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TRANS-MISSISSIPPI MIASMAS: HOW MALARIA & YELLOW FEVER SHAPED THE COURSE OF THE CIVIL WAR IN THE CONFEDERACY'S WESTERN THEATER

By Andrew McIlwaine Bell

By the autumn of 1862, Sabine City was arguably the most important Confederate seaport in Texas. Situated on a peninsula in the easternmost part of the state that separates Sabine Lake and a river of the same name from the Gulf of Mexico, the town had been transformed by the Civil War from a sleepy frontier entrepôt with one hotel, newspaper, and sawmill into a magnet for bands of smugglers and speculators who ran cotton, weapons, and other supplies between the Confederacy and the Caribbean. The U.S. Navy had only recently begun blockading the Texas coast and had most of its ships patrolling the waters around Galveston, the state's biggest port city at the time. Sabine, with its close proximity to the Gulf and a railroad line that ran into the Texas interior, became the next best option for blockade runners anxious to avoid entanglements with Union gunboats. Admiral David Farragut, the genius behind the North's capture of New Orleans, realized that his fleet could not stop the illicit trade without controlling the cities that offered smugglers safe harbor. When he encouraged his commanders to take initiative and seize these port cities wherever possible, forty-one-year-old Frederick W. Crocker, a former whaler from Massachusetts who had sailed around the world before he joined the Navy, decided to attack Sabine City.¹

At the fort protecting the city, Confederate Major Josephus Irvine had a battle on his hands even before Crocker's boats showed up. The previous July, a British blockade runner had arrived at the city's docks from the Gulf and disgorged along with its smuggled cargo the virus which causes yellow fever, one of the most feared diseases of the nineteenth century. By September, a full-blown epidemic was underway in Sabine with between three and six new cases appearing 'every 24 hours.' Panicked residents and soldiers alike evacuated the town. Those who fled to Houston and Beaumont were quarantined on the outskirts of both cities as Confederate authorities fretted about the possibility that the outbreak might spread. Mrs. Otis McGaffey lived in Sabine at the time and in later years recalled how her family's suffering was compounded by the egregious incompetence of local doctors: "[They] seemed to know little if anything about treating the patients, some getting drunk, and useless (as they were afraid of it) [;] others not knowing what to do." The McGaffeyes fled to nearby Weiss' Bluff, but were turned away by neighbors who were afraid of contracting the disease. The Confederate force guarding Sabine dropped from about 1,800 troops to fewer than eighty. By the last week of September, Crocker's squadron, consisting of three vessels—the *Kensington*, the *Rachel Seaman*, and the *Henry Janes*—arrived and opened fire on the fort. Irvine, realizing his position was untenable, ordered the guns

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spiked and withdrew his forces by eight o'clock on the morning of September 25, 1862.²

Crocker soon realized his enemies had retreated and went ashore to raise the Stars and Stripes over Fort Sabine. One of his subordinates, Lewis Pennington, who commanded the *Henry Janes* and had once lived in Sabine, entered the city and learned from the few dozen residents left that yellow fever had killed "nearly one-half of the population" (including the town's mayor) and that the disease had forced several hundred rebel troops to withdraw to nearby Beaumont. Pennington and Crocker were shocked to find the dreaded "scourge of the South" raging in Sabine and kept their men "close to their boats" as much as possible during the brief occupation, only sending them ashore to perform necessary tasks like capturing a family of Confederate spies and burning the town's railroad depot. Thirty miles away in Beaumont, the Confederates in Elmore's Twentieth Texas Regiment, who had been sent as reinforcements to drive the Yankees out of Sabine, were terrified at the prospect of entering an area plagued by yellow fever. The lieutenant-colonel in charge of the regiment raised such a ruckus about the danger of the disease that he was ordered not to mention the phrase "yellow fever" in the presence of his superior officer. With no one to challenge their landing at Sabine, the federals moved into Taylor's Bayou, ten miles away, and fired a railroad bridge, which was saved temporarily by an alert Confederate private who doused the flames, though Union troops later returned to destroy it. Crocker's forces continued to operate with impunity for another month, capturing prisoners and burning blockade runners, before rumors of a massive Confederate attack unnerved Union commanders who resumed their blockading duties and allowed the forts along the Texas coast to fall back under Southern control.³

