

Maritime military archery

Bowmen on European warships, 1000–1600

Henrik Arnstad & Abigail Christine Parkes

There is a considerable research gap in both maritime and military history concerning the naval use of bowmen. For over three millennia – spanning from the ancient Egyptians until around the year AD 1600 – archery was a key component in maritime combat. This essay highlights the importance, flexibility, and impact of naval archery with special attention given to European waters in the late Middle Ages and the early modern period.



At the sea battle off Buchow on 4 June 1565, a Danish fleet under the command of Herluf Trolle, ‘Admiral and Inspector of the Fleet’, attacked the Swedish navy in the southern Baltic Sea. Trolle attempted to board a small Swedish warship, *Troilus*, almost capsizing it as the much larger Danish flagship crashed into the leeward side. *Troilus*’ mizzenmast broke and fell overboard as water gushed into the ship’s gunports, seemingly outmatched, but according to the sources the Swedes refused to give up:

Troilus, however, did not lose courage, but with 12 guns and 70 archers stopped the enemy from coming aboard. Trolle became angry and shouted in disdain to Captain Nils Schenk on *Troilus* that he should surrender. Trolle, being dressed in a blue breastplate with the Brunswick hat and feathers, was easily recognized by Schenk, who with an arrow took revenge for the insult and gave Trolle a deadly wound.¹

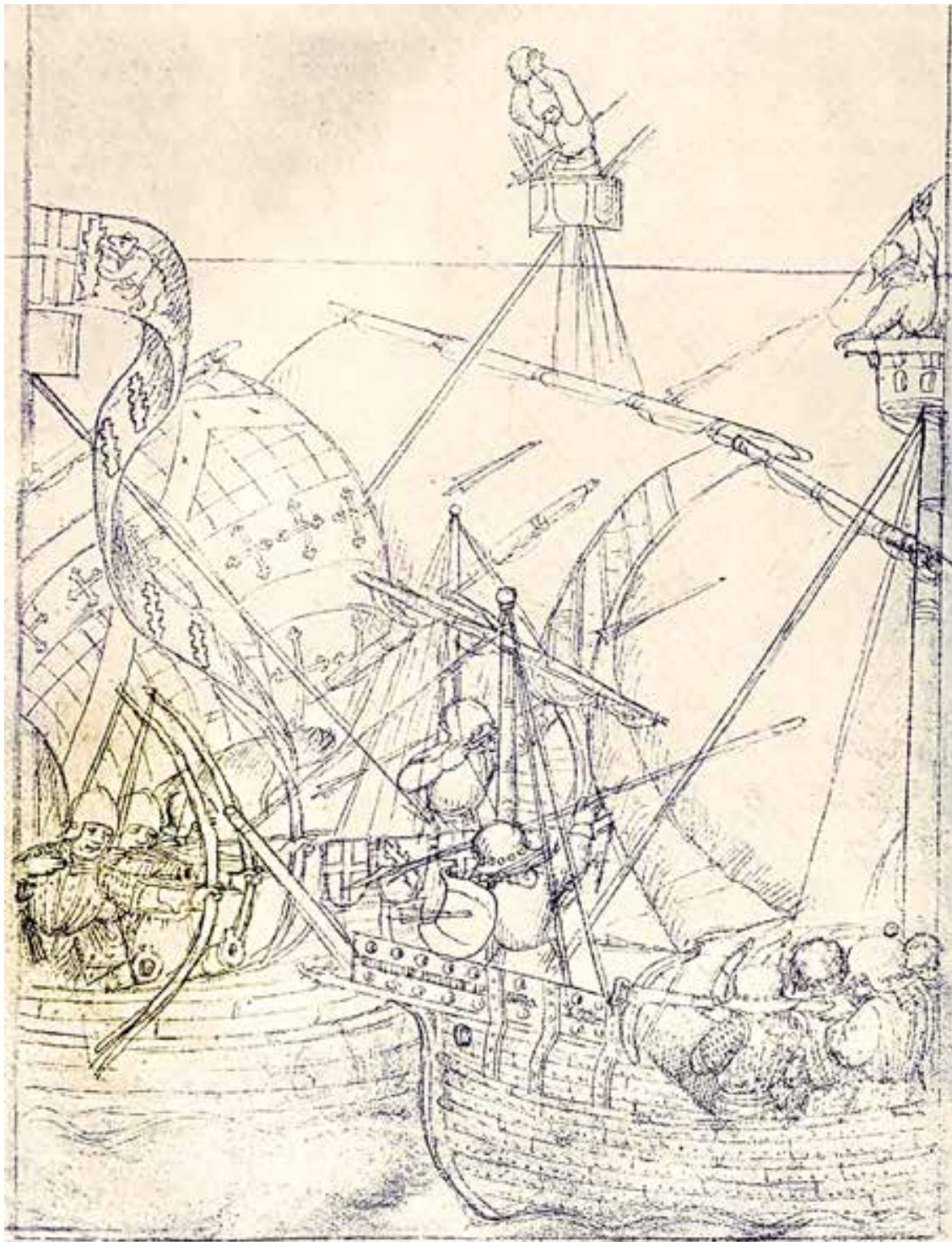


Figure 2.1 Naval longbowmen attacking enemy infantry, crossbowmen, spearmen, and stone-throwers and the rigging of an enemy ship. This late medieval image illustrates the excellent tactical flexibility of maritime archery. The Pageants of Richard Beauchamp, Earl of Warwick, 'HOWE Erie Kichard, in his commyng into England, wanne ij. greet Carykkes in the See' (1485). Cotton MS Julius E IV/3 fol. 18v, by permission of the British Library.

Eventually the Danish fleet retreated, having lost over 700 men, among them eventually Trolle, who died of his wounds on 25 June 1565 (Fig. 2.1).

For over three millennia, military archery was a key component of naval warfare. Trolle's fate demonstrates the continuing importance of maritime bowmen, well after the end of the Middle Ages into the early modern period. In the sixteenth century, naval bowmen were still as tactically flexible, efficient and deadly as they had been for over 3,000 years. Furthermore, we can see that, even though the longbow is famously associated with the English army, this weapon was neither exclusive to England nor to land warfare.² Naval archery was a transnational weapon system, and bowmen may in fact have been even more effective at sea than on land. Additionally, archery had a profound impact on naval combat and ship design, with stern- and forecastles being added originally as platforms for bowmen. The bow was the original ship artillery.³

Naval archery was used for thousands of years across the globe, and for example was well developed in South-East Asia, yet despite that fact very few studies exist regarding this segment of warfare. We will thus address the considerable research gap in both naval and military history by focusing on naval archery in European waters in the period AD 1000–1600, the period when the organized use of naval archery reached its peak and then declined in use by end of the sixteenth century.

We will use the terms 'naval archery', 'maritime military archery', or simply 'maritime archery' to describe the use of bowmen in armed conflict at sea, and the related use of crossbowmen, since they were often the archers' adversaries. Historically, maritime archery was not limited to ship-to-ship combat, being also employed in amphibious warfare, and in naval logistics operations. In some cases, archers were also employed by civilians as 'hired guns', protecting merchant ships.

Specific literature on maritime archery is very sparse, with a few notable exceptions such as *The Military Archer at Sea* by the archery expert Hugh Soar, and 'The Long-bow and the Tudor Navy Royal' by the naval historian Justin Reay.⁴ Additionally, the deployment of archers at the Battle of Sluys (1340) has been studied by the historian Kelly DeVries.⁵ Otherwise, maritime archery is discussed as a side note

in two general research fields: (1) the history of naval warfare, and (2) the history of military archery:

- 1 Naval warfare studies sometimes take time to discuss maritime archery, one example being Charles Stanton's *Medieval Maritime Warfare*; however, the use of archers on warships is commonly reduced to a prelude to the 'real' battle, as in Susan Rose's *Medieval Naval Warfare 1000–1500*, where she writes the 'opening phase of the battle was fought with missiles' and similar.⁶
- 2 Military archery studies, meanwhile, are always focused on land warfare – and especially the triumphs of the English longbow in the fourteenth and fifteenth centuries – and the maritime use of bowmen is usually overlooked. One of the few exceptions is *War Bows* by the archery expert Mike Loades, which includes several passages on the subject.⁷

The beginning of naval archery

The bow and arrow was perhaps the first man-made machine, dating back some 50,000 years.⁸ Combining archery with maritime activities (fishing, hunting, and armed conflict) on rivers and lakes and at sea also seems to have been an early step for humanity.

