

Evolution of the size of West European bow during the Middle Ages.

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Introduction

Many assertions exist about the European longbow type, such as "The bows of the Middle Ages (or the Hundred Years' War) were longbows like those of the Mary Rose", the bow of the mythic "Robin Hood" or that "Yew longbows were invented by Welsh archers in the 14th century." How many times have we heard similar statements? These omit key historical elements such as the dating of the *Mary Rose* (16th century, therefore during the Renaissance), and that Robin Hood would have lived in the 13th century. Other statements regroup under the name "longbow" the Welsh bows described in the parchment *Itinerarium Cambriae* (12th century). However, the document makes no mention of a specific length. The Welsh bows described there have a certain power and are made of elm (rightly specifying that they are not made of yew). These assertions also forget that the term "Longbow" (or "Long Bowe") appears for the first time in the 15th century (Letter from Margaret Paston, Fenn, iii.314, 1449) at the very end of the Middle Ages. It then became widespread in the 16th century in Tudor legal texts. Previously, therefore, the term "longbow" was not used.

It is also assumed that the "longbow" is a bow which is "longer than the size of the archer". We could also add that this name is specific to tapered bows, not to prehistoric wide-section bows. However, by analysing medieval West European surviving bows, excavation reports, and studies of various historians, one will be surprised to find that the effective length of many of these bows were actually smaller than the human height. We can therefore ask ourselves the following questions: Does the appearance of the term "long bowe" in the 15th century actually refer to the difference in length between that of a hand bow and that of a crossbow (perhaps suggested by the Paston correspondence)? Or does this indicate a progressive lengthening of the bows during this period? These two hypotheses are also compatible with each other.

I should like to point out that this article has no intention of reopening the debate (closed for decades) on European "short bows". Indeed, apart from a few rare exceptions (such as children's bows and the Pineuilh bow), we cannot consider that these bows existed as a distinct family of bows.

The reflection proposed in this article addresses the hypothesis of an evolution of a "human" size bow (or somewhat less), towards one of a greater length. This would be a natural and global evolution, without having to consider two families of bows existing and evolving in parallel. To study this hypothesis, we will first analyse the bows found during excavations (England, France, Germany, Switzerland, Holland, Ireland), dating from the Middle Ages in order to identify or not a potential evolution of their length. We will then compare this information to textual and then iconographic data. We will next consider a potential cause for this potential evolution.

Choice of artefacts to study based on their dating and typology.

For this part of the study, we will consider the remains of almost complete 'one wood'(self bows) bows found in Western Europe, dating from the Middle Ages (generally between +500 and +1600). Technically, the period +1500/+1600 is no longer part of the Middle Ages. This is the Renaissance, but we will take it into account here as a period of comparison.

We shall not consider the prehistoric bows (from -6000 to -1000). These bows are characterized by a very great diversity in type of wood, shapes (different and non-comparable families of bows) and therefore very varied lengths as well. In addition, prehistoric wide-section bows¹ whether from Scandinavia or from Western European prehistory, have a non-working handle and for some a fairly long non-working end to the limbs, and are therefore necessarily longer than the height of the archers. A length comparison between these different bows families would not make sense here. Certain tapered Neolithic bows (meaning without differentiated handle, between -5200 and -2500, such as La Marmotta, Otzi, Chalain, Egolzwil, Niederwil, Thayngen Weier etc) are of human size or longer, but this is a minority compared to the hundred bows found. Otzi's bow was also work in progress, and it might still have been shortened. Drawing a generalization from these few bows would be risky, given the great diversity of bow sizes over such a wide period. Generalizing these ten bows over the next 4000 years would be even more risky. This period is therefore excluded from this specific study.

The period of the end of the late Iron Age and the beginning of the Gallo-Roman Era (-1000/+200) presents a void in terms of historical artifacts for one wood bows.

The bows of the Nydam/Vimose/Kragehul/Aaderup series (+200/+500), which are made of yew and are quite long, and of which numerous examples have been found in Denmark, constitute a special case. They are probably the product of the fusion of the manufacturing techniques of Neolithic yew bows (progressively moving towards the north) and large Danish wide-section (hence long) bows. But we have no evidence of the diffusion of these bows outside Denmark at that period. Without other proof of geographical diffusion, these bows should be considered as a geographically distinct family and limited in time.

This discussion will therefore focus on a potential evolution of bows, during the 1000 years of the Middle Ages, i.e. generally from +500 to +1500.

Evolution of the size of the bows, observed on excavation artefacts

The graph (image 1) shows the actual lengths (if the bow is complete) or estimated lengths (if the bow is incomplete but its original length can be validly estimated), for all the bow artefacts entering the analysis criteria. When series of bows (more than 2 bows) have been found together, or of a similar origin (bows of Oberflacht, Mary-Rose, etc.) we will show graphically a single source and the average value of bow length. We will show also the maximum and minimum bow size of this series.

Of course, excavation artifacts represent only a minority of the bows actually used. Many more bows used over time have not been preserved. We must consider that they represent a valid sample of historical bows and the artefacts are each evidence for a particular type. It would be surprising if the "disappeared" (or yet to be discovered) bows tell us a totally different story and the trend would likely be similar. Obviously, we rarely know the size of the archers who used each bow. We can therefore only compare the found bows to an estimate average of the size of the population. The average height of a man in Western Europe in the Middle Ages was between 1.60 and 1.80 m, we will use this value (1.70 m \pm 5%) for the comparison.

Some small bows are identified as probably having been those belonging to children or adolescents (the circles in the graph, image 1, Acton Court, Saint Andrews...). They should therefore be removed from this study of the relationship between bow sizes and (adult) archers. A doubt may remain for the Irish bows (Dublin, Adare), which are very small.

We will also remove from this analysis the bows of Altdorf and Aalsum (crosses on graph). The Altdorf bow is a fragment, of circular section, which had an iron end, but whose identification as a bow is in my opinion doubtful, as is the original estimate of length. The Aalsum bow is a fragment of a gnarled and poorly worked branch measuring 1m 27cm. Broken, its original length is estimated at 1m 80cm but this is a rough estimate given the condition of the remaining fragment.

In this analysis, some bows have quite a long length which can be explained easily. The Alamana (diamond on graph) bows of Lupfen and Oberflacht are necessarily long since they have a static handle of almost 25-30cm.

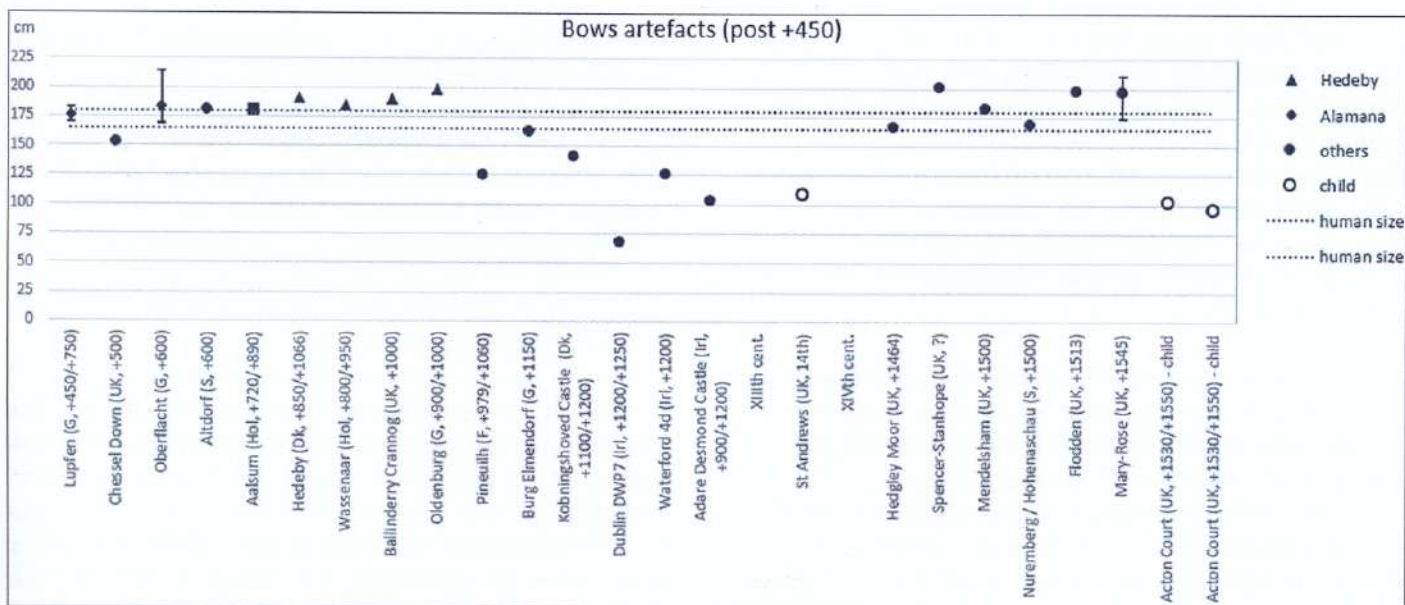


Image 1: Chart of the bow size of all artifacts.