Crocker's bloodless conquest of Sabine was made possible by the swarms of *Aedes aegypti* mosquitoes that inhabited the city. Unbeknownst to Antebellum physicians, yellow fever was being transmitted from person to person by these insects, which lay their eggs in hollow logs and artificial receptacles containing fresh water. Filthy Southern cities offered nearly limitless incubation pools for *Aedes aegypti* eggs in the form of horse troughs, barrels, clogged gutters, and trash in the streets filled with rainwater. Winter frosts limited the activity of the mosquito and prevented yellow fever from ever becoming endemic in North America, but the virus was continually reintroduced by cargo ships arriving from the Caribbean where it existed year-round. A single infected sailor or mosquito on board could spread yellow fever to the local *Aedes aegypti* population and cause widespread misery and death.⁴

The disease created a level of physical and emotional suffering that can scarcely be imagined today. Victims in the advanced stages of an infection bled from the nose and mouth, suffered excruciating headaches, fever, jaundice and, worst of all, vomited a substance resembling coffee grounds (half-digested blood) caused by internal hemorrhaging, which was a tell-tale sign of the virus. Case fatality rates during epidemics ranged from fifteen to over fifty percent, but those who survived acquired lifetime immunity. Nineteenth-century Americans lived in fear of the disease they called the "scourge of the

South" and public panics often followed the first sign of an outbreak.⁵

But this scourge was not the only mosquito-borne disease that threatened the health of soldiers and civilians living in the Confederate west. Malaria, a parasite transmitted by the anopheles mosquito, was a far more common ailment in the region. Symptoms of the disease included chills, shakcs, nausea, headache, an enlarged spleen, and a fever that spikes every one to three days depending on the type of malaria and its parasitic cycle. Of the four types of malaria that infect human beings—*plasmodium malariae*, *plasmodium ovale*, *plasmodium vivax*, and *plasmodium falciparum*—only the latter two strains were once major problems in the United States. *P. vivax* rarely proved fatal to its victims, but *p. falciparum* was often deadly.⁶

Nineteenth-century physicians categorized malaria according to how often fever spikes or "paroxysms" occurred. A "quotidian" fever appeared once every twenty-four hours, a "tertian" every forty-eight, and a "quartan" every seventy-two. *Plasmodium vivax* was commonly referred to as "intermittent fever," "ague," "dumb ague," or "chill-fever," while *plasmodium falciparum* was known as "congestive fever," "malignant fever," or "pernicious malaria" because of its lethal effect.⁷

Physicians differed over what caused malaria for most of the nineteenth century. Endless theories circulated in medical journals or were discussed at conventions at a time when medicine was more art than science. Some practitioners, perhaps a majority, believed decomposing animals and plants produced the noxious "miasmas" that poisoned the air and sickened their patients; others thought electrical charges in the ozone caused the dreaded malady. Still others rejected the "bad air" theory all together and instead blamed excess hydro-carbons in the blood. No one suspected that the tiny insects whose omnipresence seemed perfectly natural and non-threatening were responsible for the fevers that mysteriously appeared during the warmer months.⁸

As settlers cleared virgin forests to make way for the cotton farms that drove the antebellum southern economy, they inadvertently created a plethora of new breeding sites for anopheles. At a time when mosquito control measures such as DDT-spraying were still unknown, clouds of insects swarmed wagon trains and slave coffles, sparking complaints about "fever" and "ague" in the cotton states where crude housing, poor drainage, and frequent flooding increased the frequency of the disease. When men from all over the country assembled in these same states to settle the issues of federalism and slavery on the battlefield, large numbers of new prey for mosquitoes suddenly appeared.⁹

The first battle of Sabine Pass (as it would later be called) reveals the health hazards that were faced by Union and Confederate forces operating in the trans-Mississippi theater and how mosquitoes periodically played a role in the outcome of military operations in the region. The two states where these insects were the most troublesome, Arkansas and Texas, were both in the Confederacy's Trans-Mississippi Department. Arkansas held the ignoble distinction of being the Union army's most malarious department from 1863 to 1865 while Texas experienced more yellow fever epidemics during the war

than any other state in the Confederacy. Thousands of soldiers stationed in the region shook violently with “ague” or spewed black vomit before drawing their last breath.