In ancient Egypt, the New Kingdom (1570–1069 BCE) saw the birth of organized military units of naval archers, alongside the creation of a state navy.⁹ The deployment of naval archery gave the Egyptians a decisive advantage in Mediterranean wars against the Sea Peoples.¹⁰ Spectacular murals at the Temple of Rameses III in Luxor show the divine ruler using a bow to defeat his seafaring enemies at the Battle of the Delta in 1178 BCE, indicating the importance of the weapon to the Egyptians (Fig. 2.2). Indeed, maritime archers were adopted by all major Mediterranean navies in antiquity, the most important being those of the Phoenicians, Greeks, and Romans. The ram was the main weapon on their war galleys and triremes, while bowmen provided close-in fire, alongside large swivel-mounted crossbows called ballistas. Later Roman warships also had one or two wooden turrets for archers.¹¹

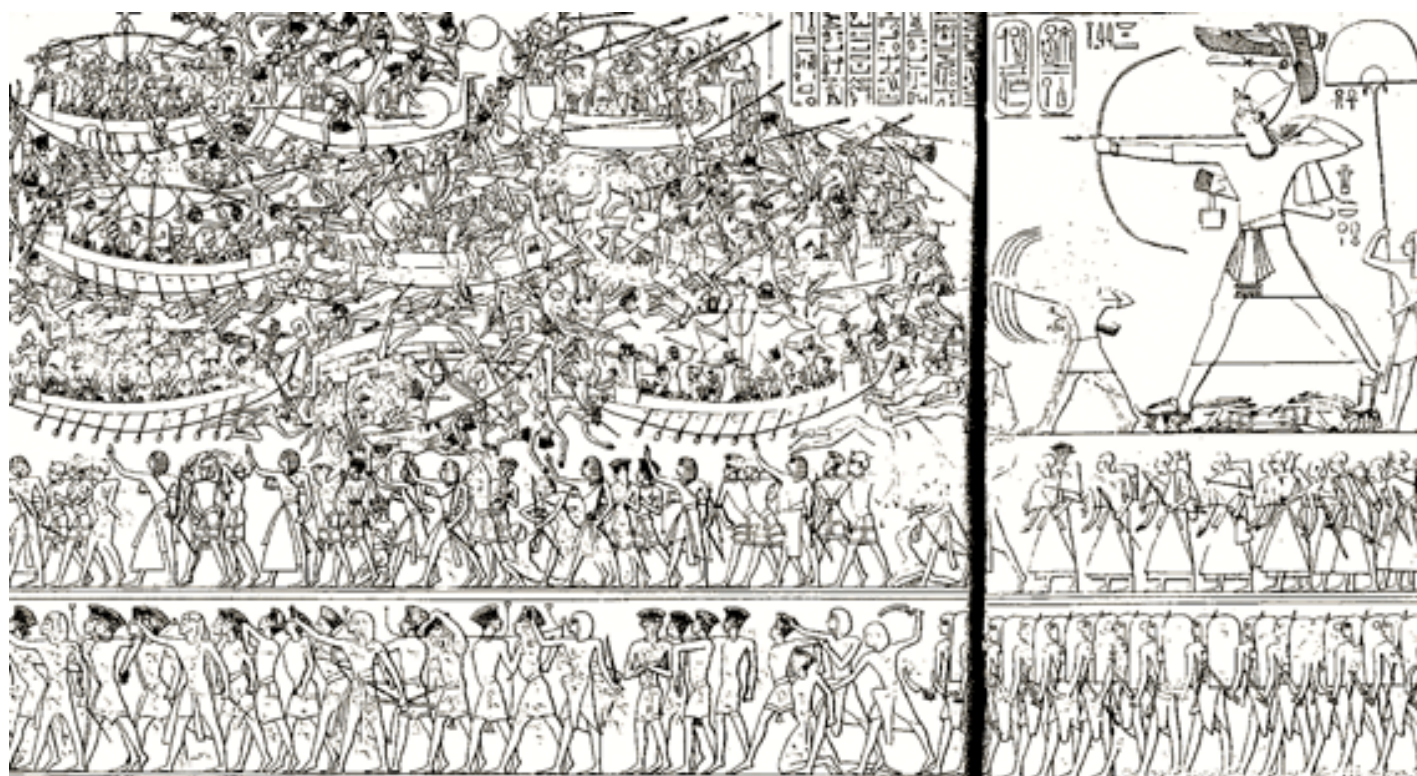


Figure 2.2 Pharaoh Ramses III defeating the Sea Peoples with his warbow, from the north wall of the Medinet Habu temple in Luxor. Photo: Wikimedia Commons.

Mediterranean naval warfare in antiquity and the post-Roman early Middle Ages was dominated by amphibious operations conducted close to the coast, due to the difficulties galley fleets had in operating on the open sea. Purely naval engagements on any scale were rare. Ship-to-ship combat was an unpredictable, messy affair and usually avoided.¹² Nevertheless, when sea battles did occur, archery was a key component, especially once ramming fell out of fashion. Changing naval tactics benefited from the use of archers, as they were flexible and able to adapt to new fighting techniques.

In the Baltic region, finds on the Nydam Boat show that warships were armed with bows by the fourth century AD. During excavations of the Nydam Bog in the south of Denmark an intact oak boat was found and with it 40 longbows and over 100 arrows.¹³ The use of archery was well documented for the Viking Age (793–1066) too, both in archaeological finds and the sagas; one saga described how ‘the arrow storm pours forth its rain’.¹⁴ The best-known discovery is the yew longbow

(191 cm) found during excavations at Hedeby, a Viking Age trading settlement on the Jutland peninsula. Excavations of the Viking town of Birka, on a small island close to what is now Stockholm, have also revealed plenty of military archery material.¹⁵ At this time, the Atlantic waters of the North Sea saw ship construction take a different direction to the Mediterranean patterns, as higher seas favoured durability. Viking navies used clinker-built longships, which provided platforms for archers.

Naval archery in the High Middle Ages

In the High Middle Ages, as trade routes in the Mediterranean expanded and grew in economic importance, tensions developed regarding control of maritime networks. For example, in the eleventh century, Norman naval expansion in the central Mediterranean resulted in military conflict with the Venetian navy. At the Battle of Corfu in 1084, the changes in the tactical use of maritime archers were evident. The Venetians deployed taller bireme galleasses against the lower Norman galleys, enabling archers to shoot down into enemy ships. A contemporary source, William of Apua, wrote that the victorious Venetians ‘showered arrows from on high on their enemies’.¹⁶ The effect of archery on warship construction was plain, with vessels built higher to increase the efficiency of naval archers.

This development in ship design also proved useful when warships were attacking land targets. A drawing of the Siege of Damietta (1218–1219) in the Fifth Crusade shows a crusader ship charging a coastal fortress, with bowmen and slingsmen standing on tall scaffolding at the aft, shooting at the defenders.¹⁷ This rickety construction may be a predecessor of the elevated fighting platforms or ‘castles’ soon to emerge on medieval warships, making archery tactically even more efficient. Other sources also show archers shooting from fighting tops (crow’s nests) high in the rigging, alongside slingsmen, stone-throwers and spearmen (Fig. 2.3).

In the thirteenth century, naval archers and crossbowmen grew in importance, sometimes surpassing the significance of hand-to-hand combat during boarding. One example was the Battle of Malta in 1283,



Figure 2.3 Crusader warship attacking the Damietta chain tower during the Siege of Damietta in 1218–1219. The bowmen on both sides are using short recurve bows. Matthew Paris, *Chronica maiora II* (c.1240–53). MS 01611 fol. 59v, by permission of the Parker Library, Corpus Christi College, Cambridge.

when a Provençal fleet was defeated by murderous barrages of bolts shot by ‘Balistarii Catalani’ (Catalan crossbowmen). The battle was described in the *Crònica* of Ramon Muntaner:

The play made by the spears and darts that the Catalans threw was such that their opponents had no defence against them. And of the crossbowmen I need not speak, for they were on the foredeck and so hardened that they fired no shot that did not maim or kill the man it struck.¹⁸

After that, the melee resembled more of ‘a mopping-up operation’ than a battle, according to Stanton.¹⁹ Successful barrages of missiles were increasingly necessary to ensure the success of melee fighting when boarding (Fig. 2.4).

