Dead Men Tell No Tales, but Animal Bones Do: A Faunal Analysis of *Queen Anne's Revenge*

By

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ABSTRACT

The Golden Age of Piracy was a historic period ranging from 1650 to 1720 CE which saw the rise of piracy across the Atlantic Ocean in response to the growing and changing global political climate. Since its end, pirates have become cultural symbols of rebellion and adventure as the lack of information about them leads to an air of mystery that many people seek to fill with tales. One pirate remains one of the most infamous in both history and fantasy: Blackbeard and his ship the *Queen Anne's Revenge*. Archaeology has allowed us to interpret the material history that pirates have left behind in an attempt to establish and understand a pirate culture and reveal what was previously unknown. Part of the pirate culture yet to be fully established is their sustenance and how they survived as a criminal group who did not have standard access to ports to purchase provisions. Zooarchaeology, the study of faunal remains in context with human material culture, allows for us to interpret part of the diet within a site. Using Blackbeard's *Queen Anne's Revenge* and comparing the faunal remains with those from contemporary ships *La Belle* and *Earl of Abergavenny*, we can study what a pirate diet looked like in comparison to other contemporary legal vessels.

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Chapter 1: Introduction

Since Robert Stevenson's Treasure Island was published in 1883, pirates have captivated the public's imagination. Piracy inspired tales of coming of age and rebellion and stories of adventures on the high seas where the crimes committed were against an unjust government and a stacked system of oppression and wealth. Today, pirates are still a formative popular culture symbol, appearing in media for a variety of ages and themes, such as *Pirates of the Caribbean: Curse of the Black Pearl* (2003), *Jake and the Never Land Pirates* (2011), and *Our Flag Means Death* (2022). They are often depicted as likable anti-heroes cloaked in mystery. In reality, pirates were criminals who may have turned to piracy as an act of rebellion but rarely discriminated when it came to the targets of their violent crimes- crimes much more violent than usually depicted in media. Much of the fascination comes from our lack of information on pirates since they kept little to no written history and left only the often-exaggerated tales of their short but exciting lives (Ewen 2006:1-4, Skowronek 2016:4-11).

Archaeology has been used in recent years to fill in the gaps of knowledge missing from the historical record. With new technology, archaeology has allowed for more careful documentation of both underwater and terrestrial pirate sites, which has given us more information than ever before. We can now use archaeology to understand their hierarchies, their technology, and even the types of food they ate (Skowronek 2016:8-14). This thesis will address the question of shipboard diet during the Golden Age of Piracy (ca.1650-1720) using the animal bones recovered from Blackbeard's *Queen Anne's Revenge*, a pirate ship that sank off of North Carolina's Outer Banks in 1718.

Research Questions

To understand the shipboard diet on pirate ships, it is necessary to compare it to contemporary non-pirate vessels to determine how different or similar their diet was to that of a common mariner. Because only faunal specimens—animal bones—are preserved in the archaeological record, they will be used to address the research questions. Edward Teach's, also known as Blackbeard, *Queen Anne's Revenge*, remains one of the "most thorough records of an early eighteenth-century ship of this size anywhere in North America" (Wilde-Ramsing and Carnes-McNaughton 2016:56). North Carolina's Department of Natural and Cultural Resources, Office of State Archaeology, Queen Anne's Revenge Conservation Lab have taken great care of the site, its records, and its artifacts, resulting in a plethora of data to examine sustenance practice of pirate culture.

Pirates were known criminals, and unlike law-abiding mariners during the seventeenth and eighteenth centuries, they did not have legal access to provisions and food in port. They would likely have had to search for food elsewhere, either by robbing other vessels and towns or hunting on the waters and coasts of the Atlantic Ocean. Because of this, I hypothesize that the faunal assemblage on *Queen Anne's Revenge* will be more diverse than the standard rations on legal contemporary vessels, representing a need to use animal food items outside of standard provisions to sustain their diet. To test this hypothesis, this thesis investigates two research questions:

A. What faunal remains have been recovered from *Queen Anne's Revenge?*

B. How does *Queen Anne's Revenge's* faunal assemblage compare to two other contemporary non-pirate vessels: *La Belle* (deFrance 2017) and *Earl of Abergavenny (*Gautrey 2014*)*?

A zooarchaeological faunal analysis was completed on the ship's two-hundred-and-fifty-five faunal remains to answer question A. This information is presented in Chapter 4 of this thesis in the form of tables, graphs, and overviews. A niche breadth comparison of the three ships was completed to compare the assemblages' diversity to answer question B. This information is presented in chapter 6 of this thesis as tables, graphs, and overviews.

Importance and Significance

This research will contribute to the historical record of piracy during the late seventeenth and early eighteenth centuries. Food is a significant part of culture and was an integral part of shipboard life. Diet can highlight the social differences among pirates on a ship and between other types of sailing vessels, as food often denotes status through type, quality, and quantity. Furthermore, understanding how pirates adapted to different environments and the survival strategies they employed helps us interpret their lives and gain a broader understanding of what a person was willing to do for their "freedom" from authority.

Chapter 2: Background

The following section describes the cultural and ecological environment in which piracy thrived and presents the history and archaeology of *Queen Anne's Revenge*, the flagship of pirate Edward Teach, more commonly known as Blackbeard. It also introduces the two contemporary vessels that *Queen Anne's Revenge's* faunal remains will be compared to, *La Belle* and *Earl of Abergavenny*.

Sailing During the Golden Age of Piracy

Due to the lax governmental presence in the circum-Caribbean region from the late seventeenth to the early eighteenth century, this period became known as the "Golden Age of Piracy." Rediker (2004) describes the Golden Age of Piracy as generations of piracy growing and thriving across the Atlantic Ocean and its coasts, spanning 1650 to 1730 CE. The discovery of gold and silver in the Americas and the Caribbean led to a fervent desire to colonize and exploit the resources of the Americas as well as previously utilized areas of resources like Asia and the west coast of Africa. Sailing across an entire ocean for months at a time became a much more frequent practice, with ships being built to handle that type of stress. Global areas of capital began to appear in new and old ports where commerce was brought, and conflict followed as nations scrambled for land and power. Piracy grew especially in these areas such as the Caribbean and the east coast of North America where government authority was weak and sailors and soldiers found themselves disillusioned and disenfranchised by their current social and economic standing (Rediker 2004, Pestana 2018:15-29).

Spain claimed most of the Americas for itself in the early sixteenth century and declared anyone who came into their waters a pirate to discredit any attempt to trade, settle, or rob their possessions (Rediker 2004). The other European powers watched as Spain brought shiploads of American silver and gold and other resources from their colonies in the Americas and devised schemes of ways to pursue it themselves. One way was privateering, which was the government-authorized raiding and capturing of ships and merchandise by private citizens on behalf of a government in the name of retribution or war, so long as the crown they served received a cut as well. Another was to settle regardless of Spain's prohibitions since many felt Spain had no claim over the land; they had never actually seen nor were they strong enough to push them out. The Atlantic Ocean was a stage for a multinational power struggle, which saw people of many countries, ethnicities, religions, socio-economic backgrounds, and goals interact and move together with the tides. Many ships and expeditions belonged to one crown, but recognizing a weak yet increasingly aggressive authority in new colonies became more apparent and less appealing to sailors of many countries and ethnicities (Rediker 2004, Pestana 2018:15-29).

A sailor's life may have appeared outwardly appealing because of regular wages, food, and shelter provided to them. However, a sailor often faced brutal discipline, diseases, dubious food, and a dangerous job, among other issues. Even worse, a sailor knew that despite these hardships, they had little to no chance to escape their role in that class system, especially since their life was more appealing than a standard laborer on land. Formerly enslaved individuals or other groups that would otherwise never be able to work freely came to resent the brutal authority of their ships and far away nations. This resentment, as well as the prospect of wealth and the seemingly better, albeit short, life of a pirate, was inviting to bitter and rebellious seafarers (Rediker 2004, Sherry 2008).

Buccaneers were the first generation of pirates Rediker (2004) recognized during the Golden Age of Piracy. They were a multiethnic, primarily French, group of hunters on western Hispaniola who lived off the feral cattle and pigs introduced to the island by the Spanish. The word buccaneer came from the French *boucanier*, which means to smoke-dry on a barbecue, which is how they prepared their meat. When not trading in smoked meat, these buccaneers sometimes seized the occasional unsuspecting vessel. Eventually, buccaneers would turn more actively to raiding coastal targets and ships, sometimes in a loose confederation but oftentimes with little organization (Cordingly 1996:86, Sherry 2008:52-58).

At the end of the seventeenth century and the beginning of the eighteenth century, piracy was common as sailors turned to it for wealth and self-governance. It is estimated that as many as one thousand to two thousand pirates existed by the end of the Golden Age of Piracy, many of whom had local knowledge of the environment surrounding them, insight into trade routes, people who would support them, and access to merchants with whom they could trade stolen goods (Sherry 2008). They also had to be a talented seaman who could handle the ships that were faster than the ships pursuing them. Pirates would target ships of all sorts under any flags to capture cargo, people, and ships that they could sell or use themselves. They did not rule under one nation or banner and instead had much more mobility during their short lives. Toward the end of the Golden Age of Piracy, many nations, desperate to end their shipping losses, offered pardons to the persistent pirates. As a counterpoint, those who did not accept the amnesty were hanged if convicted of piracy (Rediker 2004, Sherry 2008:52-58).

For many sailors, their quality of life compared to the ship's officers drove them towards piracy. Besides wealth distribution, one of the complaints was that of food and food availability. From a common seaman's perspective, on a pirate ship, food was more plentiful and divided

more evenly so that each could enjoy better food and drink (Rediker 2004). Therefore, the standard shipboard fare on a merchant or naval vessel strongly contributed to the rejection of authority towards a life of crime.

Food and Subsistence on a Ship

One of the challenges for traversing the Atlantic Ocean was providing food and water that could survive the journey's length and the ship's conditions. Refrigeration had not yet been invented, and before any ship departed, a ship's captain ensured that there were enough provisions on the ship to last the long trip by purchasing what was needed in port. Fresh meat spoiled in only a day or two, so preserving the meat either through smoking, dry salt or salt brine to prevent bacterial growth became favored in the early 18th century. While salted and preserved meat- usually pork and beef- made up a part of a sailor's diet, the provisions could have also included oil, vinegar, rice, salted fish, cheese, wheat flour, barrels of drinking water, and various alcohols. In ideal conditions, these supplies could last quite a long time. Some ships also carried livestock to replenish food as they traveled or intended to stop on the Caribbean islands stocked with pigs, goats, and cattle by the Spanish to hunt. Within the Caribbean, free-ranging populations of domesticated species were released on what are now Cuba, Puerto Rico, Haiti, the Dominican Republic, and several other smaller islands (Alfonso Ortega-S et al. 2020:424). On most ships, though, the staple was a biscuit called hard tack and salted meat (Rediker 2004, Migaud 2011:283-286, Rixon 1989:53-54).

Honest seamen who spent their days on merchant vessels or Royal Navy ships were provided an allowance for food that was sometimes near inedible, while the officers appeared to have higher quality food or a better pick of the food. The food, despite being preserved, often

crawled with worms or maggots or could be moldy and mildewy from the damp conditions of the ship. Rats were a common pest that often got into the provisions as well, adding another layer of filth to the food. And, because a sailor was stuck on the ship, he must eat whatever putrid food he was given, lest he starve. When these sailors considered a pirate's life, where rumors implied that every man is afforded the same type of food regardless of rank, it became more appealing (Rediker 2004, Lunsford 2018:129-149, Sherry 2008:52-58).

A pirate did not have access to buy provisions in port easily and instead had to rely on hunting local game, stealing it from ships and coastal villages, or taking a chance with merchants to buy provisions. This thesis discusses food on the pirate ship *Queen Anne's Revenge*, however, many historical documents focus more on the procurement of alcohol before food, as that seemed to be more important to keeping a pirate crew in check than feeding them (Shelly 1989:128, Wild-Ramsing and Carnes-McNaughton 2018:34). Still, pirates needed to eat, and was it that much different than the food the sailors were complaining about? Pirates had to deal with the same filthy food as they still lived on a damp boat sailing great distances, but the principle was that they shared in this misery from the top down. Pirates ate together, and the food and wine belonged to everyone on the ship- the captain and other officers did not claim any food as their own. Exquemelin, a buccaneer turned writer in the seventeenth century, described how "the captain is allowed no better fare than the meanest on board. If they notice he has better food, the men bring the dish from their own mess and exchange it for the captain's" (Stallybrass (Eds) 1987:70-71). The allowance was the same, regardless of rank (Cordingly 1996:100-103, Rediker 2004, Lunsford 2018:129-149).

Nevertheless, pirates were not at the mercy of moldy and near-inedible food items that had come all the way from Europe to the Americas. They could trade with merchants for fresh

provisions provided they had the money and goods, they could hunt for fresh game, or they could raid local villages and ships. Turtles, manatees, deer, hutia, birds, and anything else that was edible ended up on their communal plate. Exquemelin describes how buccaneers would steal from local herdsmen for their provisions that they would salt (1987:59). Often pirates would raid a ship for the sake of seeking provisions, such as Blackbeard's attack on *Margaret*, where he stole 35 live hogs and several live cattle to be brought onto his ship (Bostok 1718). These different methods of procuring food and the need to keep their crew fed and happy suggest that the provisions on a pirate ship would be more diverse than those of a legal sea vessel. Very few pirates left detailed accounts of what life was like on a pirate ship, and even fewer commented on what the food was like. While we know why sailors were enticed by the idea of becoming a pirate and what some former pirates have said, without detailed ship logs it is hard to know an actual pirate diet (Sherry 2008:128, Wild-Ramsing and Carnes-McNaughton 2018:34, Cordingly 1996:79-103, Lunsford 2018:129-149, Migaud 2011:287).

Queen Anne's Revenge was the pirate Blackbeard's flagship and sank in 1718 towards the end of the Golden Age of Piracy. The food carried on board is documented by insurance claims made by ships he robbed (Wild-Ramsing and Carnes-McNaughton 2018). It is impossible to tell how many biscuits or bags of rice the pirates may have consumed, but we can use the *Queen Anne's Revenge* archaeological site to help us better understand the meat that a pirate ate.

Before Piracy: *La Concorde*

Before meeting its end as Blackbeard's *Queen Anne's Revenge*, the ship was a French light frigate (Fig 2.1) known as *La Concorde*, which was used for privateering and later became

a slave ship during the transatlantic slave trade. There are no documents indicating the ship's place of construction nor the date it was constructed, only primary documents detailing its career as a privateering and slaving vessel (Wilde-Ramsing 2009:6). The ship appeared in the historical records on July 21st, 1710, owned by prominent French businessman Rene Montaudoin at the French slaving port of Nantes. While Montaudoin's business was in the slave trade, the War of the Spanish Succession halted his business- thus causing him to come into the possession of the three-hundred-ton frigate armed with twenty-six cannons primed and ready for privateering (Fontenoy 2020:308, Ducoin 2001:13).

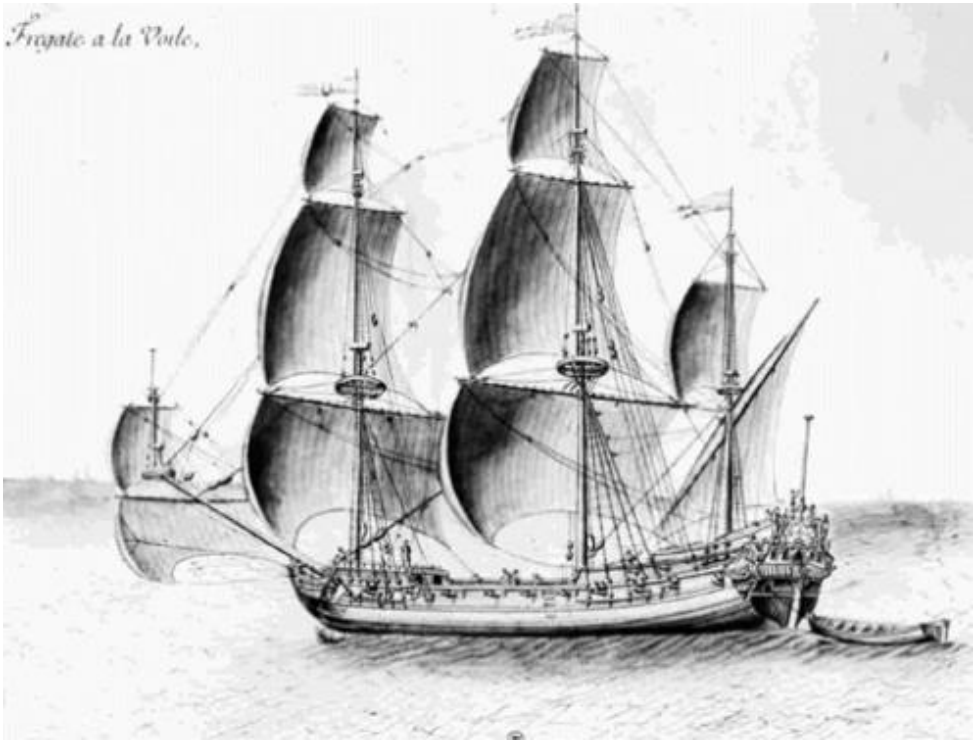

Figure 2.1: A frigate similar to *La Concorde* by Nicolas de Poilly (c.1680) (Bibliotheque Nationale de France)

French historian Jaques Ducoin (2001) put forth three hypotheses regarding the possible construction of *La Concorde*. The first hypothesis suggests that the ship was gifted or loaned to Rene Montaudoin but was constructed by the French Royal Navy. This was not unheard of, as the French Royal Navy built ships for privateering services to be sponsored by private owners, and Queen Anne's War, a territorial war between Great Britain and France for control of North America (1702-1713), was reason enough to have privateers. Montaudoin had also previously been loaned the ship *La Valeur* in 1709, but there was a substantial paper trail detailing this loan. This hypothesis is unlikely as there are no known documents detailing the construction, naming, or loaning of a ship known as *La Concorde* (Ducoin 2001: 15).

The second hypothesis suggests that it was not French built at all but was rather a prize taken during Queen Anne's War by French privateers who brought it back to Nantes and renamed it *La Concorde*. Two English ships of comparable size and description were captured as prizes by French privateers, with no other ships matching the same size as *La Concorde* declared as prizes. The two vessels were *The Koucker*, returned to England after a ransom, and *The Hampton Galley*, captured two years after *La Concorde* appeared under Montaudoin's control, ruling them out as possible candidates (Ducoin 2001: 15).

The third hypothesis Ducoin (2001:16) suggests is that the ship was built in a local commercial shipyard by Rene Montaudoin for service as a private vessel. Montaudoin constructed several ships in local yards for privateering and the slave trade. However, none were named *La Concorde*. Regardless of its origins, by 1710, *La Concorde* began its mission as a privateering vessel under Rene Montaudoin.

From 1710 to 1711, *La Concorde* traveled along the coast of West Africa and into the Caribbean under Captain Le Roux. During its voyages, it captured a Portuguese slaver, a Dutch slaver, and several English coasting vessels. The enslaved people were confiscated from the slaving vessels and sold off by Captain Le Roux when the opportunity arose during this time. *La Concorde* returned to Nantes, France, in 1711, where it remained until the conclusion of Queen Anne's War (Wilde-Ramsing 2009:112).

Shortly after the Treaty of Utrecht was signed in 1713, Rene Montaudoin put *La Concorde* back into action, this time as a slaving vessel (Eckert 2020:4). The differences between a slaving vessel and a privateering vessel were minimal. They required similar speed, but the ship underwent some changes to accommodate human cargo, including reducing the number of cannons to sixteen (Wilde-Ramsing 2009:112). From 1713 to 1717, *La Concorde* made three known slave voyages across the Atlantic, from Africa to the New World (Mettas 1978). The first from 1713-1714, and the second from 1715-1716 (Watkins-Kenney 2018:187). The third voyage ended prematurely on November 17th, 1717, when the slave ship encountered pirates and was captured (Wilde-Ramsing 2009:114).

Sixty miles off the coast of the French trading port of Martinique, *La Concorde* encountered two pirate ships. The pirates were reported to have 150 men between the two ships. In contrast, La *Concorde* was already operating at limited capacity due to sixteen deaths of crewmembers after the departure from Africa and an influx of scurvy and dysentery which landed another thirty-six sailors in the sick bay (Ernaut 1718; Dosset 1718). When the pirates approached, only thirty-one sailors could man the ship and chose to not contest the vessel's capture (Ernaut 1718). *La Concorde* surrendered to the English pirate captain Blackbeard, also known as Edward Teach.

