The washed-out Roman sites along the limes in the province of Gelderland (NL)

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PART I
Introduction

Around the beginning of the era, several castella were built by the Roman army along the Rhine. In the west of the Netherlands the remains of these castella are more or less preserved in the subsurface at their original position at the river Rhine. Further east, from the castellum at Vechten, it is a very different story. In the province of Gelderland the castella have been washed away and ended up at a depth of several meters. Only at a few locations something has been preserved.[1]

In this article the phenomenon of the washing away of the Roman castella in in the province of Gelderland will be discussed and it will be investigated whether a number of questions can be answered. Questions such as:
- How fast and gradual is the washout of a castellum?
- How far are individual objects such as building materials, pottery and metal objects carried away by the Rhine?
- How deep does the Roman material get?
- How large and how extensive is the resulting debris field at depth?

To answer these questions, several topics are addressed such as the landscape of Gelderland in the Roman period, flooding in the Roman period, the influence of man on the river, the effect of the Rhine on a castellum and on archaeological objects both metal and pottery. Using the data from the topics covered, the paper then looks at the washout conditions of some seven Roman sites. The entire article concludes with a summary, conclusions, and an epilogue with an account of the salvage of dredged finds and the problems encountered in reporting washed-out sites.

This map of the river area of the province of Gelderland shows the known Roman sites along the limes. All sites, except a part (including the principia) of the castellum of Arnhem-Meinerswijk (4), have been washed away by the river Rhine. 1. Spijk. 2. Herwen-de Bijland. 3 Duiven-Loowaard. 4. Arnhem-Meinerswijk. 5. Heteren-Steenoord. 6. Kesteren (?) 7. Amerongen-'t Spijk. 8. Maurik-Island of Maurik. 9. Rijswijk-Rijswijkse Buitenpolder. (basiskaart Nederland)

Landscape situation
During the Roman period, the eastern river area is characterized by riverbeds, riparian mounds and bowl lands. The Rhine freely weaves and meanders, creating an area with large watercourses, but also with branches of different widths and depths. Dikes were not constructed until the Middle Ages.

The Gelders river area is a relatively safe environment that is very suitable for habitation, arable farming and cattle breeding. It is known that the Romans along the upper and lower Rhine often chose the branches of waterways as a location for fortifications. For the Romans, infrastructure, strategic overview and mobility over land and water were their main settlement factors. There were fewer tributaries in the Gelderland river area. That makes it uncertain if and how many castella are still waiting to be discovered. As a rule, castella were chosen to be built directly on the river bank.[2]

This 'artist impression' gives a picture of a Roman castellum on the Rhine. In this case the castellum Nigrum Pullum in Zwammerdam. (Beeldbank Zuid-Holland, Stevie Heru, Xinas, 2016)

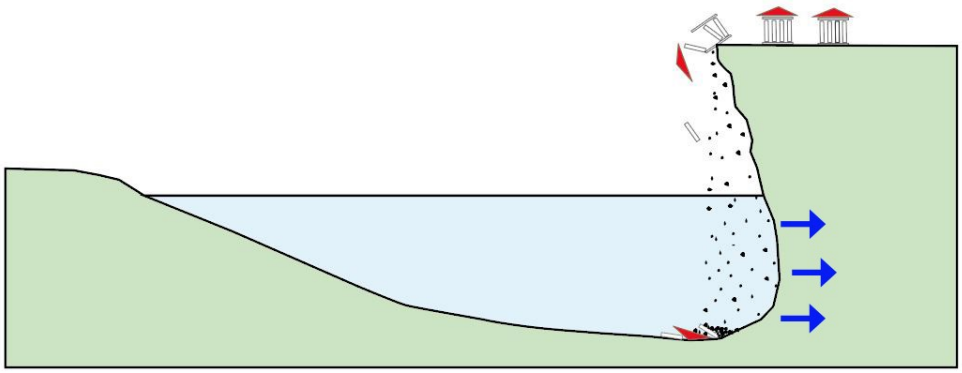
Flooding
During the first centuries, the Rhine regularly experienced high water levels. As a result - research shows[3] - considerable erosion occurred near the castellum Meinerswijk. Two flood layers prove that parts of the castellum Meinerswijk and the Limes road were eroded. After the second inundation in the first half of the second century, the site was raised by almost a meter.
Also in the western part of the country, excavations of castella have shown that they were regularly affected by high water. A clear example is the washout of the Roman road at Valkenburg, the erosion of which took place in 122/123 AD.[4]
Apart from the natural water fluctuations of the Rhine, there is another possible co-cause of these high water problems, namely the construction of the Drusus Dam.