In the High Middle Ages, the cog ship type became common in northern European waters. Often, they were not specialist warships, but merchantmen converted for armed conflict by installing an elevated



Figure 2.4 Fighting cogs in the fourteenth century. The ship on the left has two longbowmen standing on a sterncastle, an excellent platform for maritime archery. The archers are shooting broadhead arrows. Decretals of Gregory IX (c.1300–1340). Royal MS 10 E IV, fol. 19, by permission of the British Library.

sterncastle (and later also a forecastle). The high freeboards also made the cog tactically suited to naval archery, and the combination of the two became a highly effective weapon system in medieval naval warfare. In 1217 the cog proved itself in combat, when an English taskforce defeated a French fleet at the Battle of Sandwich.²⁰ This battle was also an early example of a mobile engagement in the open seas, as opposed to static fights between linked ships, close to land.

Specialist arrows

As well as the usual armour-piercing arrowheads used in land warfare, there were specialist arrows, which may have been particularly effective in naval warfare. This included fire arrows, arrows equipped with limebags, pig bladders filled with oil, and specially shaped heads for cutting through ropes and sails.

The use of lime in naval warfare in the thirteenth century has been studied by the historian William Sayers. The chronicler Bernat Desclot said of the Battle of Malta in 1283 that ‘the battle was widespread and fierce, with spears and stones, and with lime and crossbow’.²¹ At the Battle

of Sandwich in 1217, the English struck their enemy with a ‘fusillade of missiles’, including pots of quicklime.²² Another thirteenth-century source mentions that the Ottomans too used it in naval warfare – ‘as the Turks threw lime at their foes’.²³ At the end of the thirteenth century, Jean Priorat, giving advice on naval combat, mentioned both archery and lime:

Also, shields and bucklers should be stronger and larger to deflect the blows of stones and many different kinds of materials that they throw and cast and with which they kill those who are poorly protected, also quarrels and arrows, shot from long-bows and crossbows, and javelins and iron-tipped spears, pots of lime and great pieces of metal, and sickles and many other things that are both fatal and dangerous.²⁴

But why would lime be used in naval warfare? Giles of Rome provided the answer in his *De regimine principum* (1280): lime was used to blind the enemy.

An eighth recommendation for naval warfare is that there be a large number of pots filled with ground quicklime, which are to be thrown from aloft into the enemies’ ships. When the pots are thrown with force and shatter on impact, the powder rises in the air (as has been noted above in reference to land war) and enters the enemies’ eyes and irritates them so greatly that, nearly blinded, they cannot see.²⁵

What Sayers does not mention is archers shooting limebags at the enemy, using heavy war bows. A contemporary drawing shows a limebag being shot with a bow at the Battle of Sandwich in 1217. The bows used to shoot these bags must have been powerful, to be able to deliver such a heavy payload over a considerable distance (Fig. 2.5).²⁶

Alternately, pig bladders filled with oil could be secured over the head of an arrow, in the same way as a limebag. Once the arrows hit the enemy ship, the oil would leak out onto the decks and make them slippery, making it more difficult for soldiers to manoeuvre and launch their counter-fire.

One mainstay of the Bowman was the fire arrow. Fire arrows could make naval archery potentially ship-killing, especially after the intro-



Figure 2.5 The Battle of Sandwich, 24 August 1217. The bowman to the left is shooting a limebag with his recurve warbow. Matthew Paris, *Chronica maiora II* (c.1240–53). MS 016II fol. 55, by permission of the Parker Library, Corpus Christi College, Cambridge.

duction of cannons, when gunpowder was stored on board. They could also destroy sails and rigging. Fire arrows had existed for centuries and had been used by many navies by the time an Ottoman fleet used them at the Siege of Constantinople in 1453. Hermodoros Michael Kritovoulos (c.1410–c.1470) wrote about the Ottoman naval attack on enemy ships during the siege:

Then he furiously attacked the center of the fleet. Of the heavy infantry on the decks, some carried fire in their hands with the purpose of setting fire to the ships. Others hurled flaming arrows.²⁷

Fire arrows were also used in Scandinavian waters. Their effectiveness as a weapon system was proven by their continuing use by the navies of northern Europe well into the early modern period. In 1565, the Swedish king Erik XIV instructed his admiral Klas Horn to equip the royal warships with ‘fire arrows that can be shot with bows’.²⁸

Several designs of arrowhead have been suggested to be for fire arrows. Generally, they fall into two groups: a cage type and a bag type.²⁹ The cage-type fire arrow involved, as the name suggests, a sort



Figure 2.6 Replicas of standard late medieval arrowheads. From the left, a needle bodkin (for penetrating chain mail), a war bodkin (for penetrating plate armour), a cage-type fire arrowhead, and a crescent arrowhead. Photo: Henrik Arnstad.

of cage built into the arrowhead, filled with an incendiary device. Bag-type arrowheads were long and thin so a bag of flammable substance could be secured over the top. The cage type would have been easier to prepare on board ship, but experiments have shown they may extinguish in flight. The ready-made bag type was more reliable and could be coated to make them waterproof, meaning they could be stored on a ship without the risk of damp ruining them.³⁰ Fire arrows also had an iron point, enabling them to penetrate the wooden sides of a ship, which could cause significant damage to a ship's structure and potentially sink it. Studies by Mark Stretton show the general effectiveness of fire arrows in setting both damp material and thick wood ablaze and reaching distances of up to 180 metres.³¹

Additionally, some have suggested that crescent-headed arrows were specially designed to cut rigging and tear sails.³² Were this true, it would have added to the tactical flexibility and effectiveness of the archer at sea by impacting the manoeuvrability of enemy ships. Stretton's tests to investigate these ideas, while successful – the arrowheads were able to cut through hemp rope and sailcloth – show it was only possible over limited distances and at certain angles.³³ It is difficult to see how this could have been achieved in real life, on a constantly moving ship. However, Stretton's tests confirm that bows could be used for this purpose,

and perhaps in the hands of a highly skilled archer who could shoot many arrows per minute, the potential for inflicting damage was high enough for it to be worthwhile (Fig. 2.6).

Rise of the English longbow

The legendary English longbow, sometimes called the English warbow, became an important part of England's fighting forces in the thirteenth century and remained so until around 1600.³⁴ The weapon is most famous because of the legends of Robin Hood and its use by the English armies in land battles against France in the late medieval period. At this time, the longbow gained credit for many English victories, particularly in the Anglo-French Hundred Years War (1337–1453). The sudden popularity of the weapon in England has led to a belief that it was in some way special – more powerful than those that came before it. In the nineteenth century, this gave rise to the theory that an inferior, shorter bow preceded the longbow; however, as we now know, the invention of the longbow pre-dated its medieval popularity, the evidence is less clear.³⁵ A typical English warbow was heavy, with a draw weight of 70–200 pounds (30–90 kg) and most commonly 90–130 pounds (40–60 kg).³⁶ It seems reasonable to suggest that English warbows had higher draw weights than earlier longbows; however, this is more likely this was because of people's level of practice, not that an intrinsically better design made the medieval English longbow somehow a superior weapon. Moreover, how much the draw weight actually increased is yet to be determined, as no direct comparison has been made between bow draw weights from prehistory to medieval.

The English late medieval state used all means at its disposal, including legislation and proto-nationalist propaganda, to produce a steady supply of longbowmen, intended for both the army and the navy. A skilled, strong, well-trained Bowman could shoot an impressive 10–15 arrows per minute, while the equally impressive maximum range was 200–300 metres. In the hands of massed archers in battle, the English longbow has been described as a medieval machine gun, starting the infantry revolution and contributing to the end of the medieval period.³⁷

On European battlefields, the longbow and crossbow (and the gunpowder firearm) spelt the end of the dominance of the heavily armoured mounted knight, and the rise of the foot soldier.³⁸ This change in the composition of European armies also allowed for an increase in size: equipping an armoured knight was far more expensive than equipping archers, crossbowmen, or pikemen, and thus a larger army could be mustered for a lower cost.

