

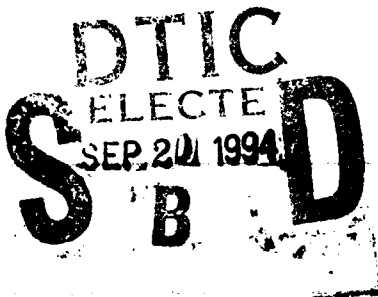


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The Impact of Mine Warfare Upon U.S. Naval Operations
During the Civil War

LCDR Edwin D. Lindgren, USN

U.S. Army Command and General Staff College
Attn: ATZL-SWD-GD
Fort Leavenworth, KS 66027-6900



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The lessons from the mine warfare experience of the Civil War are still applicable in today's warfare environment. Naval mines are a preferred weapon of minor naval powers and the U.S. Navy will be required to deal with this threat when operating in the World's coastal regions.

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THE IMPACT OF MINE WARFARE UPON
U.S. NAVAL OPERATIONS DURING THE CIVIL WAR

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE

by

EDWIN D. LINDGREN, LCDR, USN
B.S., San Diego State University, San Diego, California, 1976

Fort Leavenworth, Kansas
1994

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THESIS APPROVAL PAGE

Name of Candidate: LCDR Edwin D. Lindgren, USN

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Approved by:

William G. Robertson, Thesis Committee Chairman
William G. Robertson, Ph.D.

Thom W. Ford, Member
CAPT Thom W. Ford, USN, M.A.

Accepted this 3rd day of June 1994 by:

Philip J. Brookes, Director, Graduate Degree
Philip J. Brookes, Ph.D. Programs

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other government agency. (References to this study should include the foregoing statement.)

ABSTRACT

THE IMPACT OF MINE WARFARE UPON U.S. NAVAL OPERATIONS DURING THE CIVIL WAR by LCDR Edwin D. Lindgren, USN, 109 pages.

This study investigates the impact of Confederate naval mine warfare against the operations of the U.S. Navy during the Civil War. Mine warfare was a cost effective method for the Confederacy to defend its long coastline and inland waterways. A wide variety of fixed, moored, and drifting mines were deployed and used with effect at locations along the Atlantic coast, the Gulf coast, and along rivers, including those in the Mississippi basin.

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TABLE OF CONTENTS

	<u>Page</u>
APPROVAL PAGE	ii
ABSTRACT	iii
LIST OF MAPS AND ILLUSTRATIONS	v
CHAPTER	
1. INTRODUCTION	1
2. ATLANTIC COAST OPERATIONS	25
3. GULF COAST OPERATIONS	55
4. THE WESTERN RIVERS	70
5. CONCLUSIONS	89
APPENDIX	103
BIBLIOGRAPHY	106
INITIAL DISTRIBUTION LIST	109

LIST OF MAPS AND ILLUSTRATIONS

<u>Figure</u>	<u>Page</u>
1. AREAS OF MINE WARFARE OPERATIONS	2
2. TYPICAL CONFEDERATE NAVAL MINES	16
3. TYPICAL CONFEDERATE NAVAL MINES	19
4. EASTERN VIRGINIA	27
5. RICHMOND AND JAMES RIVER	30
6. CHARLESTON AND VICINITY	37
7. CHARLESTON HARBOR	39
8. EASTERN NORTH CAROLINA	47
9. EASTERN GEORGIA AND NORTHERN FLORIDA	50
10. MOBILE BAY AND VICINITY	57
11. LOWER MISSISSIPPI RIVER	71
12. VICKSBURG AND VICINITY	76

CHAPTER 1
INTRODUCTION

Damn the torpedoes! Four bells,
Captain Drayton, go ahead!

Admiral Farragut, Mobile Bay, August 4, 1864

The American Civil War was the first conflict in history in which mine warfare played a significant role both at sea and in the riverine operating environment. Much technical work on naval mine warfare was accomplished during the century prior to the Civil War, and naval mines saw limited employment during the Schleswig-Holstein War and Crimean War.¹ However, it was during the Civil War that the mine as a naval weapon entered its period of modern development and tactical deployment. The Union Navy's encounter with "torpedoes" at Mobile Bay in August 1864 is probably the best known encounter with naval mines in the popular literature of the Civil War. However, the Confederate States of America (CSA) used defensive mining extensively, in both marine and riverine environments along the Atlantic and Gulf Coasts, and up into the Mississippi River basin. By the end of the war, naval mines of all types had sunk or damaged a total of thirty-five Union ships, gunboats, and small vessels.² This was more damage than inflicted on Union maritime forces by all other types of weapons combined. Dealing with this threat was a significant challenge for the U.S. Navy (USN) during the war.

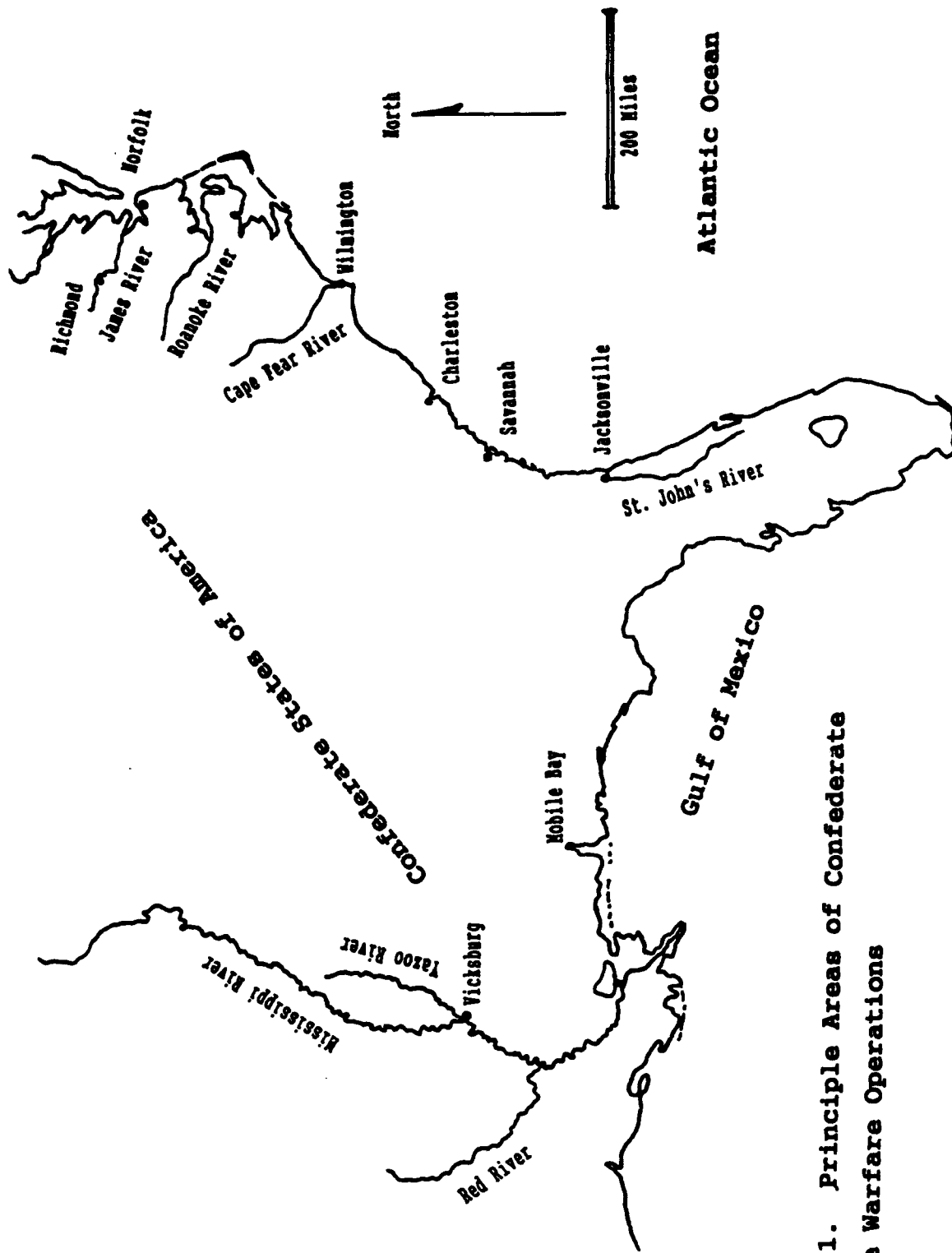


Fig. 1. Principle Areas of Confederate Mine Warfare Operations

The scientific and technological developments that led to the deployment of naval mines had their beginnings with the invention of gunpowder during the thirteenth century. Additional advancements in firearms technology and research in electricity led to the invention of three basic types of naval mines by the mid-nineteenth century. These three, the electrically-detonated mine, and the chemical and percussion contact mines, would be the principal types used by the CSA during the Civil War. The hundred year period prior to the Civil War was one of rapid development of the concept of the mine as a naval weapon. These developments took place initially in America and then the focus of activity shifted to Europe.

The first known use of mines in naval warfare was during the American Revolutionary War. David Bushnell developed a floating keg mine that was activated by a flintlock trigger. In December 1777 or January 1778 he released a number of these drifting devices in an unsuccessful attempt to sink British vessels anchored on the lower Delaware River.³ There are no other known attempts of the use of mines during the Revolutionary War. Robert Fulton conducted work on mines during the late 1700s and early 1800s. He received funding from the U.S. Government for research and tests, and demonstrated that an underwater explosion could sink a moored vessel. Fulton proposed using mines as a defensive measure during the War of 1812, but there is no evidence any action was taken on his suggestion.⁴

Early work was also progressing on developments which would lead to electrically-detonated mines. In 1751, Benjamin Franklin invented a method for igniting gunpowder using an electrical discharge between two

metal points imbedded in powder. Additional research led to the use of a fine wire, such as platinum, heated with lower voltages to ignite gunpowder.⁵ In 1839, British Colonel Charles Pasley removed a wreck lying off Portsmouth Harbor using an electrically-detonated underwater demolition. This effort brought together all the critical elements required for the success of the electrical mine, including "insulated electric cables, batteries, hot-wire initiators, and gun-powder in watertight containers."⁶ Back in the United States, Samuel Colt was conducting experiments with electrically detonated underwater explosions. He used a galvanic battery to heat a fine wire embedded in gunpowder. Colt was prolific in this work, developing concepts for managing the fire-control of an electrically detonated mine field and suggesting that these devices could be used to augment coastal defenses. However, Colt was very secretive about his work and the U.S. Government eventually lost interest.⁷

Colt's was the last major research conducted in the United States prior to the Civil War. However, significant developments were continuing in Europe. In 1839, a Committee on Underwater Experiments was established in Imperial Russia. This was the world's first military organization with official status on underwater warfare.⁸ A German physicist, Moritz von Jacobi, who was appointed to the committee by Czar Nicholas I, did work on electrically-fired mines for Russian use. The Nobel family, who were emigres from Sweden, also developed mines and a chemical method for igniting gunpowder for Russia. This consisted of placing sulfuric acid, potassium chlorate, and sugar in a glass tube which, when crushed, mixed the substances, producing sufficient heat to

ignite gunpowder.⁹ In 1848, Werner von Siemens laid a field of galvanically (electrically) controlled mines at Kiel during the Schleswig-Holstein War. This frustrated Danish attempts to bombard the city and was the first controlled moored minefield in history.¹⁰

It was during the Crimean War that the Russians put the naval mine to use in the defense of St. Petersburg and Kronstadt. Kronstadt, located at the head of the Gulf of Finland, guarded the approaches to the Russian capital at St. Petersburg. Although most of the fighting during the Crimean War was on the peninsula of the same name in the Black Sea, there was a significant British naval effort in the Baltic Sea. The Russians placed planned mine fields in defense of harbor works and fortifications, making use of both contact and electrically controlled mines. Electrical mines were laid in the sea approaches to Kronstadt, with 165 placed in 1854 and 300 in 1855. Almost 1000 mines were laid in approaches to the fortress at Sveaborg.¹¹ The mines performed poorly overall, with the contact mines having explosive charges too small to inflict significant damage to a vessel.¹² However, it is noteworthy that the British did conduct minesweeping during their operations in the Gulf of Finland and HMS Merlin sustained damage from a mine explosion at Kronstadt. This was probably the first warship in history damaged by a naval mine.¹³ Despite the large number of mines deployed by the Russians, the effort during the Crimean War was outside the main theater of operations and did not cause significant problems for the British fleet.

The dissolution of the Union and the commencement of hostilities between the Northern and Confederate States brought together two very

different navies with radically different missions and methods. There were significant differences in fleet size and composition, naval support facilities, personnel availability and training, and industrial support infrastructure between the North and South. A brief review of these factors will lead to the role the naval mine played in the South's naval strategy.

President Lincoln initially hoped to stem the tide of succession and coax rebellious states back into the Union with a minimum of bloodshed. However, following the events of April 1861 at Charleston and additional bellicose actions by the newborn Confederacy, it became obvious that concerted military action would be required to crush the rebellion. There was much confusion within the government as to the best strategy to follow; however, General of the Army Winfield Scott proposed the nucleus of a strategy that would ultimately be the cornerstone of the military effort to bring the Confederate states back into the Union. Weigley states that Scott:

proposed to subject the Southern Confederacy to a gigantic siege, employing Union naval power to blockade the Southern ports and gradually to strangle the confederate economy by preventing the export of cotton and the import of industrial products and war material. On land, he proposed to delay major actions until superior armies could be equipped and trained, whereupon he would have conducted a war of regular, deliberate approaches, using the rivers which penetrated the Confederacy, and again Union naval power, gradually to dismember the Confederacy as a besieging army might gradually chop away the bastions of a fortress.¹⁴

Scott expected a long war, possibly lasting up to three years. His strategic approach met with much critical comment, especially from those expecting a short, decisive war.

President Lincoln began to implement the naval portion of Scott's proposed strategy on April 19, 1861, when he authorized the

naval blockade of Southern ports. Although short of vessels to enforce the blockade, ships began to operate off Atlantic coast ports and along the Potomac River. The Union had to establish the blockade piecemeal, as the Navy acquired additional vessels for blockade duty. The blockade was extended to the Gulf of Mexico in May 1861. That same month Commander John Rodgers was ordered into the Mississippi River valley to begin the task of forming a naval force to operate on the Mississippi and its tributaries. He established a base at Cairo, Illinois and functioned under the command of Army General McClellan.¹⁵ Naval operations on the Mississippi, performed jointly with the Army, had three major purposes. Those were to split the Confederacy in two, isolating the western states; close the river to Confederate trade, effectively extending the blockade into the Mississippi basin; and reopen the river as an outlet for Union commerce from the upper Midwest.¹⁶ In addition, control of the river would give the Union great flexibility to move troops and material in the Western theater of operations.

At the start of the Civil War, the United States Navy was a capable organization with global, deep-water operating experience. The USN had been actively involved in combat operations during the Mexican American War, and had conducted exploration expeditions to places as varied as Antarctica and the Dead Sea.¹⁷ It was a small Navy, but active, progressive and forward thinking in most respects. At the start of the war only a handful of ships were at the home squadron, with the remainder on overseas stations. In 1861 the Navy had a total of ninety vessels; forty-two were in commission, with the rest unserviceable or

otherwise laid up.¹⁸ It was a fleet making the transition from sail to steam; the most modern vessels were steam frigates with screw propulsion. These vessels had fairly deep drafts, being designed for open ocean operations, and were not suited for operations in the shallow waters and bays of Southern coastal inshore waters. The USN had not yet begun the transition to ironclad vessels, as was being done by major European navies.

Strides had been made in naval ordnance and gunnery. The significant work of Commander John Dahlgren had led to the development and deployment of a family of large caliber, rifled naval guns which fired exploding shot. These weapons could be brought to bear with devastating effect against other vessels and masonry forts.¹⁹ The USN was also blessed with a talented pool of officers. The Navy did have problems holding promising young officers due to a moribund system which allowed senior officers to remain on active duty until death. This restricted promotion opportunity, but was quickly reformed after the outbreak of the war. However, the North's major advantage in the naval war was its industrial capacity and the nation's massive maritime industry located in the Northeast. This large commercial fleet allowed for the purchase of suitable vessels to augment the Navy until specialized ships could be built. The Navy was also able to rapidly expand its manpower using officers and men from the merchant marine. This was a capability the South could not match.

The Confederacy began the war at an extreme disadvantage, for it had no navy. It was to be locked into a war, forced to defend an extended, complex coastline of bays, inlets, and deltas running down the

Mid-Atlantic states, around Florida and into the Gulf of Mexico. The CSA had ten major seaports with rail connections inland. These were Norfolk, New Bern (North Carolina), Wilmington, Charleston, Savannah, Fernandina (Florida), Pensacola, Mobile and New Orleans. Of these, New Orleans and Mobile were the busiest commercial ports.²⁰ These ports were the South's lifeline to the world and their defense was to be a top priority of the CSA leadership.

The Southern naval strategy was, of necessity, defensive in nature. President Jefferson Davis and his cabinet realized they had to make it difficult, if not impossible, for the United States to enforce an effective blockade. In April 1861 Davis authorized Confederate letters of marque, for privately owned and armed vessels to attack and capture Northern merchant ships at sea. The purpose was two-fold. The first goal was to disrupt Northern shipping, possibly forcing the European powers to intervene in the war. The second goal was to draw off USN vessels, making it difficult to enforce an effective blockade.²¹ The Confederacy also made preparations to defend its important ports and coastline from Union naval attack.

At the beginning of the war, the CSA had a handful of small vessels, seized in various Southern ports, as the nucleus of a navy. A complication that Confederate Navy Secretary Steven Mallory had to grapple with was the issue of states' rights. The Confederate constitution zealously guarded the rights of the individual states which made up the CSA, with the result that each state formed its own navy.²² The South had a cadre of trained naval officers, since over 125 USN

officers with ties to the South resigned their commissions and went over to the Confederate cause.

However, it was the Confederacy's lack of an industrial infrastructure that made it virtually impossible to compete with the United States in a naval war. Only one foundry, located in Richmond, was capable of manufacturing naval guns. The South had only three major centers for shipbuilding, located at the Norfolk Navy Yard, the Pensacola Navy Yard, and the commercial shipyards at New Orleans.²³ The capture of the Norfolk Navy Yard from its Federal garrison, despite attempts to destroy the facility, was a stroke of good fortune for the CSA. They took possession of a great drydock, ship houses, and facilities for building and maintaining both sail and steam vessels. They also seized almost 1200 naval guns, including fifty-two nine inch Dahlgren guns, and the partially destroyed hull of the USS Merrimack.²⁴ Secretary Mallory was an early proponent of ironclad warships, which he thought could be used effectively by the South to break the blockade. However, it was not uncommon for Confederate ironclads to be armored with rail from dismantled Southern railroads. The CSA was definitely in a position of the inferior naval power and, early in the war, began to look at unique and innovative technologies in order to wage its naval war against the United States.

The Confederate States turned to naval mine warfare very early in the war. Jefferson Davis recognized the contribution of naval mine warfare, devoting significant space to it in his two-volume history of the Confederate government. Davis wrote:

The system of torpedoes adopted by us was probably more effective than any other means of naval defense. The destructiveness of these

little weapons had long been known, but no successful modes for their application to the destruction of the most powerful vessels of war and ironclads had been devised. It remained for the skill and ingenuity of our officers to bring the use of this terrible instrument to perfection.²⁵

Davis paid tribute to all those officers who adapted this new technology to the Confederacy's difficult coastal defense problem. Among those, the three who probably had the greatest impact on the use of mines in naval warfare were Matthew Fontaine Maury, Hunter Davidson, and Gabriel Rains. Of the three, it was Maury who initiated the program to use naval mines in defense of the Confederacy.