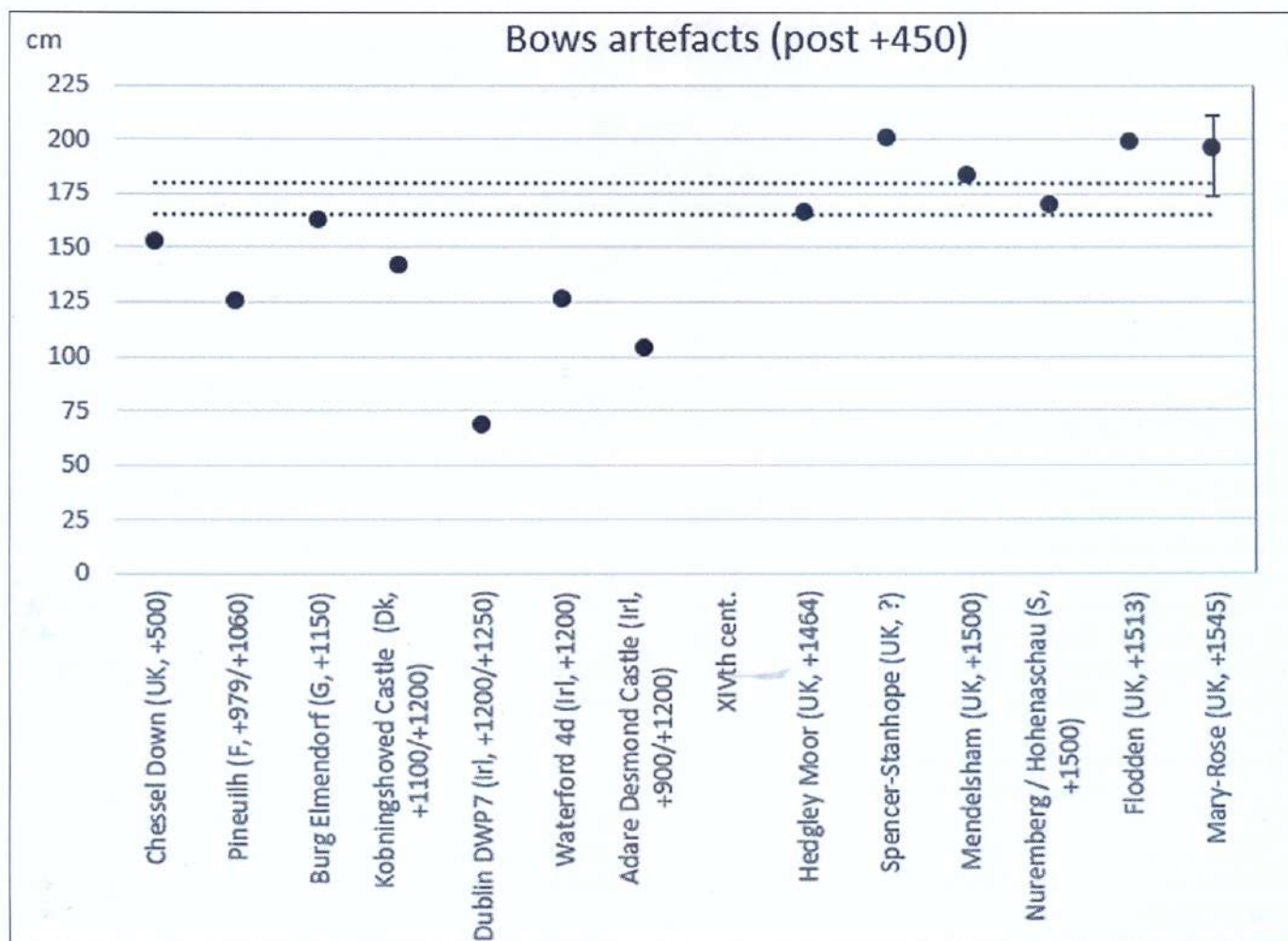


Image 2: Rectified graph for artifacts sizes.

Their effective size (the length of the bow which actually works on the dynamics of the bow, from one nock to another, without taking into account the wood beyond the nocks, nor a rigid handle) must therefore be considered 30 cm or less. In addition, they have a propeller limb shape. Both by the shape and length of their handle, and by the shape of their limbs, they are a distinct family of bows. The "Viking" bows of the Haithabu/Hedeby type (triangles on graph) have ends that are quite long and curved backwards, beyond the string notch, with a length of 7-8cm each. Their effective real size must therefore be considered almost 15cm less. Although they have been found on various "Viking" sites, they also are a distinct family of bows. If we remove these bows from the graph, we obtain the following information (Image 2).

We therefore see on this rectified graph (image 2) that many of the artefacts are like or smaller than human size, for the first "half" of the artefacts from the period studied. A change seems to appear between the 14th century and the middle of the 15th century. From the 15th century, the bows exceeded human height. The Hedgeley Moor bow is 166cm, similar to or slightly less than "classic" human

height (1.70m \pm 5%) but we do not know the actual height of the archer who used it. On the other hand, it is particularly obvious for the bows of Spencer-Stanhope (imprecise dating), Flodden and Mary-Rose (the latter two sites being dated to the 16th century, for comparison).

We can therefore, based on these results, see that until the 14th century, the effective bow size seems to have been generally smaller or similar to human size. They only become "bigger" around the 14th or 15th century. Unfortunately, there is a lack of excavation discoveries for adult bows in the 14th and 15th centuries. And we cannot take for granted that the Flodden/Mary Rose bows (in the Renaissance) were representative of the earlier bows. We therefore have a "gap" for the period where such a change in length potentially occurred.

But is it possible to confirm or clarify this hypothesis from other sources? Few textual sources tell us about the bows length. We will see some of them in the next chapter. And we will also analyze the illuminations showing a bow AND the archer who uses it, possibly allowing a comparison (provided that some precautions are taken).

The distortion of textual information before the 14th century.

Before analysing the texts, we will clarify some preconceived ideas. These ideas support the English national myth according to which "longbows" were "invented" by the Welsh, and in use long before 15th century. But this results from erroneous interpretations of written sources prior to the 14th century. We are not going to use them in the study of our hypothesis on the evolution of the bow size. It is therefore necessary to explain why with some examples.

Idea 1: The Battle of Hatfield (633).

According to Robert Hardy (1976) and J.R. Lee-Barron (2007), 'In 633, a great battle took place between Northumbria and the Welsh led by Cadwallon. Edwin (Etguin) and his two sons Osfird (or Orfird) and Eadfird were killed. Osfird is said to have been killed by an arrow shot from one of the first longbows used in war by the Welsh.'

This story is often repeated for being the first textual historical record of the use of the longbow. But if we look for this information at its source, this battle is recounted (very briefly) in two sources: *Annales Cambriae* and *Historia Brittonum* (the oldest versions of which, from the 10th century, are preserved together in MS. Harley 3859). We therefore see that the few sentences speaking of this battle say respectively: "Gidgar came and did not return. The first day of January, battle of Meicen and Etguin was killed there with his two sons. But Catguollaun was victorious." "Osfird and Eadfird were the two sons of Edguin and fell with him at the Battle of Meicen." (Meicen = Hatfield).

There is absolutely no mention of any bow in these two texts. Furthermore, if a bow had been mentioned in these texts (in Latin), the word that would have been used to describe a bow is simply "arcus", without distinction of length. So, this claim by Hardy and Lee-Baron is simply false. It comes from the reinterpretation of these texts, which was made in the 19th century by Sir John Lloyd (1861–1947) and Charles Plummer (1851–1927), who rewrote English history according to the trend of rewriting national myths in the nineteenth century.

Idea 2: *Anglica Historia* (16th century)

"Between 850-900, under Alfred the Great of Wessex and Ethelred of Anglia, the military use of the bow became widespread, which would have spread the use of the longbow."

Errors of interpretation do not only date from the 19th century. This information comes from *Anglica Historia*, written between 1534 and 1555 by Vergil.

On the one hand, this work is written 600 years after this time, without any real historical sources. On the other hand, at that time the longbow was very widespread, therefore *longbow*, is the obvious and natural description precisely because it is the term used at the time of writing this text in the 16th century. But of course this term is not representative of the mediaeval period. Finally, the manuscript was written for Henry VIII, an archery enthusiast and it is not unlikely that the text was oriented to flatter his ego and thoughts about the traditional superiority of the English bow. Therefore, this text should not be considered as a historical source for any period prior to the 16th century.

Idea 3: *Itinerarium Cambriae* (12th century)

At the end of the 12th century, Giraldus Cambrensis recounts his journey through Wales, what he sees and what he hears there. Among quite a few anecdotes (some greatly exaggerated), he cites the formidable and powerful Welsh archers: "These bows are not made of horn, nor ivory, nor yew. The Welsh carve their bows from wild elm from their forests. We can see that they are not well finished and polished, rather the opposite. The limbs are rough and gnarled, but nevertheless sturdy, broad and powerful, not intended to shoot an arrow far away, but to inflict very serious wounds in close combat."

These bows are perhaps heirs to the prehistoric wide-section elm bows, which spread from Denmark throughout Europe, and which were potentially still in use in Wales in the 12th century.

Here again, nothing to do with "longbows". However, based on these texts, 19th century historians traced their use far back to the Middle Ages, thus rewriting the English national myth, and giving them a more ancestral origin. Actually, none of these texts prove that bows "longer than the archer" were used in the Middle Ages before the 14th century. If we rely on Irish excavation pieces from this period (Dublin DWP7 68cm, Waterford 4d 126cm, Adare Desmond Castle estimated 103cm), these bows were smaller than the archers.

We can therefore discard these texts, considered unreliable (for this discussion on the bow size). But what about texts giving dimensions of bows used from the 14th century?

Textual information from the 14th-15th centuries

For texts from the 14th and 15th centuries, we can take into account 3 manuscripts: *The Book of Roy Modus and Royne Racio*, the *Hunting Book of Gaston Febus* and *Lart Darcherie* (The art of Archery). We will also look at an English edict (5 Edward IV.c.4) which talks about the dimensions of bows.

It should be noted here that Roger Ascham's *Toxophilus* dates from the 16th century. It is contemporary with the bows of the *Mary Rose* and will therefore not be able to help us here. The measurements given in these ancient texts are not in centimeters, we will take the following correspondences: for a handle (or palm), between 7 and 8 cm (7.5 cm); and for a finger, 1.85 cm, not to be confused with a thumb/inch (2.54 cm).

What information is given in these books regarding the size of the bows used?

The Book of Roy Modus and Royne Racio (1354-1377).

First of all the manuscript talks about the brace-height of the bow:

"Quant ton arc sera tendu, qu'il ait entre l'arc et la corde plaine paume, et deux doigts eschardement."

"When your bow is drawn, let it have between the bow and the string a full palm, and two fingers."

So the bow brace-height must have a palm (7.5cm) and 2 fingers (approximately 2 x 1.85cm), or 11.2cm. Which corresponds, according to current standards for a longbow whose length is 12 times the brace-height, to a bow of at least 135cm long. Having a longer bow with a 11.2cm brace-height is entirely possible, and would mean that the bow should not remain strung and under tension for too long.

It is also mentioned that:

"Un arc doit avoir de long, entre la coche du bout d'en haut, jusques à celle du bout d'en bas, vingt-deux poignés."

"A bow must be long, from the notch at the top end to that at the bottom end, twenty-two handles."

A handle, or palm, being the width of a hand, or 7.5cm, this means a bow of 165cm long. This is not contradictory to the previous information. The brace-height was probably calculated differently in the 14th century, and the bow could therefore be longer for a lower relative brace-height, but the bow was still smaller than the average human height.

The following statement can be added regarding the length of the arrows:

"La sayette de quoy tu tireras doit avoir dix poignés de long, depuis la coche de la sayette jusques aux barbeaux du fer d'icelle"

"The arrow that you will shoot must be 10 handles long, from the arrow nock to the arrow base of the tip".

That is almost 75cm long (29.5in), which corresponds (according to our current standards) to bows of around 180cm. But the bows, in the 14th century, were not drawn as far as they are today (see section on the evolution of anchor points further down in this article). So, this ratio is controversial for the 14th century, as we shall see later. It is mentioned later in the manuscript that for shooting in an open area (at a greater distance from the animal being hunted).

"L'on doit traire et tirer son arc fort droit à l'oreille, jusque au fer de la sayette."

"One must draw one's bow very straight to the ear, up to the iron of the arrow."