After the pirates had captured the vessel, *La Concorde* and the two other pirate ships sailed to the nearby island of Bequia, where they put the French crew and 455 enslaved Africans ashore (Ernaut 1718). Blackbeard pressed into service members of the French crew, which included two carpenters, three surgeons, a caulker, a cook, a sailor, a gunsmith, and a pilot (Ernaut 1718). The pirates left the French the smaller of their two sloops, which the crew used to sell the remaining enslaved Africans that Blackbeard did not keep (Mesnier 1717). Now under the control of Blackbeard, *La Concorde* was renamed *Queen Anne's Revenge* and began its short-lived career as Blackbeard's flagship, terrorizing the Caribbean and Colonial America.

The Flagship Queen Anne's Revenge

Ultimately, the capture of *La Concorde* ensured Blackbeard's place in infamy. His given name was possibly Edward Teach, although there are several different spellings in the historical record, such as Thatch (Wilde-Ramsing & Carnes-McNaughton 2018:2). Blackbeard was an English man, but where exactly he was born and raised is still debated today, with some speculating Jamaica or other Caribbean islands (Brooks 2015) or North Carolina (Duffus 2011). It was very likely that his earlier career was spent as a crewmate to pirate captain Benjamin Hornigold before he appeared in the *Boston Newsletter* in 1717 as Blackbeard (Moore 1997:32). Blackbeard's signature style was that of bravado and theatre. While many pirates opted to strike quickly and with force after stealthily stalking their quarry, some accounts detail how Blackbeard would focus on intimidation before all else- something seen in his capture of *La Concorde.* His infamous brand included huge messy black hair covering his face that he would twist and style in

strange ways, a sling of pistols on display, and lit matchcord under his hat visibly producing a cloud of smoke which, coupled with his already intense and wild eyes, successfully intimidated many people (Figure 2.2) (Wilde-Ramsing & Carnes-McNaughton 2018:2). With *Queen Anne's Revenge*- a former privateer and three smaller ships, he had a naval force that could rival many on the sea. Thus began his six-month period of terror along the Caribbean and the East Coast of British America.

Figure 2.2: 1736 copper engraving of the pirate Blackbeard with his infamous hair, smoking matches, and pistols by Joseph Nichols (Wikimedia Commons)

Through the six months that *Queen Anne's Revenge* was under Captain Blackbeard's command, the ship required continuous repair, additions, and alterations to suit the pirate's needs. The frigate was well suited for piracy as it had the speed and size needed to compete with other ships, as well as the large cargo hold to carry plenty of crew and goods (Rediker 2007:50). Blackbeard transferred the eight cannons from the sloop given to the French sailors to add to the fourteen to sixteen the ship carried when it was captured, raising the firepower of the ship - a pattern he would continue throughout the ship's life as his flagship (Wilde-Ramsing 2009:116).

In May of 1718, *Queen Anne's Revenge* and her smaller accompanying sloops were spotted by locals outside the port of modern Charleston, South Carolina (Wilde-Ramsing & Ewen 2012:113). Under his command, Blackbeard's ships held the port captive and seized and plundered many ships attempting to leave or make their way into the port. The port was released after South Carolina's Governor paid the ransom of a chest of medicine, food, liquor, and sterling- nearly half a million dollars in today's currency (Wilde-Ramsing & Ewen 2012: 114.). After the success of that maneuver, *Queen Anne's Revenge* and her accompanying ships made their way to North Carolina's inlets and waterways, where many pirates frequently sheltered (Wilde-Ramsing & Carnes-McNaughton 2018: 28.). The Outer Banks of North Carolina are constantly shifting, and the shallow sounds were tricky to navigate, which leads to fewer patrols. That was likely why a confident pirate like Blackbeard would find the area a good place to retreat to rest and resupply (Hoyt et al. 2014: 25). It was there, like hundreds of other ships, *Queen Anne's Revenge* would wreck.

In June 1718, just six months after her capture, *Queen Anne's Revenge* ran aground onto one of the sandbars in modern-day Beaufort Inlet (Figure 2.3). While attempting to help dislodge *Queen Anne's Revenge,* the sloop *Adventure* met the same fate nearby (Wilde-Ramsing and Carnes-McNaughton 2018:47).

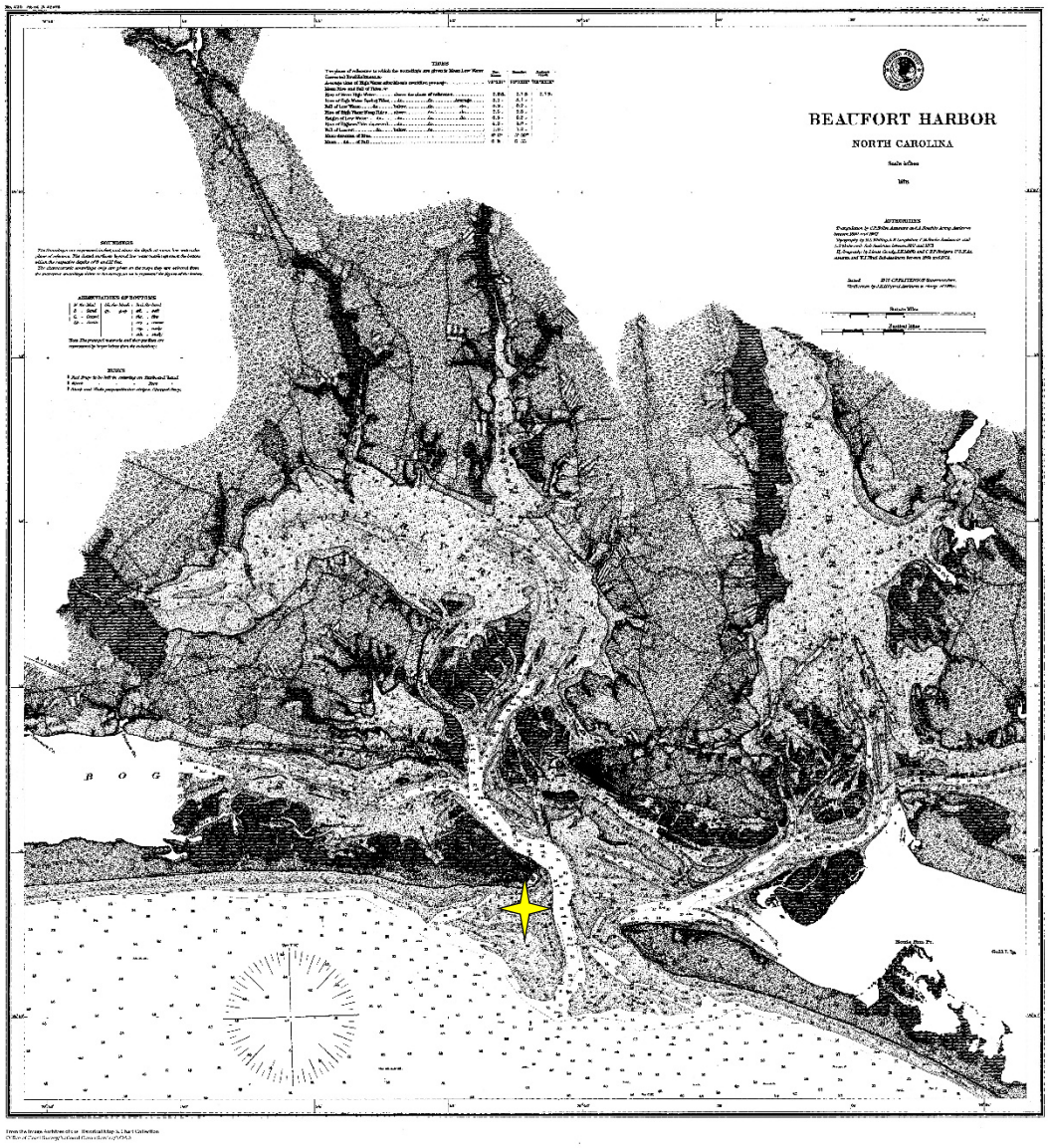

Figure 2.3: 1876 Map of Beaufort inlet, with a star showing approximately where *Queen Anne's Revenge* sank (National Oceanic and Atmospheric Administration Office of Coast Survey 1876)

Only five months later, on November the 22nd, 1718, Blackbeard died after a fierce battle with Royal Navy Lieutenant Robert Maynard off Ocracoke Island under the orders of Virginia Governor Spotswood (Wilde-Ramsing & Carnes-McNaughton 2018: 3). The ship remained visible to Beaufort residents and sailors for some months after its grounding until it completely disappeared under the shifting sands (Wilde-Ramsing and Carnes-McNaughton 2018: 47).

Site 31CR314: The Archaeology of *Queen Anne's Revenge*

Queen Anne's Revenge, Blackbeard's flagship, is one of the most infamous vessels associated with the Golden Age of Piracy. Wrecked off the coast of North Carolina in Beaufort Inlet, it sank over three hundred years ago and holds a history of piracy, slave trade, and privateering. In November 1996, the wreck was discovered by the treasure-hunting firm Intersal Inc. (Wilde-Ramsing, 2009:164). On March 3rd, 1997, the North Carolina governor announced that he believed that the shipwreck was the *Queen Anne's Revenge*. By law it was state property and the project begun in earnest by the North Carolina Department of Natural and Cultural Resources (NCDNCR). The primary reason for this assumption were the temporally-diagnostic artifacts brought up, the size of the vessel, and the number of cannons detected by magnetometry (Wilde-Ramsing & Ewen, 2012:128). Among the artifacts initially recovered were several cannon balls, the barrel of an English blunderbuss, a lead sounding-weight, and a bronze bell with the inscription "IHS Maria 1705" (Wilde-Ramsing and Ewen 2012: 113). The wreck was given the site designation of 31CR314, and the project goal shifted from gathering as much

information as possible with as little intrusion as possible to complete excavation for testing the hypothesis that it was *Queen Anne's Revenge*.

It was the most heavily-armed ship sunk in the Beauford inlet during the 18th century. *Queen Anne's Revenge* was recorded to have between 36 and 40 guns, whereas the second most heavily armed ship, *Adventure*, was only known to have 8 to 10. Fifteen cannons were pulled up during the initial field season, already surpassing *Adventure* (Wilde-Ramsing, 2006:170). Similarly, the anchors uncovered were appropriate for the ship's recorded size of 200 to 300 tons (Wilde-Ramsing, 2006:170). Concluding the first field seasons, the North Carolina Office of State Archaeology's Underwater Archaeology Branch (falling under NCDNCR) declared the material to be strong evidence for identification as *Queen Anne's Revenge*, as well as acknowledged the threat to the integrity due to the currents of the inlet and suggested a complete recovery of artifacts from the site for further research and conservation (Wilde-Ramsing and Lusardi 1999).

Excavation units of 5x5 feet were sectioned on the seabed, and sand overburden was removed with an airlift dredge (Page 2014:29). The nature of an underwater site leads to concerns about small artifacts getting lost in the matrix, so dredged material was sent through a sluice box, with spoils being passed through a 6.4 mm screen. This method of dredging for smaller artifacts was not widely used at the site until 2006, which may have inadvertently deposited dredge spoil outside of their test units. Using a small screen allowed for capturing small glass beads and allowed for over 14,000 gold flakes to be recovered by panning the dredged sand (Price 2016:158). By 2017, about 60 percent of the shipwreck had been excavated, resulting in over four hundred thousand artifacts of assorted sizes recovered (Watkins-Kenny 2018: 190) (Figure 2.4). Large artifact clusters cemented together by iron degradation

(concretions) were recovered and broken apart using air scribes in the lab to identify and isolate individual artifacts.

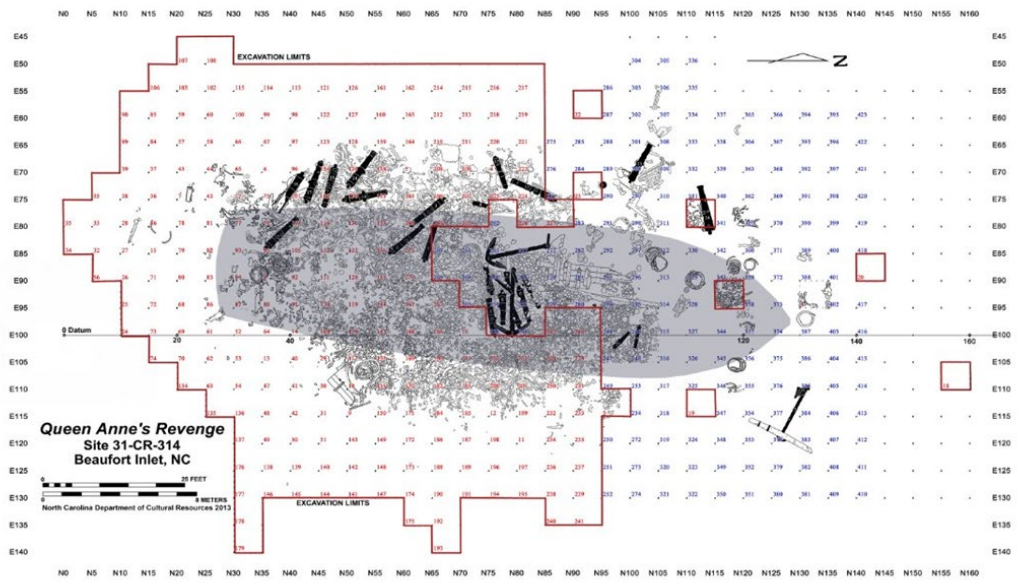

Figure 2.4: Map of Site 31-CR-314 with excavated units outlined in red

Two hundred and fifty-five faunal remains in various fragmentations and conservation have been recovered from both concretions and dredge spoils. With 40 percent of the ship remaining underwater and many concretions left to separate, this number will rise as further archaeological excavations are done on 31CR314.

From the Caribbean to Virginia: An Environmental Background

The east coast of North America and the Caribbean would have allowed many sailors to fish or hunt along the shores and in the forests. From Saint Vincent and the Grenadines Island of Bequia, which lays closer to South America than it does North America, to the final watery grave of *Queen Anne's Revenge* in North Carolina's Outer Banks, Blackbeard would have sailed the ship by diverse habitats that could have provided access to additional food items (Fig 2.5).

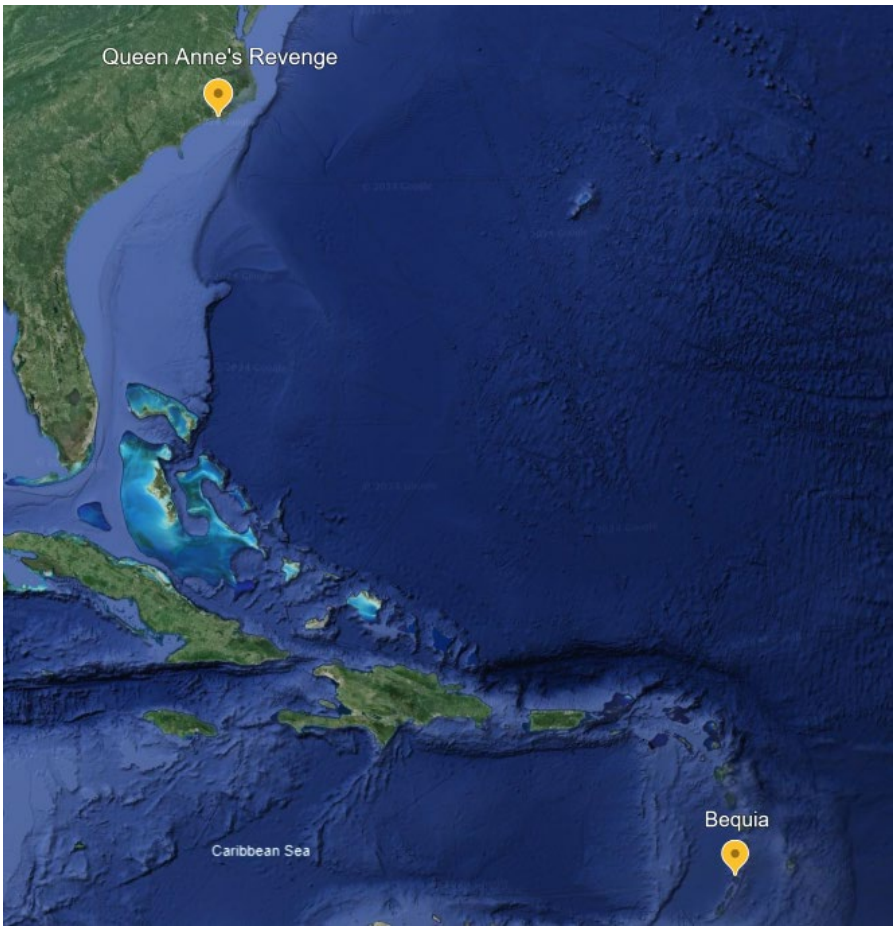

Figure 2.5: All the Caribbean islands and North American Coast between Caribbean Island Bequia, where *La Concorde*'s French Crew was dropped off, and the North Carolina Outer Banks, where *Queen Anne's Revenge* sank.

He would have seen many of the Caribbean Islands, Spanish-owned Florida, and the British Colonies of North America. This section presents the type of fauna that Blackbeard and his crew may have encountered during their journey.

The Caribbean is a region with over seven hundred different islands, islets, reefs, and cays between North and South America, often surrounded by the Caribbean Sea. In 1492, The Caribbean was the first part of the Americas that Christopher Columbus reached, and it became publicly known to Europe after his return to Spain. Inland, the European explorers found abundant animals on the islands, such as reptiles, frogs, rabbits, small deer, sloths, anteaters, rodents (Figure 2.7), and ducks, among other species, but very few large or even medium-sized animals. The Spanish also introduced cattle, pigs, chickens, goats, donkeys, and horses, all of which became economic staples in the islands. Several indigenous groups of the Caribbean subsisted on food items like shellfish, fish, green sea turtles (Figure 2.9), iguanas, rodents, waterfowl, and sea cows (Figure 2.8) (Rogoziński 1999:1-29). Visitors to the British colony of Barbados in the 19th century noted the common proteins as being goat, pork, rabbit, Muscovy ducks, chicken, pigeon, fish (Figure 2.6), and turtle (Wallman 2019:425).

Being an island chain, the sea was also quite bountiful. The Caribbean has one of the most complex and taxonomically diverse marine ecosystems on Earth, which amazed the European explorers as they encountered the new animals. The Caribbean waters host over 6000 species of mollusks and crustaceans and over one thousand-three hundred fish species, including forty shark species. At the time of Cristopher Columbus's descriptions, millions of aquatic birds could also be seen in the Caribbean (Morgan et al. 2022:55-60). The native species and the

islands full of animals used exclusively for restocking provisions would have provided ample places to gain food through hunting or fishing (Migaud 2011:286).

Figure 2.6: *Opisthonema oglinum* (Atlantic Thread Herring) (Smithsonian)

Figure 2.7: *Capromys pilorides* (Cuban hutia) (American Museum of Natural History)

Figure 2.8: 1837 illustration titled *The West Indian Manatee* (Yale Center for British Art)

Figure 2.9: *Chelonia mydas* (Green Sea turtle) (Smithsonian)

Spanish Florida featured similar arrays of wildlife that *Queen Anne's Revenge* may have had access to. According to the Florida Fish and Wildlife Conservation Commission, today, there are over seven hundred terrestrial animals and over seven hundred fish and marine mammals in freshwater and the coasts. The northern part of the state is classified as a humid subtropical climate zone, while the southern portion is usually classified as a tropical savanna region alongside most Caribbean islands (National Centers For Environmental Information 2019). The Europeans that reached Florida described it as a vast wilderness filled with wild beasts long since extinct in their countries (Whitney 1994: 302). The native mammals of Florida in the 18th century included but were not limited to, white-tail deer, squirrels, black bears, and bobcats. The coast also hosted various wild birds, such as flamingos, geese, ducks, herons, and other species. American alligators and turtles were also consumed by Spanish settlers in Florida, who sought their meat and eggs (Figure 2.10).

Figure 2.10: *Alligator mississippiensis* (American Alligator) and a clutch of eggs (Shirley and Elsey 2018)

The Florida waters teemed with fish, both cartilaginous and bony. Many sharks were present, though likely not eaten, and the fish often caught for consumption were mullet, catfish, and drum (Figure 2.11), though other fish would also be eaten. The Spanish and French brought cattle, pigs, goats, sheep, horses, and chickens, some of which succeeded more than others. Before the colonies introduced pigs to North America, there were no feral hog species in North America, though they would quickly become abundant. The region we now know as Georgia had a similar environment (Reitz 1979: 69-101).