The Sabine yellow fever epidemic was just one of a spate of outbreaks in 1862 that alarmed Union commanders and helped dissuade the North from establishing permanent occupation points along the Texas coastline. “Yellow jack” hit Brownsville, Matagorda, and Indianola in the same year and was rumored to be raging in Houston, Galveston, and at the mouth of the Rio Grande. The disease also threatened Confederate garrisons stationed near the Gulf coast, as the Sabine example shows.¹⁰

When Admiral David Farragut learned in the fall of 1862 that Confederates were trading “hundreds of bales” of cotton through Matamoros, Mexico, he wanted to seize Fort Brown and establish a Union troop presence in the area as quickly as possible. But his concerns about what yellow fever might do to an occupation force and Butler’s unwillingness to provide troops for the expedition kept Brownsville in Confederate hands for another year. One of Farragut’s subordinates, Henry French, who had command of the *U.S.S. Albatross*, was so worried by the cases of yellow fever that showed up onboard his vessel while it was off the coast of Texas that he ordered the ship back to the navy yard at Pensacola. Farragut was incensed at French’s unauthorized retreat. “You were sent to blockade the Rio Grande, and you had no right to leave that station until regularly relieved by some other vessel,” railed the admiral, who made it clear that for the Navy at least, the importance of the mission trumped all other concerns: “Our duties in war are imperative, and we are as much bound to face the fever as the enemy, and to face both when necessary in our duty.” An unlucky ship, the *Albatross* was again plagued with yellow fever the following year.¹¹

French and Crocker were not the only Union naval officers operating off the Texas coast in 1862 who were worried about yellow fever. Brooklyn-native William Renshaw received instructions in September to move his mortar flotilla “down the coast of Texas” in order to intercept blockade runners and, if possible, capture Galveston. Renshaw, inspired by Farragut’s audacious seizure of New Orleans, ordered his fleet into Galveston Bay and demanded “the unconditional surrender of the city” after a brief exchange of fire with Confederate shore batteries. Renshaw’s tough terms softened, however, when he learned from two clever southern negotiators that yellow fever was raging in Galveston (in reality, there was no epidemic in the city at the time.) Not wishing to expose un-acclimated Union troops to the disease, he agreed to a four-hour truce so that civilians could evacuate the city as long as Confederates did not bolster their defenses. Confederate Colonel Joseph J. Cook took advantage of a loophole in the terms—there was never an explicit prohibition to the withdrawal of forces—to save several guns from capture by moving them to the mainland. Cook’s apparent breach of faith outraged Renshaw and he considered launching an attack in retaliation, but after considering the diplomatic implications of potentially killing foreign nationals in the city, the strength of Confederate forces, and “the great danger of contagion

from yellow fever," he allowed Cook to proceed without incident. Renshaw believed "two old-fashioned 24-pounders, one 80-pounder rifle, and another gun" were not worth the price of exposing his sailors to a "fatal disease" that promised to kill "many innocent people." When the city surrendered a short time later, he was content to lead a small force to raise the Stars and Stripes over the customhouse for thirty minutes and then retreat to the safety of his ship while his troops stayed close to Galveston's wharves. General John B. Magruder used the guns and men Cook saved—in large part thanks to Renshaw's fears of yellow fever—to recapture Galveston for the Confederacy the following January were.¹²

As these examples show, yellow fever raged all along the Texas coast during the autumn of 1862. From Sabine to Brownsville, *Aedes aegypti* mosquitoes helped create a military stalemate in the Lone Star State that ultimately worked to the South's advantage. Although the U.S. Navy outgunned the Confederacy's shore defenses, the task of occupying the major trade hubs along six hundred miles of coastline proved impossible for the North during the sickly season, both because troops were needed elsewhere and because sending un-acclimated northern military personnel into areas known to be plagued with yellow fever was an unwise and potentially dangerous strategy. Farragut, Crocker, French, and Renshaw were all unnerved at some point by the prospect of exposing their men to "yellow jack," and either withdrew their forces or altered their plans in the region.

As *Aedes aegypti* scuttled Union Naval operations in Texas, anopheles mosquitoes attacked U.S. soldiers stationed further north, creating medical complications for men already suffering from a battery of other diseases. While stationed in Indian Territory (present-day Oklahoma), the Tenth Kansas Volunteers was stricken with "malarious fever," diarrhea, and scurvy. The Tenth's surgeon was able to obtain a "supply of desiccated vegetables," which supposedly helped eradicate the latter ailment. During the first autumn of the war, the Second Missouri Infantry spent time in the mosquito-infested country between Springfield and St. Louis and was plagued with "quotidian and tertian intermittents," (malaria) dysentery, and diarrhea. The Second had not been issued tents and soldiers slept out in the open with only blankets, making them easy targets for anopheles. In June of 1862, dysentery and diarrhea plagued their comrades in the Third Missouri Cavalry (who were stationed in the same area) and by August, the number of cases of malaria was on the rise. But soldiers sent to Arkansas suffered the most from the disease.¹³