To maximize the efficacy of archers, the English state enforced the training of archers by law, making a substantial part of the male population military bowmen.³⁹ Men had to train with the longbow from the age of seven, and there were penalties for fathers who failed to supply their sons with archery equipment. The price of the longbows was kept artificially low by the Crown to keep them affordable for the yeoman classes. Compulsory, lifelong practice would allow men to draw bows of higher and higher draw weights over their lives. This impressive state project lasted well into the late sixteenth century, which saw renewed – and enforced – legislation on the matter. For example, in the county of Essex in 1573–4, fifty-nine men were charged by the authorities for failing to practise archery.⁴⁰

An important question remains, though. If the longbow was the outstanding weapon of its time, why did not more states (primarily France) use it to the same extent as the English in their armies and navies? The answer seems to have been political stability. The period saw some European states move away from medieval feudalism towards early modern territorial states, and research suggests that what was important to England, employing the longbow, was the country's relative stability.⁴¹ The corollary of massing large numbers of peasants as well-trained archers for the Crown's purposes was there was a large number of deadly bowmen among the populace available for uprisings and revolts. Tapping the full potential of the longbow by training large numbers of men to draw very heavy bows necessarily posed a significant risk to the Crown. As such, the monarchy had to be in a relatively stable position for the risk not to outweigh the benefit. This was on top of the fact that the passing and enforcing of laws to mandate longbow training also required a degree of control over the population. The reason countries such as France

and Spain did not employ longbowmen to the same extent as England was that their monarchies did not consider themselves secure enough. The foreign (primarily Genoese) mercenary crossbowmen they turned to were militarily inferior to longbowmen both on land and at sea but were unlikely to join in a revolt.

On English warships in the High Middle Ages, longbows came with other types of artillery. The hi-tech naval artillery of the fourteenth century was the gunpowder cannon – the English 760-ton carrack, *Holyghost*, had seven cannons, for example.⁴² However, these guns were still mainly small breech-loaders, intended as anti-personnel weapons. They could not yet be compared to the efficiency of the longbow regarding range, accuracy, and firing rate. A bowman could shoot six times faster than an arquebusier and five times faster than a crossbowman, while adjusting their aim to account for the movement of the vessel they were on. Against that, there was a significant delay between firing a gunpowder weapon and the charge going off.⁴³ Reay writes:

A skilled archer on land could place his missile within an inch – to ‘the breadth of a shilling’ was a common boast; once he got his sea-legs, accommodating the lift of the sea and judging the effect of wind on ship and missile, this level of accuracy would ensure that he could, for example, hit the face of a human target with reasonable certainty.⁴⁴

Loades writes about the schooling of bowmen for war at sea:

Naval archers were an extremely important element in the defence forces of the nation. As well as needing to be able to rake the decks of enemy ships from a distance, naval archers also had to be able to shoot at targets high in the rigging. When ships grappled together, men in the crow’s nests – archers, javelin-men and men with large rocks – would assail the enemy decks with missiles; those on the decks sought to pick off those aloft.⁴⁵

The English devised a training method for this type of naval archery combat, called popinjay shooting.⁴⁶ It entailed shooting at targets, usually in the form of birds, which were set up on tall masts (usually on land so the arrows could easily be retrieved). These extensive, elaborate

training methods employed by the English state indicate how important naval archery was.

In the Hundred Years War, England and France were emerging naval powers of regional significance.⁴⁷ But they had different objectives regarding naval operations. England's strategic aim was to transport troops and supplies to the theatres of war on the continent, favouring larger vessels such as the cog. The extensive English tactical use of naval archery lent itself to the castles of cogs and carracks. France's strategic aim, meanwhile, was to hamper English military movements, and thus favoured quick, smaller vessels such as oared galleys. For naval combat, French tactics relied on men-at-arms and crossbowmen. The English thus had an advantage over the French, as its merchant fleet had plenty of cogs, which could easily be converted into warships by installing castles, both fore and aft, making them excellent fighting platforms for bowmen.

The Battle of Sluys

The English longbow gained its place in history in the Hundred Years War. However, it did not first prove itself in the famous battles of Crécy in 1346 or Agincourt in 1415. Instead, it was at the naval battle off Sluys in Flanders, in 1340 (Fig. 2.7). The battle has been studied by the historian Kelly DeVries:

Most historians of the Hundred Years War see the battle of Sluys, fought on June 24, 1340, as the first major onslaught of this late medieval conflict between France and England. A victory for the English, this naval battle allowed Edward III to land on the continent, to gather his Low Countries' allies to him, and to besiege the town of Tournai. ... The most often recognized tactical cause for the English victory is the English inclusion of archers on board their ships leading to the longbow's first great victory in the Hundred Years War.⁴⁸

Planning to engage a French fleet, the English set sail from Ipswich on 22 June 1340 with about 150 ships carrying 600 men-at-arms and 7,000



Figure 2.7 The Battle of Sluys on 24 June 1340. Jean Froissart, *Chroniques* (fourteenth century). MS Fr. 2643 fol. 72, by permission of the Bibliotheque Nationale de France.

bowmen – proportions which indicate the relative importance of naval archery as part of the English war effort.

Encountering the French fleet outside Sluys on 24 June, the English found that the enemy had linked their ships together in three ‘battles’ (lines). Unlike the English, the mainstay of the French forces consisted of melee infantry supported by Genoese crossbowmen. The English arranged their ships in groups of three – two ships filled with archers flanking a ship with infantry – and to the rear, according to a French

source, a ‘flanking squadron made up entirely of archers, which was to give support wherever needed’.⁴⁹ When the English fleet attacked, they unleashed their first ‘shower’ of arrows. The longbows, with their superior range and rate of fire, shot five projectiles for every Genoese crossbow bolt. ‘Screened by the hail of arrows from their archers, the English crews were easily able to grapple with individual French vessels’, according to Stanton.⁵⁰ Several English sources acknowledged the archers were crucial, according to DeVries – ‘Wherefore, God favouring them, the French and Normans were conquered harshly by the English archers’.⁵¹

The French writer Jean Froissart (c. 1337–c. 1405) wrote about the battle in his *Chroniques*. He was appalled by the violence inflicted by the English longbowmen and Genoese crossbowmen:

This battle which I describe for you was very foul and very horrible; battles and attacks on the sea are longer and larger than those on land, because one is unable to flee, or to retreat. ... And the archers and the arbalestriers [crossbowmen] commenced to draw their bows one against the other diversely and rapidly, and the men-at-arms approached and fought hand to hand harshly and hardily. But the English proved so good and so brave.⁵²

The battle turned into a massacre, as the panicking men aboard the French ships could not flee, as Froissart remarks. Estimates put the dead at between 25,000 and 30,000 French soldiers and Genoese crossbowmen. Many were thrown overboard to drown, unable to swim in their armour. Thomas Burton’s *Chronica monasterii de Melsa* (1396) ridiculed them: ‘If God had given the fish the power of speech after they had devoured so many of the dead, they would have spoken fluent French.’⁵³

Longbows on *Mary Rose*

The Tudor period (1485–1603) has previously been considered the end of the longbow’s career, its usage in decline as gunpowder weapons overtook it in efficiency. However, particularly in terms of its use at sea, this does not appear to be accurate. Historical records show that Henry VIII (1509–1547) was a keen sport archer and passed laws to continue the