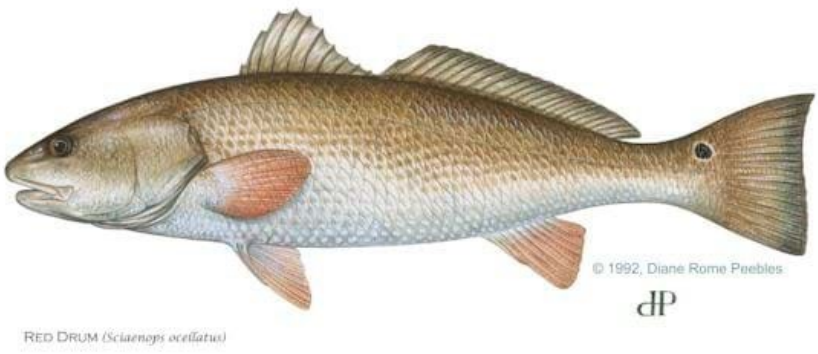

Figure 2.11: *Sciaenops ocellatus* (Red drum) (Florida Fish and Wildlife Conservation Commission)

South Carolina, North Carolina, and Virginia all have similar climate and fauna profiles. These states also fall into the humid subtropical climate zone and feature robust wildlife on their coasts and waters. North Carolina has a more unique coastline since most of its coasts are lined with barrier islands known as the Outer Banks, which separate several sounds from the Atlantic Ocean. The native mammals on these shores were opossums, squirrels, black bears, raccoons, and deer (Fig 2.12), among others, but those were the most consumed mammals in late seventeenth and early eighteenth century Charleston. Geese, turkey, and duck would have been

hunted and consumed along these coasts. Many native fish, such as bass, sheepshead, and flounder, would also have been available to passing sailors to fish. Like the southern Spanish colonies, these British colonies introduced cows, pigs, sheep, goats, and various poultry as domesticates to the region. This similarly meant that feral pigs also became common here (Fig 2.13) (Reitz and Zierden 2014: 33-42).

Figure 2.12: *Odocoileus virginianus* (White-tailed Deer) (Smithsonian)

Figure 2.13: Feral *Sus Scrofa* (Feral pig, no difference from domestic pig) (North Carolina Wildlife Resources Commission)

The coasts of the Caribbean, Spanish Florida, and Southern British Colonies were a cornucopia of available food that sailors needed to hunt or fish for. Along his route, Blackbeard could have stopped at many coasts and islands to search for fresh meat, which he could have brought on board. The animals could have been field-dressed, butchered, or brought whole onto the ship before being cooked or preserved. *Queen Anne's Revenge* had access to many bountiful spots they could restock, and because the pirates could not go to a normal port and procure provisions, one could suspect they needed to rely on the coasts. The next section describes two contemporary vessels that will be compared to *Queen Anne's Revenge- La Belle* and *Earl of Abergavenny*. One was a ship that was coming out of port with freshly stocked provisions, and the other had been foraging on the Texas coast for fresh meat. They should help display the difference between relying on standard provisions and wild-caught game.

Contemporary Vessels

Archival documents help understand the standards for the time on legal vessels but often do not actually explain the true life on a ship- which is what is being investigated. Instead, zooarchaeological analysis captures a snapshot of life that can be held up alongside historic records (Armitage 1989:144). For the comparative analysis outlined in my research questions, I will use the 1804 English merchant shipwreck *Earl of Abergavenny* and the 1686 French colonial shipwreck *La Belle*. The criterion for contemporary ships I could compare against *Queen Anne's Revenge* was that they sank within one hundred years of 1718, were of similar size to *Queen Anne's Revenge*, were in the Atlantic Ocean's Northern hemisphere or Caribbean Ocean and had undergone thorough faunal analysis. Size was considered because the food and provisions

needed for a small crew differ from a large crew. A small crew may be able to sustain for much longer with provisions that a large crew would get through in one day. Rarely are faunal studies performed on underwater sites, so there were limited options from which to choose. There were five shipwrecks with any faunal analysis performed. *San Antonio, Warwick, New Old Spaniard, La Belle,* and *Earl of Abergavenny* could be placed within the time and space criterion. Still, only two- *La Belle* (Figure 2.15) and *Earl of Abergavenny* (Figure 2.14)- met the size and study requirements (deFrance 2017, Gautrey 2014, Armitage 1989).

Figure 2.14: *La Salle's Expedition to Louisiana in 1684* painted by Jean Antoine Theodore de Gudin (1884). *La Belle* is the leftmost ship.

La Belle was a ship created for the French nobleman René-Robert Cavelier, Sieur de La Salle's plan to colonize the mouth of the Mississippi to establish a firm French presence there with the Native Americans, but also as a strategic settlement in the French war against Spain. In 1684, *La Belle*, alongside *Le Joly, L'Aimable,* and *St. Francois,* set off with that goal in mind. None of the sailors knew how to handle the Gulf of Mexico's currents, had inaccurate maps, and

were intercepted by Spanish privateers along their journey. The colonists missed the mouth of the Mississippi River and instead landed at Matagorda Bay, Texas, where only *La Belle* and *Le Joly* survived. *Le Joly* returned to France, leaving *La Belle* the sole ship with limited resources and spoiled provisions. La Salle pressed on and ordered the ship anchored in the bay while he tried to find the Mississippi River. *La Belle* and its crew lay anchored for three months while suffering from dehydration and diminished supplies. The crew were compelled to rely on the natural environment, where they appear to have spent much of their time successfully hunting in the face of all other adversity. In February of 1686, the desperate ship went against La Salle's orders and attempted to leave Matagorda Bay, where a strong North Wind grounded it along the bay's southern shores, leaving only six survivors (Bruseth 2018:3-25, deFrance 2017:749-762).

La Belle was excavated by creating a steel-walled cofferdam around the sunken site and draining the water that submerged it. Using this method, the site was treated as a terrestrial site. It was divided into units of 1 m squares and excavated in 10-centimeter levels. The archaeologists were able to preserve much more information than a standard underwater site and could operate on a more regular basis. Faunal specimens were discovered either during excavation or within the sediment and deposits once in the lab. The faunal analysis of *La Belle* identified 825 vertebral elements, showing the overwhelming use of Texas wildlife (deFrance 2017:751, Hedrick et all. 2017:45-51).

The second ship, the *Earl of Abergavenny*, was a large merchant ship under the East India Company constructed in 1796 specifically for trade with China. The Captain, John Wordsworth, had just set off on his fifth venture with the ship stocked with supplies to sell in India, to then buy items from India to sell in China, then to buy items from China to sell in England- also known as the Bengal/China trade route. It was a very lucrative trade route for not just the East

India Company but also Captain John Wordsworth, who also participated in the illegal opium trade. When the *Earl of Abergavenny* left the port of Portsmouth, England, it had trade goods valued at just under £90,000, four hundred and two individuals that included sailors, troops, and passengers of varying social classes, and provisions for the journey of various qualities for the class differences (Hayter 2002:34-46). In January 1805, the *Earl of Abergavenny* lost sight of its convoy leader and sailed into Portland Bill off Dorset, England, where the weather turned sour. A strong wind forced the ship into shallow water over sand and shingle, where it became stuck and took considerable damage from the stormy waves. By the time the ship was free from the bank, the damage was mortal; the *Earl of Abergavenny* quickly took on water and sank in the open sea. Despite the coastline being only three miles away and nearby ships hearing and seeing their distress, no real offer of assistance to the *Earl of Abergavenny* was provided. Two hundred and sixty-one individuals perished (Gautrey 2014:16-18,23-19,112).

Figure 2.15: *The 'Earl of Abergavenny' East Indiaman, off Southsea* painting by Thomas Luny (1801) (British Library)

Earl of Abergavenny was excavated in a similar manner to *Queen Anne's Revenge*. This underwater excavation lasted over twenty-three years. For much of the project, a water dredge removed the overburden and preserved anything still within the silt. Many ecofacts were found in the filtered silt. The faunal analysis of *Earl of Abergavenny* identified 1,301 vertebral elements, all of which were domesticates (Gautrey 2014:16-23).

Summary

The time that Edward Teach sailed *Queen Anne's Revenge* as Blackbeard was a time of great socio-economic and political strife that led to resentment of authority and a rebellion against it. A better life appealed to sailors, although it is difficult to know just how much better off a pirate's life was than a sailor's. To try to understand how diverse a pirate's diet may have been on *Queen Anne's Revenge*, we can use archaeology and compare the information to the contemporary ships listed above. The next chapter will discuss the methodology.

Chapter 3: Methods

This thesis employs standard zooarchaeological methodology for analyzing the data. Zooarchaeology has close ties to the natural sciences but allows scholars to observe those sciences through the lenses of humanity. It explains how the analysis of faunal remains can aid our understanding of the past. Specifically, to understand the diet pirates may have had during the Golden Age of Piracy, interpreting the faunal osteological remains they left behind through zooarchaeology is necessary.

Faunal Identification:

In 2005, a preliminary study of the recovered faunal remains documented and attempted to identify sixty-two bone fragments retrieved from several different excavation units at the *Queen Anne's Revenge* shipwreck site (Clark, 2005:2). Since 2005, additional faunal remains have been recovered either through excavation or during the reduction of concretions. One-hundred-and-eighty-eight faunal ecofacts have been recovered from *Queen Anne's Revenge*—resulting in a total of two-hundred-and-fifty-five complete or fragmented faunal remains. Working alongside the North Carolina Office of State Archaeology, the University of North Carolina (UNC) at Chapel Hill, East Carolina University, and the Queen Anne's Revenge Lab, these remains were studied beside a comparative collection at the University of North Carolina's Zooarchaeology Lab. Kimberly Kenyon, Dr. Benjamin Arbuckle, Dr. Heather Lapham, Emily McDowell, and Jay Mayfield-Loomis completed this most recent identification (as of 2024). All faunal remains not previously or confidently identified were analyzed. Everyone went into this

identification with high expectations despite the heavily fragmented state of the collection, and most bones have at least a size attribution, such as large mammal, medium mammal, or small unidentified.

To identify the bones as accurately as possible, I relied on the experience of trained zooarchaeologists (Dr. Benjamin Arbuckle, Dr.Heather Lapham, Emily McDowell), the UNC comparative collection, published guides (Broughton and Miller 2016; Reitz and Wing 2008; Driver et all 2011) and online references to identify the element and taxon. Two main osteological traits were observed when trying to infer the element and taxon of a specific specimen: morphological and metric. An element is a recognizable specific bone type with distinct markings, texture, or shape that is usually still identifiable even when fragmented (Lyman 1994:39).

Morphological traits refer to the shape or presence/absence of specific features that are unique to different families and taxon (Lyman 2019:1397). A bone can be classified according to its shape: long, short, flat, pneumatic, sesamoid, and accessory (table 3.1) (Rauf 2014:1423). Many of our attempts to identify the specific element of the collection ended here and were labeled as “bone fragments.”

Classification	Description	Example
Long Bones	A shaft and two ends, usually longer than it is wide	Femur, Ulna, Tibia
Short Bones	Short and cuboid or similar shape	Carpal, Tarsal
Flat Bones	Plate that fits around a cavity	Skull, Ribs, Scapula
Irregular Bones	Complex and distinct shape	Vertebra, Os coxae
Pneumatic Bones	Contains large air spaces	Maxilla, Ethmoid
Sesamoid Bones	Bony nodules	Patella, Fabella
Accessory Bones	An irregular bone	n/a

Table 3.1: The classifications of bones, the description, and examples

There are morphological traits that vary between species (Lyman 2019:1397), so when an element was identified, it was then compared in shape to the collection and references. For example, bones from *Odocoileus virginianus* or white-tailed deer, and *Ovis-Capra,* the genus for sheep and goat respectively, the femur can be very similar, but in *Ovis-capra* the bone is much thicker in relation to its height, and the shaft tapers much less abruptly (Figure 3.2) (Lawrence 1951: 14). Goat and sheep are very similar and difficult to taxonomically separate (Reitz and Wing 2008:166), so they will be referred to as "sheep/goat."

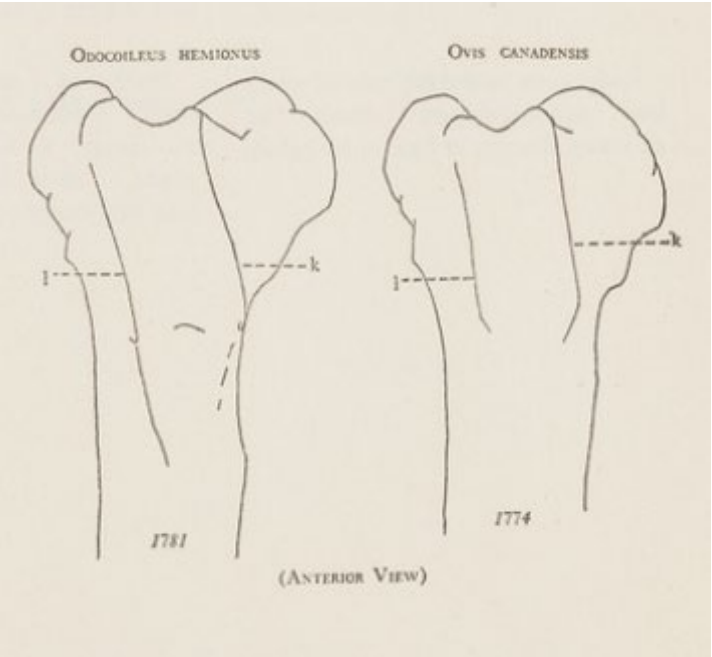

Figure 3.2: *Odocoileus hemionus* (Mule Deer) (Left) and *Ovis canadensis* (Bighorn sheep) (Right) femur, showing both similarities and differences (Lawrence 1951:14)

Metric traits were also studied, especially given that many of those morphologically unique features were not as easily observed due to fragmentation and encrustation. Metric traits are the measurements and observations in terms of size (Lyman 2019:1398). Because there is a standardized understanding of modern fauna size, and *Queen Anne's Revenge* is a historic vessel, size was also used to identify fauna. Beyond just overall size, the metric distance and shape of the bones were able to be used to further confirm taxon and element, or at least size (Figure 3.3) (Lyman 2019:1398). All bone fragments were identified to the lowest taxonomic level possible and, if unable to be identified, were labeled as bone fragments, sometimes attributed to a fauna size (e.g. large mammal).

Figure 3.3: Two rib bone specimens. The top specimen was identified as a *Bos taurus* (Cow) rib bone, whereas the bottom specimen could not be identified to a taxon. Instead, because of the size difference, it was labeled as a medium mammal (NCDNCR)

When possible, the remains were attributed to age. This is indicated by having an additional comment such as “juvenile.” This is possible because mammals and birds have Determinate Growth, which means that as the individual ages, their body develops and is remodeled into an adult form (Reitz and Wing 2008:70). When mammals are born, their long bones consist of one or more epiphyses and diaphysis which are separated by a cartilaginous growth plate that allows for articulation of their joints while they grow (Broughton and Miller 2016:74). Epiphyses are bones usually at the ends of the shafts of long bones that allow for connection between joints, and are separated from the diaphysis, or remaining shaft until the growth plate is replaced by bone, and it completes something known as “epiphyseal fusion” as the individual matures. Birds share a similar growth process, but their epiphyses are cartilaginous and change to bone rather than fuse, which marks the end of their growth. In the zooarchaeological record, you may find the unfused diaphysis and epiphyses of a juvenile individual which would represent two different specimens, or you may find that the surfaces of long bone fragments, specifically the diaphysis, will have a pitted and uneven surface from the rest of the bone, which indicates immature bone where the growth plate once was. By noting the fusion state of the specimen, you can estimate the age of many mammals as the fusion of these elements follow a consistent schedule. There are many factors that may result in an early or late fusion, but the average age of when fusion occurs for many animals has been documented and can then be compared. For example, the distal scapula of a pig fuses usually around twelve months, so were you to find evidence of an unfused distal scapula of a pig, you could reasonably assume the individual to have been twelve months or less. One can also assume that if they found a left and right humerus of a pig, and the left humerus was fully fused while the right humerus

had not yet fused the two separate humeri would not belong to the same individual (Reitz and Wing 2008:71-74).

This collection suffers from several issues that make complete identification difficult. First, most of the faunal remains are heavily fragmented, meaning that many of the bones have lost defining characteristics. Secondly, this is a 300-year-old submerged site. The integrity of the faunal assemblage reflects that. The Queen Anne's Revenge lab very carefully conserves these bones, but it does not change the fact that they were subject to submersion in a dynamic environment for hundreds of years. These two issues can cause degradation of the bone that makes identification challenging. In this thesis, the word fragmentation or fragmented will refer to the condition of the animal bones recovered from *Queen Anne's Revenge* in the form of degradation resulting in broken or divided specimens. In this case, the specimen represents any one bone. The fragmentation may have been caused by human use or through exposure to the elements.

Quantifying Data:

The entire collection was selected to perform a faunal analysis because the collection itself is small and already represents only a sample of what was consumed on the ship since the excavation is still in progress, and due to the use and destruction of the ship, this likely already represents a very small percentage of the bones that were ever on board. As approximately sixty percent of *Queen Anne's Revenge* has been excavated, and assuming the distribution of faunal remains would be even across the entire site, the presented information should represent an analysis of sixty percent of *Queen Anne's Revenge's* expected total preserved number of

individual specimens present (NISP), or bone count, and the minimum number of individuals (MNI) represented by those bones were calculated using the full collection.

NISP represents the total count of identified specimens available in the collection (Reitz and Wing 2008:202-203). It is calculated as simply as that, by analyzing the faunal remains available and assigning each individual specimen to a taxon, then counting the total number of elements for each taxon to generate the NISP. MNI represents the minimum number of individuals per species that the site can account for by counting the most abundant unique skeletal elements (Reitz and Wing 2008:205). When calculating MNI, the assumption is that any animal has an expected number of bones and that some of the specimens in an assemblage will have morphological features that are unique to a specific element, which can be unique to a specific taxon. These include things like the humerus, scapula, and skulls, and some elements can be further divided into left and right, like the right tibia or left os coxae. Each animal should have a specific number of these unique elements, so to calculate MNI at its most basic level, you find the element with the highest number for each taxon and consider that to be the absolute minimum number of that specific taxon that may have been present on the site. For example: if there was an assemblage that had 6 left scapula, 2 right scapula, 5 right ulna, 1 left ulna, 2 patella, and 1 skull all associated with the domestic cow *Bos taurus,* you would observe the left scapula as being the highest unique element, and consider the MNI to be 6, while the NISP would be 17. It is important to note that in instances of high fragmentation, where there are fewer bones able to be assigned to any specific element or taxon, the NISP and MNI will both be much lower (Marshall and Pilgram 1993:266). Neither NISP nor MNI necessarily represents the true number of animals that were present on *Queen Anne's Revenge.* For this thesis, MNI will

represent the absolute minimum number of animal portions that may have been used and should not be interpreted as the actual number of individuals present (Reitz and Wing 2008:206).

While MNI will be calculated for this thesis, there are critiques of this method. MNI was first introduced with the goal of reducing the statistical error that may have been present when using NISP on particularly fragmented sites (Lyman 2019:66). This has not proven to be true much of the time, and often results in very conservative estimates for MNIs. This is true especially in sites as highly fragmented as *Queen Anne's Revenge*, which does not have many identifiable skeletal remains that could be attributed to a specific taxon. NISP tends to be more statistically accurate in predicting the actual number of individuals that may have been present at the site (Marshall and Pilgrem 1993:267; Lyman 2019:82; Cannon 2013;417). There are also countless methods for deriving MNI which further complicates its accuracy (Reitz and Wing 2008:206-207). White (1953:397) first introduced this concept to understand human diet and suggested separating the most abundant element of any species found into right and left and using the greatest number as your MNI. Bökönyi (1970:291) suggests expanding this further and defines four additional categories specimens should be divided into based on age, then the sum of all the categories' greatest numbers will be your true MNI. Another way to calculate MNI, especially using a computer, is to record the fragments of elements numerically based on the percentage of the skeletal parts present, which is then represented by fractions and rounded up to determine whether it can represent an individual. This method requires a large sample size to work (Klein and Cruz-Uribe 1984:26-29). This can be even further scrutinized by specifying that a specific percent of an element must be present for it to be counted. For example, if 38% of a scapula is found, it may not be considered part of an individual depending on the sensitivity of their program (Albarella and Davis 1996: 3-4). Binford began using the term MNI while

intending to represent an entirely different calculation and thus interpretation (Lyman 1994:50). Binford (1984) eventually derived the term minimum number of animal units (MAU), which did not separate skeletal elements based on side- left and right-, and instead calculated the highest specific element then divided it by two to represent his minimum number instead of continuing to use the phrase MNI. Overall, MNI is a much more complicated way to quantify faunal abundance at site and is best used as an interpretation estimation of what may have been at the site, rather than actual individuals (Reitz and Wing 2008:206). It is also likely that only specific parts of an animal may have been stored on board as part of provisions, such as ribs, which may raise or lower the MNI depending on how diagnostic the part is.