The bow must be drawn further in this case and "up to the ear". It also specifies "to the iron of the arrow", perhaps implying that this was not usual. Which could confirm that the 75cm of the arrow is well beyond the length normally used during a shot, and therefore that a bow of 180cm is an overestimate here. If 5-6cm of arrow was not really used, we obtain an estimated length of 27in, corresponding to a bow estimated at 165cm (thus we fall back on the bow length value obtained previously). However, this calculation is also subject to controversy because drawing too strongly a bow that is rather small implies imposing an exaggerated curvature on it. The excessive tension on the wood creates an obvious risk of breaking the bow.

Similar information is given for shooting in the forest, but it is specified here that the bow must be of low power to be able to remain in tension while aiming. So, these are shots, which certain bows had to allow without breaking, using an unusually long draw. This text therefore does not allow us to decide precisely on the size of the bow. We have an uncertainty of 15cm in length. However, whether the result of the estimates is 165cm or 180cm, we are of the order of human height or slightly lower, not of sizes longer than the archer.

The Hunting Book of Gaston Febus (Phoebus) (1388)

Within this manuscript, we note the following information:

"L'arc se doit être d'yf ou d'autre boiz, et doit avoir de long de l'une osche où la corde se met jusque à l'autre osche XX poignées. Et doit avoir entre la corde et l'arc quand il est tendu tous les cinq doigts et la paulme large."

"The bow must be made of yew and must have a length, from one string notch to the other 20 handles. And it must have between the string and the bow, when stretched, 5 fingers and a palm wide."

The bow should therefore be 20 x 7.5cm long, or 150cm, for a brace-height of $(5 \times 1.85\text{cm}) + 7.5\text{cm} = 17\text{cm}$. Which is a huge brace-height for such a small bow. This could mean that there was, for this author, a difference in the length of a "handle" and a "palm". We're still here in an era without a standardized measurement system, so it's entirely possible. A "palm" difference of 1cm would give a difference in bow length of 20cm. This would hypothetically give a bow of 170cm, which can be compared with the 165cm above. However, we are well below the size of the archer, which is the aspect being investigated here.

Edict of Edward IV (1465)

According to the analyses of T. Roberts T. and E.T. Fox, the edict [5 Edward IV.c.4] indicates:

"That every Englishman and Irishman (...) shall have an english bow of his own length, and one fistmele at least between the necks, with twelve shafts of the lengths of three quarters of the standards (68.5cm). The bows of any ewe, wychhassel, ashe, awburne, or any other reasonable tree according to their power."

This text therefore gives classic longbow dimensions (still valid today), one palm more than the archer.

Lart Darcherie (c. 1475)

This manuscript is dated to the end of the 15th century but is known to us from a few copies dated 1515.

"Ton arc, se tu voelz quil te dure, doit avoir deux petites poignies plus de long que la longueur deux fois de la flesce "

"If you want your bow to last, it should be two small handles long, plus twice the length of the arrow".

If we postulate an arrow of 10 handles/palm (as described in *Roy Modus* a century earlier), then $10 \times 7.5\text{cm} = 75\text{cm}$ long, this makes a bow of $(2 \times 75\text{cm}) + (2 \times 7.5\text{cm}) = 165\text{cm}$ long.

But if during this period, the draw increased to follow an increase in bow length, it is obvious that the length of the arrows also increased proportionally. This estimation (one arrow = 10 handles = 75cm) is therefore completely hypothetical. Increasing the length of the arrows can quickly change the length of the bow to 175 or 180cm.

Text analysis

The average height of a man at this period is estimated at 170cm. For the 14th century texts, we

therefore remain (whatever the measurements taken into account) with bows similar to or smaller than human height. Which confirms the trend in length of bows obtained by the excavated bows up to the 14th century. For texts from the 15th century, it is obvious that in 1465, in England, the bows exceeded human size.

The information remains less precise for France (*Lart Darcherie*, 1475). If the draw-length, and therefore the arrow size, increased by 5 to 7cm, going from a shoulder or nose anchor to an ear anchor for example, then the bow moves to a length of 175 to 180cm. We are still below the length of a palm of more than the height of the archer, but this estimate is close. This is a hypothesis which cannot be verified without knowing whether the draw-length (anchor point) has evolved, or without other textual dimensions. We will therefore analyse the evolution of the archers' anchor point in a following chapter to try to confirm this hypothesis.

Note about Lart Darcherie: another kind of bow?

Although this is not directly part of this study on the evolution of the bow length, it should be noted that in the *Lart Darcherie* manuscript, we can also find the following mention:

"On fait des arcs de deux fachons, lesquels servent a tirer en trois manieres, cest a entendre des quarrez et des ronds. Les quarrez servent a tyrer a la bute pour trois raisons ; la premiere est pour tant quil y a plus de dos, et ceste cause sont plus durables ; la seconde pour tant que la flesce sy couche mieulx ; de la tierce pour ce quilz sont plus propices a tyrer droit, et tiennent mieulx leurs coups. Et doit estre ung arc pour tirer a la butte et aux chaperons tout dune sorte. On en fait aussi de ronds en deux manieres pour tyrer au chapperon et ou loing. Ceulz qui sont pour tyrer au chapperon ont plus de dos que les autres, pour ce quil en fault tyrer plus de coups, et se ils en avoient peu ils ne le pouroient endurer. Et ceulz de lon fait pour tirer au loing moins en ont et mieulx valent, car le doz en les fait que endormir et appesantir. "

"We make bows in two ways, which are used to shoot in three ways, that is, squares and circles. The squares are used to shoot at the butt for three reasons; the first is for as long as there have more backs, and this causes them to be more durable; the second for as long as the arrow lies better there; of the third they are more conducive to shooting straight, and hold their shots better. And must be a bow to shoot at the butt and at the hood as the same. We also make circles in two ways to shoot at the hood and far away. Those who are ready to shoot at the hood have more backs than the others, so that they have to shoot more arrows, and if they had few they would not be

able to endure it. And those made to shoot far away have less and are better worth, because the weight of the back makes them sleepy and heavy."

The author clearly mentions here two distinct types of bows with different uses. However, no illumination shows any difference in bows. Can we explain this difference?

The talk here is about squared bows and rounded bows, but does this refer to the shape of the section of the limbs? Or the general shape of the bow seen by profile? We do not have this information in the text. Let us therefore assume that this is the overall shape of the bow seen in profile. The rounded bows are therefore very likely the one-wood bow (self-bow) of the long type (at this period of the end of the 15th century), since once drawn, they show a compass shape.

So what would "squared" bow be? An "Eastern" kind of composite recurve bow? We know that composite bows were known in Western Europe, although not very widespread. Could we have here a trace of their European civil use? In *Lart Darcherie*, these bows are associated with target shooting, therefore on close targets, unlike the "rounded bows" used for long distance shooting. However, we know very well that eastern bows are more powerful than one-wood bows. They therefore allow shots at much greater distances! This contradiction leads to only one conclusion, it is not these bows that the author is talking about here. It cannot therefore be the squared or rounded side profile of the bows, but rather the section of the limbs.

There were therefore, in the 15th century, two kinds of one-wood bows used. Bows with a "squared" section and bows with a "rounded" section of limbs. We can very likely link bows with a "rounded" (or oval) section to longbows of the Mary-Rose type (a century later) since these clearly have round and oval sections. These are bows, according to the author, suitable for shooting at medium distance (hood shooting) and long distance (flight shooting) and tapered (with a lesser back) to "be less heavy", meaning to have less inertia. It is therefore logical that these bows were also used militarily as shown on illuminations.

But what about "squared" bows, suitable for shooting at close targets (butt shooting) and medium distance (hood shooting)? These bows are described as having "more back", therefore a wider back than rounded bows. So wide limbs. Could it be that (neolithic) propeller bows survived until the end of the Middle Ages, and were then supplanted by longbows? This can only remain a hypothesis until other material, textual, or iconographic evidence has been brought to light.

Analysis of illuminations, basis of study.

Concerning illuminations, as the basis of a study, I have over 3 years collected more than 400 bow illuminations, from more than 120 manuscripts, on the internet (museum sites, online libraries, etc.). I will only consider here illuminations showing straight bows (therefore not eastern recurves). This makes a basis reduced to more than 370 bows illuminations from around a hundred manuscripts. Of course, there are certainly many other illuminations showing archers, but this is the data base currently collected and on which I was able to work. Other illuminations may complete this analysis in the years to come. The illuminations collected range from the 9th century to the 15th century, and therefore cover a good part of the Middle Ages, even if the first centuries are less extensive than should like. We will consider here a manuscript (which may contain several bows illuminations) as being a single unique source.

If an evolution in the size of the bows did indeed take place in the actual manufacturing of bows, it should be seen in art. But drawing precise deductions from illuminations is a difficult process and must be done with caution. Of course, illuminations are not as accurate as photographs. Of course, there is an element of subjectivity, of artistic distortion. Of course, we must consider what the artist wanted to represent (for example an archer from the Near East, or a mythical Roman). And also, the date the illumination was produced. An illumination showing the battle of Poitiers (1356), but produced in the 15th century, will provide information for the 15th century. Of course, there is also an element of the artist's personal choices in these illuminations. We can imagine that sometimes the hand can be moved to be able to see the face of people (for example). This kind of artistic freedom is mainly shown for the important characters, in the centre of the image, but much less for the archers blended into the mass of fighters (in the case of a battle illumination). However, to avoid this, we will not focus on any particular illumination. We will analyse the trends across the entire basis and see if an evolution can emerge overall.

Analysis of illuminations, part 1: evolution of the anchor point.

An archer's anchor point (the position of the string hand, during "aiming", i.e. just before the release) is linked to the maximum traction applied to a bow. It is measured by the archer's draw-length (length of pull on the string). It is therefore also directly linked to the maximum flexion of the bow limbs. Bending the limbs of the bow further means risking the wood breaking. For modern bows (or Near Eastern bows), protected by composite

materials (whether modern or made of glue and sinews), this limit is different, the resilience being greater. But for one-wood bows it is important to take this bending limit into account. Of course, this bending limit depends on the kind of wood used (wood species, growing conditions, therefore tightening of the rings, intrinsic elasticity, etc.), as well as the thickness of the limbs of the bow, but we generally consider the following relationship between the length of the bow and the draw-length of the archer:

Bow length = 2 x draw-length + 11 inches.

We can therefore generally remember that there is a limit of bending that wood can withstand before breaking. So, to draw the bow further (increase the draw, i.e. pull more on the string, and apply greater propulsion energy to the arrow), we must increase the length of the bow.

While it is true that an illumination may show an archer drawing his bow at a lower draw (mid-draw, or just before the bow is fully drawn), the indication of the maximum length visible on the illuminations of a same period can be significant. If this maximum draw-length increases in a period, inevitably this will indicate a change in the uses of bows by archers of that period. And so, this could also indicate a similar increase in the bow length.

Less draw-length may not be significant, but greater draw-length inevitably is. Even more so if this change does not merely concern a one-off illumination but is repeated on many images of the same period.

