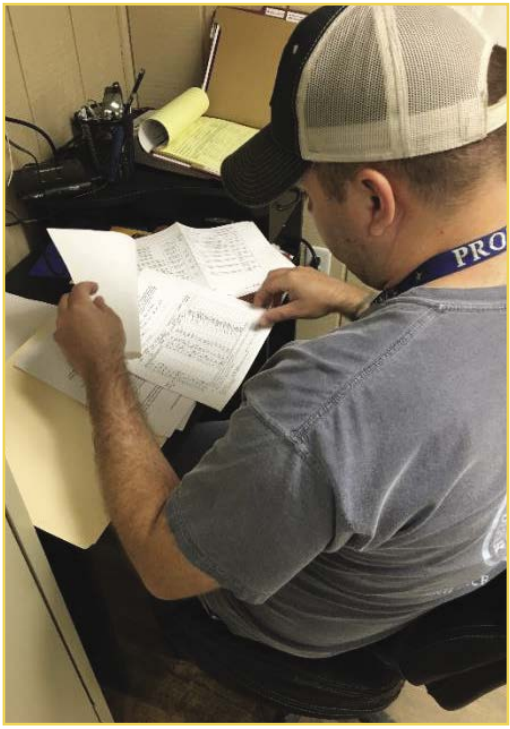
Source: Local History and Genealogy Department Image Collection / Biloxi Public Library / Harrison County Library System

Time and Temperature Regulations on Harvesting Oysters

There are several pathogens associated with the consumption of oysters that can cause illnesses. One such pathogen is *Vibrio*. *Vibrio* is a naturally occurring bacteria found in the Gulf of Mexico and is present in higher concentrations in warmer weather. If *Vibrio* is present in an oyster the growth rate will increase when exposed to higher temperatures. Higher concentrations of *Vibrio* within an oyster can increase the likelihood of illness. To decrease infections, Mississippi implements a *Vibrio* Management Plan. This plan includes time and temperature controls limiting the exposure to warmer temperatures. The plan is active during months with an average water temperature above 70°F. During *Vibrio* Management months, the MDMR will set time restrictions on harvesting and time/temperature requirements for primary certified dealers.

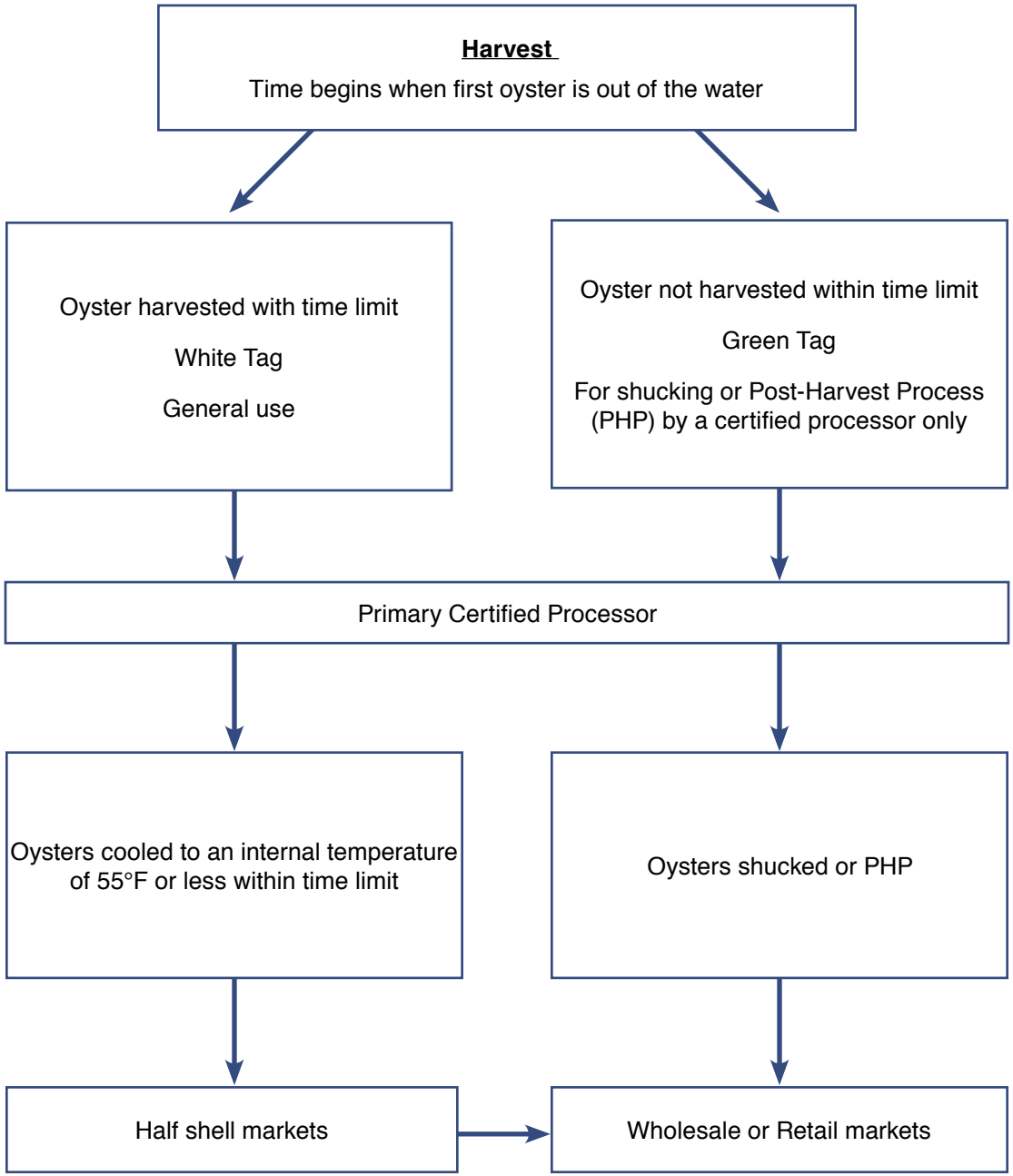


MDMR Seafood Officer Jessica Rankin measuring internal meat temperature



MDMR Seafood Officer Jeff Davis reviewing dealer records

Vibrio Management Flow Chart



Oyster Trip Ticket Program

The Oyster Trip Ticket Program is designed to keep track of all oysters harvested from Mississippi waters. Oystermen complete a notification slip each morning and place the slip in a drop box before they begin harvesting oysters. The notification slips are removed from the drop box each morning and the information is entered into the trip ticket database. When the harvester returns from harvesting oysters, they report to the check station and present their license number. This license number is entered into the trip ticket program and the information for that harvester's daily trip is recorded onto a trip ticket.

Each trip ticket consists of the following information (refer to the following page to observe a sample of the trip ticket):

- Trip ticket number
- Vessel ID number
- Boat name
- Fiscal year
- Inspectors initials
- Date
- Depart time
- Return time
- Commercial or recreational
- Type and number of gear used
- Area harvested
- Reef harvested
- Number of crew aboard the vessel
- Fishing license number
- License type
- Last and first name of the boat owner
- Tag sequence
- Personal use
- Total sacks harvested
- Sacks sold in state
- Sacks sold out-of-state
- Sacks taken home for commercial use
- Sacks taken home for personal or recreational use
- Shell retention fee received
- License number of the dealer purchasing oysters

Each trip ticket must have the inspector's initials in order for it to be a valid trip ticket. After each trip ticket is completed and the shell retention fee is collected for the number of sacks harvested, the trip ticket is then printed and the harvester is given three carbon copies of the four pages. The original page is retained by MDMR Staff and the harvester is given one white page, one green page, and one yellow page. The harvester then takes the copies to the dealer that is purchasing oysters.

The dealer fills in the bottom portion supplying the MDMR with additional information including the number of sacks purchased from the harvester and the price of each sack. The harvester retains the yellow page for personal records. The dealer retains the second white page and the green page. At the end of each month, the dealer submits all white copies to MDMR Shellfish Bureau. The data collected on these white copies are entered into the trip ticket database. MDMR issues an invoice to the dealer for the sacks purchased. The dealer then pays the shell retention fee that is due to the state for each sack purchased. This database allows the MDMR to keep track of sacks harvested from each oyster reef.

Trip Ticket Number

0637249

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES

OFFICE OF MARINE FISHERIES
1141 BAYVIEW AVENUE, SUITE 101
BILOXI, MS 39530
(228) 374-5000 OR 1-800-374-3449

Continuation Number | Vessel ID | Boat Name

FY | Ck St | Inspector | / / Date | : Depart Time | : Return Time | Void

Commercial

Recreational

Type Gear | No | Area | Reef | Crew | Fishing License Number | Lic Type

Captain: Last Name | First Name

Void | Tag Sequence | PCR

Total Sacks Harvested

Sacks Sold In State

Sacks Sold Out-Of-State

Sacks Taken Home (Commercial Only)

Sacks Taken Home (Pers / Rec Use Only)

NOTE: SHELL RETENTION FEE WILL BE ASSESSED IN ACCORDANCE WITH §49-15-46 MS CODE

$.

Shell Fee Recieved

Sacks Sold To: (Dealer License No.)

INSPECTOR INITIALS

This area used by DMR office only.

FORM NO: **OTT-1**

ORIGINAL - DMR

Mississippi Oyster Tags

The Mississippi Department of Marine Resources (MDMR) revised the state's oyster tags in April 2019. The goal of these changes was to be consistent with other Gulf States oyster tagging systems. Consistency of tag colors among Gulf States will eliminate confusion when product arrives in dealer facilities. The previously yellow, commercially harvested tag became a white tag and new wording was added to the reverse side. The green tag changed meaning from personal use to restricted use, and also displays new wording on the reverse. The red tag which was previously a recreational tag has now become a personal use tag encompassing both recreationally harvested oysters and personal take home oysters by a MS harvester.

Statements made on all tags follow the Interstate Shellfish Sanitation Conference (ISSC), National Shellfish Sanitation Program (NSSP) Model Ordinance. The purpose of the NSSP is to promote and improve the sanitation of shellfish through federal and state cooperation and encourage uniformity of State shellfish programs. Harvesters must place one of the three types of tags on each oyster parcel at the time of landing. These tags may be purchased at one of the MDMR facilities during operating hours. The following is an explanation of each type of oyster tag distributed in Mississippi.

- **COMMERCIAL TAGS** are white. The front side of the tag includes the following information: the harvester's name, license number, date of harvest and harvest area. It also states the type of crustacean, the quantity and an individual tag number specific to that tag. The reverse side displays the dealer's information including company name, address, certification number, and original shellstock shipper certification number. This side also displays consumer advisory statements in compliance with the ISSC NSSP Model Ordinance.

- **RESTRICTED USE TAGS** are green. The front and back side of this tag includes the same information as the commercial tag however it also includes the statement: *For shucking by a certified dealer or post-harvest processing only.* These oysters are not intended for raw consumption. A green tag signifies restrictions to the lot of oysters as deemed necessary by the regulating authority. These restrictions are set forth by the ISSC NSSP Model Ordinance.

- **PERSONAL USE TAGS** are red. The front side of this tag includes the same information as the commercial tag. The reverse side of the tag displays the following notice: *Recreationally harvested oysters*. Sale prohibited by law. If a parcel of oysters displays a red tag, this parcel is for personal consumption and cannot be sold. Recreational and commercial harvesters are only allowed to harvest three personal oyster parcels in a seven-day period.

Notification Slip

Oystermen must complete a notification slip each morning before leaving the harbor to harvest oysters. This slip is placed in a drop box located in or near a state oyster check station before the oystermen leave the harbor for harvest. The intention of this notification slip is to allow check station staff to input license data into the trip ticket program before the harvester returns to the check station to purchase oyster tags. The notification slip includes the following information:

1. The vessel identification number which is either the state registration number or documentation number for the vessel. The state registration number will begin with letters representing the state of vessel registration including: MI for Mississippi, AL for Alabama, LA for Louisiana, etc.
2. The name of the vessel used for harvesting oysters.
3. The time the vessel left the dock to harvest oysters.
4. License type (either commercial or recreational).
5. License type (either dredging or tonging).
6. The number of either dredges or tongs used during harvest (usually one or two).
7. The area where the oysters were harvested, which will be: 2A, 1B, 2B, 2D, 2E, 2F, 2G, 2H or 2I. Refer to the map on pages 15-16 of this book to view the layout of areas in the western Mississippi Sound.
8. The name of the reef harvested (Pass Christian, Pass Marianne,Telegraph, etc). Again, refer to the map on pages 15-16 of this book to view the reef names.
9. The vessel's oyster license number.
10. Type of license registered (either in state or out of state license).
11. The name of the person listed on the oyster license.
12. The code for license type. This code will be a number corresponding to the state of license holding and the type of harvesting including: recreational, commercial dredger or commercial tonger. This chart shows a few of the most common codes used for license type in MS.

Code	License Type
5	MS Recreational License
6	MS Commercial Tonger
7	MS Commercial Dredger
8	Out of State Tonger
9	Out of State Dredger
14/39	Louisiana Dredger
29	Louisiana Tonger
98	MS On-Bottom Oyster Aquaculture
99	Out of State On-Bottom Oyster Aquaculture

Codes used in Mississippi for Each License Type

13. Number of people on board the harvesting vessel, including the captain.

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES
OYSTER NOTIFICATION SLIP

Vessel ID Number:_____ 1 Vessel Name:_____ 2

Date:_____ Time Out:_____ 3 Comm ❑ 4 Rec ❑ Dredge ❑ 5 Tong ❑

# of Gear:_____ 6 Reef Area:_____ 7 Reef Name:_____ 8

License Number:_____ 9 In State ❑ 10 Out of State ❑

License Harvester Name: _____ 11 Lic Type: _____ 12

Captain's Name: _____ # Of Crew:_____ 13

Oystermen must complete this notification slip each morning before leaving the harbor to harvest oysters.

