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Roman imports and metal recycling in the Roman Iron Age settlement Kamen-Westick

Abstract: *The archaeological documentation of the settlement Kamen-Westick revealed a large number and broad variation of native Germanic metal objects, Roman imports and remains of non-ferrous metal and silver handicraft. The metal finds date from the 1st until the 6th century AD, but especially to the 4th and first half of the 5th century AD. The remains of the non-ferrous metal and silver handicraft include waste of scrap metal recycling, melting, casting and bar ingots. The archeological as well as the chemical metal analysis indicate clearly that especially Roman metal vessels were recycled at Kamen-Westick for the production of native goods.*

KEYWORDS: KAMEN-WESTICK, ROMAN IRON AGE, ROMAN IMPORTS, SCRAP METAL RECYCLING

Introduction

Kamen, district Unna, is located approximately 16 km north-east of Dortmund (Germany/North Rhine-Westphalia). The settlement find spot Westick is situated at Kamen-Methler at the confluence of the Körne stream and the river Seseke that flows into the Lippe (Fig.1).

First smaller archaeological investigations took place in 1926–1927 and larger excavations were executed from 1930–1935 and 1998–2001. Already the excavations in the 1930s revealed a settlement of the Roman Iron Age that was outstanding in the region. In 2004, the close part of the canalized Körne stream was re-naturated. The archaeological observation of these activities by the local office for heritage conservation (LWL-Archäologie für Westfalen, Außenstelle Olpe) in cooperation with volunteer associates lead to the recovery of a large number of finds, which were discovered especially in a previous branch of the river. In addition, regular surveys by volunteer associates since the 1990s produced a broad quantity of finds, which are reported to the local office for heritage conservation (Eggenstein, 2008, pp.23-31; Baales, Cichy, et al., 2009).

Despite its long research history, Kamen-Westick is evaluated and published only in small parts (Bänfer and

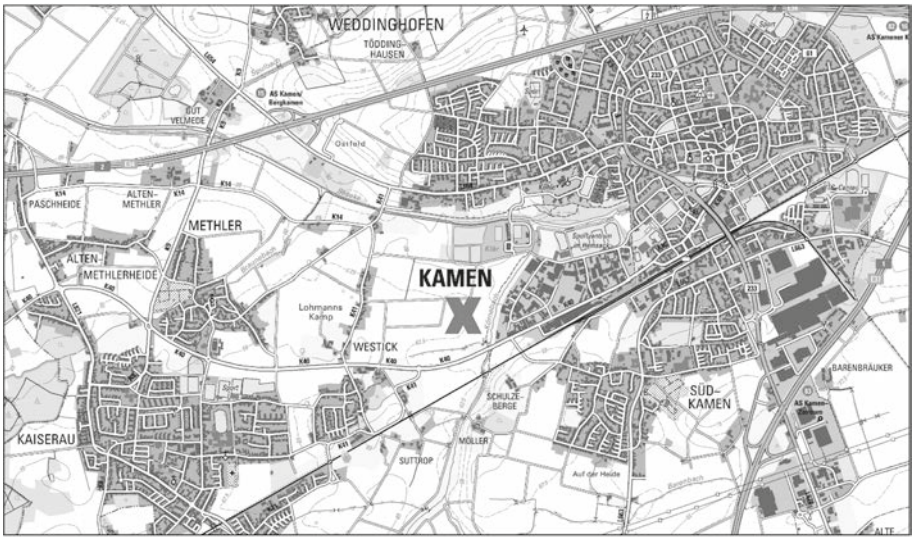

Fig. 1. Map of the settlement find spot Kamen-Westick. The approximate situation of the settlement is marked by a cross. M: 1: 25.000 (map basis: Geobasisdaten der Kommunen und des Landes NRW ©Geobasis NRW 2016).

Stieren, 1936; Eggenstein, 2008; Fremersdorf, 1970; Ilisch, 2008; Schoppa, 1970).

During the excavations in 1930–1935 and 1998–2001, a large number of pits and post holes were documented. Five houses were identified. One of these has been reconstructed with a size of 48 m length and 7.50 m width. The broad variation and quantity of artifacts consists of Germanic and Roman ceramics, iron artifacts, evidence of iron smelting, animal bones and more than 1000 Roman coins. The coins are especially composed of copper alloy money that was minted in the first half of the 4th century AD (see at last Eggenstein, 2008; Ilisch, 2008).

The author´s PhD thesis (Könemann, in preparation) dealt with the copper alloy and noble metal objects of the Kamen-Westick settlement. The quantity and quality of native and Roman metal objects is until now outstanding at the eastern part of the Rhineland and Westphalia, although a lot of these objects are also known from other settlements in the environment of Westick. More than 1300 precious and non-ferrous metal objects dating to the Roman Iron Age and the earliest part of the Migration period have been documented in the thesis. About 530 of these objects can be classified typologically. Most of the other items are metal fragments, sheet metal, casting waste and crucible fragments which prove a non-ferrous metal working, based on recycling.