Among the entire range of illuminations collected, we will choose those which represent archers using straight bows, and ready to shoot their arrows. Since the question that arises concerns

Période	manuscripts
800-1300	11
1300-1450	24
1450-1500	17
total	52

Image 3: Table of the number of manuscripts (anchor points)

the evolution of the anchor point between the beginning of the 14th and the middle of the 15th century, this is a reduced corpus of 24 manuscripts. For comparison, we will include illuminations from a period before 1300 and a period after 1450 (image3).

We shall therefore study where their string-hand is placed and estimate their anchor point. We will distinguish 5 anchoring zones (image 4).

Anchor zone 1: the front elbow and the biceps.

Anchor zone 2: the front shoulder, the front clavicle, the first nipple.

Anchor zone 3: nose, chin, front of the mouth, eye.

Anchor zone 4: the sternum, the cheek, and the back of the mouth.

Anchor zone 5: the 2nd clavicle, the ear, the rear shoulder, the overdraw shot.



Image 4: Images of each anchor zone.

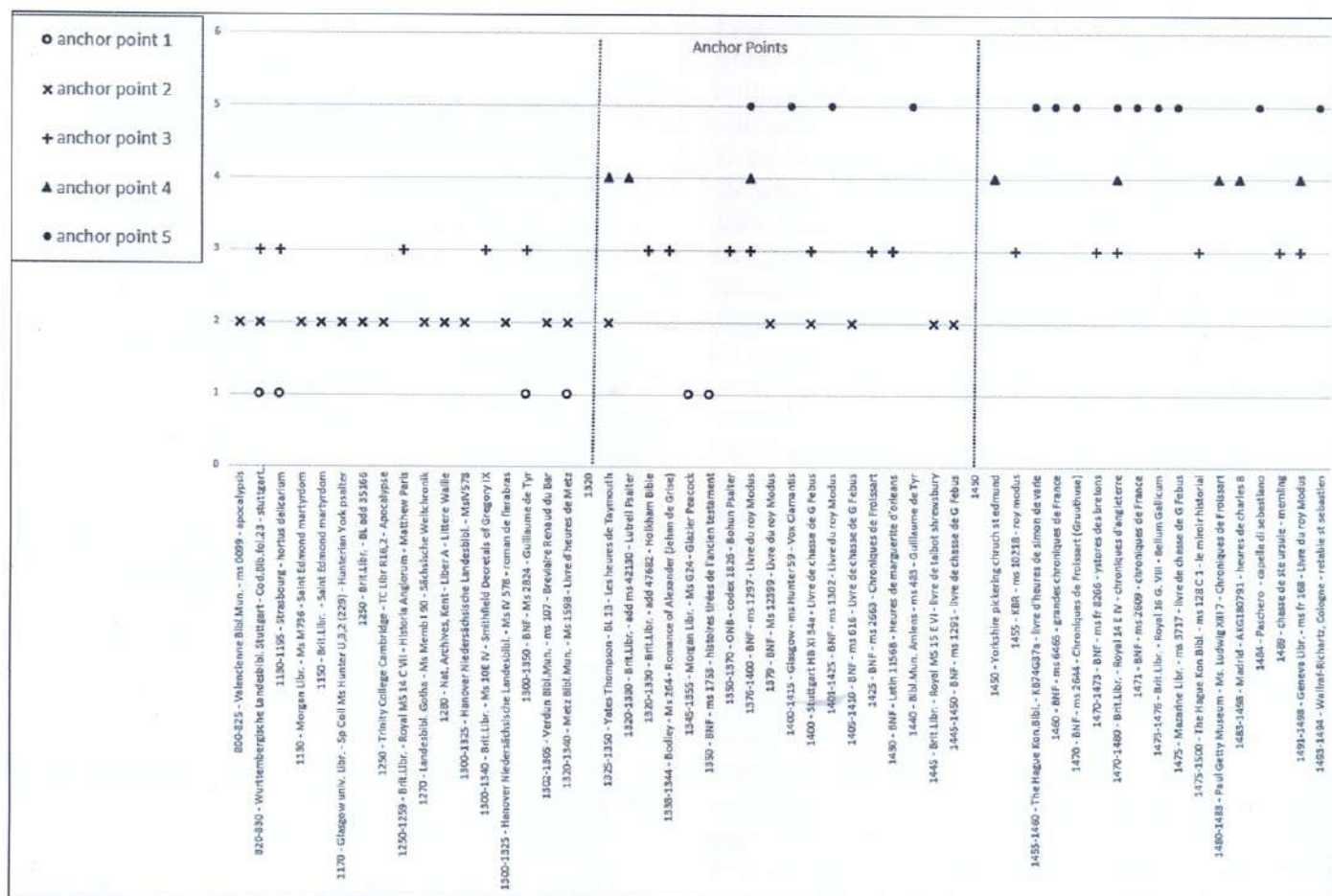


Image 5: Graph of the evolution of anchor points,

By graphing the anchor points (image 5), some fairly obvious observations can be made. Until the middle of the 14th century (Ms.107 Arnaud du Bar, Ms.1598 Livre d'Heures de Metz), the anchor point did not exceed zone 3. Likewise, after 1450 (Ms.10218 Roy Modus, K.B. 74G37a Simon de Varie) 3-4-5 anchor points are the norm. At the end of the 15th century, zones 1 and 2 completely disappear. By indicating on the graph the period of 1320-1450 (vertical lines), we can see that it indeed corresponds to the evolution of the anchor point. It is at this period that zones 1 and 2 disappear, and little by little, zone 4, then zone 5 (still used currently) appear.

There is therefore, in the art of illuminations in any case, a change which takes place between 1320 and 1440. This goes in the same direction as the textual information analysed previously, and in the analysis of the excavation artefacts. This change is visible, whether in the illuminations from England or those from the continent. It is indeed a global artistic evolution. If we had a much larger basis, we could probably try to draw finer trends to better define the period or region of origin of the change. But this is not the case here, and we must limit ourselves to simply noting that there has indeed been a significant change in the archer's anchor point, therefore in the drawn-length, and therefore in the bow size.

Analysis of the illuminations, part 2: evolution of the size of the bows.

We will now return to the basis of illuminations and analyse the proportions between the bow and the archer who uses it. Of course, proportions are not always exactly kept or represented. And this is all the truer for the oldest illuminations, or for marginal illustrations, etc. But in this case, it will often be an artistic exaggeration of the dimensions of an object, to make it more visible. Decreasing the size of an object to make it less visible would not make sense: it would simply be omitted. Exaggerated objects (spear, helmet, dishes, musical instrument, bow, arrows, etc.) will therefore most often be "bigger" than usual (image 6). Therefore, a bow similar in size to human height will be able to represent a human-sized or smaller bow, but not a longer bow. A bow smaller than the archer will not represent a longer bow in the reality.

Now the question that arises here is "when did the bows exceed human height?". The analysis of illuminations, even exaggerated, could therefore (in this specific case) provide the element of an answer.

But we must then take some precautions: First, we cannot consider the illuminations one by one. To eliminate artistic uncertainty, it will be necessary to consider a sufficient basis of illuminations,

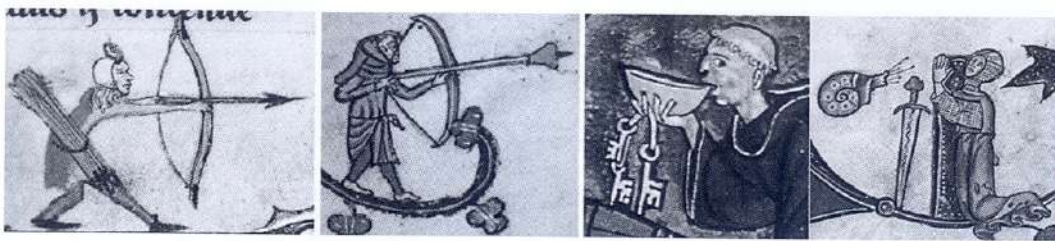


Image 6: Exaggerated object illumination.

in order to analyze them as a whole and from this draw trends. It is these trends which will then be significant (or not) when trying to draw conclusions. Likewise, we will not try to determine precise sizes per cm, for each bow of each illumination, but we will limit ourselves to determining a ratio of the bow size in relation to the height of the archer. This percentage will tell us whether the bow depicted is smaller than the archer's height (let's say less than 90%), like the archer size (between 90% and 110%), or longer than the archer (at above 110%). It doesn't matter here whether the ratio is 74% or 78%. Here we will simply look at whether the bow is "smaller", "similar" or "bigger" than the archer. This reduces the artistic impact on the analysis. If several bows are represented in the same manuscript (on different illuminations or on the same illumination), an average of the ratios will be established, as well as a maximum and a minimum, shown as an error bar on the graph, to show the variability bows sizes within this same source.

Finally, we will see if the evolution of the size ratios corresponds to or differs from the reality observed on the pieces excavated. If this is the case, perhaps we can clarify the deductions obtained above a little. If not, probably the iconographic analysis will be too distorted by the artistic impact. The only reality to base ourselves on is that given by the excavated pieces!

For this analysis, we will take into account the previously cited illuminations, but also others, simply showing the archer next to his bow, but without necessarily him being ready to shoot. The study basis is therefore increased to more than 370 bows from more than 100 manuscripts (image 7). Once we graph the size ratios, we will see that we will be able to define 3 large groups: before 1375, between 1375 and 1440, and after 1440.

Analysis and calculation basis

A human body being generally proportional, and artists having (often) a tendency to respect these proportions, apart from the head because it is often exaggerated in size for the oldest illuminations, we can establish the size of an archer represented on an illumination, even if only part of the archer (bust, arms, etc.) is represented. If several points of comparison are possible, they will all be calculated to establish an average.

For the bow, the length will be measured following the curvature of the wood. If the entire bow is not visible, half of the bow will be considered to be located in the middle of the hand holding the bow.

These measurements are taken by enlarging the illumination as much as possible (the benefit of computing compared to measurements which would be taken directly on an illumination of a few centimetres, thus reducing uncertainty in the measurement), then by dividing the measured length of the bow by that of the archer to obtain the size ratio. It is this ratio (and this ratio only) which will be considered here. Once we have obtained all these values, we can graph them for each manuscript (images 8-9-10-11). If, for the same manuscript, several bows can be measured, the average of the ratios will be displayed on the graph, with the maximum and minimum ratios placed in the error bar.

Analysis

We can already notice something obvious: the bows represented in the marginal illuminations are often exaggerated and show greater variability in relative size. They are therefore less representative.

Illuminations (Morgan Libr. Ms M736 and ONB Han.Cod.1179) show "Viking" bows of the Haithabu type. It should be noted that the excavation examples of these bows show backwards curved tips 7-10cm long, beyond the string notch (therefore 15-20cm larger than their effective length). This makes these bows clearly identifiable on the illuminations as well. However, on the illuminations showing these 5 bows, only one (Han. Cod.1179) shows a bow longer than the height of the archer. We can therefore ask ourselves here the question of the information possessed by the copyists of the manuscript Ms.736, since they represented "Viking" bows but of "classic" smaller size.