Oyster Reef Cultch Planting

Oyster cultch is clean, hard material placed in suitable areas, upon which oyster larvae can attach and grow. Typically, this material includes: oyster shell, limestone or crushed concrete. The goal of the Mississippi oyster cultch planting program is to restore and enhance oyster reefs within the existing footprint of oyster harvest areas. Oyster cultch plant areas are routinely surveyed to identify potential enhancement and restoration opportunities.

Danny Ross, Former MDMR Marine Fisheries Technician, measures a barge of limestone for cultch planting.

Mississippi Cultch Plant History

YEAR	Reef Name	Cultch Material	Cubic Yards	Acreage
1997	Telegraph Reef	Oyster Shell/Concrete		328.4
	Kittiwake Tonging Reef (Long Beach)	Oyster Shell		
	St. Stanislaus Reef	Oyster Shell		
	Waveland Reef	Oyster Shell		
1999	Telegraph Reef	Crushed Concrete		20.0
2000	Square Handkerchief Reef	Oyster Shell		165.0
	Point Clear Reef	Oyster Shell		
	St. Joe Reef	Oyster Shell		
2001	Pass Christian Reef	Oyster Shell		50.0
	Pass Christian Reef	Oyster Shell		50.0
2002	Henderson Point Reef	Oyster Shell		80.0
	Telegraph Reef	Oyster Shell	3,950.0	80.0
2003	Kittiwake Tonging Reef (Long Beach)	Oyster Shell		14.0
	Telegraph Reef	Limestone		85.0
	Between the Bridges, Bay St. Louis	Oyster Shell		5.0
	St. Stanislaus Reef	Oyster Shell		14.0
	Square Handkerchief Reef	Oyster Shell		65.0
2004	Square Handkerchief Reef	Oyster Shell		60.0
	Telegraph Reef	Oyster Shell		90.0
2005	Telegraph Reef	Limestone		215.0
	Kittiwake Tonging Reef (Long Beach)	Oyster Shell		10.0
	Henderson Point Reef	Oyster Shell		75.0
2006	Henderson Point Reef	Oyster Shell	5,022.0	50.0
	Telegraph Reef	Limestone	9,352.0	125.0
2007	St. Louis Bay Reef	Oyster Shell	439.0	4.0
	Biloxi Bay Reef	Limestone	1,763.0	10.0
	Henderson Point Reef	Limestone		108.0
	Pass Marianne Reef	Limestone	37,000.0	375.0
	Pass Christian Reef	Limestone	20,168.0	200.0
2008	Pass Christian Reef	Oyster Shell	24,196.0	1,600.0
	Pass Marianne Reef			
	Henderson Point Reef			
	Pass Christian Reef	Limestone	24,444.0	
	Pass Marianne Reef			
	Henderson Point Reef			
2009	Pass Marianne Reef	Oyster Shell	6,042.0	292.0
	Pass Christian Reef	Limestone	14,330.0	
	Pass Marianne Reef			
	St. Joe Reef			
	Pass Christian Reef	Oyster Shell	14,961.0	283.0
	Pass Marianne Reef			
	Pass Christian Reef	Limestone	23,589.0	500.0
	Pass Marianne Reef			

YEAR	Reef Name	Cultch Material	Cubic Yards	Acreage
2011	Henderson Point Reef	Oyster Shell	17,606.0	175.0
	Pass Marianne Reef	Oyster Shell	30,000.0	1,043.0
	St. Joe Reef			
	Henderson Point Reef	Limestone	34,861.0	
	Telegraph Reef			
	Pass Marianne Reef			
	Pass Christian Reef			
2012	Pass Christian Reef	Limestone	20,372.4	200.0
2013	Pass Christian Reef	Limestone	120,807.0	1,030.0
	St. Joe Reef			
	Pass Marianne Reef			
	Pass Christian Reef	Oyster Shell	20,000.0	200.0
	Henderson Point Reef			
	St. Louis Bay Reef	Oyster Shell	1,068.0	10.0
	Biloxi Bay Reef	Oyster Shell	2,467.0	25.0
2014	Biloxi Bay Reef	Oyster Shell	2,350.0	20.0
			200.0	
	Pass Christian Reef	Limestone	27,502.0	250.0
	Pass Christian Reef			
2017	Pass Christian Reef	Limestone	22,315.0	352.7
	Henderson Point Reef			
	Pass Marianne Reef			
	St Joe Reef			
	Waveland Reef			
	Pass Christian	Limestone	11,258.5	162.0
	Pass Christian			
	Henderson Point			
	St Joe			
	Pass Marianne			
2018	St. Joe Reef	Limestone	16,805.6	144.0
	Pass Christian			
	Pass Christian			
	Henderson Point			
	Pass Marianne			
	St. Joe Reef	Limestone	9,307.5	93.0
	Pass Christian			
	Henderson Point Reef			
	Pass Marianne Reef			
	St. Stanislaus Reef			
	Henderson Point Reef	Oyster Shell	3,345.0	33.0

Oyster Reef Cultivation

Cultivation of oyster reefs is the process of using bagless dredges, or a similar apparatus to drag over the shells. The primary purpose of cultivation activity is to sufficiently clean fouling organisms and sediment from shells, exposing clean shell material, thereby making the reef more conducive to an oyster spat set. For this primary purpose, the timing of the cultivation activity is critical to a successful spat set. Too far in advance of a spat set, and the material may become re-fouled. Too late, and the spat set will be missed. Secondary beneficial purposes include breaking up clusters of oysters for a more even distribution of the reef, and to help reduce hooked mussel infestations.

A Bagless Dredge Used for Cultivation

Culling Oyster Clusters

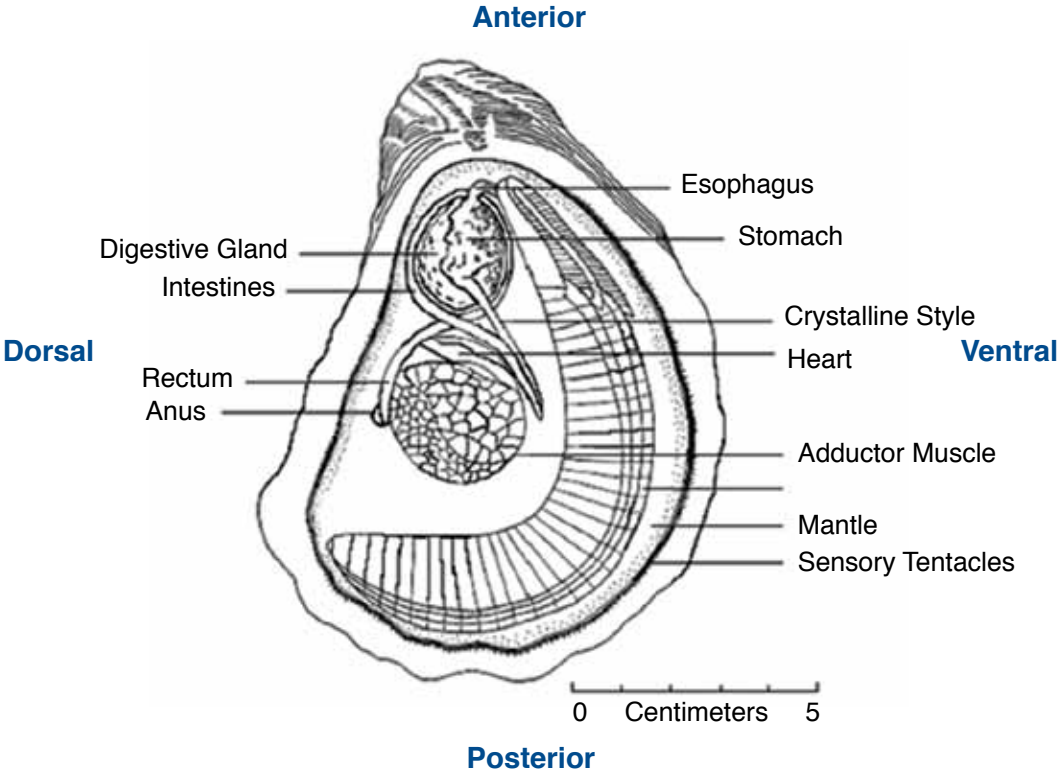
Culling oysters is the process of removing undersized oysters, dead shell, or cultch material from a live market oyster. Mussel growth and juvenile oysters naturally attach to hard substrate such as other oyster shells for stationary growth. It is important to remove this extra material from the live market oyster to ensure the quality of the oysters. The correct equipment is essential for effective culling. Such equipment includes a small hatchet, a piece of flat bar, or a traditional culling tool. Culling ensures that all material including undersized oysters are returned to the reefs for future growth and sustainability.

Oyster Reef Relay

The primary purpose of a relay project is to move viable oysters from areas of higher abundance into areas with lower abundance, or into areas more favorable to their growth and survival. This project utilizes commercial fishermen to harvest the oysters from the original donor area, and having the contracted fishermen unload the oysters onto a contractor's barge for transport to and deployment on the receiving area. Biologists conduct biological sampling before relaying begins to measure and count the oysters in a specific area. A major consideration is whether the oysters are of sufficient size to survive any injury from dredging.

Oysters are taken from a productive reef and loaded onto a barge for relocation.

Anatomy of an Oyster



General anatomy of an oyster viewed from the right side with the right valve removed (Galtsoff 1964).

How long can an oyster live?

An oyster can live 20-30 years, depending on the species. Some may live longer, based on the body of water and the algae it consumes.

How do oysters reproduce?

Under natural conditions, oysters spawn as water temperatures rise in the spring. The temperature at which spawning occurs varies from north to south. Southern oysters spawn at temperatures above 68°F (20°C) while northern oysters spawn at temperatures between 60° and 68°F (15.5° and 20°C). Spawning can occur throughout the warm months. Sperm and eggs are released at the same time and fertilization occurs in the water column. Eggs are fertilized in the water, outside of the oyster's body, resulting in a low survival rate. When successful, a tiny larvae forms. Young oysters progress through

several developmental stages. Fertilized eggs hatch into oyster larvae called trocophores. Only one percent of larvae reach the next stage of development. Those that survive become veligers and begin to swim and drift, feeding on tiny plants. Eventually, the veliger becomes a pedi-veliger, producing a foot-like formation and settling onto a hard, clean substrate. Once there, the juvenile oyster, called a 'spat', attaches itself to the substrate with a cement secretion from a gland in the foot. Here, it will spend the remainder of its life.

How does an oyster eat?

Oysters are filter feeders, meaning they pump water through their gills by opening and closing their shell. Each adult oyster filters and cleans approximately 50 gallons of water per day ingesting algae or phytoplankton in the process. In addition to phytoplankton, the oysters consume anything that is in the water including zooplankton, larvae and detritus. The flavor of an oyster usually is influenced by the algae oysters filter, the depth in which it is growing, as well as the amount of salt in the water it filters.

Are oysters male or female?

Oysters are protandric, meaning they are all born male. A portion of the population converts to female after birth so the species can reproduce. But if an oyster colony (called a 'bed') ends up lacking males, some females will convert back to being male to balance out the sexes.

It is impossible to differentiate male oysters from female oysters by examining their shells. The gonads (organs responsible for producing both eggs and sperm) surround the digestive organs and are made up of sex cells, branching tubules and connective tissue.

Do all oysters develop pearls?

Pearls do occur in Mississippi oysters, but are extremely rare, and are usually poor quality. A pearl begins as a grain of sand that becomes trapped inside the oyster and is covered in calcium as a defense mechanism of the oyster. In order to protect itself from irritation, the oyster will quickly begin covering the uninvited visitor with layers of nacre — the mineral/organic matrix substance that fashions the mollusk's shells. Layer upon layer of nacre, also known as mother-of-pearl, coat the grain of sand until the iridescent gem is formed.

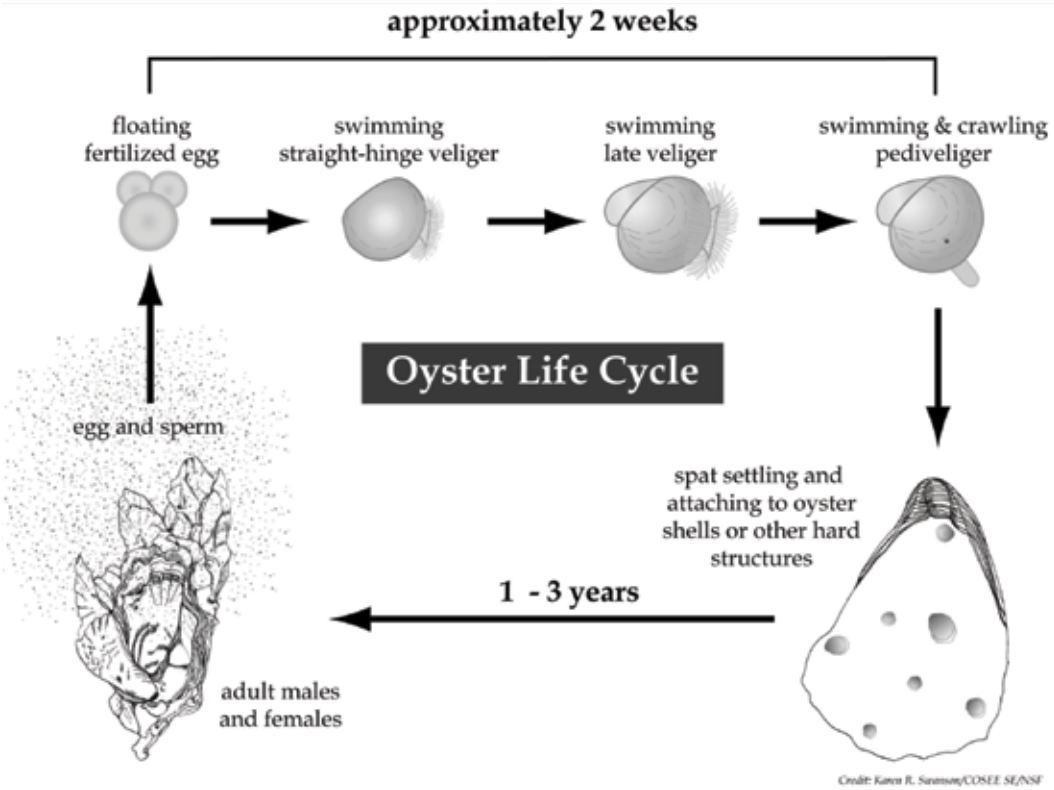
Cultured pearls are made in the same way. The only difference is that instead of accidental circumstances, a "pearl farmer" embeds a grain of sand into the mollusk. The pearl known to the jewelry industry is cultivated mostly in the South China Sea. The pearl oyster is called a Rock Oyster, Crassostrea malagrina, and is only farmed for pearl-culturing purposes. A quarter-inch pearl requires almost 10 years to grow in nature, but in a controlled environment, it can be accomplished in a third of the time.