So why use MNI at all? Ultimately, neither MNI nor NISP can answer every research question and must be used together to fully analyze the collection (Reitz and Wing 2008:212). MNI is still a useful tool for interpreting what may have been present at the site and is often the easiest and most digestible way to present faunal data. The collections from *Queen Anne's Revenge* will be compared to, *La Belle* (deFrance 2017) and *Earl of Abergavenny* (Gautrey 2014), are similarly represented mainly by their MNI. The MNI will be used to calculate niche breadth (detailed in later text) and helps understand the absolute bare minimum presence of animals that may have been on the ship as it provides a quantified number we can understand and work with.

This thesis will be following White's (1953:397) methods, as well as Bökönyi's (1970) further suggestions for calculating MNI. White's methods are simple, where the suggestions of Bökönyi account for age, which I think is most appropriate for this collection. Instead of utilizing the four separate categories of both sex and age, there will be two categories: juvenile, which represents unfused specimens, and adult. The bones will be sorted according to taxon and

element, then side, and then age will be considered by studying the fusion state of the remains. If there are matches for a respective piece either by side, age, or fragmentation, they will be considered together and will not increase the count. It is understood that many of the animals or animal remains (especially that of pig or cattle) that made their way onto their ship were likely in some stage of adolescence, so the use of sorting by age may result in an artificially high number due to varying stages of fusion amongst different elements. However, it should more accurately represent the fauna and elements of fauna present on the ship when it sank, since not identifying and sorting by age would likely lead to a low estimate for MNI. Ultimately, I hope this method will compensate for the increased fragmentation and the small sample size.

Comparative Analysis: Niche Breadth

I will use these data to calculate *Queen Anne's Revenge*'s dietary diversity by its niche breadth. Niche breadth, sometimes called niche width, is the overall diversity in animals present in the site (Reitz and Wing 2008:245). The goal of calculating niche breadth is to indicate subsistence strategies to discuss the means of procuring and using animals as part of one's diet. While you can use NISP, MNI, specimen weight, or sample biomass to calculate niche breadth, I will use MNI, as the ships that *Queen Anne's Revenge* is being compared to used MNI, although with different calculation methods. To calculate the niche breadth, I will determine what percentage of the collection is represented by each species. Then, each proportion will be squared, which will then be added together.

The sum of the total squared proportions will be divided by 1, resulting in the niche breadth. Niche breadth is represented by this formula:

$$\text{Niche Breadth: } \frac{1}{\Sigma p^2}$$

The niche breadth will be a positive number, and the higher the number, the more diverse the diet in terms of different species utilized, whereas a lower number represents a less varied diet (Barber 1994:95). In simpler terms, niche breadth represents the amount of variety available in the assemblage and can be interpreted to represent whether a group was eating and relying on a select species, or if they were consuming a wide selection of different species. *Queen Anne's Revenge* was a pirate ship that had less regular access to ports and merchants where they could acquire standard provisions and instead had to rely on what could be confiscated from other vessels and perhaps what could be hunted or fished on the coast. Since they would not be able to have first pick of select species, such as cattle or pigs, and likely had to subsidize their diet by consuming other items, I expect their niche width score to be higher, representing a more diversified diet due to their circumstances.

Once *Queen Anne's Revenge'*s niche breadth has been calculated, those of *La Belle* (deFrance 2017) and *Earl of Abergavenny'*s (Gautrey 2014) will also be calculated. Each ship's niche width will be compared, and the highest number will suggest a more diverse diet. These ships are contemporary with *Queen Anne's Revenge*, as *La Belle* was a colonizing ship run aground and ultimately destroyed by nature in 1686 off the coast of present-day Texas (Bruseth 2017:20), and *Earl of Abergavenny* was a merchant ship that ran against a bank before returning to the sea and sinking in 1805 off the coast of England (Gautrey 2014:27-28). There are not very many comprehensive faunal analyses of ships, and these two ships were selected among the few

for their relation to *Queen Anne's Revenge* due to size and age, as well as representing different types of ship purposes to compare- a colonial ship and a merchant ship, which should offer different insights in comparison. After finishing the 2014 faunal analysis of *Earl of Abergavenny,* Hannah Gautrey interpreted that "the foods on offer[s] ... suggesting life onboard the ship was very typical for the 18th-19th centuries" (156). If we are to take their interpretation as valid, we should be able to use *Earl of Abergavenny* as a standard for a typical niche breadth. Assuming that is true, then the niche breadth of *Queen Anne's Revenge* being higher than *Earl of Abergavenny* should represent a deviation from the norm, even if *La Belle* proves to be more diverse.

NISP, MNI, and a general overview of the faunal remains sorted by taxon and element of *Queen Anne's Revenge* will be presented in a series of tables. There will be a separate table that shows the niche breadth calculation using MNI, which will be compared to similar tables for *La Belle* and *Earl of* Abergavenny. There will also be a table of figures representing the artifacts alongside their QAR artifact number.

Considerations

While it was not unusual to have live animals on board, and Blackbeard himself was documented as having confiscated 35 pigs from the sloop *Margaret,* although the extent of their husbandry practices and the life expectancies of the animals on *Queen Anne's Revenge* is unknown (Wilde-Ramsing and Carnes-McNaughton 2018: 34), it is very likely that any elements we see may not be representative of a whole animal, but rather sections of an animal brought onto the ship. Most provisions were usually salted after being portioned out into smaller sections

to preserve the meat (Rixson 1989:54), and that action likely didn't happen on *Queen Anne's Revenge*. At least part of this faunal assemblage represents these provisions, so one can assume that any of the elements identified may not have a matching element in terms of side and may even be the only element for an individual that would have ever been on *Queen Anne's Revenge* or *La Concorde*. Because of this, the MNI will likely not represent the minimum number of individuals that were present, as that implies a whole individual present, but are interpreted to mean the minimum number of individuals or portions of individuals that were present. There will likely be specific elements that show up more in the assemblage, which can be attributed to those elements being more readily preserved than others, such as cow ribs. An abundance of a specific element will represent this manner of preferential preservation.

Queen Anne's Revenge sank very slowly and sat in the now Beaufort Inlet for several months before it broke apart, only to lay there until the present. The wreck was not particularly violent, which allowed Edward Teach and his crew to safely evacuate the ship alongside their belongings and any provisions they could carry (Wilde-Ramsing and Carnes-McNaughton 2018: 34). The ship's faunal assemblages represent what was left behind - either because it could not be brought onto the second ship for one reason or another, or it was previously consumed and discarded by the crew before they left. Thus, *Queen Anne's Revenge* represents the garbage that was left by Blackbeard. Faunal items may have been disposed of overboard during the journey as well, further diluting what is left. The specimens that remain will still represent to some degree the fauna and diet on board *Queen Anne's Revenge,* as the only way these bones would have ended up on this ship is from some manner of human activity. It is just important to recognize that this assemblage is the trash or forgotten items of Blackbeard, not what was on the ship on the day of its wreck in 1718.

Blackbeard sailed *Queen Anne's Revenge* for less than a year, whereas French sailors sailed *La Concorde* for years before that. To definitively say that a specific specimen was consumed or brought onto the ship by a pirate, or a Frenchman would be impossible. Some of the specimens were likely deposited on *La Concorde* before it became the pirate ship *Queen Anne's Revenge*, and one cannot conclusively say that all the elements used to determine MNI and Niche Breadth were used and consumed by a pirate. This distinction would not be possible, nor necessary, since provisions that were on *La Concorde* would have been confiscated and used by *Queen Anne's Revenge*, causing an overlap. Any artifact subsequently and secondarily becomes a pirate artifact when a pirate takes claim of it. Every specimen (apart from those deemed intrusive) is considered an ecofact of *Queen Anne's Revenge* and will be included in NISP, MNI, and niche breadth.

A majority of the intrusive items found in *Queen Anne's Revenge's* faunal assemblage were identified as fish or marine mammals, usually in the form of a vertebra. These items were especially observed for butchery marks, looking for deep grooves associated with cut and cleaving actions or saw marks associated with someone attempting to cut into a bone, to represent human consumption patterns to ensure they were truly intrusive. Only one fish specimen is recorded as having cut marks on it. If they were fossilized, they were deemed too old to have been a natural part of the assemblage. If the specimen was located on top of the concretion surrounding the wreck and not completely concreted, it was determined to have been deposited later and given the tag of intrusive. Intrusive specimens will be on the complete table in figures but not placed on any table that measures NISP, MNI, or Niche Breadth.

Finally, there are a few specimens that have been identified as rats or small mammals. They will be included in NISP and MNI but should not be considered as part of the diet for pirates, but rather part of ship life. They will consequently not be used for niche breadth. The small mammal

remains may be evidence of something other than a rat that could be a food item but to avoid adding an additional unknown species to the niche breadth and skewing the results because of *Queen Anne's Revenge*'s small assemblage size; they will be excluded. Further analysis of these specimens should be conducted in the future.

Chapter 4: Assemblage Analysis Overview

Two hundred and fifty five animal bones have been recovered from the wreck of *Queen Anne's Revenge***.** The following data represent only the specimens within the collection that were determined to be in context with the ship and not deposited by other means. It is viewable first by total assemblage, as represented in tables 4.1 and 4.2, then individual sections for each species that delve into the specifics. This information is presented alongside photographs, graphs, and illustrations as necessary and available.

Total Assemblage Overview:

In total, 172 specimens of faunal bones were determined to be present in *Queen Anne's Revenge* because of human activity on the ship (table 4.1). Of those, 104 or 60% of the total assemblage could be attributed to a specific taxon (table 4.2). The most abundant species in NISP was *Sus scrofa*, or pig, which accounts for 30% of the assemblage. *Bos taurus* (cow) made up 24%, and *Odocoileus* (deer) made up 2%. The following each made up 1% or less of the remaining identified assemblage: *Caprine* (sheep and goat), *Anatidae* (duck), *Meleagris* (turkey), *Rattus rattus* (rat), and fish.

The remaining specimens were able to be sorted into size categories. Many within these size categories could be attributed to a distinct element but were either missing defining markers for the species or were too degraded to determine it accurately and were labeled "Large Mammal," "Medium Mammal," "Small Unidentified," or Avian.

Species	**NISP**
Bos taurus (Cow)	42
Sus scrofa (Pig)	52
Caprine (Sheep/Goat)	1
Odocoileus (Deer)	3
Large Mammal	14
Medium Mammal	40
Anatidae (Duck)	1
Meleagris (Turkey)	2
Avian	9
Fish	1
Rattus rattus (Rat)	2
Small Unidentified	5
	172

Table 4.1: Assemblage NISP

Species	**MNI**
Bos taurus (Cow)	4
Sus scrofa (Pig)	6
Caprine (Sheep/Goat)	1
Odocoileus (Deer)	1
Anatidae (Duck)	1
Meleagris (Turkey)	1
Rattus rattus (Rat)	1
Fish	1
	16

Table 4.2: Identifiable taxon MNI

Large mammal specimens were determined to be generally that of either *Sus scrofa* or *Bos taurus*; the medium mammal specimens were determined to be medium ruminant, likely a *Caprine* or *Odocoileus*; and small unidentified specimens were either too small to be identified by species or element to any degree or could be a small mammal or avian. Within these categories, there were still defining elements like scapula or vertebra. Avian and fish could be narrowed down to that, but not any further. Of the remaining 41% of the assemblage, large mammals comprised 8%, medium mammals comprised 23%, avian 5%, small unidentified 3%, and fish 1% by NISP (Figure 4.3).

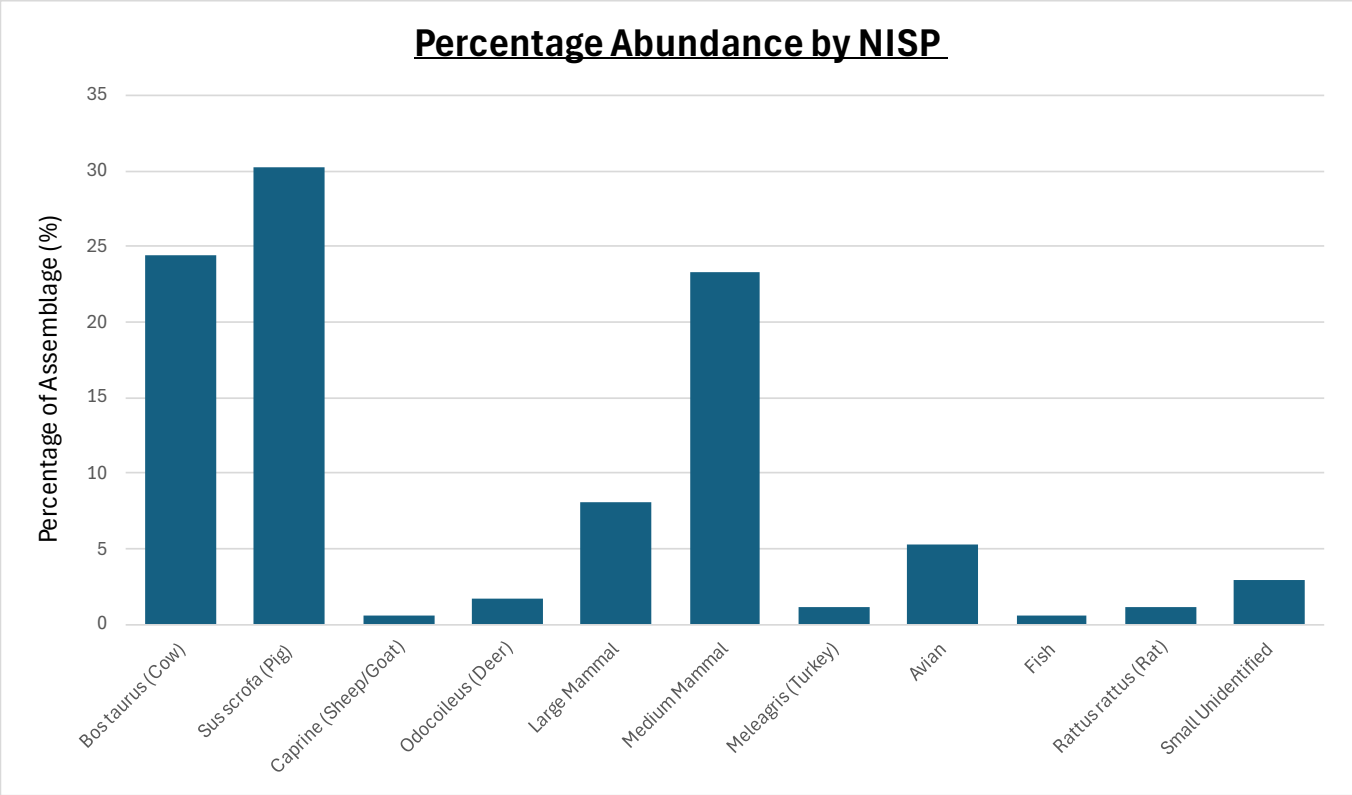

Figure 4.3: Species percentage abundance by NISP

The minimum number of individuals within this assemblage is 16 (Figure 4.2). Again, *Sus scrofa* accounts for the highest MNI at 6 individuals, accounting for 37.5% of the total assemblage by MNI. *Bos taurus* was again the second highest at 25% with 4. All other categories each comprised 6.25% of the total assemblage by MNI and were only attributed to 1 since no elements would account for more (see fig 4.4).

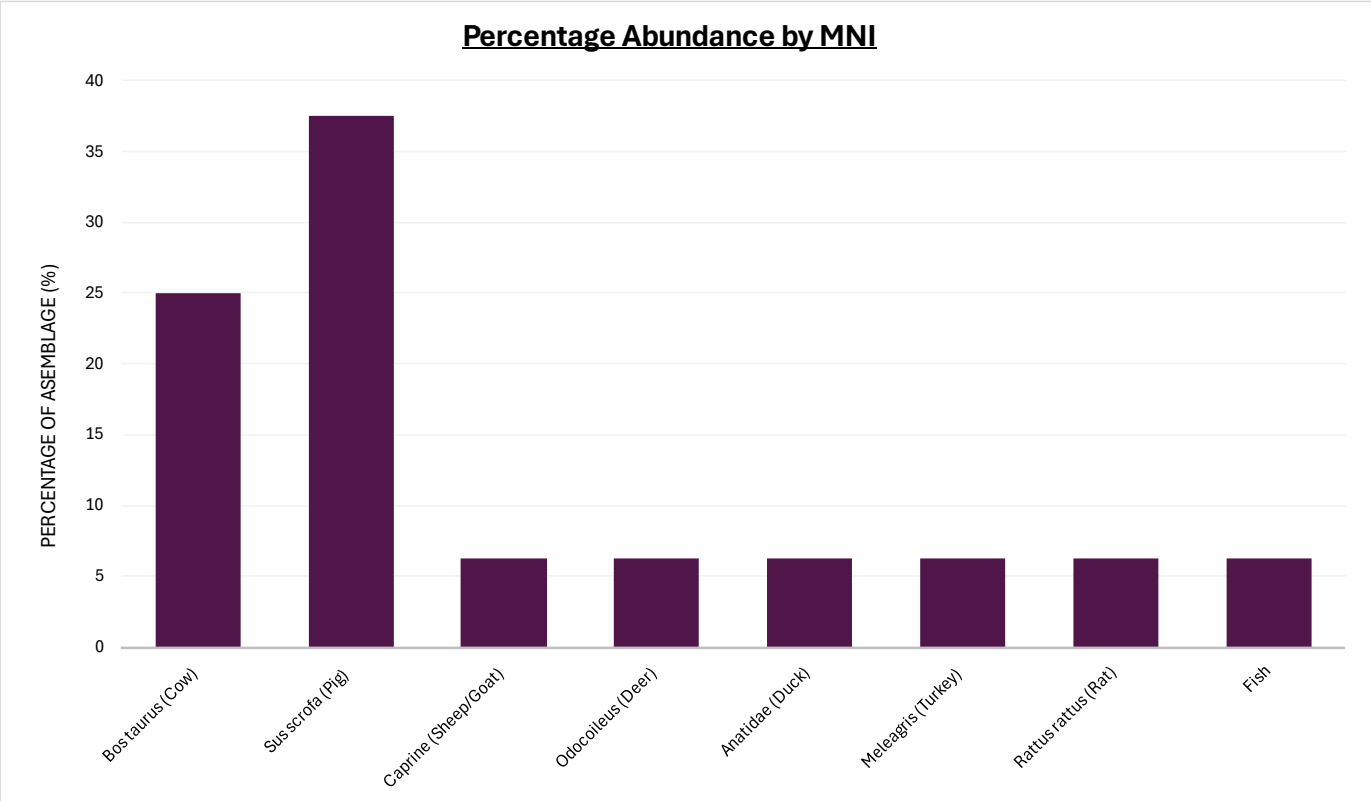

Figure 4.4: Species percentage abundance by MNI

Ribs were the most common element throughout the assemblage. Twenty-one ribs or rib fragments were identified, accounting for 12% of the total assemblage, most of which were *Bos*

taurus. Ribs are easily identified but not unique since there are so many per individual. When ribs were encountered for each species, the MNI was determined to be one per age division (mature or juvenile). Many of the ribs exhibited signs of rodent gnawing.

Some specimens had evidence of butchery or modification, though no thorough research was done on this other than using butchery marks to determine human use so a specimen could be included as part of the assemblage. Of creatures that would be intrusive, such as turtles or fish, only those that bore butchery marks (see fish section) were considered.

Mammalian Skeletal Analysis

Five mammal taxa were identified, resulting in the NISP count of one hundred. These mammals were *Bos taurus, Sus scrofa, Caprine, Odocoileus, and Rattus rattus*. The unidentified large mammal and medium mammal categories raised the NISP to 154. Factoring in large and medium mammals by NISP, they represent 58% of the assemblage's total individual specimens and 81% of the total assemblage by MNI. It is reasonable to assume that everything except *Rattus rattus* was consumed and should count towards the diet diversity on board the ship.