Drususdam
The Central and Eastern Netherlands river area was an important base for Roman military exercises. From 12 BC, under General Drusus, an attempt was probably made to gain more control of the area up to the Elbe. Drusus takes the initiative to build a dam on the Waal River. This will allow the Rhine

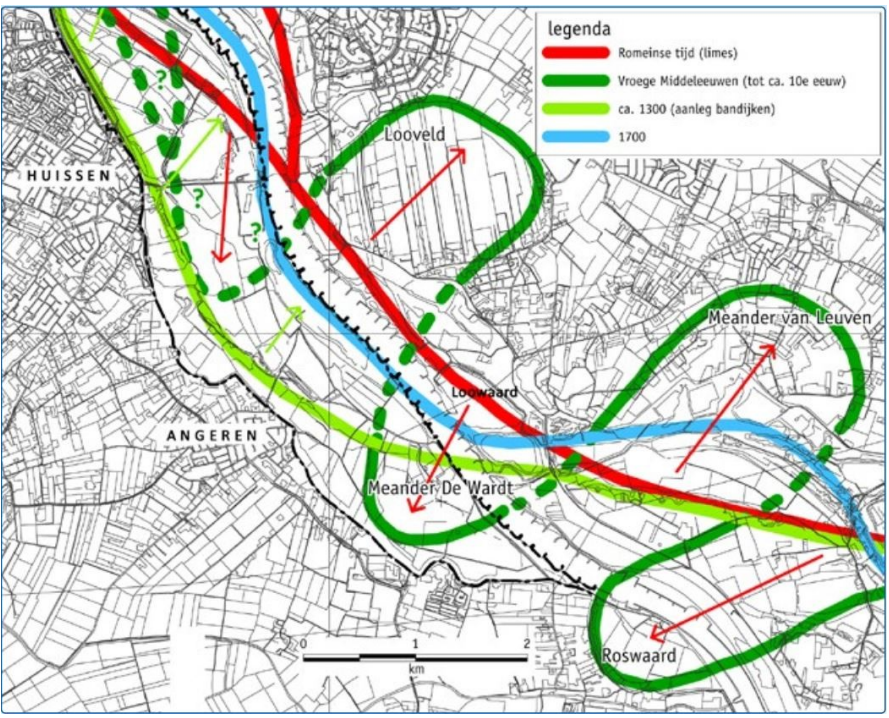
to carry more water, thus achieving better navigability in the smaller downstream tributaries. This is necessary for troop transport from the Rhine delta to the north (Flevo Lake, Friesland and the mouths of the Ems, Weser and Elbe). The construction of the Drusus Dam caused more water to flow through the Rhine, increasing the risk of flooding as described above in the castellum near Meinerswijk. It is also possible that the construction of the Drusus dam made the Rhine more restless and powerful in its 'meandering behavior'.

Meandering

A meander is a loop in the course of a natural watercourse (stream or river). A succession of meanders forms a meandering river. Such loops occur in rivers because soil is washed away on the outside bend, where the water flows fastest, while soil is deposited on the other side. And, as outlined above, the Rhine meandered freely in the first centuries, creating an area of large watercourses. This braiding and meandering were a continuous process, and in addition to occasional high water, the Romans had to deal with the meandering nature of the Rhine.



This cross section of the river shows the undercutting of the bank on the outside bend due to meandering of a river.



The castella were located directly on the river.[5] Put somewhat simply, they are then the first to 'have a turn' when the river starts to move towards the castellum. But meanders not only widen, they also move downstream. How much a castellum is affected by a meander therefore depends on many factors. For example, there are castella (Utrecht, De Meern, Woerden, Vechten over time) where the river moved away from the castellum. Because of the meandering, (remains) of Roman castella in the Gelderland river area were eventually eroded by the Rhine in the course of centuries. The remains/objects from the site ended up at the bottom of the river. The amount of (building) material there forms a kind of debris field or rubble mass at a certain depth.

The meandering of the Rhine through the ages. The castellum in the Loowaard, centrally located on this map, was completely washed away during the early Middle Ages. (Willemse 2016, RAAP)

The thickness and area of the debris field of a washed castellum

The average size of a castellum built in the Netherlands is about 100 x 140 meters.[6] A camp village (vicus) was usually located in the vicinity. The castella in the Netherlands were initially built of wood. At the end of the second century a number of castella were rebuilt in stone. An uncertain factor is the fact that after the Roman period the castella were used as a quarry, to use building materials elsewhere because natural stone is not present in that part of the Netherlands. To what extent this happened is of course unknown. This may vary from castellum to castellum. In any case, it affects the thickness and compactness of the debris field present in the depth of the river.

How far are objects moved by the flow of the Rhine?