Total		375	105
Période	%	nb arcs	nb manuscrits
800-1375	27%	102	36
1375-1440	24%	89	24
1440-1500	49%	184	45

Image 7: Table of numbers of bows and manuscripts (for bow size analysis).

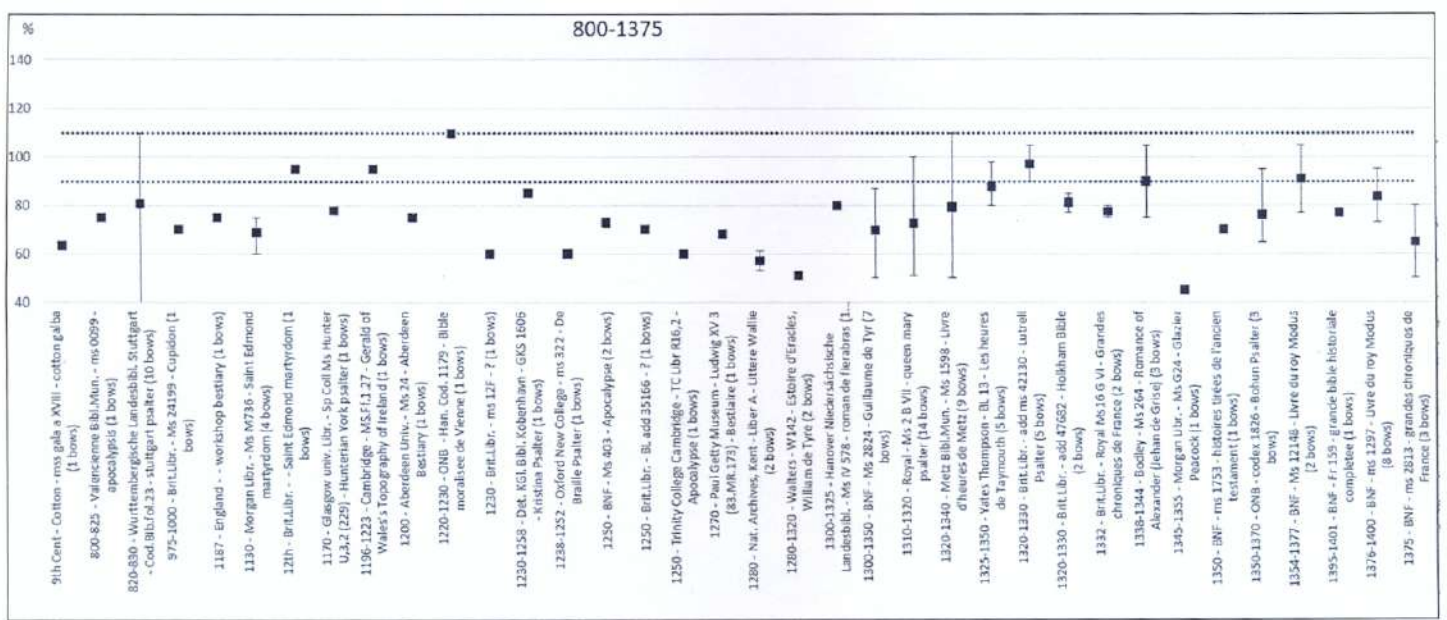


Image 8: Bow size ratios in illuminations (800-1375).

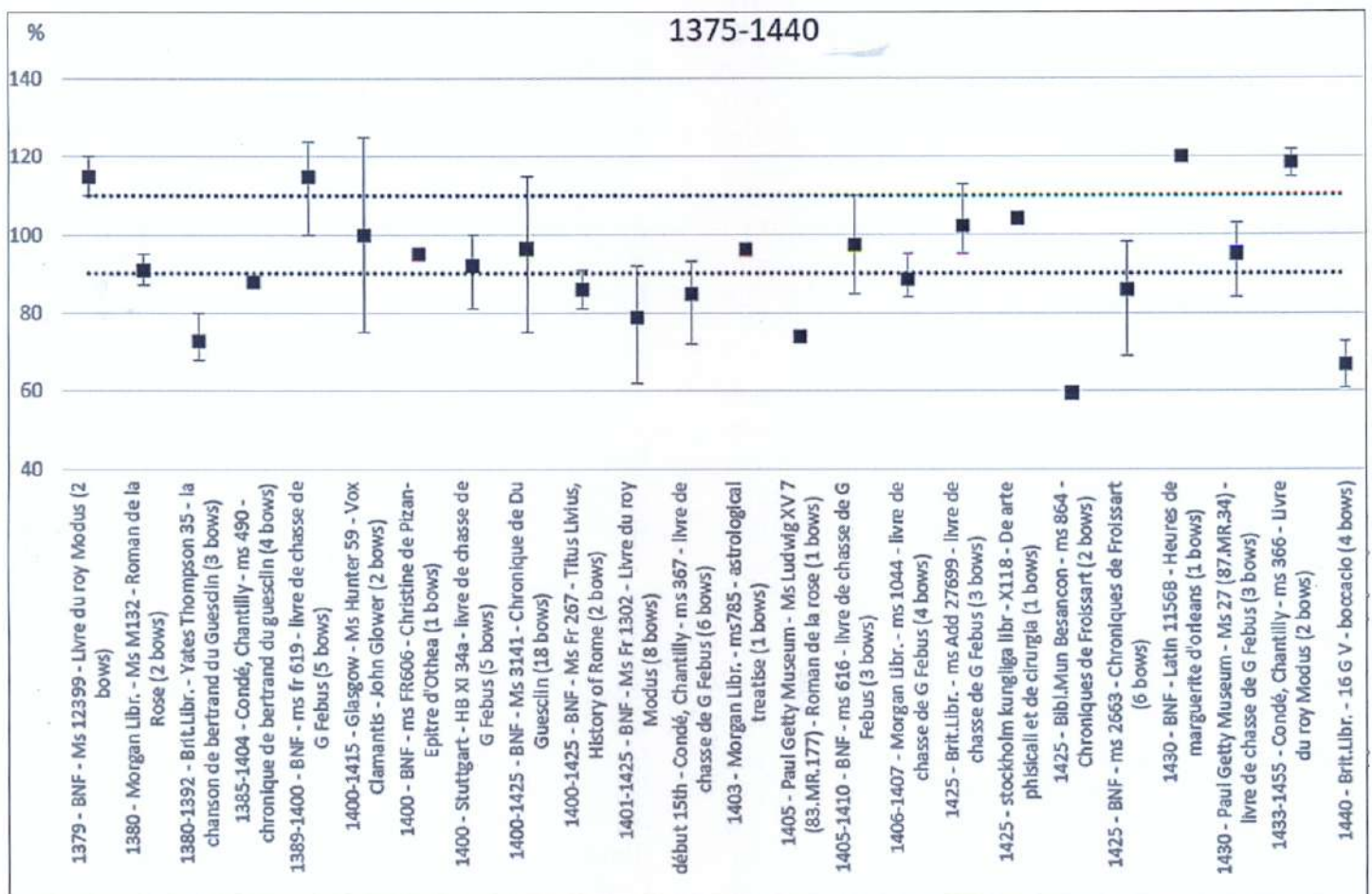


Image 9: Bow sizes ratios in illuminations (1375-1440).

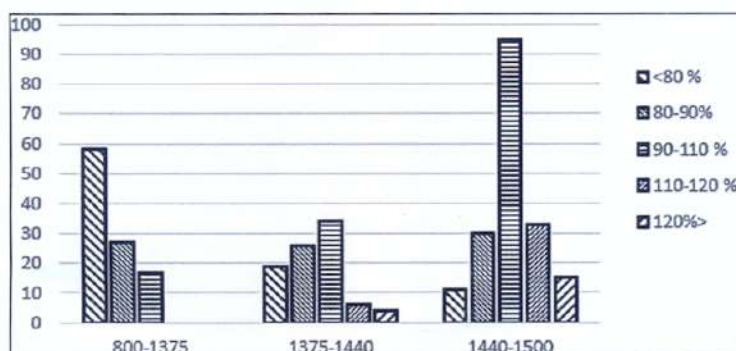


Image 11: Bow size ratios summary in columns.

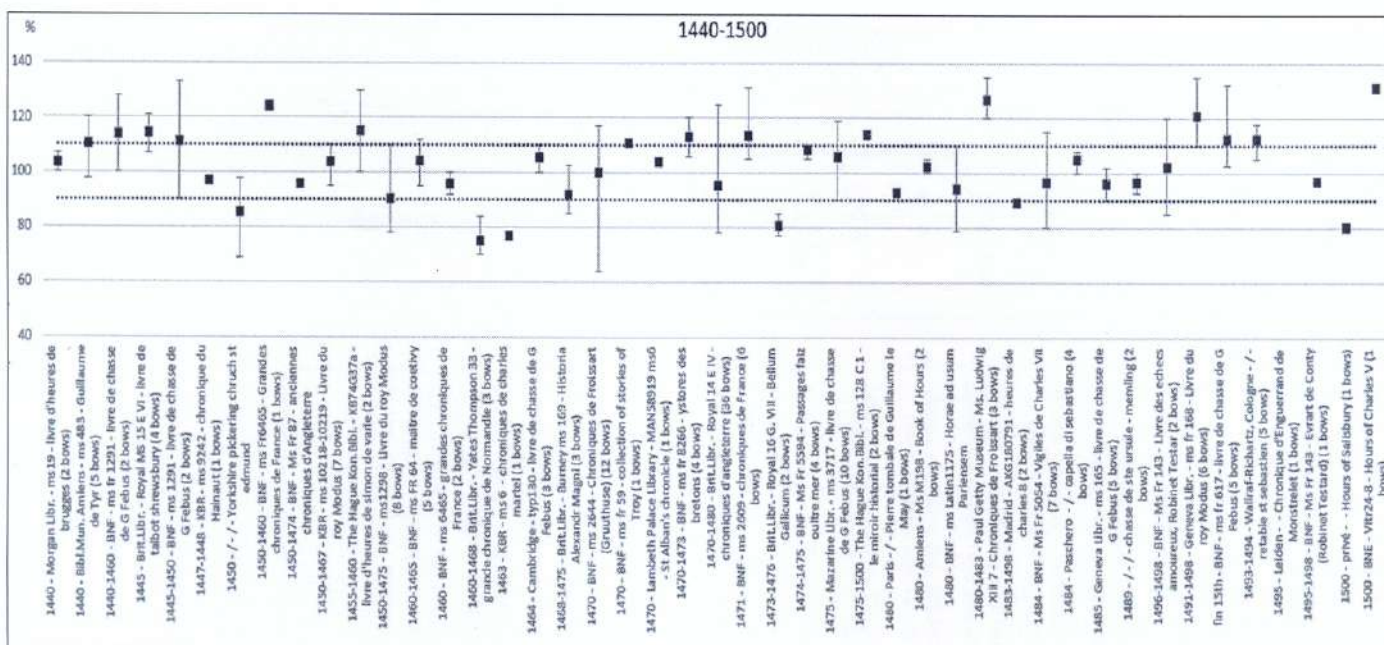


Image 10: Bow size ratios in illuminations (1440-1500).

