Late use of chipped stone tools

A case study of Viking age and Medieval material from middle Sweden

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Abstract

Stone tools define earlier prehistory but the extent of their usage in later periods remains uncertain, as the archaeological community tends to focus on trademark materials from respective time periods. Accordingly, usage of chipped stone such as quartz and flint in later periods, tends to be ignored or regarded as residual from earlier Stone age activities, resulting in that valuable knowledge is lost. Therefore, this thesis aims to critically review the Viking age and Medieval (750-1500 AD) usage of chipped stone tools, with a geographical focus on middle Sweden. The thesis executes four case studies from two regions, three rural settlements in Värmland, and one urban settlement in Mälardalen, dated from the Viking age to the Middle age. The chipped stone material from these case studies are investigated via the theoretical perspective's affordance and entanglement, and the two methodologies lithics analysis and use-wear analysis. The result points towards that in Värmland there existed a local stone using practice in one of the case study sites, where quartz scrapers were used in fur production. In Mälardalen a substantial flint using practice existed that might have been spread in the local area and have connections to southern Scandinavia. The thesis suggests that the attributes of late usage of chipped stone in rural areas mainly is based on the unique affordances that quartz of flint provides. However, the usage of chipped stone in urban settlements seems to be based on a tradition and habit of using chipped stone that might have parallels in other urban settlement and in southern Scandinavia. Further, chipped stone tools can be seen as entangled in complex relationships between flint and quartz, fur-products, stone-smithing knowhow, and other goods, incorporating both rural and urban settlements.

Keywords: Viking age, Middle age, Lithics analysis, Use-wear analysis, Affordance, Entanglement, Scandinavia, Värmland, Mälardalen, Skramle, Birka, Scrapers, Fur-production, Trade, flint, quartz.

Definitions.	
Scandinavian Bronze age:	1800-500 BC.
Scandinavian Iron age:	500 BC-1050 AD.
Viking age:	750-1050 AD.
Scandinavian Middle age:	1050-1530 AD.

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1 Part one: introduction

Studies of lithic technologies is central in Stone age research. However, in Iron and Middle age research, chipped stone technology is an understudied subject. Accordingly, in excavations of Iron age and Medieval settlements, finds of chipped stone such as flint and quarts are commonly explained either as residuals from earlier Stone age settlements, as strike-a-lights or not analysing the material at all, only mentioning its presence (Knarrström, 2000, p. 96; Strinnholm, 2008).

I argue that this is due to a notion that chipped stone are an archaic material, that reflexively are connected to earlier periods or/and imbued with primitivity. I have personally experienced this notion when I have presented this study and one of the case study areas, the landscape Värmland, receiving the following comment: "so the tradition of using chipped stone lingered there longer?". This notion implies that chipped stone tools are in nature connected to the Stone age technological complex, ignores the material agency of chippable stone and the possibility that materials could have been used independently between periods.

This way of relating to a material is in my opinion deeply rooted in the history of archaeology and its tendency to organize observable data into generalised patterns. This tradition has its roots in 18th-century natural science, when animals and plants were divided into classes, families, and species establishing the idea that this diversion could reflect natural conditions and evolution (Simpson, 1961, p. 16ff). This model was later embraced by archaeology: by comparing archaeological objects physical appearance and contexts, it was possible to clarify their relationship and divide prehistory into chronological phases (Gräslund, 1987, p. 17ff). As an example, Mesolithic's = microblade flint technology, Neolithic´s = pressure flake flint technology, Bronze age = bronze smithing, Iron age = Iron smithing. Accordingly, influenced by ideas of sociocultural evolutionism, analogues were made between the development of primitive to advanced organisms, to the development of (perceived) primitive to advanced technologies: for example, from using stone (primitive) to using metal (advanced) (Bowler, 2009, p. 211; Gräslund, 1987, p. 101ff). An example: 19th- century Scandinavian archaeologist argued that different materials originated from different ethnic groups that replaced each other: stone was used by Finno-Ugrian savages, bronze was used by Celtic nomads, iron was used by Germanic farmers, mirroring the politics at the time (Kyllingstad, 2014, p. 8f).

The result was the three-age system we use today, Stone age, Bronze age, and Iron age and the typologies of material culture connected to these phases (Montelius, 1899, 1917; Thomsen et al., 1836). It's important to point out that evolutionary theory have since the 19th century come a long way and are a now vibrant field of research (see Barton & Clark, 1997; O'Brien & Lyman, 2002; Riede et al., 2012; Shennan, 2008). However, I argue that some of the early sociocultural evolutionist way of relating to materials still lingers within

present-day archaeology. Therefore, when discussing materials that are perceived as older and primitive but found in contexts perceived as younger and advanced, there is a tendency to interpret the former as unnatural and deviant (Högberg & Olausson, 2005, p. 97ff).

This tendency specifically affects finds of chipped stone made in contexts to which they, according to the logic of the three-age system, do not belong to, such as Iron Age and Medieval settlements. This creates a catch-22 situation: If perceived older material is not anticipated to be a part of a younger settlement's material history, the methods needed to find the material are not applied (such as sieving soil masses from cultural layers or features). Since the methods are not applied, the material is not found, therefore it is not part of the excavations research questions which in turn dictate the research method. If the material is found, it is not part of the analysis and discussion (Humphrey, 2004, p. 207ff). This leads to that the full knowledge potential that chipped stone tools found in Iron Age and Medieval settlements possesses are not taken advantage of. The result is as mentioned earlier: later use of chipped stone tools is an understudied field of research.

During later years, this issue has started to be addressed as a growing number of studies have established that chipped stone tools were used after the end of the stone age. These studies have demonstrated that chipped stone has the potential to reveal new and vital knowledge about the Bronze, Iron and Middle Ages. However, these have mainly focused on northern Scandinavia, where it's connected to nomadic hunter & gatherer cultures, and southern Scandinavia, where flint is naturally an abundant resource through its geology (Högberg, 2001; Knarrström, 2001; Palmbo, 2009; Zachrisson, 1976, 1987). Accordingly, research targeting middle Scandinavia, and especially middle Sweden, is sparse and consists of one article about the Iron age trading settlement Helgö in Mälardalen, that revealed that flint was used for various tools (Strinnholm, 2008). Accordingly, a need can be identified for further studies.

1.1 Research Aim

To conclude: archaeology tends to focus on materials that are perceived as characteristic of the respective period. Accordingly, materials found in the same contexts but perceived as connected to earlier periods are overlooked, resulting in that essential knowledge is lost. There is particularly a lack of research regarding the use of chipped stone tools during the Iron- and Middle age in middle Sweden. To address this issue, this thesis *aims to critically review the late usage of chipped stone tools, with a geographical focus on middle Sweden.*

The layout of the thesis is the following:

- A brief review of previous research is used to identify the research objectives, the research questions and the case studies needed to fulfil the research aim. The

identified case studies consist of four urban and rural sites in middle-Sweden, three rural farms in Värmland and one urban settlement in Mälardalen.

- The case studies are discussed from a source-critical point-of-view and analysed via two methodologies: lithic analysis, to identify chipped stone tools, and use-wear analysis, to verify their interpretation.
- The results from the case studies are then discussed in relation to two theoretical frameworks: affordance theory, to understand the origin of the late use of chipped stone, and entanglement theory, to understand chipped stone tools interaction with other material and flint trading patterns.

1.2 Late usage of chipped stone tools: a brief review of previous research

Early in the history of Swedish archaeology there were concerns that the Bronze age should be reclassified as an extension of the Stone age, due to the large amount of chipped stone connected to Bronze age settlements. However, these opinions did not gain supporters in the archaeological community at the time (Högberg, 2009 p. 219 and references therein). It´s first during the last two decades that this subject has started to be addressed in research, internationally and in Scandinavia.