Excerpts taken from "*An Oyster Manifesto*" by Mark Mavrantonis; "*Guide to Oysters From European Flats to Pacifics*" By Molly Watson; Fisheries and Oceans Canada, Underwater World, The American Oyster; Live Science, "*How Do Oysters Make Pearls?*" by Michelle Bryner, Life's Little Mysteries Contributor

Oyster Life Cycle

score.dnr.sc.gov

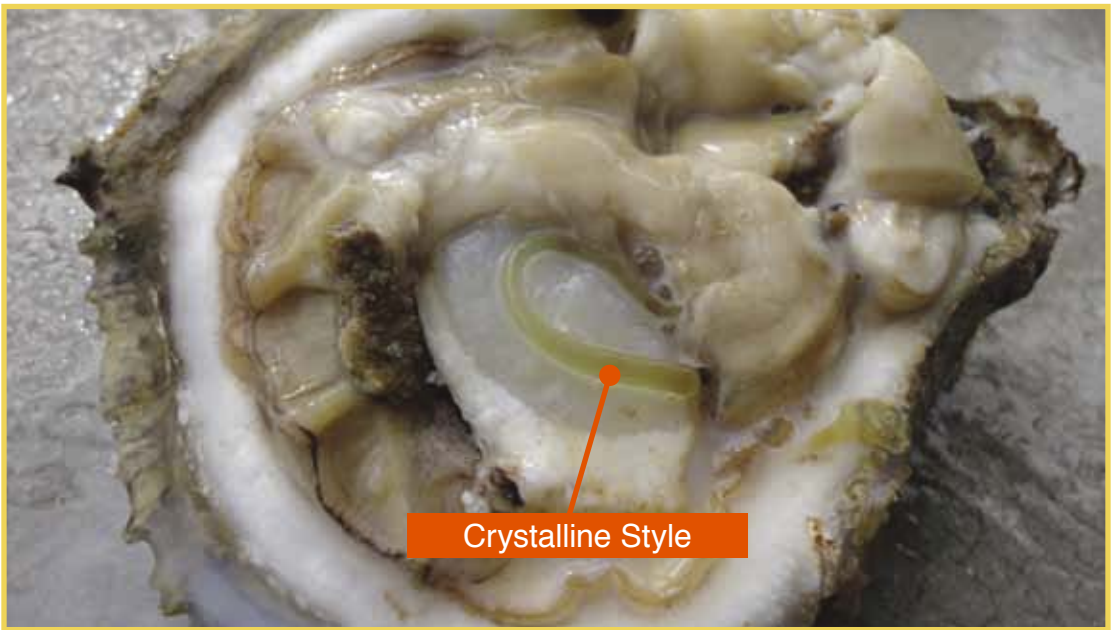
Adult oysters begin reproduction when water temperatures become greater than 68°F (~20°C). Oysters are broadcast spawners, meaning they release eggs and sperm into the water column. A fertilized egg develops into a planktonic (free-swimming) trochophore larva in about six hours. A fully shelled veliger larva is formed within 12 to 24 hours. The larva remains planktonic for about three weeks. Towards the end of this period it develops a foot (hence, pediveliger) and settles to the bottom of the water column where it seeks a hard substrate. When a suitable surface (ideally adult oyster shell) is located, the larva cements itself and metamorphoses to the adult form. This newly attached oyster is known as a "spat."



Information and illustration courtesy of South Carolina Department of Natural Resources. More information can be found at the following website: http://score.dnr.sc.gov.

Crystalline Style

The crystalline style or style sac is a long gelatinous, jelly-like protein rod found in oysters and other gastropods. The main function of the crystalline style is the digestion of food particles. The top of the crystalline style has a bulging head protruding inside the stomach wall and resembles a translucent worm. Due to the remarkable resemblance of a worm, it is often mistaken as a parasite by people shucking fresh oysters. Its color ranges from a deep yellow to brown depending on the food being consumed. The crystalline style rod rotates clockwise against the gastric shield to grind algae or phytoplankton and releases enzymes to help aid and digest them as food. The presence of the crystalline style indicates that the oyster is healthy and feeding. When the oyster is taken out of the water, the crystalline style is reabsorbed and disappears in two to three hours.



The crystalline style functions to digest food particles. It is often mistaken for a parasite since it resembles a worm.

The Southern Oyster Drill

The Southern Oyster Drill, *Stramonita haemastoma*, can be found throughout the Gulf of Mexico. Oyster drills are one of the most devastating predators to oysters. The drill's rate of feeding usually increases during the warmer months. They do not like colder water and will stop feeding at about 54°F (12°C). Drills prefer salty water above 15 parts per thousand (ppt), but can tolerate fresher water as low as 8 ppt.

Adult Oyster Drill in It's Shell

DID YOU KNOW?

Hermit crabs often use discarded oyster drill shells as their homes. The hermit crab does not make its own shell.

Hermit Crab in Drill Shell

The oyster drill uses a radula, or tongue-like projection with teeth, to open the oyster and then digest the meat. They can consume one large oyster every few days. Drills are devastating to oyster reefs because of their large population. They lay their eggs in creamy yellow casings. Once the eggs hatch or the casings have dried out, the casings turn purple. These egg casings can each contain up to 900 embryo. These animals can also overwhelm an oyster reef by eating young oysters called spat. One drill can consume over 100 spat per day.

Information derived from "Marine Maladies? Worms, Germs, and Other Symbionts From the Northern Gulf of Mexico" by Robin M. Overstreet

Oyster Drill Egg Casings attached to a hatchet

Oyster Drill Egg Casings

Oyster Drill Egg Casings

Hooked Mussels

The Hooked Mussel (*Ischadium recurvum*) is native to the northern Gulf of Mexico, and is found in coastal Mississippi waters as a member of oyster reef ecosystems. Hooked Mussels thrive in lower salinity estuarine habitat, where they grow on similar substrate to oysters. Hooked Mussels attach themselves to a suitable surface with byssal threads. Hooked Mussels can be a major problem to oyster reefs because live oysters are a preferred substrate. However, a Hooked Mussel is not a parasite. Instead, it is a symbiont. Symbionts are different organisms that live together. This relationship can be helpful, harmful, or have no effect on the organisms. As it turns out, hooked mussels do not directly harm the oysters they are living on. However, thick aggregations of mussels can have some negative results. Because hooked mussels are competitors of oysters, mussels and oysters compete for food and substrate. Also, clusters of hooked mussels can be a nuisance to oyster harvesters. Thick clusters of mussels can decrease harvesting efficiency, leading to increased harvest times and culling.

Predators of Hooked Mussels

Crabs are a natural predator of Hooked Mussels. Of all the crab species of the Mississippi Sound, the Blue Crab (*Callinectes sapidus*) has been shown to be the most prominent predator of Hooked Mussels. Studies have also shown that Blue Crabs can help control Hooked Mussel populations.

Another prominent predator of Hooked Mussels is the Black Drum (*Pogonias cromis*). Black Drum have strong jaws suitable for crushing shells of mussels, oysters, and crustaceans.

What can we do?

The MDMR uses bagless oyster dredges to cultivate oyster beds. By dragging the bagless dredges over the oyster reefs, mussel clusters are broken apart allowing crabs access to the mussels.

Hooked mussels attach themselves to a suitable surface with byssal threads.

Bagless Oyster Dredge Used for Oyster Cultivation

Oysters Parasitic Relationships

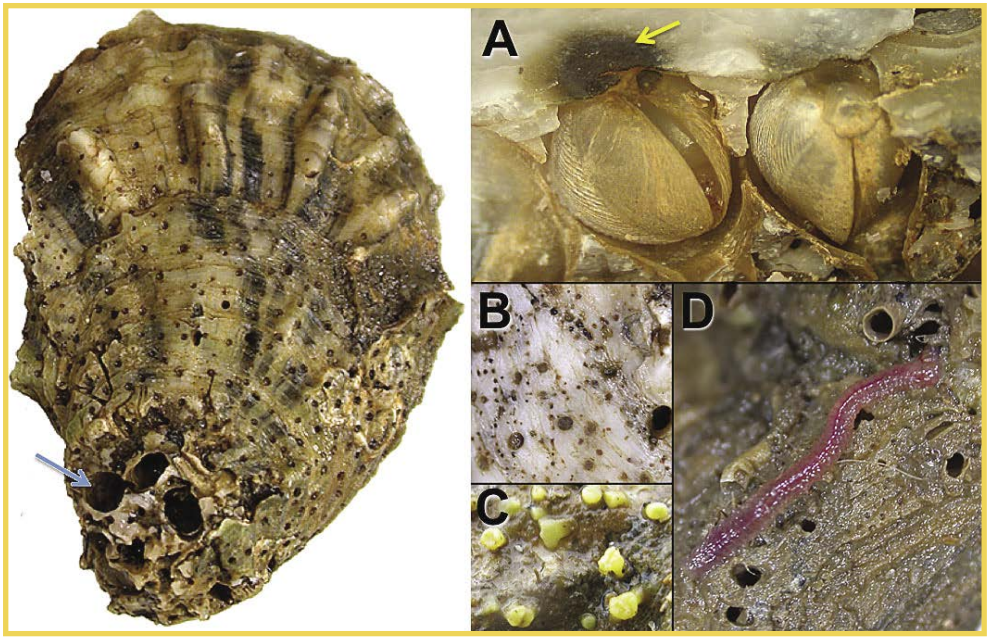
In Biological terms, a parasitic relationship occurs between two species of plants or animals where one organism, the parasite, lives off another organism, the host. The parasite lives on or in the body of the host species and at the detriment of the host species. The parasite may consume body tissues or deprive the host species of needed nutrients weakening the health of the host and potentially leading to death. There are a few examples of parasitic relationships involving the American Oyster (*Crassostrea virginica*) in the northern Gulf of Mexico where the oyster acts as a host to a parasite.

The Boring Clam – The Boring Clam (*Diplothyra smithii*) is a small, pear-shaped bivalve mollusk and parasite that excavates a space in the shell of an oyster to live. The clam mechanically bores a globular burrow in the host by use of abrasive spines on the ridge of the clam's shell. Although the clam is a filter feeder and does not consume nutrients from the oyster meat, it's burrowing process weakens the oyster's shell and triggers the oyster to expend energies reinforcing the interior wall of the shell. Boring clam activity can be identified on oyster shells by the presence of oblong burrow holes in the shell that may be as large as 12mm in diameter.

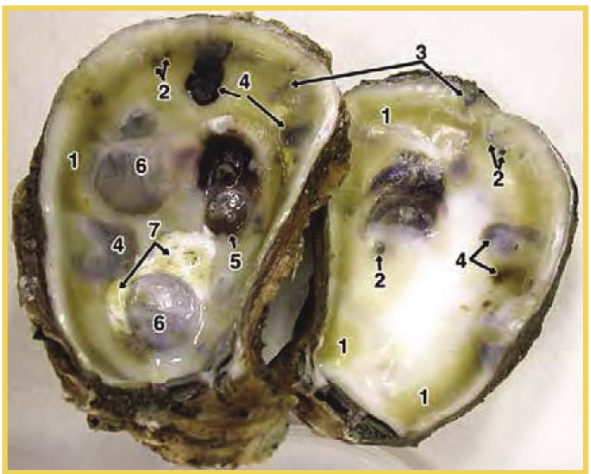
The Boring Sponge – The Boring Sponge (*Cliona spp.*) is a parasitic sponge found in Mississippi oyster populations that will chemically etch cavities throughout the oyster shell and take up residence in the shell substrate. The Boring Sponge is a filter feeder drawing water through tiny pores to filter out plankton for consumption. The boring sponge is generally yellow in appearance and will create numerous small round holes on the outer surface of the oyster's shell, usually less the 3mm in diameter, forming a tunnel system in a honeycomb pattern. These tunnel systems may weaken the oyster's shell leaving it susceptible to predators and causing the oyster to expend energies repairing its shell.

The Mud Worm – The mud worm (*Polydora websteri*) is a marine worm that makes its home inside of a living oyster's shell. The boring mechanism of the worm is predominately a chemical process whereby the worm secretes an acid that dissolves the shell material creating a U-shaped tube filled with mud and debris that is commonly known as a "mud blister". If this tube penetrates the interior of the shell, the oyster must expend energies to seal out the intruding parasite. Mud worms, somewhat resembling a centipede, are red in color and can be as large as 20mm long. Not only do oysters infected by mud worms have weaker shells and increased mortality rates, but they are also less desirable to the commercial market due to the diminished appearance of the shell.

Overstreet, R.M. 1978. "Marine maladies? Worms, germs and other symbionts from the northern Gulf of Mexico." Miss.-Ala. Publ. Oceans Springs, Miss. MASGP- 78-021. 140pp.