The main focus of this paper in particular lies on questions concerning Roman metal imports and their connection with the production of native Germanic objects in Kamen-Westick. It will be pointed out which kinds of native and Roman metal artifacts are represented in Kamen-Westick. Which steps of the non-ferrous and precious metal working can be identified? On the base of metallurgical analysis methods, it shall be argued how the compositions of the objects of indigenous, Germanic origin match alloys that were used in the Roman Empire are made. Therefore, it is to be shown if the Germanic objects can be traced back to Roman object groups, which were recycled in order to produce the Germanic artifacts.

Overview of the non-ferrous and noble metal objects from Kamen-Westick

In this part we give a short overview of the non-ferrous and precious metal finds. At first, there will be an overview of the Germanic material and a second one of the Roman imports.

Brooches are documented in a larger number with up-to-date 151 items. These are mostly Germanic forms. The classification follows the typology of O. Almgren and the further structuring of W. Matthes (Almgren, 1923; Matthes, 1931).Only two Germanic brooches from Kamen-Westick date to the older Roman Iron Age. These are an Almgren 38 brooch (*Rollenkappenfibel*) (Fig. 2,1) and a knee-brooch like Almgren V, Series 9 (Fig. 2,2). They date to the chronological step B 2 (70–150/160). Most brooches found at Kamen-Westick date to the younger Roman Iron Age and earliest part of the Migration period. Twenty of them belong to the group Almgren VII with a high catch-plate dating to the later 2nd and 3rd century AD. Especially represented is the Matthes Series 3 (knee-shaped bow and foot cut of straight) (Figs. 2, 3 and 4). Other forms like Almgren 193 and Almgren 199 are documented just one time. The largest part of brooches date to the 4th and early 5th century AD and can be classified as facetted brooches with a rectangular foot and fixed catch-plate of the group Almgren VI, 2 (*Einfache Armbrustfibeln* Almgren VI, 2 *mit gleich breitem, facettiertem Fuß und festem, kastenförmigem Nadelhalter*) (Fig. 2,5). These brooches are the most common form in Westphalia at this time (Böhme, 1974, pp.7-8, map 1; Brieske, 2001a, p.22, footnote 113; Schulze, 1977, pp.31-32).

Other native types in Kamen-Westick are 14 disc brooches from the 3rd to the 5th century and four supporting arm brooches (*Stützarmfibeln*) from the first half of the early 5th century.

In addition to copper alloy brooches, seven brooches or fragments are made of silver. Extraordinary is a silver fibula of the group Almgren VI, 2 that is decorated by beaded wires and a coating of a gilded foil (Fig. 3). This brooch is comparable in its manufacturing to brooches from the Elbian-Germanic areas from the late second half of the 3rd and early 4th century (Becker, 2010, pp.76-78; Voß, 1998, p.146, fig. 9).

The 48 hairpins of Kamen-Westick can be classified predominantly as specimens of the Wijster (Fig. 2, 8) and especially Fécamp (Fig. 2, 9) types dating to the late 4th and early 5th century (Böhme, 1974, p.38).

Very extraordinary is a fitting made of a square shaped lead plaque that is coated by a gilded, decorated silver foil (Fig. 4). The ornament shows a hooved animal looking backwards. This motif is well-known in northern Germany and Scandinavia. Comparisons from Stráže (Slovakia) and Skedemosse (Sweden) suggest that the fitting of Kamen-Westick belonged to a splendorous belt (Rau, 2012, pp.387-388, fig. 9; Quast, 2009, pp.48-50).

The numerous Roman metal goods from Kamen-Westick can be generally subdivided into the following groups: costume accessories and jewelry, utensils and instruments, small figures, metal parts of chests and furniture, military equipment and metal vessels.

To the group costume accessories and jewelry belong brooches, finger rings and bracelets. Among the Roman brooches, there are enamel decorated disc brooches (Fig. 2, 9) with a total number of nine specimens, the most frequent Roman types in Kamen-Westick. Other forms of the 1st to the 3rd century, like the types Almgren 15, 22, 45, 101, 236 or 237 and 247 are just represented one time. The later Roman brooches, dating to the late 3rd and 4th century, are forms that can be connected to the late Roman military. These are eight crossbow brooches, among these four crossbow brooches with onion knobs. Jewelry is documented by finger rings,