After the re-opening of the Mississippi River in the summer of 1863, Union commanders were anxious to keep pressure on the remaining Confederate armies in the field and seize as much territory as possible. In Arkansas, it was necessary for U.S. forces to control the Arkansas River in order to protect the northern part of the state and Missouri from rebel attacks. With these goals in mind, Grant ordered Major General Frederick Steele to march an army of 12,000 bluecoats across Arkansas to destroy General Sterling Price's Confederate force and capture the state capital at Little Rock. Steele's Army of Arkansas consisted of regiments that had been stationed at

Helena all summer—a city one Union soldier remembered as a “malaria-stricken, disease-fostering hole”—and units transferred from Mississippi after the fall of Vicksburg. Large numbers of men in both groups were already infected with plasmodium parasites when they rendezvoused in Helena at the end of July. Two brigades from Kimball’s Division (Sixteenth Corps) arrived from Snyder’s Bluff “suffering severely from the malarious influences of the Yazoo country.” The Third Minnesota had contracted malaria in the area while felling trees, digging rifle pits, and performing picket duty. A number of other units sent to Steele had spent time along the Big Black River, an area the U.S. Sanitary Commission had found to be rife with disease. The parasites these men contracted in Mississippi were introduced into an environment that was already plagued with endemic malaria. “Swamps” and “bayous” that were “covered with green scum in dry weather,” dominated the countryside surrounding Helena, conditions that allowed mosquitoes to thrive. Malaria was so common in Helena that one soldier thought that the “chief occupation” of the city’s residents was “damning the Union every day and shaking with ague every other day.”¹⁴

The anopheles population of Arkansas quickly spread various strains of malaria among the men in Steele’s command and helped make their march to Little Rock a nightmarish ordeal. Scores of men fell out of the ranks in exhaustion while others cast off blankets, clothing, and knapsacks to lighten the load, creating a trail of discarded items along the marching route. By the time Steele arrived in Clarendon, where John W. Davidson and 6,000 Union cavalrymen reinforced his troops, malaria was epidemic in his army. Andrew Sperry was a soldier with the Thirty-third Iowa who in later years described Clarendon as the “home and head-quarters of ague in bulk and quantity.” He and his fellow Iowans, who had grown up in a malarious state, believed the Arkansas variety of the disease was especially severe. One morning during their stay at Clarendon, the bugler responsible for blowing the Thirty-third to sick call was shaking so severely from a malaria-induced chill that he could not perform his duties. When two other men, including a lieutenant colonel, attempted to fill in for the ailing soldier, they too were seized with malarial shakes, leading Sperry to conclude that there “was ague in the bugle.”¹⁵

By the time the army reached De Valls Bluff at the end of August, Steele took notice of the disease problem. “The sick list is frightful, including many officers,” he reported to General Stephen Hurlbut on the twenty-third. “More than 1,000 here present are reported unfit for duty, and about one-half of the command proper are absent.” On September 1, he identified the cause of his troops’ suffering: “Many of our men have been taken down with fevers, and chills and fever, lately.”¹⁶

Malaria afflicted Steele’s army for a number of reasons. First, it marched through the “swamps and marshes” of Arkansas at a time of year when mosquitoes were highly active. Nineteen thousand men and an untold number of animals clustered together provided an irresistible target for hungry anopheles. Many of these men had spent the summer in the Mississippi, Yazoo, or Big Black River basins and already carried plasmodium parasites before the cam-

paign began. Second, the Army of Arkansas was poorly provisioned. Many of the soldiers had not been issued tents and were forced to sleep in the open, making it easy for mosquitoes to feed on their bodies. Quinine, the one medicine that could effectively control the symptoms of malaria, was administered only irregularly because of army supply problems and the unusually high demand for the drug in the department. Steele set up temporary hospitals at Clarendon, De Valls Bluff, Brownsville, and eventually Little Rock, which stretched his supply of medicines to the breaking point. Requests for additional drug supplies had to be sent to Memphis, which created "long and vexatious delays." Finally, Steele's medical staff was in disarray during much of the campaign. There was a shortage of doctors—several regimental medical officers were inexplicably absent during the campaign—and at least some of those on duty were "manifestly unfit for their place." Shoddy treatment of the sick prompted Steele to take action on August the twenty-fourth while the army was camped at De Valls Bluff. He ordered his regimental commanders to find out who was to blame for the "gross neglect" of ill troops. Eventually, a group of regimental surgeons brought charges of "incompetency and neglect of duty" against J.C. Whitehill, Assistant Medical Director of the Army but Steele, pressed by Confederate cavalry raids and worried about Confederate General Sterling Price's next move, dropped the matter.¹⁷