Harm van Netten writes on the website Geology of the Netherlands, *"All the material carried by a river is eventually deposited as it settles. Because a river can carry more and larger material when the flow rate is higher, at any point in the river where the flow rate drops, material will settle and sediment. At the beginning of the stream, the decay, and therefore the velocity, is highest. There, mainly larger chunks will sediment, while the smaller particles will be carried further by the water. As the river gets closer to the sea, the flow velocity decreases more and more and more material will sink to the bottom: first the coarse gravel, then the fine gravel, then coarse sand, then fine sand, and finally - near the mouth - clay and silt. This 'sorting' from coarse to fine from source to mouth can be seen in every river. Also with the rivers that flow through our country. For example, upon entering our country, the Rhine still has a flow rate of about 1.5 m/s. This is just enough to carry some light gravel. Heavier gravel has already been left in Germany. The bottom of the Rhine therefore consists mainly of coarse sand, which further on changes to fine sand.*[7]

During dredging in Spijk, the gravel was sieved with a sieve with a 3.2-cm mesh. A lot of residual material (so-called 32 plus) consisting of large pebbles, boulders, wood, bone material and also washed-out Roman (building) materials was left over. In the Loowaard, 12 km downstream, a 3.2 cm sieve was also used but there was significantly less residual material there.

Objects in the river

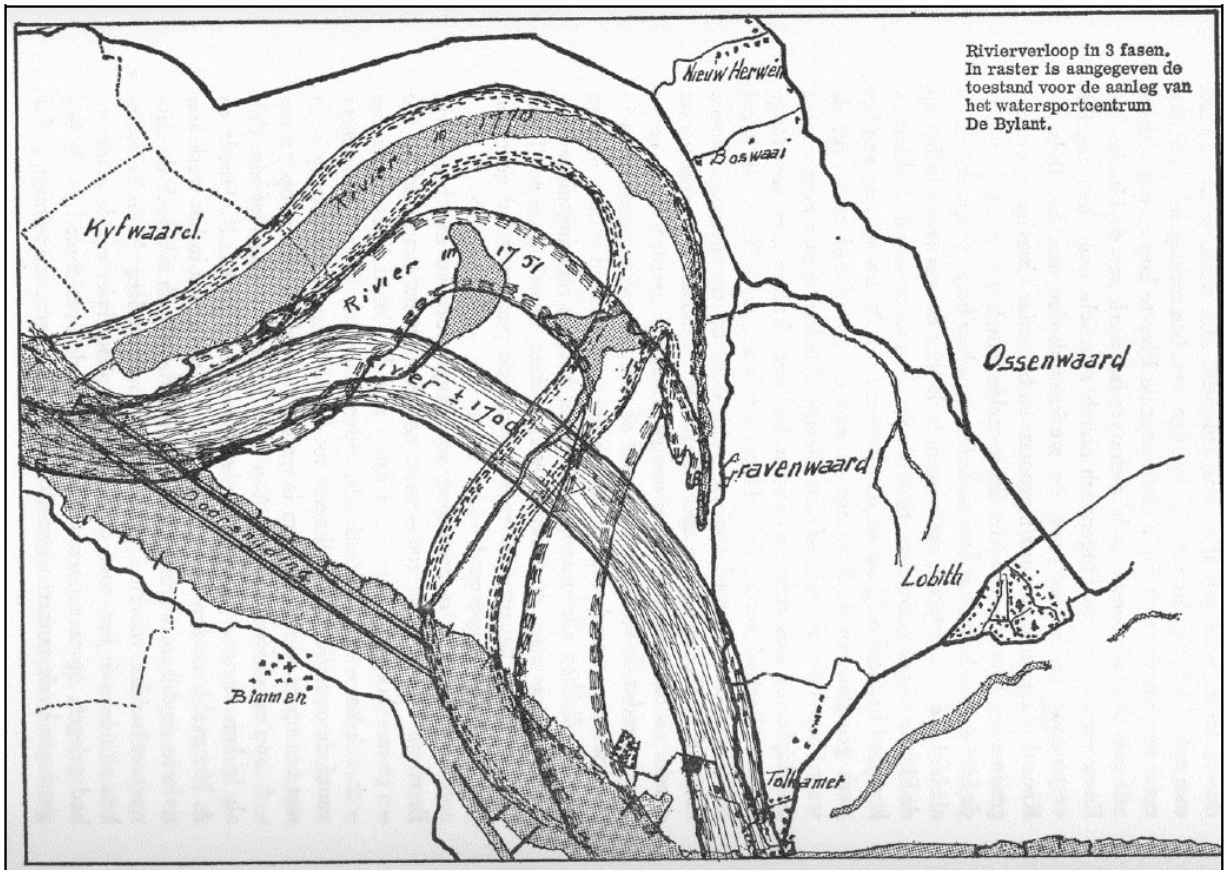
The illustration of the cross section of the river shows that the strongest current is precisely in the calving outer bend where the objects of a threatened castellum fall into the water. It is also the deepest point in the bend. When objects fall into the river, they are moved over a certain distance by the river's current. Objects experience an upward force in the water equal to the volume of water displaced (Archimedes' Law). The result is that they become relatively lighter and therefore can be carried somewhat more easily by the water. How far objects are carried depends on several factors:

1. The specific gravity: A bone playing disk is moved farther than a copper *dupondius* of the same diameter.

2. Shape: a round piece of tuff rolls much farther than a flat fragment of Roman tile. A bronze jug of a certain weight is carried much farther by the current than an iron axe of the same weight.