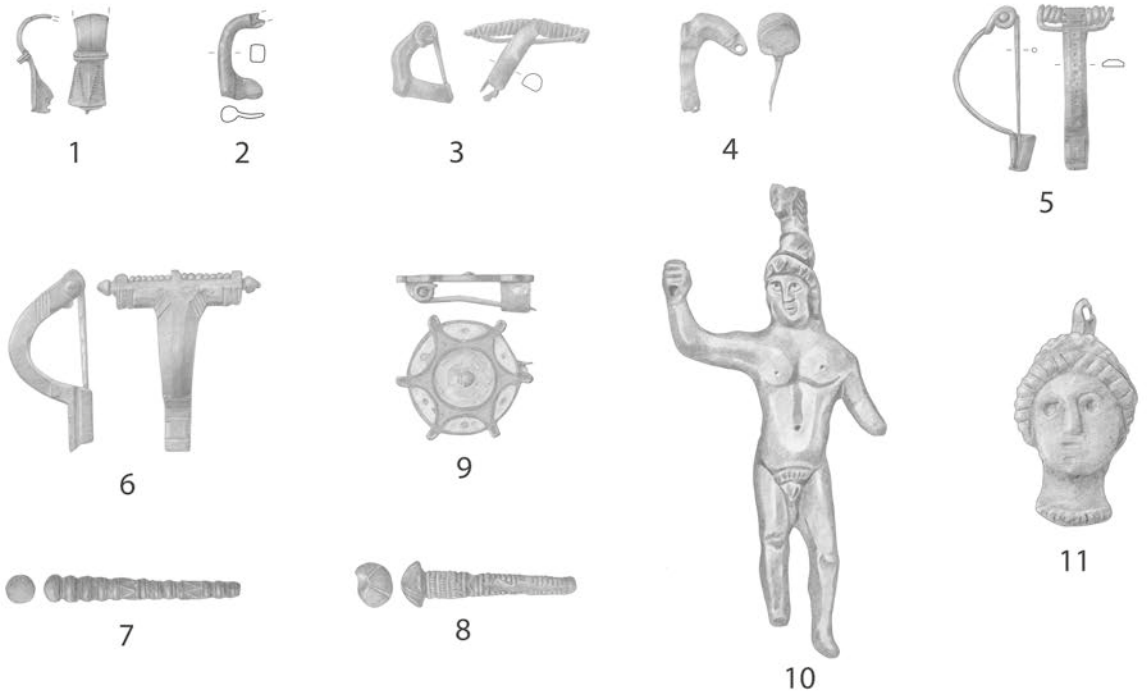

Fig. 2. A small selection of finds from the find spot Kamen-Westick. M.: 1:3 (graphic by Patrick Könemann; drawings LWL-Archäologie für Westfalen / Karin Peters).

Fig. 3. Silver brooch made of silver decorated by beaded wires and a coating of a gilded foil. 3rd century AD (photo: LWL-Archäologie für Westfalen).

Fig. 4. Fitting made of a square shaped lead plaque, coated by a gilded silver foil decorated with a hooved animal. 3rd century AD (photo: LWL-Archäologie für Westfalen/ Patrick Könemann).

pendants and bracelets made of copper alloys, silver and, in one case, gold.

In total, four small figures and three standing bases are documented in Kamen-Westick. Represented are two images of the god Mars (Fig. 2, 10), one of Minerva and one arm of a Jupiter. In general, these small figures were found very often in temples or private house shrines (Kaufmann-Heinimann, 1998). The Mars and Minerva images are not very detailed manufactured forms. In case of this special Mars type, this type has been found in a larger number in the temple area at “Auf dem Spätzrech” near Schwarzenbach (Germany / Saarland). D. Burger interpreted these as cheap votive offerings (Burger, 2012).

The military equipment can be differentiated in early, middle and late Roman forms. Metal fittings dating to the 1st century are very few in number. These are some horse trappings, belt parts and two scabbard components. Among the parts of Roman military equipment of the 2nd and 3rd century, horse harness fittings are with 60 items very frequent. In contrast, belt fittings, like a fastener of a

balteus, are fewer in number. To the 4th and early 5th century date 40 belt parts. These are connected mostly to the late Roman military of the end of the 4th and first half of the 5th century and to Germanic soldiers in service of the Roman army (Böhme, 1974, p.90, pp.166-207; Sommer, 1984, pp.83-86, p.88, p.93). Nowadays, the fixed model that these late antique belts have only been used in the Roman military is recently discussed because they also appear in civilian contexts (Nicolay, 2007, p.216). But their military origin cannot be denied.

Parts of chests and furniture are represented mostly by decorative fittings. To this category belong decorative chest studs, studs for the attachment of a lock-plate, a lid for a padlock and handle parts from chests. Outstanding is a figurative ornament of a Roman folding table showing Bacchus (Eggenstein, 2008, p.47, fig. 33). These folding tables are luxury furniture found in Roman *villae rusticae* or in the grave 3 of Wehringen that is equipped in very rich manner. The few folding tables found in *Germania magna* are known predominantly from the very splendourous graves from Gommern, Mušov, Zakrzów and Stráže (Klatt, 1995; Künzl, 2002, pp.472-474; Künzl, 2010, pp.179-184; Nuber, 2000; Quast, 2009, pp.20-21).