Shell parasites observed in Apalachicola Bay oysters 2012-2013. The whole oyster shell on the left shows evidence of several types of parasite damage. The blue arrow points to one of several larger holes formed by boring clams (*Diplothyra smithii*). Also evident are numerous smaller holes associated with the boring sponge, *Cliona spp.* Panel on the right shows close up images of common Apalachicola Bay oyster shell parasites. Panel A shows two boring clams seen at the edge of a shell that was fractured to reveal the parasites. Note the black spot (yellow arrow) associated with the clam's activity on the inner nacreous layer of the shell. Panel B shows close up of exterior shell holes bored by *Cliona* sponge. In life, this sponge organism is yellow and protrudes from the shell holes (Panel C). Panel D shows one of two types of polychaete worms, *Polydora*. This worm forms tubes within the shell, and can cause the oyster host to wall off this invader by forming mud blisters on the inside of the shell.



Internal shell observations associated with parasites from Apalachicola Bay oysters. Observations are described by number.

1 Yellowing. This discoloration in the nacreous layer is deposited by the mantle under stressful conditions.

2 Black spots associated with *Diplothyra* clams living within the shell

3 Burrowing tubes at periphery of shell. These are points of access for boring *Polydora* worms.

4 Enlarged Polydora burrows within shell

5 Mud Blister. This "blister" is formed when *Polydora* worms penetrate the nacreous layer of the shell. The oyster host expends energy to secrete more nacre to wall-off the invader.

6 Long-standing mud blisters with thicker layer of nacre walling off the worm

7 Chalky deposits. These white deposits are also laid down by the mantle under stressful conditions.

Excerpt taken from: *Apalachicola Bay Oyster Situation Report, 2013*

Dermo

Dermo is the common name for a parasitic disease that occurs in the American Oyster. It is caused by the protozoan *Perkinsus marinus* (syn. *Dermocystidium marinum*) and often leads to oyster mortality. It poses no known hazard to human health, but it does have the potential to devastate entire oyster reefs.

Without lab tests, it's difficult to tell if an oyster is infected. However, oyster tissue infected with Dermo often exhibits a yellowish appearance and a shrunken size.

After death, oysters will have a characteristic gaping shell. In the picture below, you will see an example of both a healthy oyster and an infected oyster.

Trophozoites of Perkinsus marinus, the microscopic protozoan responsible for Dermo infection in oysters.

Healthy oyster (left) vs. infected oyster (right.)

Dead oyster cluster, possibly from a Dermo infection, exhibiting gaping shells.

Most of the Dermo life cycle happens inside the oyster. The parasite divides, enlarges, and forms daughter cells. The infection is usually spread upon the death of an oyster or when the infection reaches high enough levels.

Dermo cells occasionally form zoospores. This mobile version of the parasite has the ability to swim. Dermo growth increases when both water salinity and water temperature are high. It is often present in low numbers throughout winter months, but increases rapidly when the temperature rises above 77°F (25°C). The growth of Dermo is suppressed in areas with salinities below eight to ten parts per thousand, and will proliferate if infected oysters from these areas are exposed to higher salinities.

What can we do?

There is little that we can do to prevent Dermo infection; however, oyster reef managers may recommend certain measures be taken to reduce the impact of the disease once infection has been identified. Transplanting infected oysters to lower salinity areas is one such management technique.

MDMR currently conducts quarterly assessments to check for the occurrence of Dermo.

Zoospore of Perkinsus marinus, with attached flagella giving it the ability to swim

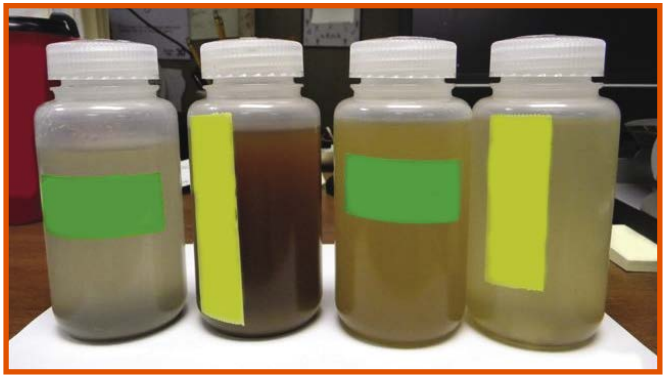
Information taken from “Dermo Disease” by Inke Sunila, Connecticut Dept. of Agriculture; and “Marine Maladies? Worms, Germs, and Other Symbionts From the Northern Gulf of Mexico’ by Robin M. Overstreet *Pictures courtesy: “Perkinsus spp. EURL for Molluscs Diseases”, http://www.eurl-mollusc.eu/Scientific- activities/Perkinsus-spp

Source: Local History and Genealogy Department Image Collection / Biloxi Public Library / Harrison County Library System

Harmful Algal Blooms

Marine Phytoplankton

The MDMR Shellfish Bureau conducts phytoplankton sampling twice per month during oyster season to monitor local oyster reefs for harmful algal blooms. Biologists use a 20-micron mesh plankton net to conduct a three-minute plankton tow.



Discoloration of water due to a non-toxic phytoplankton bloom.

Environmental water quality data is recorded during each sample trip. This includes: air and water temperature, salinity, dissolved oxygen, pH, and turbidity. Qualitative analysis is conducted in house with a phase contrast microscope. In the event of a bloom, quantitative analysis will be conducted to determine possible toxicity levels.

MDMR personnel conduct field observations for water discoloration during routine water sampling. If an area is suspected of a toxic bloom, samples are taken for phytoplankton identification. MDMR personnel investigate possible toxic blooms reported by credible sources primarily: adjacent state agencies, federal agencies, local health agencies, and academic institutions. In the event of a biotoxin producing bloom, not caused by the classic “red tide” organism, *Karenia brevis*, technical assistance from FDA and others will be sought in determining oyster reef closing criteria.

A Scientist collects a phytoplankton sample using a plankton net.

Aerial photos of a phytoplankton bloom, Ceratium furca. Photos taken by Darrin Stewart, MDMR Projects Officer.

What are Phytoplankton?

https://earthobservatory.nasa.gov

Derived from the Greek words phyto (plant) and plankton (made to wander or drift), phytoplankton are microscopic organisms that live in watery environments, both salty and fresh.

Some phytoplankton are bacteria, some are protists, and most are single-celled plants. Among the common kinds are cyanobacteria, silica-encased diatoms, dinoflagellates, green algae, and chalk-coated coccolithophores.

Like land plants, phytoplankton have chlorophyll to capture sunlight. They use photosynthesis to convert to chemical energy. They consume carbon dioxide, and release oxygen. All phytoplankton photosynthesize, but some get additional energy by consuming other organisms.

Phytoplankton growth depends on the availability of carbon dioxide, sunlight, and nutrients. Phytoplankton, like land plants, require nutrients such as nitrate, phosphate, silicate, and calcium at various levels depending on the species. Some phytoplankton can fix nitrogen and can grow in areas where nitrate concentrations are low. They also require trace amounts of iron which limits phytoplankton growth in large areas of the ocean due to iron concentrations being very low. Other factors that influence phytoplankton growth rates include: water temperature, salinity, water depth, wind, and predators.

When conditions are right, phytoplankton populations can grow explosively, a phenomenon known as an algal bloom. Blooms in the ocean may cover hundreds of square kilometers and are easily visible in satellite images. A bloom may last several weeks, but the life span of any individual phytoplankton is rarely more than a few days.

The Food Web

Phytoplankton are the foundation of the aquatic food web. These primary producers feed everything from microscopic, animal-like zooplankton to multi-ton whales. Small fish and invertebrates also graze on the plant-like organisms and, in turn, those smaller animals are eaten by larger ones.

Phytoplankton can also be the harbingers of death or disease. Certain species of phytoplankton produce powerful biotoxins, making them responsible for “red tides,” or harmful algal blooms. These toxic blooms can kill marine life.

Phytoplankton cause mass mortality in other ways. In the aftermath of a massive bloom, dead phytoplankton sink to the ocean or lake floor. The bacteria that decompose the phytoplankton deplete the oxygen in the water, suffocating animal life; the result is a dead zone.

Microscopic view of marine phytoplankton collected from the Mississippi Sound. Photos taken by Kristina Broussard, MDMR Biological Program Coordinator

Vibrio Bacteria

There are two main types of harmful bacteria associated with eating raw oysters: *Vibrio vulnificus* (Vv.) and *Vibrio parahaemolyticus* (Vp.). These bacteria are found naturally in waters of the Gulf of Mexico and are present in higher concentrations during the summer months. These two bacteria are part of the diets of oysters, clams and all Molluscan filter-feeders. Eating raw or undercooked oysters highly increases the risk of developing sickness from *Vibrio* bacteria. If a person is an at-risk consumer, meaning that they have a compromised immune system, he/she can become seriously ill from consuming *Vibrio* bacteria. A more serious consequence is death. Most healthy individuals are not at risk for Vv. infection.

Microscopic view of the bacterium Vibrio vulnificus

Vibrio vulnificus is a gram-negative bacterium and is considered the most dangerous of the *Vibrio* Genus. Present in brackish and salt water, this bacterium is not the result of pollution of marine waters. Vv. is found in higher concentrations from April through October when coastal waters are at their warmest.

When *Vibrio vulnificus* bacteria are digested, the primary illness is septicemia, i.e. an infected bloodstream. Vv. multiplies rapidly in the digestive tract. Fever and chills occur and usually are accompanied by nausea, vomiting and diarrhea. A sharp drop in blood pressure also occurs. Sometimes the patient goes into shock and then death occurs. In addition, high-risk individuals may become infected when cuts, burns or sores come in contact with seawater containing Vv. The majority of patients also develop painful skin lesions. The skin initially appears red, and then blisters form and quickly erode into necrotic ulcers.

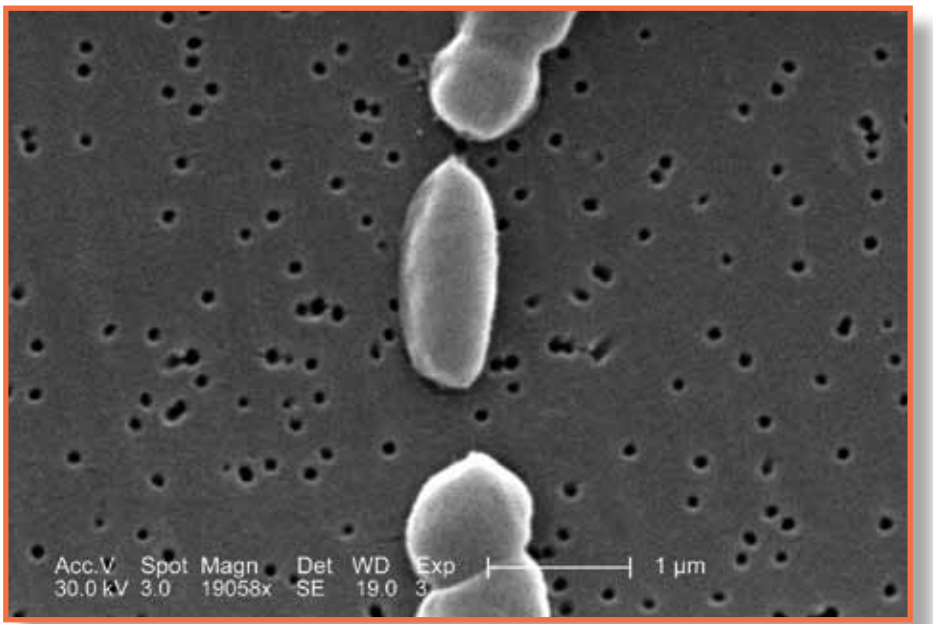
Vibrio parahaemolyticus is a bacterium in the same family as those that cause cholera. When consumed, it can cause gastrointestinal illness in humans and its symptoms include: diarrhea, abdominal cramping, nausea, vomiting, fever and chills. Usually these symptoms occur within 24-hours of ingestion and last three days. Severe disease is rare from Vp. and occurs more commonly in persons with weakened immune systems. Vp. can also cause an infection of the skin when an open wound is exposed to warm seawater.

Microscopic view of the bacterium Vibrio parahaemolyticus

Which individuals are at higher risk for Vibrio infection?

High-risk individuals include those with liver disorders, including hepatitis, cirrhosis and liver cancer; hemochromatosis (excessive iron); diabetes mellitus; and those with immune-compromising conditions, such as HIV/AIDS, cancer, or undergoing treatments. People who take prescribed medication to decrease stomach acid levels or who have had gastric surgery are also at risk. Younger and older individuals, as well as pregnant women, are included among the immune-compromised.

If anyone exhibits these symptoms, seek medical attention immediately and inform the doctor that they have eaten raw or undercooked seafood. Most infections caused by Vv. and Vp. can be prevented by thoroughly cooking seafood, especially oysters. Wound infections can be prevented by avoiding exposure of open wounds to warm seawater. If consumers have a desire to consume raw or under-cooked oysters, they should consider post harvest processed (PHP) or treated oysters found in many coastal seafood markets. There are four types of commercially available PHP products: individually quick-frozen oysters (IQF), heat-cool pasteurized oysters (HCP), high hydrostatic pressurized oysters (HHP) and irradiated oysters.



Microscopic view of the bacterium Vibrio parahaemolyticus

Norovirus

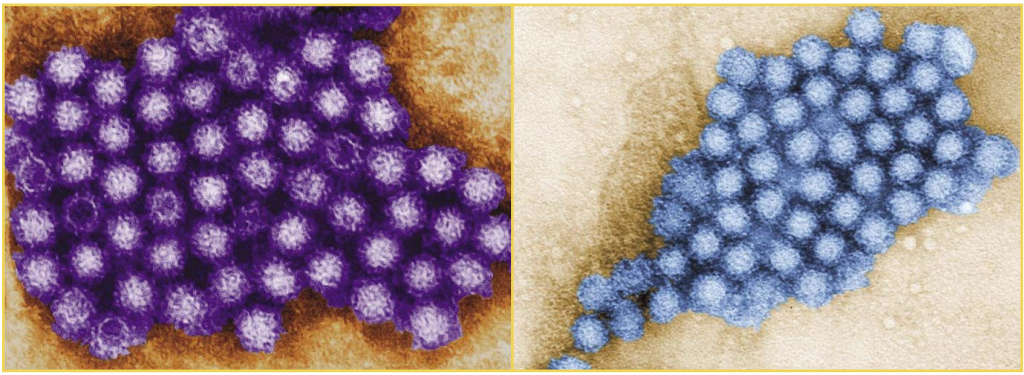
What is Norovirus?