Skeletal Analysis: *Sus Scrofa*

Sus scrofa (pig) has a NISP count of 52 (Fig 4.5). The most frequently identified element was metatarsals, which cannot be used to create an accurate MNI due to their abundance within the body. The most frequent unique element was the tibia at 6 mature and 1 juvenile by NISP, resulting in a MNI of 6, at least 5 mature and 1 juvenile. *Sus scrofa* was also the only species with identifiable cranial fragments, teeth, and mandibles, suggesting the occurrence of live species (Figure 4.6). The presence of feet and skulls suggest live individuals since they would typically be discarded during butchery (Rixson 1989: 50). These items are still edible and cannot be completely ruled out as being brought onto the ship already butchered. While pigs' feet were a lower grade meat option, they were often pickled in a brine and consumed over the course of a ship's journey, and head meat could be treated in a similar fashion (Simmons 2011: 289). This collection likely represents both preserved and live meat (See *Sus scrofa* discussion section).

Element	Left	Right	NISP	MNI
Rib				
Mature	-	-	1	1
Juvenile	-	-	1	1
				2
Phalanx				
Mature	-	-	3	1
Juvenile	-	-	2	1
				2
Metacarpal				
Mature	-	-	2	1
Juvenile	1		1	1
				2
Carpal				
Mature	2	-	2	2
Juvenile	1	-	1	1
				2
Metatarsus				
Mature	-	-	11	1

Juvenile	-	-	2	1
				2
Metapodial				
Mature	-	-	3	1
Juvenile	-	-	1	1
				2
Tibia				
Mature	-	5	6	5
Juvenile	-	-	1	1
				6
Vertebra				
Mature Cervical	-	-	1	1
Mature General	-	-	1	1
				1
Femur				
Juvenile	-	-	1	1
				1
Radius				
Juvenile Epiphysis	-	-	1	1
				1
Cranial				
-	-	-	5	5
				5
Calcaneus				
-	-	-	2	2
				2
Mandible				
-	-	-	1	1
				1
Teeth				
Unerupted	-	-	1	1
				1
Indeterminate				
-	-	-	2	1
				1
Total			**52**	**MNI=6**

Table 4.5: *Sus scrofa* elements sorted by type, age, NISP, and MNI

Sus scrofa also had the highest number of bones attributed to juvenile individuals. This is likely because pigs are often killed for their meat long before they reach full skeletal maturity, which can take anywhere from 48-84 months (Reitz and Wing 2008: 72). Many of the bones and the unerupted teeth suggest individuals younger than 12 months old.

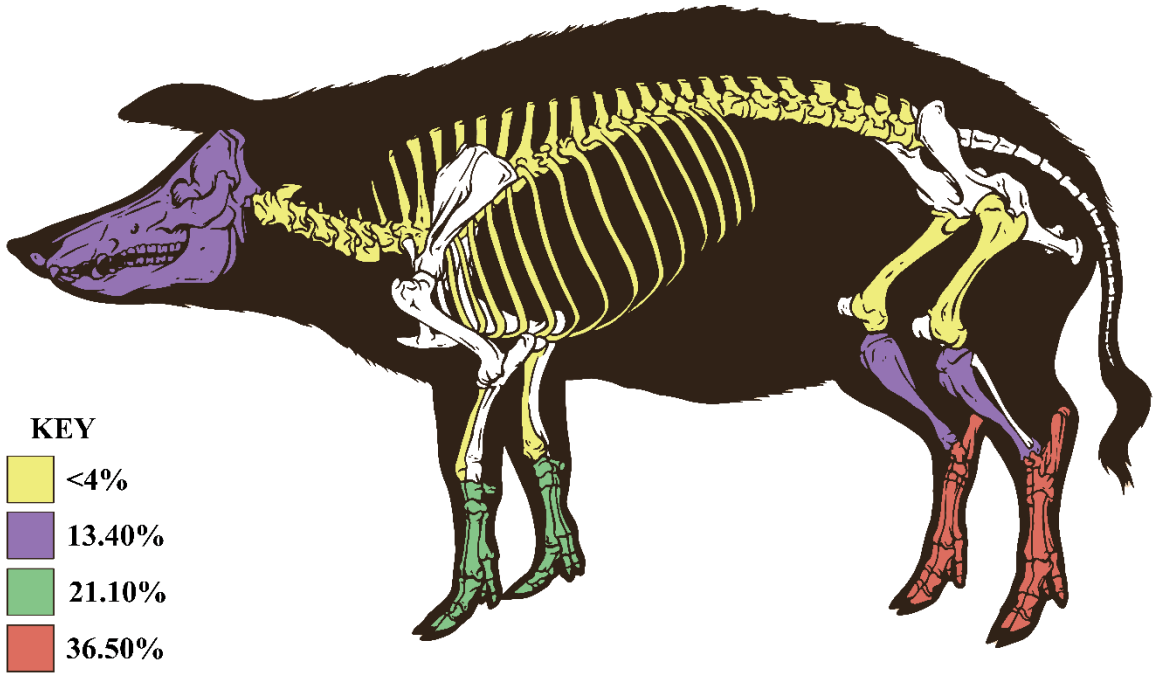

Figure 4.6: Image of *Sus scrofa* showing the percentage of assemblage by element NISP

The elements are diverse and present a relatively complete picture of a pig. The quantity of metacarpal, metatarsal, and carpal bones can be attributed to the fact that these bones are naturally abundant in mammals.

Dr. Eric Guiry, a lecturer for biomolecular archaeology at the University of Leicester, conducted a stable isotope analysis on several bones, which was communicated through private

correspondence. His research discovered that several *Sus scrofa* had distinct isotope signatures, which implied different areas of husbandry and diet. The exact circumstances that may have resulted in the difference could not be confidently concluded, but he suggested that it was likely due to regional differences in diets.

Guiry's analysis also concluded that from the faunal remains of *Sus scrofa* he was able to analyze, the isotope analysis had a signature that could be attributed to a diet from forests. This indicates the presence of feral hogs amongst the *Sus scrofa* assemblage. We can determine then that there was a presence of the subspecies *Sus scrofa scrofa* as well as *Sus scrofa domesticus*, representing the wild boar and the domestic pig, respectively, on board the ship. One metatarsal (see Fig 4.7) and indeterminate bone were identified as feral pigs. In Guiry's research, only 25 bones were analyzed from the assemblage, and 8 were *Sus scrofa*. Further analysis may determine that more of the *Sus scrofa* remains belong to the subspecies of wild boar.

Figure 4.7: *Sus scrofa scrofa* (wild boar) metatarsal (NCDNCR)

Skeletal Analysis*: Bos taurus*

Bos taurus (cow) has a NISP count of 42 and an MNI of 4 (table 4.8). The most frequently identified element was rib, accounting for approximately 29% of the total *Bos taurus* assemblage. These ribs were identified as both mature and juvenile due to their shape and fusion state. Ribs are not unique elements in a skeleton and cannot be used to determine a MNI accurately. There were eight total radius elements identified, but the MNI of 4 was calculated due to specimens being reasonably assumed to be of different sides or one singular element, but not with total confidence. From the 4 MNI, at least one individual can be attributed to a juvenile bone state. Much like *Sus scrofa*, *Bos taurus* is often slaughtered before reaching full skeletal maturity at 84 -108 months, meaning many, if not all, the juvenile specimens may represent a nearly adult individual rather than a calf (Reitz and Wing 2008: 72).

Compared to *Sus scrofa*, the *Bos taurus* assemblage has few metatarsals and metacarpals, with only one carpal and one calcaneus identified, both of which sit quite high on *Bos taurus* limbs (Figure 4.9). The lack of metacarpal, metatarsal bones, and cranium suggests a butchered and preserved meat. During the 18th and 19th centuries, cow ribs were often divided into small sections of approximately 4 to 6 inches. The MNI of *Bos taurus* by ribs is 2: one mature and one juvenile, with a NISP of 12, but butchery practices could point to each specimen representing an individual. The ribs, scapula, vertebra, and upper fore and hind limbs are the cow's meatiest parts and are the most commonly occurring faunal remains at butchery sites in the 18th century (Crabtree and Campana 2008:324). This matches the assemblage found on *Queen Anne's Revenge*, suggesting the *Bos taurus* present on the ship were butchered before they were brought on. The faunal remains represent the bones that would have had the most meat rather than a full skeleton (Rixon 1989: 50).

Element	Left	Right	Total	MNI
Rib				
Mature	-	-	8	1
Juvenile	-	-	4	1
				2
Vertebra				
Mature Cervical	-	-	1	1
Mature General	-	-	1	1
Juvenile	-	-	1	1
				2
Scapula				
-	-	-	3	3
				3
Carpal				
-	-	-	1	1
				1
Calcaneus				
-	-	-	1	1
				1
Tibia				
-	-	-	1	1
				1
Ulna				
Mature	-	-	2	1
Juvenile	1	-	1	1
				2
Femur				
Mature	-	-	2	2
Juvenile	-	-	1	1
				3
Radius				
-	-	-	8	4
				4
Indeterminate				
-	-	-	3	1
				1
Total			42	MNI=4

Table 4.8: *Bos taurus* elements sorted by type, age, NISP, and MNI

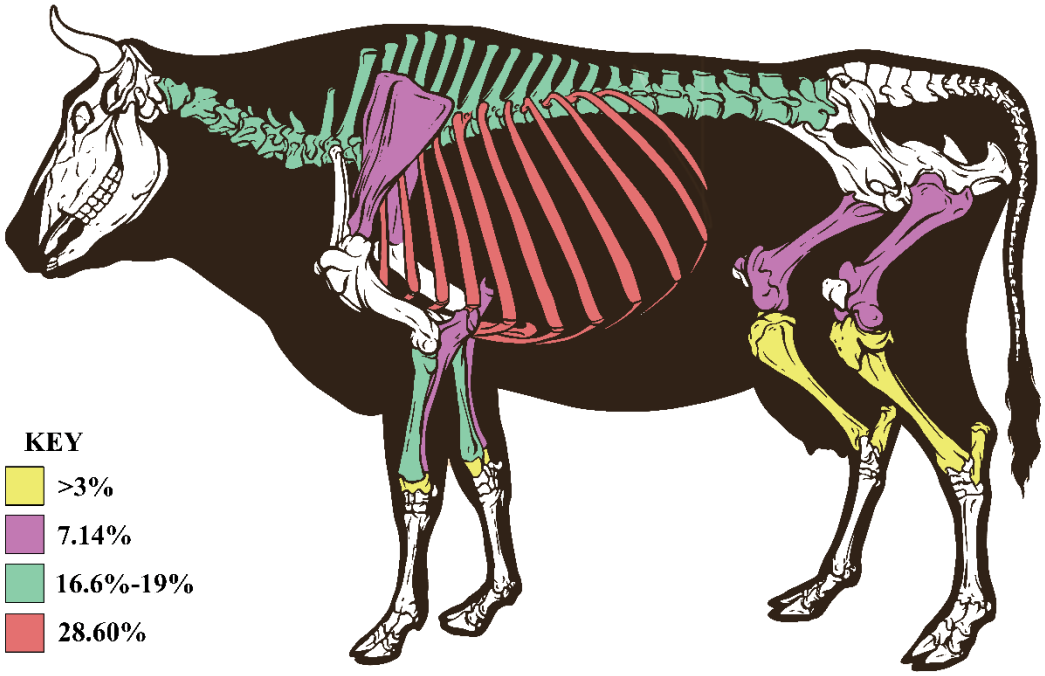

Figure 4.9: Image of *Bos taurus* showing the percentage of assemblage by element NISP

Dr. Guiry performed an isotope analysis on 8 cattle specimens, resulting in a similar analysis to *Sus scrofa* but slightly less diversity. The 8 specimens used in the analysis were reared either in a different environment, a different diet, or both.

Bos taurus also had the largest number of elements with identifiable rat gnawing, which are especially visible on the ribs (Figure 4.10).

Figure 4.10: Evidence of rodent gnawing on *Bos taurus* rib (NCDNCR)

Skeletal Analysis*: Caprine*

Between the previous and most recent analyses, only one specimen could be conclusively identified as belonging to *Caprine* (sheep and goat), although the element could not be determined (Table 4.11). Previous studies determined that one fragment belonged to a lamb, but it may be a juvenile fragment of a different caprine species, such as the more common goat (Reitz 1992:85) (Figure 4.12). Juvenile *Caprine* meat is considered more luxurious and expensive and is often culled between 6-9 months when being raised for that reason (Payne 1973:281). This specimen may be a result of that. Despite this being the only positively identified *Caprine* element, the medium mammal specimens likely contain individuals belonging to the genus.

Element	Left	Right	Total	MNI
Indiscriminate				
-	-	-	1	1
				1
			1	MNI=1

Table 4.11: *Caprine* elements sorted by type, age, NISP, and MNI

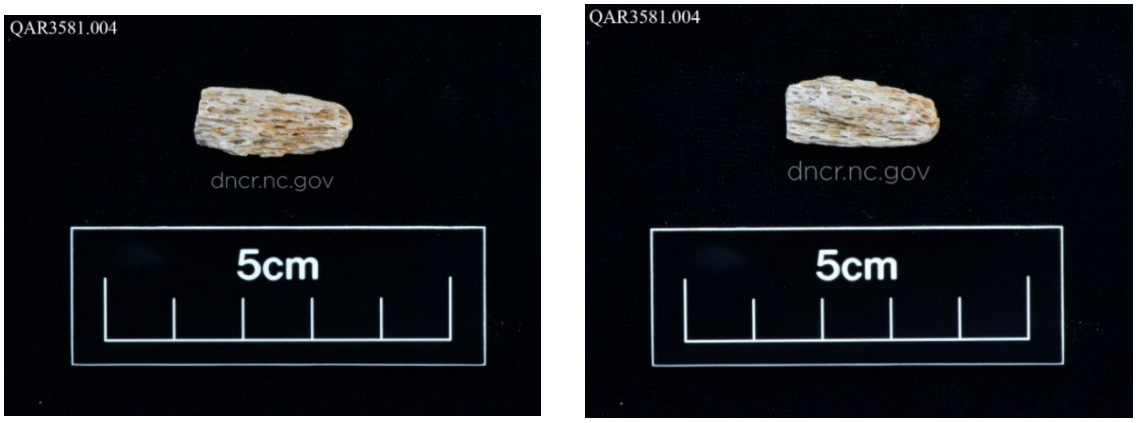

Figure 4.12: Bone fragment previously identified as lamb bone (NCDNCR)

Skeletal Analysis: *Odocoileus*

Odocoileus (deer) had the NISP of 3, with a MNI of 1 (Table 4.13). The most common element was ribs, with 2 being identified. One thoracic vertebra was also determined to belong to *Odocoileus*. Neither rib nor vertebra are unique elements, so a MNI of 1 was determined. The *Odocoileus* present is likely a white-tailed deer, or *virginianus*, which would have been hunted off the east coast. It has been assigned *Odocoileus* because of this, but if these specimens made their way onto the ship in Europe, it may belong to *Capreolus capreolus*, or roe deer instead. Given the nature of *Queen Anne's Revenge* as a slaving ship before its capture, the more likely culprit is *Odocoileus virginianus*. The vertebra exhibits signs of chopping butchering, such as chopping and slicing, which suggests at least partial butchery on the ship (Figure 4.14).

Element	Left	Right	Total	MNI
Rib				
-	-	-	2	1
				1
Vertebra				
Thoracic	-	-	1	1
				1
			3	MNI=1

Table 4.13: *Odocoileus* elements sorted by type, age, NISP, and MNI

In Dr. Eric Guiry's analysis, the isotope levels of the deer sample showed similar patterns to the wild hog samples, suggesting they may have been collected within the same area.

Like *Caprine*, these 3 specimens were the only ones able to be assigned *Odocoileus*, but the medium mammal category may have specimens belonging to *Odocoileus* that could not be identified to this genus.

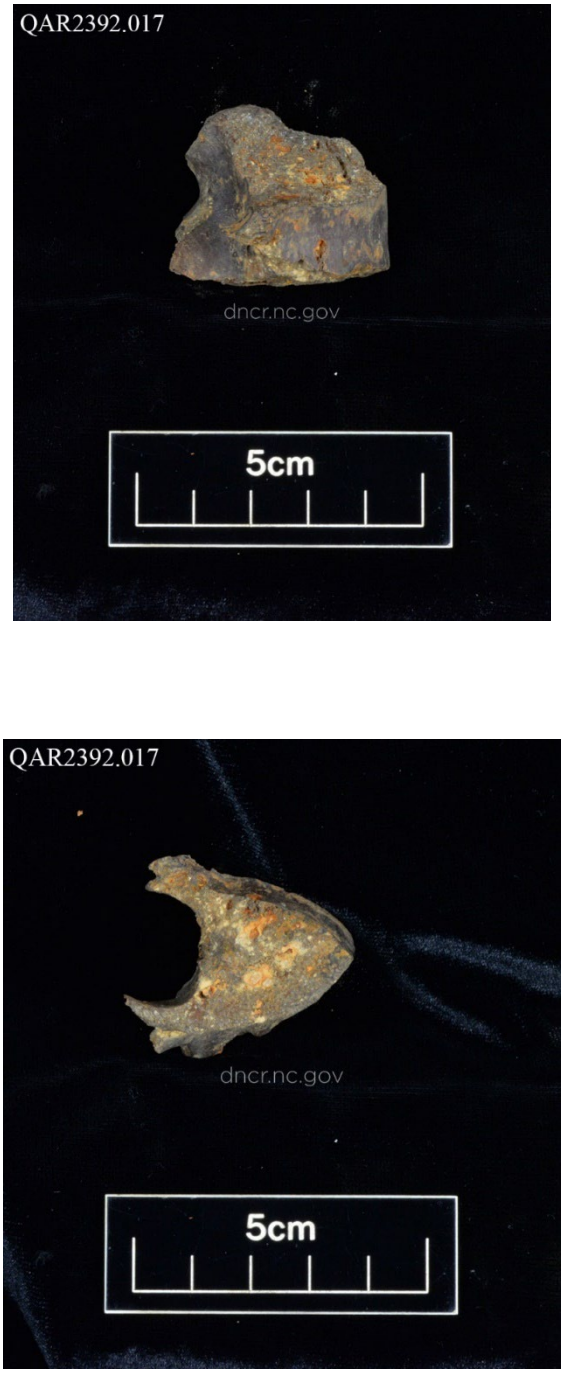

Figure 4.14: *Odocoileus* thoracic vertebra. The specimen shows extensive iron staining due to corrosion of adjacent iron artifacts. (NCDNCR)

Skeletal Analysis*: Rattus rattus*

Only two elements were positively identified as a rat, one juvenile ulna (Figure 4.16), and one vertebra, making the MNI 1 (Table 4.15). During Guiry's analysis, he determined that the ulna belonged to the species *Rattus rattus*, otherwise known as the black rat or ship rat. The vertebra may belong to different species within the genus *rattus* but has been labeled *Rattus rattus* for this analysis due to its association with the ulna. Because black rats have always been much more common than their counterpart *Rattus norvegicus*, also known as brown rats, I feel confident labeling it as *Rattus rattus* (Matheson 1939: 77).

Element	Left	Right	Total	MNI
Ulna				
Juvenile	-	-	1	1
				1
Vertebra				
-	-	-	1	1
				1
			2	MNI=1

Table 4.15: *Rattus rattus* elements sorted by type, age, NISP, and MNI

No sign of butchery or human consumption is present on these remains, nor would I expect there to be. These rats were not part of the food assemblage but rather unfortunate stowaways who were not able to make their escape with Blackbeard during the wrecking.

While there is a low number of elements associated with *Rattus rattus*, the bones are small and light and would have easily been lost during the wreck and site formation. Some small rodent specimens may be present in the small unidentified category but could not be attributed confidently to mammals. Besides the faunal remains, gnawing marks on other faunal specimens provide evidence for their presence.

Figure 4.16: *Rattus rattus* ulna (NCDNCR)

Large Mammal Analysis

During analysis, the designation of "large mammal" was given to what was most likely a pig or cow specimen but could not be attributed to either one confidently. Rib and vertebra were the only identifiable elements, with 2 ribs and 2 vertebrae. Most of the specimens were indeterminate, but that of a large mammal (Table 4.17). Neither the ribs nor vertebrae are unique elements, so even if they were able to be identified as specifically *Bos taurus* or *Sus scrofa*, it would not increase the total MNI for either species. Both rib and vertebrae were commonly found in *Sus scrofa* and *Bos taurus*, so the interpretation of the skeletal analysis would not be different, nor would any of these elements be able to be attributed to a species.

