

*Queen Anne's Revenge*  
**Shipwreck Project**



**RESEARCH REPORT AND BULLETIN SERIES**  
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**Analysis of Armament from Shipwreck 31CR314:**  
*Queen Anne's Revenge Site*

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## Introduction

In October of 1997 the North Carolina Department of Cultural Resources began an effort to better understand and eventually recover the remains of an eighteenth-century shipwreck (31CR314) thought to be the *Queen Anne's Revenge (QAR)*. The location of the shipwreck site corresponds with where, in 1718, the wreck reportedly occurred. Analysis of the artifacts suggested an early eighteenth-century context for the wrecking event. Thirteen years after its discovery, and thousands of recovered artifacts later, nothing has been found to indicate the shipwreck site is anything other than the former flagship of Blackbeard the Pirate.

The following report introduces the cannon from site 31CR314 that have been conserved and analyzed through 2006. Small arms and ammunition will be addressed in separate reports. Artillery analysis can reveal information about both manufacturer and end user of the artifact. Manufacturing information comes from the artifact itself: composition, style, or markings. Information about the user comes more from their context within the site. For instance, the quantity and caliber of the artillery complement has significant implications relating to the size and purpose of a ship. This is one reason there was an emphasis from the beginning of the project to locate all of the cannon on the site.

By virtue of their relative size, it was easier to identify and obtain general information from cannons in situ than smaller artifacts encased in concretion and not visible. For this reason the artillery section is at this time more comprehensive than the small arms or ammunition section. As recovery and conservation progress larger samples of all artifacts will become available for study. Thus, this report should be considered preliminary because only five cannon of the twenty-five identified on the site have been fully cleaned and examined.

## Artillery

When viewing the *QAR* shipwreck site map, the most prominent and readily identifiable artifacts are the artillery. During the first field season in 1997 all exposed guns were assigned designations (C1, C2, C3, etc.), tagged with that number and drawn into the site map. As new guns were discovered they were assigned sequential numbers. As of 2005 twenty-four cast iron artillery pieces had been located. Eight have been recovered and five of these have been cleaned and analyzed (see labeled guns, Figure 1). Dozens of iron shot have been recovered as well as thousands of lead shot. Rough dimensions of the seventeen guns remaining on the site were also obtained.

All recovered concretions were assigned field numbers when initially cataloged. Recovered artifacts were assigned accession numbers as entered into the database. Nevertheless, the research team has always thought of the guns in terms of their initial in situ designation (Cannon 1 or C1).