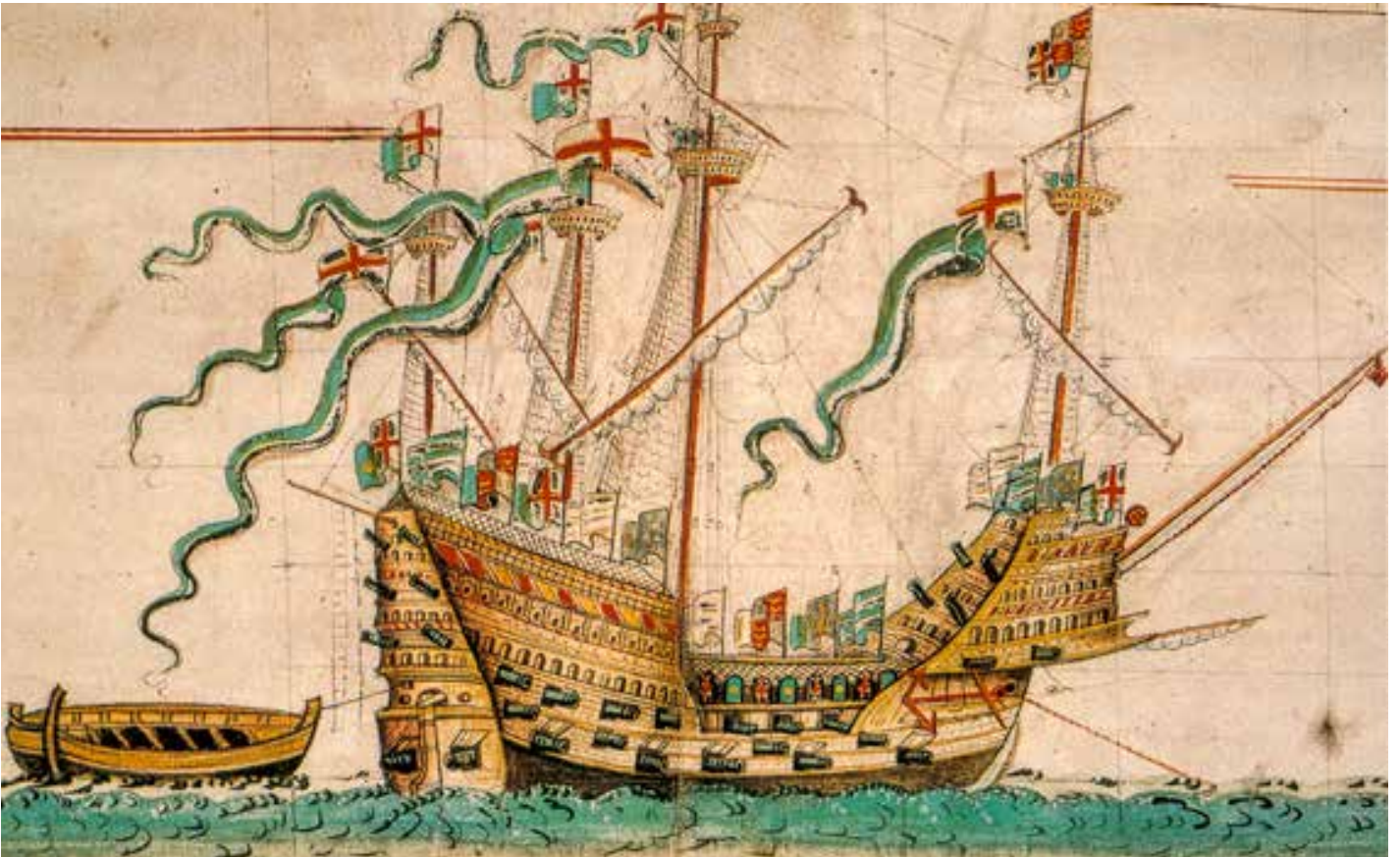


Figure 2.8 *Mary Rose* in the Anthony Roll in the 1540s. Pepys 2991, by permission of the Pepys Library, Magdalene College, Cambridge.

tradition of training all young men to be proficient longbow archers. He had the highest quality European yew wood imported for his armies and paid bowyers handsomely for making the staves into bows.⁵⁴

In terms of naval archery, records such as the Anthony Roll of 1545 show that all the ships in the Henrician fleet were equipped with a large number of bows and arrows. The most famous of them was *Mary Rose* (Fig. 2.8). Completed in April 1512, *Mary Rose* had a 33-year long career as Henry's flagship, seeing its first battle on 10 August that year.⁵⁵ Unusually among his contemporaries, Henry VIII's policy was to maintain his fleet outside of combat, and *Mary Rose* underwent repairs in 1527 and a major rebuild in 1536 to allow the addition of more cannons.⁵⁶ It capsized and sank nine years later on 19 July 1545, the extra guns the likely culprit.⁵⁷ However, it also carried 250 bows and 9,600 arrows,

showing the continued importance of naval archery even as cannon usage increased.

The discovery, excavation, and salvage of *Mary Rose* in the 1970s and early 1980s gave a whole new understanding of life aboard a Tudor warship. Among the thousands of unique artefacts recovered were 172 English longbows, most of which are complete and appear as new, and not only comprise the largest collection of longbows in the world, but the only collection of longbows from the medieval and early modern period. They therefore present a unique opportunity to learn about the weapon in general but also about the use of the longbow at sea. However, since an initial study by the Mary Rose Trust, the bows have not been revisited, and many questions about them remain unanswered (Fig. 2.9).

At first glance, the *Mary Rose* longbows appear fairly uniform. However, closer inspection reveals there is a great deal of variation. The lengths of the complete longbows range from 1,740 mm to 2,113 mm and four shapes of cross-section have been identified. A small group of bows have a grip area in the centre, marked by a change in cross-section. Approximately half the bows have markings, but these are in many forms. Bows were found on all decks of the ship, both loose and in chests on the Orlop and Upper decks.⁵⁸ These differences have given rise to many theories about the reasons for the variations and how the bows were used at sea, which fall into two distinct groups: one that the bows were standardized; the other that there were different groups of archers with different roles aboard the ship.

Much of the evidence speaks against the idea the bows were standardized, yet while they appear different physically, it is possible their function was the same by having the same draw weight. Wood is not homogenous, even within the same species, and variations in the wood create variations in its mechanical properties, so for all the *Mary Rose* bows to have the same draw weight, slightly different shapes would have been required. For bows, one of the key properties was density; a stave with a high density would need to be made into a shorter bow than a lower-density stave to achieve the same draw weight in the finished weapon. If the bows were standardized by draw weight it would mean any man aboard the ship could pick up and use any weapon.

The opposing idea is that different groups of longbows aboard the ship had different roles, and the variations in the collection represent this. For example, seven bows in the collection have been categorized as ‘handled’; it has been suggested that they were designed to shoot fire arrows. The handle is a section at the centre of the bow, where it changes in cross-section from flat-sided to a more rounded, traditional D shape. This change in cross-section could allow the bow to accommodate a binding that would prevent it from being burnt when drawing a lit fire arrow. It is certainly the case that these bows are also some of the largest and sturdiest in the collection, with high predicted draw weights.⁵⁹ Fire arrows, as Stretton notes in his tests, are on the heavier side because of the added weight of the incendiary device.⁶⁰ A larger draw weight would be needed to maximize their range. In addition, there were nine arrow-like objects recovered, which are potentially shafts for fire arrows. They have ambiguous features, which make certain identification difficult: the notched taper at the end, for example, is typical of a crossbow bolt, but they are longer than was usual for a crossbow. At the same time, they are shorter than a longbow arrow.⁶¹ However, were they fitted with an extra-long bodkin arrowhead, as tested by Stretton, they could have been fired from a longbow. Other suggestions of alternative roles aboard the ship include archers using other specialist heads (discussed above), and acting as rangefinders for gunners, wind indicators, or sharpshooters to pick off enemy marksmen.

There is also the matter of the meaning of the marks on the bows. Numerous objects on *Mary Rose* were found to have ownership marks, but many of the marks on the bows are not unique enough to indicate ownership, as several bear the same mark. Perhaps they were makers’ marks, or indicated something to the archers – where to hold the bow, which way was up, where to nock the arrow, etc. Of course, that still does not explain why some had them and others did not.

As well as the physical variation, there is also the matter of the context, found in a chest or loose, and location where the bows were found. Bows found in different parts of the ship might have had different functions, while it is also possible those found loose were in use or intended to be used on the ship, while those in chests were being



Figure 2.9 Archaeological Supervisor Christopher Dobbs examines a longbow just raised from one of the stored boxes. Courtesy of the Mary Rose Trust.

transported, ready for a land campaign. In this case there might then be a difference between bows designed for use at sea and bows for fighting on land. An alternative suggestion is that the loose bows belonged to a specialist company of archers, while those in chests were for any man on board to pick up as necessary, as they would all have been trained archers to some degree. Yet if that were the case, what was the role of specialist archers aboard the ship?

A statistical analysis of the bows' dimensions suggested a possible link between the draw weight and the shape of the cross-section. For each cross-section, the average length and density of that group of bows was different, which may indicate different draw weights – both length and density being factors in determining the draw weight of a bow.⁶² A shape analysis of the cross-sections using geometric morphometrics was done to determine whether the groups of bows were 'true' groups or the result of the human tendency to find patterns in random data, and it found that two of the groups in particular differed significantly from each other and the rest.⁶³ The next step in investigating whether archers on *Mary Rose* had different roles will be understanding how shape relates to the function of the bow in terms of draw weight and range, which in turn will give a clearer picture of archery tactics.

The longbow finds from *Mary Rose* are important when understanding of the longbow as a weapon in general and its use at sea. Yet despite the context of the bows being maritime military archery, this has been forgotten. Data from the bows has been used to inform replicas tested against armour in order to 'prove' the effectiveness of the longbow in battle, while questions about the bows in context of the ship itself are left unanswered. The historical records show that longbows were valuable weapons for Henry VIII's navy. They were not just a relic from the past that can only help us understand the land battles of Agincourt or Crécy.