Dysentery and the suffocating summertime humidity of Arkansas wreaked further havoc on the health of Steele's men. Lacking a steady supply of fresh water, thirsty soldiers dipped their canteens in stagnant bogs and puddles where hogs had wallowed. By the first week of September, the army was at Brownsville where it again was "encumbered with a large number of sick—near 700." Steele had no choice but to detach two brigades of cavalry to guard the ailing troops and keep his supply lines open. Despite such setbacks, the general drove the remainder of his army across the Arkansas River and into Little Rock. Outgunned, outflanked, and anxious to avoid John Pemberton's fate, Price hastily withdrew his forces sixty miles southwest to Arkadelphia. Steele's exhausted cavalymen only gave brief chase before retiring. In the end, only 136 men in the Army of Arkansas were killed or wounded during the series of skirmishes that constituted the campaign for Little Rock while disease incapacitated at least a thousand, results consistent with the Union army's experience in Arkansas as a whole during the war. Thousands of northern men poured into a state that plagued with malaria and played only a small role in the success of the Union war effort. Anopheles mosquitoes prostrated far more soldiers stationed in Arkansas than were killed and wounded in battle. Between July of 1863 and June of 1865, over 72,000 Union troops assigned to the state were diagnosed with malaria, making it the U.S. military's most malarious department.¹⁸

The prevalence of mosquito-borne disease in Arkansas may help explain why Steele's troops did almost nothing to impede the Confederate invasion of Missouri that took place in the autumn of 1864. General Sterling "Old Pap" Price designed the raid to draw bluecoats away from Petersburg and Atlanta and encourage Missourians to vote the Democratic ticket in the November presi-

dential election. At both the beginning and end of the unsuccessful campaign, the lion's share of Price's forces crossed the Arkansas River unmolested by Steele's federals, a failure which caused "great dissatisfaction" in Washington City. Steele thought the small size of his force and the vast size of the surrounding territory made it impossible for him to bag "Old Pap." A report on the department's troop strength issued at the end of October shows that only 17,618 out of the 44,506 soldiers the general had on paper were actually available to fight. Most of the others were ill, chiefly with malaria and diarrhea.¹⁹

While Steele's troops were battling malarial infections in Arkansas, the worst yellow fever epidemic to hit Texas during the Civil War sickened rebel regiments stationed at Galveston. In January of 1863, Confederate General John Magruder had successfully driven off the Massachusetts regiment that had been sent to occupy Galveston after the end of the sickly season. He fortified the city with more than three dozen cannon placed in various forts erected on Galveston and Pelican Islands, as well as at Virginia Point. Although the U.S. naval blockade of the area continued, Galveston did not fall back into Union hands until after Appomattox. By the summer of 1864, conditions inside the city became deplorable. Confederate soldiers suffered from food and supply shortages and were also owed back pay. In August, rumors circulated that yellow fever was present in the city, prompting Magruder to quarantine ships arriving from areas known to have problems with the disease, such as the West Indies and Mexico. The scene got even uglier when several hundred fearful and frustrated soldiers mutinied and surrounded a house where Magruder and his officers were being entertained by the ladies of Galveston. The general was able to talk his way out of the situation, but was probably relieved when he was transferred to Arkansas later in the month, since by the middle of September Galveston was in the throes of a full-blown yellow fever epidemic. The disease "caused considerable excitement among the troops" and "a number of them" tried to desert their posts under cover of darkness on September 16, the night before a lock-down of the island went into effect. General James Morrison Hawes asked the residents of Houston to send nurses to attend to the sick and dying, but they were unavailable due to an epidemic in their own city. The large sick list and shortage of acclimated guards caused a breakdown of law and order in Galveston, with reports of robberies, murders, and at least one attempted rape. The chaos afforded the Union fleet patrolling the waters off Galveston an opportunity to seize the city, but even the toughest salts were not about to expose their crews to the dreaded "yellow jack." Farragut issued orders to his commanders off Galveston to steer clear of the city and avoid picking up passengers.²⁰