In the UK, work have been done regarding flint usage during the British Iron age (Humphrey, 2004; Humphrey & Young, 2016; Young & Humphrey, 1999), challenging previous views that all Iron age flint should be perceived as Stone age residuals (Saville, 1981).

In Scandinavia there are a small number of studies addressing this topic. As mentioned, the most substantial work has been done regarding material from southern Scandinavia and northern Scandinavia.

The following review will account for the results and conclusions of these studies. These will then be used to identify research objectives, research questions and case study areas.

1.2.1 Southern Scandinavia

In southern Scandinavia, two significant studies have been produced that discusses the late usage of chipped stone, both employing lithic analysis and use-wear analysis.

In his doctoral thesis from 2009, Anders Högberg points out that the transition between using bronze to iron was not a linear event where iron straight out replaced bronze. Instead, Högberg identifies an intermediate phase between bronze and iron where a specialised flint tool was used. The background for Högbergs argument is that there is a deviant pattern in the transition from bronze to iron in southern Scandinavia compared to central Europe: the Hallstatt's culture started using iron from the 800 BC. However, it took until 500 BC for iron to make its debut in southern Scandinavia.

Figure 1: Large blade flint knife, photo: Inga Ullén, SHMM.

Högberg argues that this is due to the following: around 900 BC there where an introduction of a new flint tool in southern Scandinavia: large blade flint knifes made in specialised workshops with a refined technology, used for cutting cereals and reeds. These knives can be seen in contrast to an existing *ad hoch* flint usage of household tools made with simple technology (*Figure 1* ; 2009, p. 263). The large blade flint knives have previously been seen as a primitive substitute for bronze due to lack of material. Högberg challenge this point of view and suggest that large blade flint knives should be seen as new technology (separate to the existing simpler flint technology), that together with iron representing a transforming societal power that challenged the use of bronze as a force of production, leading to the introduction of iron but also delaying it with 300 years. As Högberg claims: "The Bronze age did not become the Iron age. The Bronze age became something else which in turn became the Iron age" (2009, pp. 283, 284).

The main point from Högbergs thesis that relevant for this study is that the development of what material was used, does not always follow the linear advance. Rather, flint could be used at the same time as metals and be a part of their replacement.

The other study regarding late usage of chipped stone in southern Scandinavia is Knarrstöms doctoral thesis from 2000. Knarrströms conducts a diachronic review of the usage of flint, from the mesolithic to modern time via analysing material from eight sites in southwestern Scania. Knarrström concludes that flint tools were commonly used during the Bronze age and Iron age but decreased in use during the Middle age. No flint tools could be related to modern or early modern contexts. During the bronze and Iron age, flint was used

as cutting tools, scrapers, drills, and strike-a-light stones. These types of tools were also used during the middle age, however less common (2000, p. 159ff). It was also possible to observe a stylistic similarity between the Iron age and Medieval flint, pointing towards that flint craftmanship was communicated through generation's (2001, p. 131).

Knarrström also identifies a general decrease in flint-smithing craftmanship from the Bronze age and forward and relates this to that when bronze was introduced into the society, flint as a material lost its prestige and was reduced to functional objects. However, there is a period of increased flint smithing quality during the Viking age. Knarrström tangibly connect this to an increase of propertyless slaves in the Scanian farms at the time. Knarrström suggests that slaves might not have had access to their owner's metal tools and therefor resulted to collecting and using the flint-material naturally available in the moraine (2000, pp. 126, 164ff).

The main points from Knarrströms study relevant for this thesis is that it's possible to identify a continues use of flint tools from the Stone age to the Middle age in southern Scandinavia. These tools had the same functions, but the later tools had simplified and non-standardized shapes. Further, even if the level of flint craftsmanship generally decreased after the introduction of metals, there where periods where the craftmanship was higher.

1.2.2 Northern Scandinavia

The other area where studies have directly addressed late usage of chipped stone are northern Scandinavia.

An excavation of a hunter-gatherer coastal settlement in Nederkalix, dating 500 BC to 800 AD, revealed the process were quartz smithing transitioned into iron smithing. In the beginning of the settlement's history, only quartz tools were used. Metal smithing was introduced from 200 BC and coexisted with quartz smithing for 450 years until 250 AD (Palmbo, 2009, pp. 22ff, 35). Previous studies have pointed out that the technological quality of stone smithing in Norrland decreased in quality when iron was introduced (Forsberg, 1989). However, this development was not possible to observe in the Nederkalix material. The absolute majority of quartz finds consisted of ordinary flakes and only a small number of retouched objects and scrapers was identified. This points towards that flakes were used unmodified to different tasks (Palmbo, 2009, p. 34f). The results from the Nederkalix excavation prompted a research excavation of another coastal settlement dated from 180 BC to 80 AD, confirming that stone and metalsmithing were practised simultaneously in this period (Bennerhag, 2012, pp. 3f, 10ff).

These two studies points to that chipped stone usage in Iron age hunter-gatherer sites in coastal regions of northern Sweden ended around 300 AD. However, the transition from using stone to using metal was a slow process that took several hundred years.

Further, the end date of chipped stone usage of about 100-300 AD is in line with several other studies. An excavation of a hunter-gatherer settlements in Gene, Ångermanland, shows that quartz tools were used until ca 100 AD. (Lindqvist, 1994, pp. 91, 97f). In contemporary nearby sedentary agrarian settlement, chipped stone was not used. Instead, signs of iron and bronze smithing were detected. This points towards that stone usage in this region might be connected to differences in economy (Lindqvist, 1994, p. 83). Also, studies of several sites in the mountains of southern Norway points to that quartz stone tools were used up until about 300 AD by hunter-gatherer populations. The tools were predominantly scrapers but also arrowheads (Martens, 1970, pp. 86ff, 97f; Mjærum, 2012; Schaller Åhrberg, 2007, pp. 68ff, 92ff).

However, there are Iron age and Medieval settlements in northern Scandinavia where chipped stone tools was used all the way until the late Middle-ages, mainly in inland settlements connected to Saami societies.

A study of 12 Saami sites from Dalarna to Norwegian Finnmark, dating from early roman Iron age to late Middle age, points to that scrapers in quartz was commonly used. The scrapers were often found with flakes, indicating production at the sites (Zachrisson, 1987, p. 389ff). The quartz scrapers might explain the absence of iron scrapers in the material from northern Scandinavia, which is unexpected in relation to the extensive skin production in the area during the Iron Age and the Middle Age. Bad preservation conditions for iron could explain parts of the lack of metal scrapers, but as other iron objects, such as metal knives have been found at some sites, it is feasible that stone scrapers were so effective that they were preferred over their metal equivalents (Zachrisson, 1976, p. 84, 1987, p. 389ff).

This theory is further supported by a Sami settlement in Juikenttä, Finnland, dated from 1100 AD to the end of the Middle Ages. The site contained a large number of objects in quartz and quartzite, primarily scrapers but also chisels and points (Carpelan, 1967). Further, in the Varanger peninsula (the coastal region in northern Norway) chipped stone tools, especially scrapers, were used until the early Middle ages and possibly longer in the inlands (Olsen, 1984, p. 49f).

The points from these studies relevant for this thesis is that the transition from stone to metal was a slow process taking several hundred years, as in southern Scandinavia. Also, there seem to be a difference in the usage of chipped stone between different geographical areas. In the coastal regions of northern Sweden and the southern mountain of Norway, chipped stone usage seems to end around 0-300 AD. However, in the inlands and northern Norway's coastal region, chipped stone tools seem to be used until the Middle Ages.