If we except these specific cases, some trends emerge from the analysis of the graph. Here too we can notice that until the beginning of the 14th century, most bows were less than 85% of the height of the archer. During the 15th century, the size ratio seems to increase and approach 70-100%. That said, between 1310 and 1375, drawn bows exceeding human height seem to be exceptions (4 manuscripts concerned only).

From 1375, the increase in ratio becomes visible and the most part of bows are more between 80% and 110%. We are clearly in a phase of artistic transition. Bows range from a relative size of 60% to 125%. This phase will last until around 1440.

From 1430, we exceeded 110% more regularly. From 1440, bows represented under 90% ratio were rare. Most of the bows will be drawn at relative sizes of 90-120%. Therefore showing stages in the evolution of the bow. Overall, a large majority of illuminated bows until the beginning of the 14th century are less than 85%. So, these are bows mostly smaller than human size. In the 14th century and early 15th century, the proportions began to balance with human size, and longer bows hesitantly appear. After 1440, they are about or longer than human height.

Analysis of illuminations, part 3: recurring illuminations.

Some manuscripts were widely distributed and copied over a long period. We will talk here more specifically about two French hunting treatises showing archery illuminations, and often copied over a century and a half, between 1350 and 1500, precisely the period that interests us.

First, we have the Book of *Roy Modus* and *Royne Racio*, written between 1354 and 1377. The second manuscript is the *Hunting Book of Gaston Febus*, written between 1387 and 1389. Copies were made throughout the entire 15th century of these two hunting treatises.

As the various versions of these manuscripts are copies of earlier versions (some illuminations are clearly similar), it would not be surprising if the relative size of the bows (in relation to the archers using them) remained similar. When it comes to images created by hand the relative dimensions will never be identical, of course. Likewise, the relative sizes of the bows (within the same manuscript) can vary, be exaggerated, depending on the scene represented by the artist and his desire to highlight the bow (oversized object), or not. But a bow "smaller" than human height should remain "smaller" when copying the manuscript.

If the relative size changes, on all the illuminations of the same manuscript, isolated among other manuscripts with similar ratios to each other, this could be an artist's effect on this specific manuscript. But if the size ratio evolves consistently across a set of manuscripts, this could be indicative of a true change in the bow captured by the subsequent copyists of these manuscripts. And this will have to be compared to other trends already analysed. Let us therefore graph the relative sizes of the bows, calculated on the same bases as previously, for these manuscripts, specifically for the 14th and 15th centuries.

For the Book of *Roy Modus* and *Royne Racio* (triangles in the graph, image 12), as we saw previously, the text clearly speaks of bows smaller

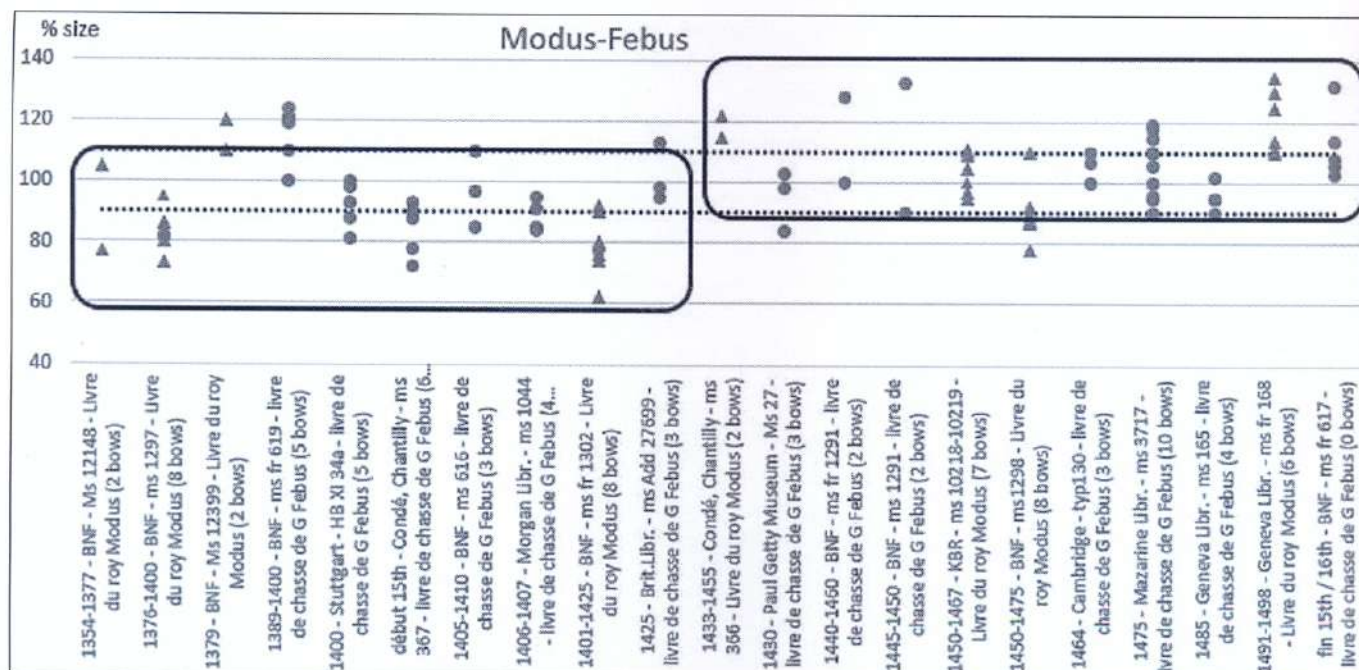


Image 12: Bow analysis from *Modus* & *Febus* manuscripts.

than human size. However, we see here, in the first 4 manuscripts (before 1425), out of a total of 20 illuminated bows, 15 bows have a relative size of 60% to 90% compared to the size of the archer. Only two bows are 90-100% relative size, and 3 bows exceed 100% relative size. Three quarters of the illuminated bows are therefore much smaller than the height of the archer. After 1425, we have 4 other manuscripts (for 23 drawn bows) and the proportions are reversed. Only 6 bows are illuminated at 75-90% relative size. 4 bows are between 90 and 100%, and 13 bows exceed 100% relative size. While only a quarter of bows are "smaller" than the archer, more than half exceed this size. It is further possible that the manuscript Ms.1298, showing all bows less than 90%, was a true copy of a manuscript before 1425 (Ms.1297 or Ms.Fr.1302), and that the copyist has not been in contact with archers and their equipment. There is indeed a change in the copies of this manuscript around 1425.

For the *Hunting Book of Gaston Febus* (rounds, image 12), the text also speaks of bows smaller than human height. And in fact, the first 5 manuscripts analysed (1389-1410) show most bows of a size similar to or smaller than the size of the archer. Of the 23 illuminated bows there, 9 are between 70 and 90% of the archer's size, 9 others are between 90 and 100%. 5 bows are greater than 100%, but it should be noted that 4 of these bows (and one bow of 100%) are all from the same manuscript (Ms.Fr.619). We can therefore ask questions about the illuminations of this atypical manuscript. Were all these bows there illuminated with exaggeration, all in the same way by the artist? Were they deliberately illuminated larger in opposition to the text? Is this indicative of an earlier change, not reflected in the other copies?

This point would require more in-depth analyses of this manuscript, and that is not the objective here.

After 1425 we have 8 manuscripts and 32 illuminated bows. Of these, only one is less than a relative size of 84%. 13 bows are between 90% and 100%, and 18 bows are greater than 100%. More than half are therefore of greater relative size than the archer, and the others (except for one) are of similar size. In this series of manuscripts too, a variation in the relative size of the bows can be noted, over the same period. Except for Ms.Fr.619 this is much more marked than for the *Modus*.

Illuminations information compared to textual information and excavation pieces.

The first part of this study showed that excavations from sites of the early Middle Ages (until 1200) generally yield bows smaller than human height. The 13th and 14th centuries are unfortunately devoid of interpretable artefacts. The bow from Hedgeley Moor (1464) gives us a similar human-sized bow. While the bows of the late 15th and 16th centuries give us bows longer than human height.

Texts prior to the 14th century are unreliable, or do not give an indication of bow length. In the 14th century, hunting treatises (*Modus* and *Febus*) indicate bows smaller than or like human size, depending on the measurement conversions used. For the 15th century, the *Lart Darcherie* manuscript indicates bows just below human height, while the *Edict of Edward IV* clearly gives bows above human height. These elements indicate a variation in the size of the bows during the 14th and 15th centuries. Variation that we also meet in the illuminations.

The analysis of the anchor points (so the bending and length of the bow) indicates "fairly short" bows until 1320. Then a period of increase in elongation between 1320 and 1450. Finally, stabilization at a large extension (therefore longer bows) after 1450.

Analysis of the relative sizes of bows and archers in the illuminations shows us bows smaller than the archer before 1375, a period of increase between 1375 and 1440, and bows overall longer than the archer after 1440. Concerning the "recurring" manuscripts therefore copied several times over time (*Modus* and *Febus*), the period of transition in the length of the bows would seem to be around 1425.

Hypothesis: Impact of the Hundred Years' War

It therefore seems that the change in length of the bows, observed in the excavated examples, between the 13th and the 15th century, is confirmed in the texts, and is also reflected in the iconography, both by the anchoring points of the archers, and in terms of the relative size of the bows. From the iconography, we can also assume that this change would have started around 1320-1375, and ended around 1425-1440, but the art may have been around ten years behind reality. We can then wonder what the technical reason for this evolution in the size of the bows would have been.

And when we analyse this period (1320-1440), there is only one global event corresponding to these dates, which marked the history of England and the continent in the same way, and which may have influenced the use (hence the manufacture) of bows: the Hundred Years' War (1337-1453). We can therefore allow ourselves to pose a hypothesis, about the lengthening of the bows during the Hundred Years' War. This certainly did not happen quickly (neither in the actual use of the bows, nor in its artistic representation, which probably marks a certain delay in adaptation). But during this century (1337-1453) we can indeed note an evolution of the anchor point in the art of illuminations. Such a change would have had no reason to exist if it had not been inspired by a certain reality in the manufacture of bows.

Of course, bows had been used in warfare for centuries. Can one more war justify this change? Maybe. But to understand it, we must perhaps consider not the bow, but the arrow, and therefore the target. Because everything is linked.