3. Flow velocity: the faster water flows, the more kinetic energy it has and the easier and farther material is moved.

4. The speed and location of meanders: the eighteenth-century map shows how quickly a river can meander. It is clear that a castellum located in the middle of the bend can be completely washed away in a decade or so. But if the entire site and surrounding habitation is located slightly adjacent to the meander loop then it can take much longer for the entire castellum to disappear into the river. Then the material at the bottom is exposed to the current for much longer and is then carried further along. The entire debris field will be stretched more as a result.



Map from the eighteenth century depicting the rapid movement of the main channel of the Waal northward. In 70 years, the river moves over nearly four times its own width. (Source: A.G. van Dalen, 1972)

Characteristics of river-displaced sherds and building materials

The displacement of shards and building material by the flow of the Rhine causes wear and tear at the fracture edges. These displaced shards and this building material can then be recognised by the rounded fracture edges. They are also referred to as 'washed-up' shards. Perhaps it is better to speak of 'displaced' shards and building materials. In the Netherlands this displaced material will mainly be found in the upper reaches of the Rhine where the current is so great that pebbles are still displaced. The further downstream the site is located the lower the flow velocity and the less the degree of rounded fracture edges of sherds and building materials will occur.

PART II

The sedimentation conditions of seven washed-out Roman sites

Introduction

In the foregoing, a number of topics have been discussed that have to do with the washing away of the material from Roman castella/find sites in the Gelderland river area. In the following section seven washed-up Roman sites will be discussed. These are all sites that have become known through dredging activities. Each site will be described in general terms, including the description of the finds, and - if known - the depth at which the material was found and the size of the find spot/rubble field.

Spijk

General

The first Roman site along the Rhine in the Netherlands is near Spijk. The site was recognized as a Roman site in 2016[8]. A publication is in preparation.

The site is close to the moraine near Elten. Here the Rhine still has a fairly high flow velocity when it enters the Netherlands. Both early and late Roman finds have been recovered from this site. Most of the pottery shows signs of displacement: the edges of many pieces have been rounded off considerably. The large quantity of pottery and fragments of coarse ceramics point to the presence of a Roman complex, inhabited for several centuries. There were several stone buildings, at least one of which had a hypocaust. The coarse ceramics also demonstrate the presence of a military component in the find complex. The displaced finds could have come from a castellum located further upstream. Probably the Roman castellum at the junction of the Rhine and Waal rivers which must have been near there.

Finds

Hundreds of fragments of Roman building material such as tegulae, tubuli, imbrices and latera were found. Legion stamps were found on seven roof tile fragments. In addition, a large amount of tuff was found. Pottery of varying shapes was also recovered. From the entire Roman period including a quantity of terra sigillata. Four spathae were found along with ten spearheads and several ballista balls. At the end of the work, a crest of a late Roman intercisa helmet was found. The Archis database lists the find of a knee brooche and an unidentified Roman find from the second century.

Depth

The finds came from depths ranging from 7 to 14 meters.

Debris field

Presumably, the debris field is located in the floodplain between Spijk (in the Netherlands) and Rindern (in Germany) on German territory.

Finds from Spijk.[9]

Herwen-De Bijland

General

In 1938, during sand and gravel extraction in the water of the Bijland, Roman objects were found. The inscription on a dredged up tombstone mentions that soldier Marcus Mallius was buried near the moles (= dam) in Carvium. Presumably this concerns the Drusus dam built about 10 B.C. The castellum at Herwen probably had a role in defending this dam. It is therefore likely that it was founded in the same period. Some 700 meters to the east, the intact remains of at least two military camps have been preserved 'on dry land'. These remains, along with the remains of the castellum, have been included in the dossier for nomination to the Unesco World Heritage List.

The remains of the castellum in the Bijland now lies below the surface of the water.

Finds

In Herwen-De Bijland, dredging was done with a so-called bucket dredger. Building rubble, pottery and metal objects were found. The bucket dredger also unearthed larger objects such as a tombstone, large chunks of stone, bronze vessels, cauldrons and a sword sheath. Using the metal detector, several more Roman finds came to light in a later period.