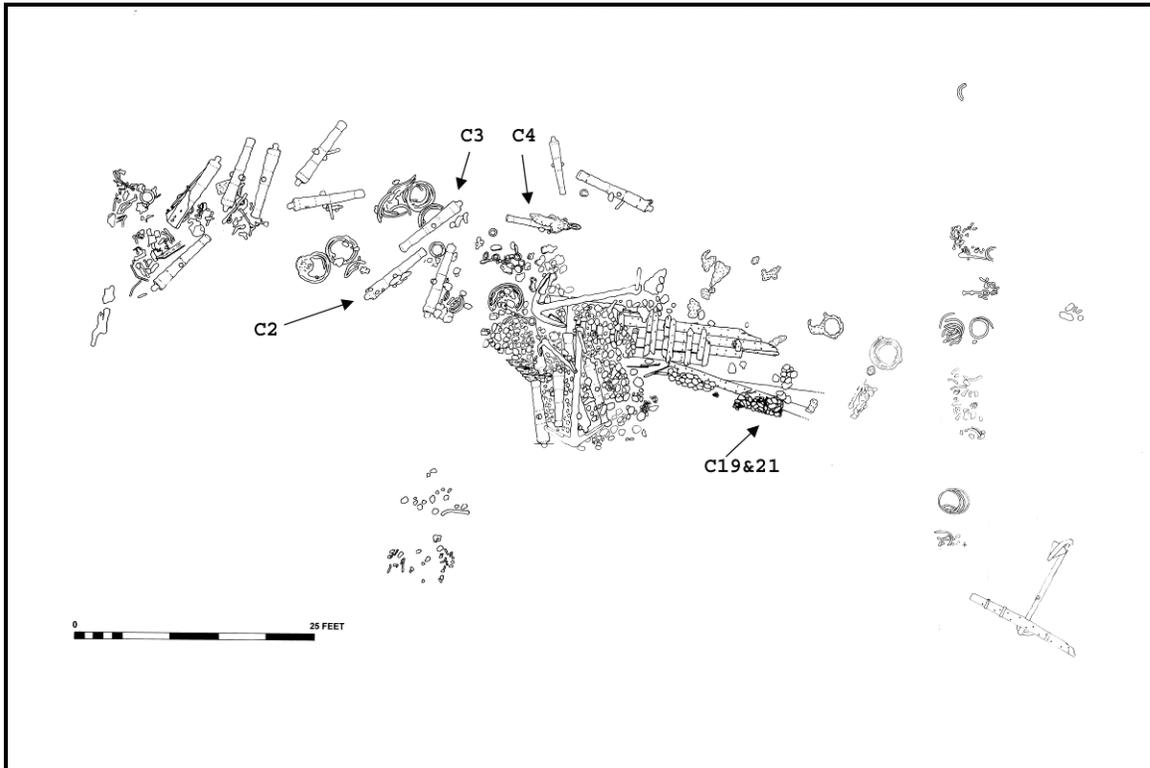


Figure 1: QAR Site Map

### Cannon 2 – QAR 232.001

Cannon 2 is a cast iron six-pounder measuring 7.5 feet from the rear of the base ring to the face of the muzzle. Each reinforce is distinct, typifying the “three frustrums (sic) of cones” construction described by John Muller to be “as old as the invention of guns” (1965:38). The mouldings are simple with single rings at the junction of the first to second reinforce and second reinforce to the chase. There is no vent pan or chase astragal (second ring forward of the second reinforce). The trunnions are cylindrical and anchored below the centerline of tube. The gun has no extant marks and was in an unloaded condition when recovered. The heavily fouled bore when cleaned measured at 3.84 inches diameter.

Without founder’s marks it is impossible to determine exactly who the founder was or in what nation the gun was cast. The two largest producers of cast iron artillery in the last half of the seventeenth century and throughout the eighteenth century were England and Sweden (Frantzen 2004). Ordnance exports from both countries were prevalent throughout Europe and anywhere Europeans traded. The reality is that the international ordnance trade was so complex that once guns left the foundry they could end up on ships of any nationality (Caruana 1994:228; Brown 2003).

For example, English warships prior to the 1703 Establishment were commonly issued eight-pounders, bought from the Dutch, which were produced in Sweden (Caruana 1994:117-122). Following the 1703 Establishment there was an attempt to replace the Dutch eight-pounders and **obsolete sakers with new**

pattern six-pounders, and there was a corresponding increase in English six-pounder production. In fact, of all iron guns produced in England during the reign of Queen Anne (1702-1714), forty percent were six-pounders (Caruana 1994:152-159). Thus there is a good probability Cannon 2 was produced in England.



**Figure 2: Cannon 2 (232.001)**

If the gun was English made, the lack of a chase astragal suggests a production date prior to 1716 or thereabouts. To understand this one has to recognize that a fairly radical change in the design of English guns was introduced just prior to the second decade of the eighteenth century. In an effort to reduce the weight and cost of artillery, the Board of Ordnance mandated that the relative length of the first and second reinforces be shortened to the point that the second reinforce barely extended beyond the trunnions. Often, a second ring called a chase astragal was placed just forward of the second reinforce. On models produced prior to this change, the second reinforce extended well beyond the trunnions (Caruana 1997: 30, 35). Cannon 2 falls into the earlier category.

### **Cannon 3 – QAR 233.001**

Cannon 3 is a cast iron six-pounder, seven-feet in length (base ring to muzzle). The trunnions are slightly conical in shape with no visible foundry markings and attach below the centerline of the tube. Several features suggest that the gun was produced in Sweden. English guns typically have pronounced reinforces (see 232.001) while Cannon 3 has a more angular, single-cone shape with the



**Figure 3: Cannon 3 233.001**

sides forming nearly a straight line from the vent field to the muzzle astragal. Likewise, the muzzle swell appears more angular in shape than the typical English tulip swell.