To the category of instruments and utensils belong writing implements, cosmetical or medical instruments, small copper alloy bells and parts and weights of balances. In connection to writing are a lid of an ink pot and a leaf-shaped, enameled cover of a seal box. The cosmetical instruments are several tweezers, an ear probe, an ear scoop and maybe the handle of a small straight razor. Several weights and a lift hook belong to a steelyard balance. One weight has got the form of a female head (Fig. 2,11).

In total, 66 parts of metal vessels can be identified. Documented forms are a bottom of a casserole with a handle (*patera*), several fragments of Hemmoorer buckets, a few parts of Vestland-cauldrons, a lid of a sheet-metal jug, a sheet-metal plate or frying pan, a rim of a plate like Eggers 118, and a lid of a basin. Some attachments belonged to basins. Most identifiable vessel fragments are strainers or dippers. The metal vessel types found at Kamen-Westick were mostly produced in the 2nd and 3rd century, some date back to the late 1st and early 2nd century.

Chronological conclusion of the datable metal objects from Kamen-Westick

The beginning of the settlement of Kamen-Westick is uncertain yet. Metal objects from the older Roman Iron Age are represented only by a few objects. From the period Eggers B 1 (1–70 AD) just Roman artifact forms are known. Some of these date back to the Augustean and Tiberian era. The period B 2 (70-150/160) is represented only by two Germanic brooches and a few Roman objects. Germanic ceramics from the older Roman Iron Age is unknown until now. The earliest Roman ceramics are five Terra Sigillata shards produced in the Vespasian time (Berke, 2009, p.89, 91, and 94; cat. no.: IX-12-5/5.8; IX-12-5/5.37;IX-12-5/5.43; IX-12-5/5.82; IX-12-5/5.90).

The most finds of Kamen-Westick indubitably date to the Roman Iron Age period C. Higher in number are brooches of the form Almgren VII dating to period C 1. Pottery of the form Uslar II proves the existence of a Germanic settlement at Kamen-Westick during this time. The settlement reaches its definitive zenith in the 4th and early 5th century AD. Most metal artifacts belong to this time. The peak is already known from Roman ceramics, Roman glass vessels and Roman coins (Fremersdorf, 1970; Ilisch, 2008; Schoppa, 1970). After the second half of the 5th century AD there is a strong decline of metal finds. Just a few brooches and belt fittings date until the late 6th century. Metal objects of the 7th and 8th century are unknown from this find place. Although there is a decline of metal finds since the 2nd half of the 5th century, a first examination of the imported Roman and early medieval ceramics by Robert Fahr showed that there is continuity in the Post Roman and early medieval imports from the western Rhine area (Könemann and Fahr, 2016).

Evidence for Production

The 66 classifiable Roman metal vessels are all fragmented and have in many cases clear traces of dissection. Often, only the thicker vessel rims or small parts of sieve sections of strainers have been found. That suggests very much that the metal vessels were used as raw material for the production of native goods. The majority of the scrap metal is composed of more than 300 sheet fragments. Mostly, they have a size of up to 6 cm, larger pieces are seldom. In several cases, these sheets have clear cutting marks. It is to suppose that many of these sheet fragments were cut out from Roman metal vessels.

At solid cast objects clear cutting marks have been observed more seldom. They appear at a Roman horse harness fitting, where the less solid parts were cut off, whereas the massif middle part remained untouched. From a Jupiter figure only the arm has been discovered. From the casserole with a handle only the massif bottom remained, the thinner parts were cut off all around. In addition there are several solid fragments which cannot be classified.

All these fragments have to be considered as secondary raw materials for the production of native goods. The predominance of cut sheet metals and the fragmented parts of Roman metal vessels indicate that this material was obviously especially preferred. On the one side, these sheets could be transformed to sheet metal objects, like disc brooches or belt-parts, which are present in material of the settlement Kamen-Westick. On the other side, it can be cut and melted down without high energy usage.