Depth

As for the depth, Verhagen stated after research in 2015[10]: *'All in all, we may conclude that there is no reason to doubt the conclusion of the depth measurements that in the Bijland the layer in which washed-up objects were deposited lies between 9 and 13 m below the (average) water level'*.

Debris field

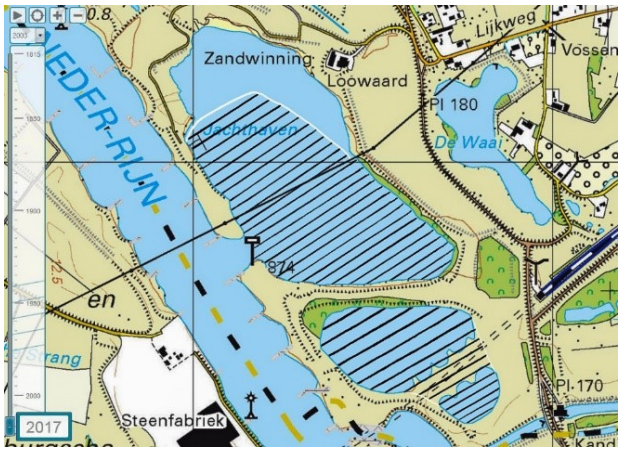
The size of the stone mass found was set at 200 by 70 meters in 1938. At the time, the dredger had to dredge around this mass because it was almost impossible to get through. This was clearly visible by a sonar survey in 2006. A multibeam bottom scan shows an area that matches the 1938 description in that the clearly visible dredging trenches suddenly stop.[11]

Sword sheath and bronze vessels from the Herwen-De Bijland area. (RMO, Leiden)

Duiven-Loowaard

General

From 1969 until today, dredging has been conducted in the floodplain Loowaard in the municipality of Duiven. Thanks to the metal detector more than 600 metal finds have been recovered.[12] The castellum was founded in the second quarter of the first century AD (possibly/probably around 40-41 AD) and was inhabited until the second/third quarter of the third century. Around 400 AD there was a small reoccupation.



Duiven-Loowaard. The shaded area indicates the total find location of approximately 350 x 1000 meters. No more finds were found in the northern part of the lake. (CC-BY Kadaster 2017)

Finds

The Roman finds included building material, pottery and thanks to the metal detector, a lot of Roman metal objects such as over 180 fibulae, about 40 coins, almost 90 pieces of militaria in addition to jewelry and other objects. The widely represented pottery and building material (roofing tiles/tuff) shows partial signs of displacement.

The dredger in the Loowaard used a suction dredger. Later, the suction mouth was fitted with a basket. This worked like a sieve, only allowing material smaller than the size of a brick to pass through. As a result, any larger material stayed behind on the bottom. In the Loowaard no sonar research has taken place.

Depth
The depth to which dredging was carried out was a maximum of 22 m. At a depth of eight meters, the dredger encountered a wall of stone debris at a location in the dredgehole that he was unable to work through. The dredger dredged around this (just like the dredger in 1938 in Herwen-De Bijland).

Debris field
The area in which the finds were discovered through dredging concerns an area of approximately 350 by 1000 meters. The total area within which archaeological finds can be found is most likely larger. The many Roman metal finds come mainly from the smaller dredging hole located most upstream.

Dredging has been taking place on the north side of the dredgehole between 1995 and the present. A large number of mountains of gravel were temporarily dumped on the east side of the gravel pit during this period. This gravel is completely clean of archaeological finds: not a single sherd, not even (fragments) of nails or other metal. Only a lot of recent recreational waste is found.

Finds from the Loowaard.[13]

Heteren-Steenoord

General
The Heteren-Steenoord site was discovered in 2018[14] and lies about 8.5 km west of the castellum Arnhem-Meinerswijk. To the east it lies 11 km from the Roman site of Kesteren. Although a castellum at Kesteren has not been proven, it is suspected.
The finds come from dredged up gravel. Here too the metal detector proved its usefulness. Some of the metal finds show an absence of river patina and are corroded. This suggests that they did not enter the water until much later in time. This may indicate that some of the material was not washed away. For example, because it has been lying on the surface. If this site was on the river in situ, the other river patina finds may belong to it, otherwise they are more likely to be two (or more) different complexes.
A few well-dated fibulae can be characterized as early Roman. In addition, there is unmistakably a military component. The terra sigillata, just like the tuff and the Roman roof tiles, fits perfectly in a picture of a military complex.
The find complex is dated from the second or third quarter of the first century to the end of the second century. Although with these small numbers of finds one must be cautious.