The transition from first reinforce to second reinforce to chase is indicated by sets of doubled rings, one set behind and one set forward of the trunnions (see Figure 4). Though some early seventeenth century English guns displayed this trait, it is more commonly associated with Swedish guns produced from the second half of the seventeenth century and throughout the eighteenth century (Brown 2005).



**Figure 4: Double Rings on C3**

These guns are commonly called by the Danish descriptor “finbankers”, a general term that describes a variety of Swedish guns associated with the De Geers foundry at Finspong where they were produced. Quantities were exported to the Netherlands, ostensibly to arm the VOC ships but in fact were traded throughout Western Europe (Fantzen 2001:8). The ring set profiles on Cannon 3 are (breech to muzzle) a narrow astragal followed by a ring surrounded by a series of wide fillets. Frantzen describes this as a characteristic of “type B finbankers” but provides no information as to dates of production (2001:20). Ruth Brown, formerly of the Royal Armouries, has noted this characteristic on guns dating from the 1660s to sometime before 1719. She stated that the gun was probably cast in Sweden “most likely from c1675-c1700” (Brown 2005). Eleven, three-pounder finbankers were found on the Danish frigate Mynden (1718) with shape and mouldings identical to

Cannon 3 (Auer 2005:272). The characteristic “F” found on the trunnion faces of classic finbankers has not been detected on Cannon 3.

The gun was loaded with powder cartridge (disintegrated), inner wad, an English six-pounder ball (3.5-inch), and an outer wad. No tompon was in the muzzle and the bore was thoroughly fouled with concretion when the gun was recovered. The bore diameter measured 4.08 inches and is slightly larger than the original due to loss of metal through corrosion and subsequent cleaning and disarming in the conservation laboratory. Regardless of the caliber, it was being used as a six-pounder, based on the dimension of the shot (Muller 1965: 6-10).

The only marks on the piece are what appear to be Arabic numerals crudely chiseled along the axis into the top of the first reinforce (see Figure 5). These numerals: 1,7,3, and an unrecognizable symbol resembling a 0, have been interpreted by some as the gun’s weight (Lusardi 1999:124, 2000:61-62, 2002:35).



**Figure 5: Mysterious engraving on C3**

Although guns were often marked with their weight, the ciphers were typically, neatly engraved perpendicular to the axis of the gun either across the base ring or just forward of the vent field (see *QAR366.001*, *QAR418.012* for example). The weight of a piece was an indirect indicator of the gun’s strength. If length and caliber were equal, the heavier gun had more iron surrounding the bore and was therefore considered stronger. In addition, a gun’s market price was partly based on its weight. Therefore it is possible that a secondary merchant weighed and marked the piece.

It has been suggested that the numerals could indicate the year that the gun was cast (Rodgers et. al. 2005:30). This is highly unlikely. Dates, when placed on guns, were carefully engraved on the first reinforce, trunnion face, or base ring. These would be engraved on the piece as part of the finishing process or formed on the mold to produce the numerals in relief (Kennard 1986:19). As with the

weight, when the founder placed the date on the first reinforce it was aligned perpendicular to the gun's axis in smaller, carefully produced numerals (Brown 2005; Blackmore 1979:42).

Though still in situ, Cannon 1, lying adjacent to where Cannon 3 was recovered, also exhibits the distinctive double-ring configuration of a Swedish finbanker. No other gun on the site exhibits this characteristic. Upon the future recovery and cleaning of Cannon 1 it is hoped that further light will be shed upon the mysterious markings appearing on Cannon 3.

#### **Cannon 4 – QAR 366.001**

Cannon 4 is a cast iron minion class or four-pounder, 5.5 feet in length from base ring to muzzle face. The trunnions, anchored low on the tube, have a slight conical shape. The right trunnion face bears an “IF” foundry mark (see Figure 7). This mark is associated with at least two generations of John Fullers who operated the Heathfield Furnace in East Sussex. The gun has the characteristics of the 1690 English naval pattern that persisted until 1715 with the adoption of the Borgard pattern. Based on this, it was likely produced while Major John Fuller (1652-1722) headed the foundry (Brown, personal correspondence; Caruana 1997: 31-35). Each reinforce is very distinct and the muzzle exhibits a tulip shaped swell. An English proof mark is engraved on the first reinforce. The weight in English hundredweights is engraved on the first reinforce, just forward of the vent astragal [6(112) + 3(28) + 7 = 763 lbs.]. The current weight is only six pounds lighter than the marked weight, indicating that the gun lost only 0.7 percent of its weight through corrosion.