1.2.3 Middle Scandinavia

Middle Scandinavia is the most understudied geographical region concerning late chipped stone usage. Only one smaller study has targeted Iron age flint usage directly, where a study of flint material from the Iron age site Helgö, Mälardalen, resulted in the discovery of a rich flint smithing practice and the use of flint for a multitude of purposes. Several tools such as scrapers, bruins and retouched flakes and strike-a-light flints was identified. Further, a large number of flint flakes was found pointing to that these was used as on demand cutting tools (Strinnholm, 2008). The distribution pattern points to that flint were used all over the settlement, and the raw material was likely imported from southern Scandinavia, (Lamm, 2008, p. 98). Due to the land uplift, the material could with certainty be linked to Iron age activities (Grandin, 2008).

Otherwise, late usage of chipped stone is rarely mentioned in middle Scandinavian archaeology. As an example, in Iron age and Medieval settlements such as Birka, Sigtuna, Kaupang an Lödöse has large amount of flint been found but never properly processed, usually explained as ballast from visiting ships (Ambrosiani, 2013; Skre, 2007; Wikström, 2011: Trädgårdh verbal communication).

1.2.4 Summary: previous research of chipped stone usage in later periods

This short review of the previous research shows that there where a use of chipped stone tools in Scandinavia until the Middle Ages.

In southern Scandinavia these mainly consisted of different flint tools such as cutting tools, scrapers, drills and strike-a-light stones. The craftmanship of the chipped stone technology generally decreased after the introduction of metals, pointing towards that metal replaced flint as a material of prestige. However, there were periods were the craftmanship increased such as the end of the Bronze age and during the Viking age.

In northern Scandinavia the tools were made in quartz and quartzite, mainly consisting of scrapers, drills and points and to a lesser degree of cutting tools. Also, in northern Scandinavia there seem to be two phases of chipped stone usage. An earlier phase that ended in about 100-300 AD in northern Sweden's coastal region and the mountains in southern Norway, and a later phase that lasted until the end of the Middle Ages in the inlands and northern Norway's coastal region. The craftmanship of the stone smithing in northern Scandinavia is believed to decrease with the introduction of iron, however, there were probably differences between sites.

Generally, the transition from stone to metal seems to be a slow process in both northern and southern Scandinavia, taking several hundred years and was probably not detectable in the contemporary societies.

In middle Scandinavia, specifically middle-Sweden, the site Helgö in Mälardalen had a wide use of flint, mainly strike-a-lights but also scrapers, bruins and other retouched flakes. Further, unmodified flakes might have been used as cutting tools. As only one study exists from this area, a general lack of knowledge regarding the late usage of chipped stone that targets the geographical region of middle Scandinavia, especially middle Sweden can be identified.

1.3 Designing a new study: research objectives, research questions and case study areas

The above conclusions will act as guidelines for the design of this study, to fulfil the aim of critically reviewing the late usage of chipped stone tools. As there have been identified a lack of knowledge regarding middle Sweden, material from this area will be used for case studies. The first objective will therefore be the following:

- Execute case studies of late chipped stone usage in middle-Scandinavia.

Further, the review of the previous research has identified several aspects of late usage of chipped stone that have previously been addressed:

1 The technological development.
2 The relation between chipped stone and its contexts.
3 The type of tools used.
4 The transition from a stone using culture to a metal using culture.

Depending on the design of the case study, these aspects of late chipped stone usage are more or less possible to investigate. As there is a limitation in material and scope for a master's thesis, it is difficult to identify possible technological development, as it would require a diachronic sample of material that are representative from the Bronze age to the Middle age in the case study. Similar restriction applies to investigations of the transition from stone to metal. However, if the case study's allows comparable data within the same timeframe and region, it might be possible to detect differences and make preliminary conclusions if the potential chipped stone usage was widely spread in a connected cultural pattern or if it was local traditions restricted to respective sites. As an example, by looking at occurrence of tools and their potential morphological similarities.

Therefore, the second objective will be the following.

- Evaluate if the late chipped stone usage was widely spread over a larger area or connected to local traditions.

Also, depending on the quality of excavation methods applied to the sites in the case studies, it's possible to address the relationships between chipped stone and its contexts.

Similarly, with the right methods it's possible to evaluate what chipped stone was used for at these sites.

Therefore, the third objective of this study will be the following:

- Evaluate what tasks chipped stone was assigned to and how chipped stone tools related to its contexts.

A related question is how the raw material for chipped stone tools was acquired. Quartz and Quartzite is readily available in the geology of middle Sweden. Flint however is not and must be transported from areas where it naturally occurs. This might provide insights in trading patterns and further knowledge of late chipped stone usage in relation to other materials and things. The fourth objective will therefore be the following:

- Evaluate the procurement strategies of flint in middle Scandinavia.

Lastly, as there seem to be a constant struggle between the knowledge of late chipped stone usage and the operationalization of said knowledge in both archaeological research and rescue archaeology, it would be gainful to evaluate why late usage of chipped stone still largely remains understudied. The last objective of this study will therefore be the following:

- Evaluate why late usage of chipped stone tools is overlooked by archaeology.

Transforming the aim and objectives into research questions results in the following:

1. What functions can be attributed to late chipped stone tools and how is it connected to its context*?*
2. Was late usage of chipped stone connected to local traditions or was it spread over a larger area?
3. How was flint raw material procured?
4. Why is the late use of chipped stone understudied within archaeology?

With the aim, objectives and research questions established, a detailed case study can be designed.

1.3.1 Case study areas

As stated in the introduction, there is a tendency to within archaeology employ a lingering sociocultural evolutionist perspective imbedded in the use of the three-age system. This tendency creates biases towards materials perceived as not fitting in certain time periods, such as flint or quartz found in Iron age and Medieval contexts. This affects how these remains are excavated: soil from Iron age and Medieval contexts are usually not sieved, and therefore only detects larger objects. This is especially a factor within contract archaeology where sieving usually is only applied to stone-age contexts. This creates source critical

problems when designing a case-study of late usage of chipped stone. Accordingly, to answer the research questions, only material from excavations where the soil was sieved could be used, more commonly applied in research excavations.

Further criteria for the design of the case studies was that parts of the material should be from a geographically and temporally collected area for facilitate the answer on research question number 2 (*Was late usage of chipped stone connected to local traditions or was it spread over a larger area?*). Further, as relevant comparisons between sites become possible, a geographically and temporarily collected sample would make better conditions for answering question number 1 (*What functions can be attributed to late chipped stone tools and how is it connected to its context?).*

To answer the first two research questions, four archaeologically investigated sites from one region was identified. The excavations were executed by the same community of archaeologist during a period of 30 years, with comparably excavation methods, including sieving of soil from contexts and features. The excavations targeted Viking age and Medieval settlements in the county of Värmland. Therefore, Värmland was selected as the primary case study region with the temporal delimitation of Viking age to Middle age.

Three of these was agrarian forest settlements, Skramle, Skinnerud and Ivarsbråten (for detailed description see below) and one Medieval fortress (Saxholmen). However, when analysing the material from Saxholmen, it was discovered that C-14 dating's was lacking, and typical Mesolithic flint artifacts was included in the find material (Röjder & Schedin, 2004). Therefore, Saxholmen was excluded due to source critical issues.

To target research question number 3 (*How was flint raw material procured?*), a site outside Värmland, but still tangibly connected, was required. First, sites close to Värmland was considered, such as the Iron age town Kaupang in Southern Norway and the Medieval town Lödöse at the river Göta älv. Unfortunately, the results from these excavations have not been processed and published to a satisfactory level, and therefore is not suitable for a comparable study. Therefore, considering the criteria's stated above, the Iron age trading settlement Birka in Mälardalen was selected instead, as it was excavated with high level of methodological ambition, including the sieving of cultural layers, but also the result of the stratigraphic analysis and the finds processing have been published to a great extent. Even if the material from Birka and Värmland do not have a direct connection, they might have worked by the same principles, as these sites are all part of the same proto-urban phenomena. Therefore, the result from the Värmland – Birka study can be used to formulate outlines for further research, which later can be challenged when the material from the other sites becomes available.