Element	Left	Right	Total
Rib			
-	-	-	2
Vertebra			
-	-	-	2
Indeterminate			
-	-	-	10
			14

Table 4.17: Large mammal elements sorted by type, age, and NISP

Bos taurus is a larger animal than *Sus scrofa*, but *Sus scrofa* bones tend to be denser and larger than *Caprine* or *Odocoileus*. Particularly large fragments are more likely to belong to *Bos*

taurus than *Sus scrofa*. Still, most of the fragments within this category were too small to compare in such a manner (Figure 4.18).

Figure 4.18: Large mammal fragment (NCDNCR)

Medium Mammal Analysis

The category medium mammal has the third-highest number of individual specimens, with a NISP of 40 (Table 4.19). By NISP, this category accounts for 23% of the total assemblage. Many of the specimens are indeterminate; however, rib, vertebrae, humerus, and scapula (Figure 4.20) were found. In typical fashion, compared to the rest of the food items mammals in this assemblage, there is a noticeable number of vertebrae and ribs present. This assemblage had both mature and juvenile specimens.

Element	Left	Right	Total
Rib			
-	-	-	3
Vertebra			
Lumbar	-	-	2
Unfused Epiphysis	-	-	1
Humerus			
-	-	-	2
Scapula			
-	-	-	6
Indeterminate			
-	-	-	26
			40

Table 4.19: Medium mammal elements sorted by type, age, and NISP

Figure 4.20: Medium mammal scapula (NCDNCR)

Specimens from the medium mammal category likely belong to a medium ruminant species, such as *Caprine* or *Odocoileus*. The identified elements could be identified as medium

ruminants, while most indeterminate specimens could only be attributed to medium mammals. Some of the specimens listed as indeterminate in this category may belong to *Sus scrofa* due to the overall size of a pig skeleton. It is unlikely that any of the identified elements could be attributed to *Sus scrofa*, as during analysis, the rib, vertebra, humerus, and scapula were determined to belong to a medium ruminant rather than a pig.

There are many unique elements present in this category that would change the interpretation of *Caprine* and *Odocoileus* if they were able to be identified as such. *Caprine* has a NISP of 1, while *Odocoileus* has a NISP of 3, meaning any specimen that can be identified to those genera would be statistically powerful. The low NISP values for each genus can be attributed to the number of specimens that could not be identified besides their size within this category. Further analysis, such as a stable isotope analysis of these specimens, may be able to identify the specific genus to which they belong.

Non-Mammalian Skeletal Analysis

The NISP for non-intrusive, non-mammalian individuals is thirteen conclusively non-mammalian specimens and five small unidentified specimens that may also include small mammals. The thirteen specimens represent just 8% of the total assemblage by NISP. The identified families are *Anatidae* and *Meleagris*, followed by the less specific categories of fish and avian. A MNI of 4 can be attributed to non-mammalian individuals, making up 18% of the total assemblage by MNI.

Anatidae Skeletal Analysis

The genus *Anatidae* (duck) has a NISP of 1 and a MNI of 1 (Table 4.21). It represents less than 1% of the total assemblage's NISP, at 0.6%. The only specimen is an intact humerus belonging to a duck from the east coast of the Americas (Figure 4.22). An exact species could not be determined despite the preservation of the element. The preservation and lack of staining suggested that it may be intrusive but was determined to be in context. It is medium-sized and likely belongs to a sea or coastal duck, such as *Bucephala clangula* (Common Goldeneye) or *Melanitta deglandi* (White-winged Scoter).

Element	Left	Right	NISP	MNI
Humerus				
-	-	-	1	1
				1
			1	MNI=1

Table 4.21: *Anatidae* elements sorted by type, age, NISP, and MNI

Like the smaller rat bones, the site wreckage may have caused the light bones of a duck to be lost to the ocean.

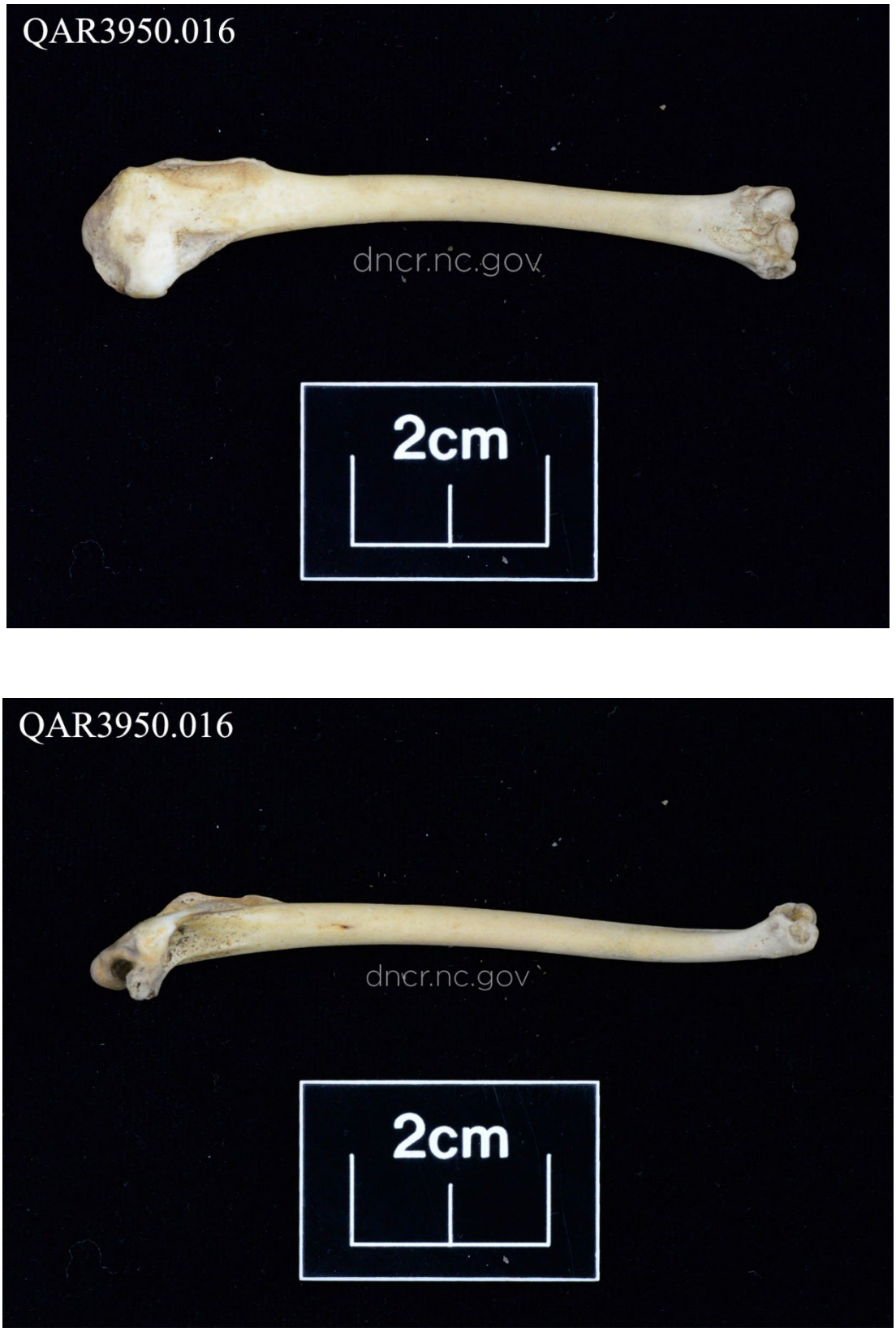

Figure 4.22: *Anatidae* humerus (NCDNCR)

Meleagris Skeletal Analysis

Meleagris (turkey) has a NISP of 2, resulting in a MNI of 1 (Table 4.23). By NISP, *Meleagris* represents only 1.2% of the total assemblage. The only element identified was a tibiotarsus, the fusion of the tarsus and tibia in a bird (Figure 4.24). The tibiotarsus belongs to an adult bird that has undergone epiphysial fusion, which would have occurred within the first 10 months of the bird's life (Reitz and Wing 2008: 71).

Element	Left	Right	Total	MNI
Tibiotarsus				
-	-	-	2	1
				1
			2	MNI=1

Table 4.23: *Meleagris* elements sorted by type, age, NISP, and MNI.

Guiry performed stable isotope analysis on the tibiotarsus and discovered that the isotope signatures suggested a maize-based diet or nearby salt marsh. He interpreted it as more likely that the turkey was reared nearby through husbandry and may not have been wild.

Figure 4.24: *Meleagris* tibiotarsus (NCDNCR)

Avian Skeletal Analysis

9 specimens could be identified as avian in nature but could not be identified as any specific taxon or element (Table 4.25). Some specimens appear to be leg bone fragments (Figure 4.26). These specimens could represent *Meleagris*, *Anatidae*, or any other bird in the Atlantic Ocean and coasts. However, since no other avian families were identified, it can be concluded that these specimens were duck or turkey rather than an unknown and unidentified species.

Element	Left	Right	Total
Indiscriminate			
-	-	-	9
			9

Table 4.25: Avian elements sorted by type, age, and NISP

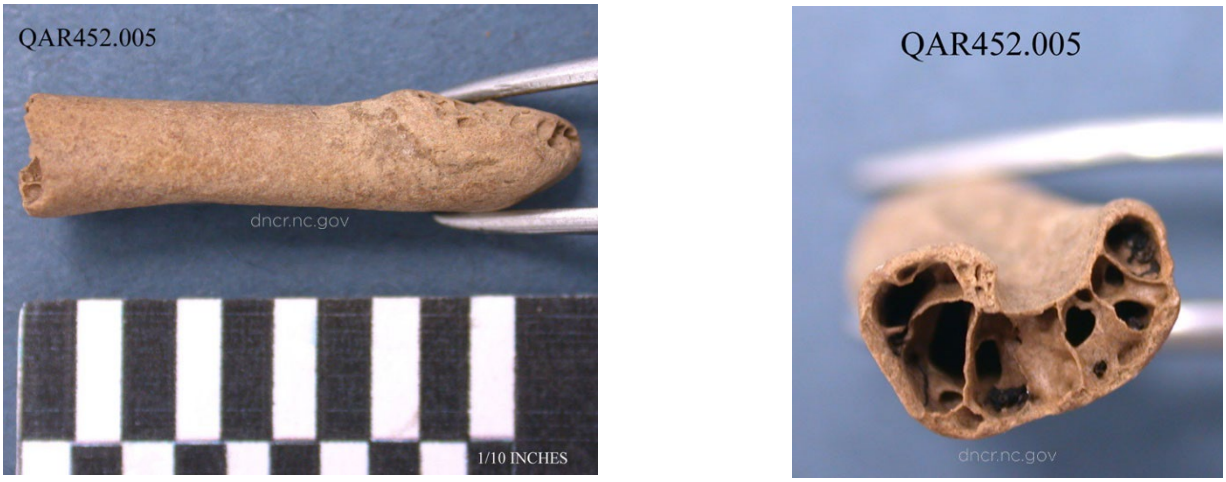

Figure 4.26: Unidentified avian limb bone exterior and bone structure (NCDNCR)

Fish Skeletal Analysis

Only one fish specimen could be placed in *Queen Anne's Revenge*'s context- a single vertebra (Figure 4.28). In a previous analysis of the assemblage, it was determined to have marks where it had been hacked or sheared as part of butchery. The shape and material allow the vertebra to be identified more closely with a bony fish, like Black Sea Bass (*Centropristis striata*), rather than a cartilaginous fish like a shark or ray. With the singular vertebra, it is also difficult to place a size on it that would help give it a taxon, and it is instead labeled very simply as "fish." The MNI is 1, representing at least 1 fish, but it is a conservative estimate (Table 4.27).

Element	Left	Right	Total	MNI
Vertebrae				
-	-	-	1	1
				1
			1	MNI=1

Table 4.27: Fish elements sorted by type, age, NISP, and MNI.

Within the assemblage, there are several other fish specimens. Some can be attributed to a specific element or species, while others are indeterminate (see Appendix 1). Most of them are identifiable as native North Carolina species. Because the site is a shipwreck off the coast of North Carolina, only the singular specimen that can prove human use was used in this analysis.

Specimens within the collection deemed intrusive may have been consumed on *Queen Anne's Revenge* but were not considered as there was no additional evidence.

As with *Rattus*, avian, and other small bones, fish specimens would have been at much greater risk of being lost because of the wreck.

Figure 4.28: Fish vertebra with butchery marks (NCDNCR)

Figure 4.28: (continued): Fish vertebra with butchery marks (NCDNCR)

Small Unidentified Skeletal Analysis

The remaining specimens were attributed to the size class small, represented by the NISP of 5 (Table 4.29). These specimens often could not be attributed to a class of mammal, avian, reptile, or fish. The Os coxae and one phalanx were determined to belong to a small mammal but nothing further (Figure 4.30).

Element	Left	Right	Total
Os Coxae			
-	-	-	1
Phalanx			
-	-	-	2
Indiscriminate			
-	-	-	2
			5

Table 4.29: Small unidentified elements sorted by type, age, and NISP.

How this assemblage was acquired and utilized on *Queen Anne's Revenge* will be explored in the next chapter.

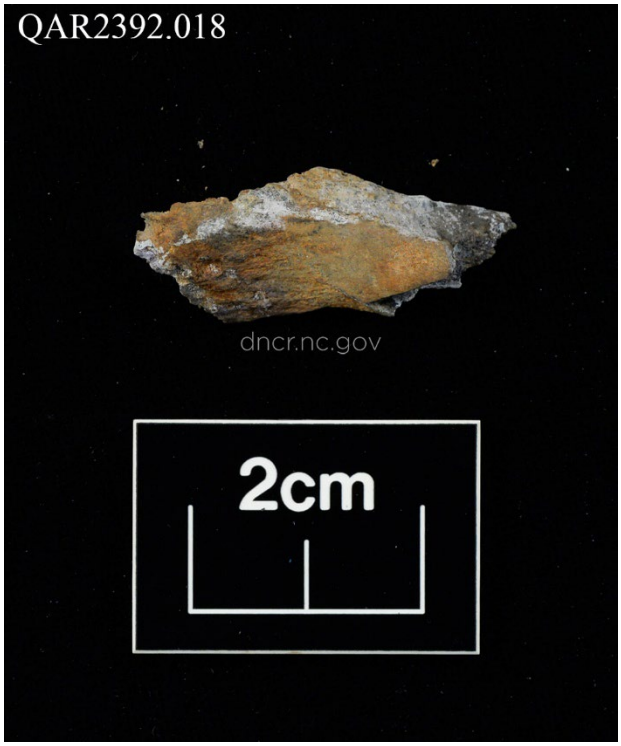

Figure 4.30: Os coxae of small mammal (NCDNCR)

Chapter 5: *Queen Anne's Revenge* Assemblage Discussion

The faunal assemblage from *Queen Anne's Revenge* suggests a diet made up of mostly pig and cow, which was supplemented by other domestic and wild species. The assemblage suffered from the wrecking, abandonment, and degradation of the ship over hundreds of years, likely resulting in skewing of the data. Many of the problems originate from certain specimens, especially within the medium mammal category, which cannot be assigned a taxon. The categories of *Caprine* and *Odocoileus* have low NISP and MNI, and even one specimen being attributed to them could impact the interpretation. Furthermore, the ship's state would have resulted in smaller bones being lost, which also plays a part in the skewing. Pig and cow would likely still be the most abundant species were the assemblage perfectly preserved, but the difference in percentage of abundance between each species would likely be less intense. Given how many medium mammal specimens could only be identified as medium ruminants, I would also expect to see a higher NISP and MNI in either sheep/goat or deer if the assemblage was in perfect state.

Pigs and cows appear to be the most relied upon species, as they match the common types of salted meat used on ships during the 18th and 19th centuries (Wright 2011). Many specimens suggest the presence of immature or juvenile individuals (unfused), which may be due to the individuals being truly young or because many of the species complete skeletal fusion after the age they would typically be butchered.

Mammalian Discussion

Mammals account for most of the faunal remains in the wreck, which makes sense due to size and availability, especially that of pigs and cows. Pigs and cows were a standard provision on a ship, so their presence was expected (Simmons 2011). The three most commonly occurring types are pig, cow, and medium mammal. Combining the deer, sheep, and goat with the medium mammal category shows how these categories comprise over three-fourths of the site assemblage (Figure 5.1). *Queen Anne's Revenge* relied heavily on medium and large mammalian species.

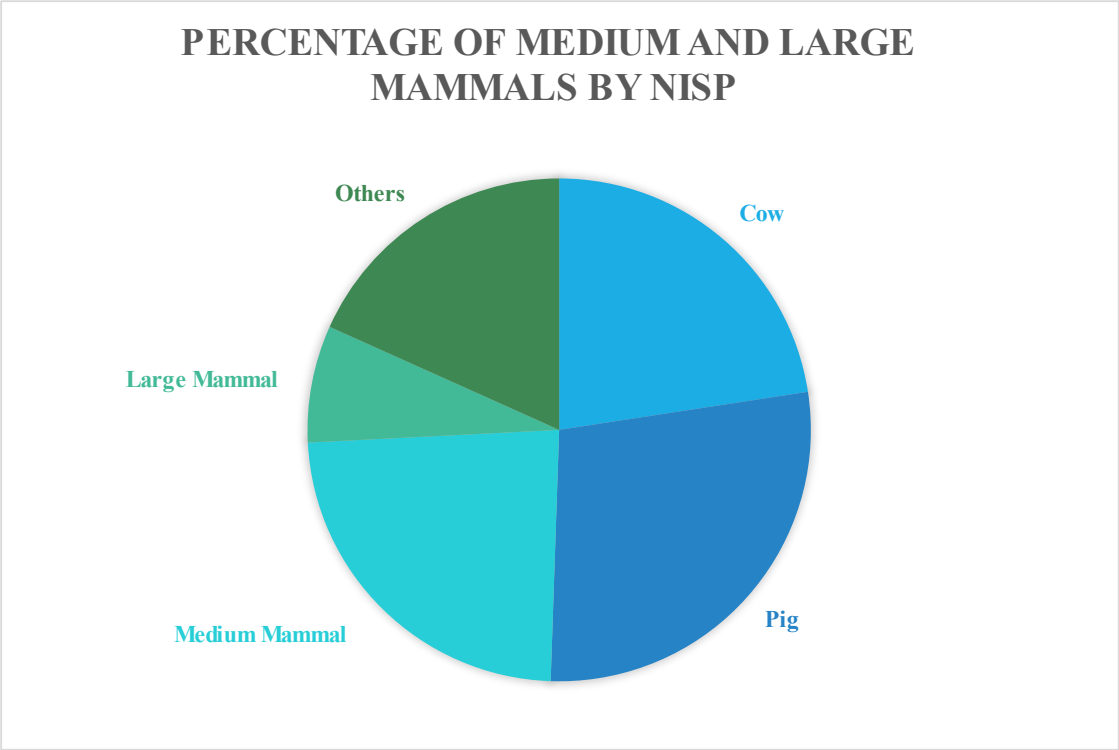

Figure 5.1: Pie chart presenting assemblage percentage attributed to mammals compared to other specimens by NISP.

Pig

Pigs (*Sus scrofa*) were identified to have the highest numbers in both MNI (6) and NISP (52) in the assemblage, implying it was the most abundant species on the ship. The stable isotope alongside the identified elements shows that the pigs came from both the Old and New World. On *Queen Anne's Revenge*, the specimens that appear to be from the Old World are likely to be the result of preservation in Europe, and the specimens from the New World are likely to be the result of livestock for the sake of fresh meat. The Old World pig specimen can reasonably be assumed to be from *La Concorde's* provisions or stolen from another ship coming to the New World from the Old World. The specimens attributed to wild boar are because of hunting practices along the East Coast to continue to maintain ship stock, something performed by buccaneers, pirates, and sometimes standard sailors if the food went bad along the East Coast and the Caribbean (Migaud 2011:286).

The extent of Blackbeard's husbandry practices is unknown, but the assemblage alongside accounts of looting suggests that live pigs were present on the ship, even if just for a moment. Mariner Henry Bostock gave a deposition on December 19th, 1717, describing being robbed by *Queen Anne's Revenge* as he sailed the sloop *Margaret* off the coast of Puerto Rico. In this robbery, Blackbeard asked specifically if they had livestock and took thirty-five live pigs from them. Bostock (1718) also mentions that it did not seem like the pirates wanted provisions, only the livestock. The presence of livestock on ships was common and usually occurred because they were being transported to a new location for breeding stock there, they were being transported as goods to sell at a port or to offer an additional source of food, which was usually reserved for high-ranking officers or guests on non-pirate vessels (Migaud 2011:283). It is

unknown why Blackbeard stole the livestock, whether for food or as goods, or how long the livestock stayed alive.