Matthew Fontaine Maury was born in Virginia and joined the United States Navy as a midshipman in 1825. Injured in a stagecoach accident in 1839, he was declared unfit for continued sea-duty and was appointed superintendent of the USN's Depot of Charts and Instruments in 1842. In this position he was also in charge of the Naval Observatory and the Hydrography Office. In this capacity, he became one of the founders of the science of physical oceanography. By collecting and analyzing vast amounts of data on ocean currents, winds and other meteorological and hydrographic information, he was able to prepare charts that permitted sailing vessels to cut days off trans-oceanic voyages. Maury, a believer in states rights, went over to the Confederate cause when his home state of Virginia left the Union in April 1861. He was commissioned a commander in the Confederate States Navy (CSN) and placed in charge of Confederate harbor and river defenses.²⁶

Maury recognized the tremendous problem confronting the Confederacy, with its long, vulnerable coastline and virtually no navy

for protection. Maury "urged that the most effective way to keep off the enemy was to mine the channelways, and blow up [his vessels] . . . when he attempted passage."²⁷ Although there was much skepticism about the effectiveness of naval mines, and questions about the lawfulness and morality of that mode of warfare, Maury began to conduct experiments on naval mine technology. His initial work was with minute charges of powder detonated in an ordinary washtub. He later conducted explosions of much larger devices in the James River in order to test their mechanisms and effectiveness.²⁸ In the Summer and Fall of 1861, two attempts were made to attack Union vessels at anchor at Hampton Roads with drifting mines. Maury personally directed the first effort made in July. Neither operation caused any damage to the Federal fleet, but valuable experience with mine warfare was gained by the participants.²⁹ Maury continued his work with naval mines, concentrating primarily on perfecting electrical bottom mines for use in the defense of the capital of Richmond. In June 1862, he was replaced by Lieutenant Hunter Davidson, CSN, who had been his assistant.³⁰ By the Fall of that year, Maury was in England, where he had access to the facilities and the expertise to continue his work on mine development. He did not return to America until immediately prior to the end of the war.³¹

Hunter Davidson served in the United States Navy for twenty years prior to his joining the Confederate cause in 1861. As Maury's assistant, he worked on developing submarine defenses around the capital of Richmond. He then relieved Maury as chief of the operation in June 1862. When the Submarine Battery Service was stood up in late 1862, Davidson became chief of the organization. Davidson carried the work on

electrical mines that Maury began to its logical conclusion, creating an integrated, functional weapon with significant capability. Davidson wrote that his work resulted in:

the organization of a department, the application of an electric battery of convenient size and sufficient strength to the explosion of submarine mines; the construction of a large number of wrought iron mines . . . , holding 1,800 pounds of gunpowder, which were placed at a depth of seven fathoms; the importation of insulated cable to connect the mines and the electric batteries; the manufacture of the platinum or quantity fuse, which alone was used in the electrical defences around Richmond, and in those at Charleston.³²

By January 1863 Davidson's organization had nine electrical torpedo stations on the James River. These were linked to each other and Navy Secretary Mallory's office by telegraph.³³

Davidson did not confine his activity only to defensive mine warfare operations. In March 1864 he was also involved in an attempt to sink the USS Minnesota with an offensive spar torpedo, a explosive charge attached by a spar to a manned vessel. However, the bulk of his military activity during the war was with electrical torpedoes. Davidson probably did little, if any, work with contact mines. In his post-war writings, he did not consider contact mines effective and thought them to be too indiscriminate a weapon, believing electrical mines to be superior in every respect.³⁴

General Gabriel J. Rains, Confederate States Army (CSA), began his military service in the United States Army. In 1840, during the Seminole Wars in Florida, Rains made use of a land mine, which was probably more properly classified as a booby-trap, when in command of a company of the Seventh U.S. Infantry at Fort King.³⁵ Placed in charge of the Confederate Torpedo Service, Rains was responsible for both land

and naval mine warfare operations. He developed a very sensitive contact fuse, and the Rains keg torpedo was probably the most common type in used for coastal and harbor defense.

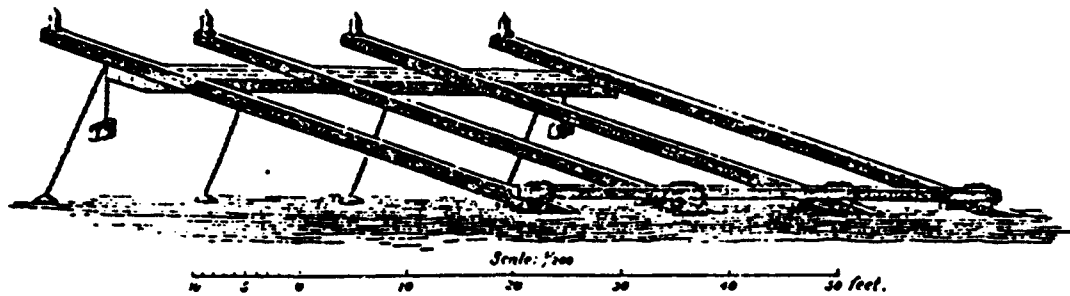
The Confederate Congress passed legislation in October 1862 to organize its varied mine warfare operations. It authorized three organizations which would be responsible for experimentation, development, training, and field application of torpedoes. They were the Secret Service, Confederate States Submarine Battery Service, and the Torpedo Bureau. The Secret Service had little to do with naval mine warfare as understood in the modern sense and will not be discussed further. The Torpedo Bureau was an Army organization which concentrated on mechanical mine technology, with General Rains in charge. The Submarine Battery Service was a naval operation, commanded by Hunter Davidson, that concentrated on the use of electrical mines. In addition to organizing the Southern effort, this legislation essentially legalized mine warfare insofar as the CSA was concerned. It extended legal protection and prisoner-of-war rights for those involved in mine warfare activity.³⁶ This was significant in light of the thinking of the time that mine warfare was a somewhat underhanded and immoral way of conducting war. The result was an attempt to convert an effort that had been piecemeal, ad hoc, and local into a major effort with centralized control and government support. Talented people were recruited into the engineering effort and agents were sent to Europe to investigate advances in mine warfare being made there. As an example of the impact on this reorganization on efforts in the field, the "Department of Submarine Defences" at Charleston was an Confederate army organization

with fifty to sixty officers and men. Their only duty was to prepare, place, inspect and maintain the torpedo defenses of that city. To perform their duties, they had the material and technical support of the "Bureau" at Richmond. At other points along the Confederate coastline the same system was in place.³⁷

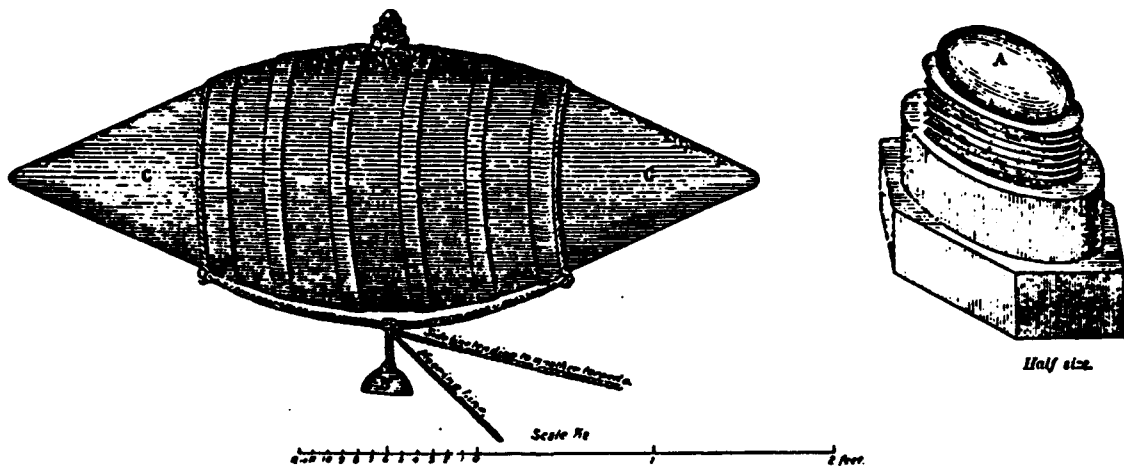
Unmanned torpedoes used by the South were classified into two basic types, fixed and drifting torpedoes. The fixed torpedoes were considered to be defensive in nature, while those that drifted with the current were considered to be an offensive weapon. The drifting mines were usually fairly crude weapons designed to strike or get hung up on a vessel's hull. They used contact fuses or had an actual burning fuse of long duration that would allow them time to drift to their intended target. Drifting torpedoes were used with limited effectiveness during the war.

Although there was a great deal of local innovation, the Confederates used three basic types of fixed or defensive naval mines. These were frame mines, floating or buoyant (moored) mines, and electrical mines. Each was designed for a specific type of environment and will be briefly described.

Frame torpedoes served the function of both mine and obstruction. They were generally placed in narrow, shallow channels, at the entrances to creeks and rivers, and on shallow bars. They were submerged frames constructed of timber, upon the head of which were secured one or more mines. The frames were constructed in such a way that the mines would float immediately below the water's surface. The mines used either a percussion or chemical contact fuse. Frame



Frame torpedoes used in the Ashley River at Charleston.



Keg-type contact mine, with fuse.

Fig. 2. Examples of typical Confederate naval mines. Reprinted from Official Records of the Union and Confederate Navies in the War of the Rebellion (Washington, D.C.: Government Printing Office, 1895-1929).

torpedoes were considered by Union naval officers to be very difficult to force a passage through, and were used extensively at Charleston, Wilmington, and Mobile.³⁸

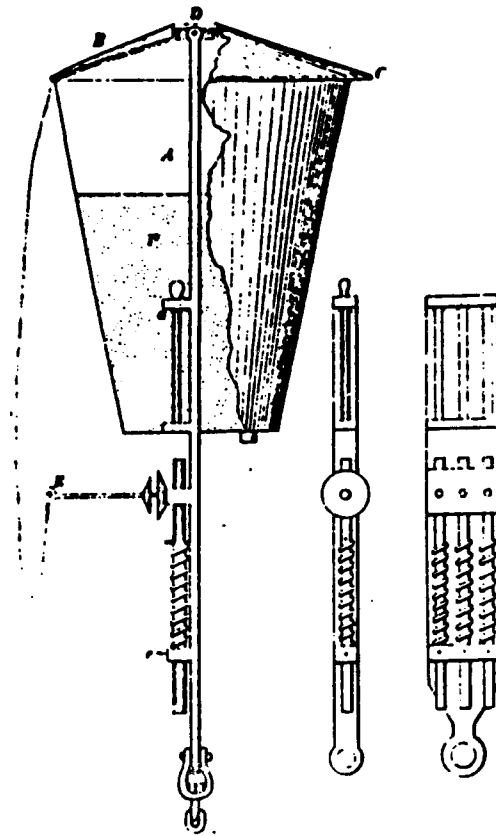
The floating or buoyant mine was a moored weapon that took many forms during the war. The two most common and successful types were the keg torpedo and the Singer torpedo. The keg torpedo, also known as the Rains keg torpedo, was constructed from a small barrel; lager beer barrels were the preferred vessel. They were made waterproof with pitch inside and out, and cones constructed of pine were attached to each end in order to properly stabilize the barrel in the current following mooring. They generally had a charge of seventy to 120 pounds of black powder and had five or more contact fuses placed to the top of the barrel. A mooring was attached using hemp line and a weight, and the mine was ready to be laid. Keg mines were inexpensive, and easy to construct and lay. However, they were dangerous because they often shifted their moorings in strong currents, which did inflict friendly casualties. They were extensively used by the Confederates and large numbers were kept on hand at key locations.³⁹

The Singer metal torpedo was another floating type of unique design, and may have been one of the most successful Southern naval mines. The mine consisted of a tin case half-filled with fifty to one hundred pounds of powder. The remainder was air-space to provide buoyancy. A heavy metal cap on top of the explosive case and firing mechanism were also part of the device. The mine was activated when a vessel would strike it, knocking off the metal cap. This would activate a plunger which forced a rod into mercury fulminate, detonating the

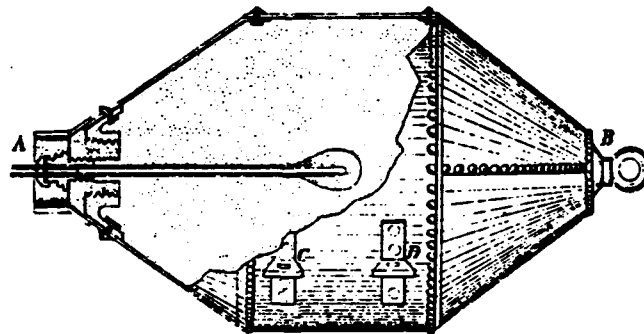
charge. These mines had safety features to protect the party conducting the mine laying operation from premature detonation. Singer torpedoes were used in both the Mississippi River basin, at Mobile Bay, and along the East Coast.⁴⁰

Electrical mines were the largest naval mines used by the South during the Civil War. They were bottom mines, usually placed in narrow, deep channels where navigation was restricted. Initially old boilers were used, but eventually cases were fabricated to specification for the purpose. Explosive charges were large, consisting usually of about 2000 pounds of powder. Ordinary telegraph wire was used to make the electrical connection, with the submerged portions of the wire being protected with tarred hemp. The fuse was a platinum wire passed through a goose quill filled with fulminate of mercury. The electrical charge was provided with ordinary voltaic piles. These mines were usually placed in such a way that one shore station could control several mines. A series of range stakes would be surveyed in so that the shore station operators could determine the positions of their intended targets relative to the mines. These mines were used with devastating effectiveness because of the massive size of their explosive charge, and were placed in the James River, at Charleston, and at Fort Fisher.⁴¹

The objective of this thesis will be to investigate the tactical, operational, and strategic impact of Confederate mining operations upon Union naval operations. Although the Union made some limited use of naval mines, that use will not be a topic of this thesis. The primary question to be investigated will be how effective was the Confederate use of mine warfare against operations of the U.S. Navy



Singer-Fretwell contact mine.



Electrical bottom mine.

Fig. 3. Examples of typical Confederate naval mines. Reprinted from J. S. Barnes, Submarine Warfare, Offensive and Defensive (New York: D. Van Nostrand, 1869).

during the Civil War? Secondary questions will include the following. What types of mines were used by the Confederate forces and how were they employed? In what campaigns and operations did defensive and offensive mine warfare play a role? How did the real or perceived presence of mines result in modification in tactics and operations by Union forces? What methods did the Union Navy use to detect and sweep Confederate naval mines? What are the lessons of the Union experience with mine warfare, and how can these lessons be applied to contemporary coastal and littoral warfare?

This is an appropriate point to briefly discuss an item on terminology and address a constraint on this research. The self-propelled torpedo, as understood in the modern sense, was not invented until after the end of the American Civil War. During the Civil War, the term "torpedo" was used to refer to a variety of both defensive and offensive naval weapons. These included both unmanned moored and free-floating devices, and spar torpedoes attached to delivery vehicles, such as the Hunley manned submersible. This thesis will use the terms torpedo and mine interchangeably when discussing moored or free-floating naval mines. The subject of this thesis will be naval mine warfare as understood in the modern sense and will not address explosive devices associated with surface or submerged manned delivery vehicles.

The Confederates conducted mine warfare operations along virtually their entire coastal region and up into the Mississippi River basin. This thesis will examine the Confederate use of mines by geographical region. Chapter 2 will survey those mine warfare operations which took place along the Atlantic Seaboard and present an

analysis of their impact upon Union naval and joint operations. Chapters 3 and 4 will do the same for the Gulf Coast and Mississippi River basin, respectively. Chapter 5 will present a summary of lessons learned and apply those lessons to naval mine warfare as practiced in the late twentieth century, with special emphasis on application to the U.S. Navy's current doctrine for coastal and littoral warfare.

Endnotes

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¹⁵Bern Anderson, By Sea and by River: The Naval History of the Civil War (New York: Alfred A. Knopf, 1962), 41-43.

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²⁶Bruce Catton, The Centennial History of the Civil War 3 vols. (New York: Pocket Books, 1963) 1: 429-430.

²⁷Richard L. Maury, "The First Marine Torpedoes were Made in Richmond, Va., and Used in James River," Southern Historical Society Papers 31 (1903): 327.

²⁸Ibid., 328.

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³⁰S. R. Mallory to LT Hunter Davidson, 20 June 1862, Official Records of the Union and Confederate Navies in the War of the Rebellion 31 vols. (Washington, D.C.: Government Printing Office, 1895-1929) series I, 7: 546. (Cited hereafter as N.R. Further references are to series I unless otherwise noted.)

³¹Maury, 331.

³²Jefferson Davis and Hunter Davidson, "Davis and Davidson: A Chapter of War History Concerning Torpedoes," Southern Historical Society Papers 24 (1896): 285-286.

³³Ibid., 286.

³⁴Hunter Davidson, "Electrical Torpedoes as a System of Defence," Southern Historical Society Papers 2 (1876): 3.

³⁵G. J. Rains, "Torpedoes," Southern Historical Society Papers 3 (1877): 257-259.

³⁶Perry, 30-31.

³⁷John S. Barnes, Submarine Warfare, Offensive and Defensive (New York: D. Van Nostrand, 1869), 66.

³⁸Ibid., 66-69.

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CHAPTER 2
ATLANTIC COAST OPERATIONS

The Confederates used defensive mining extensively along the Atlantic Coast littoral, estuaries, bays, and tributary rivers. These areas included Chesapeake Bay/James River area, Cape Fear River, Charleston Bay, and the St. John's River. Union forces did not suffer significant losses to mines in these areas, but naval mining operations by the Confederate forces were a serious impediment to activity, especially on the James River and at Charleston Harbor.

The Chesapeake Bay and its tributary rivers had a vital role to play in the military geography of the Civil War. Throughout the war, the Union Army of the Potomac and the Confederate Army of Northern Virginia conducted operations in that portion of Virginia to the west of the Chesapeake Bay. The Potomac, Rappahannock, York, and James Rivers were all navigable for some distance above Chesapeake Bay, with the James navigable all the way to Richmond. These rivers, which thrust deep into the eastern Virginia countryside, were ideal avenues of approach for the Union armies attempting to seize the Confederate capitol and surrounding territory. The Union Army, with the active support of the Navy, would make extensive use of these rivers during the course of the war. The Confederacy would expend considerable effort to deny the Union the use of these rivers, with mine warfare playing a significant role.

The Potomac River was not the site of significant naval operations during the Civil War. The U.S. Navy's Potomac River Flotilla had the major responsibilities of keeping the river open for Federal shipping to and from Washington, and of suppressing smuggling from Maryland into Virginia.¹ However, the Potomac was the location for the first documented encounter of Union naval forces with Confederate mines. This incident, which took place on July 9, 1861 off Aquia Creek, was reported by the commanding officer of the USS Pawnee and the acting master of the USS Resolute. The device they encountered was a floating torpedo which consisted of two separate explosive charges connected with "25 fathoms" of line. Each explosive device consisted of a powder-filled iron cylinder attached beneath a large wooden cask for floatation. The powder was to be ignited with a burning fuse. The commanding officer of the Pawnee reported:

The evident intention of the design of the machine was to drop it down with the tide, and at a suitable distance to set fire to matches, and when it had swung across the cable with one of the machines close under each bow, to explode in due time and so destroy the ship. The idea was a wicked one, but the execution clumsy.²

The torpedo was recovered and sent to Washington for examination by Captain John Dahlgren at the Bureau of Ordnance.