These outlines will be created by comparing the flint raw material from Birka with the flint raw material from Värmland. Via this, conclusions of Iron age, and tangibly Medieval flint trading can be drawn, and put in relation to other trading goods. The potential chipped stone tools from Birka could also be compared with the tools from Värmland, as well as

result from the studies from northern and southern Scandinavia, and assist answering research question number 1, and 2.

Finally, the analysis of material from all the sites would collectively assist in answering research question number 4: *Why is the late use of chipped stone understudied within archaeology.* Below is a short description of the four case study sites (for map see figure 2).

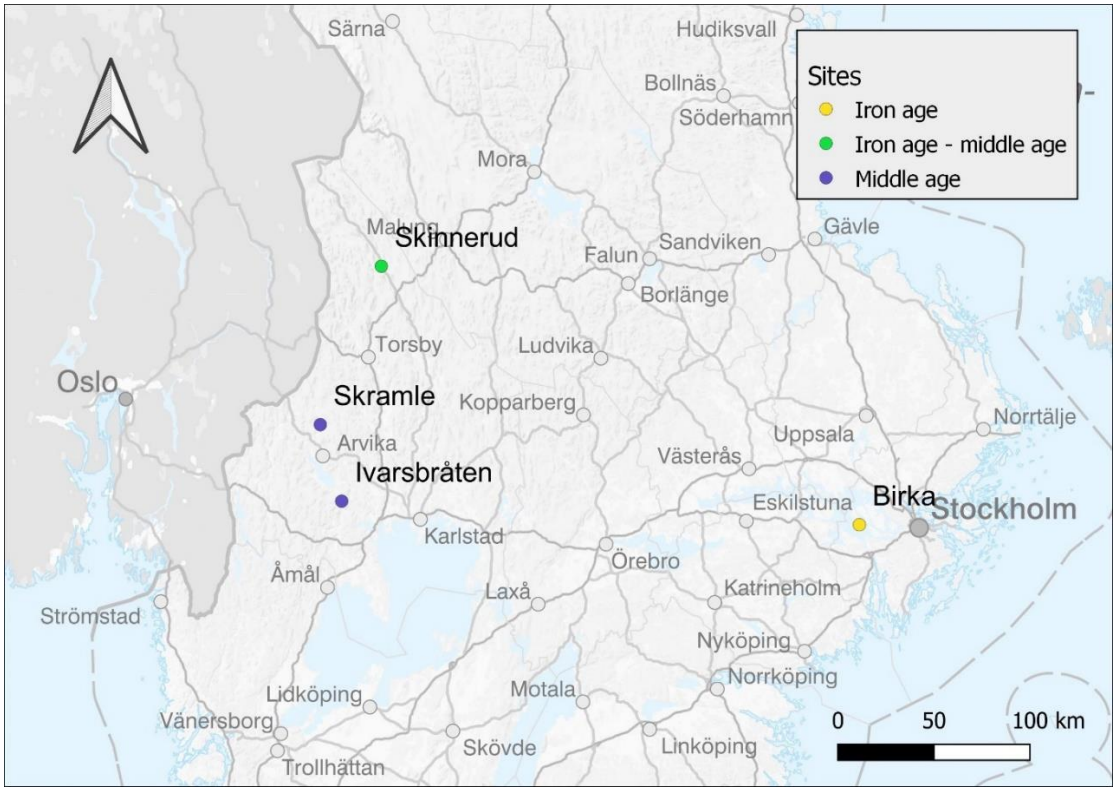


Figure 2: Sites in the case study

Case study one: Skramle

A 5-16th century hamlet in western Värmland at the shore of lake Gunnern. The site was excavated between 1900 and 1998 and revealed a settlement in four phases will a multitude of buildings. The economy was based on agriculture, animal husbandry, soapstone handicraft and leather and fur production (Andersson & Svensson, 2002).

Table 1: Finds of chipped stone in Skramle, phase three

Flint	Quartz	Rock crystal	Total
33	175	7	215

Case study two: Skinnerud

A 9th-13th century farm in northern Värmland at the shore of river Klarälven. The site was excavated 1996-1999. The farm consisted of two residential buildings and two outhouses. The economy was based on agriculture, iron production and leather and fur production (Emanuelsson, 2003).

Table 2: Finds of chipped stone in Skinnerud

Flint	Quartz	Total
44	4	48

Case study three: Ivarsbråten

A 14th century shielding situated in western Värmland on the eastern hill surrounding the valley of lake Glafsfjorden, excavated as a research project between 2013-2019. The shielding consisted of one residential building and an outhouse. The economy was based on agriculture, animal husbandry and textile production (Pettersson et al., 2021).

Table 3: Finds of chipped stone in Ivarsbråten

Flint	Quartz	Total
12	1	13

Case study four: Birka

An 8th-10th century Iron age trading town located at the shore of lake Mälaren in Mälardalen. The chipped stone material derived from the black earth excavation (1990-1995). However, as the material was vast, a sub selection consisting of material from one interpreted phase was selected (Ambrosiani, 2013b, 2021; Bergström, 2013).

Table 4: Finds of chipped stone in Birka

Flint	Quartz	Total
823	0	823

1.4 Methods

As the research objectives and questions, the methodology of this study builds on the previous research in this field. As the research questions focus on the physical attributes of

the quartz and flint found in the Iron age and Medieval contexts, a logical choice of methodology is lithics analysis. However, a visually based analysis can only go so far as it is in its nature generalising and can therefore misinterpret objects. Therefore, a sample of objects was subjected to a use-wear analysis for further identification.

1.4.1 Lithics analysis

The lithics analysis will consist of two parts. The first part aims to identify potential tools and formulate theories of their usage and function. This is facilitated by a visual inspection where dimensions are measured, and the objects are studied for negative and positive flake scars, bulb of percussions and for signs of retouches and use-wear. The results are compared with a nomenclature for flint sorting previously created by Högberg et al., but simplified for this purpose (2000, table 5). The simplification was necessary as the nomenclature was created with chipped stone from all time periods in mind. As late chipped stone usage might not follow the same patterns as earlier usage, the nomenclature categories were widened in definition.

Table 5: Sorting nomenclature used in this thesis

Name	Description
Flake	Larger than 10 mm, with a positive bulb of percussion or scar, waves, or fissures.
Splitter	Smaller then 10mm.
Blade	≈ 10 mm wide and at least double the length. On one side, one or more ridges.
Scraper	Flake or blade with convex retouches opposite of the bulb of percussion. Small retouches on other parts can occur.
Atypical scraper	Retouched flake that is perceived as a scraper, but don't meet the requirements.
Strike-a-light	Retouches on several sides and edges. Can be in different shapes but are often squarish. *Comment: Strike-a-lights is the only type of flint tools that previously have in general opinion been connectable to later periods. Therefore, this study will not focus on strike-a-lights itself. Rather, it's used as a comparable material to other object such as scrapers (see the use-wear chapter below).*
Retouched flake	Flake that's deliberately been retouched.
Flake with use-wear	Flake that shows signs of micro-retouches from use.
Point	Pointy flake used as an awl or as a drill.
Cutting tool	Flake or similar object with a minimum 10mm edge suitable for cutting.
Core	Raw material with one or more negative scar after flakes being taken out.
Hammerstone	Round or oval stone with an area with scars after knapping

	flint or quartz.
Multitool	Tool that demonstrates features of several categories.
Raw material	Unmodified quartz or flint.