Keeping livestock comes with many issues: smells, noise, manure, and providing food for your food. It is unclear if any pens were available to house the live pigs or where they would have been kept if they had remained alive for the days following their capture. Live pigs were often kept on the deck or in steerage, either free-roaming or penned up (Migaud 2011:283; Wilde-Ramsing and Carnes-McNaughton 2018:130). The juvenile elements and individuals are younger than twelve months, suggesting that many pigs were not kept alive much longer than that.

Cattle

Cow (*Bos taurus*) was the second highest in both MNI (4) and NISP (42). Because there is a distinct lack of carpal and tarsal bones, and the remains present represent the meatiest part of the cow, this assemblage suggests most, if not all, the cow remains were slaughtered or butchered before they made their way onto the ship. These remains were then likely salt-preserved for travel, a common staple among sailors during the time (Rixson 1989). The cow may have also been from both the New and Old World, and further analysis of the stable isotopes may help identify the regions where the cattle were raised before slaughter and preservation. The presence of preserved cattle is expected on any ship and may be present from *La Concorde* before Blackbeard captured her or taken from other locations on the East Coast.

The assemblage lacks *Bos taurus* carpal or tarsal bones, which indicates preserved provisions over live cattle. However, historical records suggest that *Queen Anne's Revenge*

hosted at least four live cattle. In December of 1717, Henrey Bostock reported the loss of "four Beeves" alongside the thirty-five pigs stolen from his sloop *Margaret* by Blackbeard (1718). (Beeves is the plural for beef and an archaic term for cow and cattle.) Much like keeping pigs as livestock, maintaining cattle would also be a challenging, and would have likely been tethered on deck or corralled under it (Wilde-Ramsing and Carnes-McNaughton 2018:130). How long the cattle stayed after being stolen and the purpose behind their theft is unknown; however, they may have been used for food and provisions.

Sheep/Goat

One juvenile *Caprine* fragment was identified, suggesting that high-quality or luxury meat was consumed at some point in the ship's life. Sheep and goats were often found as livestock on ships because of how poorly the meat kept, even preserved, so this specimen may suggest a live juvenile sheep or goat on *Queen Anne's Revenge* (Migaud 2011:288). From the fragment alone, however, not much information can be ascertained. If specimens from the medium mammal category can be attributed to *Caprine* in the future, there may be a stronger interpretation.

Previous analysis identified the singular fragment as lamb, although goat was far more common in the Caribbean and the southeast coast of North America. Sheep species from the western hemisphere were unsuccessful colonial livestock animals due to fertility problems and their inability to handle the heat and humidity of the Caribbean (Reitz 1992:89). Goats and species of African sheep that were imported onto the islands were far more common because of their ability to thrive in the hot tropical climate (Wallman 2019: 330). Along the southeast coast

of North America and in the Caribbean, the Spanish also brought goats with them, which resulted in a species now referred to as the Spanish goat or brush goat (Capra aegagrus circus). For hundreds of years, Spanish goats were a dominant and necessary species in southern North America's foodways (Gipson 2019:43).

It is reasonable to assume that it was picked up in the Caribbean or southern North America and would have likely been consumed by the pirates on *Queen Anne's Revenge.*

Deer

Deer (NISP=3, MNI=1) remains appear to resemble an adult individual. The elements present have a high meat content, and even in the medium mammal category, no tarsal or carpal bones were present. This may suggest that the deer was field-dressed before being brought back to the ship or that those elements have been lost in the degradation of the ship. The metatarsal of a wild boar is present in the pig assemblage, which would raise questions about why they would have field-dressed a deer and not a boar given their similar size, but it is difficult to tell why there are no tarsal or metatarsal elements present. As with sheep, if the medium mammal specimens can be attributed to *Odocoileus* in the future, further interpretation is possible.

Rat

Rat (NISP=2, MNI=1) was probably not consumed on *Queen Anne's Revenge* but would have been a common pest that any seasoned sailor or pirate would have often encountered during their lifetime. In the faunal assemblage, at least one black rat was present, and where there is

one, there are usually many. Their presence is also seen in other faunal specimens, which were gnawed on during the journey.

Avian

Only two birds were able to be identified to a taxon: turkey (NISP=2, MNI=1) and duck (NISP=1, MNI=1). Nine additional elements were able to be identified as avian, but nothing further. There are several bird species present from the Caribbean to the Atlantic Coast of North America, any of which the specimen may have belonged to. Birds do not offer as much meat yield as medium or large mammals, however, so the specimens likely represent a whole individual present on the ship, rather than parts of an individual. With a crew consisting of 200 to 400 men, according to scattered primary accounts (Lawrence 2008), avian creatures like ducks would have been truly supplementary, as it would have been difficult to acquire the number of birds necessary to feed a crew that large. The turkey appeared to have an isotopic signature suggesting a degree of husbandry, so it is unclear how *Queen Anne's Revenge* came to possess the bird. Perhaps it was stolen or hunted from where it was being reared or stolen from a ship that had recently purchased it in the area. It is also unknown who may have been domesticating the turkey. Turkey was originally domesticated by Mesoamericans and spread into North America before being adopted by the Spanish (Speller et al. 2010: 2809) Still, if the individual belonged to Native Americans along the Atlantic coast, he could have bought or bartered for it- this seems unlikely, however, as Blackbeard was not known for his peaceful commerce, nor is there any evidence on *Queen Anne's Revenge* for trade with Native Americans.

Fish

Fish (NISP=1, MNI=1) were the most difficult to place within the context of *Queen Anne's Revenge*. In this context, it is unfortunate that the saying "there are plenty of fish in the sea" is true. Even if you go to the North Carolina State Aquarium at Pine Knoll Shores, you will find a model of *Queen Anne's Revenge's* wreck, surrounded by some of the native fish that naturally congregate there. There are a plethora of fish remaining within *Queen Anne's Revenge's* assemblage, but nearly all of them cannot be ruled out as intrusive. Only one vertebra was determined to have butchery marks, suggesting its use as a human food item, but could not be identified as anything other than a fish. It is likely a bony fish, which could be any fish native to the Caribbean or Atlantic Coast of North America during the 6 months of summer into winter that Blackbeard sailed *Queen Anne's Revenge*. Much like avian species, the number of fish that would have needed to be consumed to make up a large portion of a 300-person crew's diet is astronomical, and fish were likely supplementary to other food items rather than a staple. The MNI of 1 is a very conservative estimate for a very broad category of animals and instead should be interpreted as a positive indication for fish consumption on *Queen Anne's Revenge*. How Blackbeard and his crew may have acquired this fish is another question, as only a few *Queen Anne's Revenge* artifacts indicate fishing- though those personal effects may have been taken during the ship's evacuation. While no metal fishhooks have been found, a copper alloy fishing hook leader line similar to those found in nearby French settlement posts was discovered at the site (Wilde-Ramsing and Carnes-McNaughton 2018:140). The pirates may have had the means to fish, and have been fishing regularly, or as with much of their food, may have stolen the fish from merchants or fishermen.

Reptile

Like fish, the presence of turtle specimens could not be attributed to being definitively in context and were ultimately excluded from the study. One turtle specimen underwent stable isotope analysis, where it was determined that it had a signature expected of a coastal turtle on the Atlantic coast of North America. Turtles may have been food items, but as the specimens could not be ruled out as intrusive, they were not considered in this analysis (See Appendix 1). Some of the remains appeared to be fossilized, implying their death far before the sinking of *Queen Anne's Revenge*. If turtles had been consumed on *Queen Anne's Revenge*, they would have been supplementary, like birds or fish.

Closing Discussion

As discussed, *Queen Anne's Revenge* assemblage shows a relatively high reliance on pigs and cows while supplementing their diet with other animal species. There are many reasons why the assemblage described above does not represent a full picture of the pirate diet. Specimens may have been lost during the wrecking event; they likely took the provisions they had with them as they fled the ship, and this is assuming that they didn't just throw all their food waste overboard when most convenient. However, this assemblage still shows information about the pirate diet on *Queen Anne's Revenge* that wasn't known before. This information can be used to compare the diet of Blackbeard and his crew to other ships during the time using niche breadth analysis.

Chapter 6: Niche Breadth Comparison

Two additional contemporary ships' assemblages were compared to *Queen Anne's Revenge* to assess diversity and utilization of diet. These two ships were the French colonial ship *La Belle* (deFrance 2017) and the English merchant ship *Earl of Abergavenny* (Gautrey 2014). As mentioned in the introduction, these two ships were chosen due to their location, the date they sank, and faunal analysis. To achieve this analysis, only positively identified faunal remains deemed possible food items were used in the calculation. The *Rattus rattus*, large mammal, medium mammal, Avian, and small unidentified specimens were not used in the niche breadth analysis per my discretion. When choosing what specimens to include for the two other ships, I used only the animals that Susan deFrance and Hannah Gautrey determined to be food items, as this analysis was completed to analyze diet diversity, not overall assemblage diversity, as well as the MNI they provided. All three analyses were completed using the formula discussed in the Comparative Analysis section of the Methods Chapter.

Within the *Queen Anne's Revenge* faunal assemblage, only seven species were identified and determined to be food items. While fish was not able to be identified as a specific species, there is only one specimen, and it bears evidence of human use, so it was included in this analysis under fish. The seven species total an MNI of 15. The seven species by the percentage of the faunal assemblage are pig (40%), cow (26.67%), sheep/goat, deer, duck, and fish (all 6.67%) (see Table 6.1). Before doing any further calculations, it is clear from this data that pig and cow primarily dominated *Queen Anne's Revenge's* assemblage.

Species	MNI	% of Assemblage
Pig	6	40.00
Cow	4	26.67
Sheep/Goat	1	6.67
White-Tailed Deer	1	6.67
Duck	1	6.67
Turkey	1	6.67
Fish	1	6.67
	15	100

Table 6.1: MNI and Percentage of Assemblage for Food Species on *Queen Anne's Revenge*

Earl of Abergavenny's assemblage had six species that could be attributed to food items, as determined by Hannah Gautrey (2014). The horses and dogs discovered during her analysis were not food items, so they were not included in this niche breadth analysis. The total assemblage has an MNI of 41. The six species by the percentage of the faunal assemblage are pig (39.02%), cow (36.59%), sheep/goat (17.07%), rabbit, turkey, and domestic fowl (all 2.44%) (see Table 6.2). Like *Queen Anne's Revenge*, *Earl of Abergavenny*'s assemblage is also dominated by pigs and cows, although they only had domesticates and fewer non-cow or pig options. This assemblage also features both live and butchered specimens (Gautrey 2014).

Species	MNI	% of Assemblage
Pig	16	39.02
Cow	15	36.59
Sheep/Goat	7	17.07
Rabbit	1	2.44
Turkey	1	2.44
Domestic Fowl	1	2.44
	41	100

Table 6.2: MNI and Percentage of Assemblage for Food Species on *Earl of Abergavenny*

Unlike the previous two ships, *La Belle* had a much greater variety of species identified to be food items (deFrance 2017). In total, 18 individual species with a total MNI of 33 were in the ship's assemblage. Several distinct species of fish, birds, turtles, and mammals were identified, although only a small number of fish species could be attributed to food refuse as opposed to naturally intrusive (deFrance 2017:759) (see Table 6.3). No one species accounted for more than 15.15% of the total assemblage. This number may be inflated due to the number of fish bones that were able to accurately be identified to both a species and human use, but *Queen Anne's Revenge* can only account for a singular fish bone of an unknown bony fish species, and *Earl of Abergavenny* does not have any fish bones, each fish species has been listed as their own so long as deFrance deemed them a food item. It is also unknown if the white-tailed deer specimens represent food use or were killed for the sake of trophies, as only cranial fragments and antlers were discovered. A crewman's journal does, however, describe several instances of hunting deer and field dressing them alongside other food items, such as bison, so they have been

included in this analysis (Joutel 1998). The most common food fauna by assemblage percentages were pig (15.15%), white-tailed deer (12.12%), and Atlantic cod (12.12%). White-tailed deer is a wild species, while pig and cod likely represent provisions.

Species	MNI	%
Pig	5	15.15
White Tailed Deer	4	12.12
Atlantic Cod	4	12.12
Western box turtle	3	9.09
Sheep/Goat	2	6.06
Geese	2	6.06
Cow/Bison	2	6.06
Turkey	1	3.03
Tern	1	3.03
Small Turtle	1	3.03
Small Duck	1	3.03
Shorebird	1	3.03
Left-Eyed Flounder	1	3.03
Large turtle	1	3.03
Killifish	1	3.03
Flounder	1	3.03
Domestic Duck	1	3.03
Bison	1	3.03
	33	100.00

Table 6.3: MNI and Percentage of Assemblage for Food Species on *La Belle*

After determining the species representing human use on all three vessels and calculating the percentage of the assemblage's MNI each represents, I performed a niche breadth analysis. As described in the methods section, each specimen's percentage was squared, the total of those squares was summed, and then that sum was divided by the MNI, resulting in the niche breadth score. The higher the number, the more diverse the assemblage. Upon doing that for all three vessels, the niche breadth scores were as follows: *Queen Anne's Revenge* at 3.9474, *La Belle* at 12.2360, and *Earl of Abergavenny* at 3.1538 (see Table 6.4).

Ship	Niche Breadth
Queen Anne's Revenge	3.9474
La Belle	12.2360
Earl of Abergavenny	3.1538

Table 6.4: Results of niche breadth between three ships: a colonial ship (*La Belle*), a merchant ship (*Earl of Abergavenny*), and a pirate ship (*Queen Anne's Revenge*) For full calculation, please see Appendix 2

The results of the niche breadth analysis are as follows: the faunal assemblage on *Queen Anne's Revenge* has a niche breadth of 3.9474, which is a low number. The assemblage suggests a strong reliance on specific foods. After seeing the percentages of species by NISP and MNI on *Queen Anne's Revenge* (see Figure 4.3, Figure 4.4) it is not hard to see what animals they were relying on for their food, given the volume of *Bos taurus* (cow) and *Sus scrofa* (pig) remains compared to everything else.

While minute, the 3.9474 suggests some diversity in the diet on board *Queen Anne's Revenge* when compared to *Earl of Abergavenny's* niche breadth of 3.1538. This niche breadth suggests a near dependence on specific food items: *Bos taurus* and *Sus scrofa* (Gautrey 2014). *Queen Anne's Revenge* shares a similar reliance. The niche breadth of *Queen Anne's Revenge* being higher than *Earl of Abergavenny* allows us to interpret that, at least by the remains present and identified within each assemblage, *Queen Anne's Revenge* had a slightly more diverse diet. On *Queen Anne's Revenge*, some remains, such as fish and deer, could be associated with hunting or fishing along the coast. In contrast, the *Earl of Abergavenny* appears to be a fully domesticated assemblage. *Earl of Abergavenny* had just set off on its commercial journey to China, and there would have been no reason for non-domesticated food items on the ship. The food items identified by the *Earl of Abergavenny* that were used for this niche breadth were *Bos Taurus* (cattle), *Caprine* (Sheep/Goat), *Sus* (Pig), *Oryctolagus cuniculus* (European rabbit), *Meleagris gallopavo* (domestic turkey), and *Gallus gallus* (domestic fowl) (Gautrey 2014:42).

At least one domestic turkey was present in *Earl of Abergavenny's* assemblage, mirroring *Queen Anne's Revenge*. Though no stable isotope analysis was done on that collection, I would assume the *Meleagris gallopavo* from *Earl of Abergavenny* would boast a very different signature than the one on *Queen Anne's Revenge*, given the merchant ship had sunk off the coast of England intending to go to China (Gautrey 2014:16). I would expect the turkey on that ship to have been raised at least partially in England sometime in the very early 19th century, as opposed to the turkey on *Queen Anne's Revenge*, which appears to be from North America. I would go as far as to confidently assume that most, if not all, of *Earl of Abergavenny's* provisions and livestock came from England and its surrounding area.

Comparatively, *La Belle* has a higher niche breadth of 12.2360. This number suggests a more diverse diet, which matches the desperation of a lost French ship as it moved along the coast of North America toward Texas from France (deFrance 2017). Some fish were assumed to be salted preserves for the journey across the ocean, but native fish, like *Bothidae* (lefteye flounders), also appear to have been used. This assemblage shows a need to live off of the land as standard provisions such as live pig and salted cod were spoiling or being depleted. The low niche breadth result reflects the fact that no one species represented more than 16% of the assemblage and shows that while they would have otherwise relied on the standard provisions, they no longer could.

The integrity of the assemblages may also affect the faunal food items able to be recovered for each ship. While both *Queen Anne's Revenge* and *Earl of Abergavenny* were done in a standard underwater excavation style, where the archaeologists spent time underwater diving, dredging, and airlifting artifacts while recording what they could (Wilde-Ramsing 2006:173, Gautrey 2014:19), *La Belle* was instead surrounded by a steel-wall cofferdam and drained, allowing it to be treated like a terrestrial site, as opposed to an underwater site (Hendrick et all. 2017:45). This allowed for a more specialized excavation and conservation of the site, which was aided by the fact that Matagorda Bay has far less disturbance than Beaufort Inlet and already featured a more preserved site.

Figure 6.5 shows a graph demonstrating the reliance on specific species. This graph does not represent the total number of individuals present on each ship but rather what percentage of the assemblage they account for. The larger the bar, the greater the reliance on that species for that specific ship. No species accounts for more than 15.15% of *La Belle's* assemblage, whereas in *Queen Anne's Revenge* and *Earl of Abergavenny*, pig accounts for nearly 40%. The graph also

displays the variety of species that were utilized by *La Belle* as opposed to *Queen Anne's Revenge* and *Earl of Abergavenny*, showing once more the need to use food outside of standard naval provisions.

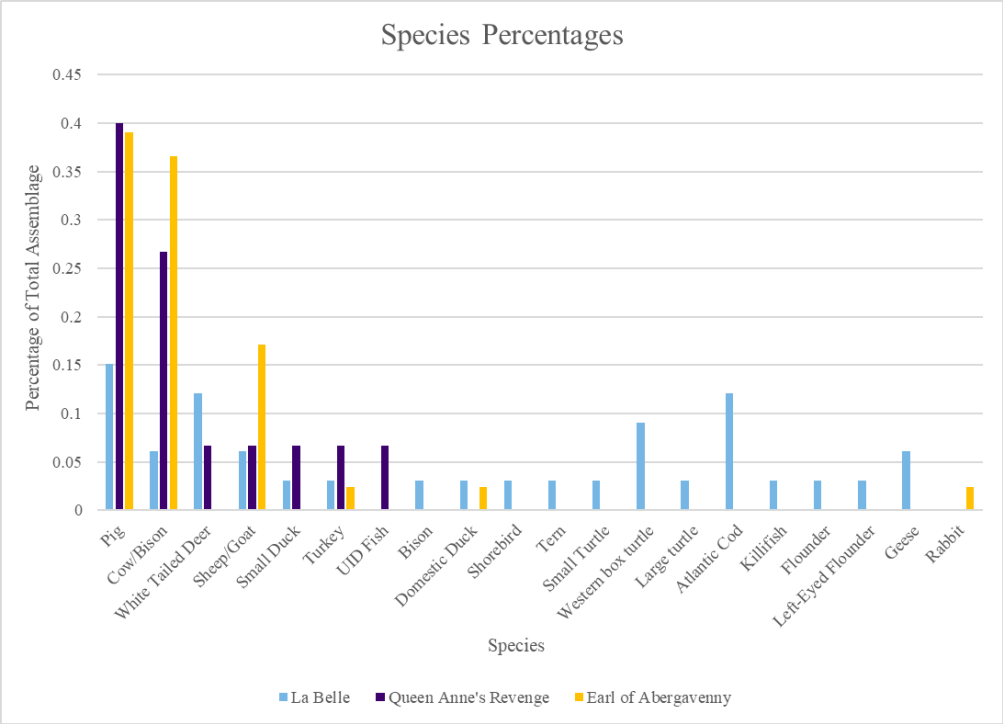

Figure 6.5: Percentage (by decimal point) of (consumed) assemblage each species accounts for by MNI by each ship: (*Queen Anne's Revenge, Earl of Abergavenny, and La Belle)*

Queen Anne's Revenge had a total MNI attributed to consumed species of 15, *Earl of Abergavenny* 41, and *La Belle* 33. Given the size differences in assemblages, *Queen Anne's Revenge* likely has extreme numbers associated with the percentages of assemblage by MNI. However, *Queen Anne's Revenge* does show evidence of the acquisition and use of native species outside of normal provisions, though they still relied heavily on pigs and cows. This interpretation supports the niche width being higher than a ship that stocked itself standardly but lower than a ship with little to no access to standard provisions. This means that Blackbeard and his crew could sustain themselves on a near standard diet.