The James, York, and Rappahannock Rivers played a more strategically significant role in operations conducted during the Civil War, beginning with the Peninsula Campaign in the Spring of 1862. General George McClellan conceived of this operation to take Richmond by moving up the peninsulas formed by the three rivers from the southeast, avoided the overland approach to the Confederate capitol from Washington. By supporting his army from these rivers, McClellan "could

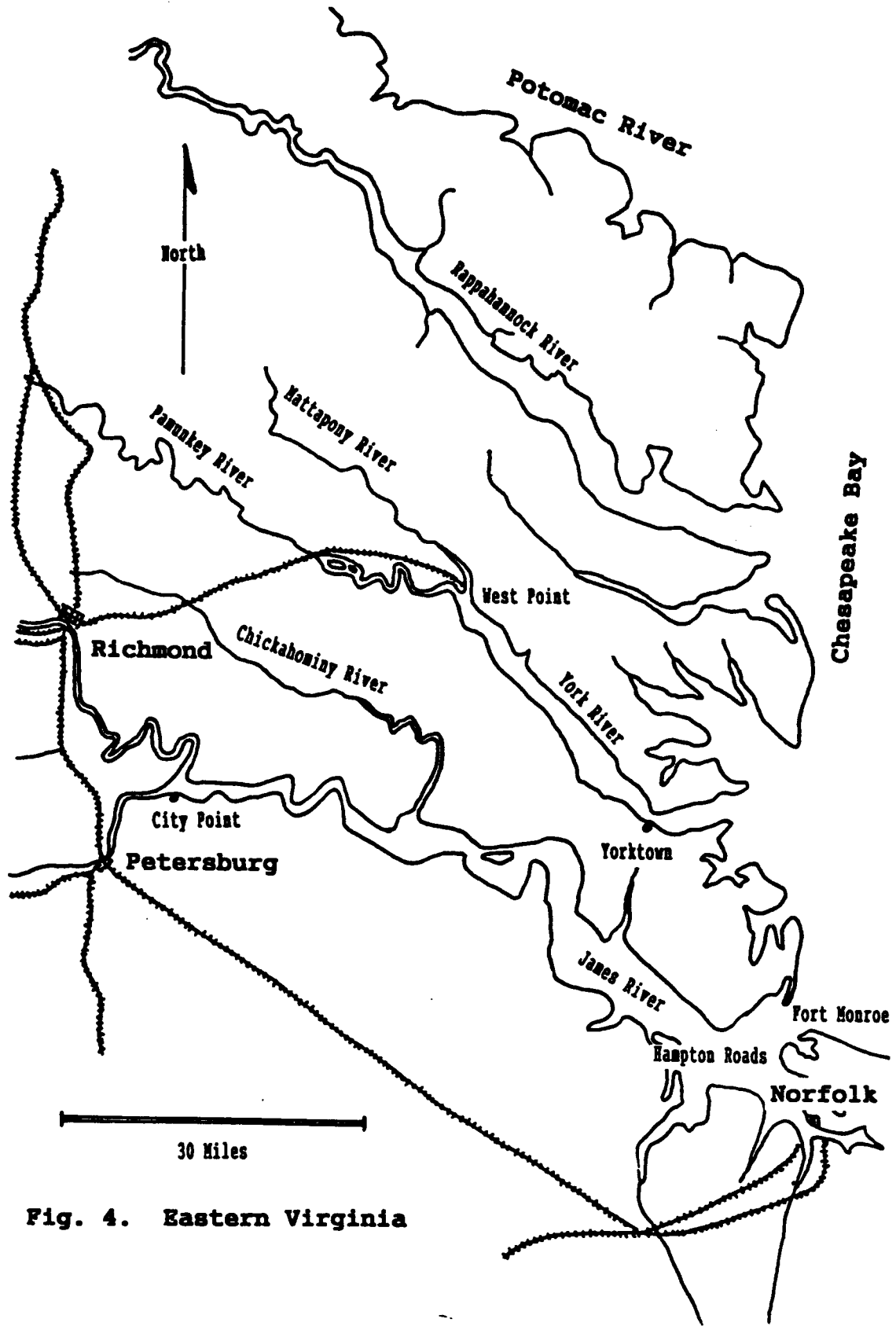


Fig. 4. Eastern Virginia

depend upon water transportation for supplies and equipment, and naval gunboats could support his movements."³ The Peninsula Campaign ended with Union failure in July 1862, when Union forces withdrew to Harrison's Landing on the James. The following month, they were evacuated by water back to Washington. However, this operation had demonstrated the vulnerability of Richmond by the use of these rivers for joint Army-Navy operations. That May, a Union naval force had sailed up the James River as far as Drewry's Bluff, immediately below Richmond, before being turned back by heavy Confederate fire. Had this operation been jointly supported by the Army, it is possible that Federal forces could have seized and held this strategic stronghold on the James.⁴

Defensive mine warfare played virtually no role in the Confederate defense of Richmond during the Peninsula Campaign. There are no references of note on torpedo use in the official records of these operations. However, it became obvious to Confederate commanders that they were vulnerable to Union naval and joint operations up the James and other rivers tributary to the Chesapeake. On May 1, 1862, M. F. Maury wrote General Randolph, the Confederate Secretary of War, that "the most effectual way of keeping off the enemy with his shotproof vessels is to mine the channelways [of the James], and blow up by means of electricity when he attempts the passage."⁵ Shortly thereafter, Hunter Davidson perfected the submarine electrical torpedo and his Submarine Battery Service began to lay these weapons in the James. By January 1863, the James River below Richmond was defended by an

integrated network of torpedo stations controlling huge, electrically-detonated bottom mines.⁶

Federal forces did not attempt any major operations up the rivers again until the Spring of 1864, although a number of smaller joint and naval demonstrations and reconnaissances were conducted. One of the more significant of these smaller operations was a reconnaissance conducted up the James River in early August 1863 by a joint force. The vessels participating included the monitor USS Sangamon, the ferry-boat USS Commodore Barney, the USS Cohasset, and the army transport John Farron. On August 5, while operating just beyond Cox's Landing, above Bermuda Hundred:

two torpedoes exploded under the starboard bow of the Barney, producing a lively concussion and washing the decks with the agitated water. Some 20 men were either swept or jumped overboard, two of whom are missing and may be drowned. The engine of the vessel was partially disabled by the cutting of steam pipe and the connection of steam whistle. The Commodore Barney was then taken in tow by the Cohasset and they came to anchor at Dutch Gap.

The Commodore Barney was damaged, but not so badly that she couldn't complete the reconnaissance operation.⁸ The next month the John Farron was seriously damaged by a mine on the James. Despite these incidents, there was little concerted effort in the short term by Federal forces to take precautions to avoid further destructive encounters with Confederate torpedoes.

The U.S. Navy returned in force to the James River region in the Spring of 1864, as part of the effort by the Army of the Potomac to take Richmond. U. S. Grant conceived of an operation to use Major General B. F. Butler's Department of Virginia and North Carolina as an effort to support Major General George Meade's main thrust towards Richmond from

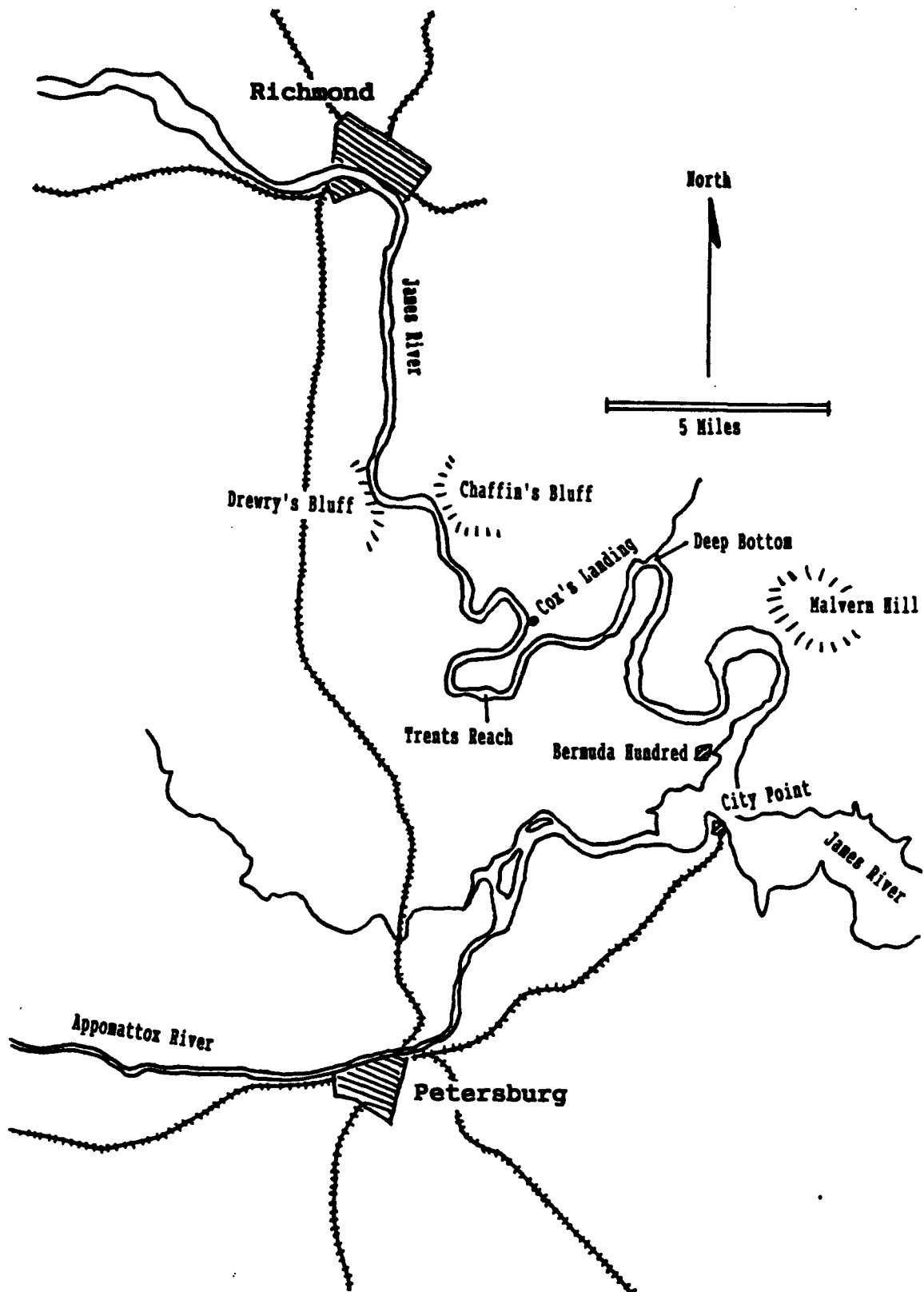


Fig. 5. Richmond and James River

the north. Butler's movement up the James would be a joint Army-Navy operation, with Acting Rear Admiral S. P. Lee's North Atlantic Blockading Squadron providing naval transport and gunfire support for the landing of Federal troops.

Rear Admiral Lee was sensitive to the Confederate preparations made along the James, to both mine and fortify the river against Union riverine operations. Despite some initial problems with determining what the Army required of the Navy for this operation, Lee was informed by Butler that the Navy would provide transport for Federal troops up the James to City Point, landing these troops on both sides of the Appomattox River. The Navy would also assist in seizing key terrain along the river and provide naval gunfire support. Butler also offered Lee the use of shallow draft army boats to "precede the naval force and drag the river for torpedoes or obstructions..."⁹ Once aware of the Army's requirements for support from the Navy, Lee issued detailed instructions to his force for conducting the operation. This guidance included the following on dealing with the Confederate torpedo threat:

The following vessels will be underway by midnight, and take positions in the following order ahead of the army transports: Osceola, Commodore Morris, Shokokon, Stepping Stones, Delaware, General Putnam, Shawsheen.

All of these vessels will be fully prepared to drag for torpedoes themselves

Upon arriving at Harrison's Bar, the General Putnam and Stepping Stones will go ahead and drag the bar carefully for torpedoes, taking care to keep 100 to 200 yards apart, so that they do not explode the torpedoes under each other. As soon as a torpedo is discovered, the vessel making the discovery will at once signify it by hoisting the meal pennant, when every precaution will be taken by dragging with the boats and following slowly. After leaving Harrison's Bar, the Stepping Stones, General Putnam, Delaware, and Shawsheen will, together, search the waters between that point and one mile above Bermuda Hundred for torpedoes, the Delaware on the

port side of the channel, the Shawsheen on the starboard side, the General Putnam and Stepping Stones in mid-channel, in bow and quarter line as near as practicable. The ironclads will not go up to their positions until this is done.¹⁰

All of Lee's instructions to his riverine forces were equally detailed with regard to precautions required for locating and neutralizing the Confederate torpedoes.

The joint operation commenced on schedule, with Butler's troops being successfully landed at Bermuda Hundred on May 5, a short distance above the confluence of the James and Appomattox Rivers. The next day, the Commodore Jones, Commodore Morris, and the Mackinaw were involved in minesweeping operations, dragging for torpedoes on the James at Deep Bottom. At 1400 the Commodore Jones drifted over an electrical bottom mine, which was detonated by its shore operator, totally destroying the Union gunboat. A party of sailors and marines landed immediately by the Mackinaw located the shore control station and killed or captured the Submarine Battery Service party manning the site.¹¹ The loss of the Commodore Jones, along with sixty-nine of her crew, resulted in Admiral Lee redoubling his effort to clear the James of torpedoes. On May 12, Lee established a torpedo and picket division, placing Lieutenant Lamson, USN, in charge. Lee ordered:

The Stepping Stones, Delaware, and Tritonia, several extra officers and 45 men, are detailed for this service. The left bank commanding our vessels should be picketed day and night to prevent surprise. Both banks must be thoroughly examined for torpedo lines..., torpedo wires, and magnetic batteries. The river should be dragged for torpedoes in the channel and for the wires or lines leading between them and from them to both banks. By night keep picket vessels and boats ahead and underway with alarm signals to prevent surprise from rebel river craft, rams, torpedo "Davids," and fire rafts.¹²

General Butler was attempting to get additional Navy support upriver for his operations; however, Lee was hesitant to expose his limited

assets in those reaches of the James that had not been properly cleared of torpedoes. Lee wrote Butler that "the explosion of the gunboat Commodore Jones by a torpedo shows that the river must be cleared of [torpedoes] before we can ascend."¹³ Lee went on to request troops from Butler to help assist in the effort to clear the river of mines and hold critical terrain along the river's bank. The work was dangerous, with the crews subject not only to destruction by detonating mines, but also from harassing Confederate gunfire from the river banks. Lieutenant Lamson, the commander of the Torpedo Division, described a typical operation:

The force assigned to this duty consists of . . . eleven armed cutters from the different vessels, and 175 sailors, marines, and soldiers as skirmishers and pickets to drive back the small bodies of rebels along the left bank and enable the boats to pursue their search unmolested.

The skirmishers ashore searched the banks thoroughly down to the water's edge; the small boats pulled close along either shore, dragging the bottom carefully with grapnels, and the three vessels . . . followed in the channel, dragging grapnels and covering and protecting the boats and parties ashore.

All the grapnel lines were long enough to allow the torpedo caught by the grapnel to explode without injury to the boat or vessel. Some of the large torpedoes were found by tracing the wires from the battery on shore and some by catching the wires with the grapnels.¹⁴

Minesweeping operations such as this and vigilance against floating mines would continue for the duration of the war, and take considerable manpower and effort.

General Grant, concerned about the threat posed to his riverine supply lines by the Confederate ironclads located at Richmond, ordered the James River obstructed to prevent these vessels from moving downstream. In mid-June, the Union forces placed obstructions at Trent's Reach, effectively blocking the James River to navigation at

that point.¹⁵ Federal naval forces would not operate above Trent's Reach until after the fall of Richmond. Rear Admiral Lee's force would be responsible for keeping the James open from Hampton Roads to City Point, and moving troops and supplies on the river.

On April 2, 1865, Grant's forces broke through the Confederate lines at Petersburg; Richmond was evacuated later the same day. Confederate Rear Admiral Raphael Semmes ordered his ironclads destroyed at Richmond, after which he and his men departed for North Carolina to join the remnants of General Johnston's Confederate army. Rear Admiral David Porter, who had command of the North Atlantic Squadron at this point, made preparations to open the river to navigation all the way to Richmond. Porter tasked ten vessels to conduct minesweeping on the James on April 4, conducting a thorough enough sweep that President Lincoln was able to travel up the James on Porter's flagship Malvern later that same day.¹⁶

In summary, the Confederate use of mine warfare on those rivers tributary to Chesapeake Bay probably did not cause any significant disruption to the operational plans for the Union campaigns during 1864-65. It would appear that the presence of the Confederate ironclad fleet at Richmond had more influence on overall use of Federal riverine forces than did the Confederate mine warfare activities along the river. However, there is little doubt that at the tactical level, the Union forces did have to expend considerable effort and manpower to deal with the threat. Rear Admiral Lee made detailed preparations for sweeping the James prior to the movement up that river in May 1864. He was forced to redouble this effort following the destruction of the

Commodore Jones, and counter-mine operations would continue to occupy his forces throughout their operations on the James.

Union naval activity along the bays and inlets of the Atlantic coast to the south of Hampton Roads had a decidedly different character from those off the Chesapeake. Federal operations early in the war established a series of lodgements between Hampton Roads and Florida. By November 1861 Fort Hatteras, Fort Clark, and Port Royal were all in the hands of Union forces. The North Atlantic Blockade Squadron took control of Roanoke Island, Elizabeth City and New Bern, all in North Carolina, by the end of March 1862. The South Atlantic Blockade Squadron seized Fort Pulaski and Brunswick, Georgia, as well as Fernandina, Jacksonville, and St. Augustine in Florida. All these operations along the south Atlantic coast were completed by April 9, 1862. The reasons for seizing these lodgements were two-fold; first, to deny the use of the ports for Confederate commerce and second, to provide logistics support bases for both the North and South Atlantic Blockade Squadrons. By mid-1862, the only major Confederate ports open along the Atlantic seaboard for the use of blockade runners were Wilmington, Charleston and Savannah. Once these initial operations were completed, follow-on activity to seize additional territory along the coast were modest at best. The Union Army did not want to spare the manpower required for additional joint operations against objectives not deemed critical to the overall war effort. The Navy continued the blockade and conducted a number of small scale probes and demonstrations up coastal rivers, but significant offensive operations were limited to Charleston until late in the war.

Charleston, more than any other Southern city, personified the Southern cause for the Confederacy. At the same time, it represented the seat of rebellion for the North and was viewed as the hotbed of secessionist fervor. For these reasons, the South went to great pains to defend the city, while the North made an extraordinary effort to reduce resistance at the city and force its surrender. On September 15, 1862, General P. G. T. Beauregard, CSA, relieved General J. C. Pemberton as commander of the Department of South Carolina and Georgia. On a joint inspection tour conducted with Pemberton shortly after assuming command, Beauregard was dismayed at the poor state of the defenses of Charleston, which was the location of the headquarters for his Department. He "found at Charleston an exceedingly bad defensive condition against a determined attack."¹⁷ Beauregard ordered additional effort to significantly upgrade the state of the city's defenses, including a program which "multiplied the laying out of torpedoes in all navigable streams liable to be ascended by Federal gunboats and other craft."¹⁸

In addition to his troops, and the complex of forts and batteries surrounding the harbor, Beauregard relied on several types of harbor obstructions and mines to complicate and thwart any Union attack upon the city. The obstructions consisted of two types, floating booms and piles. The booms, constructed of heavy timbers in such a manner that a vessel could not break through, were used in various locations. The most prominent boom extended across the main ship channel between Fort Sumter and Sullivan's Island. Pilings were placed in shallow water to impede navigation and restrict vessels to the main channels, where

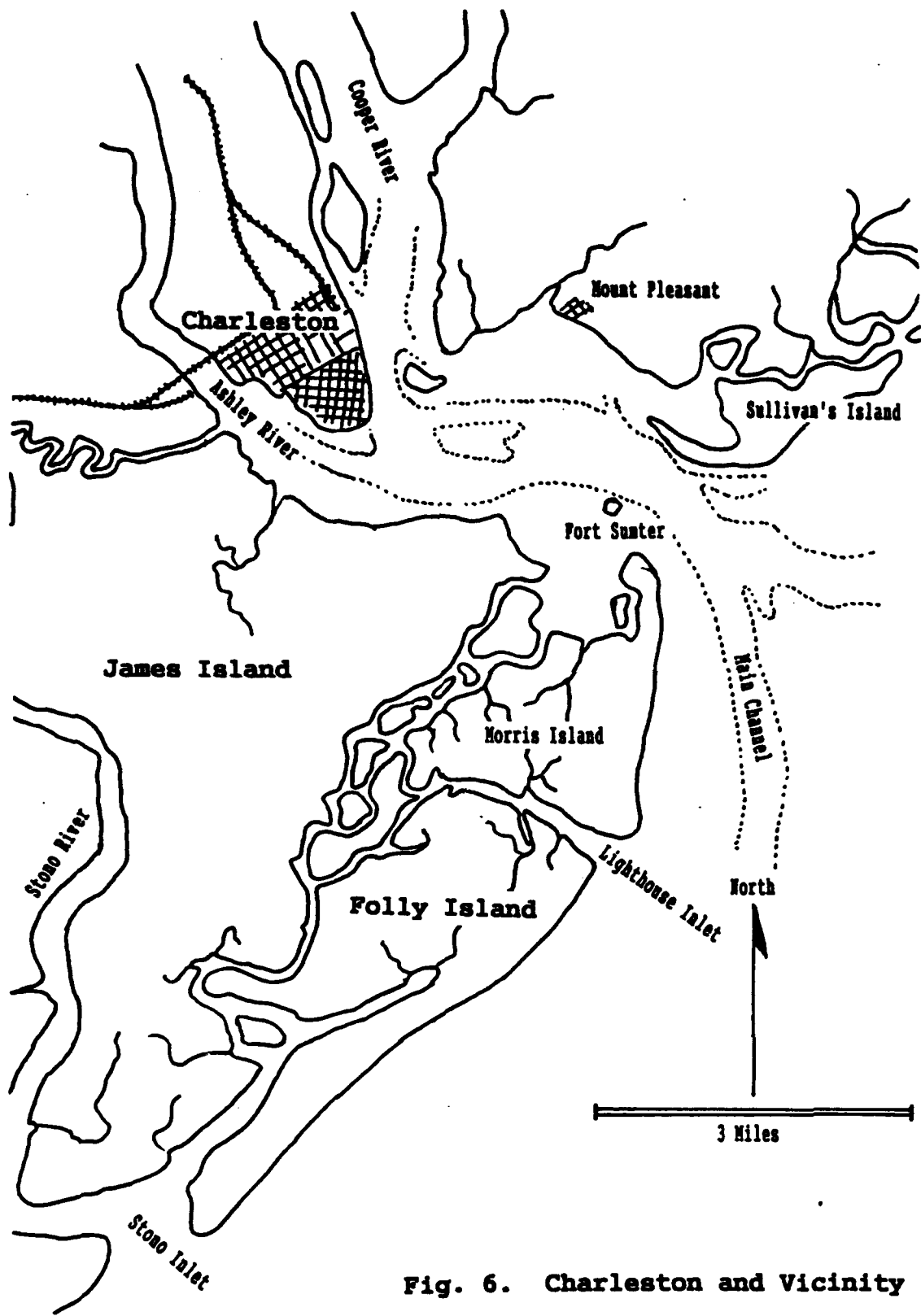


Fig. 6. Charleston and Vicinity

they would be subject to overlapping fire from the numerous defending batteries around the harbor.¹⁹