Norovirus is a highly contagious virus that affects people of all ages. It is the most common cause of food borne disease outbreaks in the United States. Infection can come from; an infected person, contaminated food or water, or by touching contaminated surfaces. The virus causes acute gastroenteritis, inflammation of the stomach and/or intestines. This leads to stomach pain, nausea, diarrhea and vomiting. Anyone can be infected with Norovirus and it is possible to have the illness many times. Norovirus illness may become serious, especially for young children and older adults.

Norovirus is the most common cause of acute gastroenteritis in the United States. According to the Centers for Disease Control, Norovirus causes about 21 million illnesses and contributes to about 70,000 hospitalizations and 800 deaths annually. The best way to help prevent Norovirus is to practice proper hand washing and general cleanliness.

How is Norovirus Spread?

- Person-to-Person - direct contact with a sick person
- Food borne Exposure - ingesting contaminated foods
- Waterborne Exposure - exposure to contaminated water
- Contaminated Surfaces - touching contaminated surfaces then putting your unwashed hands in your mouth



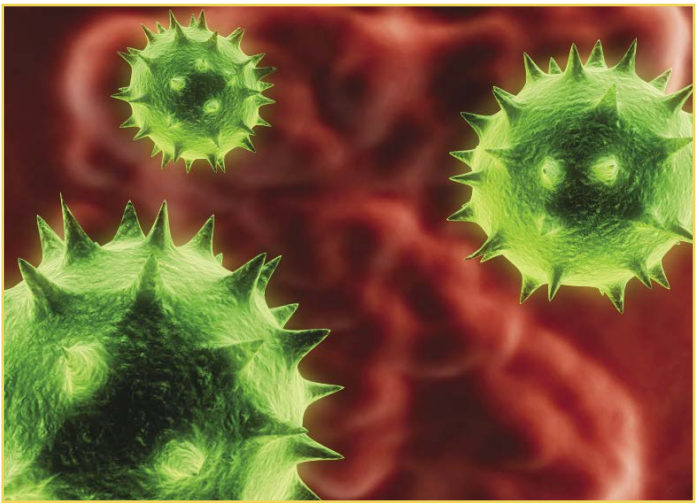
Microscopic view of the structure of norovirus. Photo courtesy of: CDC/Charles D. Humphrey

Norovirus Symptoms Include

- Nausea
- Stomach Cramps
- Vomiting
- Diarrhea Without Blood
- Low-Grade Fever

Norovirus Treatment

- The only treatment is to drink plenty of fluids to prevent dehydration.
- No vaccine exists.
- There is no specific drug to treat the virus. It cannot be treated with antibiotics due to its viral nature.



Microscopic view of Norovirus. Photo courtesy of: cruiselawnews.com

How can you protect yourself and others from Norovirus infection?

- Wash your hands thoroughly with soap and water.
- Clean and disinfect contaminated surfaces.
- Wash exposed laundry thoroughly.
- Rinse fruits and vegetables.
- Stay home when sick and for two days after symptoms stop.
- Avoid preparing food for others when sick and for two days after symptoms stop.

How can you help protect our waters from contamination?

- Use a marine sanitation device.
- Use an approved pump-out station.
- Do NOT dispose of waste overboard.

For pump-out station locations visit the following website:
dmr.ms.gov/boating/pump-out-stations

Information derived from the Centers for Disease Control and Prevention. For more information on Norovirus, visit *cdc.gov/norovirus*

Boating Safety in Mississippi Waters

The MDMR encourages everyone to keep safety in the forefront while boating on Mississippi's coastal waters. Don't let misfortune find you unprepared. Before venturing out, be sure to file a float plan with a responsible friend or relative. The float plan should include the place of departure, destination points and expected times of arrival, the time of expected return, and the names of all individuals on-board. Advise the friend or relative to contact proper authorities, i.e. MDMR's Marine Patrol Office or the United States Coast Guard (USCG), if you have not returned by an agreed upon time. It is of paramount importance that you do not deviate from the intended float plan. In the event of an emergency, valuable search and rescue time could be saved if a float plan has been properly filed and followed.

Before departure, a boat check should be performed to ensure the proper equipment is on board and functional. Remember, some equipment items, such as visual distress signals, first aid kits and fire extinguishers, have items with expiration dates where service or replacement is required.

Always be watchful for adverse weather conditions. A small National Oceanic and Atmospheric Administration (NOAA) weather radio is an excellent way to constantly receive updated weather broadcasts, and severe weather warnings. NOAA also provides National Weather Service, which may be accessed via the Internet at http://www.nws.noaa.gov/.

In addition, the USCG provides emergency alerts and marine warning broadcasts on Very High Frequency (VHF) channels 16 and 22 as conditions warrant. Remember to have adequate communications on board your boat at all times. A VHF radio is the preferred equipment for marine use. Cell phones, although popular for communicating on land, have a limited use on the water. A cell phone should not be depended upon as your only form of communication. Also, remember to have personal flotation devices (PFD) or lifejackets on the boat at all times.

Knowing the boat and water safety rules and regulations can save lives, and significantly reduces the possibility of accident or injury while on the water. For more information or to sign up for MDMR Boating Safety Classes, please call MDMR Bureau of Boat and Water Safety (228) 523-4134.

Why should I take a boating education course?

All persons born on or after June 30, 1980, must have passed a boating education course approved by the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) to legally operate a vessel. In addition, to operate a motorboat or a personal watercraft, a person under 12 years of age must also be accompanied onboard by someone who is at least 21 years old. The boating education certificate must be carried onboard the vessel whenever it is operated by someone required to have a certificate. Again, the MDMR Marine Patrol offers free approved boating education classes to the public along the Mississippi Gulf Coast.

How do I register my boat?

If your boat is motorized or is a sailboat, you must have a Mississippi Certificate Number and validation decals to legally operate your vessel on public waters in Mississippi. The validation decal must be affixed on both sides of the vessel, preceding the prefix letters of the registration number and within six inches of the registration number. If your vessel requires registration, it is illegal to operate or allow others to operate your vessel unless it is registered and numbered as described above.

If a registered vessel is sold or otherwise transferred to another person, the "buyer" must apply for the Certificate of Number to be transferred to his or her name within ten days of the date of purchase. Owners of new or used boats may obtain a registration form at any local county tax collector's office, most places where boats are sold or serviced, the MDMR office, the MDWFP district and Jackson offices, or online at www.mdwfp.com.

Personal Watercraft (PWC) and Towing Requirements

Each person riding on or towed behind a personal water craft (PWC) must wear a Type I, II or III USCG approved PFD in Mississippi waters south of Interstate 10. The PWC must be equipped with a self-circling device or lanyard-type ignition safety switch with the lanyard attached to the operator's person, clothing or PFD. The PWC may not be operated at an excessive speed within 100 feet of another occupied vessel except in a crossing situation or overtaking in accordance with the navigation rules. The PWC may not jump, or attempt to jump, the wake of another vessel within 100 feet of that vessel and may not follow within 100 feet of a water skier. Every vessel towing a person(s) on water skis, a surfboard or a similar device must have a person older than ten years of age, in addition to the operator, observing the towed person(s) at all times. If towing a person behind a PWC, the PWC must be rated for at least three people: the driver, the observer and the person being towed.

What equipment is legally required on my boat?

Personal Flotation Devices (PFDs)

All vessels must carry one wearable USCG-approved PFD for each person onboard. In addition to the above, vessels 16 feet in length or longer must have one Type IV, USCG-approved PFD onboard and readily accessible. Anyone who has not reached their 13th birthday must wear a Type I, II or III USCG-approved PFD whenever underway in a vessel under 26 feet in length. Each person riding on or being towed behind a personal watercraft must wear a Type I, II or III USCG-approved PFD. In addition, all PFDs must be:

- In good and serviceable condition.
- Readily accessible, which means you are able to put the PFD on quickly in an emergency.
- The proper size for the intended wearer. Sizing for PFDs is based on body weight and chest size.

Navigation Lights

Boat lights help you and other boaters determine which vessel is the give-way vessel when encountering each other at night. These lights should be displayed from sunset to sunrise and during periods of restricted visibility such as fog.

Fire Extinguisher

Approved types of fire extinguishers are labeled “Marine Type USCG Approved,” followed by the size and type symbols and the approved number. All vessels are required to have a Type B fire extinguisher onboard if one or more of the following conditions exist:

- Closed compartments under seats where portable fuel tanks are stored.
- Closed storage compartments in which flammable or combustible materials are stored.
- Closed living spaces.
- Permanently installed fuel tanks.

Sound Producing Devices

Any vessel less than 39.4 feet (12 meters) in length is required to make an efficient sound signal (horn, whistle or bell) to signal your position in periods of reduced visibility. Vessel operators are required to carry some type of horn or whistle capable of a four-second blast audible for one half mile for all boats. Athletic whistles are not acceptable on boats over 39.4 feet.

Visual Distress Signals

All boats less than 16 feet operating between sunset and sunrise must be equipped with visual distress signals, such as flares. Boats larger than 16 feet must be equipped with visual distress signals at all times. All boats used on federally controlled waters must be equipped with USCG-approved (day and night) visual distress signals.

All boats on federal waters are required to carry night signals when operating between sunset and sunrise. In addition, the following boats must also carry day signals:

- Recreational boats 16 feet or longer.
- Non-motorized, open sailboats 26 feet or longer.

Weather Emergencies on the Water

Weather can change very rapidly and create unexpected situations for boat operators. Even meteorologists have trouble predicting rapid weather changes. You should always monitor weather developments. Preferably, tune a Very High Frequency (VHF) radio to the frequencies listed below for NOAA weather reports.

What to do if caught in severe weather.

Prepare the boat to handle severe weather.

- Slow down, but keep enough power to maintain headway and steering.
- Close all hatches, windows, and doors to reduce the chance of swamping.
- Stow any unnecessary gear.
- Turn on your boat's navigation lights. If there is fog, sound your fog horn.
- Keep bilges free of water. Be prepared to remove water by bailing.
- If there is lightning, disconnect all electrical equipment. Stay as clear of metal objects as possible.

Prepare your passengers for severe weather.

- Have everyone put on a United States Coast Guard (USCG)-approved life jacket or personal flotation device (PFD). If passengers are already wearing their PFDs, make sure they are secured properly.
- Have your passengers sit on the vessel floor close to the centerline for their safety and to make the boat more stable.

Decide whether to go to shore or ride out the storm.

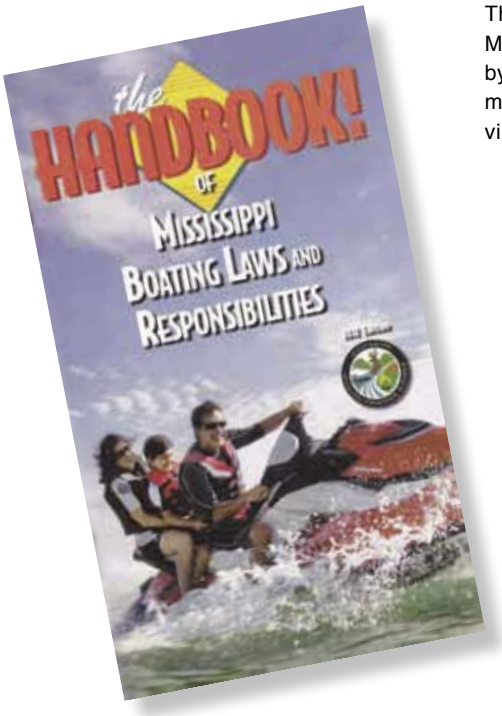
- If possible, head for the nearest shore that is safe to approach. If already caught in a storm, it may be best to ride it out in open water rather than try to approach the shore in heavy wind and waves.
- Head the bow into the waves at a 45 degree angle. PWCs should head directly into the waves.
- If the engine stops, drop a "sea anchor" on a line off the bow to keep the bow headed into the wind and reduce drifting while you ride out the storm. In an emergency, a bucket will work as a sea anchor.
- If the sea anchor is not sufficient, anchor using your conventional anchor to prevent your boat from drifting into dangerous areas.

VHF Frequencies Broadcasting NOAA Weather Reports

162.400 MHz	162.450 MHz	162.500 MHz	162.550 MHz
162.425 MHz	162.475 MHz	162.525 MHz	

The following are the most commonly used VHF channels on US waters.

- Channel 6: Internship safety communications.
- Channel 9: Communications between vessels (commercial and recreational), and ship to coast (calling channel in designated USCG).
- Channel 13: Navigational use by commercial, military, and recreational vessels at bridges, locks, and harbors.
- Channel 16: Distress and safety calls to USCG and others, and to initiate calls to other vessels; often called the “hailing” channel. Some regions use other channels as the hailing channel. When hailing, contact the other vessel, quickly agree to another channel, and then switch to that channel to continue the conversation.
- Channel 22: Communications between the USCG and the maritime public, both recreational and commercial. Severe weather warnings, hazards to navigation, and other safety warnings are broadcast on this channel.
- Channels 24-28: Public telephone calls (to marine operator).
- Channels 68, 69, and 71: Recreational vessel radio channels and ship to coast.
- Channel 70: Digital selective calling “alert channel”.



This information was taken from “The Handbook of Mississippi Boating Laws and Responsibilities” developed by the Department of Wildlife, Fisheries & Parks. For more information and to request a copy of the handbook, visit their website at www.mdwfp.com or call (601) 432-2182.

Beaufort Wind Scale

The Beaufort scale is a measure that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale, although it is a measure of wind speed and not of "force" in the scientific sense of the word. The scale was developed in 1805 by Francis Beaufort (later Rear Admiral Sir Francis Beaufort), an Irish Royal Navy officer, while serving on HMS Woolwich. He developed the scale to help sailors estimate the winds via visual observations. The scale starts with 0 and goes to a force of 12.