The analysis will result in an estimation of the assemblage of tools found in the respective case study sites. Further, the ratio of flakes and splitter compared to tools, can provide insights where if tools were produced at the sites. This part of the lithics analysis will primarily be used to answer research question number 1: "*What functions can be attributed to late chipped stone tools and how is it connected to its context?"*. Further, the visual analysis will also aid in answering question number 2*: "Was late usage of chipped stone connected to local traditions or was it spread over a larger area?",* as it facilitates comparisons between sites. All object identified as potential tools will be photographed and presented in scale in the analysis chapter.

The second part focuses on the flint raw material. By analysing properties such as colour, opaqueness, and structure, the flint can be divided into categories. These can then be compared to literature covering natural occurring sources of flint in Scandinavia (Högberg & Olausson, 2007), further complemented by a collection of physical samples of naturally occurring flint from four geographical locations (Figure 3).

Figure 3: Reference material of flint from different geographical locations. Photo Mikael Lindahl.

Aided by the reference literature and samples, the flint from the case study sites can then be connected to geographical areas, via statistical charts where flint types from the different sites are compared with each other. For these analyses, only flakes or larger flints was used, as splitter would bend the results.

The aim is to create a preliminary assessment of the geographical origin of the flint found in the case study sites, and from this create theories of Iron age and Medieval flint trading patterns, answering research question number 3: *How was flint raw material procured?*

However, there are source critical problems regarding visual classification of flint raw material. Firstly, most flint, belong to the same geological source but spread by the ice age over a larger area in southern Sweden and eastern Denmark (Högberg & Olausson, 2007). Therefore, most flint-types can only be connected to a larger region rather than a focused area. Following, the flint will be presented in four categories, “south Scandinavian flint”. “burnt flint“, “unidentifiable flint” and “course flint” where the later tangibly can originate in sites such as the Swedish and Norwegian west coast.

Secondly, flint can be visually similar but still originating from different sites with a different chemical footprint. Similarly, patinated flint is not possible to visually classify. To counter this issue, the original objective was to conduct an XRF-analysis on a sample of the flint from the case study sites (for discussion of provenance studies via XRF, see Högberg et al., 2012, 2013, 2014, 2016; Hughes, 2012; Hughes et al., 2010, 2012; Olausson et al., 2012). However, due to equipment failure during the XRF-analysis this data was not possible to acquire. The result from this part of the lithics analysis have therefor to be seen as preliminary and need to be verified by an XRF-analysis or similar method in a future study.

1.4.2 Use-wear analysis

As previously mentioned, classifying chipped stone from later periods is difficult, as the chipped stone sorting nomenclatures are mainly based on Mesolithic and Neolithic flint assemblages. Also, a nomenclature for late chipped stone usage is difficult to create as it tends to be more of an ad hock nature, focusing on functions rather than following norms of shapes that archaeologists later could divide into typologies (Högberg, 2009, p. 263; Knarrström, 2000, p. 163). Therefore, an identification process based on generalising of shapes are in some areas a blunt tool. This problem is especially present when differentiating between flat strike-a-light flints and scrapers. As they both are flat and have retouches on appropriate edges, these cannot be identified without additional methods. Accordingly, a simplified use-wear analysis will be applied to a selection of tools.

Use-wear analysis operates via detecting macroscopical and microscopical traces created when an object is used on different materials. By identifying these, it's possible to determine what an object was used for and on what material, by comparing with use-wear on modern copies used on different materials such as wood, bone, or hides (Knarrström, 2001, p. 26ff; Knutsson & Knutsson, 2004; Marreiros et al., 2015a, p. 5ff)

However, assessing with certainty the type of material a tool was used on, require proper training and appropriate supervision to certify the quality of the assessment. As this was not

available, the goal of the use-wear analysis was restricted to primarily identify the presence of use-wear and differentiate these from use-wear potentially created by strike-a-light actions, and via this, identify potential scrapers. However, a preliminary assessment of what type of material the scrapers was used on will be attempted. The use-wear analysis will aid in answering research question number 1: "*What functions can be attributed to late chipped stone tools and how is it connected to its context?"*.

The analysis will be made in several steps.

- The surface is first cleaned with acetone to remove debris and fats from handling (Knarrström, 2001, p. 26ff).
- The material is then studied in a low power microscope with 20-63x magnification for the identification of areas with polishes and characteristic micro-cracks. There is also a third step when a high-power microscope with 150-600x magnification are used (Marreiros et al., 2015a, p. 11f). However, this step was not necessary as the presence use-wear was clear in the lower power microscope.
- The result will be photographed and compared with a modern reference material. This will be taken from the available literature and three experimental tools: A scraper used on dry hide for 10 minutes, a scraper used on hard wood for 10 min, and a strike-a-light flint used with a strike-a-light steel (see attachment one) (Högberg, 2009; Knarrström, 2000; Marreiros et al., 2015b).

The cleaning of the artefacts with acetone has some downsides as it can remove possible remains of organic residue, like fats, fibres, and DNA. These can also be used to determine what chipped stone tools have been used for, for example, lipid analysis of fats (Craig et al., 2020). Therefore, at least 50% of surfaces containing use-ware will not be cleaned, so future studies of organic residue can be conducted. This means that small objects with smaller amount of surface with potential use-wear will be saved for a future study. Use-wear analysis will only be applied to material from Värmland due to permission.

1.5 Theoretical frameworks – affordance and entanglement theory

As pointed out in the introduction, chipped stone are often without critical review associated with earlier periods of history, due to a sociocultural evolutionist perspective lingering in the use of the three-age system. Therefore, chipped stone are "imbued" with Stone age connotations that hinders the study of later use of chipped stone. To counter this, it's of essence to return to the actual chipped stone material and its possibilities and limitations. The lithics analysis and the use-wear analysis used in this study will therefore be operationalized with two theoretical frameworks:

1: Affordance theory, that aims to understand the opportunities and constraints of a material. In this study, affordance theory aims to facilitate a detailed understanding of the

result of the lithic analysis and use-wear analysis to answer research questions number 1,2 and 4.

2: Entanglement theory, that aims to understand how materials, things and people interact. In this study, entanglement theory aims to facilitate the understanding how chipped stone related to its contexts and the mechanisms of flint trading patterns, answering research question number 1 and 3.

1.5.1 Affordance: material opportunities and constraints

The theory of affordance aims to explain how an object can be used when its properties (colour, form, size, plasticity, etc.) and its accompanying possibilities and limitations, meet with a human agency. This topic was first explored by Kurt Koffka in his analysis of human and animal behaviour. Koffka highlighted how the things in our environment tell us what to do with them: “fruit says eat me; water says drink me; thunder says fear me” (1935, p. 7). In this case, fruit affords that someone eat It, as it is a part of its reproductive strategy. Thunder can be dangerous to be exposed to, and therefore affords fear, so the animal or human agencies can protect themselves. In this way, Koffka means that the material frames and limits what a human agency can model with it, but also, presents possibilities.

This idea was later picked up by the psychologist James Gibson, that coined the term affordance, as a way of describing the relationship between animals and the surrounding landscape: “The affordances of the environment are what it offers the animal and matter, what it provides or furnishes, either for good or ill” (Gibson, 1986, p. 127). In other words: how the environment creates positive or negative possibilities for animals or humans. As an example, If an object rests on the ground, are rigid, level and flat and are about the same hights of an adult’s human’s knees, it affords to be sat on. However, if the human in question is a child, the object is too high and its sitting affordance is not activated (Keane, 2018, p. 31). One can also exemplify affordance as a closed glass door that by mistake is assumed open, resulting in that a person walked into the door and hurt hers/his knee. In this case, one of the affordances of the glass door, that it can be seen through, affected the human agency to misunderstand the door's other affordance, that it can be walked through (Gibson, 1986, p. 142f).