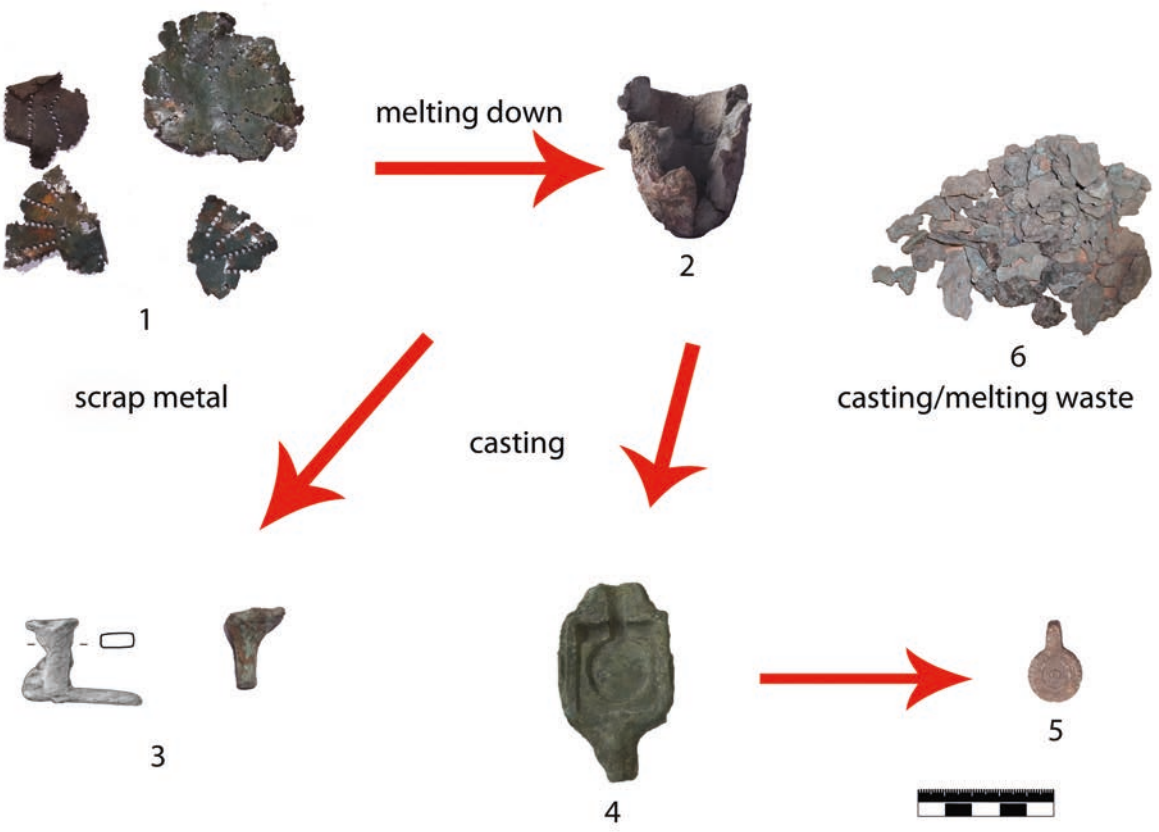

Fig. 5. Identified steps of non-ferrous metal working at Kamen-Westick: 1 Scrap metal (strainer fragments); 2. Crucible; 3. Casting sprues; 4. Permanent mould made of a copper alloy; 5. Belt fitting, late 4th / early 5th century; 5. Casting and melting waste (graphic Patrick Könemann; drawing LWL-Archäologie für Westfalen / Karin Peters; photos: Haus der Kamener Stadtgeschichte, Gustav-Lübcke-Museum Hamm and LWL-Archäologie für Westfalen / Patrick Könemann).

A number of 98 crucible fragments suggest the meltdown in the settlement. There is only one crucible that is nearly complete (Fig. 5, 2). It has got a height of 4, 8 cm, a diameter of 3, 6 cm and a wall thickness of 8 mm. Most other fragments belonged, according to their diameter and wall thickness, to the same type of small crucibles. Another fragment indicates a crucible type which was insignificantly larger in size. It measures 4, 5 cm diameter and has a wall thickness of 1, 2 cm. The small crucibles are sufficient for the production of smaller objects. All these crucibles are strongly heated. In some of them remained droplets of a copper alloy. This proves that all the crucibles have been used. Melting of non-ferrous metals at Kamen-Westick is in addition proven by around 230 amorphous pieces of melting or casting waste (Fig. 5, 6).

Casting is testified by three casting sprues (Fig. 5, 3). The only mould is one part of a, at least two pieced, permanent mould made of a copper alloy (Fig. 5, 5). It was designed to produce belt fittings in the late 4th and early 5th century AD that are also represented several times in the settlement.

Twelve copper alloy bar ingots can be considered as semi-products or raw material. From several of these ingots parts have been cut off, probably for another step of production.

In smaller range than for non-ferrous metal working there is evidence for a production of silver objects. Two brooches are obviously discarded and can be considered as scrap metal. There are two silver bar ingots; one of them has obvious cutting marks. Five amorphous silver droplets could indicate a melting process. One of them has been hammered flat.

In case of non-ferrous metals, the adduced evidence speaks clearly for a production on a regular scale. The evidence testifies the dissection of objects, especially Roman metal goods, in particular sheet metal objects, like vessels. The meltdown is proven by used crucible fragments, melted droplets and three casting sprues (Fig. 5).