By the time the first frost ended the Galveston epidemic in late November, 111 soldiers and 158 civilians were dead. Nearly twenty percent of the casualties in the army occurred among German immigrants who had grown up in areas where yellow fever was non-existent and as a result, had no immunity when exposed, men such as twenty-five-year-old John Eickelberg who lived in Austin County prior to the war and served as a musician in Elmore's regiment before a mosquito bite ended his life. Or Private Zitzleman who died as

a member of Wilke's Battery and was buried in the potter's field in Galveston. Confederate soldiers from Ireland, England, and France also perished during the outbreak along with dozens of native Texans. The Houston epidemic continued well into December and killed an untold number of others. General John George Walker, who had replaced Magruder in August as commander of the District of Texas, New Mexico, and Arizona and abandoned his Houston headquarters when yellow fever appeared, believed the outbreak had been a "great drawback" to his defense strategy for Galveston. Walker, whose overall plan for Texas depended on occupying key locations and using interior lines to transfer troops to threatened points, pulled soldiers from Sabine Pass to prop up the weakened command at Galveston. Fortunately for the Confederates, by the autumn of 1864, Union military planners were uninterested in committing large numbers of men to an area with little strategic value that was periodically beset with dangerous plagues. The attack Walker prepared for never materialized, but the shock of the 1864 Galveston epidemic lingered after the war was over. Union forces occupying the city during the summer of 1865 instituted a quarantine and strict sanitation measures in order to prevent another epidemic. The next major outbreak in Galveston would occur two years later and kill over 1100 people.²¹

Each summer and fall, rebel and federal troops stationed in the Confederate Trans-Mississippi theater were vulnerable to attack by both their enemies and diseases they feared, but barely comprehended. Even the rumor of a yellow fever epidemic was enough to send soldiers and their commanders scurrying for the safety of healthier locations. But the risks posed by yellow fever paled in comparison to the widespread sickness caused by anopheles mosquitoes. Malaria was endemic in the region and weakened the immune systems of soldiers who were already battling the various bacterial infections that were common during the Civil War. Fresh recruits from the North proved especially susceptible to the disease and fell ill in droves during their first "sickly season" in the South. The wartime experience of many of these young men revolved around mosquitoes and violent fevers rather than battlefield heroics. Anopheles and *Aedes aegypti* helped make sure that the campaigns waged in the trans-Mississippi theater, most of which were inconsequential to the larger conflict, were unusually sickly. Moreover, the diseases these insects carried influenced the military decisions and strategic thinking of both Union and Confederate commanders operating in the region.

NOTES

¹Edward T. Cotham, Jr., *Sabine Pass: The Confederacy's Thermopylae* (Austin: University of Texas Press, 2004), 1-27; Andrew Forest Muir, "Dick Dowling and the Battle of Sabine Pass" in Ralph A. Wooster, ed., *Lonestar Blue and Gray: Essays on Texas in the Civil War* (Austin: Texas State Historical Association, 1995), 190; Shelby Foote, *The Civil War: A Narrative, Vol. 1* (New York: Vintage Books, 1986), 745.

²*Natchitoches Union*, 18 September 1862; Muir, "Dowling," 190; *The Bellville Countryman*, 6 September 1862 (quotation); "Autobiography of Mrs. Otis McGaffey, Sr.," *Yellowed Pages* 28 (Fall 1998): 1-14 (quotation); Cotham, *Sabine*, 29; Alwyn Barr, "Texas Coastal Defense, 1861-1865" in Wooster, *Lonestar*, 161; *The War of the Rebellion: A Compilation of the Official Records*

of the Union and Confederate Armies, Vol. 15, Series 1, p. 144-45, 813-15, hereafter referred to as *O.R.*

¹Lewis W. Pennington to William B. Renshaw, September 29, 1862, *Official Records of the Union and Confederate Navies in the War of the Rebellion*, Vol. 19, Series 1, 219-24, hereafter referred to as *ORN*; *Galveston Weekly News*, 15 October 1862 (quotation); X.B. Debray to P.O. Hébert, September 28, 1862, *O.R.* 15, Series 1, 815-17; Rodman L. Underwood, *Waters of Discord: The Union Blockade of Texas During the Civil War* (London: McFarland & Company, 2003), 83.

²Margaret Humphreys, *Yellow Fever and the South* (Baltimore: The Johns Hopkins University Press, 1992), 4-5; S. Rickard Christophers, *Aedes Aegypti: The Yellow Fever Mosquito* (Cambridge: Cambridge University Press, 1960), 57; Thomas M. Rivers, *Viral and Rickettsial Infections of Man, 2nd Edition* (Philadelphia: J.B. Lippincott Company, 1952), 538-544; Andrew Spielman and Michael D'Antonio, *Mosquito: A Natural History of Our Most Persistent and Deadly Foe* (New York: Hyperion, 2001), 54-61.