**Figure 6: Cannon 4 (366.001)**

The gun was loaded with cartridge elements and wads that sandwiched the 2.85-inch shot. Though a three-pounder gun could conceivably accommodate a shot of this diameter, the windage would have been only several hundredths of an inch. It is more likely the gun was designed as a four-pounder. The 3.24-inch bore diameter is consistent with an English four-pounder (Muller 1965:6).



**Figure 7: Cannon 4 foundry mark "IF"**

Hundreds of artifacts were removed from the concretion surrounding Cannon 4, most of which were wrought iron nails and spikes. Also included were chain, deadeye strops, iron cask hoops, various size iron-shot and firearm components. Although a portion of the wrought iron artifacts are completely corroded, astounding preservation was observed on an accumulation of several hundred small nails as well as an assortment of organic artifacts. As an illustration, even the tiny wooden fid used to plug the gun's vent survived.

### **Cannon 19 – QAR 418.001**

Cannon 19 was encased in a relatively large concretion that hid two guns within it (see C21, 418.012) and numerous smaller artifacts. Both C19 and C21 were very well preserved. Cannon 19 is a cast iron one-pounder, four feet in length from base ring to muzzle. Each reinforce is distinct and

the cascabel is somewhat flat, compared to the other recovered guns. The conical trunnions are cast low on the tube, anchored into solid metal beneath the bore.



**Figure 8: Cannon 19 (418.001)**

The master founder's mark "IEC" is embossed on the face of the right trunnion indicating that the gun was produced at the Ehrendal foundry in Sweden. A three-pounder Ehrendal gun in the Swedish Army Museum has an embossed "695" on the left trunnion indicating a casting date of 1695 (Brown 2005). Cannon 19 has a "713" embossed on the face of the left trunnion indicating 1713 as the casting date.



**Figure 9: Cannon 19 foundry marks "IEC" and "713"**

Jesper Eliaeson started the Ehrendal foundry as early as 1689 and was the master founder until his death in 1722. Thomas Roth, head of research at the Army Museum in Stockholm, Sweden states, "As far as we know the mark "IE" (for Jesper Eliaeson) was used on one of the trunnions from 1689 to 1695 but it is possible that the mark could have been altered after that year until 1722 when his

son, Olof, began using “OEC” (Roth 2004). The addition of the “C” to Jesper’s mark may have coincided with his 1695 ennoblement by the Swedish monarchy, and subsequent surname change from Eliaeson to Ehrencreutz (Jobling 1990: 99-100). A sixty-pounder mortar in the Tojhusmuseet in Copenhagen has IEC on the right trunnion and 1721 on the left, indicating its manufacture one year before Jesper Ehrencreutz’s death (Brown 2005).

The two-inch caliber gun was loaded with a powder cartridge, a 1.81-inch diameter cast iron ball and three wrought iron bolts bundled together to form a roughly cylindrical projectile about eight inches in length. Wads sandwiched each projectile. The eighteenth-century term for ammunition formed of bundled bolts was “langrage”. Falconer’s *Marine Dictionary* (1780:171) states: “This contrivance is particularly designed to wound or carry away masts, or tear the sails and rigging of the adversary, so as to disable him from flight or pursuit. It is never used in royal ships, but very often by privateers and merchantmen.”

This definition clearly describes the purpose of the projectile and also suggests the vocation of the ship’s crew. Had Falconer been writing during the Golden Age of Piracy, he may well have added pirates to the list of those using the “contrivance”. A wooden tompion fashioned from pine was in place in the muzzle, sealing the bore and preventing fouling during the years that the gun was under water.

### **Cannon 21 – QAR 418.012**

Cannon 21 is a cast iron one-half-pounder or robinette, 3.5 feet in length from the base ring to the muzzle. The trunnions were cast low on the tube and anchored over the solid metal below the bore. No tapering of the trunnions is evident and no founder’s marks are present. Each reinforce is distinct and the muzzle swell has a tulip shape, beyond which a protrusion of ogees and fillets steps down to the face. An English proof mark "P" is present on the first reinforce. The weight was engraved across the first reinforce in English hundredweights: 1-3-3 = 1(112) +3(28) +3 = 199 lbs.