Three types of fixed mines were used in the defense of the harbor. The first type laid down were frame torpedoes, which were placed initially in the Ashley River below the Spring Street railroad bridge in February or March of 1863. Frame torpedoes were later placed between Castle Pinckney and Fort Ripley, and along the north side of the bay between Hog Island and Moultrieville.²⁰ Confederate engineers also placed a few electrical, boiler-torpedoes, with the first being set just days before the April 7, 1863 Federal naval attack on the harbor. This first boiler-torpedo was placed in the main shipping channel about one mile off Fort Sumter and one half mile from Fort Wagner. A second boiler torpedo was prepared for placement in the main shipping channel on April 5, but was not ready on that date. It was subsequently sunk on the afternoon of April 7, at a location known as "Poor Man's Hole."²¹ Keg torpedoes were used throughout the siege of the city in large numbers. A stock of these were kept continuously on hand and laid in response to Federal naval activity or when currents swept away previously laid mines. Over sixty keg torpedoes were found in Charleston following the Union occupation of the city, ready for use.²²

The Confederate Torpedo Service at Charleston was an organization that at any time kept twenty to sixty men, both black and white, employed in the manufacture, laying, and maintenance of torpedoes. Its personnel were skilled in the construction of the devices and could lay them on short notice. One man so employed described that "in the putting down of the torpedoes dark nights were

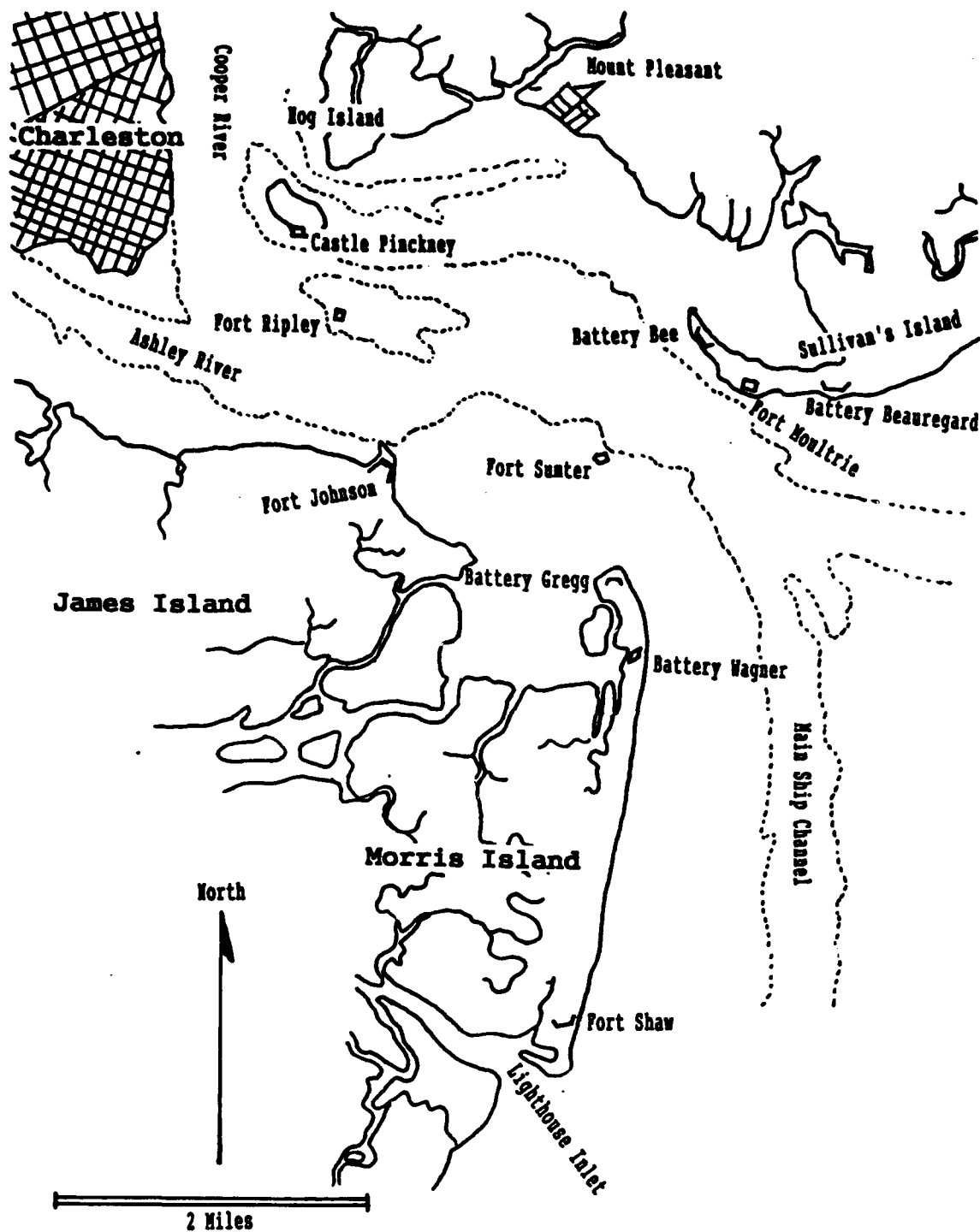


Fig. 7. Charleston Harbor

always selected, using a yawl boat for the purpose, carrying three or four torpedoes, taking from half an hour to an hour to put down the four."²³ The work was fraught with hazard; General Beauregard described an incident where a steamer planting mines at the mouth of the Cooper and Ashley rivers was "swung around by the returning tide, struck and exploded one of the torpedoes just anchored. The steamer sank immediately."²⁴ At least two additional Confederate vessels were sunk by friendly mines in Charleston harbor during the course of the siege.

Union naval officers had knowledge of the torpedo threat at Charleston and took this threat into consideration with their plans for operating in the area. In addition to the force blockading the harbor, there were major attempts to reduce the Confederate defenses of the city, as well as smaller demonstrations and reconnaissance missions up bodies of water such as Light-House Inlet and the Stono River.

The first significant Union effort to take the city was Rear Admiral Du Pont's attack of April 7, 1863. This attack involved the use of nine ironclads and monitors in an attempt to destroy Fort Sumter and the batteries on Morris Island. The attack ultimately failed for several reasons, but significant amongst those was the inability of the force to maneuver, mainly due to the presence of obstacles, but also because of the fear of mines believed placed in the harbor. Rear Admiral Du Pont stated in post-action reports to Navy Secretary Welles that the inability to pass obstructions and concern over the torpedo threat contributed to the decision to withdraw from the attack.²⁵ The defenders of the city had developed these defenses with care and in such a way so as to bring vessels delayed by them into overlapping fields of

fire from the shore batteries. However, at the time of this attack the Confederate mine defenses were rather meager, consisting of only the frame torpedoes within the harbor and the single electrical mine off Fort Sumter. It was the fear of mines, more than the actual presence of mines in the water, which contributed to anxiety on the part of Union naval commanders.²⁶

Du Pont was aware of the potential mine and obstacle threat. There is no evidence that he ordered any sweeping of the channel prior to his attack. Du Pont did equip his fleet with "torpedo catchers" rigged from spars, boarding nets, and grapnels to explode or prevent torpedoes from coming in contact with his vessels.²⁷ He also had a device known as the Ericcson raft attached to the bow of his lead monitor, the USS Weehawken. The Ericcson raft was a "torpedo searcher" developed by John Ericcson for the purpose of removing underwater obstacles and torpedoes. It was essentially a large wooden raft, lashed by multiple points to the bow of the monitor. Ericcson apparently intended that the raft would be configured with an explosive device, described in written reports as a torpedo, which would remove obstacles with a submarine detonation. At Charleston the raft was not equipped with the torpedo due to concerns about safety. Instead multiple chains and grapnels were mounted on it to remove obstructions and snag mines during the approach. Captain John Rodgers of the Weehawken reported that the raft did not impede steering, but did bang against his vessel in even moderately rough water. Ironically, the USS New Ironsides, following damage which impaired its ability of maneuver during the battle, temporarily anchored over the single operational electrical

bottom mine off Morris Island. However, the Confederate personnel at the control station on the beach could not detonate the mine.²⁸

Due to concerns about Du Pont's perceived lack of aggressiveness in conducting his operations, Navy Secretary Welles replaced him with Rear Admiral John Dahlgren in June 1863. Dahlgren was well aware of the formidable nature of the Confederate defenses and had a healthy respect for Southern mine warfare capabilities; as head of the Bureau of Ordnance he had opportunities to examine captured Confederate naval mines. Dahlgren never attempted a direct attack into the harbor similar to Du Pont's April 1863 effort. Dahlgren did repeatedly stress to his commanders the necessity to take precautions for both the mine and torpedo boat threat. Such countermeasures included the use of nets and protective booms around vessels, torpedo "rakes" mounted on the bows of boats, the use of picket boats equipped with calcium lights for night illumination about moored vessels, and eternal vigilance on the part of ship's officers and crew.

The single most catastrophic Union loss to a mine during operations in the vicinity of Charleston was the sinking of the monitor USS Patapsco on January 15, 1865. Ironically, when it struck the mine the Patapsco was assigned as the picket monitor, covering a group of scout and picket boats that were searching the main shipping channel for obstructions and torpedoes just east of Fort Sumter. The Patapsco sank in less than a minute, taking sixty-two officers and men to their death. The vessel probably detonated a keg mine despite its taking appropriate countermeasures. The vessel was properly configured with both torpedo fenders and protective netting stretched around the hull. In addition,

the smaller vessels she had been covering had been arrayed around the monitor, dragging for mines and obstructions.²⁹ Despite precautions, a significant risk remained for vessels operating in these mined waters.

Dahlgren wrote:

Most minute instructions have been given and repeated in regard to rebel torpedoes, and nothing more can be done to bar the chance of accident, save permanent torpedo catchers, substantially made and attached to the bows, so as to be entirely submerged and thus not to be exposed to shot in action.³⁰

After the Patapsco sinking, Dahlgren temporarily removed monitors from the duty of screening boats engaged in the removal of obstructions and mines.

Ultimately, General Sherman and his army accomplished what the Navy had been unable to do for the last two years. As his army swept northward through the Carolinas, the Confederate defenders of Charleston realized their communications to the rest of the Confederate States would be cut off completely, not only by sea, but also by land. The decision was made and on February 17, 1865, Confederate forces evacuated the city. Federal forces were free to occupy the city and the surrounding area unopposed. Thus began the task of opening up the bay to navigation by removing all submarine obstructions and mines. In this project, the Union Navy was assisted by Confederate personnel who fell into their hands after the evacuation of the city. Captain M. M. Gray, who was responsible for torpedo defenses at Charleston from late 1862 until August 1864, when he was relieved of his duties and placed under arrest by Confederate authorities, assisted the Federal forces in this effort. Gray had fallen from favor due to suspicions that he was less than diligent in performing his duties.³¹

Charleston Harbor and environs remained a hazardous place during the Federal minesweeping effort. Union vessels would have an increasing number of encounters with Confederate mines as the campaign drew to a close, a situation which would be repeated during Union operations at Mobile Bay. The tug USS Jonquil, assigned to drag the Ashley River and pull up frame torpedoes, detonated one on March 6. The commanding officer of the Jonquil, Acting Ensign C. H. Hanson, reported:

I secured three of the torpedoes in dragging; the logs became separated. I hooked on to the log which had the fourth one on, but the log came up with the end, not having the torpedo on. I hoisted it to the bow of the steamer and started for shore. On shoaling the water, the torpedo being down, struck the bottom and exploded directly under and about amidships of the steamer. Its force was so great as to raise the boilers 5 inches from their bed and knocked nine men overboard and completely flooded the vessel. One of the men was standing on the berth deck at the time of the explosion, and its force was so great as to throw him up against the deck and split his head open, and the engineer on watch had his back severely hurt by the concussion. At the time of the explosion, I was in about 10 feet of water, and had it been any shoaler the vessel would have been entirely destroyed. Every movable thing was thrown down, doors shattered, windows all broken, and all light work started. The howitzer forward was upset and three beams were badly sprung. The steam gauge and condenser were broken and nearly all light machinery was disabled. The hull of the vessel, however, I found on examination, was not materially damaged.³²

On March 17, the U.S. Coast Survey steamer Bibb struck and detonated a torpedo while returning to Charleston following survey work in the harbor. Damage to the vessel was minor and it was back in operation within three days.³³ The USS Massachusetts struck a torpedo while leaving Charleston harbor on March 19, but the device did not detonate. The most significant loss to a mine during the month of March was Dahlgren's flagship, the USS Harvest Moon, which struck a mine and sank south of Georgetown, South Carolina. Rear Admiral Dahlgren was aboard the vessel at the time and reported:

It was nearly 8 o'clock, and I was waiting breakfast in the cabin, when instantly a loud noise and shock occurred, and the bulkhead separating the cabin from the wardroom was shattered and driven in toward me. A variety of articles lying about me were dispersed in different directions.

My first impression was that the boiler had burst, as a report had been made by the engineer the evening before that it needed repair badly. The smell of gunpowder quickly followed and gave the idea that the magazine had exploded.

There was naturally some little confusion, for it was evident that the vessel was sinking, and she was not long in reaching the bottom.³⁴

Naval mines continued to exact a toll on the Federal naval forces, even after the defensive purpose for which they had been laid no longer existed.

Rear Admiral Dahlgren prepared an extensive report on the obstructions and torpedo defenses of Charleston.³⁵ It is apparent from the space devoted in the report to mine warfare that Dahlgren believed it to be an effective and formidable method of waging war. There can be little doubt that he was forced to reconsider the use of his naval forces in view of the threat posed by mines in Charleston harbor. Dahlgren specifically mentioned the mine threat when rebutting a report by General Gillmore that was critical of a lack of navy aggressiveness during operations against Morris Island in 1863. Dahlgren again discussed the difficulties associated with the torpedo threat, including the problems of detection and removal, and the ease with which Confederate forces could lay and replace these weapons.³⁶ In the final analysis, the Confederate use of mines at Charleston was a major contributing factor in the inability of Federal forces to take the city by sea; although, it should be stated that their impact was often more psychological than real. The torpedo was truly a "weapon which attacks both matter and mind."³⁷

The South used naval mines along other portions of the Atlantic seaboard, most notably on the Roanoke River, Cape Fear River, at Savannah, and on the St. John River in northeast Florida. In North Carolina, Federal forces dominated the sounds early in the war, forcing Confederate forces up the major rivers of the region to prepare their defenses. Confederate forces used mines on the Roanoke River to good effect. Union forces did not operate up the Roanoke until late in the war; however, in December 1864 a joint Army-Navy expedition was tasked to capture Rainbow Bluff. The naval vessels, under the command of Commander W. H. Macomb, had some rudimentary provisions for dealing with mines, mainly in the form of torpedo catchers or rakes affixed to the bows of his vessels. However, the expedition lost two watercraft almost immediately to mines. On December 9, the gunboat USS Otsego was sunk when it drifted over two mines. Ironically, the boat was properly rigged with spars and a net to catch floating torpedoes; two which had been scooped up were in the net when the vessel sank. The next day, the tug Bazely was sunk by a torpedo immediately adjacent to the wreck of the Otsego when it attempted to come alongside to remove several personnel.³⁸

Macomb, now fully aware of the mine threat he was up against, slowed the pace of his advance up the river, and assigned additional men and boats to the task of sweeping the river for torpedoes. More mines were found as the expedition continued to advance, but the sweeping operations were soon complicated by Confederate skirmishers and sharpshooters harassing the Federal forces from the river banks. Macomb put Marines ashore to provide cover for those dragging the river, and

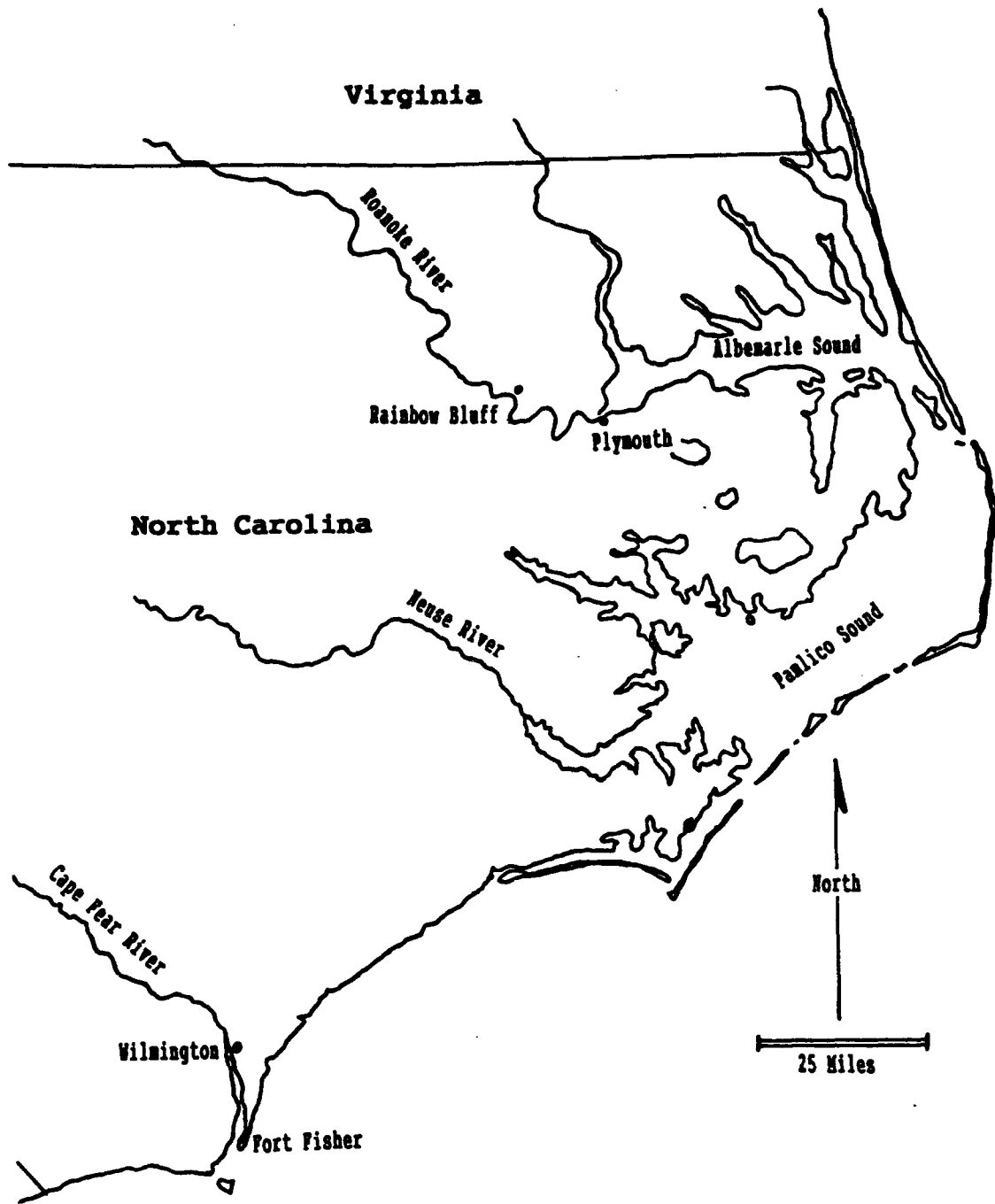


Fig. 8. Eastern North Carolina

both grape and canister were fired from the gunboats to drive away Confederate forces on the shore. Ultimately, Macomb made a decision to fall back short of his objective because it simply became too difficult to sweep the mines under harassing Confederate gunfire. He attributed the expeditions failure to accomplish its objective to the mine threat on the Roanoke.³⁹

Confederate forces employed both electrically-detonated bottom mines and floating keg mines on the Cape Fear River in their defense of Wilmington, North Carolina.⁴⁰ Union naval forces were not hazarded by these weapons until Fort Fisher, which guarded the approaches to the Cape Fear, had been seized by a joint Army-Navy operation in January 1865. The electrical mine threat was neutralized when the shore stations controlling the weapons fell into Union hands with the fall of the land fortifications. Union forces moved up the Cape Fear in February in support of General Terry's forces advancing on Wilmington. On February 20th, a large number of keg mines were released by the Confederates up the river to drift down upon the Federal naval force. Rear Admiral Porter had a large number of small boats placed in the water to locate these mines, which he estimated numbered about 200, and destroy them with the use of close range musket fire. A boat from the USS Shawmut was destroyed by a mine during the operation, with two killed and two wounded. Another lodged in the paddlewheel housing of the USS Osceola and detonated, damaging that vessel. The next morning, Porter ordered fishing nets spread across the river to stop any additional drifting keg mines.⁴¹ Confederate forces evacuated Wilmington on February 22.