In the United States, winds of force 6 or 7 result in the issuance of a small craft advisory, with force 8 or 9 winds bringing about a gale warning. Force 10 or 11 winds lead to a storm warning or a tropical storm warning and force 12 winds result in a hurricane force wind warning or a hurricane warning if related to a tropical cyclone. A set of red warning flags for day time and red warning lights for night time are displayed at shore establishments which coincide with the various levels of warning. Note that wave heights in the scale are for conditions in the open ocean, not along the shore.

Hurricane force winds are sometimes described as Beaufort scale 12 through 16, very roughly related to the respective category speeds of the Saffir–Simpson Hurricane Scale, by which actual hurricanes are measured, where Category 1 is equivalent to Beaufort 12. However, the extended Beaufort numbers above 13 do not match the Saffir–Simpson Scale.

Huler, Scott (2004). Defining the Wind: The Beaufort Scale, and How a 19th-Century Admiral Turned Science into Poetry. Crown. ISBN 1-4000-4884-2.

Force	Wind Speed (Knots)	Classification	Appearance of Wind Effects On the Water	Appearance of Wind Effects On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended

Force	Wind Speed (Knots)	Classification	Appearance of Wind Effects On the Water	Appearance of Wind Effects On Land
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-19 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

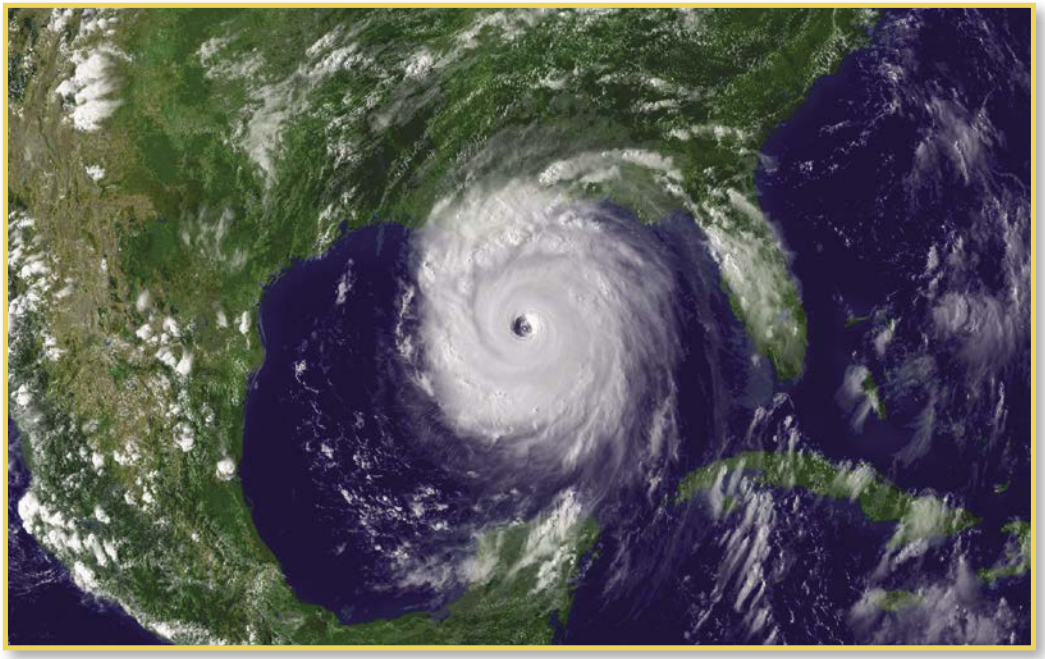
This chart can be found at the following NOAA website: http://www.spc.noaa.gov/faq/tornado/beaufort.html

Saffir-Simpson Hurricane Wind Scale

The Saffir-Simpson Hurricane Wind Scale (SSHWS) is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures. In the western North Pacific, the term "super typhoon" is used for tropical cyclones with sustained winds exceeding 150 mph.

The SSHWS underwent a minor modification in 2012 in order to resolve awkwardness associated with conversions among the various units used for wind speed in advisory products. The change broadens the Category 4 wind speed range by one mile per hour (mph) at each end of the range, yielding a new range of 130-156 mph. This change does not alter the category assignments of any storms in the historical record, nor will it change the category assignments for future storms.

This information was derived from the NOAA Hurricane Center. For more information or to view a conceptual animation illustrating the wind damage associated with increasing hurricane intensity, visit their website at http://www.nhc.noaa.gov/aboutsshws.php.



Saffir-Simpson Hurricane Wind Scale – Hurricane Katrina

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 knots 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 knots 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 knots 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 knots 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 knots or higher 252 km/h or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Wind Chill Chart

National Weather Service Wind Chill Chart

Wind (mph)	Temperature (°F)																	
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

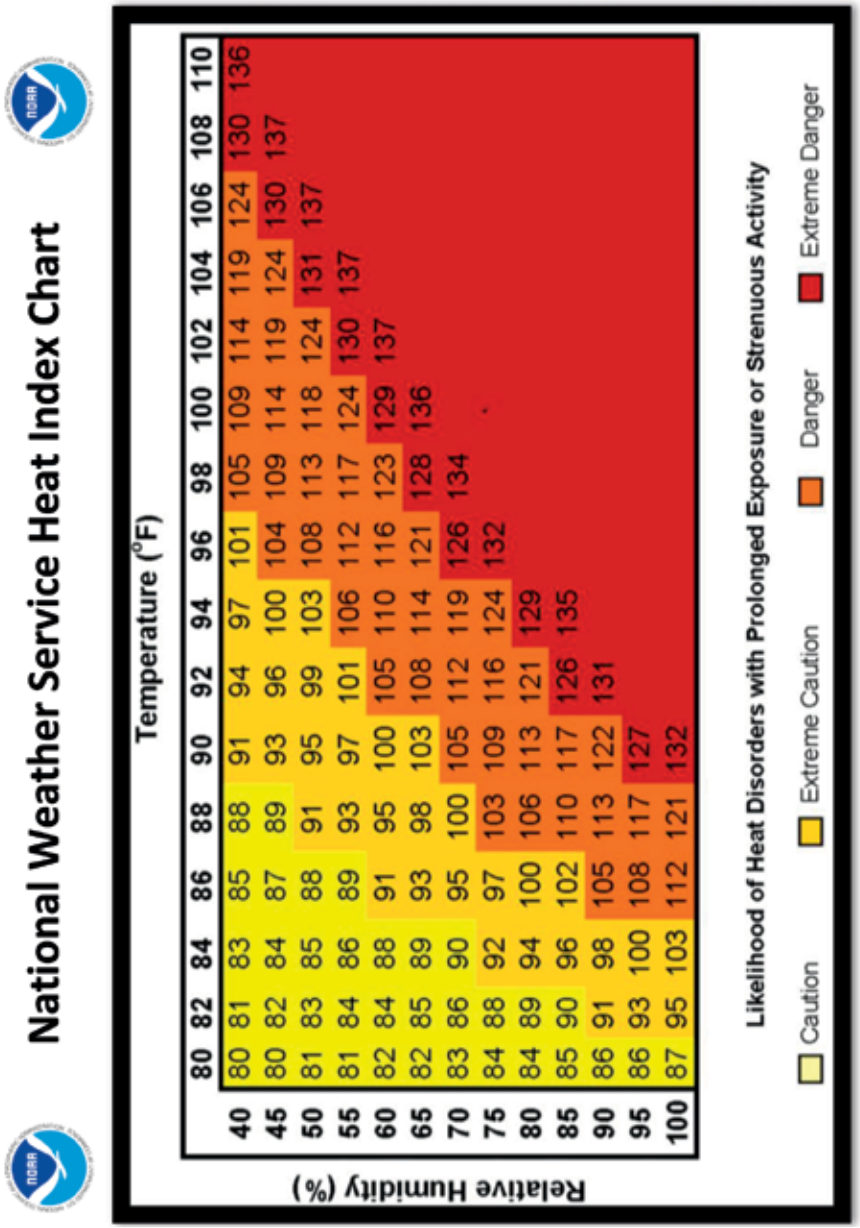
$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

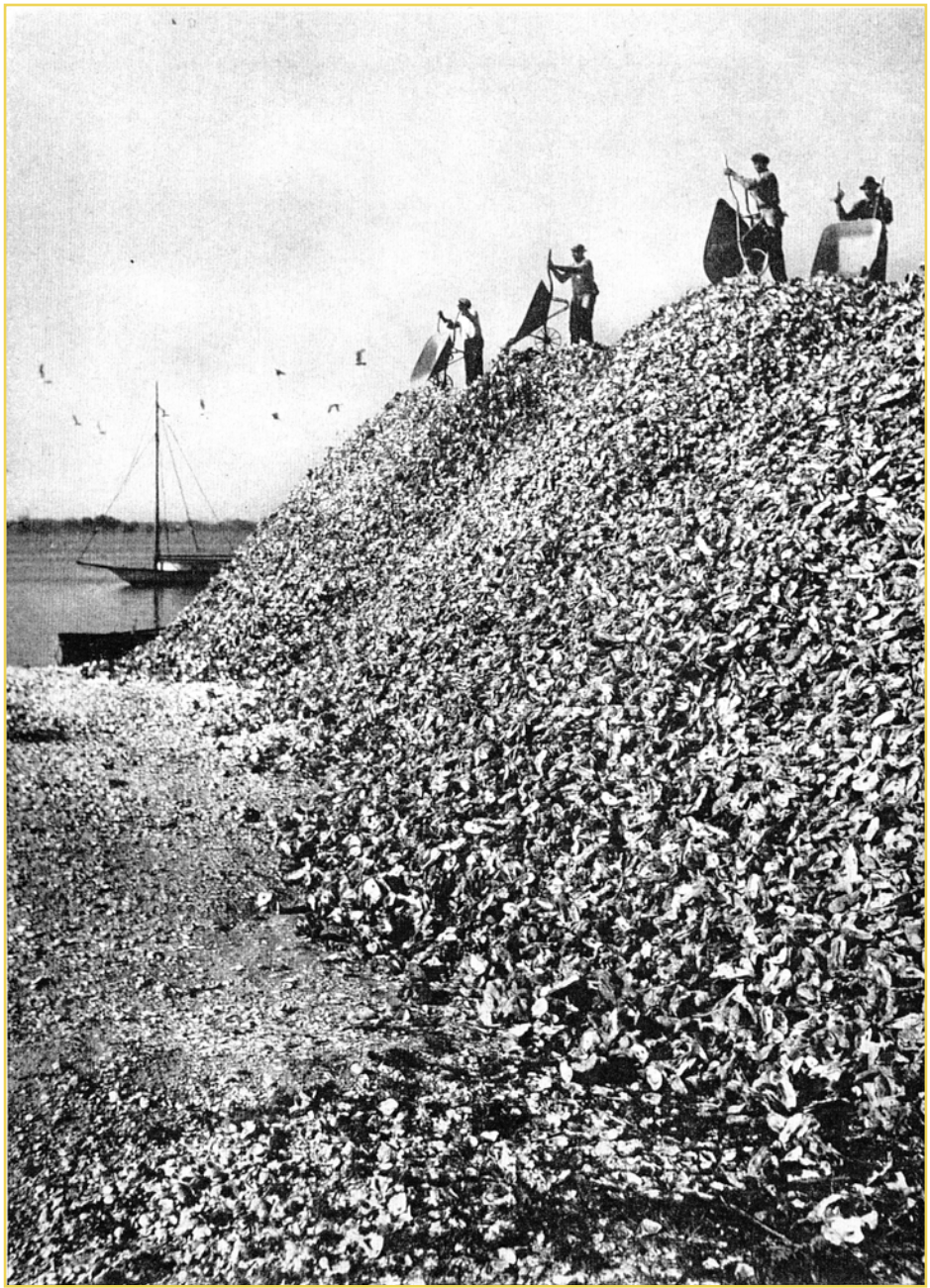
Effective 11/01/01

This chart may be found at the following NOAA link: www.weather.gov/safety/cold-wind-chill-chart

Heat Index Chart



This chart may be found at the following NOAA link: www.weather.gov/safety/heat-index



Source: Local History and Genealogy Department Image Collection / Biloxi Public Library / Harrison County Library System

NOAA

Extreme Weather

INFORMATION SHEET

Weather-Ready Nation: Saving Lives and Livelihoods

To download the latest updated version of this sheet: www.ngdc.noaa.gov/newis/

STATE INFORMATION

Mississippi Emergency Management Agency (www.msema.org) 1-866-519-6362
..... (24 hrs) 1-800-222-MEMA (6362)
Ready.gov ..... www.ready.gov/mississippi
Official State Website ..... www.ms.gov
Mississippi Department of Transportation (http://mdot.ms.gov/portal/home.aspx) 601-359-7001
Mississippi Traffic Alerts ..... www.mdottraffic.com/
Mississippi Department of Public Safety (www.dps.ms.gov) 601-987-1212
Mississippi Highway Patrol (www.dps.ms.gov/highway-patrol) ..... *HP from cell phone
Division of Tourism (https://visitmississippi.org/) 601-359-3297
Board of Animal Health (www.mbah.state.ms.us) 888-722-3106
Governor's Office (www.governorbryant.ms.gov) 601-359-3150
Mississippi Attorney General (www.ago.state.ms.us) 601-359-3680
Mississippi Insurance Department (www.mid.ms.gov) 1-800-562-2957
Mississippi Department of Environmental Quality (www.mdeq.ms.gov/) 1-888-786-0661
Department of Marine Resources (https://dmr.ms.gov/) 1-800-374-3449
National Weather Service Forecast Office (New Orleans/Baton Rouge) (www.weather.gov/lix) 504-522-7330
National Weather Service Forecast Office (Mobile) (www.weather.gov/mob) 251-633-6443
NOAA National Weather Service Southern Region ..... www.weather.gov/srh
StormSmart Coasts ..... http://gom.stormsmart.org/
US Coast Guard, 8th District www.atlanticarea.uscg.mil/Our-Organization/District-8/
Mississippi Power (www.mississippipower.com) ..... Outage 1-800-487-3275
Coast Electric Power Association (https://coastepa.com) 1-877-769-2372
Singing River Electric Association (https://singingriver.com) 601-947-4211
Pearl River Valley Electric Power Association (http://prvepa.com) 1-855-2PRVEPA (277-8372)