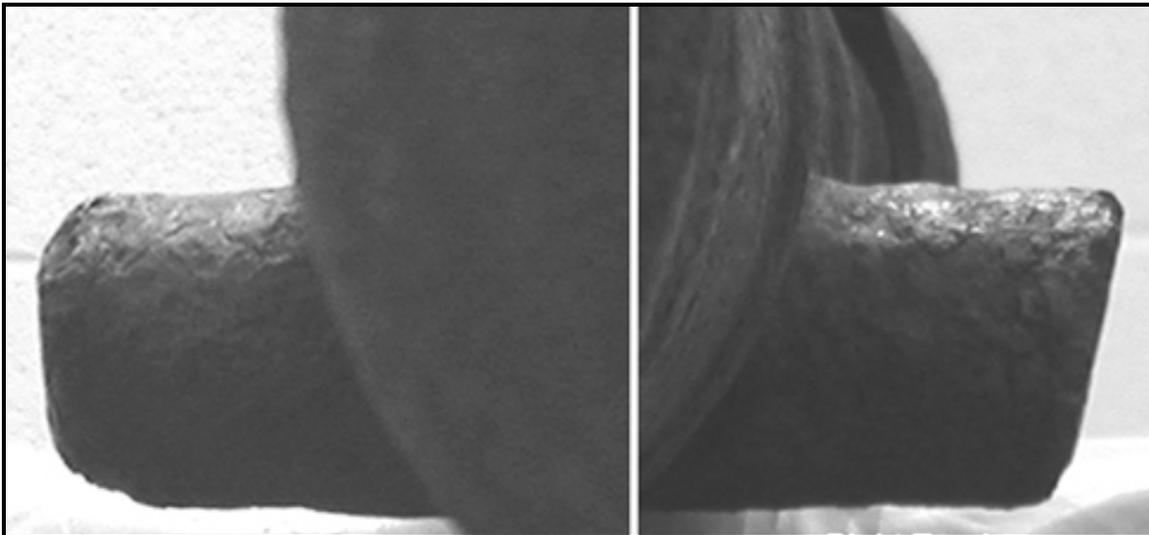


**Figure 10: Cannon 21 (418.012)**

This and the proof mark strongly suggest an English manufacturer. This is important as will be seen.

Cannon 21 was loaded with a cartridge, and was sandwiching a 1.5-inch diameter iron shot that together with the gun's 1.8-inch caliber indicates the equivalent of an English one-half-pounder (Muller 1965: 6-10). The gun's muzzle was plugged with a wooden tompon, fashioned from fir, which protected the bore during the years under water.

The gun was cast in a two-part mold. The resulting seam is apparent on each reinforce and chase as well as the muzzle and rings. The mold consisted of top and bottom halves, the bottom half containing extensions for the trunnions. A curious feature of this gun is that left trunnion face is beveled (see Figure 11). The bevel is not present on the right trunnion face. The surface of the gun is very well preserved and casting imperfections are clearly seen.



**Figure 11: Beveled face of the left trunnion only**

Cast iron one-half-pounders were rare in the first quarter of eighteenth century due to the difficulty of producing thin-walled, lightweight guns that would pass proof. Interestingly, no documentation has come to light indicating that the English government purchased cast iron guns of this caliber prior to 1716. When a small caliber gun was required, it was typically produced in bronze (Brown and Smith 2004).

Equally unusual in the early eighteenth century was a gun cast in a two-part mold. Before and throughout the eighteenth century, guns were typically cast in solid one-part molds, requiring destruction of the model within the mold and the mold from around the casting (Kennard 1986). Examples exist in the United Kingdom of small caliber iron guns produced in two-part molds, but all have been dated to after 1725, based on physical characteristics. This gun exhibits the earlier attributes including a relatively long second reinforce, indicating that at least one English gun-

founder was experimenting with two-part molds during the late seventeenth or early eighteenth century (Brown and Smith 2004). One benefit of this was to reduce production costs by allowing the reuse of the model. As the “P” on the first reinforce attests, Cannon 21 passed the proof.