'Find V', a Scandinavian *Mary Rose*?

Kalmar Castle was of paramount importance to Sweden. Built in the twelfth century in the far south of the country, it was a border stronghold until the seventeenth century, and saw centuries of wars against



Figure 2.10 Broken remains of the ‘pointy sticks’ found on Find V. Photo: Jenny Nyberg, Statens historiska museer.

Denmark which included extensive naval and amphibious operations. Kalmar Castle, guarding not only a hostile border but also overlooking a strategic strait in the Baltic Sea, played a key role. The fortress saw a great deal of action, especially in the turbulent sixteenth century, when Sweden broke away from the Kalmar Union with Denmark and fought its way to independent statehood.

In 1920–1940, Kalmar Castle underwent extensive restorations and the surrounding bay was drained, exposing a multitude of shipwrecks. A construction draftsman, Harald Åkerlund (1900–1980), organized excavations, becoming a pioneer of Swedish maritime archaeology. The finds were presented in the book *Fartygsfynden i den forna hamnen i Kalmar* (1951, ‘Ship-finds in the former harbour of Kalmar’).⁶⁴ Unknown to Åkerlund, his finds also suggest that archery was part of Scandinavian naval warfare in the 1520s.

The ‘most interesting find’ during the excavations, according to Åkerlund, was a warship referred to as ‘Find V’.⁶⁵ Åkerlund’s book discussed in detail when Find V may have sunk. A type of shoe found on the ship was common in the period 1525–1550, from which Åkerlund concluded that the ship probably met its fate in the battles fought at Kalmar in 1523–1525. This would make it contemporary with *Mary Rose*. Find V was found close to the castle walls and had been partly destroyed by fire before it sank, probably set alight by the castle’s defenders. This would imply the warship was Danish. ‘It probably got stuck while attempting to land, and thereafter shot ablaze,’ Åkerlund wrote,

implying fire arrows were used.⁶⁶ He also enthused about a ‘couple of interesting finds’ on Find V: ‘two crossbow arrows made of wood. One of them is broken, the other one is still in one piece.’⁶⁷ However, he did not reflect on crossbows’ suitability for shooting fire arrows. Another find on the warship puzzled Åkerlund:

In the ship were furthermore two long, thin, and pointy ‘sticks’ made of ash. One of them is in one piece and is 73 cm long, pointy at one end and the other end is cut off. Some other parts of similar sticks were found. The author cannot explain the purpose of these.⁶⁸

Mary Rose provides a likely answer to Åkerlund’s question about the ‘pointy “sticks” made of ash’: they were probably remains of arrow shafts (Fig. 2.10).

Over 3,500 longbow arrows were found on *Mary Rose* and they are very similar to the Kalmar finds. The Kalmar sticks are slightly shorter than *Mary Rose* arrow shafts, which measured between 740 mm and 790 mm, but still fell within the typical range for a longbow arrow.⁶⁹ Their shorter length suggests that Scandinavian naval bows may have been shorter than the English longbows, resulting in a shorter draw length. However, the Kalmar sticks are thicker in the middle, implying that Scandinavian fletchers were as experienced in arrow-making as their English colleagues, knowing that the middle of the arrow was exposed to greater stresses when released (Fig. 2.11).

The existence of warbows in Scandinavia is further supported by multiple finds of military arrowheads all over Sweden. For example, during excavations of the small Stockholm island of Helgeandsholmen in 1978–1980, some 50 warbow arrowheads were found.⁷⁰ Regarding Kalmar specifically, during an excavation in 1992, military arrowheads were found.⁷¹ These were of the needle bodkin type, made for penetrating chainmail. The same type – alongside other types of standardized military arrowheads – can be found all over Europe.

The most interesting thing about the finds in Kalmar is the date, as they place Scandinavian maritime archers in the sixteenth century. The assumption that in the early modern period the military use of bows and arrows was a thing of the past, at least outside England, can thus be



Figure 2.11 Visual evidence that Scandinavian warships carried archers is plentiful, as in this mid-fourteenth-century wall painting of a cog in Skamstrup, Denmark. The bowman on the ship's sterncastle has a recurve warbow. Photo: Kurt Villads Jensen, Stockholm University.

dismissed. The Swedish navy equipped its warships with 'fire arrows that can be shot with bows' in the Northern Seven Years War (1563–1570).⁷² There was the example which opened this essay: the Danish–Swedish naval battle of 4 June 1565, when Admiral Trolle met his death when exposed to Swedish warbows (Fig. 2.12). Plainly, the definition of naval archery must be broadened, both temporally and geographically. Maritime bowmen were deployed on warships for later than is commonly



Figure 2.12 Admiral Herluf Trolle, the Danish Inspector of the Fleet (1551).
Photo: Wikimedia Commons.

recognized – and they continued to constitute a transnational weapon system, not a specifically English one.

The decline of military archery in the 1590s

On 28 August 1595, an English fleet under the command of Francis Drake and John Hawkins set sail from Plymouth, heading to the West Indies to attack the Spanish. The bills of lading for *Defiance*, *Garland*,

Hope, Elizabeth Bonaventure, Adventure, and Foresight included ‘longe bowes’, ‘bowe strings’, ‘longbowe shotte’, ‘arrows with ffirewourkes’ (fire arrows), ‘arrowros [*sic*] for longbows’ and ‘chesstes for bowes and arrows’, suggesting Drake and Hawkins understood the value of naval bowmen and intended to put them to good use in the West Indies campaign of 1595–1596.⁷³ Nevertheless, warbows were soon to disappear from European warships. Over 3,000 years after the Egyptian pharaohs first created organized units of maritime archers, a naval tradition came to an end.

In the 1590s there was a fierce debate in England about whether its military should focus on gunpowder handguns or continue the use of longbows. ‘The debate was primarily concerned, on the one hand, with arguments favouring the complete abandonment of the longbow and, on the other, the defence of the bow as fully superior to firearms’, according to the historian Thomas Esper.⁷⁴ In the hands of bowyers, fletchers, arrowsmiths, and stringers the manufacture of archery materials developed into a major early modern proto-industrial business – with a keen interest in the continuation of the English military use of longbows. The craftsmen and merchants commanded considerable financial resources, allowing them to publish pamphlets and treatises arguing the benefits of the longbow. In 1596, the bowyers and fletchers of England were behind the publication of *A briefe treatise, to proove the necessitie and excellence of the use of archerie*, which announced:

Archerie to be of farre greater effect then anie other weapon that ever was invented: And that in respect therof onlie, this Realme of England hath been ever feared and honored of all Nations.⁷⁵

The historian Lois G. Schwoerer remarks that a historical mystique of sorts continued to surround the longbow in England, even as it gradually disappeared from the armed forces. ‘English people generally believed, as a law put it, that the longbow was God’s gift to England’, according to Schwoerer.⁷⁶ William Shakespeare’s play *Henry V* in 1599 was perhaps part of the same pro-longbow propaganda effort, immortalizing the bowmen at Agincourt in 1415. The king names them his ‘brothers’ in the play: ‘We fewe, we happie fewe, we bond of brothers, For he to day that sheads his blood by mine, Shalbe my brother.’⁷⁷

On the pro-handgun side in the debate in the 1590s, the main argument was that using the English longbow, however effective it might have been two centuries earlier, was now an embarrassment to the English armed forces. The origin of this standpoint was the experience of English soldiers who had served in the Netherlands, who, as Esper writes,

were greatly impressed by what they termed the ‘new discipline.’ Elizabeth’s army was never a standing force, and its organization remained inferior to that of the Spanish. The poorly organized English forces sent to fight the Spaniards soon proved unequal to the superior training, armament, and staff organization of the Iberians.⁷⁸

One English officer, Sir Roger Williams, saw service on both sides of the fighting there. To military men like him, the warbow symbolized a frightening English backwardness in the art of modern warfare: ‘God forbid we should try our bows with their muskets and calivers [harquebuses], without the like shot to answer them.’⁷⁹ Military officers arguing for the continued use of bowmen were ridiculed as victims of nostalgia – ‘king Harry captains’.⁸⁰ Also, as argued in 1592 by Humfrey Barwick in his *A breefe discourse, concerning the force and effect of all manuell weapons of fire and the disability of the long bowe or archery*, the new types of harquebuses could fire 40 shots an hour, which he said brought their rate of fire close to that of the longbow.⁸¹

However, when studying the sources, the sheer embarrassment of the English using bows seems more important to the pro-gun side than the actual relative effectiveness of archers and musketeers. Esper’s opinion is that ‘the replacement of the longbow by firearms occurred at a time when the former was still a superior weapon’.⁸² Be that as it may, when it came to the usefulness of longbows versus the firearms of the 1590s, ‘the gun triumphed’, as Schwoerer concludes.⁸³

The forgotten naval archer

Warbows were not completely forgotten after 1600. Quite the contrary, in fact, as England had pronounced proto-nationalistic sentiments about the longbow. In the seventeenth and eighteenth centuries, the

myths about the English national hero and master longbowman Robin Hood became more and more popular. However, at the same time as the forest-dwelling ‘prince of thieves’ and the army bowmen of Agincourt in 1415 became cornerstones in an early English national identity, the naval archers of England were forgotten.