For this study, affordance theory provides two advantages:

First, it’s a way of looking at material from the point of view of what possibilities and limitations it provides. In the case of quartz and flint, these materials possess properties such as being corrosion resistant, sharp, dull, and depending on geographical location, available or unavailable. Depending on the situation these can act as both possibilities and limitations. Together these affordances invite the human agency to interact with it and create things.

Secondly, it's a way of counter the tendency that chipped stone are connected to archaic cultures. As Tim Ingold argues, affordance theory provides a way of explaining the world without resulting in an endless self-replication of the dualism between nature and culture, as it provides a way for humans to enter meaningful relation to the world without having to explain these with cultural traditions. In this point-of-view, culture does not always need to be between humans and the world (Ingold, 1992).

In this study, affordance theory will be used to overcome the tendency to interpret chipped stone as Stone age residuals, and the bias towards trademark material such as metals during the Iron and Middle age. By studying the materials possibilities and limitations, the chipped stone material can be position within the material culture of Iron age and Medieval settlements.

1.5.3 Entanglement: How things and humans interact

The objects that are created via the aforementioned affordances can on a broader scale be seen as parts of a network where material and human agencies interact and intervene with each other.

Ian Hodder calls this *Entanglement*. Objects, structures, and people that inhabit the landscape are entrapped in complex webs of dependence and dependency. These two factors can be compared with the possibilities and limitations that builds up a materials affordances. Humans are in dependence of things that enables different task to be performed, as an example, a tool that affords that something is built. But if the tool is broken its starts to limit the same task, and creates a dependency, prompting that the tool is repaired, creating a dependence between the tool and the human. This creates a complex web of relationships between things and humans in all possible constellations (Hodder, 2012, pp. 17f, 88). Further, one can widen the participants in this network to also include other elements such as chemicals and weather (Edensor, 2011, p. 241ff).

Hodder uses as an example clay and plaster in the neolithic settlement Çatalhöyük. A long line of procurement strategies and human interactions afforded that plastering tools was created. These tools afforded that a room was plastered. As the room was used by a human agency, the walls were sooted and needed to be replastered, affording thin layers of generations of use and the continuous creation of tools (2012, p. 180ff). In this way material and human agency and things interact and build up a community of practice. This practice is in turn reflected in the archaeological material.

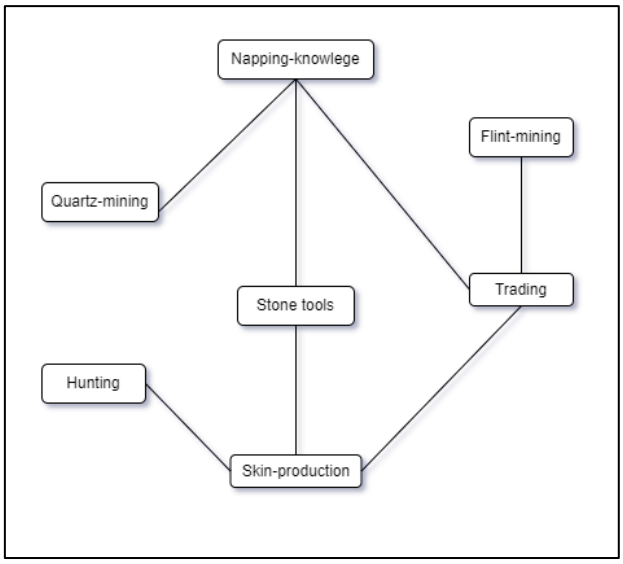


Figure 4: Suggested entanglements of chipped stone

In this study entanglements will be used to detect possible networks of dependencies where material such as quartz and flint create possibilities and limitations to activities such as hunting, skin production and trading, that in turn possibilities and limitations in the creation and usage of chipped stone tools (figure 4). By studying these entanglements, a map of how chipped stone tools related to other objects and activities in the Iron age and Medieval society can be created.

2 Part two: analysis and results

In this chapter, the analysis of the case studies will be presented together with the results.

The case studies consist of three Iron age - Medieval sites in Värmland: Skramle, Ivarsbråten, Skinnerud, and one Iron age site in Mälardalen: Birka (Figure 2), along with the provenance analysis of flint raw material. These will be presented in separate chapters.

2.1 Case-study one: Skramle

Figure 5: Skramles location at lake Gunnern, background map "topografisk webbkarta" and "Terränglutning" ©Lantmäteriet.

Skramle is a small hamlet with roots in the Iron age, but as most active in the 13-14th century, located in western Värmland at the shore of lake Gunnern (figure 5). The excavation of Skramle revealed four phases (table 6).

Table 6: Phases in Skramle

Phase one	**6th to early 7th AD**	**Long house with thin cultural layers and few finds**
Phase two	8th AD – unknown	Small timber log building with thin cultural layers and few finds.

Phase three	late 13th AD – middle 14th AD	Eight buildings and outhouses with substantial cultural layers and a rich find material.
Phase four	late 15th - early 16th AD	Seven buildings and outhouses with thin cultural layers and few finds.

Among the finds was a large number of flakes and chipped stone tools in flint, quartz and rock crystal (table 7, Andersson & Svensson, 2002, pp. 43ff, 73ff).

Table 7: Finds of chipped stone in Skramle

	Flint	**Quartz**	**Rock crystal**	**Total**
Phase one	0	0	0	0
Phase two	0	2	0	2
Phase three	33	175	7	215
Phase four	1	14	0	15
Unknown	0	39	4	43

2.1.1 Phase one

The first phase stretched between the 6th to the early 7th AD. The remains from this phase were few and mainly consisted of a badly preserved longhouse with a shallow heart sunk into the ground (figure 6). No finds of chipped stone could be connected to this phase. The general lack of finds and the badly preserved structures, might be a result of damage from activities connected to later phases (Andersson & Svensson, 2002, pp. 44f, 60)

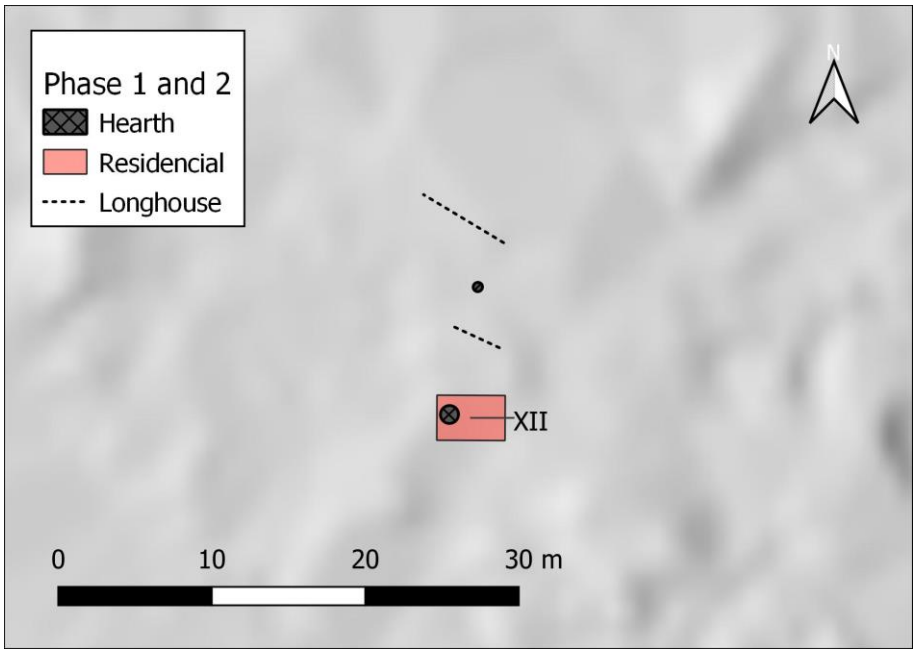


Figure 6: Buildings in phase 1 and 2, background map "Terränglutning" ©Lantmäteriet.