Union forces encountered mines on the Savannah River as early as February 1862. A torpedo consisting of multiple charges moored across the Savannah River was discovered by the USS Pembina's crew on February 13th.⁴² Southern forces placed formidable mine obstacles, including frame torpedoes, in the waters around Savannah. However, Union naval forces suffered no losses in the area and had only a single ship damaged. The monitor USS Montauk struck a mine on the Ogeechee River shortly after it destroyed the Confederate ironclad CSS Nashville on February 28, 1863. Although seriously damaged by the blast, the Montauk was repaired and back in service within a month.⁴³ Union forces did not engage in significant offensive naval operations against Savannah and the city was captured by General Sherman's forces from a landward approach on December 21, 1864.

During the first half of 1864, Confederate forces conducted an aggressive mine warfare operation in the St. John's River in northeast Florida. In February 1864, General Truman Seymour began a campaign to take control of northern Florida from the Confederacy. The wide, shallow St. John's River was a vital transportation and communication link for Union forces operating in the region. The large Federal garrison at Palatka was especially dependent on the river for transportation to and from Jacksonville and the coast. Realizing the vulnerability of Federal boats to torpedoes, Captain E. P. Bryan was dispatched by General Beauregard from Charleston to lay mines in the St. John's. On March 30, he supervised the laying of twelve mines near Mandarin Point, on the St. John's about ten miles above Jacksonville.⁴⁴ Two days later, the U.S. Army transport Maple Leaf struck one of these

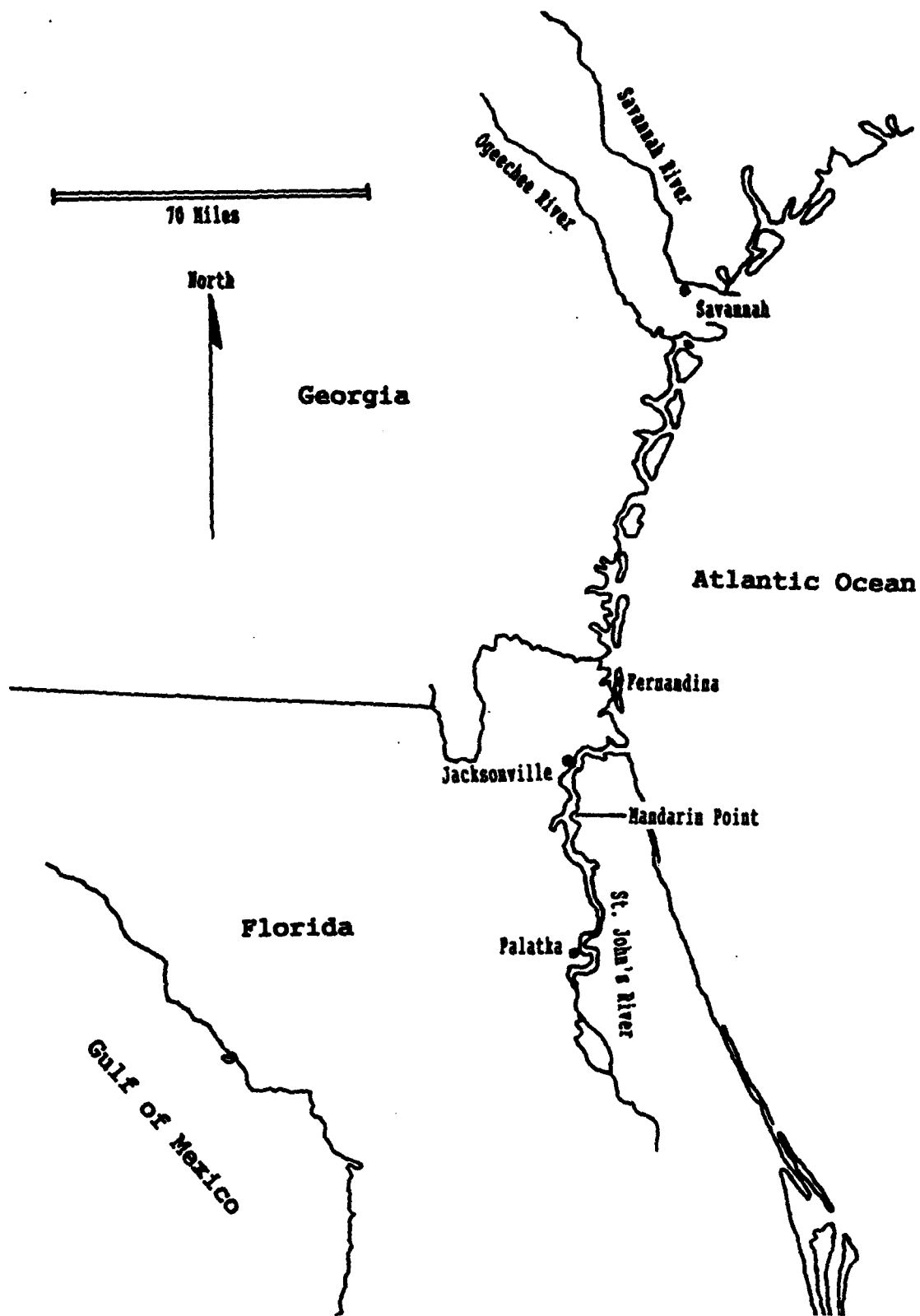


Fig. 9. Eastern Georgia and Northeast Florida

mines off Mandarin Point while enroute from Palatka to Jacksonville and sank. Over the next two and a half months, three more Army transports, the General Hunter, H. A. Weed, and Alice Price, would be sunk on the St. John's by mines.⁴⁵ A number of mines recovered near the H. A. Weed wreck by C. O. Boutelle of the U.S. Coast Survey were discovered to be small keg mines, holding about seventy pounds of powder, with a percussion cap fuse.⁴⁶ Ultimately, Federal troops were tasked to scour the banks of the river for torpedo layers, scouts, and pickets. They were also to remove all inhabitants of the east bank of the river who were loyal to the Confederate cause as it was suspected they were providing information on the movements of Union ships up and down the river.⁴⁷

In summary, Confederate mine warfare was extensively used all along the Atlantic Seaboard from the earliest days of the War. However, the end results for the Confederate forces were mixed. There can be little doubt that at Charleston and on the Roanoke River, the use of mines had a significant and probably major role to play in frustrating Federal attempts to use naval forces effectively. On the James River, much effort was expended by Federal naval personnel to deal with the mine threat, slowing up operations. The use of mines did not significantly alter the Federal use of naval force on the James however. The effort to detect and remove these weapons had to be factored into the time required to accomplish a given operation. To ignore these weapons was an invitation to court almost certain losses.

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CHAPTER 3

GULF COAST OPERATIONS

The major Confederate ports on the Gulf of Mexico were at New Orleans, Galveston, Pensacola, and Mobile. New Orleans was the most strategically significant port in the entire Confederacy, lying at the outlet of the Mississippi River into the Gulf. Surprisingly, Southern commanders at New Orleans did not incorporate mines into their naval defenses for the city. The city fell to Rear Admiral D. G. Farragut's squadron on April 25, 1862. At Pensacola, Union forces held Fort Pickens, which controlled the entrance to Pensacola Bay, from the first day of the war. Confederate forces destroyed the navy yard, then evacuated Pensacola on May 10, 1862. Mine warfare played a very minor role in defending coastal Texas and Louisiana. Mobile Bay remained the one area on the Gulf of Mexico where mine warfare was destined to play a major role in the conduct of the war.

Mobile Bay was undoubtedly the most significant area for Confederate mine warfare activity during the entire war. The defenders laid hundreds of mines to defend the city and these weapons inflicted the most significant losses the Union was to suffer from mines of any campaign in the Civil War. Of the twenty-three Navy and Army vessels sunk by mines during the war, eight were lost at Mobile Bay.¹ Confederate commanders responsible for the defense of Mobile Bay and the city made extensive use of mines to augment an impressive system of

fortifications and fixed barriers, which complicated the Union campaign to take control of the bay.

The Union did not attempt to take Mobile until late in the war, although the city had been under blockade from the commencement of hostilities. The campaign to take the city was a part of Grant's grand 1864 strategic concept for defeating the Confederacy. The advance on Mobile by Major General N. P. Banks' forces, supported by Farragut's West Gulf Blockade Squadron, would be a secondary effort in support of General Sherman's advance against the Army of Tennessee, the main Union effort in the West.² The Union campaign to take the city was a two phase effort which began in August 1864, with the joint Army-Navy action to take the forts guarding the entrance to Mobile Bay. The final operations to take the city of Mobile itself did not commence until the Spring of 1865.

The city of Mobile is set at the upper reaches of Mobile Bay, approximately thirty miles from the entrance to the Gulf of Mexico. The outlet to the Gulf is a three mile gap, with Dauphin Island and Fort Gaines on the west, and Mobile Point and the more formidable Fort Morgan to the east. The passage is very shallow, with the exception of the extreme eastern portion of the opening, under the guns of Fort Morgan. In addition to strengthening the defenses of the two forts, Confederate engineers placed a combination of obstructions and mines in the channel to provide additional defense against naval attack. Pile obstructions extended from Dauphin Island eastward to the west edge of the navigable channel. The mine field extended from the end of the pile obstructions to a red buoy, a little over 200 yards from the water battery under Fort

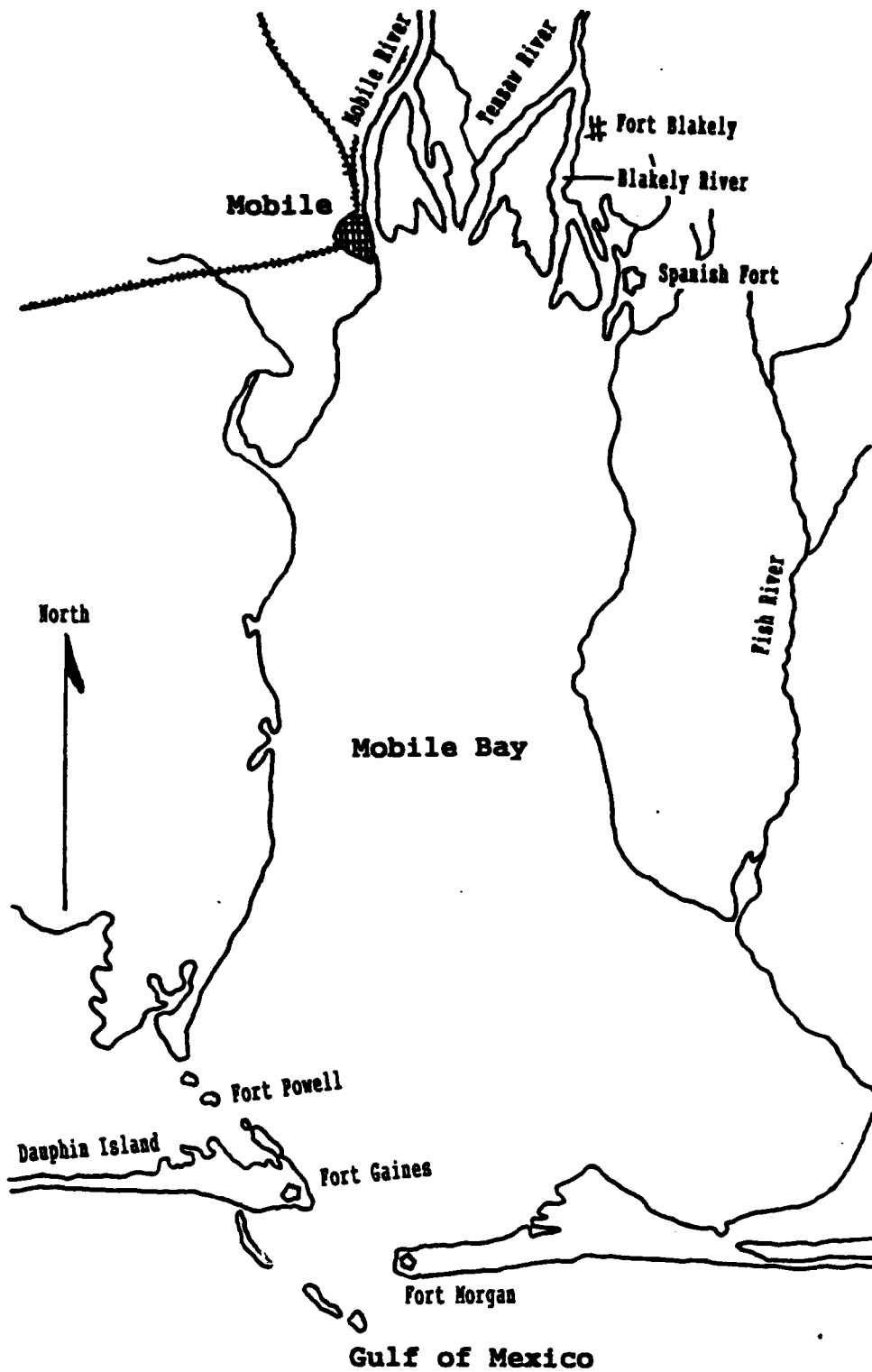


Fig. 10. Mobile Bay and Vicinity 10 Miles

Morgan. This passage, about one hundred yards wide and directly under the guns of Fort Morgan, was left for the use of Southern blockade runners.³

The Confederates apparently laid a mix of keg and Singer-Fretwell mines across the channel between Fort Gaines and Fort Morgan. Captain L. J. Fremaux, CSA engineer in charge of lower bay defenses, reported on June 2, 1864 that he had "eighty-six [tin] torpedoes placed on the line extending from the can buoy (opposite the fort) to the west bank."⁴ He had an additional seventy-six tin torpedoes to place, but had concerns about doing so because of a poor lacquering of the devices. He feared they would corrode easily and should be placed immediately prior to any engagement where they might be brought to bear on an enemy vessel. A. T. Mahan, in his authoritative history of Gulf Coast naval operations, discussed the use of a mix of almost 200 keg and Fretwell-Singer tin torpedoes across the channel, and also mentioned electrical mines.⁵ There is little additional evidence that the latter type were actually used at Mobile Bay by its defenders, although references are made in reports to their potential use.

The Union naval forces offshore were well aware of the general nature of the defenses at the passage into Mobile Bay. The laying of mines was observed by Union forces, as was the use of the extreme eastern portion of the channel by Confederate vessels. Farragut also sent his flag lieutenant in on multiple night reconnaissances to examine the nature of the submarine defenses. Farragut reported:

These buoys had been previously examined by my flag-lieutenant, J. Crittenden Watson, in several nightly reconnaissances. Though he had not been able to discover the sunken torpedoes, yet we had been assured by refugees, deserters, and others of their existence, but

believing that from their having been some time in the water, they were probably innocuous, I determined to take the chance of their explosion.⁶

The last portion of Farragut's report is significant. Both he and the Confederate defenders of the bay had concerns about how the mines would stand up to exposure in the marine environment. Not only did strong currents wash away poorly moored mines, but corrosive salt water and marine organisms would damage and foul the mines. Farragut's force made no attempt to sweep the channel prior to making their attack. It undoubtedly would have been extremely difficult, if not impossible, under the guns of Fort Morgan. Farragut decided to take the risk and attempt to keep his battle fleet in the clear eastern portion of the channel.

Mobile Bay was not assaulted until fairly late in the war. There were problems assembling the troops and ships required to undertake the attack, and when these finally became available, they were only sufficient to seize the forts at the mouth of Mobile Bay. This was enough to close the city to marine commerce for good and was the option initially executed. Farragut, in concert with Union Army commanders Edward Canby and Gordon Granger, made plans to conduct the operation. Due to a lack of troops, it was decided that Fort Gaines would be attacked by a joint Army-Navy operation, while Fort Morgan would be reduced by a naval siege. Granger's Army troops arrived on August 1, 1864, and were placed on Dauphin Island on the 3rd. On August 4, the USS Tecumseh, the last of the four monitors that Farragut requested for his assault on the bay, arrived from Pensacola.⁷

Farragut's plan for passing the defenses of Fort Morgan and gaining entrance to Mobile Bay was based on his experience assaulting shore fortifications at New Orleans and Vicksburg. He ordered that his vessels, with the exception of the monitors, would run in lashed together in pairs. The larger ship of each pair would be on the east side, providing some protection to the smaller vessel from the guns of Fort Morgan. The four monitors, with Tecumseh in the lead, would form a line between the wooden warships and the fort. This would allow them to bring their turret-guns to bear on Fort Morgan and put them in position between the Federal fleet and the Confederate ram CSS Tennessee, which would be awaiting them just inside the bay. Farragut was also clear to his commanders that they should remain within the eastern portion of the ship channel. Farragut ordered:

There are certain black buoys placed by the enemy from the piles on the west side of the channel across it toward Fort Morgan. It being understood that there are torpedoes and other obstructions between the buoys, the vessels will take care to pass to the eastward of the eastern most buoy, which is clear of all obstructions.

Rather than risk men and vessels attempting to clear a path through the minefield, Farragut decided to use the existing channel, although it was directly under the guns of Fort Morgan.

On the morning of August 5, 1864, the weather and tidal conditions were satisfactory for an attempt upon the passage. The battle fleet formed up out in the Gulf of Mexico, with the USS Brooklyn, lashed to the USS Octorara, leading the wooden steamers. Farragut's flagship, the USS Hartford, which was lashed to the USS Metacomet, followed. As planned, the USS Tecumseh led the four monitors into the bay. The fleet got underway at 0545, with the first shots fired by Fort

Morgan at 0706. At 0740 the Tecumseh struck a mine and rapidly sank, carrying down almost her entire crew, including the commanding officer, Captain T. A. M. Craven. By 0830 all the other Union vessels had successfully run past the fort and were inside Mobile Bay. By 1000 the Tennessee was captured by the Federal fleet and the other Confederate vessels were either destroyed or had run for the upper bay.⁹

The tragic loss of the Tecumseh was the only significant loss in an otherwise successful operation. It is accepted that Captain Craven made a decision to pass to the west of the eastern most buoy marking the clear channel and sailed into the Confederate minefield. It is believed that he sighted the Tennessee, had some concerns about the narrowness of the clear channel, and made a decision to make straight for the Confederate ironclad to engage her.¹⁰ When the Tecumseh sank, it did so suddenly and with such speed that the Union battle line began to back down and falter. Farragut ordered the Hartford to pull up alongside the Brooklyn, then took the lead. The rest of the force fell in behind and continued forward, by this time on a modified course that took the vessels into the minefield, rather than through the clear channel. Many sailors thought they were following their Admiral to a certain death. As they crossed the line of mines, the crews "heard [torpedo cases] knocking against the bottom of the ship and the primers snapping," but the devices did not explode.¹¹

Fort Morgan did not fall to the Federal forces until August 23rd, when Brigadier General Page surrendered his garrison. Immediately thereafter, Farragut ordered the main channel into Mobile Bay swept of mines. The work began uneventfully, with five being removed the first

day. Of these, four were found to have deteriorated seriously in the water, with only the fifth having dry powder. Unfortunately, this caused crews performing the sweeping to become careless and the next day one exploded while being removed, killing five and wounding nine men.¹² By mid September, twenty-two mines had been removed from the main channel and Farragut believed many more, rendered inert, had sunk to the bottom of the bay.

The first phase of the naval siege of Mobile was now completed. Farragut would, at his request, relinquish command of the West Gulf Blockade Squadron to Commodore J. S. Palmer in the Fall of 1864, and return to the East Coast. Farragut, probably the premier combat commander of the U.S. Navy during the Civil War, had taken a risk at Mobile Bay and had come away victorious. He had balanced the risk between attempting to sweep the channel under hostile fire against the knowledge that many of the Confederate torpedoes would not perform properly following prolonged immersion. As post-action sweeping confirmed, many of the devices were in fact inoperable, but a few were in fine shape, as the Tecumseh sinking demonstrated. Farragut was also keenly aware of the psychological effect of mines upon the ability of his officers and men to perform their mission. Farragut wrote:

Regular discipline will bring men to any amount of endurance, but there is a natural fear of hidden dangers, particularly when so awfully destructive of human life as the torpedo, which requires more than discipline to overcome.¹³

This dimension Farragut had experienced when his fleet temporarily faltered immediately following the Tecumseh sinking.