Heteren-Steenoord

Finds
Coins, fibulae, militaria, jewelry, fragments of Roman roof tiles and tuff were found. In addition, several pieces of terra sigillata, a fragment of a cork urn, a grinding stone and other Roman pottery were found. The shards show hardly any drawing of displacement. The pottery dates from the second half of the first century to the end of the second century. A denarius of Gordianus III has been dated to 240 AD.

Depth
The depth of the find layer is unknown.

Debris field
Nothing is known about the location of a possible rubble field.

Finds from Heteren.[15]

The sherd material from Heteren shows hardly any signs of displacement. This can be seen by the sharp (fracture) edges.

Kesteren

Due to the large amount of finds in the area, also of military origin, a castellum is suspected near Kesteren. It has not yet been located.

Amerongen-'t Spijk

General

During dredging activities in the sand pit 't Spijk, in the floodplain near Amerongen, Roman finds were recovered during the years 1972-1975.[16] Most of the finds were made during dredging in 1973 and 1974 from an arm of the Rhine, which probably served as a main bed in the Middle Ages. When dredging at a depth of about 6 meters, the dredge operator was bothered by a roughly northwest-southeast running "wood track". This was about 30 meters long and 8 meters wide and consisted of perpendicular wood elements (logs?). Some chipping is mentioned with the pottery.

Amerongen-'t Spijk (Apeldoorn kadaster)

Finds

In the vicinity of the 'wood track', many shards and debris from the Roman period were sucked up. Fragments of the bronze lining of a Roman iron helmet were found. An inscription on the bronze covering read REBVRRI, i.e. the army division of Reburrus. Also Roman was a fragment of a roof tile stamped: EXGERINF (the Lower Germanic army).

Depth

The 'wood track' was found at a depth of 6 meters. It is also mentioned[17] that most of the finds came from a depth of about 8 meters below ground level.

Debris field

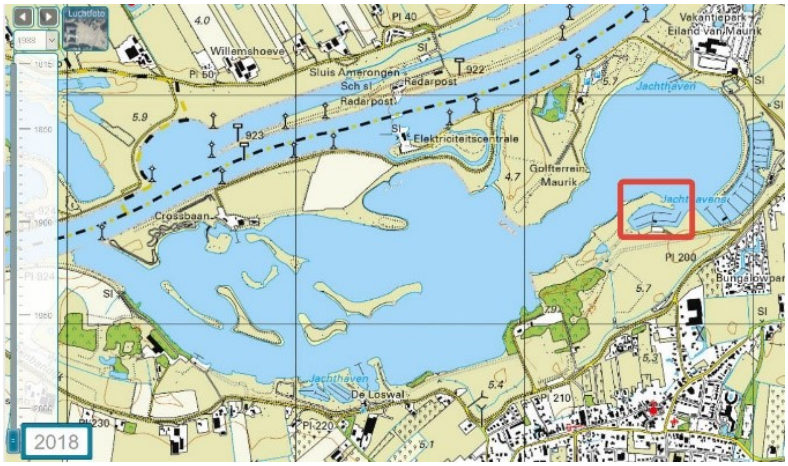
Nothing is known about the presence of a rubble field.

Finds from Amerongen-'t Spijk (the province of Utrecht)

Maurik-Island of Maurik

General

A little further downstream lies the Roman site at the Island of Maurik. In 1972, during dredging works, militaria[18] were found there originating from a Roman settlement. No remains were found in situ. Based on the find material, the fort seems to have been occupied from the Batavian revolt (70 AD) until the second half of the third century.[19] The finds were discovered by members of the Historische Kring Kesteren en Omstreken. They sifted the sand and clay that lay near the small marina in the west of the large lake.[20] A number of finds were also made on the dredgers themselves. Much of the Maurik sand was towed to Texel for use in strengthening dikes.



Maurik-Eiland van Maurik. (Kadaster Apeldoorn)

Finds

The members of the Historische Kring Kesteren found many shards, building materials (including more than 130 pieces with military stamps), militaria, jewelry, more than 300 coins and 190 fibulae. Later research with the metal detector revealed several more nice finds like the three finds in the pictures below. The shards show no sign of displacement/washing.

Depth

The depth of the find layer is 4-6 meters below the (average) water table.[21]

Debris field

It is remarkable that almost all finds were found within a few hundred meters of the small marina. The hotspot of the find complex was around this small harbour. Downstream from the site a very wide and long area has been dredged. Yet apart from a few stray shards, no more Roman finds have been recovered there.

Finds from Maurik.[22]

Around 1983 several more finds were recovered in Maurik thanks to the metal detector.