MISSISSIPPI

FOR EMERGENCIES CALL 911 • FOR NON-EMERGENCIES CALL 211

COUNTY INFORMATION

GEORGE
Emergency Management 601-947-7557
..... www.facebook.com/GeorgeCountyMsEmergencyManagement
Sheriff 601- 947-9156
..... www.georgecountymssheriff.com

HANCOCK
Emergency Management..... 228-255-0942
..... https://.facebook.com/hancockmseoc
Sheriff 228-466-6900
..... www.hancockso.com

HARRISON
Emergency Management 228-865-4002
..... http://co.harrison.ms.us/departments/ema
Sheriff 228-865-7060
.....http://harrisoncountysheriff.com

JACKSON
Emergency Management 228-769-3111
..... www.co.jackson.ms.us/224/Office-of-Emergency-Services
Sheriff 228-769-3063
..... www.co.jackson.ms.us/149/Sheriff

PEARL RIVER
Emergency Management 601-795-3058
..... www.pearlrivercounty.net/civdef
Sheriff 601-795-2241
..... www.pearlrivercounty.net/sheriff/index.htm

STONE
Emergency Management..... 601-928-3077
..... www.stonecountygov.com/emergency-management
Sheriff 601-928-7251
..... www.stonecountygov.com/sheriff

NATIONAL INFORMATION

American Red Cross..... 1-800-RED-CROSS (1-800-733-2767)
..... www.redcross.org
Centers for Disease Control.....www.cdc.gov
Environmental Protection Agency .....www.epa.gov
Federal Emergency Management Agency (FEMA)..... 1-800-621-FEMA (3362)
..... www.fema.gov
Agencia Federal para el Manejo de Emergencias (FEMA) ..... www.fema.gov/es
National Oceanic and Atmospheric Administration (NOAA) ..... www.noaa.gov
National Weather Service..... www.weather.gov
Gulf of Mexico Disaster Response Center https://ceanservice.noaa.gov/hazards/drc
National Data Buoy Center.....www.ndbc.noaa.gov
National Hurricane Center ..... www.nhc.noaa.gov
National Centers for Environmental Information (NCEI)...www.ncei.noaa.gov
National Environmental Satellite, Data, and Information Service (NESDIS)
..... www.nhc.noaa.gov/satellite.shtml
US Department of Homeland Security ..... www.dhs.gov

DOWNLOAD THE FREE NEWIS APP

Compatible with iPhone, iPod Touch, and iPad! Search 'NEWIS' in the App Store to download on your Apple device.

The National Hurricane Center normally issues public advisories on their website and to the media for Atlantic tropical cyclones every six hours at 4:00 AM CDT, 10:00 AM CDT, 4:00 PM CDT, and 10:00 PM CDT. Intermediate public advisories are issued every 3 hours when coastal watches or warnings are in effect. Additionally, special public advisories may be issued at any time due to significant changes in warnings or in the cyclone.

511 Travel Info

Mississippi 511 Traveler Information

Mississippi 511 is a free, statewide service that's available 24 hours a day, seven days a week. It uses an interactive voice response system with speech recognition as the primary interface with callers, allowing for hands free operation. Travelers can dial 511 or visit www.mdottraffic.com for around-the-clock, real-time traffic updates as well as information about construction activities and weather-related road conditions simply by saying the route or region about which they are seeking information.

Traveler information is available in the Mississippi 511 system for all Interstates, and select US highways and State Routes, including US Highways 49, 49W, 49E, 61, 45, 45 ALT, 90, 98, 84, 82, 78 and State Routes 25, 6 and 302.

In utilizing 511, www.mdottraffic.com or MDOT's mobile smartphone application, travelers can obtain route-specific information including:

- Incident/accident information,
- Road construction and maintenance projects,
- Road closures, road diversions and major delays,
- Weather warnings and alerts

NATIONAL HURRICANE CENTER MOBILE DATA

Graphical Tropical Weather Outlook RSS/XML feed
.....www.nhc.noaa.gov/gtwo.xml
Website for Tablets and Smartphones.....www.nhc.noaa.gov/mobile

RADIO STATIONS

MS PUBLIC BROADCASTING 88.1- 91.3 FM
WQRZ 103.5 FM (BAY ST. LOUIS)
WBUV 104.9 FM (BILOXI)
WGCM 102.3 (BILOXI)
WCPR 97.9FM (GULFPORT/WIGGINS)
WZKX 107.9 FM (GULFPORT)
WJZD 94.5 FM (GULFPORT)
WXYK 107.1FM (GULFPORT)
WXRR 104.5 (HATTIESBURG)
WKNN 99.1 FM (PASCAGOULA)
WQBB 105.9FM (PASCAGOULA)
WRJW 1320 AM (PICAYUNE)

NOAA WEATHER RADIO

Not manufactured by NOAA, NWR receivers can be purchased at many retail outlets and on the Internet

NOAA Weather Radio (NWR) All Hazards is a nationwide network of radio stations broadcasting continuous weather information directly from a nearby National Weather Service office. NWR broadcasts National Weather Service warnings, watches, forecasts, and other hazard information 24 hours a day.

162.400 MHz **162.425 MHz** **162.450 MHz** **162.475 MHz** **162.500 MHz** **162.525 MHz** **162.550 MHz**

- Emergency alerts including evacuations and amber alerts,
- Tourism information,
- Public transportation,
- Welcome centers and rest areas, and
- Travel times.

The goal of MDOT is to provide reliable, route-specific information to motorists through as many avenues as possible. Traffic resource options include text or email alerts; online, social media and smartphone applications; radio and television broadcasts and now 511. MDOT encourages motorists using 511 or any of its travel information tools to put safety first.

PREPARED BY

The Center for Coasts, Oceans & Geophysics of NOAA's National Centers for Environmental Information under NESDIS

1-866-732-2382 or email: NCEI.Info@noaa.gov

To download the latest pdf version of this sheet go to: www.ngdc.noaa.gov/newis/

Published October 2019 Version 1.2

Ropes, Knots and Splicing

A knot is a way of joining or securing a line, such as a rope, by tying or interlacing. It may be a section of one or several pieces of line material like rope, string, webbing, twine, strap, cable or even chain; intertwined such that the line can connect to itself, another section of line or to another object.

Knot-tying is one of the earliest complex skills learned in life. Tying your shoes is so automatic; it is usually done without even thinking about it. Many different knots are used daily in different occupations. On board a vessel, knot-tying is a necessary everyday skill you should master. A properly tied knot may be the difference between life and death. A knot can help secure a vessel to the dock, in both calm and stormy conditions. This section will cover some common knots you may find useful as well as some of their various uses. Chances are, you probably already know and frequently use more than a few of these knots. This section may also be used to refresh your knot-tying skills, learn new knots, or be useful in teaching someone else about tying a particular knot or its usage.

CAUTION! - INCORRECT USE OF ROPES MAY RESULT IN SERIOUS INJURY, DEATH OR PROPERTY DAMAGE.

Turn or Single Turn – or single turn is a single pass behind or through an object. [1]

Round Turn – the complete encirclement of an object; requires two passes. [1]

Half Hitch – A simple overhand knot, where the working end of a line is brought over and under the standing part. [2]

Round Turn and Two Half Hitches – is a hitch used to secure the end of a rope to a fixed object. The name refers to the components used to form the knot: a round turn wraps the rope around the object, completely encircling it, and the two half hitches secure the end around the standing part. Variations of this hitch can be made with differing numbers of turns and half-hitches. [3]

Bowline – used for tying a loop in the end of a rope, as around one's waist or to secure a ring or grommet. This knot is also used as an anchor knot. [1] It is easy to tie and untie and will not jam. The bowline is one of the most useful knots on a boat. Make a quick loop to tie up to a piling. All boaters should know this knot. Many people remember how to tie a bowline by memorizing the saying:

"The rabbit comes out of the hole, around the tree then back down the hole."

It is tied by making a loop (the hole) with the standing line (the tree), then bringing the free end (the rabbit) through the loop (the hole), around the back of the standing line (the tree), and back through the loop (the hole).

The knot should be tightened by holding the standing line while pulling firmly on the free end.

Rolling Hitch or Magnus Hitch – A knot used to attach a rope to a rod, pole, or other rope. [2] It is tied by making a round turn around the object. Then crossing over the standing end and finishing with a half-hitch tied firmly around the object. It is simple to tie and more secure than a clove hitch.

Square Knot – for joining the ends of a piece of cordage wrapped around an object or objects. [1]

Clove Hitch – two successive half hitches around an object. [2] It is often used to start and stop lashings.

Figure 8 Knot – a stopper knot. [1] It may be used for stopping ropes from running out of retaining devices.

1. Tying a Figure 8 Knot

2. Figure 8 Knot Tightened

Sheet Bend – for joining the ends of two ropes, which need not be the same diameter. [1]

1. Tying a Sheet Bend Knot

2. Sheet Bend Knot Tightened

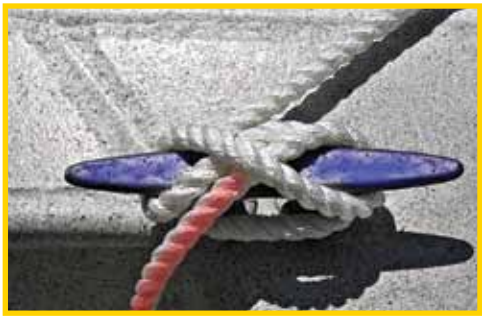
Cleat Hitch – a knot used to secure a rope to a cleat. [4] Additional turns or wraps may be added to provide more security if the line tends to slip, or in rough conditions.

1. Pass the running end under the cleat horn farthest from, but on the same side as the standing part.

2. Pass the running end under the cleat horn nearest to and towards the standing part.

3. Wrap the running end over the top of the cleat, and under the opposite cleat horn.

4. Wrap the running end back over the cleat again, making an under hand loop over the cleat horn closest to the standing part.



5. Tighten by pulling firmly on the running end.

Constrictor Knot – one of the most effective binding knots. Simple and secure, it is a harsh knot that can be difficult or impossible to untie once tightened. [5] A constrictor knot can be used temporarily to hold the fibers of a cut line until a final whipping can be applied. [6] The constrictor knot may even be useful as an emergency hose clamp when sticks are tied to each end for extreme tightening with your hands and feet.

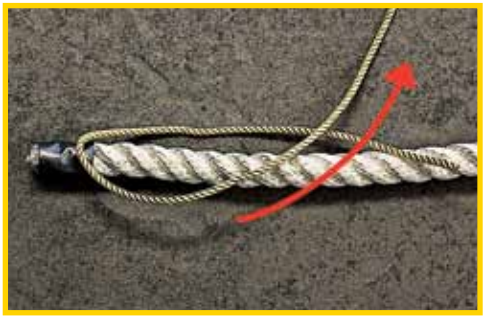
1. Make a turn around the object and cross over the standing part with the second turn.

2. Bring the running end over the standing part.

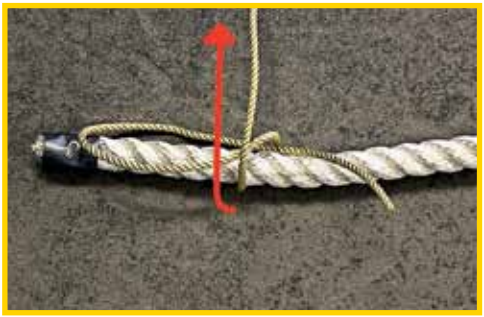
3. Tuck the running end under the “X” formed by the first crossover.

4. Pull firmly on both ends to tighten the knot.

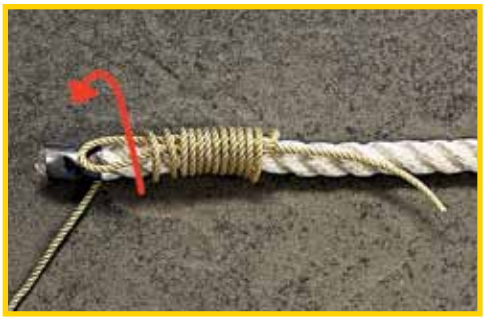
Whipping – a binding of marline twine or whipcord around the end of a rope to prevent its natural tendency to fray. The whipping can be made neat and permanent by tying it off or sewing the ends of the twine through the rope. [6]



1. The rope should be whipped a short distance, about 1½ times the rope diameter, from its end. Lay the head of the twine along the rope. Make a bight along the rope.

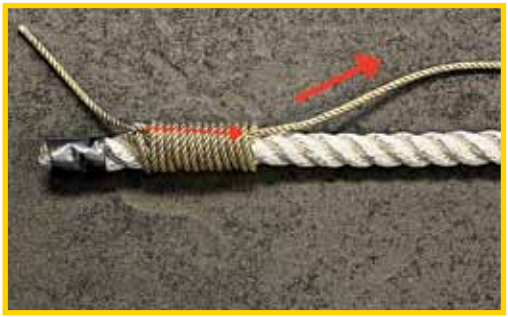


2. Wrap the twine around the rope and bight of twine securely. You should wrap in the same direction as the twist of the rope.