No explicit technical sites for non-ferrous metals were identified during the excavations. That has to be reviewed by the classification of the features in the future.

A clear evidence concerning the question what has been produced is missing, too. Explicit semi-products of objects are missing. Disc brooches or sheet belt fittings could have been made of metal sheets. The large number of hairpins, especially of the type Fécamp, and brooches, especially the type Almgren VI, 2 with a fixed catch plate suppose that at least a part of these was produced in Kamen-Westick. In case of the permanent mould there is no definite evidence that it has been used. The few known casting moulds for late antique belt-fittings were found in

the Roman provinces, except a clay mould from a well at Emmerich-Praest, close to the Roman border (Janssen, 1978, pp.107-108). If the mould from Westick was used at this place, this would be evidence that these belts were not only produced in the Roman provinces, but also copied in the area between the rivers Ruhr and Lippe.

Metallurgical analysis

During the author's dissertation project, the opportunity was given to sample 55 objects from Kamen-Westick for a mass spectrochemical analysis at the Deutsches Bergbau-Museum Bochum. The choice of objects, the sampling by drilling and the interpretation of the results were carried out by the author. The analysis was done by Dr. Michael Bode by a mass spectrometer of the type Element XR (Thermo Scientific).

Among the 55 sampled artifacts, 37 are native Germanic forms. In addition, six bar ingots and 12 Roman objects were sampled. Among the native brooches, eleven are forms of the group Almgren VII. Fourteen brooches belong to the younger group Almgren VI, 2, especially brooches with fixed catch-plate. Furthermore, seven hairpins have been chosen. One belongs to the group Beckmann VIII, which is a form of the late 3rd century, the others are pins of the types Fécamp and Wijster, dating to the late 4th and early 5th century. Furthermore, the selection of samples included three supporting arm brooches from the first half of the 5th century, two disc brooches and a penannular brooch. Among the Roman objects were two brooches, five vessel fragments and three fittings. The focus of the sampled objects from Kamen-Westick will lie on the Germanic objects.

The result of the analyzed objects showed that among the examined brooches the older brooches of the type Almgren VII were made in seven of eleven cases of brass with around 10 % zinc. On the other side, the younger brooches of the group Almgren VI,2 were mostly composed of copper and tin. A few of these were made of brass or leaded gun metal. The hairpin type Beckmann VIII was a tin bronze, and those of the types Fécamp and Wijster mostly made of brass or at least a zinc containing alloy. The supporting arm brooches are cast of leaded bronze or leaded gun metal.

The classification into alloy groups (Fig. 6) was carried out following the subdivision of Peter Hammer, Hans-Ulrich Voß and Joachim Lutz (Hammer, Voß and Lutz, 1998, pp.277-279). The most analyzed Germanic finds from Kamen-Westick consist of a forgeable bronze (alloy type 2) and brass (alloy type 5). A few objects were made of a copper alloy with just a smaller percentage of minor alloying components (alloy type 1). All these alloys have good forgeable properties. Most of the sampled artifacts were cast but needed a post processing by hammering, especially in case of the catch plates.

Alloys with good casting properties are underrepresented. Casting bronzes (alloy type 4), with a higher or very high lead content were detected just two times among the sampled objects. One item was a brooch of the group Almgren VII, the other a supporting arm brooch. Both were cast. Secondary alloys (alloy type 6) were just used for types from the 4th and first half of the 5th century. All these objects were cast.

The conclusion of the small series of 37 Germanic objects shows that among these alloys those with good properties for hammering, bending and chasing techniques were obviously preferred. Compositions suited for casting were rarely used, more often for hairpins and cast objects from the late 4th and early 5th century.

Comparable metal analyses of Germanic material have been carried out at objects from the Roman Iron Age well-hoard of Bad Pyrmont (Teegen, 1997) and in a larger number from eastern German federal states (Voß, Hammer, Lutz, et al., 1998).

The results of both research projects are comparable with the conclusion of the studies at the objects from Kamen-Westick. Especially the project in the eastern German federal states showed already that the Germanic objects were mostly made of alloys, which are suitable for techniques like bending, hammering, chasing etc. Brooches from the 2nd and early 3rd century were also made in other Germanic regions, often of brass like the brooches from Kamen-Westick. Secondary alloys or casting alloys with more than 5 % lead were more seldom.

This leads to the conclusion that not just more or less the same or equal brooch types were used but that the choice of preferred raw materials to produce non-ferrous metal objects was equal in very distant regions.

The choice of raw materials for brooches in the Germanic areas was different to the Roman provinces. Here, in the 1st century brass was favored. Since the 2nd century, the use of alloy with good casting properties has been increasing over the time. Tin bronzes just played a minor role for the production of Roman brooches (Jouttijärvi, 2009, pp.214-217, fig. 3).