Following the August 1864 attack on the fortifications in lower Mobile Bay, there were no significant operations against the city proper

the rest of that year, again due to a lack of troops and other resources. At this point in the war, Mobile did not have a high priority in the overall strategic plan with other more important operations ongoing. This time was used by the Confederate defenders to strengthen the defenses of the upper bay adjacent to Mobile. This included the laying of additional mines to thwart any naval attacks on the city and its defending fortifications. Late in the year, on December 7, the Union tug USS Narcissus struck a mine in Mobile Bay and sank, injuring several men on the crew.¹⁴

The terrain on upper Mobile Bay, where the city itself was located, was a complicated delta topography of rivers, swamps, and bayous. Three rivers emptied into the bay at its northern extreme. From the west they were the Mobile River, the Tensaw River, and the Blakely River, which was also known as the Apalachee. The area was very swampy, heavily forested, and was terrain not conducive to good overland mobility.

The major Confederate fortifications were located at Spanish Fort, which was on the Blakely River just upstream from where it entered Mobile Bay, and Fort Blakely, located on the river about five miles above Spanish Fort. Both of these forts were field fortifications, rather than masonry structures such as those used on the lower bay. They were constructed of earth and logs, and consisted of earthen batteries and trenchworks which were quite extensive. Old Spanish Fort represented the core of the Spanish Fort complex, with an earthwork known as Fort McDermott guarding the southeast corner. These fortifications were on the east bank of the Blakely River. Two smaller

earthwork batteries, Forts Huger and Tracy, were located just upstream from Spanish Fort. Of interest was the use of land mines in the defense of these fortifications, manufactured by General Rains' Torpedo Bureau.¹⁵ The city of Mobile was protected by its own series of forts.

In January 1865, General Grant ordered Major General E. R. S. Canby to move against Mobile. By this time, Rear Admiral H. K. Thatcher had taken command of the West Gulf Blockade Squadron. Canby believed that an advance up the eastern side of Mobile Bay, with the objective of taking Spanish Fort and Fort Blakely, would force the abandonment of the city by Confederate forces. The navy would provide transport and gunfire support for the plan. On March 21 the operation began, with vessels landing Canby's force on the Fish River, which flows into Mobile Bay on the east side. Following an overland march, they began the assault on Spanish Fort.¹⁶

Rear Admiral Thatcher's vessels provided transport, covering gunfire and gunfire support for Canby's force ashore. Thatcher was deeply concerned about the mine threat on the Blakely River, as well as with getting his vessels over the shallow bar into the stream. Prior to sending his monitors into the river, he ordered it to be "thoroughly dragged for torpedoes" and reported that many were removed.¹⁷ Despite the precautions, Thatcher lost three vessels on the Blakely over the course of five days.

The monitor USS Milwaukee was sunk by a mine on March 29. Her skipper, Lieutenant Commander Gillis, reported:

I had proceeded up the Blakely River in company with the USS Winnebago to within about 1 1/2 miles of the lower fort on the left bank of the river for the purpose of shelling a rebel transport supposed to be carrying supplies to the fort; had succeeded in

causing the steamer to retreat up the river, and was dropping with the current to resume my former position, keeping the bow of the vessel headed upstream, my object in so doing being to avoid in turning the accident that caused the sinking of the Milwaukee. I had returned within about 200 yards of the U.S. ironclad Kickapoo, then lying at anchor, and supposed the danger from torpedoes was past, as I was where our boats had been sweeping, and also exactly in the same place where the U.S. ironclad Winnebago had turned not ten minutes before, when I felt a shock and saw at once that a torpedo had exploded on the port side of the vessel, abaft the after turret, and, as near as I could determine at the time, about 40 feet from the stern.¹⁸

The Milwaukee sank in about three minutes, but without any loss of life.

The next day the turreted ironclad USS Osage struck a mine and sank while shifting its anchorage inside the Blakely River bar. She suffered four dead and eight wounded in the incident. On the first day of April, the armored river gunboat USS Rodolph was moving a barge with salvage equipment alongside the Milwaukee wreck when it struck a mine and rapidly sank. Her skipper estimated the size of the hole in the vessel's starboard bow to be at least ten feet in diameter. The toll from this mine incident was four killed and eleven wounded.¹⁹ In the cases of both the Milwaukee and the Osage the vessels had torpedo rakes deployed when they struck the mines.

Thatcher reiterated measures to counter the mine threat on the Blakely River, including redoubling the sweeping effort. He ordered that picket boat crews detailed to duty should be composed of the best and most trustworthy men available, for theirs was "most important work, one on which the safety of the ironclads depends, and that nothing can excuse a careless discharge of such duty,"²⁰ Thatcher ordered that picket boats would sweep the Blakely River bar both day and night, and had a boarding net stretched across the river above the bar to intercept floating mines.

Following the Confederate evacuation of Spanish Fort on April 8, Federal forces moved further up the Blakely River in order to engage Forts Huger and Tracy. On April 9, ten pairs of small boats using nets swept the river repeatedly, destroying over twenty torpedoes in the process. By April 12, over 150 mines had been removed from the river.²¹ At this point the campaign against Mobile was drawing to a close. Fort Blakely was evacuated by Confederate forces on April 11 and the city of Mobile was evacuated the next day.

Mines were still destined to take their toll on Union vessels. Three vessels were destroyed on April 13 and 14. The tug Ida struck a mine in the Blakely River, killing two of her crew. On April 14, the gunboat USS Sciota struck a mine in Mobile Bay while delivering the personnel from a working party back to their vessel, killing four and wounding six. The same day, a launch from the ironclad USS Cincinnati was involved in removing mines on the Blakely River. The launch crew had brought a mine almost to the surface, when the mooring line parted and the strain of the drag rope brought the weapon against the boat, detonating it, and killing three of the crew.²² Ironically, this would not be the end of losses to torpedoes on the bay. The final incident took place on May 12, 1865, when the Army transport R. B. Hamilton struck a mine and sank in Mobile Bay. This was over a month after Lee surrendered to Grant at Appomattox and was the last mine casualty of the Civil War.

Mine warfare played a significant role in the war at Mobile Bay. However, despite the extensive use of these weapons by the Confederate forces defending the bay and city, the Union forces were able to

overcome them through the use of sweeping and countermeasures. Mines caused delays in Union naval operations due to the requirement to sweep and absorbed resources for the location and removal of these weapons. However, this could not change the ultimate outcome of the campaign at the operational and strategic level. Regardless, the Confederacy inflicted significant, if not decisive losses, with eight vessels plus a launch sunk and over 200 men killed.

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CHAPTER 4

THE WESTERN RIVERS

Union losses to mines on the Mississippi River and its tributaries were very light, relative to the size of the theater and the intensity of riverine operations. The U.S. Navy lost a total of three armored rivercraft, two on the Yazoo River and one on the Red River. Despite these light losses, mine warfare was a significant problem for Federal riverine forces, especially during the campaign to take possession of Vicksburg.

The Mississippi River, its tributaries, and the surrounding territory constituted the Western theater of operations for Federal forces during the Civil War. The Mississippi was the key to controlling the western half of the Confederate States and both sides were keenly aware of this fact. This river was the transportation artery for the heartland of the continent, and was heavily used to move agricultural products south to the port of New Orleans. In addition, control of the river would allow the domination of a rich territory which supplied the Confederacy with cotton, produce, and meat. The control of the Mississippi was recognized early in the war as an essential part of the plan for defeating the Confederacy.

The Mississippi area of operations extended for a distance of approximately 1100 miles from Cairo, Illinois to the river's delta in the Gulf of Mexico. Although the topography of the region is generally

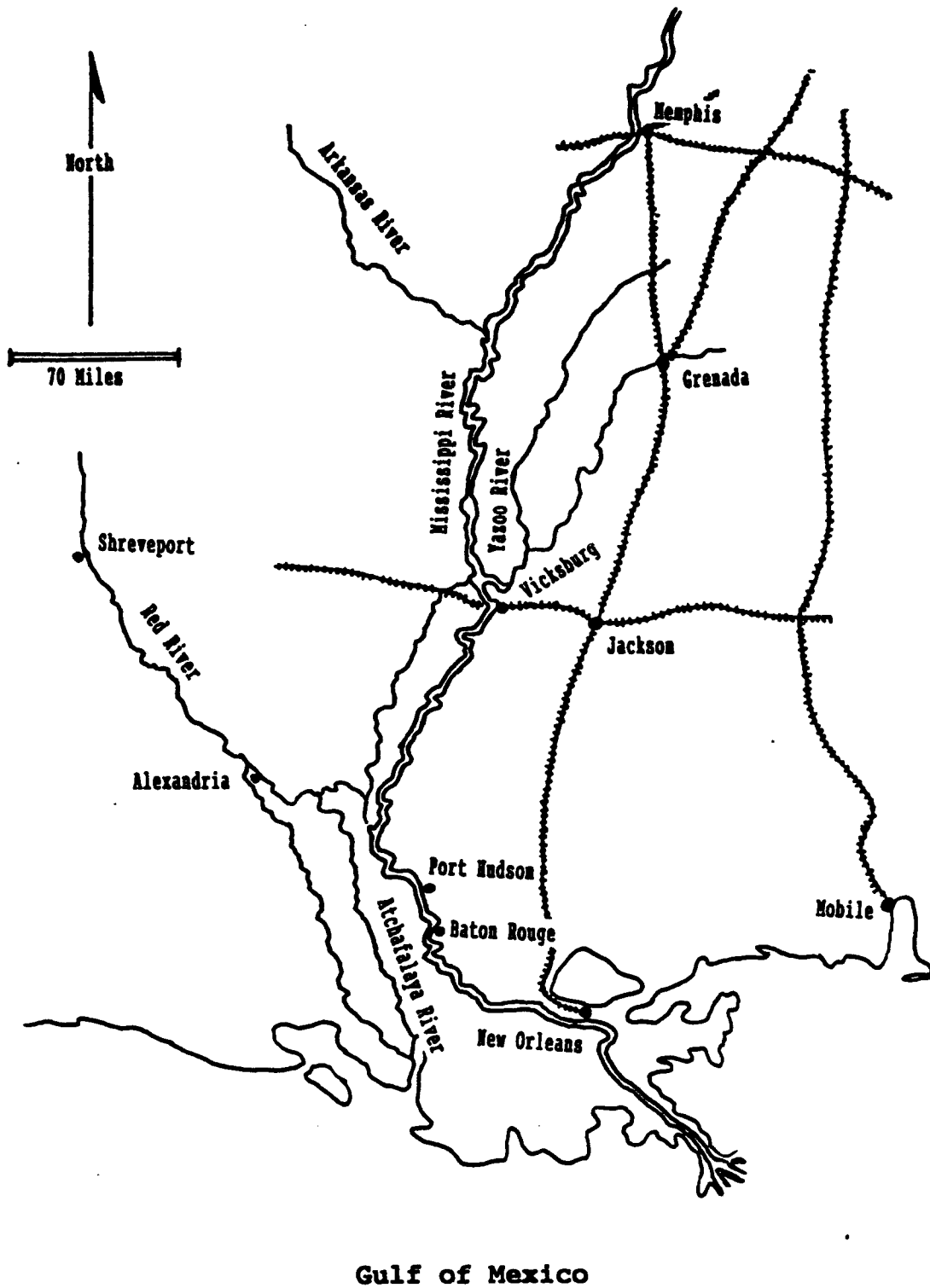


Fig. 11. Lower Mississippi River

low, bluffs are present along the east side of the river and are especially prominent in the vicinity of Columbus, New Madrid, Memphis, Vicksburg, and Baton Rouge. These elevated areas would be used to good effect by Confederate engineers for the construction of batteries and fortifications. Ultimately, they had forces at Columbus, Island Number 10, Fort Pillow, Vicksburg, Grand Gulf, Port Hudson, Baton Rouge, and Forts Jackson and St. Philip, both located below New Orleans.¹ The Confederates believed these fortifications would allow them to control navigation on the Mississippi River and deny the use of this vital waterway to Union forces.

Since the focus of the war in the West was on the Mississippi River and its tributaries, it was obvious that riverine transport was destined to play a significant role in the Union campaigns to dominate this strategic area. Joint Army and Navy operations were the rule in every significant operation which took place in the proximity of the rivers. Riverine forces provided transportation for troops, equipment, and supplies, assisted with gunfire support, and performed scouting and reconnaissance missions. The Federal government had a sizeable fleet of vessels, including both modified riverboats and vessels built from the keel up as ironclads. This combination of naval forces operating jointly with the Army provided the flexibility required for Union victory on the Mississippi and its tributaries.

The Union strategy for seizing control of the Mississippi River involved a two pronged approach, with forces moving down the river from Cairo, which was a major Union base, and up the river following the capture of New Orleans. Federal Army forces, commanded by U. S. Grant

and supported by Flag Officer Foote's riverine forces, seized both Fort Henry on the Tennessee River and Fort Donelson on the Cumberland River in February 1862. During the next two months, both New Madrid and Island Number 10 fell to the Union forces. On April 24, David Farragut's fleet passed Forts Jackson and St. Philip at the mouth of the Mississippi and the next day he captured New Orleans, beginning the advance up the river from the south. In June, both Fort Pillow and Memphis were taken by the Union and late that month Farragut's fleet passed upstream under the batteries of Vicksburg. Unlike the situation at New Orleans, Farragut could not take Vicksburg with naval forces alone. By the middle of 1862, the stage was set for the Union to take that last stronghold on the Mississippi. These operations would last until the middle of 1863.

The record suggests that very early in the war Confederate commanders along the Mississippi used naval mines to augment their defenses. In the Summer of 1861, Lieutenant Issac N. Brown, CSN, was in Virginia searching for ordnance and other material to assist in the defenses along the upper reaches of the Mississippi. Brown wrote to Major General Polk, commander of Department Two at Memphis, that he had been in contact with M. F. Maury and said he would be going west "to plant submarine batteries or magazines."² In December of that same year, Maury apparently made arrangements to ship components for as many as twenty-five submarine batteries out West to Brown for use in the Mississippi.³ In addition, a civilian named A. L. Saunders was engaged in manufacturing submarine batteries in Memphis. Correspondence suggests he provided these devices to Polk's engineers at Columbus,

Kentucky.⁴ There is no additional information on how either Maury's or Saunders' devices might have been employed.

The earliest encounter by Union forces with Confederate mines on the western rivers occurred in January and February 1862, during Federal operations against Fort Henry on the Tennessee River. The Confederate defenders at Fort Henry placed mines in the river adjacent to the fort to augment its defenses. The Union forces cleared a number of these mines which had broken free of their moorings during a high water freshet on the river.⁵

The Mississippi River itself was too deep, and its current much too swift, for the routine employment of moored submarine torpedoes. However, some sporadic use was made of them in places. In January 1863, the ironclad USS Essex was engaged in a reconnaissance of Port Hudson, Louisiana. While making the run upriver, the vessel ran over a pair of buoys in the vicinity of Profit Island. Suspecting a mine, the commanding officer of the Essex stopped while making his return trip back downriver, placed two boats in the water, and had his crew remove the device. It was a mine designed in such a way as to be activated either with a friction primer or electricity. Unable to disassemble the mine for a thorough examination without risking a explosion, the Essex's commanding officer had it detonated ashore, where it went off with a tremendous explosion.⁶ On February 27, 1863, the Essex once again located a mine on the lower Mississippi. This device was a drifting mine, containing 114 pounds of powder packed into an air-tight iron cylinder and secured underneath a log float.⁷ However, incidents such as these on the Mississippi itself were rare. Mine warfare would play

out its role in the defense of the Confederacy on those rivers tributary to the Mississippi.

On November 2, 1862, U. S. Grant moved his army south from Bolivar, Tennessee and began his campaign to take Vicksburg and Mississippi. At this time Vicksburg remained the last significant fortified location on the river still under Confederate control. The series of operations that would constitute the campaign to seize the city would involve close cooperation between Grant's army forces and the riverine forces under the command of Flag Officer David D. Porter. It would be at Vicksburg where Confederate mine warfare would have the greatest impact upon Union naval operations on the Western rivers.

The Mississippi River and its tributaries dominate the terrain to the north, west and south of the city of Vicksburg. Grant described the setting, as well as his military problem, as follows:

Vicksburg . . . is on the first high land coming to the river's edge, below that on which Memphis stands. The bluff, or high land, follows the left bank of the Yazoo for some distance and continues in a southerly direction to the Mississippi River, thence it runs along the Mississippi to Warrenton, six miles below. The Yazoo River leaves the high land a short distance below Haines' Bluff and empties into the Mississippi nine miles above Vicksburg. Vicksburg is built on this high land where the Mississippi washes the base of the hill. Haines' Bluff, eleven miles from Vicksburg, on the Yazoo River, was strongly fortified. The whole distance from there to Vicksburg and thence to Warrenton was also entrenched, with batteries at suitable distances and rifle-pits connecting them.

From Young's Point the Mississippi turns in a north-easterly direction to a point just above the city, when it again turns and runs south-westerly, leaving vessels, which might attempt to run the blockade, exposed to the fire of batteries six miles below the city before they were in range of the upper batteries. Since then the river has made a cut-off, leaving what was the peninsula in front of the city, an island. North of the Yazoo was all marsh, heavily timbered, cut up with bayous, and much overflowed. A frontal attack was therefore impossible.⁸

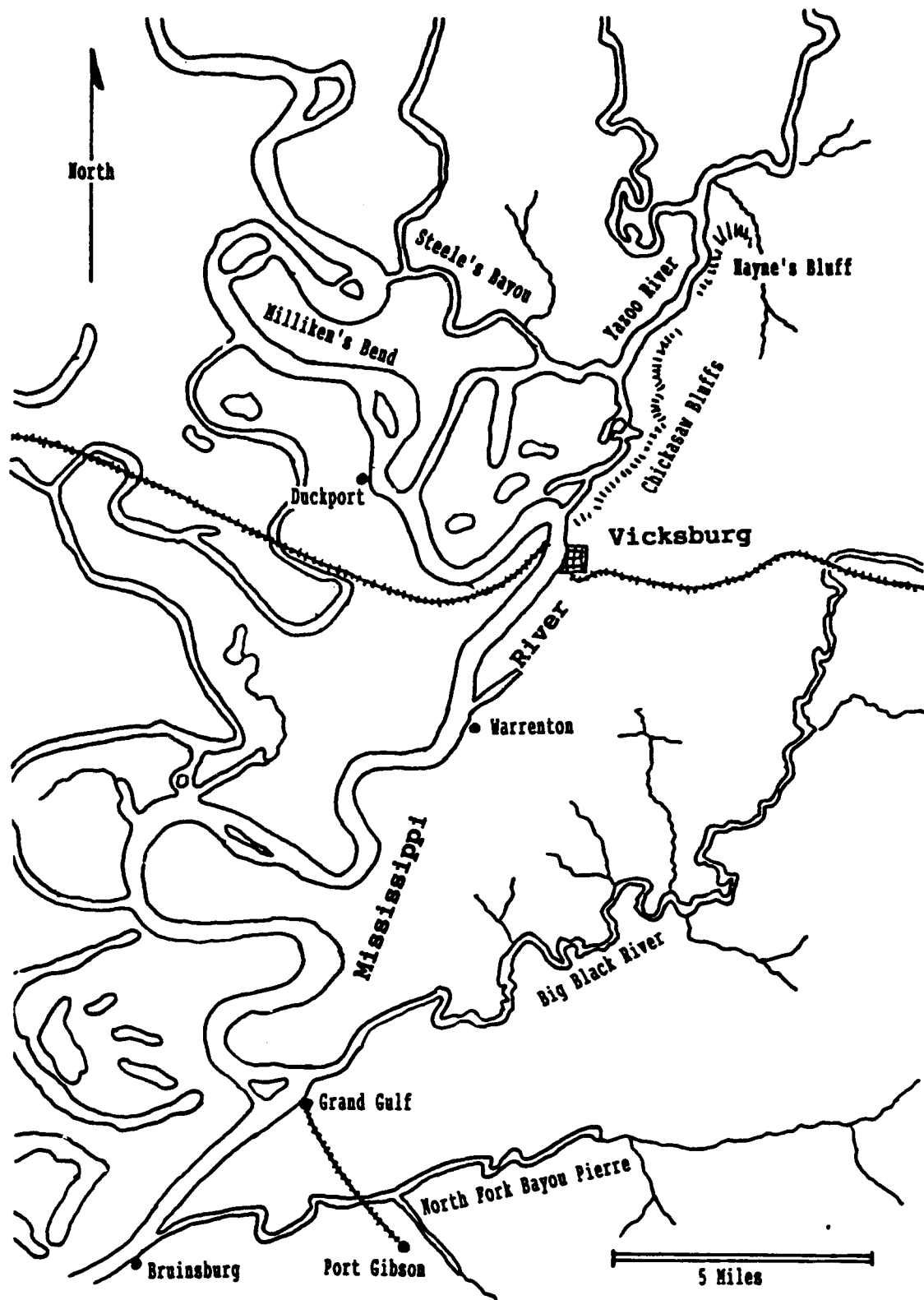


Fig. 12. Vicksburg and Vicinity

Grant's first effort to take Vicksburg in December 1862 involved an attempt to outflank the Confederate forces and avoid a frontal attack on the city. This operation had General W. T. Sherman taking 40,000 men down the Mississippi as part of a joint Army-Navy effort. Those forces would land above Vicksburg, using the Yazoo River for an approach if possible, "and cut the Mississippi Central [rail]road and the road running east from Vicksburg, where they cross the Black River."⁹ The use of the Yazoo River for an approach was quite reasonable, in view of the fact that either Haynes Bluffs or Chickasaw Bluffs were the only two decent landing sites on the east bank of the Mississippi River for miles north and south of Vicksburg.¹⁰

General Pemberton, in command of the Confederate forces defending Vicksburg and vicinity, had constructed formidable defenses along both the Mississippi and Yazoo Rivers. He had naval mines augmenting these defenses on the Yazoo. Lieutenant Issac Brown, who had earlier made arrangements for mines to defend Columbus, was tasked to place torpedoes in the Yazoo. Working with limited resources, he managed to place several mines in the river prior to the commencement of Union naval operations. Brown described his devices in the following manner:

So poor in resources were we, that in order to make a beginning I borrowed a five-gallon glass demijohn, and procuring from the army the powder to fill it and an artillery friction tube to explode it, I set these two enterprising men to work with a coil of small iron wire which they stretched from bank to bank, the demijohn filled with inflammable material being suspended from the middle, some feet below the surface of the water, and so connected with the friction tube inside as to ignite when a vessel should come in contact with the wire.¹¹

There is no indication as to how many devices were placed in the Yazoo prior to the first Union naval operations, but the number apparently was quite limited.