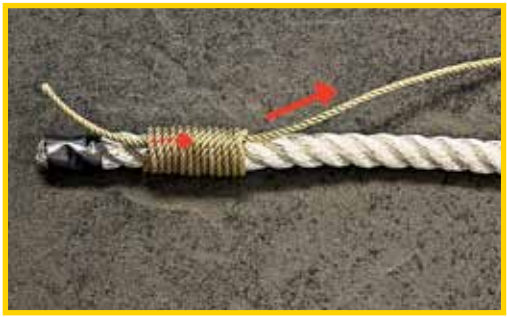


3. Continue wrapping tightly.

4. Slip the working end of the twine through the bight.



5. Carefully pull on the standing end of the twine so the bight and working end are pulled back to the whipping. Hold the working end so the wrapping does not untwist.



6. Continue pulling the standing end, until the bight and working end are about half way under the whipping. Don't pull all the way through!

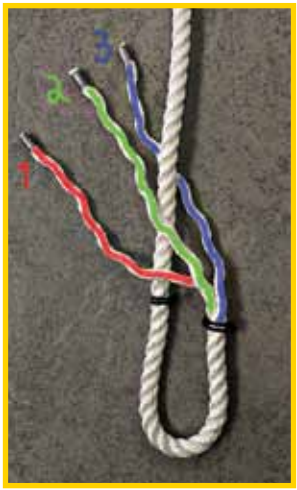
7. Trim the twine ends and the rope to give the end a finished look. Leave at least half the ropes width from the whipping.

A constrictor knot can be used temporarily to hold the fibers of a cut line until a final whipping can be applied.

French whipping is a whipping knot that consists of a series of half hitches. It is used to stop unraveling of rope ends as well as to provide a grip over railings.

Take care of your boat lines so they will last longer and do a better job.

Splicing Rope – the forming of a semi-permanent joint between two ropes or two parts of the same rope by partly untwisting and then interweaving their strands. Splices can be used to form a stopper at the end of a line, to form a loop or an eye in a rope, or for joining two ropes together. Splices are preferred to knotted rope, since while a knot typically reduces the strength by 20-40%, some splices can retain up to 95% of the strength of the line. However, splicing usually results in a thickening of the line and, if subsequently removed, there will be a distortion of the rope.[7]



1. Open more than enough of the rope strands than is necessary for tucking. It may help to mark or secure the ends with tape or a constrictor knot. You may also mark the location you will begin splicing so the "eye" will be the desired size. Place ends so the two strands nearer the eye are across the lay of the rope and the third is behind.

2. Using a marline spike or a fid, open a main strand enough for a loose strand to pass through.

3. Tuck strand #2 through the opening you made with the marline spike.

4. Tuck strand #1 under the next main strand, going in where strand #2 comes out.

5. Turn splice over and tuck strand #3 under the only main strand without an end under it, going the same way around the rope as the other two tucks.

6. There will now be one end projecting from each space in the rope. Pull the ends through to give an even tension and a close joint.

7. Continue by tucking strand #2 again, over and under one main strand, then similarly, in order #1, #3, etc., each over one and under one main strand, pulling to even tension, for a total of at least four tucks per strand for synthetic rope, and at least three for natural rope.

8. You may roll the splice under your foot to help "set" it. Finish by trimming the excess strands with a sharp knife.

A metal thimble is often spliced tightly into the eye, and may be used to help protect the rope from wear when it is fastened to a chain with a shackle.

Metal thimbles are available for various sized rope.

"Practice makes perfect."

Knot Glossary and Terms [1]

Bend – A knot uniting two lines.

Bight – Any curved section, slack part, or loop between the ends of a rope, string, or yarn.

Binding – A knot that restricts object(s) by making multiple winds.

Bitter End – The end of a rope that is tied off, hence the expression "hanging on to the bitter end". This is more of a rope maker's term rather than a knot term. In fact the bitter end is the end of the anchor "cable" that connects to the anchor bitts in the cable locker under the forecastle or poop using the bitter pin. (British nautical usage.) Other uses may be borrowed from this derivation.

Coil – Knots used to tie up lines for storage.

Decorative Knot – A complex knot exhibiting repeating patterns often constructed around and enhancing an object.

Elbow – Two crossing points created by an extra twist in a loop.

Hitch – A knot tied to a post, cable, ring, or spar.

Lashing – A knot used to hold poles together.

Loop – A full circle formed by passing the working end over itself or a knot used to create a closed circle in a line.

Plait (or braid) – A number of lines interwoven in a simple regular pattern.

Seizing – A knot used to hold two lines or two parts of the same line together.

Sennit – A number of lines interwoven in a complex pattern.

Slip (or running) – A knot tied with a hitch around one of its parts. In contrast, a loop is closed with a bend. While a slip knot can be closed, a loop remains the same size.

Slipped – Some knots may be finished by passing a bight rather than the end, for ease of untying. The common shoelace knot is an example, being a reef (square) knot with both ends slipped.

Splice – A knot formed by interweaving strands of rope rather than whole lines. More time-consuming but usually stronger than simple knots.

Standing End – The longer end of the rope not involved in the knot, often shown as unfinished. It is often, but not always, the end of the rope under load after the knot is complete. For example, when a clove hitch ties a boat to a pier, the end going to the boat is the standing end.

Standing Part – Section of line between knot and the standing end.

Stopper – A knot tied to hold a line through a hole.

Turn – A single pass behind or through an object. A round turn is the complete encirclement of an object and requires two passes. Two round turns circles the object twice and requires three passes.

Whipping – A binding knot used to prevent another line from fraying.

Working end – The active end of a line used in making the knot. May also be called the 'running end', 'live end', or 'tag end'.

Working part – Section of line between knot and the working end.

References

1. http://en.wikipedia.org/wiki/Knot
2. http://en.wikipedia.org/wiki/List_of_hitch_knots
3. http://en.wikipedia.org/wiki/Round_turn_and_two_half-hitches
4. http://en.wikipedia.org/wiki/Cleat_hitch
5. http://en.wikipedia.org/wiki/Constrictor_knot
6. http://en.wikipedia.org/wiki/Whipping_knot
7. http://en.wikipedia.org/wiki/Rope_splicing

International Guild of Knot Tyers - Knot Charts http://www.igkt.net/index.php
AF REGULATION 64-4, VOLUME I, 15 July 1985, Search and Rescue, SURVIVAL TRAINING
U.S. Army Field Manual 3-05.70 Survival (FM 21-76) May 2002
http://wikimediafoundation.org/wiki/Terms_of_Use

Source: Local History and Genealogy Department Image Collection / Biloxi Public Library / Harrison County Library System

Local History and Genealogy Department Image Collection, Biloxi Public Library, Harrison County Library System

Pump-Out Stations: Keeping Our Waters Clean

http://www.dmr.ms.gov/environment/sport-fish-restoration/123-clean-vessel-act

The MDMR has been committed to cleaning up the quality of our water since 1992, when the Clean Vessel Act (CVA) program was first authorized. Since that time, discharging raw sewage into state waters has been prohibited. The program provides for a cost reimbursable grant with a 75% Federal and 25% marina match, and any marina in Mississippi is eligible to participate.

Since 1992, the Coast has grown significantly and more people continue being drawn to the Coast. With an increase in population, there is an increase in threats to the richness and beauty of the waters which provide these attractions in the first place. Even boating can contribute to the degradation or loss of our important coastal resources. Extensive studies show boat sewage dumped into our waters may affect aquatic plants, fish and other animals. The primary goal of Mississippi's CVA program is to reduce and eventually eliminate overboard sewage discharge from boats.

Congress passed the CVA in 1992 to reduce pollution from vessel discharges after finding an inadequate number of onshore sewage disposal facilities and determining this to substantially contribute to localized degradation of water quality. Under the CVA, $40 million will be distributed to the states for funding of marine toilet pump-out facilities for sewage waste disposal. These funds come from boaters and anglers through taxes paid on fishing tackle and motorboat fuels under the Federal Aid in Sport Fish Restoration Program. Federal funds can constitute up to 75% of all approved projects with remaining funds provided by the states or marinas.

Raw sewage can spread disease; contaminate shellfish beds and lower oxygen levels in water, causing fish and other aquatic animals to die. Because of the CVA, boaters can expect to see more convenient and reasonably priced pump-out and dump stations and as a result, cleaner waters, with healthier fish and shellfish populations.

Why use a pump-out station?

Extensive studies prove that boat sewage dumped into our waters may affect aquatic plants, fish and other animals. By using a pump-out station to properly dispose of waste, you can help reduce overboard sewage discharge, resulting in cleaner waters and healthy fish and shellfish populations.

How can marinas help?

All designated Mississippi marinas must have fully functioning pump-out or dump stations for proper disposal of all vessel wastes, as required by the CMR in Title 22, Part 10. Owners of marinas, harbors and other boating facilities may apply through the MDMR for grants to install pump-out stations. For more information, call (228) 523-4150 or visit

dmr.ms.gov/environment/sport-fish-restoration/123-clean-vessel-act. This website offers several links including an electronic grant application for installation of the pump-out stations.

The Clean Marina Initiative is a voluntary incentive-based program promoted by the MDMR that encourages marinas and recreational boaters to protect coastal water quality by engaging in environmentally sound operating and maintenance procedures. The program offers information, guidance and technical assistance to marina operators, local governments and recreational boaters on best management practices that can be used to prevent or reduce pollution. Marinas that participate in the Clean Marina Program are recognized for their environmental stewardship through a certified designation and the right to fly the Clean Marina flag.

Coastal Pump-Out Locations

Hancock County:

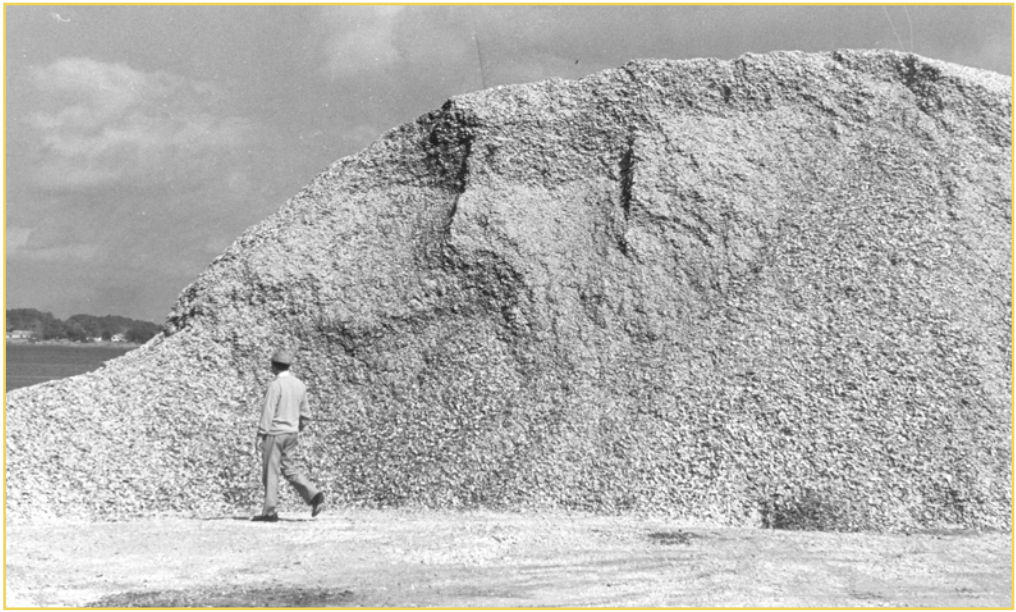
- Bay Marina, Bay St. Louis, (228) 466-4970 (for tenants only)
- Diamondhead Marina, Diamondhead, (228) 216-6247

Harrison County:

- Biloxi Small Craft Harbor, Biloxi, (228) 436-4062
- Gulfport Small Craft Harbor, Gulfport, Harbor Office (228) 867-8721, Daytime – 8am to 4pm (228) 236-8070, Night time – 4pm to 8am (228) 236-8071,(seven pump-out stations located at the end of each pier)
- Long Beach Small Craft Harbor, Long Beach, (228) 863-4795
- Pass Christian Small Craft Harbor, Pass Christian, Harbor Office (228) 452-5128
- Point Cadet Marina, Biloxi, (228) 432-0454, (currently under construction)
- Schooner Pier, Biloxi, (228) 435-6320

Jackson County:

- Ocean Springs Harbor, Ocean Springs, (228) 872-5754
- Mary Walker Marina, Gautier, (228) 497-3141 (by appointment only)
- Pascagoula Inner Harbor, Pascagoula, (228) 938-2356



Source: Local History and Genealogy Department Image Collection, Biloxi Public Library, Harrison County Library System

“The Oyster”

There once was an oyster
Whose story I tell,
Who found that some sand
Had got into his shell.
It was only a grain,
But it gave him great pain.
For oysters have feelings
Although they’re so plain.

Now, did he berate
The harsh working of fate
That had brought him
To such a deplorable state?
Did he curse at the government,
Cry for election,
And claim that the sea should
Have given him protection?

No – he said to himself
As he lay on a shell,
Since I cannot remove it,
I shall try to improve it.
Now the years have rolled around,
As the years always do,
And he came to his ultimate
Destiny – stew.

And the small grain of sand
That had bothered him so
Was a beautiful pearl
All richly aglow.
Now the tale has a moral;
For isn’t it grand
What an oyster can do
With a morsel of sand?

What couldn’t we do
If we’d only begin
With some of the things
That get under our skin.

Author: Unknown

http://www.scrapbook.com/poems/doc/4617/109.html

An Old Schooner Named Mamie Foster, Used for Harvesting Oysters By Dredge

Source: Shorpy.com at https://www.shorpy.com/

A publication of the
Mississippi Department of Marine Resources
Marine Fisheries – Shellfish Bureau
1141 Bayview Ave, Biloxi, MS. 39530
Phone: (800) 374-3449
Website: www.dmr.ms.gov
Oyster Hotline: (800) 385-5902

The Mississippi Department of Marine Resources is dedicated to enhancing, protecting and conserving marine interests of the state by managing all marine life, public trust wetlands, adjacent uplands and waterfront areas to provide for the optimal commercial, recreational, educational and economic uses of these resources consistent with environmental concerns and social changes.

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES

ENHANCE ★ PROTECT ★ CONSERVE