Comparison with Roman alloys

In another step of this study, the results of the sampled Germanic artifacts from Kamen-Westick were compared with alloys from Roman metal objects. The question was if the Germanic artifacts mirror compositions of the Roman material that could have been used as raw material. The comparison was mainly based on published data of Roman items. Different studies showed that for many Roman types standardized copper alloys have been used. Hemmoorer buckets were mostly made of brass with around 20 % zinc content. Other vessels were especially produced of a tin bronze with about 10 % tin. Solid cast objects, like fittings for furniture and other items, small figures or statues, were often made of a composition with a high lead content (For an Overview: Dungworth, 1997; Jouttijärvi, 2009, pp.214-217; Nieweglowski, 1995; Riederer, 1995; Riederer, 2002a; Riederer, 2002b).

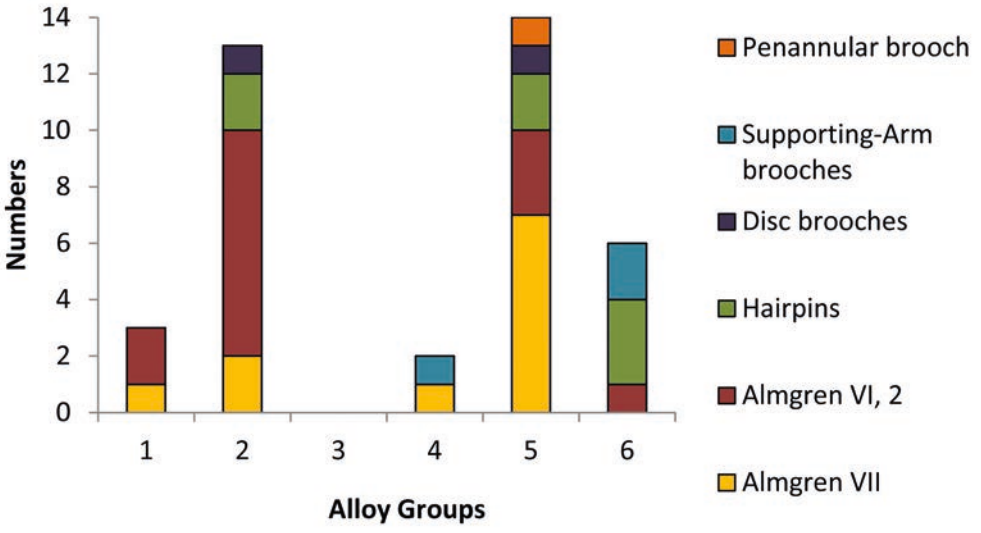

Fig. 6. Copper alloy groups of the sampled Germanic objects from Kamen-Westick according to the classification of Hammer, Voß and Lutz, 1998. Group 1: Copper with minor components up to 5 %; Group 2: Smithing bronzes with up to 14 % tin and less than 5 % lead and zinc; Group 3: Highly alloyed tin bronzes with more than 14 % tin and less than 5 % lead and zinc; Group 4: Casting bronzes with more than 5 % lead, less than 3 % zinc and random tin; Group 5: Ancient brass with 5-30 % zinc, tin as much as zinc, and less than 5 % lead; Group 6: Intermixed and secondary alloys with 3 % lead, tin and zinc each (graphic: Patrick Könemann).

In addition to the published data, eleven Roman brooches, five vessel fragments and three fittings from Kamen-Westick have been sampled.

A group of five objects was made of brass with around 20 % zinc and a smaller amount of tin and lead, under 5 %. These are two hairpins of the type Fécamp, two crossbow *fibulae* Almgren VI, 2 with a fixed catch plate and a pennanular brooch. In addition to these objects, a piece of a handle and a rim fragment of Hemmoorer buckets from Kamen-Westick have got a very equal composition. This kind of brass is in general very common, especially for buckets of the Hemmoorer type (Den Boesterd and Hoekstra, 1965, p.118, cat. 146-148; Nieweglowski, 1995, p.205, tab. 4), but it is also known from other vessels (Den Boesterd and Hoekstra 1965, p. 120, Kat. Nr. 186; 192; Riederer, 2008, p. 430, no. 434) and commodities (see for example Beck, Menu and Berthoud, 1985, pp.122-123, no. 6224; pp.130-131, no. 1512; pp.132-133, no. 803; pp.134-135, no.7474; Riederer, 1997, p.97, cat. 130).

Another group of analyzed objects from Kamen-Westick is made of a tin bronze. These tin bronzes can be divided into three groups. First of all, there is one tin bronze with a low tin content of about 3 % tin, secondly four tin bronzes with about 10 % tin and in some cases up to 3 % lead, and the third group determined at nine objects is equal to the second group with the exception that they contain 3 % of zinc in addition.