2.1.2 Phase two

Around the 8th century, a small timber-log residential building was constructed (house XII , figure 6). Finds of chipped stone from phase two consists of two quarts objects, interpreted as a flake and core (figure 7). Both were found inside the timber-log building

.

Figure 7: Quartz core from phase two.

It is unclear when phase two ended. However, the area was abandoned before the next phase, sometime between the 9th and the early 13th century (Andersson & Svensson, 2002, p. 44ff).

2.1.3 Phase three

The settlement was re-established during the second part of the 13th century. The buildings and finds are significantly more numerous than in previous phases, with 215 finds of chipped stone and eight buildings. Four of these are interpreted as residential houses with fixed benches and hearths and the rest as outhouses (figure 8, table 8).

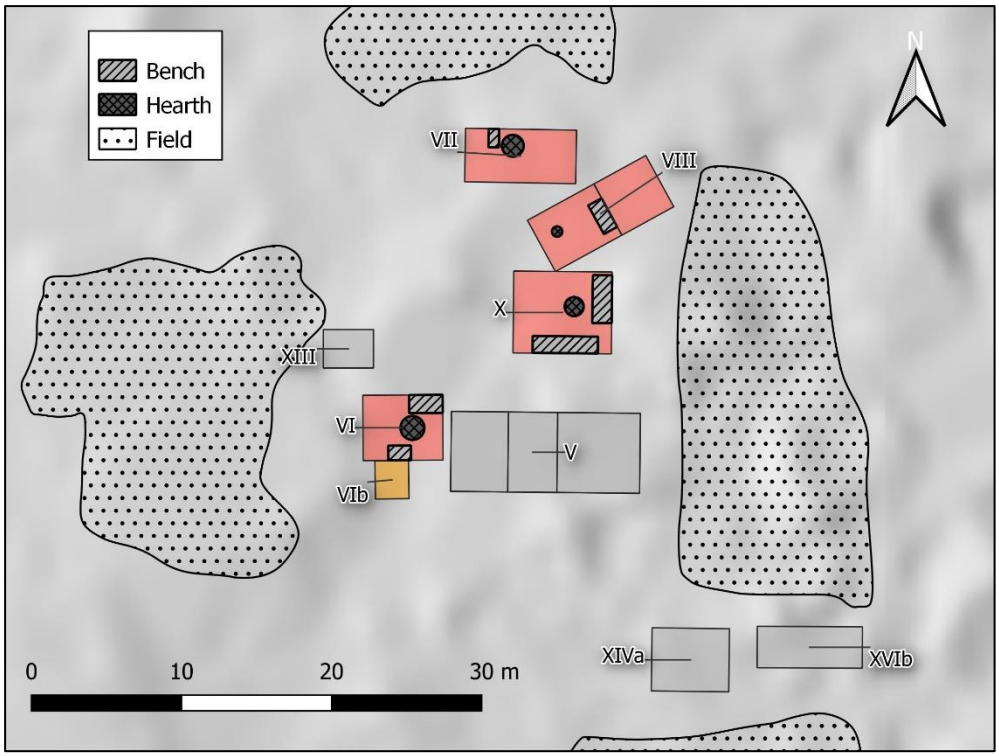


Figure 8: Skramle during phase three, background map "Terränglutning" ©Lantmäteriet.

Table 8 : Buildings during phase three.

Type	Number	Heating	Dimensions	Features	Other
Residential	X	Brick Smoke-oven	7x6,5 meters	Two benches	largest assembly of finds
Residential	VI	Pit hearth	5x5,5 meters	Bench	-
Residential	VII	Brick Smoke-oven	7,5x4 meters	Bench	Signs of brass melting and soapstone handicrafts.
Residential	VIII	Pit hearth	9.5x4.5 meter	Bench	Signs of soapstone handicrafts.

Outhouse, general storage	V	-	13x6 meter	Substantial floor layer.	7th century runestone found in the foundation. Divided in to three departments, tangibly connected to each of the households.
Outhouse, Cattle byre?	XIV A, B	-	14x3-4,5 meters	-	Unclear if it's one large or two smaller buildings.
Outhouse	XII	-	3,5x3 meters	-	-

The interpretation of phase three is that Skramle was a small village, containing several nucleus households that collaborated with the daily work at the farm. The occurrence of brick-built smoke-ovens in two of the houses is early for a 13-14th century rural village, as these types of ovens and materials have mostly been found in contemporary urban environments. Thought, as few rural Medieval settlements have been excavated, it's not possible to conclude how unique the brick smoke ovens are. However, the ovens, together with the other rich find material where, a heraldic emblem stands out, points towards that Skramle were a wealthy settlement.

The settlements seem to end in the middle of the 14th century. The artefact's position within the houses seems to be found in situ, probably originally laying on shelves and storage units. Therefore, the village seems to be abandoned and left to decay as it was, supporting a local tradition that Skramle was abandoned after the black death (Andersson & Svensson, 2002, pp. 48ff, 173f).

The rich finds of quartz and flint points to that chipped stone was part of the material culture at Skramle. However, as pointed out in the introduction, a common concern with attributing chipped stone tools to Iron age and Medieval settlement is the possibility that they belong to earlier Stone age activities at the same site. Therefore, for source critical concerns, this possibility needs to be addressed before continuing with the analysis.

2.1.3.1 Source critical concerns

Skramle is situated on a southern slope of lake Gunnern, a site that probably was desirable during the Stone age. In the surrounding landscape, several possible Stone age settlements are registered around the shores of lake Gunnern (figure 9).

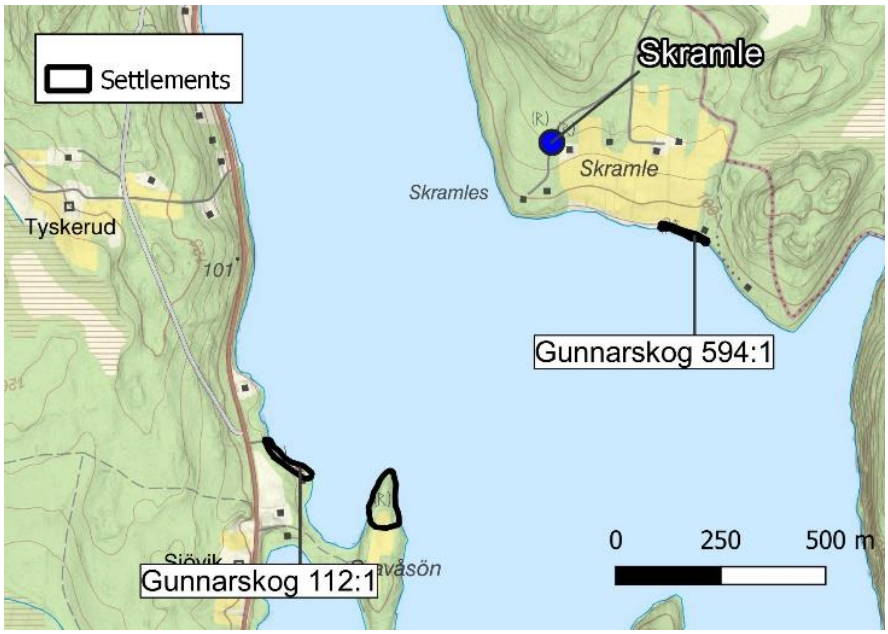


Figure 9: Registered Stone age settlements around lake Gunnern, background map "topografisk webbkarta" and "Terränglutning" ©Lantmäteriet.