The Hundred Years' War saw a major evolution in body protection. Where previously there were gambesons (quilted jackets) and mail armor, during the Hundred Years' War, we saw the appearance and widespread use of iron plate armor then simple steel later, and finally in hardened steel. The battles of Crécy, Poitiers, Agincourt proved the danger of archers and arrows against soldiers on foot, against

knights in armor, and against horses, if they were not protected by sufficient plate. So, this war saw the arrival of more resistant plate armor (where iron is around 80 VPH, the hardened steel of 15th century armor that has come down to us goes from 250 to 600 VPH!), with more rounded shapes to deflect arrows.

If Crécy (1346) saw fighters mainly equipped with gambesons, mail and the first forms of iron armor, at Poitiers (1356) a small unit of elite horsemen were already equipped with plate armor impenetrable to arrows, and archers were only able to get rid of them by going around them and aiming at the unprotected rump of their mounts. Arrow-proof armor existed from this time but it only equipped a very small minority of fighters. During the Battle of Agincourt, recent studies show that 50% of the French were still equipped with iron armor compared to 30% with ordinary steel and only 15% with hardened steel (which explains why some nobles do not seem to have suffered from the arrow storm unlike others).

In Verneuil-sur-Avre (1424) the French, fearing the English bow, specially recruited a troop of several hundred Lombard mercenaries whose excellent, state-of-the-art Milanese armor completely protected them and their mounts from arrows. We had to wait for the creation of the standing army and the orders of Charles VII to finally see a real generalization of hardened steel armor among knights and men-at-arms (the infantrymen and archers continued to wear less expensive iron protection and therefore more vulnerable to the bow). The same armor evolution will have taken place in English armies and other continental ones.

As a result, archers also had to evolve so as to shoot arrows with more penetrating power, therefore heavier, retaining more energy on impact, but having to be shot with more energy. Shooting an arrow with more energy can be done in two ways. Either with a more powerful bow, therefore thicker (this is the birth of "warbows"), or for a bow of the same thickness by accumulating more potential energy to transmit to the arrow ie. by pulling the string further; and if you pull the string further, to prevent the bow from breaking due to too much curvature, you must lengthen the bow in the same proportion. This seems logical, but are there other elements that could confirm this hypothesis?

A study could be carried out on the arrows found during excavations. Very often it is the arrowheads that are found, but have complete arrows also been found (apart from those of the Mary-Rose)? Is there an evolution in the length of the arrows? or their diameter (weight)? This could be confirmed based on the diameter of the arrowhead sockets. But the arrows are not part of this study, so we will leave it to others to confirm these speculations.

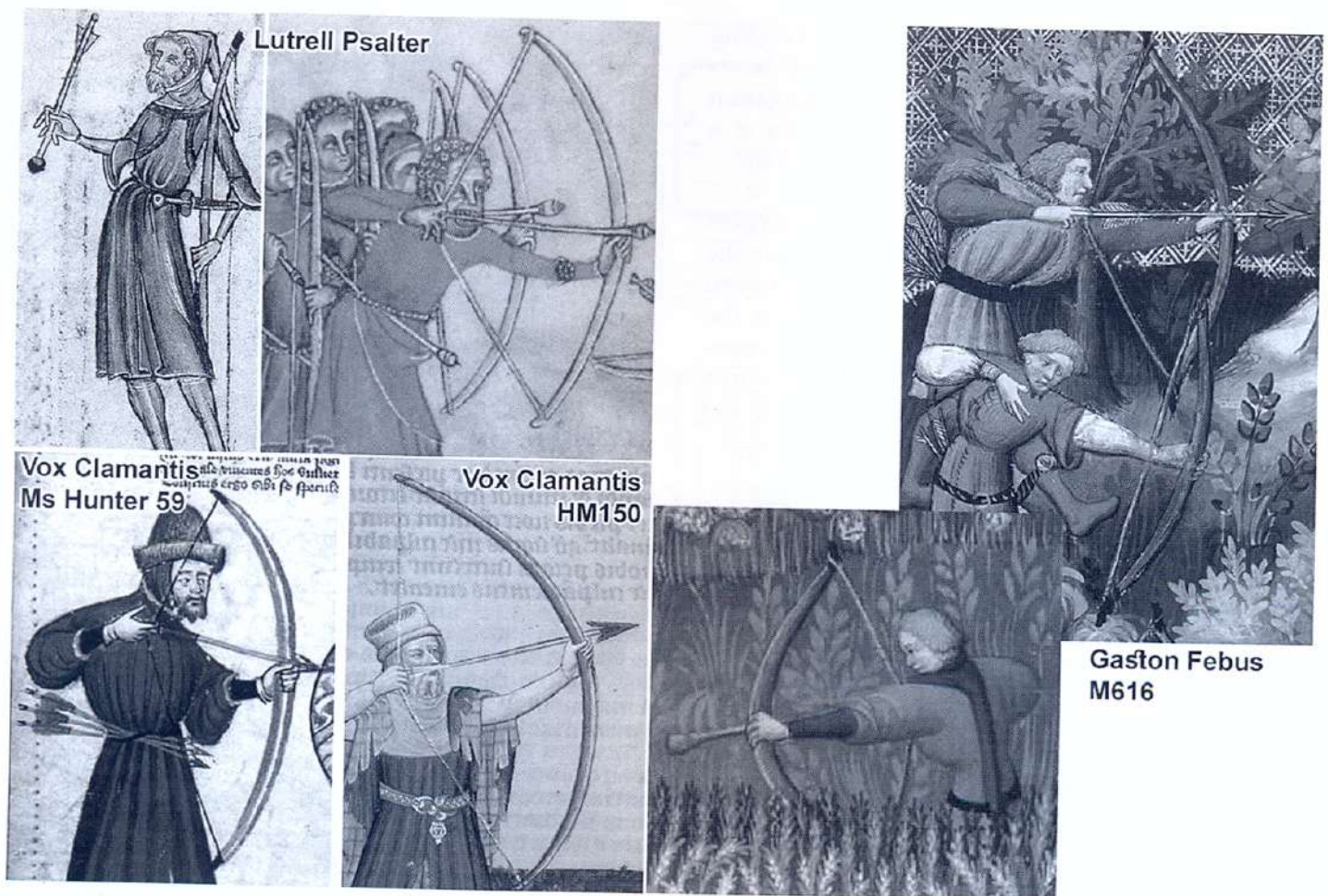


Image 13: Firsts potential horn nocks in the manuscripts.

If the bows are more powerful, perhaps it was necessary to reinforce the ends of the limbs, the attachment points of the string, to prevent the wood from splitting under tension. Exactly when did horn reinforcements (horn nocks) appear at the tips of bows to secure the strings? They did not exist at the beginning of the Middle Ages. If the bows are more powerful, more hand strength is also required to draw them. Many illuminations show archers drawing bows with two fingers. Starting when was the 3rd finger used? These clues of more powerful bows may indicate the birth of the "warbow", and not exactly that of the "longbow". Power remains different from length. But it may have participated in the same evolution, due to the same causes.

About horn nocks and String Fingers

The *Lart Darcherie* manuscript (late 15th century) clearly tells us of nocks made of cow horn, deer antler or silver placed on the bows. This diversity tells us that it is a very widespread use. But this tells us nothing about the origin of horn nocks since it was written at the end of the 15th century. Likewise, the Nuremberg bow (catalogue reference W741) is the oldest bow to my knowledge bearing horn nocks. These were handcrafted, and decorative, not a crudely utilitarian form. But this bow is dated

from the 16th century, like the bows of the *Mary Rose* (some of which were also designed to carry horn nocks, cfr *Weapons of Warre*). This also tells us nothing about the use of horn nocks in the 15th century and the date of their appearance. We will therefore turn again to illuminations to try to find answers.

Of course, most of the bows depicted are too small a scale to make out any details. And of course, the question remains whether the artist wanted to go into this kind of detail or simply depict a bow. So, a small illumination of a bow not showing a horn nock will not mean that at that period there was none to be found on the bows. But on the contrary, when the artist has been quite precise and the illumination, or painting, shows a horn nock, this will undoubtedly mean that these were indeed in use at that time.

In the corpus of illuminations, it is already obvious that until the end of the 14th century, no horn nock is visible. Even when the artist was precise enough to trace down to the string knot on the bow. A question may arise concerning the *Lutrell Psalter* (1320-1330, Brit. Libr. add ms 42130) in which we can see a bow whose two ends are black. Some see it as the first illumination showing horn nocks. I will be less categorical since the string knot is made below these two black spots. Let us admit

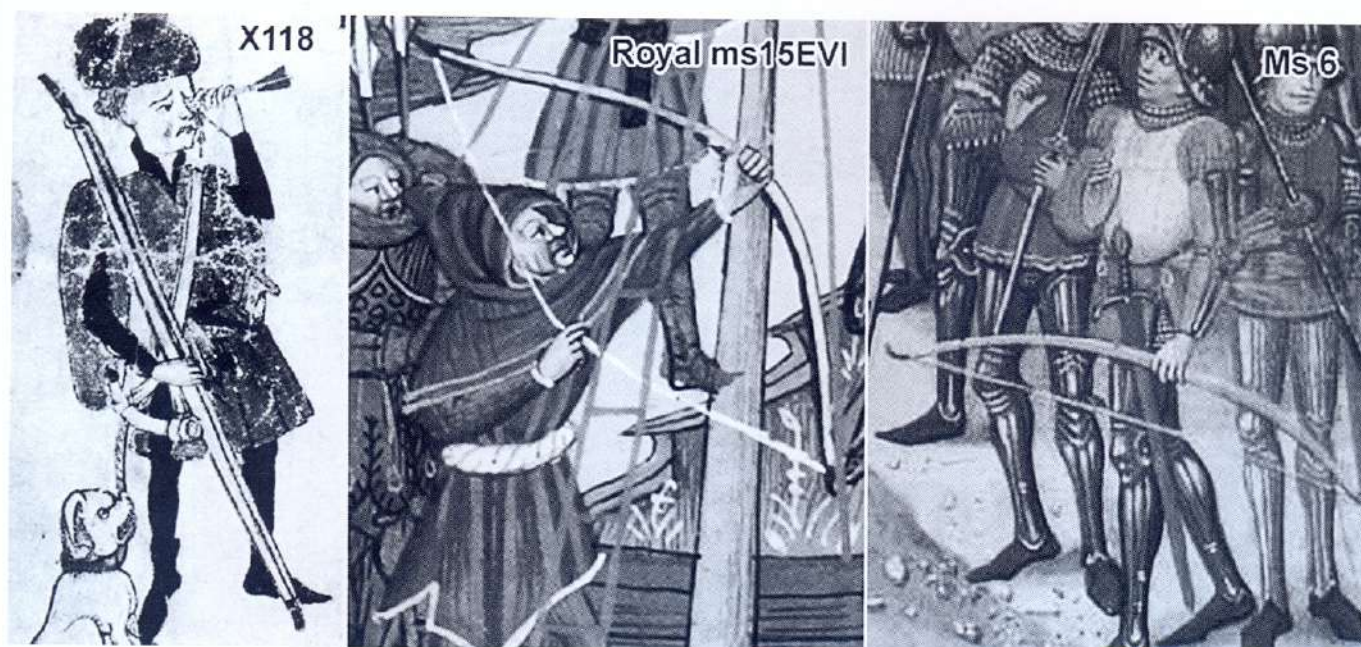


Image 14: Horn nocks clearly identified in the manuscripts.

a certain doubt here, especially since another illumination in this *Psalter* obviously shows no horn nock. Doubt reinforced by the fact that at this period, the Hundred Years' War had not yet begun, and that the need for warbows, and therefore the need to reinforce the tips of the bows, had not yet occurred.