The alloy with a low tin content is known especially from Östland cauldrons (Bollingberg and Lund Hansen, 1995; Bollingberg and Lund Hansen, 2008). It matches also sheet bronze dishes like the type Künzl NE 24 (Riederer, 1997, p.96, no. 54 and 55; Riederer, 2008, p.428, E134). That is also confirmed by a sampled fragment of a dish of the type Künzl NE 24 from Kamen-Westick. The composition of the other sampled Germanic tin bronzes from Kamen-Westick made of a tin bronze matches very much alloys from different Roman metal vessels (Riederer, 2008, p.429 and 439). The alloy type is also in accordance with the results of analyzed parts of a metal sheet, a Vestland cauldron and a strainer from Kamen-Westick. Many Roman metal vessels contain, apart from a minor component of about 10 % tin, an amount of about 3 % zinc that corresponds to the third group of tin bronzes from Kamen-Westick (Riederer, 2008, pp.407-412, no. 33, 66-70, 83, 96, 99, 140, 145, 229, 242, 245, 290).

The alloy of a brooch Almgren VII from Westick with a high lead component of 28 % is comparable for example with the composition of small figures or cast lids from vessels. Some other Germanic objects from Kamen made of leaded gun metal are comparable in composition with two sampled horse harness trappings of the 2nd and 3rd century from Kamen-Westick.

The conclusion of comparing the sampled Germanic objects from Kamen-Westick and the composition of Roman items showed that the native hairpins and brooches from Westick go well with alloys that have been used especially for Roman metal vessels.

Conclusion and Discussion

The archaeological documentation of the Roman Iron Age settlement at Kamen-Westick revealed a large number and broad variation of native Germanic metal

objects as well as Roman imports. The remains of non-ferrous metal processing at Kamen-Westick concentrate, according to the archaeological finds, obviously in particular on sheet metals that seem to originate, at least mostly, from Roman metal vessels. It cannot be identified for sure what has been produced because definite semi-products are unknown until now. The large number of brooches and hairpins indicate that at least a part of them has been produced in Kamen-Westick. The copper alloy mould suggests the production of Roman type belt parts.

The metallurgical analysis of 37 Germanic brooches and hairpins shows that most of them, especially the brooches of the types Almgren VII and VI, 2, were made of alloys that have good properties for techniques like bending, hammering and chasing. These results correspond to other analysis of Germanic objects from other areas.

The conclusion of the comparison between alloys from the Roman provinces and the sampled Germanic objects from Kamen-Westick indicate that most probably, Roman metal vessels, or at least items with good forgeable qualities, were recycled for the production of native goods. Alloys with good casting properties that were used for different Roman objects are represented fewer in number. The metallurgical results show the same pattern as the archaeological remains from Kamen-Westick, where remains of sheet metal and Roman metal vessels are dominant.

The interpretation, based on the comparison with Roman alloys, that most probably in particular Roman metal vessels were recycled to produce native objects leads to a chronological problem. The brooches of the type Almgren VI, 2 with a rectangular foot and fixed catch plate, and the hairpins of the types Fécamp and Wijster are forms of the 4th and early 5th century. The Roman metal vessel types which are also represented in fragments at Kamen-Westick, are dated to the second half of the 2nd century until the late 3rd century. The end of production of these types is mostly dated by Roman hoard finds, which are, according to a historical dating, set into the time of the Roman imperial crisis. The end of the production of the Hemmoorer buckets is even dated to the middle of the 3rd century because they are represented very seldom in the aforesaid hoards. In contrast, Hemmoorer buckets still appear in Germanic graves dated to the early 4th century (for an overview of the dating of metal vessels see for example Künzl, 2008). Vestland cauldrons and their succeeding forms are still known from the 5th and even 6th century (Hoeper, 1999).These facts admit different conclusions. First of all, the Germanic objects from Kamen-Westick, dating to the 4th and early 5th century, were made of different and younger objects than assumed. Secondly, these objects are for centuries products of recycling, with its point of departure in the times where these certain Roman metals were still present in a larger number. Another possibility is that the Roman metal vessels and fittings had been very old when they were melted down at Kamen-Westick. Or, at last, they have been produced or at least circulated longer than assumed or they circulated more in the Roman provinces than thought before. This dilemma can only be solved by studying the closed contexts of Kamen-Westick or other Germanic settlements but also by the review of the chronological life span of the Roman goods, through dating the *stratae* of Roman cities and other settlements.

Concluding, the results from Kamen-Westick can be considered as another step of knowledge of alloy use and recycling in the Germanic area that is still at its beginning. More metal analysis is necessary to verify these results. It has also to be checked if for other material groups than brooches and hairpins other alloys were used.

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