This continued into the post-1789 era, when modern English nationalism was constructed using memory culture surrounding the longbow. In the nineteenth century, following the enormous success of Walter Scott’s novel *Ivanhoe* (1819), longbow archery and Robin Hood developed into a nationalist English mass movement.⁸⁴ To be a true native Englishman was synonymous with being a longbow archer, according to the nationalist discourse voiced in *Ivanhoe*.⁸⁵ In 1791 the archery expert Thomas Roberts had proclaimed the longbow not to be British but English.⁸⁶ Alas, the most obvious difference between the two identities is the role of the sea. The British identity is largely maritime, Britain being ‘the British Isles’, while English national identity is land-based. In the nineteenth century, Britannia ruled the waves while Robin Hood ruled the Sherwood Forest. The identarian heroes of Britishness were Admiral Horatio Nelson and the quest-driven, ever-travelling Arthur, ‘king of the Britons’, while English longbow nationalism was contextualized by the forest, far from transnational coastlines and imperial British maritime ventures.⁸⁷ It is hardly surprising that, even today, the maritime sixteenth-century longbows of the English (not British) ship *Mary Rose* are contextualized, in both popular and scientific writing, as the land-based medieval warbows of Agincourt. The 130 years that elapsed between the Battle of Agincourt in 1415 and the *Mary Rose* sinking in 1545 were unimportant when it came to obscuring the importance of maritime archery, because the longbow was central to the English land-based national identity. This was not a conscious decision. On the contrary, the decision-making was unaware, showing how strongly modern minds are affected by nationalism, social hegemonic structures, and power discourses.

Maritime history since the 1980s has focused on the introduction of cannons on warships in the late Middle Ages and the early modern period. Warships were transformed into platforms for heavy gunpowder

artillery, which was undeniably an important transition of warfare at sea. Nevertheless, the importance of this narrative should not obscure the success of maritime archery. Castles were originally built on warships not to accommodate guns but units of archers, and the first guns did not outcompete trained archers in rate of fire, range, or accuracy. At sea, gunpowder risked getting wet, rendering the gun useless, while fire arrows could even be made to work at sea with the application of a waterproof coating – and may even have been more effective there than on land.

The use of warbows lives on in modern military language. For example in words such as ‘marksman’ (shooting ‘at a mark’ being a form of military archery practice developed in the fifteenth century), but also at sea, where the order to ‘shoot’ is still often used as a firing command.⁸⁸ The continued use of archery-related language shows the long-lasting impact maritime archery has had. It is baffling to think that despite this the naval archer has been forgotten. This essay has focused on Europe in the medieval and early modern period, and there are thousands of years of maritime military archery around the world which warrant further study. Bows and arrows were known in six of the seven continents and taking them to sea was similarly widespread.

Notes

- 1 Carl Gustaf Tornqvist, *Utkast till svenska flottans sjö-tåg af Carl Gustaf Tornquist* (Stockholm 1788), 46 an account based on letters from the Northern Seven Years War (1563–1570). We are grateful to Niklas Eriksson for the information about archery at the battle of 1565.
- 2 The longbow (unlike the shorter bows often used by mounted archers) is typically defined as a bow taller than the person who draws it, so usually 180–200 cm. The length of the limbs allows more energy to be stored in the bow and transferred to the arrow upon release. Yew (*Taxus baccata*) was considered the best wood for longbows, although elm and hazel have been documented. A self-bow is a bow made from a single piece of wood, using the natural properties of the wood to form a spring; a composite bow uses layers of different materials (wood, horn, bone or sinew), glued together to achieve the same effect.
- 3 The International Longbow Archers Association, www.archery-longbow.com/Longbow/: ‘Many still current expressions in the English language come directly from Artillery Shooting or shooting at the Marks. Are you ‘up to the Mark’. To ‘up the Stakes’. To ‘hit the Mark’. To ‘make your Mark’. To ‘lower your sights’. To ‘have Clout’. Even

- ‘on your Marks’ is nothing to do with athletics; it meant do you have your eye on the Mark, i.e. are you ready to shoot.’
- 4 Hugh David Soar, *The Military Archer at Sea* (Bristol 1996); Justin Reay, ‘The Longbow and the Tudor Navy Royal’, *Britannia Naval Research Association Journal* (2007), www.academia.edu/9079374/The_Long_bow_and_the_Tudor_Navy_Royal.
 - 5 Kelly DeVries, ‘God, Leadership, Flemings and Archery: Contemporary Perceptions of Victory and Defeat at the Battle of Sluys, 1340’, *American Neptune* 55 (1995); reprinted in id. (ed.), *Guns and Men in Medieval Europe, 1200–1500* (Aldershot 2002).
 - 6 Charles D. Stanton, *Medieval Maritime Warfare* (Barnsley 2015); Susan Rose, *Medieval Naval Warfare 1000–1500* (Oxon 2002), 24. The extensive index includes crossbows, crossbowmen and cannons, but does not list archery, bowmen, or bows.
 - 7 Mike Loades, *War Bows* (Oxford 2019).
 - 8 A bow may be defined as a machine designed to store the low-quality muscle power of the archer, converting it on release into high-quality rapid mechanical movement, see Gad Rausing, *The Bow: Some notes on its origin and development* (Lund 1967), 16; Robert Hardy, *Longbow: A Social and Military History* (Stroud 2006). This very early evidence is based on arrowhead finds. The earliest confirmed bow specimens come from Mesolithic bog sites (15,000–5,000 BP). Some fragmentary wooden pieces found alongside wooden arrow shafts in Stellmoor, Germany, are believed to be the remains of bows, dating to 9000 BCE. Complete elm self-bows have been recovered in Holmegaard, Denmark, dating to around 6000 BCE. Charles Grayson, Mary French & Michael O’Brien, ‘A Brief Overview of Traditional Archery’, in *Traditional Archery from Six Continents* (University of Missouri Press 2007), 1. The Stone Age ‘Ötzi the Iceman’, who lived some 5,000 years ago, was equipped with a 183 cm yew self-longbow, similar to the weapon used by European armed forces in the sixteenth century.
 - 9 Finds from tombs – including the famous tomb of Tutankhamen (1341–1323 BCE) – shows that Egyptian archers were using sophisticated equipment (Rausing 1967, 77); Jimmy Dunn, ‘The Ancient Egyptian Navy’, Feb. 2003, www.touregypt.net/feature-stories/navy.htm.
 - 10 Dunn 2003: ‘The Sea People, who we are told of on reliefs at Medinet Habu and Karnak, as well as from the text of the Great Harris Papyrus (now in the British Museum), are said to be a loose confederation of people originating in the eastern Mediterranean.’
 - 11 *Encyclopaedia Britannica*, s.v. ‘Naval ship’ (2017).
 - 12 Stanton 2015, 5.
 - 13 Soar 1996, 5.
 - 14 Soar 1996, 2.
 - 15 Fredrik Lundström, ‘Det vikingatida bågskyttet i Birka: Ett exempel på en framstående stridskonst med främmande inslag’ (MA diss., Stockholm University 2006).
 - 16 Stanton 2015, 70.
 - 17 Miniature from the thirteenth-century *Chronica maiora* by Matthew Paris (Parker Library, Corpus Christi College, Cambridge).
 - 18 William Sayers, ‘The use of quicklime in medieval naval warfare’, *Mariner’s Mirror* 92/3 (2006), 263.
 - 19 Stanton 2015, 157.
 - 20 Stanton 2015, 236. The battle is also known as the Battle of Dover.
 - 21 Sayers 2006, 262.
 - 22 Stanton 2015, 239.