As Sherman was moving his forces downriver for the planned operation, Porter tasked lead elements of his naval force to conduct a demonstration up the Yazoo in preparation for Sherman's assault. Captain H. Walke was tasked with commanding this lead operation and was ordered to move up the Yazoo, and seize as much of it as possible while reducing Confederate resistance. On December 11, the tinclad gunboats Signal and Marmora moved about twenty miles up the Yazoo on a reconnaissance. At the furthest point of their advance, a number of small scows and floats were observed in the river channel. When one torpedo exploded near the Marmora, the decision was made to return down the river, but not before Marmora's crew destroyed another mine with musket fire.¹²

The next day, the Signal and Marmora moved back up the Yazoo, reinforced by the ram Queen of the West, and the ironclad gunboats Cairo and Pittsburg. This flotilla was specifically tasked to sweep the river for torpedoes, using small boats to scour the river and shoreline for the devices. The Signal and Marmora were to lead the formation, with the ram behind them, and the two ironclad gunboats in the rear to provide gunfire support if required. The vessels got underway at 0730, moved up the river encountering virtually no resistance, and arrived in the vicinity of the torpedoes at about 1100. Acting Ensign W. E. H. Fentress, USN, who commanded a detachment of sharpshooters on board the Marmora reported what followed:

The Marmora being about 100 yards in advance, her engines were stopped, and the fleet closed up to "close order." The steamer Cairo came nearly abreast of us, and hailed the Marmora to "go ahead," which order was obeyed, and we moved ahead very slowly. Soon we discovered an object ahead, resembling a small buoy, and I requested Captain Getty to allow me to examine it. As I approached it, I found a boat from the Cairo on the same errand, and I pushed forward to reach a line that I saw on the bank. As soon as I could I severed the line with my sword, and a large object immediately arose in the middle of the river. Pulling to it by the line, I soon discovered it to be some "infernal machine," and upon closer examination I found a wire running from it to the shore, and was ordered from the Cairo to cut it, which I did, and towed the torpedo to the Marmora. As I was engaged breaking it to pieces, I heard an explosion from the Cairo, and on looking up I saw her anchor thrown up several feet in the air. In an instant she commenced to settle, and was run to the bank and a hawser got out; but shortly she slid off the bank and disappeared below the water. Every possible assistance was rendered by all the fleet, while they shelled both banks on both sides of the river.¹³

The crew of the Cairo escaped with only minor injuries and they were embarked on the other vessels for the return trip down the river. The Queen of the West pulled down the Cairo's two stacks so that the Confederate forces would have difficulty locating the wreck, while the other vessels swept ten or twelve additional mines from the river. At 1400 the remaining four vessels began to move back down the Yazoo, shelling locations along the bank where skirmishers had been noted earlier. The Cairo undoubtedly struck one (or possible two, as some accounts describe two explosions) of Issac Brown's crude demijohn mines, thus becoming the first Union naval vessel sunk by a mine during the Civil War.¹⁴

On December 20, Porter issued instructions to Lieutenant Commander William Gwin, who was tasked to lead a follow-up expedition up the Yazoo for the purpose of securing a landing place for Sherman's troops. Gwin would also be responsible for clearing the river of mines and reducing Confederate resistance along the banks. Much as S. P. Lee

had done during operations on the James River, Porter issued very detailed instructions for dealing with the mine threat:

The river is full of torpedoes, and you will have to proceed with much care. The brightest lookout must be kept, and no movement made except in clear daylight. You will have plenty of rowboats to go ahead of the light steamers, provided with drags and searches of all kinds. Some boats must pass along close in to the banks and, with boat hooks, scrape the banks deeply near the water's edge, to see that no wires are concealed; this must be done thoroughly, for there is the danger. Others must spread themselves across the river and drag the bottom. Whenever a buoy or floating object is seen, it must be approached cautiously, and a long running bowline thrown over it; the bow will then haul the torpedo on shore and make it fast. No one must be allowed to handle these torpedoes or break them up until we know more about them.

The moment a wire or line is discovered it must be cut, and the end held on to, to drag the machine on shore by. Take every precaution when the torpedoes are found (for the sailors are so reckless), and see that reliable officers go in every boat and that the boats go armed with muskets.

Just before the vessels get to the torpedo neighborhood the three large vessels will anchor, sending out their boats, which must be kept under cover of the guns, to search all around the spot for infernal machines. The landings are the places where the enemy will likely place the most of their torpedoes, and they must be searched for on top of the bank for some distance up and down. You will also examine if any torpedoes are buried in or on top of the bank, keeping the men under the cover of the small gunboats.

The rowboats must proceed slow, each boat with a long, light spar, stuck out over the bow (besides the drag astern), with a weight and hook lowered down 12 feet for the purpose of catching anything floating that deep.

It is likely that wire will be laid up and down the river in mid-channel; let the river be dragged carefully crosswise.

Demijohns will likely be used, containing friction matches. Let the boats try their musketry on these at a distance of not less than 30 yards, firing one musket at a time; if the machine is hit and sinks there is not much danger of it; at the same time drag it up and take a description of it for the benefit of others.¹⁵

Of interest, Porter also instructed Gwin to keep detailed diagrams of the river and the positions of mines in the river. Porter believed that "the rebels have a regular plan or system [for laying mines] which we can avoid when we know it."¹⁶

On December 23, an advance expedition under Lieutenant Commander Walker on the Baron De Kalb, with the Queen of the West, Signal, and a tug, began to work its way up the Yazoo, sweeping for mines. Shortly thereafter, Gwin arrived with his instructions from Porter in hand, and he took command of the minesweeping operations. From the 24th through the 27th, Gwin worked up the river with his force of eight vessels (Benton, Tyler, Lexington, Queen of the West, Lioness, Signal, Romeo, and Juliet), operating continuously under severe harassing fire from Confederate sharpshooters and skirmishers. The vessels were badly damaged by shot where not armored and numerous casualties were taken by the Union navy men, including Lieutenant Commander Gwin, who was mortally wounded during the operation. Regardless, the vessels worked their way well up river and secured landing positions for Sherman's troops at the base of Chickasaw Bluffs; by December 26, about 25,000 troops had been landed on the east bank of the Yazoo. Sherman's troops would spend the next two days probing the Confederate defenses north of Vicksburg. Porter, in his official reports on the operations, describes "hundreds" of torpedoes in the river, but there are no detailed references to specific numbers removed by the expedition.¹⁷

One unique development during this phase of the Vicksburg operation was the design and construction of a torpedo rake, to be used in the sweeping of mines. Although not actually used during this operation, it was the first construction of a device that would see fairly wide application by the Union Navy during the Civil War as an early example of a mine countermeasures device. Colonel Charles Ellet, who commanded the ram fleet on the Mississippi River, conceived of the

rake as a method for removing mines with little risk to the sweeping vessel. Ellet described the concept as follows:

My plan was to attach to the bow of a swift and powerful steamboat a strong framework, consisting of two heavy spars, 65 feet in length, firmly secured by transverse and diagonal braces and extending 50 feet forward of the steamer's bow. A crosspiece, 35 feet in length, was to be bolted to the forward extremities of these spars. Through each end of this crosspiece and through the center a heavy iron rod, 1 1/2 inches in diameter and 10 feet long, descended into the river, terminating in a hook. An intermediate hook was attached to each bar 3 feet from the bottom. The three bars were strengthened by a light piece of timber halfway down, through which they were passed and bolted.

I proposed to secure this rake to the bow of the steamer Lioness and run her at full speed up the river. The torpedoes are sunk in the water, but the cords by which they are fired are attached to buoys floating on the surface. My belief was that the curved hooks of the rake would catch these cords, and, driven by the powerful boat, would either explode the torpedoes or tear them to pieces and break the ropes, thus rendering them harmless to succeeding vessels. As there would be at least 45 feet of water between the point of explosion and the bow of my vessel, I anticipated no danger would be done the boat. If the rake was destroyed a new one could be easily constructed.¹⁸

The attack up the Yazoo that the rake was to be used in, scheduled for December 31, did not take place due to fog and bad weather. The rake was dismantled, but it was to become a standard feature for the protection of vessels from mines and would see wide application with the Union Navy before the war ended.

Porter's naval force continued to provide support to Sherman's troops, mainly in the form of gunfire support and transport, but there were no additional counter-mine operations of significance during this phase of the Vicksburg campaign. Sherman attacked Pemberton's Confederate troops in force on December 29, but was firmly repulsed. Facing greater resistance than expected and deteriorating weather, Sherman withdrew his troops from the east bank of the Yazoo on the 1st and 2nd of January, 1863. Following the failure of this flank attack,

the Vicksburg campaign developed into an effort to find an alternate approach to the city using the waterways to the north. The joint Army-Navy efforts to use Steele's Bayou and Yazoo Pass as methods of bypassing the heavy Yazoo River defenses failed, but Confederate torpedo defenses played virtually no role in this phase of the campaign. By April, Grant had made the decision to land his forces on the east bank of the Mississippi to the south of Vicksburg. At the end of the month this was done at Bruinsburg, Mississippi, and the fight for Vicksburg became primarily a land campaign.¹⁹

Following the fall of Vicksburg on July 4, 1863, Grant worked to consolidate the Federal position in the region around the city. This included several operations to deal with Confederate resistance on the Red, Black, Tensas and White Rivers. In addition, a joint Army-Navy expedition was sent up the Yazoo in mid-July, under the command of Major General Francis J. Herron and Lieutenant Commander John Walker, to retake Yazoo City. General Joe Johnston had seized Yazoo City as part of a Confederate effort to relieve Vicksburg after its surrender to Grant's forces. The naval force included Walker's Baron De Kalb, New National, Kenwood, and the Signal.²⁰

Lieutenant Issac Brown, who had been involved in the effort to mine the Yazoo the previous December which had resulted in the loss of Cairo, was tasked to assist in the Confederate defense of Yazoo City against attack by Union gunboats. He had possession of a small number of Fretwell contact mines, at least two of which he placed a half mile down-river from the land battery his men were manning below Yazoo City. The Federal force which advanced up the river on July 13 did not suspect

additional mine laying activity by the Confederate forces and apparently did not take measures to defend against a possible mine threat. There was usually information on Confederate torpedo activities from "negroes and deserters", but in this case, as Rear Admiral Porter later reported, there was no indication that mine laying had taken place.²¹

Herron, along with his 5000 troops and Walker's small flotilla of gunboats, moved successfully against Yazoo City. At about 1930, the De Kalb was moving up river at a point opposite Yazoo City when she struck a mine, tearing a hole in her port bow. The ironclad went down in fifteen minutes, but all of her crew managed to escape. Walker salvaged all the ship's guns and small arms, but the vessel was a total loss. Porter's after-action reports discuss seventeen torpedoes as being planted in the river, "without wires attached to them." This would confirm that the devices were contact mines of some type and suggest that some effort was made to sweep for and remove additional devices; however, there is no detailed reporting on this activity if it in fact took place.²²

Porter was concerned following the loss of the Baron De Kalb that a significant mine threat to his fleet still existed. On July 24, 1863, he issued General Order Number 75 to the U. S. Mississippi Squadron, ordering that all vessels "going up the narrow rivers on expeditions, . . . will provide themselves with an apparatus to destroy torpedoes."²³ The commanding officer of the USS Lexington wrote to Porter that he had found the type of device recommended by Porter not satisfactory because it impeded the maneuverability of his vessel, therefore he modified it, improving his ship's performance.²⁴

The third and final Union loss to Confederate mines on the Western Rivers occurred during the Red River expedition in the Spring of 1864. This operation, launched to secure control of northern Louisiana and southern Arkansas, was the last major riverine operation of the war. It was not a successful operation for the Federal forces; General Banks' force was defeated at Sabine Cross Roads and was forced to withdraw short of the main objective of Shreveport following the loss of its supply train. Porter came very close to having his entire fleet stranded in the Red River due to a rapid drop in the river, which made navigation difficult. The loss of the Eastport was a relatively minor event in the operation. She ran over a mine on April 15 and despite heroic efforts to keep the vessel afloat, eventually grounded at Montgomery, Louisiana. On April 26, her skipper had the vessel destroyed to keep it from falling into Confederate hands. There is no evidence the Confederate forces had any systematic program for mine warfare on the Red River and Union forces took no precautions for dealing with mines.²⁵

There were no additional operations of significance involving mine warfare on the Mississippi or its tributary rivers. Other than a couple of minor incidents involving floating mines, there is little of note in the official reports. Rear Admiral Porter was concerned about the potential for additional activity of this nature and issued instructions for the arrest of individuals believed involved in Confederate mine warfare activity. The nature of these orders suggests that those involved in mine warfare still lacked the status of legitimate combatants, at least in the eyes of senior Union commanders.

Porter, in his General Order Number 184, uses the word "arrest" rather than capture, and states that "the sooner [those involved in torpedo warfare] are got rid of the better."²⁶ Although the use of mines did not have any significant impact on the overall conduct of the riverine war, they had been a severe annoyance for Porter and he had lost three fine gunboats to the devices before it was all over.

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¹³Acting ENS Walter E. H. Fentress to CAPT Henry Walke, 13 December 1862, N.R., 23: 547-548.

¹⁴LCDR T. O. Selfridge to CAPT H. Walke, 13 December 1862, N.R., 23: 550-551; Acting Volunteer LT W. R. Hoel to CAPT H. Walke, 13 December 1862, N.R., 23: 550-551; Mahan, 117-118.

¹⁵Acting RADM D. D. Porter to LCDR Wm. Gwin, 20 December 1862, N.R., 23: 567-568.

¹⁶Ibid., 568.

¹⁷Acting RADM D. D. Porter to Hon. Gideon Welles, 27 December 1862, N.R., 23: 580-581; Acting RADM D. D. Porter to Hon. Gideon Welles, 31 December 1862, N.R., 23: 591.

¹⁸COL C. R. Ellet to BG A. W. Ellet, 3 January 1863, N.R., 23: 593-594.

¹⁹Mangum, 76-77.

²⁰Fletcher Pratt, Civil War on Western Waters (New York: Henry Holt and Company, 1956), 183; James Russell Soley, "Naval Operations in the Vicksburg Campaign," Battles and Leaders of the Civil War 4, pt. 1 (New York: The Century Company, 1888), 570.

²¹Brown, 580; Acting RADM D. D. Porter to Hon. Gideon Welles, 14 July 1863, N.R., 25: 282.

²²Acting RADM D. D. Porter to Hon. Gideon Welles, 14 July 1863, N.R., 25: 282-283; Acting RADM D. D. Porter to Hon. Gideon Welles, 22 July 1863, N.R., 25: 284.

²³Acting RADM D. D. Porter's General Order No. 75, dated 24 July 1863, N.R., 25: 320-321.

²⁴LT G. M. Bache to Acting RADM D. D. Porter, 28 July 1863, N.R., 25: 348-349.

²⁵Pratt, 189-193; LCDR S. L. Phelps to RADM D. D. Porter, 28 April 1864, N.R., 26: 78-79.

²⁶General Order No. 184 of RADM D. D. Porter, dated 20 March 1864, N.R., 26: 184.

CHAPTER 5
CONCLUSIONS AND APPLICATION TO CONTEMPORARY
NAVAL OPERATIONS

On May 12, 1865, the Union army transport R. B. Hamilton was sunk by a mine at Mobile Bay, becoming the last vessel lost in the campaign of Confederate mine warfare against Federal forces. Interestingly, this sinking occurred after the capitulation of the Confederate States of America and the assassination of President Lincoln. Confederate naval mines contributed significantly to the losses suffered by United States maritime forces during the Civil War. Twenty-two vessels were sunk by mines, not including three ship's launches so destroyed, and eight vessels received sufficient damage to require repair.¹ Historically, evaluating the military effectiveness of mine warfare has been a difficult, subjective endeavor. This becomes apparent when one realizes that a mine can be an effective weapon even if it never destroys or damages a vessel. The mere knowledge that mines are present or thought to be present could be enough to significantly influence an enemy's course of action. With this in mind, this chapter will attempt to derive some lessons from the sum total of the Union and Confederate experience with these weapons. It is important to realize that mine warfare consists of two subdisciplines, mine development and mine countermeasures. The Confederacy emphasized the former, while the Union was preoccupied with the latter. This chapter will first

discuss the Confederate considerations for the employment of mines. Next, the impact of Confederate mine warfare upon Union naval operations will be considered, examining the strategic, operational and tactical levels of war. Finally, these lessons will be examined in terms of contemporary naval operations and the U.S. Navy's current "From the Sea" doctrine to determine if they are still germane.

There can be little doubt that the Confederate use of naval mines was one of the few success stories for the CSN. The South had little choice but to develop this untried technology when faced with massive Federal naval superiority. With virtually no navy and thousands of miles of coastline and inland rivers to defend, mines provided a cheap, effective method for defending these waters.

There was certainly no overall strategic direction for the conduct of the South's mine warfare operations. This was in spite of attempts to coordinate activity through the creation of organizations such as the Torpedo Bureau and the Submarine Battery Service. The Torpedo Bureau did conduct operations throughout the Confederacy, primarily to provide expertise for mine development and production, but did not command or coordinate all mine warfare activities. The Submarine Battery Service was mainly limited to the James River basin. Mine warfare efforts were organized at the military department or local command level, with little coordination between these command elements. Thus, its impact was primarily at the operational and tactical levels of war.

The South was blessed with a cadre of creative men, including Maury, Davidson, Rains, Brown, Singer, and Fretwell, who had the

ingenuity and skill to develop a family of lethal naval mines. The electrical bottom mine, moored contact mines, and frame mines represented a multi-faceted threat to Union coastal and riverine operations. A weapon that in many cases cost the Confederacy only a few dollars to construct and deploy frequently destroyed vessels worth many tens of thousands of dollars. The manpower and equipment requirements for maintaining a minefield, such as those deployed at Charleston Harbor, represented a minute fraction of the total force. Mine warfare was truly cost effective for the CSA.

What was the impact of mine warfare upon Union naval operations at the strategic, operational, and tactical levels of war? Examining first the strategic impact of Confederate mine warfare, it is apparent that it was negligible, if not nonexistent. Mine warfare did not affect the ultimate outcome of the war for the South. It is quite probable that had the Confederacy not used mines at all, the war would have proceeded along essentially the same strategic design, with the same outcome, along the same general timelines. As mentioned above, there was no overall strategic guidance for the use of these weapons. Had that guidance existed, it is still doubtful the outcome would have been much different.

At the operational level, results of the mine warfare operations are more apparent. Mines contributed significantly to the halting of two major Union naval operations, those being the attempt to take Charleston from the sea and the joint Army-Navy expedition up the Roanoke in December 1864. At Charleston, Beauregard had the support of a small, but effective Torpedo Service which maintained mixed fields of

electrical, moored contact, and frame mines. These augmented other defenses to include obstructions and fixed shore fortifications. The result was a defense of Charleston harbor which was never penetrated by Union naval forces. Du Pont's April 1863 attack was unsuccessful and his successor, John Dahlgren, never attempted a major assault of the same type. Dahlgren, in large part due to his respect for the Confederate mine threat, maintained the blockade and used his forces against outlying Confederate fortifications, but kept his vessels out of the harbor itself. It would have been difficult, if not impossible, to attempt removal of these mines since they lay under the guns of the Charleston defenses. Dahlgren, in his after action reporting, had great praise for the design, use, and potential destructive power of these submarine weapons.