Rijswijk-Rijswijkse Buitenpolder

General

In 1979, employees of the archaeological excavation near Dorestad (Wijk bij Duurstede) visited the sand dredgers in Rijswijk regularly (once or twice a week) for six months to collect finds. The attention of the team was drawn to this site by the dredging of a Roman helmet. There were periods in which no finds were brought to the surface because the suction was too deep, or that the site was limited in size and did not extend over the entire extraction area, or a combination of both.[23] Polak states[24]: *'There is a strong impression that this represents the material from more than one site. Even if we want to believe that the helmets indicate a fort (there are plenty of militaria in the river area that have nothing to do with a fort), the large amount of hand-formed pottery suggests that a rural settlement was also washed away.'*

Finds

The find material comes from the Middle Roman period and the period between the late seventh and the end(?) of the ninth century; obvious Late Roman and Merovingian finds are lacking. The finds consisted for the most part of Roman roof tiles, Roman sherds and a remarkably large quantity of hand-formed pottery. This included late Merovingian and Carolingian pottery fragments. A very remarkable find was the bronze Roman infantry helmet with at least three punctuated inscriptions on the neck guard, indicating the owner, or rather user. Fragments of two more helmets were found. Around 1981, several more Roman metal finds were recovered in Rijswijk using the metal detector.

Rijswijk-Rijswijkse Buitenpolder around 1981.

Depth
The finds came from a deep sandy deposit covered by 3 meters of clay.[25]

Debris field
The exact location of the site could not be determined. Nor was it clear whether the objects were in situ or in a secondary position, for example in a Carolingian Rhine bed.

Finds from Rijswijk including a fragment of an altar stone.[26]

When the area in Rijswijk-Rijswijkse Buitenpolder was redeveloped in 1981, detector amateurs found several more Roman objects.

Summary and conclusions

In this article a number of aspects concerning the washing away of castella in the Gelderland limes have been listed. With the data of the subjects, the 'washing-out conditions' of seven known Roman sites were examined.

The castella suffered from flooding
Due to regular floods of the Rhine, the castella located along the river were threatened time and again. The construction of the Drusus Dam increased the amount of water flowing through the Rhine and, as a result, increased the risk of flooding. It is possible that the construction of this dam also made the Rhine more restless and powerful in its 'meandering behavior'. Eventually the remains of most castella in the Gelderland river area were washed away by the Rhine and ended up at a certain depth.

The amount of remnants of a castellum can vary to a great extent
It is uncertain what and how much the remains are when a castellum has been washed away by the Rhine. After all, how long and intensively was an abandoned castellum used as a quarry? It will vary per castellum. In any case, it affects the thickness and compactness of the debris field located at depth.

The depth of a debris field gets shallower downstream
The depth of a debris field of a washed-up Roman site in the Gelders river area lies near the Gelders Poort at 7 to 14 meters (Spijk), between 9 and 13 meters (De Bijland) and 8 meters (Loowaard) below the (average) water level.
In Amerongen which is only a few kilometers upstream of Maurik, a water depth of 6-8 meters is mentioned. In Maurik the material was found at 4-6 meters. At Rijswijk it is mentioned that the finds came from a deep sandy deposit and were covered with 3 meters of clay. It seems that further downstream the washed-out remains of castella get shallower and shallower.

The size of a debris field gets smaller further downstream
Upon entering the Netherlands, the Rhine still has an average flow velocity sufficient to carry gravel. In Spijk, the material is clearly washed away and the exact original location(s) of the material is unknown. The size of a debris field/find field in the Bijland is 70 x 200 meters. However, a portion of unknown size had already been dredged away. Further find data are lacking.

The area with finds in the Loowaard is about 350 x 1000 meters. It could be even larger to three sides. The rubble field/finds area is stretched out there, it does end quite abruptly. If the find area in the Loowaard is still quite large, near Maurik it is smaller and downstream hardly any or no finds have been found.

It seems that downstream of the Rhine, where the flow strength is less and less, the debris field is almost of the same size as the surface of the original castellum with vicus.

Displaced pottery is found in the Netherlands only in the upper reaches of the Rhine.
Under water, objects are relatively lighter. Objects are more easily carried away by the current of a river if they have a low specific gravity, are rounder in shape, if the current is faster and if objects are exposed to the current for a longer time.

In the upper reaches of the Rhine, rounded off sherd and building material is still found (as in Spijk and the Loowaard) as a sign of displacement by the Rhine. At castella further downstream the displacement is less and less. Already at Heteren the sherd material shows hardly any signs of

displacement anymore. However in Amerongen the sherd material could still have been displaced somewhat. In Maurik the material has not been displaced any more.

This supports the idea that at least from Maurik (possibly even earlier at Heteren) and further downstream, the remains of washed castella/finds will be almost at their original location.

Final: castellum or not?
It is difficult to prove the actual presence of a castellum at a washed-out site. There are no traces of soil, foundations or structures. The finds and the location must tell the story. At the Bijland and the Loowaard there is evidence of substantial remains of stone walls at great depth. The richness and military character of all the finds justifies an interpretation as the remains of a military fort.[27]

This also applies to the site Maurik where there is a wealth of finds and the military character of the collected finds.