³The last yellow fever outbreak to occur north of Virginia happened in New York City in 1822. The reasons why the disease became a uniquely southern malady in the nineteenth century remain unclear, although the North's longer winters, quarantine and sanitation practices, and trade patterns may have played a role. John Duffy, "Yellow Fever in the Continental United States During the Nineteenth Century," *Bulletin of the New York Academy of Medicine* 44 (June 1968): 687-701; K. David Patterson, "Yellow Fever Epidemics and Mortality in the United States, 1693-1905," *Social Science and Medicine* 34 (1992): 855-865; Jo Ann Carrigan, "Yellow Fever: Scourge of the South," in *Disease and Distinctiveness in the American South*, ed. Todd L. Savitt and James Harvey Young (Knoxville: The University of Tennessee Press, 1988), 55-78.

⁴Donald J. Krogstad, "Plasmodium Species (Malaria)" in *Principles and Practice of Infectious Diseases, 5th Edition*, ed. Gerald L. Mandell, John E. Bennett, and Raphael Dolin (Philadelphia: Churchill Livingstone, 2000), 2817-2829; Margaret Humphreys, *Malaria: Poverty, Race, and Public Health in the United States* (Baltimore: The Johns Hopkins University Press, 2001), 9; Darrett B. Rutman and Anita H. Rutman, "Of Agues and Fevers: Malaria in the Early Chesapeake," *William and Mary Quarterly* 33 (January 1976): 31-60; Michael Colbourne, *Malaria in Africa* (London: Oxford University Press, 1966), 13-16; Richard F. Darsie, Jr. and Ronald A. Ward, *Identification and Geographical Distribution of the Mosquitoes of North America, North of Mexico* (Gainesville: University Press of Florida, 2005), 286-297; N.R.H. Burgess and G.O. Cowan, *Atlas of Medical Entomology* (London: Chapman and Hall Medical, 1993), 11-14.

⁵Elisha Bartlett, *The History, Diagnosis, and Treatment of the Fevers of the United States* (Philadelphia: Blanchard & Lea, 1852), 347-399; Edwin Samuel Gaillard, *An Essay on Intermittent and Bilious Remittent Fevers: With Their Pathological Relation to Ozone* (Charleston: Walker & Evans, Stationers and Printers, 1856), 17-18; Frs. Xavier DeRolette, *Lecture on the Fever & Ague and Other Intermittent Fevers* (Pittsburgh: A.A. Anderson & Sons, 1865), 5; A.P. Merrill, *Lectures on Fever, Delivered in the Memphis Medical College, in 1853-6* (New York: Harper & Brothers, 1865), 98; John Duffy "The Impact of Malaria On the South," in Savitt, *Disease*, 29-54.

⁶Daniel Drake, *A Systematic Treatise, Historical, Etiological, and Practical, on the Principal Diseases of the Interior Valley of North America, As They Appear in the Caucasian, African, Indian, and Esquimaux Varieties of Its Population*, ed. Norman D. Levine (Urbana: University of Illinois Press, 1964), 703-11; J.D. Rumph, "Thoughts on Malaria, and the Causes Generally of Fever," *The Charleston Medical Journal and Review* IX (July 1854): 439-46; William Webb, "On the So-called Malarious Diseases. A Paper Read Before the St. Louis Medical Society," *The St. Louis Medical and Surgical Journal* XII (December 1854): 481-85.

⁷The same process can be seen today in South America. In Peru, for example, rainforest destruction is causing an explosion in the number of malaria-carrying mosquitoes. See Anne Underwood, "Tracking Disease," *Newsweek* CXLVI (November 14, 2005): 46-48; Erwin H. Ackerknecht, *Malaria in the Upper Mississippi Valley, 1760-1900* (Baltimore: The Johns Hopkins University Press, 1945), 1-15.

¹⁰Paul E. Steiner, *Disease in the Civil War: Natural Biological Warfare in 1861-1865* (Springfield, IL: Charles C. Thomas, 1968), 218-19; John Carrier, "Medicine in Texas: the struggle with yellow fever, 1839-1903," *Texas Medicine* 82 (November 1986): 62-65; *The Bellville Countryman*, 18 & 25 October, 1 November 1862; *Galveston Weekly News*, 22 October 1862.

¹¹D.G. Farragut to Gideon Welles, October 9, 1862 (quotation), H. French to D.G. Farragut, September 18, 1862 (quotation), D.G. Farragut to H. French, October 7, 1862 (quotation), *ORN* 19, Series 1, 265, 289-293.