Discussion

The niche breadth of *Queen Anne's Revenge* confirms a reliance on pigs and cows that became apparent during the assemblage analysis. As commented during the discussion portion of the thesis, the additional species were likely supplemental and a way to eat fresh food.

The niche breadth also showed that this exploitation of the local fauna gave the pirates a slightly more diversified diet when compared to a recently stocked merchant vessel leaving England. I also did not separate the wild and domestic pigs when doing this analysis since *Sus scrofa* is one species, but also because it is difficult to know without additional isotope analysis how much of *Queen Anne's Revenge's Sus scrofa* population can be attributed to domestic or feral. Though the pig is the most abundant in both *Earl of Abergavenny and Queen Anne's Revenge*, the diversity within the pig category- North American, European/African, feral- appears higher on the pirate ship than the merchant ship. The food outside of pigs and cows, like fowl or rabbit, was likely food intended for wealthy guests or the captain's table, not the general crew or passengers. Hanna Gautrey (2014) concluded that the *Earl of Abergavenny* represented the average faunal assemblage for any standard ship in the 18th and 19th centuries. If we consider that conclusion valid, *Queen Anne's Revenge* has a slightly more diverse diet than the standard.

La Belle shows what true need and reliance on the land look like when nothing else is available. With confidence, *Queen Anne's Revenge* has a much less diverse assemblage than *La Belle*. After comparing these two assemblages, Blackbeard and his crew did not seem to suffer from severe food insecurity; they only supplemented their diet with wild game rather than relying on it. Blackbeard was an experienced sailor and pirate with far more experience in the Americas than a French colonial ship that had already undergone bad luck. Blackbeard also had

the means, non-adherence to laws, and ability to steal food from traditionally stocked vessels, as opposed to the passengers of *La Belle*, who had to survive instead. I would argue that these reasons are why *Queen Anne's Revenge* has a much lower niche breadth than *La Belle*.

The complete comparative analysis through niche breadth shows that the crew of *Queen Anne's Revenge* could consume a relatively stable diet relying on pig and cow, which was standard for sailors during this time. Wild game was likely consumed when needed or when fresh meat was preferred, but it appears to have been supplemental, not foundational. The niche breadth does not suggest that the pirates had any food insecurity that would have caused them to eat outside of their typical means regularly, such as the standard for *La Belle*.

Chapter 7: Conclusion

The goal of this research was to understand the diet of Blackbeard and his crew on *Queen Anne's Revenge* through faunal analysis, then use that analysis to compare it to contemporary vessels to interpret how a pirate's diet compared to other mariners using niche breadth analysis. This research was conducted on the two hundred and fifty-five faunal remains recovered from the site, of which one hundred and seventy-two specimens were determined to be present in *Queen Anne's Revenge's* assemblage due to human activity on the ship and were ultimately used for the analysis. I hypothesized that *Queen Anne's Revenge*'s assemblage would represent a more diverse diet than standard contemporary vessels because pirates did not have easy access to legal provisions and would have had to rely on other means to find food.

The faunal analysis revealed that the *Queen Anne's Revenge* pirates' diet was mostly pig and cow, which they supplemented with local fauna. At the time of the wreck, the MNI suggests at least six individual pigs and four individual cows were present on the ship in varying stages of bone maturity. The faunal assemblage for pigs represents a collection of pre-butchered provisions and live individuals. In contrast, the cow assemblage suggests evidence of at least partial butchery before it was on the ship. Historic documents confirm the presence of live pigs and cattle stolen by Blackbeard. The other species on board the vessel, sheep/goat, deer, duck, turkey, and fish, do not represent a significant deviation in diet due to their MNI and NISP but imply they were present and utilized. The presence of wild animals, such as fish, deer, and some pig specimens, shows a pattern of hunting for some level of sustenance, likely supplemental. The analysis also suggests that at least one black rat was present in *Queen Anne's Revenge*, which is unsurprising and deemed not a food item.

After analyzing the assemblage on *Queen Anne's Revenge*, niche breadth analysis suggested a slightly diversified diet but still a heavy reliance on pigs and cows. Compared to the two contemporary vessels, *Queen Anne's Revenge* had a higher niche breadth than *Earl of Abergavenny* but a much lower niche breadth than *La Belle*. This is likely because *La Belle* ran out of provisions and ate anything they could to sustain themselves in Texas's wildlife, resulting in a diverse diet. Hannah Gautrey concluded that the *Earl of Abergavenny's* assemblage represented the standard for sailing vessels for the time regarding faunal food items. Assuming that conclusion to be valid, we can say that Blackbeard and the pirates of *Queen Anne's Revenge* had a more diverse diet than a standard vessel during the 18th and 19th centuries. Using local fauna as food items alongside their standard provisions makes their diet slightly more diverse. Where authorized sailing vessels would stock up on provisions at ports, the pirates would have likely gathered provisions by buying them through merchants willing to trade with pirates, hunting and fishing along the coasts of the Caribbean and North America, or stealing them from other ships.

Pirates, including the infamous pirate Blackbeard, did not typically record much of their lives. As other food items, such as grains, vinegar, and biscuits, would have been destroyed during the wreck and subsequent degradation of three hundred years, the faunal remains are some of the only ways we can unveil the mystery of pirates regarding their diet. As they appealed to many sailors in the seventeenth and eighteenth centuries, pirates have an appeal to people today as adventuring people living their lives together on the high seas as a form of rebellion against apparent unjust authority. Answering questions about the simple parts of life, such as their diet, can help unravel the romanticization and fantasy surrounding the prolific criminals of the early Americas.

Queen Anne's Revenge's faunal assemblage does not represent a fantastic diet of banquet meals, but a relatively normal diet of salted meat broken up by supplemental food items such as hunted game or fish or live animals they may have stolen or bought. The pirates were not in the desperate circumstance of the sailors of *La Belle* and willing to eat anything they could get their hands on and could eat a relatively normal diet of pigs and cows.

Future Research

Queen Anne's Revenge still has quite a bit of ship to be excavated and many artifacts to be treated, which will no doubt result in additional faunal remains being added to the assemblage. Future faunal analysis conducted on new specimens may alter the interpretation of the ship because the total assemblage of one hundred and seventy-two is small, and even small discoveries may be statistically significant. Similarly, future analyses of the distribution of specimens by unit may offer a unique look into the areas where food was stored or disposed of, which would be incredibly useful once the entire ship has been excavated. This would be completed by using the site map, and the artifact logs for each specimen to locate areas of density within the site map where the ecofacts were found.

Additional isotope analysis on the current and future assemblage may help identify where some of the bones came from. Stable isotope analysis isolates isolates specific isotopes of elements in bones to determine a creature's diet when it was alive (C/N) or origins (O/Sr). A broader comparative collection with further analysis of fragmentary specimens could similarly identify additional taxa and elements. It may even allow the duck and fish taxa to be determined

down to a specific species. Any unidentified bones given additional identification will be statistically significant, although it may not be possible within the current assemblage. Furthermore, a zooarchaeologist with more knowledge of Ichthyology, could study the fish within the assemblage to try to glean any additional information, as we did not have access to a robust comparative collection of fish, and fish are notoriously difficult to identify. This study could only determine evidence that fish was consumed, but not to a degree, so any further study on this can be helpful.

As part of the comparative analysis, only two other ships could be placed as contemporary and similar in size to *Queen Anne's Revenge—La Belle and Earl of Abergavenny*—so any additional ships excavated in the future will prove insightful. Future faunal analysis on ships within the Atlantic Ocean and its coasts may challenge or support the conclusion that *Queen Anne's Revenge* was more diverse than the average vessel during this time.

In the future, this assemblage may also be used to understand the degradation of osteological specimens within the Atlantic Ocean and Outer Banks. Many specimens were recovered from concretion, and study on them may show how bones are preserved and degraded due to iron concretion. This sort of study is also made possible by the good work done at the *Queen Anne's Revenge Lab*, which takes great care in recovering, treating, and curating every artifact—both in context and intrusive—that has been recovered from this wreck.

Much of the future research relies on further excavations and additional analysis of new ships and *Queen Anne's Revenge* itself. Additional research may offer further insight into a pirate's life, the food items available on the east coast of North America, and the distribution and preservation of bones during a wreck. Pirates have become more of a fantasy trope than a

historical occupation, and many inaccuracies and romanticizations have filled the gaps that history cannot fill. Archaeology such as this research is just one of the steps to truly understanding the enigmatic lives of the criminal pirates.

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Appendices

Appendix 1: Total Bone Tables

QAR#	Remarks	Count
0005.003	Pig, mandible, shatter	1
0009.003	Cattle, Vertebra, 1st cervical/axis, hacked,saw groove, 12 months+	1
0026.000	Cattle,Tibia,split	1
0101.002	Fish, sturgeon?,(vertebrae), hack/sheared	1
0120.000	Small mammal size, limb bone, split shatter	1
0150.001	Bird, limb bone, split,	4
0233.007	Pig-Cattle size, limb bone, burnt?	1
0234.002	Pig-Cattle size?, limb bone, sawn, Intrusive?	1
0265.000	Fossil bone	1
0296.000	Marine mammal, vertebrae, split, Intrusive?	1
0340.010	Cattle, vertebrae	1
0342.006	Cattle, rib, unfused, juvenile	1
0342.007	Cattle rib, hacked shaft	1
0342.008	Pig metatarsus, unfused, juvenile	1
0342.009	Pig tooth molar, unerupted, <14 mos	1
0342.010	Pig-Cattle limb bone, shatter piece	1
0342.011	Cattle vertebrae, <12 mos	2
0342.012	Pig-Cattle vertebrae, split piece	1
0342.020	Pig metatarsus, unfused, juvenile	1
0342.021	Pig rib, snapped shaft, unfused, <12 mos	1
0342.024	Pig metatarsus, fused, 18-24 mos	1
0342.025	Cattle radius (?), split-shear piece	1
0342.026	Pig phalanx	1
0342.027	Cattle rib, split section	1
0342.028	Pig cranial eye orbit	2
0342.029	Pig cranial	1
0342.030	Pig metatarsus	1
0342.032	Pig metacarpus	1
0342.033	Pig-Cattle limb	1
0351.003	Bone, Pig phalanx, juvenile	1
0366.012	Pig metatarsus	1
0366.013	Pig metatarsus, snapped	1
0366.014	Pig-cattle limb	1
0366.015	Cattle ulna, hack/shatter	1

0366.016	Pig cranial, hacked/split	1
0366.017	Pig metatarsus	1
0366.053	Pig-Cattle, limb	1
0366.090	Pig metatarsus	1
0366.091	Pig phalanx (2)	1
0366.104	Cattle femur, split shaft, unfused	1
0366.111	Cattle vertebrae, hacked off.	1
0387.001	Pig metacarpus.	1
0387.002	Cattle Rib	1
0387.003	Bone, Rat Ulna, juvenile rattus rattus	1
0387.005	Pig tibia? Shaft split	1
0387.006	Pig-Cattle rib	1
0418.029	Pig astragulus, hacked/sheared end; pig calcanius	2
0418.030	Bone, Pig phalanx, juvenile	1
0418.046	Pig Metatarsus	1
0418.047	Pig Metatarsus	1
0418.048	Pig Metatarsus	1
0418.083	Cattle Calcanius, Hacked/sheared	1
0418.117	Cattle radius, shattered	1
0418.119	Pig cranial, shattered	1
0418.124	Cattle size limb bone	1
0418.125	Cattle size carpus?	1
0444.019	Fish cranial, Intrusive?	1
0444.020	Fish Cranial, Intrusive?	1
0445.025	Fish vertebrae, Intrusive?	3
0445.026	Fish Cranial	3
0445.027	Pig-Cattle size limb bone, shattered	1
0445.028	Pig-Cattle size limb bone, polished/abraded	1
0452.002	Fish Vertebrae, Intrusive?	1
0452.003	Fish Cranial, Intrusive?	2
0452.004	Fish Scale, Intrusive?	2
0452.005	Bird Limb bone	1
0455.002	Marine mammal?, Intrusive?	3
0456.002	Fish Cranial, Intrusive?	3
0479.002	Pig Metatarsus	1
0494.010	Archosargus, probatocephal tooth	1
0507.003	Fish, Scate? tooth, Intrusive?	1
0507.005	Fish Vertebrae	1
0530.021	Bone, vertebra, aquatic, cetaceous	1
0546.001	Bone fragments (insufficient for ID)	3
0620.001	Pig vertebrae	1

0636.020	Bone, Bos taurus (rib)	1
0637.003	bovine vertebrae	1
0637.008	whale bone fragment	2
0680.002	bone fragment, zygomatic arch?, insufficient to ID	1
1015.001	Fish Vertebra	1
1108.014	Bone, phalanx or caudal vertebra, small mammal/bird	1
1143.004	Fish bone	1
1292.005	Bone, fish skull	1
1363.002	Bovine ulna fragment	1
1363.003	Bone, fish vertebrae fragments	5
1388.004	fossilized tuna vertebra	1
1498.007	Bone, wild boar	1
1721.024	Bone, burned, fish fossil	1
1724.003	Bone, unfused distal left end of femur, juvenile pig	1
1810.002	Bone, Fossilized skate tooth	1
1845.000	Bone, Avian	1
1900.001	Bone, bovine rib shaft fragment	1
1903.012	Bone, Fish Vertebra	1
1919.009	Bone, humerus, possibly cut, distal end, medium ruminant	1
1951.006	Bone, cattle (?) rib, cut	1
1951.009	Bone, lumbar vertebra zygopophyses, medium ruminant	2
1955.015	Bone, rib, deer (?)	2
1955.028	Bone, butchered cervical vertebra, pig?	1
1955.037	Bone, cattle axis, C2 vertebra	1
1955.044	Bone, skull (?), pig (?), not enough to ID	1
1955.058	Bone, pig (?), UID	1
1955.059	Bone, long bone fragment (humerus?), medium mammal	1
1955.061	Bone, spinus process fragment, large mammal	1
1955.072	Bone, medium mammal (pig?), right tibia	5
1955.077	Bone, vertebra epiphysis from centrum, unfused, medium mammal	1
1958.001	Bone fragments, medium mammal, UID	2
1958.014	Bone (from inside nesting weight)	2
2018.001	small turtle plastron fragment	1
2067.001	Bone, pig rib fragment	1
2104.002	Bone, Fish fin fragment	1
2128.002	Bone fragments, pig, ulnar carpal, left	2
2197.001	Bone, scapula, cut?/snapped	5
2224.004	Bone, Chrondrichthyes	1
2251.010	Bone, dolphin fish	1
2387.000	Bone, fossilized whale bone	1

2392.005	Bone, radius, rodent damage, cow-sized	2
2392.006	Bone, unfused, distal, left ulna, cattle	1
2392.008	Bone, scapula, medium mammal	1
2392.015	Bone, UID	1
2392.017	Bone, thoracic vertebra, sliced, v-shaped, deer-sized	1
2392.018	Bone, os coxa, small mammal	1
2392.021	Bone, rib from medium ruminant (deer, sheep/goat)	1
2392.022	Bone, thoracic vertebra, zygopophyses, medium ruminant	1
2392.023	Bone, shaft and fragment of large mammal long bone	1
2392.026	Bone, cattle rib, butchered	1
2392.028	Bone, UID	1
2392.031	Bone, long bone fragment, medium mammal	1
2392.035	Bone, fused radius/ulna, cattle	1
2447.001	Bone, wild hog, (sus scrofa),1-metatarsal	1
2474.005	Bone, Fish vertebra	1
2477.006	Bone, fish Vertebra	1
2479.002	Bone, Fish Vertebra	2
2697.005	Bone, large mammal	1
2722.015	Bone, avian	1
2723.011	Bone, fish	2
2850.000	Turtle bone	1
2852.012	Bone, Fish Vertebra	1
2855.001	Bone fragment, unfused proximal pig (?) tibia	1
2855.005	Bone, distal radius epiphysis, pig (?), unfused (?)	2
2856.001	Bone, long bone shaft fragment, medium mammal	1
2906.005	Fish bone fragment	1
2912.007	Fish scale fragment	1
2913.002	Bone, fish dorsal spine	1
2915.006	Bone fragments	3
2918.003	Bone, Fish Vertebrae	1
2920.003	Bone, avian	2
2948.008	Bone, Shark vertebra	1
2953.006	Bone, Fish vertebra	1
3010.005	Bone, rib, medium ruminant	1
3010.006	Bone, cow-sized radius	3
3020.008	Bone, Shark Vertebrae	2
3105.009	Bone, pig metapodial	3
3105.017	Bone Fragment (insufficient for ID)	1
3105.021	Bone fragment, pig phalanx, distal end	1
3170.021	Bone, UID	1
3217.000	Bone (turtle)	1

3316.005	Bone, fossil (sea robin)	1
3321.004	fish tooth?, Pognies cromis (possible sheephead incisor fragment)	1
3322.009	large mammal bone	1
3337.001	Bone fragment, scapula blade, large mammal - cattle	3
3347.007	Bone fragment, uunfused distal peripheral metapodial, pig	1
3401.019	Fish Bone, Pisces (vertebrae)	1
3443.001	Bone, (cf) meleagris (turkey) (distal tibiotarsus)	2
3527.002	Bone, rib, cattle/pig	1
3550.000	Bone, Bos taurus (rib), juvenile (joins to 3553.000)	2
3553.000	Bone, bos taurus rib, juvenile (joins with 3550.000)	1
3580.006	Bone, skate fossils	5
3580.010	Bone, turtle fossil	1
3581.004	Bone fragment, large mammal (lamb bone fragment)	1
3583.008	Bone fragments, medium mammal, trivecular fragments, burned	9
3583.019	Bone fragment, skate/shark vertebrae	1
3587.003	Bone, ruttus spine vertebrea	1
3587.009	Bone fragment, skate/ray vertebrea	1
3617.011	Bone, pisces vertebra	1
3632.011	Bone, pig metacarpal 4, left side, unfused	1
3659.003	Bone, long bone fragment, medium mammal, cut	1
3697.011	Bone fragment, large mammal shaft fragment, cattle, burned corticle bone	1
3767.010	Bone, aquatic	1
3781.000	Bone, Bos taurus (rib), rodent gnawn	1
3939.015	Sand dollar tooth	1
3944.006	Bone, fish	5
3950.016	Bone, duck humerus	1
3951.001	Bone frag, mammal (fossil bone)	1
3955.005	Bone, vertebra, turtle	1
4031.002	Bone, long bone fragment from small animal	1
4038.004	Bone, phalanx, small mammal	1
712.000.01	Bone fragment found under sternpost, Bos taurus (rib)	1

*All remarks are how they appear unedited in the NCDNCR QAR database

Appendix 2: Niche Breadth Analysis

La Belle Species	MNI	%		Niche Breadth
Pig	5	0.151515	0.022956841	
White Tailed Deer	4	0.121212	0.014692378	
Bison	1	0.030303	0.000918274	
Cow/Bison	2	0.060606	0.003673095	
Sheep/Goat	2	0.060606	0.003673095	
Domestic Duck	1	0.030303	0.000918274	
Small Duck	1	0.030303	0.000918274	
Shorebird	1	0.030303	0.000918274	
Tern	1	0.030303	0.000918274	
Small Turtle	1	0.030303	0.000918274	
Western box turtle	3	0.090909	0.008264463	
Large turtle	1	0.030303	0.000918274	
Atlantic Cod	4	0.121212	0.014692378	
Killifish	1	0.030303	0.000918274	
Flounder	1	0.030303	0.000918274	
Left-Eyed Flounder	1	0.030303	0.000918274	
Turkey	1	0.030303	0.000918274	
Geese	2	0.060606	0.003673095	
	33	1	0.081726354	12.23595506

QAR Species	MNI	%		Niche Breadth
Cow	4	0.266667	0.071111111	
Pig	6	0.4	0.16	
Sheep/Goat	1	0.066667	0.004444444	
Deer	1	0.066667	0.004444444	
Duck	1	0.066667	0.004444444	
Turkey	1	0.066667	0.004444444	
Fish	1	0.066667	0.004444444	
	15	1	0.25	3.947368421

EOA Species	MNI	%		Niche Breadth
Cow	15	0.365854	0.133848899	
Sheep/Goat	7	0.170732	0.029149316	
Pig	16	0.390244	0.152290303	
Rabbit	1	0.02439	0.000594884	
Turkey	1	0.02439	0.000594884	
Domestic Fowl	1	0.02439	0.000594884	
	41	1	0.317073171	3.153846154