The recently discovered site near Spijk has an unmistakable military component. The displaced finds could have come from a castellum located further upstream. Probably the Roman castellum at the junction of the Rhine and Waal rivers which must have been near there.

The material from Heteren seems to have a military character. However the amount of finds is very small. Nevertheless it is indeed a military find complex. A nearby castellum or guard post is possible.

The helmet fragments near Amerongen and the presumed position on the right bank of the Rhine have led to the assumption that a watchtower or other small installation stood here.

The find material from Rijswijk is less convincing to attribute it to a fort. This find material has a strikingly civil character.

Epilogue

The collection of dredge finds and the problems of a survey publication.
Almost without exception, Roman dredge finds are recovered by detector amateurs and/or amateur archaeologists. This has to do with the fact that the find material is collected over a very long period of time. Amateurs have to visit the same site or dredge more often to collect finds. Something the archaeological profession simply does not have time for. A lot of material is also lost undetected because of the large quantity of dredged material and the speed with which it is processed. Often several amateurs search the same spot and therefore the material of a site is spread over several collections.

There are also long periods during the period of dredging when almost nothing comes to the surface. Then one comes home empty-handed again and again. That is why some amateurs drop out before the end of the dredging period. It should be clear that an overview publication of the dredged find material from a site requires a mandatory tour of several amateur collections. It then becomes clear that some amateurs can no longer be traced or are sometimes unwilling to share the knowledge about their finds. This means that the material to be studied is ultimately only a fraction of what was originally present in the soil.

Protection of sites in the floodplain
To protect a potentially important site, the salvaging of finds by amateurs is actually insufficient. Recently, the research in the Loowaard[28] has once again demonstrated the great importance of a location in the floodplain. It is time that these sites are seen as an archaeological complex of high

value, translated into protection, or serious field research before a site is given away, if protection is not an option. If a site is given up for excavation, thorough and well-covered preliminary research should be required beforehand, to determine whether in situ remains are still present. Sanctuaries, castella, ships and harbours, settlements and burial grounds can be expected and, in part, possibly in situ. Only if good preliminary research indicates that any remains have been washed away, can the collection of finds during dredging be considered. Even then all the finds must be collected and published. And this can be done with good cooperation between professionals and amateurs.

Accountability
I thank Dr. M. Polak lecturer/researcher at KU Nijmegen for his corrections and additional comments and D. J. van Veelen for his linguistic corrections.

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Footnotes

[1] Of the castellum in Arnhem-Meinerswijk a small part -foundations of the principia (main building)- is still present. At Herwen-de Bijland it has been shown that near the washed-out castellum, a few hundred meters to the east, intact remains of at least two military camps have been preserved 'on dry land'. The Roman site at Heteren-Steenoord may have been partially washed away. Finds have been recovered with a river patina, but also with corrosion consistent with surface finds.

[2] Polak, 2004, 250.
[3] Willems 1984, 181-2. : A similar embankment package has also been observed around the castellum Laurium (Woerden), after which the castellum was (partly) constructed of stone (Blom/Vos (red.) 2007).
[4] Dierendonck/Hallewas/Waugh 1993, 36-7.
[5] Polak, 2004, 250.
[6] Franzen 2015, 7.
[7] Netten, Geologie van Nederland. https://www.geologievannederland.nl/landschap/vormende-krachten/rivieren-stromende-kracht#head7
[8] Kuijpers. In preparation: a material study and interpretation of Roman dredge finds from Spijk.
[9] PAN-numbers: PAN-00053725, PAN-00056410, PAN-00076317.
[10] Verhagen 2015, 23
[11] Verhagen 2015, 24.
[12] Kuijpers, 2021.
[13] PAN-numbers: PAN-00042948, PAN-00023627, PAN-00023761.
[14] Kuijpers 2019, 10-14.
[15] PAN-numbers: PAN-00036254, PAN-00036249, PAN-00036265.
[16] Tent 1970-1979, 4.
[17] Ibidem
[18] Wildenberg, 1995, Unpublished thesis.
[19] Haalebos 1986, 9.
[20] Polak/De Bruin 2016, 32.
[21] Van der Heijden 2020, 31.
[22] PAN-numbers: PAN-00056356, PAN-00051667, PAN-00056340.
[23] Es/Verwers 2010, 19.
[24] Mededeling M. Polak.
[25] Es/Verwers 2010, 19.
[26] PAN-numbers: PAN-00059325, PAN-00042958, PAN-00061615.
[27] Polak/De Bruin 2016, 32.
[28] Kuijpers, 2021.