¹²D.G. Farragut to W.B. Renshaw, September 19, 1862 (quotation), W.B. Renshaw to D.G. Farragut, October 8, 1862 (quotation), *ORN* 19, Series 1, 213, 255-260; Charles C. Cumberland, "The Confederate Loss and Recapture of Galveston, 1862-1863," *The Southwestern Historical Quarterly* LI (October 1947): 109-119; Peggy H. Gregory, comp., *Record of Interments of the City of Galveston, 1859-1872* (Houston: Privately Printed, 1976), 28-29, in Rosenberg Library, Galveston; David G. McComb, *Galveston: A History* (Austin: University of Texas Press, 1986), 74-76.

¹³It is not clear how effective "desiccated vegetables" may have been against scurvy. The manufacturing and preparation methods used for these foodstuffs limited the amount of Vitamin C they contained. *The Medical and Surgical History of the Civil War*, Vol. 3 (Wilmington, NC: Broadfoot Publishing Company, 1991), 84-85 (quotations), hereafter referred to as *M.S.H.*

¹⁴Charles W. Johnson, "Narrative of the Sixth Regiment," in *Minnesota in the Civil and Indian Wars, 1861-1865*. (St. Paul: Pioneer Press Company, 1891), 300-328 (quotation); Charles H. Lothrop, MD, *A History of the First Regiment Iowa Cavalry Veteran Volunteers* (Lyons, IA: Beers & Eaton, 1890), 130; *Illinois at Vicksburg* (Published Under the Authority of an Act of the Forty-fifth General Assembly by the Illinois-Vicksburg Military Park Commission, 1907), Library of Congress, 141-312; F.B. Quincer, *The Military History of Wisconsin* (Chicago: Clarke & Co., Publishers, 1866), 760-66; C.C. Andrews, "Narrative of the Third Regiment", in *Minnesota*, 165-67; Frederick Steele to John Schofield, September 12, 1863, *O.R.* 22, Series 1, Pt. 1, 474-77 (quotation.).

¹⁵John Scott, *Story of the Thirty Second Iowa Infantry Volunteers*. (Nevada, IA: John Scott, 1896), 59; Foote, *Civil War*, Vol. II, 702; A.F. Sperry, *History of the 33d Iowa Infantry Volunteer Regiment, 1863-6* (Des Moines: Mills & Company, 1866), 37-41 (quotation.).

¹⁶Frederick Steele to Stephen A. Hurlbut, August 23, 1863, Steele to John Schofield, September 1, 1863, *O.R.* 22, Series 1, Pt. 1, 472-474.

¹⁷Joseph R. Smith to J.K. Barnes, January 20, 1866, *Sanitary Report of the Army of Arkansas for the last quarter of 1863*, U.S. Surgeon General's Office, History of Medicine Division, National Library of Medicine, Bethesda, Maryland (quotation); *M.S.H.*, Vol. 2, 343-46 (quotation.).

¹⁸Scott, *Iowa*, 59-61; Sperry, *33d Iowa*, 42-43 (quotation); Frederick Steele to H.W. Halleck, September 12, 1863, *O.R.* 22, Series 1, Pt. 1, 474-82 (quotation); Steiner, *Disease*, 218-19.

¹⁹H.W. Halleck to F.R.S. Canby, November 12, 1864, *O.R.* 41, Series 1, Pt. 4, 529 (quotation); F. Steele to J.M. Thayer, November 12, 1864, *O.R.* 41, Series 1, Pt. 4, 535; "Report of troops serving in the Department of Arkansas", October 31, 1864, *O.R.* 41, Series 1, Pt. 4, 341; Steiner, *Disease*, 219.

²⁰Cumberland, "Loss," 118; Barr, "Texas," 14-15; McComb, *Galveston*, 79; H.C. Medford, "The Diary of H.C. Medford, Confederate Soldier, 1864," *Southwestern Historical Quarterly* 34 (1930): 106-140; *Austin State Gazette*, 21 September (quotation) & 12 October 1864; Charles W. Hayes, *History of the Island and the City of Galveston*, Vol. II (Austin: Jenkins Garrett Press, 1974), 623-625; *O.R.* 41, Series 1, Pt. 2, 1020; D.G. Farragut to W.E. Le Roy, September 21, 1864, *ORN* 21, Series 1, 655.

²¹*Austin State Gazette*, 7, 14 & 24 December 1864; Galveston Internment Records, 43-49; J.G. Walker to W.R. Boggs, October 26, 1864, *O.R.* 41, Series 1, Pt. 4, 1014-15 (quotation); Hayes, *Galveston*, 649-51; Patterson, "Yellow Fever," 858.