- 23 Sayers 2006, 263.
- 24 Sayers 2006, 265.
- 25 Sayers 2006, 265.
- 26 Soar 1996, 8.
- 27 Hermodoros Michael Kritovoulos, *History of Mehmed the Conqueror*, ed. & tr. Charles T. Riggs (Princeton 1954), 50.
- 28 Tornqvist 1788.
- 29 Loades 2019, 28.
- 30 Fire arrows' payload was a mix of gunpowder and alcohol, which would burn intensely for a certain period of time.
- 31 Mark Stretton, 'Fire Arrows Part 3: How Far can they be Shot?', 28 Oct. 2017, and 'Fire Arrows Part 4: What can they set on fire?', 22 Nov. 2017, markstretton.blogspot.com.
- 32 Loades 2019, 68.
- 33 Mark Stretton, 'Practical Tests Part 6: Was The Crescent Head Used to Cut Rope and Sails on Ships?', 20 Feb. 2016, markstretton.blogspot.com.
- 34 The term warbow refers to the idea that larger, heavier draw weight bows, which could fire arrows further and harder, were used in war. Hunting longbows did not need to be as heavy or long ranged. Edward I (1239–1307) is usually credited with the introduction of massed longbow archers in the English army. Edward is said to have tested the new English tactics against the Scots at the Battle of Falkirk in 1298.
- 35 There is limited archaeological evidence of the bow in this period, owing to the biological nature of the materials and the inexpensiveness of the weapon, meaning the bow was discarded when broken rather than maintained as a suit of armour might be.
- 36 Hugh David Soar, *The Crooked Stick: The history of the longbow* (Yardley, 2004), 101.
- 37 Martin Neuding Skoog, *I rikets tjänst: Krig, stat och samhälle i Sverige 1450–1550* (Stockholm 2018) discusses the introduction of the infantry's new ranged weapon tactics (longbows, crossbows, and muskets) over the course of the century to 1550; also Clifford Rogers, 'The Military Revolutions of the Hundred Years War', *Journal of Military History* 57/2 (1993), 241–78.
- 38 Clifford Rogers, 'Tactics and the face of battle', in *European Warfare, 1350–1750* (Cambridge 2010), 203–235.
- 39 Interestingly, 'the minimum property qualification which gave a man the right to vote in Parliamentary elections was set at the low level of 40 shillings of land income per year – the same amount which legally obliged him to own a bow' (Rogers 1993, 254).
- 40 Lois G. Schworer, *Gun Culture in Early Modern England* (Charlottesville 2016), 55.
- 41 See, for example, Douglas W. Allen & Peter T. Leeson, 'Institutionally Constrained Technology Adoption: Resolving the Longbow Puzzle', *Journal of Law and Economics* 58/3 (2015), 638–715.
- 42 Stanton 2015, 246.
- 43 Loades 2019, 61.
- 44 Reay 2007.
- 45 Loades 2019, 40.
- 46 Loades 2019, 40.
- 47 Stanton 2015, 241.
- 48 DeVries 1995/2002, 223, 224.
- 49 Stanton 2015, 264.

- 50 Stanton 2015, 266.
- 51 DeVries 1995/2002, 227.
- 52 DeVries 1995/2002, 223–34.
- 53 DeVries 1995/2002, 226.
- 54 Jim Bradbury, *The Medieval Archer* (Woodbridge 1985), 155; Hardy 2006, 201.
- 55 Brian Lavery, *Mary Rose: King Henry VIII's warship, 1510–45* (Yeovil 2015), 11–19.
- 56 Peter Marsden, *Sealed by Time* (Portsmouth 2003), 15.
- 57 The reason why Mary Rose sank will probably never be fully known; see Geoffrey Moorhouse, *Great Harry's Navy* (London 2005) and Margaret Rule, *The Mary Rose* (London 1982).
- 58 For a full breakdown of the features of the longbows, see Alexandra Hildred (ed.), *Weapons of Warre* (Portsmouth 2011), ch.8.
- 59 Clive Bartlett, Chris Boyton, Steve Jackson, Adam Jackson, Douglas McElvogue, Alexandra Hildred & Keith Watson, 'The Longbow Assemblage', in Hildred 2011, 602–604.
- 60 Stretton, 'Fire Arrows Part 3: How Far can they be Shot?', 28 Oct. 2017.
- 61 Alexandra Hildred, 'Handgun Bolts, Incendiary Arrows or Top Darts', in Hildred 2011, 700–702.
- 62 Abigail Parkes, 'Mary Rose Bows: A statistical analysis' (BSc diss., University of Southampton, 2018).
- 63 Abigail Parkes, 'Mary Rose Bows: A morphometric analysis' (MSc diss., University of Southampton, 2019).
- 64 Harald Åkerlund, *Fartygsfynden i den forna hamnen i Kalmar* (Uppsala 1951).
- 65 Åkerlund 1951, 68.
- 66 Åkerlund 1951, 79.
- 67 Åkerlund 1951, 78, tr. Henrik Arnstad.
- 68 Åkerlund 1951, 78, tr. Henrik Arnstad. Jenny Nyberg at the Swedish National Historical Museums tracked down the Kalmar arrow shaft fragments, which today measure at 680 mm – in the original catalogue and on one of the find tags the measurements are given as 735 mm and 900 mm.
- 69 The length of an English longbow arrow was between 711 mm and 914 mm. John J. Mortimer, 'Tactics, strategy, and battlefield formation during the hundred years war: the role of the longbow in the infantry revolution' (PhD thesis, Indiana University of Pennsylvania 2013), 32.
- 70 m.facebook.com/medeltidsmuseet/photos/a.155473727815710/2540286809334378.
- 71 Kalmar County Museum 1992, <https://digitaltmuseum.se/021017078357/arkeologisk-undersokning-for-husbyggnation-pilspetsar>
- 72 Tornqvist 1788.
- 73 'Bill of Lading for the Ships Returning from the Drake's Last voyage', 1595–96, available at www.indrakeswake.co.uk/Society/Research/billoflading.htm (Loades 2019, 68).
- 74 Thomas Esper, 'The Replacement of the Longbow by Firearms in the English Army', *Technology & Culture* 6/3 (1965), 384.
- 75 R. S., *A briefe treatise, to proouue the necessitie and excellence of the use of archerie* (London 1596), with a dedication by the 'Companies of Bowyers and Fletchers', available at <http://name.umd.umich.edu/A11250.0001.001>.
- 76 Schwoerer 2016, 54.
- 77 Shakespeare, *Henry V*, Act IV Scene III (London 1600).

- 78 Esper 1965, 384.
- 79 Esper 1965, 385.
- 80 'King Harry' being Henry V, the victor of Agincourt in 1415.
- 81 This seems to be a remarkable statement, considering that a longbowman could fire 600–900 arrows in an hour. However, perhaps the true rate of fire was less than this due to physical exhaustion – an issue that did not affect the handgun. Humfrey Barwick, *A breefe discourse, concerning the force and effect of all manuell weapons of fire and the disability of the long bowe or archery, in respect of others of greater force now in use* (London 1592).
- 82 Esper 1965, 393.
- 83 Schwoerer 2016, 58.
- 84 The notion being the 'Anglo-Saxon' English were superior to the 'Celtic fringe' who populated the rest of the British Isles. Stephanie Barczewski, *Myth and National Identity in Nineteenth-Century Britain: The Legends of King Arthur and Robin Hood* (Oxford 2000), 6 describes the difference between Englishness (nationalism) and Britishness (allegiance to an imperial transnational state) as 'A Briton could be made, but one had to be born English'.
- 85 The author of *Ivanhoe*, Sir Walter Scott, an Edinburgh-born Scot, included the Lowland Scots in the Anglo-Saxon 'race', claiming that the real border was with the Highland Scots, who were Celtic and thus inferior.
- 86 Thomas Roberts, *The English Bowman* (Yorkshire, 1791, 1801), 14: 'The bow used by the inhabitants of this island, has always been distinguished by the title of the English longbow. Although the English do not claim the merit of its first invention, yet the wonders it has performed in the hands of our ancestors (who we find at a very early period adopted and fostered this their darling weapon,) very naturally and significantly annexed their name to it. The bow was the singular gift of God to the English nation.'
- 87 Henrik Arnstad, *The Amazon Archers of England: Longbows, gender and English nationalism 1780–1845* (Stockholm 2019), 54.
- 88 Reay 2007.