### **Cannon Accessories**

Tompions were present in the muzzle of both guns from feature 418. Tompions were wooden plugs inserted into the muzzle of guns to keep water out of the bore of the gun, thus allowing the piece to be kept in a loaded state without fear of the powder charge becoming ruined. The tompion in Cannon 19 (418.001) was manufactured of European pine of the sula group; the tompion in Cannon 21 (418.012) was manufactured of a species of fir (*Abies* sp.) (Newsome 2004).



**Figure 12: Lead apron**

In addition to the tompions recovered from the muzzles of C19 and C21, several sheet lead artifacts have been identified as cannon aprons. These, like the tompions, were designed to keep water from entering the bore. Aprons fit over the cannon's vent and were secured to the gun by means of thongs passing through holes in the sides of the aprons. One apron (*QAR* 002.0) is an elegant example with slices in the rear to allow the apron to tightly cover the vent and conform to the base ring (see Figure 12). A nearly identical specimen (A#13503) was recovered from the Whydah shipwreck (Hamilton 1992:59).

Likewise, a wooden plug or fid was placed in the vent of a gun to keep water from entering the bore. Cannon 4, Cannon 19, and Cannon 21 held remnants of these, though they were so small it was impossible to determine the type of wood used. To date, there have been no artifacts positively identified as artillery implements or carriage components.

## Discussion

Acquiring the cannon dimensions in situ was complicated by several factors. Seven of the guns occur on the ballast mound and are to various degrees covered by ballast stones and ferrous concretions that prevented straightforward measurement (see Figure 13). Ten guns are scattered across the site and although fairly easy to measure, most are generally buried under one to four feet of sand. General measurements were taken when cannon were initially uncovered by excavation, but each was quickly re-buried, making additional detailed measurements impractical. All guns are heavily encrusted with concretion that varies depending on the microenvironment around each gun. Therefore existing in situ measurements only approximate the guns' outer dimensions and bore diameters were impossible to measure.

The dimensions of the guns remaining on the site were compared to those of the recovered cannon to determine a general makeup of the ship's armament (see Figure 13). Assuming all the larger guns have been located and none were salvaged, the ship associated with the *QAR* site had a primary armament consisting of at least seventeen 6-pounders and four 3 to 4-pounders. The smaller guns, C19, C21, and C22 would not have been considered part of the ship's primary armament from a naval inventory perspective due to their small caliber. The vessel would be considered, in terms of naval establishments and inventories, a twenty to twenty-two gun ship.

According to the 1703 Establishment that prescribed the "numbers and natures of guns" for English warships this compliment of artillery would be consistent with a Sixth Rate. Twenty guns would also be consistent with that of medium-sized French light frigate. Warships of this size had a single gundeck and on either ship the six-pounders would typically have been mounted on the gundeck and the three to four-pounders on the quarterdeck (Caruana 1994:157; Boudriot 1993:64).

In addition to the primary armament, a number of small caliber guns could be added. Goodwin noted a model of a Sixth Rate at the National Maritime Museum at Greenwich fitted with twenty-two swivels (1988:15).

This is not to say that the shipwreck site 31CR314 represents the remains of an English Sixth Rate or a French light frigate, but simply that the vessel had comparable armament. Warships of this class were designed for speed and maneuverability, used as dispatch vessels, for protection of merchant convoys, for coastal protection, for voyages to the colonies, and other missions considered unsuitable for ships of the line (Goodwin 1988; Boudriot 1993:12). Looking at them in the context of the English Channel they were not heavily armed warships. In the context of the New World colonies, a twenty-two gun warship was formidable.

The distribution of the guns across site 31CR314 probably reflects their arrangement on board the ship prior to the wrecking event. Broadside guns needed to be arranged by caliber and weight in pairs, so that the starboard arrangement would mirror that of the portside. This would be required to properly trim the ship. Looking at Figure 13, it is not difficult to pick out pairs of guns, muzzles facing opposite directions, coming together as the ship rolled to her port side.