Reasonable doubt can also be cast on the *Vox Clamantis* (1400-1415, Glasgow Univ.Lib., Ms Hunter 59, f6v, & Huntington Library, HM150, f13v). Here the Hundred Years' War began well, but if one illumination shows a black spot at the ends of the bow (without further detail), others show absolutely nothing. It is therefore uncertain but (unlike the *Lutrell Psalter*) the string is fastened in the black area. (picture 13)

However, casting doubt on the *Vox Clamantis* does not change the dating of the first illuminated horn nock. At the same period as the *Vox Clamantis*, a copy of the *Hunting Book* by Gaston Febus (1405-1410, BNF, ms 616, f111v, f118v) shows clearly and in detail a horn nock whose curvature can be seen. Clearly identifiable horn nocks are in the following manuscripts (image 14).

1425 - Stockholm Kungliga Libr - X118 - *De arte phisicali et de chirurgia*

1445 - Brit.Lib. - Royal MS 15 E VI - *Book by Talbot Shrewsbury*

1463 - KBR - ms6 - *Chronicles of Charles Martel*

We can also note the presence of horn nocks on the archer's bow represented on the *Black Tapestry* in the Zamora Cathedral museum (Spain, image 15). This is estimated around 1425 and was made in a tapestry workshop of Brussels.

While most of the Middle Ages saw the use of bows whose string was fixed directly to the wood, the beginning of the 15th century (1400-1425) saw the appearance of horn nocks. It is not possible here to determine precisely geographically where these appeared. This innovation was contemporary with the appearance of "warbows" during the Hundred Years' War, whether on the continent or in England, to allow greater tension to be applied by the string on the wood, without splitting it.

Concerning the use of two or three fingers to draw the bowstring, we note the following text, in the book *Modus* (1377), in the 14th century:

"On doit traire à trois doigts, et doit on tenir la coche de la sayette entre le doigt qui est emprez le paulz, et l'autre doigt d'emprez".

"You must shoot with 3 fingers and hold the nock of the arrow between the finger that is close to the thumb and the next finger".

The beginning of the sentence clearly mentions that "you must draw the bow with 3 fingers". However, if the original dates from the 14th century, you should know that this manuscript was often copied in the 15th century, and therefore it may be a later modification.

Let us look in the illuminations at which moment the archers go from 2 to 3 fingers of string traction. We will only consider here the illuminations showing straight bows (not recurve ones), and showing, of course, the archer's hand in full draw, dated from the 14th and 15th centuries. During this analysis, it is obvious that 95% of the illuminations in the basis show archers shooting with 2 fingers. But a few (rare) illuminations now stand out (image 15).

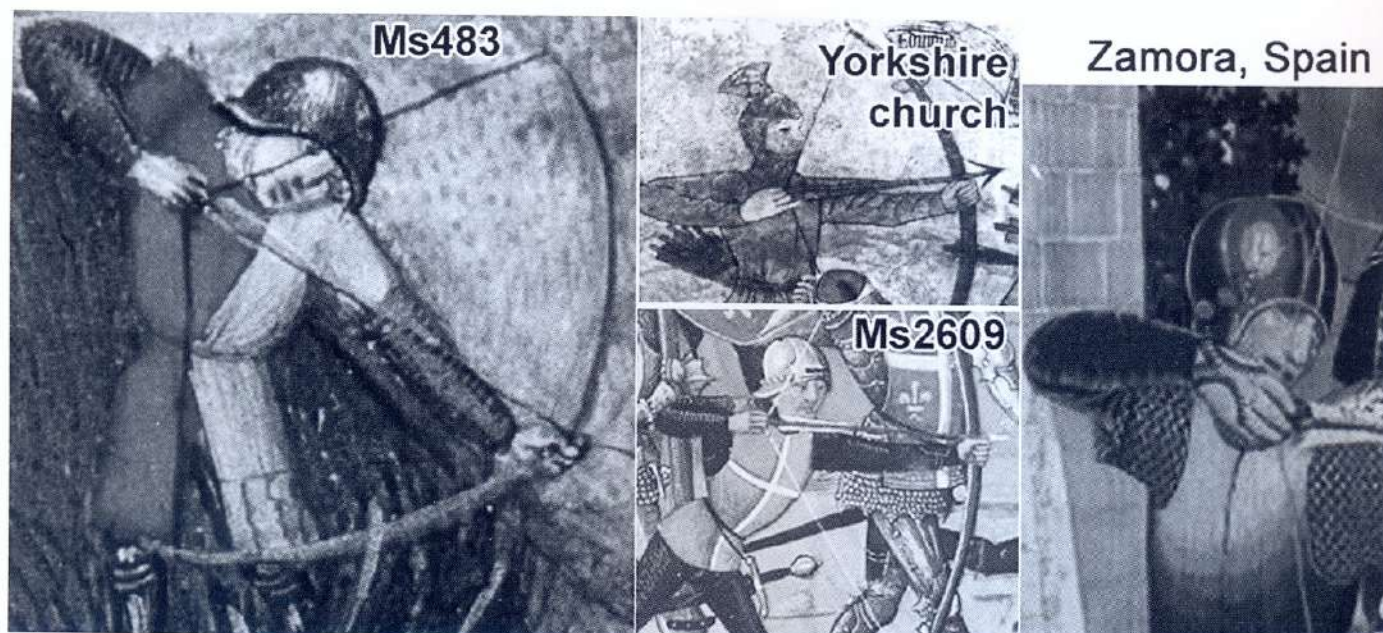


Image 15: Archers using more than 2 fingers to draw the bow.

1440 - Bibl.Mun. Amiens - ms 483 - *William of Tire*

1450 - Yorkshire Pickering church St Edmund

1471 - BNF - ms 2609 - *Chronicles of France*

These 15th century illuminations show the archer using more than two fingers to draw the string. We even have the image of an archer using a 3-fingered glove very similar to current archery gloves (Flemish Tapestry, 1425, Zamora Cathedral Museum, Spain).

Of course, these few illuminations are scattered over a period of 60 years and drowned in an enormous number of other illuminations always showing archers using 2 shooting fingers. We can pose two hypotheses here to explain this. First, not all civilian archers have taken up the use of the powerful bows that required a 3 finger pull. The "warbows" would rather be given to seasoned archers to be trained in their use. It was probably not widely used in civilian archery communities. And on the other hand, art may have long remained influenced by the famous "two fingers" of archers, used for so long.

Without being technically linked to the length of the bow, these two innovations (horn nocks and number of fingers used to draw the bow) are however part of the same logic of evolution of the power of bows at the same period.

Conclusion

To conclude this reflection, it seems that the size of the bows evolved during the Middle Ages. Here we have collected several clues pointing in this direction.

First, the excavated examples show bows whose effective size is less than or equal to human height, before the 14th century, and equal to or greater than human height from the 15th century.

Then, if the texts preceding the 13th century are unreliable, or often misinterpreted, the 14th century texts do speak, according to our calculations of lengths, of bows smaller than human height. At the end of the 15th century, there were mentions of bows longer than human height.

The analysis of the anchor points on the illuminations also shows an evolution which would have taken place between 1320 and 1450. However, the resulting increase in the tension on the bow required an increase in the length of the bow.

Furthermore, the comparative analysis of the sizes of the bows and archers in the illuminations tends to indicate three levels. Before 1375 the bows would have been mostly smaller than human height. From 1375 to 1440, the bows would generally be smaller than or like human height. While after 1440, the bows would be like or greater than human height. Of course, this part of the analysis can be reinforced in the future by an analysis of a larger sample of illuminations.

This change, linked to both textual information and the evidence of excavated bows, therefore seems to show a significant development in the evolution of bows at the very beginning of the 15th century. This development, contemporary with the Hundred Years' War, is probably not a coincidence. It is reasonable to assume that the evolution of body armour led archers to adapt their equipment, and vice versa.

The 1350-1430 period of evolution of body armour corresponds well to the period of Evolution of bows of 1375-1440. We already knew that one of the responses to this evolution of armour had been the appearance of the more powerful "warbow". This increase in power most likely goes hand in hand with the appearance of horn nocks and the use of three fingers to pull the string with more energy.

It is also likely that the need to propel more massive arrows with more energy led to the use of a greater draw-length, allowing more energy to be stored before release, with a movement of the anchor point further rearwards and extending of the bow limbs at the very end of the 14th century or at the beginning of the 15th century. This is a hypothesis which seems credible in view of the elements gathered here, but which will have to be confirmed by other sources, which could help to evaluate the date of appearance of the "longbow". There is no doubt that the bow played a vital role in the history of the Middle Ages (not only in England but also in the rest of Europe), but before 1375, it seems that bows were of a size similar to the size of the archer, or even slightly smaller, despite the enduring legend of Robin Hood armed with his famous "longbow" which would probably not have existed in the 13th century.

Acknowledgement

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975 - 1000 - Brit.Lib. - Ms 24199 - Cupidon
9th Cent - Cotton - mss gala a XVIII - cotton galba
1130 - Morgan Libr. - Ms M736 - Saint Edmond martyrdom
1170 - Glasgow univ. Libr. - Sp Coll Ms Hunter U,3,2 (229) - Hunterian York psalter
1187 - England - Workshop bestiary
1196 - 1223 - Cambridge - MS.Ff.1.27 - Gerald of Wales's Topography of Ireland
1200 - Aberdeen Univ. - Ms 24 - Aberdeen Bestiary
1220 - 1230 - ONB - Han. Cod. 1179 - Bible moralisee de Vienne
1230 - Brit.Lib. - ms 12F
1230 - 1258 - Det. Kgl. Bibl. Kobenhavn - GKS 1606 - Kristina Psalter
1238 - 1252 - Oxford New College - ms 322 - De Braille Psalter

1250 - BNF - Ms 403 - Apocalypse

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1354 - 1377 - BNF - Ms 12148 - Livre du roy Modus

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1379 - BNF - Ms 12399 - Livre du roy Modus

1380 - Morgan Libr. - Ms M132 - Roman de la Rose

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1389 - 1400 - BNF - ms fr 619 - Livre de chasse de G Febus

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1400 - BNF - ms FR606 - Christine de Pizan-Epitre d'Othea

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