The joint Union expedition up the Roanoke River in December, 1864 to seize Rainbow Bluff was also completely halted, in large part due to mines placed in the river. In this case, attempts to sweep the river were complicated by Confederate sharpshooters and skirmishers along the banks, which harassed personnel attempting to drag the river for mines. Despite the use of naval gunfire and Marines placed ashore, Commander W. H. Macomb was forced to terminate the expedition and turn back downriver. Macomb attributed the failure to attain his objective to the mine threat.

Another operational consideration of interest is the observation that Union losses to mines increased as the war progressed. One vessel was sunk in 1862, one in 1863, ten in 1864, and an additional ten during the first five months of 1865. These increasing losses can be explained

by two factors. First, the Confederates were making more extensive use of mines as the war progressed and were perfecting the weapons, resulting in more reliable devices. Second, Union naval forces increased their penetration of Confederate coastal waters and inland rivers into 1864 and 1865. More aggressive operations led to increased losses to mines on the Union side.

There can be little doubt that the largest impact of mine warfare operations came at the tactical level of war. While mines did not often change the outcome of an operation, with those exceptions described above, they did seriously complicate individual operations. Of course, the single biggest impact were those incidents where mines actually destroyed or damaged vessels. Beyond this obvious effect, there are three general areas where the Union forces were affected tactically by the actual or assumed use of mines. First, the presence of mines would delay an attacking force, stretching out the timeline for the completion of an operation. Second, the dedication of resources, including men, vessels, equipment, and time, was required to conduct countermine operations which were frequently very involved. Finally, the use of mines undoubtedly had a psychological effect on those men aboard vessels that were the potential targets of the weapons. Each of these areas will be explored in more detail.

A commander facing a mine threat could immediately assume that he would require additional time to attain his objective. This was necessitated by the requirement to locate and sweep for the weapons, an operation that could be complicated by harassing fire from one's enemy. Union naval forces operating in coastal and riverine waters repeatedly

found themselves confronting this problem. Porter had to deal with it on the Yazoo River in December 1862 while in support of Sherman. A dedicated force took four days to clear the river for further riverine operations. S. P. Lee's riverine force was frustrated by mines on the James River in the Spring of 1864 and, much like Porter on the Yazoo, he had to dedicate a force for countermine operations. This took up time and delayed his operations. Union naval forces were similarly delayed when attempting to invest the Confederate fortifications on the Blakely River during the final campaign against Mobile in 1865.

This factor of extending operational timelines leads directly into the next tactical issue; the dedication of valuable resources for countermine operations. Men, vessels, and equipment had to be assigned to the duty of locating mines and neutralizing the threat. This was hazardous, often unforgiving work which has been described in detail in excerpts from the Official Records within this thesis. There were no major breakthroughs in sweeping techniques during the war. Methods were slow, labor intensive, and often very difficult to execute under hostile conditions. Different techniques were used, including the dragging of a river or channel with either small hawsers or grapnels, and the detailed searching of riverbanks for torpedo control stations with shore parties. Often times, channels were dragged, then vessels would proceed using passive measures such as nets and torpedo rakes for protection.² Devices, such as the Ericcson raft and Ellet's torpedo rake, were tried and adapted with varying degrees of success. The torpedo rake came into wide use, but these devices were frequently modified on the whim of individual ship commanders, which may explain why they were frequently

ineffective at countering the mine threat. The drifting mine threat was also a problem for the Federal forces. Ships lying at anchor were potential targets, which led to the use of measures such as nets and protective booms around vessels, the use of picket boats and calcium lamps to improve night time visibility, and extra vigilance by ship's officers and crews.

Of course, an obvious alternative to engaging in active or passive mine countermeasures would be to simply do nothing at all. This was the course that Farragut elected to take during his assault on Mobile Bay. Farragut did not make this decision in a vacuum; he had knowledge of a clear channel his attacking force could exploit, as well as an educated guess that many of the mines he knew to be in place would be rendered ineffective due to environmental deterioration. He was also constrained by the fact that there was no way his forces could sweep the channel under the guns of Fort Morgan. Farragut took a risk and his operation would have been totally successful, but for the loss of the Tecumseh. This was the only operation of significance where the commander elected not to take active mine countermeasures during the Civil War.

The final area for discussion focuses on the psychological impact of the real or assumed presence of mines on the crews of vessels. This is a difficult area to assess, but there can be little doubt that these weapons created conditions of fear, dread, and apprehension in those seamen required to face them. Farragut's force at Mobile Bay was temporarily paralyzed by the sudden destruction of the Tecumseh and Farragut himself later hinted at the terrible psychological toll mines

could take on sailors. These weapons were named "infernal machines" by the navy men of the day for good reason. It is noteworthy that mines continued to destroy vessels even after hostilities in an area had ceased. At both Charleston harbor and Mobile Bay, mines sank and damaged vessels involved in minesweeping and other operations long after Confederate forces had surrendered or withdrawn from the area.

How are these observations and lessons from the mine warfare operations of the Civil War applicable to the current situation in the very late twentieth century? The technology associated with naval mine warfare has advanced tremendously since the Civil War, both in the areas of the weapons themselves and also in the countermeasures used to neutralize the mine threat. However, the fundamental principles derived from a study of the use of naval mines can all be applied in the modern warfare environment. Mine warfare has been extensively used in post-World War II military engagements, including Korea (1951-53), both Indochina Wars (French and U.S.), the Falklands War (1982), the Iran-Iraq War (1980s), and the Iraq-Kuwait War (1990-91). There have also been incidents of mines being used as weapons of terrorism, most notably by Libya. The world-wide stocks of naval mines are immense, with dozens of nations possessing mines and having the capability to deploy them. There can be little doubt that they will continue to see wide use in future military operations. With this in mind, each principle will be addressed in turn, focusing on the contemporary situation.

Naval mines are a weapon of choice for a minor naval power, especially when used in a defensive role. The Confederacy realized they could never match the naval strength of the United States, so it

embraced the untested naval mine as a method for the defense of their long coastline and rivers. Modern nations facing similar situations have done much the same. During the Korean War, the North Koreans, with the assistance of the Russians and Chinese, planted defensive mine barriers in their coastal waters when faced with an overwhelming U.S. naval threat. This effort was especially successful at the port city of Wonsan, as will be described in more detail below.³ During the first Indochina War the Viet Minh, who had no navy, used mining to counter French riverine forces operating upon the extensive river system in the Mekong Delta. The same methods were used by the Viet Cong when fighting the United States and Republic of South Vietnam riverine forces during the Vietnam War.⁴ A final example would be the use of naval mines by Iraq when it faced the allied coalition during Desert Shield/Desert Storm. When faced with overwhelming naval superiority by the coalition, the Iraqis resorted to defensive mining to defend their territorial gains in the northwest Persian Gulf. This effort resulted in significant damage to the USS Tripoli and USS Princeton while both vessels were participating in mine countermeasure operations.⁵

Naval mines are inexpensive to produce and place. The Confederacy certainly found mines to be very cost effective. The weapons cost little to produce, and only a few men and minor resources were required to lay them. Modern mines remain very inexpensive in comparison to the platforms that they target. Many types of modern mines are relatively simple to use and can be placed with a very modest commitment of resources. The use of naval mines at Wonsan during the Korean War is an excellent example of this principle in application:

One must credit the Russian naval personnel who had been assigned to mine Wonsan with the achievement of a considerable success. Prior to their departure in early October, these gentlemen had not only held mine school for the North Koreans, but had assembled the magnetic mines, planned the minefields, and supervised their planting. The effort had been an extremely economical one. Barges towed by motor sampan had been employed as minelayers, and local labor used both to load the barges and to roll the mines off the stern. With this negligible investment in training, equipment, and personnel, more than 2,000 of a planned 4,000 mines had been planted in the harbor, four ships had been sunk, and a delay of six weeks imposed upon the [U.S.] Attack Force.⁶

Another example of the simplicity and inexpensive nature of naval mine warfare operations was the Iranian use of mines during the Iran-Iraq War to interdict tanker traffic in the Persian Gulf. The Iranians used Russian-made, 1908-vintage M-08 bottom-moored contact mines laid by the modified landing craft Iran Ajr. For a very modest investment in material, these "obsolete" mines wreaked havoc in the Persian Gulf. Several ships, including the U.S. frigate Roberts, were damaged by these weapons and a significant, costly mine countermeasures program was initiated to deal with the problem.⁷

Naval mines will create delays in enemy operations. Time will be required to move mine countermeasures equipment to the area of operations, conduct the mine-hunting operations to locate the weapons, and then proceed to sweep a clear channel through the mined area. Confederate mine laying resulted in Union forces expending time in order to remove mines on the James and Yazoo Rivers, and at Mobile Bay during the final operations there. Looking once again at the Wonsan example from the Korean War, the communist mine operation delayed landing operations at Wonsan by several weeks. On the west coast of the peninsula, defensive mining delayed sea-borne supply for United Nations forces moving up the west coast of Korea. These forces had difficulty

using landlines for resupply because these transportation arteries had been seriously damaged by the war effort to date and resupply from the sea was considered critical to the continued northward advance of the U.N. force.⁸

Naval mines force an adversary to expend effort and equipment on countermeasures to sweep the devices. This force could otherwise be applied to other, more productive operations if the mine threat did not exist. The Union navy was forced to dedicate ironclads, gunboats, launches, sailors, and troops to extended operations to clear Confederate mines from rivers and channels. No less an effort has been required during modern countermine operations. A good contemporary example was the effort required to sweep the handful of mines planted in the Persian Gulf by the Iran Air during 1987. The U.S. deployed a squadron of RH-53D Sea Stallion minesweeping helicopters, the USS Guadalcanal to support the RH-53D squadron, six fleet minesweepers to conduct a surface minesweeping effort, and associated logistics support. This mine countermeasures effort lasted from the early Fall of 1987 until the early Spring of 1988. A small investment by the Iranians resulted in a response by the U.S. costing tens of millions of dollars.⁹

Naval mines have a significant psychological impact and threaten an adversary's morale. As discussed above, this effect is difficult to quantify, but there is an undeniable impact. Farragut's force at Mobile Bay was certainly a victim of mine warfare's psychological dimension when the Tecumseh was sunk. The dread of dealing with this unseen threat will induce fatigue and stress a vessel's crew. These impacts will transcend the tactical level, and move into the operational and

strategic levels of warfare. Following the loss of two fleet minesweepers during the initial attempt to sweep the channel at Wonsan, U.S. naval commanders informed Washington that the Navy had "lost command of the sea in Korean waters."¹⁰

With the significant change that has taken place in the World geopolitical situation during this decade, the United States Navy has adapted a new doctrine to guide both the Navy and the Marine Corps. "From the Sea" (FTS) shifts the focus from the super-power confrontation to the more common regional challenges and opportunities. This also involves a shift from an open ocean, blue water strategy to one that is regional in focus, oriented towards the coastal or "littoral" areas, and is expeditionary in nature.¹¹

The key to the successful application of the FTS strategy is the ability to control the littoral region as a prerequisite for the conduct of power projection operations ashore. This concept of battlespace dominance is one of four key operational capabilities identified in FTS, the others being command, control, and surveillance, power projection, and force sustainment. As stated in FTS:

The battlespace is the sea, air, and land environment where we will conduct our operations. The dominated battlespace expands and contracts and has limits. Dominating the battlespace presupposes effective command and control capabilities and serves as the logical prerequisite for the projection of power ashore. Battlespace dominance means that we can maintain access from the sea to permit the effective entry of equipment and resupply. This dominance implies that Naval Forces can bring to bear decisive power on and below the sea, on land, and in the air.¹²

Battlespace dominance lies at the heart of FTS. Naval forces will use this battlespace dominance in the coastal regions to mass forces and

generate intense offensive combat power for power projection operations ashore.

This littoral environment is a complex one to operate within. It is characterized by congested, confined waters and airspace. An operator will find friend, foe, and neutral platforms operating within this zone, making identification and targeting extremely difficult. Adversaries, who only need to deny us the freedom to operate, will be able to bring a variety of modern, sophisticated weapons systems to bear on our naval forces. These will include diesel submarines, coastal defense cruise missiles, sea-skimming cruise missiles fired from aircraft and fast patrol craft, tactical ballistic missiles, and naval mines. All of these systems are currently available to even modest regional powers and severely tax our ability to maintain battlespace dominance in the littoral zone.¹³ One only need examine the United States' experience in the Persian Gulf over the last decade to appreciate the complexity of this problem.

It is obvious from the above discussion that naval mine warfare will be a significant element in the successful implementation of the FTS strategy. The ability of the United States Navy to deal with the mine threat and take effective countermeasures will be critical if battlespace dominance is to be achieved and power is to be projected ashore. Modern naval operators would do well to re-examine the lessons derived from the experience of the Federal Navy during the Civil War. They are timeless lessons which naval operators will be forced to heed when facing the naval mine threat in coastal waters, an event that will surely come at some date in the future.

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¹Milton F. Perry, Infernal Machines: The Story of Confederate Submarine and Mine Warfare (Baton Rouge: Louisiana State University Press, 1965), 199-201.

²R. H. Stotherd, Torpedoes, Offensive and Defensive (Washington, D. C.: Government Printing Office, 1872), 271-273.

³James A. Field, Jr, History of United States Naval Operations: Korea (Washington, D.C.: Government Printing Office, 1962), 229-242.

⁴R. L. Schreadley, From the Rivers to the Sea: The United States Navy in Vietnam (Annapolis: Naval Institute Press, 1992), 20-21.

⁵Norman Friedman, Desert Victory: The War for Kuwait (Annapolis: Naval Institute Press, 1991), 213.

⁶Field, 237.

⁷Gregory K. Hartmann, Weapons That Wait: Mine Warfare in the U.S. Navy (Annapolis: Naval Institute Press, 1991), 255-261.

⁸Field, 237.

⁹Hartmann, 256-257.

¹⁰Andrew Patterson, Jr, "Mining: A Naval Strategy," Naval War College Review 23 (May, 1971): 56.

¹¹Sean O'Keefe, Frank B. Kelso II, and Carl E. Mundy, Jr, From the Sea: Preparing the Naval Service for the 21st Century (Washington, D.C.: Department of the Navy, 1992), 6.

¹²Ibid., 8.

¹³Ibid., 6.

APPENDIX

U.S. NAVY VESSELS SUNK OR DAMAGED BY CONFEDERATE NAVAL MINES

The following chronological list describes the destruction or damage to Union naval and army vessels by Confederate naval mines. It includes date, vessel name, type, tonnage, and a brief narrative of the incident, including the location. Adapted from Perry (1965).

14 Feb 1862 Susquehanna's launch (ship's launch)
Sustained minor damage from mine on Wright River, Georgia.

12 Dec 1862 Cairo (armored river gunboat, 512 tons)
Sunk by crude demijohn mine on Yazoo River while supporting reconnaissance expedition. Crew suffered minor injuries.

28 Feb 1863 Montauk (monitor, 844 tons)
Struck a mine in Ogeechee River, Georgia shortly after it destroyed Confederate ironclad Nashville. Seriously damaged, but back in service within one month.

14 Mar 1863 Richmond (screw sloop, 1929 tons)
Received minor damage after striking mine opposite Port Hudson, Louisiana while running up the Mississippi River.

07 Apr 1863 Weehawken (monitor, 840 tons)
Detonated possible mine at entrance to Charleston Harbor while pushing Ericsson raft to clear mines and obstructions. Minor damage to vessel.

13 Jul 1863 Baron De Kalb (armored river gunboat, 512 tons)
Sunk by mine (possibly Singer-Fretwell contact mine) on Yazoo River at a point opposite Yazoo City. Vessel sank in fifteen minutes, but entire crew escaped.

05 Aug 1863 Commodore Barney (river gunboat, 513 tons)
Seriously damaged by two mines on James River while conducting reconnaissance on James River immediately upstream of Cox's Landing. Two sailors killed.

16 Aug 1863 Pawnee's launch (ship's launch)
Launch destroyed by drifting mine while tied to Pawnee at Light House Inlet, South Carolina.

16 Aug 1863 Pawnee (gunboat, 872 tons)
 Received minor damage from same drifting mine that destroyed ship's launch at Light House Inlet.

-- Sep 1863 John Farron (army transport, 250 tons)
 Seriously damaged by mine on James River.

01 Apr 1864 Maple Leaf (army transport, 508 tons)
 Sunk by probable keg mine on St. John's River near Mandarin Point.

15 Apr 1864 Eastport (armored river gunboat, 700 tons)
 Struck mine during expedition up the Red River. Grounded at Montgomery, Louisiana and destroyed by crew to keep vessel from Confederate hands.

16 Apr 1864 General Hunter (army transport, 460 tons)
 Sunk by probable keg mine on St. John's River above Jacksonville.

06 May 1864 Commodore Jones (river gunboat, 542 tons)
 Totally destroyed by electrical bottom mine at Deep Bottom on James River while conducting minesweeping operations. Sixty-nine of crew lost.

09 May 1864 Harriet A. Weed (army transport, 290 tons)
 Sunk by probable keg mine on St. John's River above Jacksonville.

19 Jun 1864 Alice Price (army transport, 320 tons)
 Sunk by probable keg mine on St. John's River above Jacksonville.

05 Aug 1864 Tecumseh (monitor, 1034 tons)
 Struck single mine and sank just west of Fort Morgan during assault on Mobile Bay, Alabama. Sank rapidly with loss of virtually entire crew.

07 Dec 1864 Narcissus (tug, 101 tons)
 Sank after striking a mine in Mobile Bay. Several crew injured.

09 Dec 1864 Otsego (gunboat, 974 tons)
 Sunk by two mines during expedition up Roanoke River against Rainbow Bluff.

10 Dec 1864 Bazely (tug, 55 tons)
 Sunk by mine on Roanoke River when it attempted to come alongside wreck of Otsego to remove personnel.

15 Jan 1865 Patapsco (monitor, 844 tons)
 Sunk by probable keg mine while participating in minesweeping operations just to east of Fort Sumter at Charleston. Went down in less than one minute with loss of sixty-two officers and men.

20 Feb 1865 Shawmut's launch (ship's launch)
 Destroyed by floating mine on Cape Fear River at Wilmington during attempt to destroy mines with musket fire. Two killed and two wounded.

21 Feb 1865 Osceola (gunboat, 974 tons)
 Minor damage to vessel on Cape Fear River when floating mine lodged in housing for paddle wheel and detonated.

01 Mar 1865 Harvest Moon (gunboat, 546 tons)
 Rear Admiral Dahlgren's flagship was sunk by mine south of Georgetown, South Carolina while enroute Charleston.

04 Mar 1865 Thorne (army transport, 403 tons)
 Sunk by single mine below Fort Anderson on Cape Fear River.

06 Mar 1865 Jonquil (gunboat, 90 tons)
 Seriously damaged while engaged in pulling out frame torpedoes on Ashley River at Charleston. Two men badly injured.

12 Mar 1865 Althea (gunboat, 72 tons)
 Sunk by mine on Blakely River while dragging the channel. Two crew killed and three wounded.

17 Mar 1865 Bibb (coast survey steamer, unknown)
 Slightly damaged by mine while returning to Charleston following survey work in the harbor.

28 Mar 1865 Milwaukee (monitor, 970 tons)
 Struck a single mine in Blakely River (Alabama) and sank while conducting assault on Old Spanish Fort. Sank in three minutes, but with no loss of life. Torpedo rake used by vessel.

29 Mar 1865 Osage (monitor, 523 tons)
 Sunk by single mine while shifting its anchorage inside the Blakely River bar. Four dead and eight wounded in incident. Torpedo rake used by vessel.

01 Apr 1865 Rodolph (armored river gunboat, 217 tons)
 Struck a single mine and sank in Blakely River while moving barge with salvage equipment alongside wreck of the Milwaukee. Four crewmen killed and eleven wounded.

13 Apr 1865 Ida (tug, 104 tons)
 Sunk by a single mine in Blakely River with two crew killed.

14 Apr 1865 Sciota (gunboat, 507 tons)
 Struck mine and sank in Mobile Bay while transporting personnel in working party back to their ship. Four killed and six wounded.

14 Apr 1865 Cincinnati's launch (ship's launch)
 Launch destroyed while engaged in minesweeping operations on Blakely River. Mooring line parted and strain of drag rope brought launch against mine, detonating it. Three crew killed.

12 May 1865 R. B. Hamilton (army transport, 400 tons)
 Sunk by mine on Mobile Bay.

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