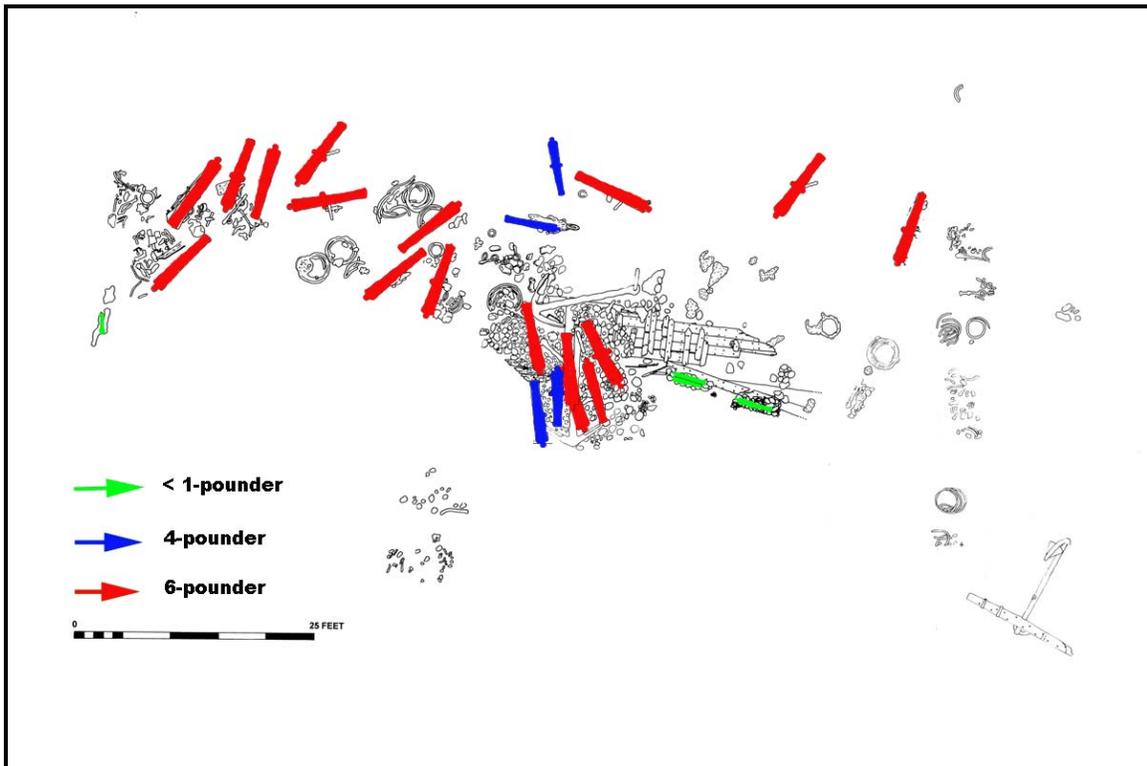


Figure 13: Cannon size distribution

## Summary

This report should be considered preliminary. Its purpose is to introduce artifacts of artillery that have been cleaned and studied as of as of 2006. At this time only five guns out of twenty-five known to exist have been cleaned of their concretion encasement: two 6-pounders, one 4-pounder, and two 1-pounders or less.

Artillery found on 31CR314 is consistent in form with what was being produced by English and Swedish gunfounders of the late seventeenth and early eighteenth-century. Although only two of the guns have dateable foundry marks, the marks reinforce this observation. Other than a single small gun (418.012) that was cast in a 2-part mold, none possess traits that typically began to appear after the second decade of the eighteenth century.

Based on dimensions of cannon from site 31CR314 and according to early eighteenth-century establishments the vessel would be considered at minimum a twenty-gun ship with a primary armament of at least seventeen 6-pounders and four 4-pounders. Additional smaller caliber guns brought the compliment to at least twenty-four guns. Although a high resolution magnetometer search suggests that all iron guns on the site have been identified, it is possible that additional guns will be found as recovery excavations progress. Nevertheless, with what is currently known, the vessel would be considered heavily armed in a Colonial North Carolina context, particularly in Beaufort Inlet.

Complete recovery of the artifacts on the *Queen Anne's Revenge* site began in the fall of 2006. With this comprehensive excavation our understanding of the armament collection will increase dramatically. Findings will be presented on this website as additional artifacts relating to the ship's artillery are analyzed.

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