However, their classification is solely based on that chipped flint and quartz have been found at these locations. As an example, at Gunnarskog 594:1, about 320 meters southeast of Skramle, a sole flint flake of 2,9 cm has motivated the registration of a 110x10 meter large settlement. This can easily create circular arguments in both directions. If Stone age sites have been found in the adjacent area, the chipped stone tools at Skramle are likely to be Stone age residuals, or, if Medieval chipped stone tools have been found at Skramle, these sites can just as well be remains of Medieval activities. Therefore, without any c-14 dateable contexts or a typologically dateable object, these are difficult to use as an argument that the stone tools in Skramle are Stone age residuals.

Though, it is to be noted that within the artefact's assemblage, two objects might have a stone-age origin: fragments of a rock stone axe (find nr 456 found in house X) and a blade in burnt flint, with heavy retouches at the sides, (find nr: 189, found in house VIII figure 12).

However, these objects can be explained as parts of the material culture of the Medieval settlement. The axe can be interpreted by the traditions of "Torsviggar", where stone-age axes were interpreted as remains of thunderstrikes and therefore placed in houses to protect them from the later, as the popular belief was that thunder never strikes the same spot (Carelli, 1997, p. 404ff). The burnt blade with heavy retouches is probably a neolithic object later reused as a strike-a-light flint, similar to Viking age strike-a-lights made from Mesolithic and Neolithic objects found in Hedeby, present day Denmark (figure 10), or as strike-a-lights made of a neolithic flint dagger found in a Medieval context in Ås, Jämtland (Olausson & Engelmark, 1985; Paulsen, 2007).

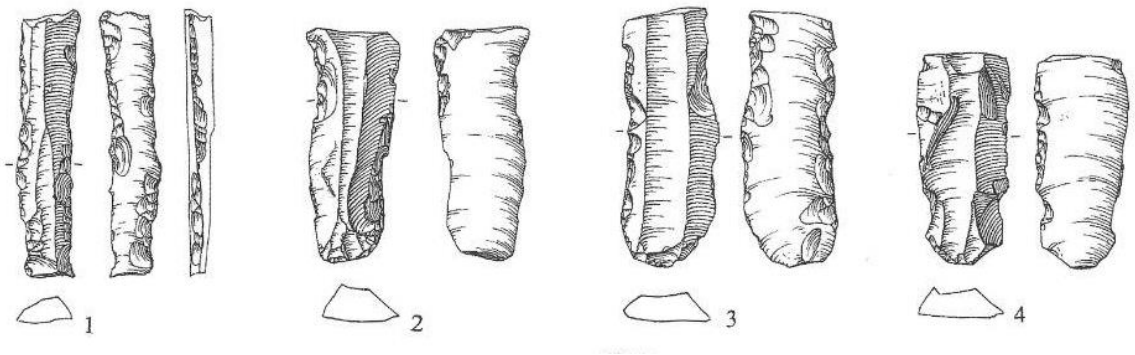


Figure 10: Neolithic flint blades reused as Viking age strike-a-lights in Hedeby. From Paulsen, 2007.

Furthermore, the archaeologist responsible for the excavation at Skramle, states that the chipped stone tools was found well within the Medieval layers (E. Svensson, personal communication, 13 May 2022)**.** Therefore, its deemed unlikely that the chipped stone at Skramle is derived from Stone age residuals.

2.1.3.2 The economy of Skramle

To understand the chipped stone at Skramle, a short background of the economics must first be drawn. The economy of Skramle in phase three is interpreted to be based on several activities: agriculture, animal husbandry and two different types of handicrafts.

Pollen analysis from the surrounding fields and macrofossil analysis from the contexts shows indication of cereal production and that the surrounding landscape was grazed by animals (Andersson & Svensson, 2002, p. 70f).

Further, soapstone handicrafts were practiced, evident in the large amount of soapstone artifacts found at the site. These were spindle whorls and parts of vessels, half-finished objects, waste from soapstone production and raw material, probably from a local quarry. It's difficult to determine if the soapstone handicraft was solely for household needs or if it was produced for trading. However, the amount points to the latter. The other practiced handicraft was leather and fur production. This is visible in the large number of smoothing stones found. Further, a large number of chipped stone scrapers can be connected to this activity. The Scrapers was likely used to process the skin and the smoothing stones for further refinements (Andersson & Svensson, 2002, pp. 86ff, 98ff, 172, 185)

The leather and fur production can be connected to other parts of the find material and features in the surrounding landscape. Five metal arrows were found and interpreted as intended for hunting, possibly for animals with skin suitable for fur production. Furthermore, 110 pitfalls for trapping animals have been identified in the surrounding landscape. Traditionally related to the trapping of elks, but could also be used for bears, wolf's, foxes,

etc. Some of these pitfalls have been c-14 dated and at least 2 of these is contemporary with the Medieval phases of Skramle (Svensson, 1998, pp. 69, 75).

Further, the first documented tax records from 16th century, mention several cases where tax were paid in fur products such as moose, fox's, lynx, squirrel and marten (Björklund, 2018, pp. 30, 365, 418, 458, 464, 501, 510). Also, from the 16th century there are accounts that the local bailiff was tasked to buy marten and black fox skins from Värmland, as well as there was laws against unlicensed trade with these products (2018, pp. 30f, 222). Also, a law from the 15th century states that hunting squirrel on others land was illegal, pointing to the value of squirrel skins (2018, p. 46). These taxes and laws point towards that fur production and trade was an important part of the economy in Medieval Värmland.

However, In the osteological material from Skramle, fur-production is not highly visible as it indicates only goat/sheep, cattle, pigs, and birds. As goat/sheep, cattle are suitable for some leather and fur products, other fur bearing animals such as fox, marten, squirrel etc. is lacking from the material (Andersson & Svensson, 2002, p. 70f). As the finds list point out that waste layers were excavated, it's not likely that bones from furbearing animals were discarded outside the excavated area. This question will be further addressed in the discussion chapter.

2.1.3.3 Finds of chipped stone

In the excavation report of Skramle, chipped stone scrapers were identified and connected to the skin production. The lithic analysis conducted for this study identified even more scrapers, as well as other chipped stone tools in flint and quartz. These are depicted below.

Figure 11

Scale 1:1

Point
Nr:26
Flint

Point
Nr:29
Flint

Point
Nr:485
Quartz

Blade reused as strike-a-light
Nr 189
Burnt flint

Cutting tool reused as strike-a-light
Nr:540
Burnt flint

Strike-a-light
nr:287
Flint

Strike-a-light
nr:270
Flint

3 cm

Figure 12

Scale 2:1

Strike-a-light
nr 40
Flint

Flake with use-wear
nr:338
Flint

Strike-a-light
nr 78
Flint

Flake with use-wear
nr:56
Flint

Retouched flake
nr:121
Quartz

Flake with use-wear
nr:208
Flint

Retouched flake
nr:433
Flint

Scraper
nr:124
Quartz

Scraper
nr: 606
Quartz

3 cm

Figure 13

Scale 2:1

Scraper
Nr:219
Flint

Atypical scraper
nr:173
Flint

Scraper / Point
Nr:600
Burnt flint

Scraper
nr:634
Flint

Atypical scraper
Nr:298
Quartz

Scraper
Nr:226
Flint

Scraper
Nr:601
Flint

3 cm

Figure 14

Scale 2:1

Atypical scraper
Nr:359
Quartz

Scraper
Nr:49
Rockcrystal

Scraper
Nr:592
Quartz

Scraper
Nr39
Flint

Scraper
Nr:117
Quartz

3 cm

Figure 15

Scale 2:1

Scraper
Nr:561
Quartz

Scraper
Nr:655
Quartz

Scraper
Nr:550
Quartz

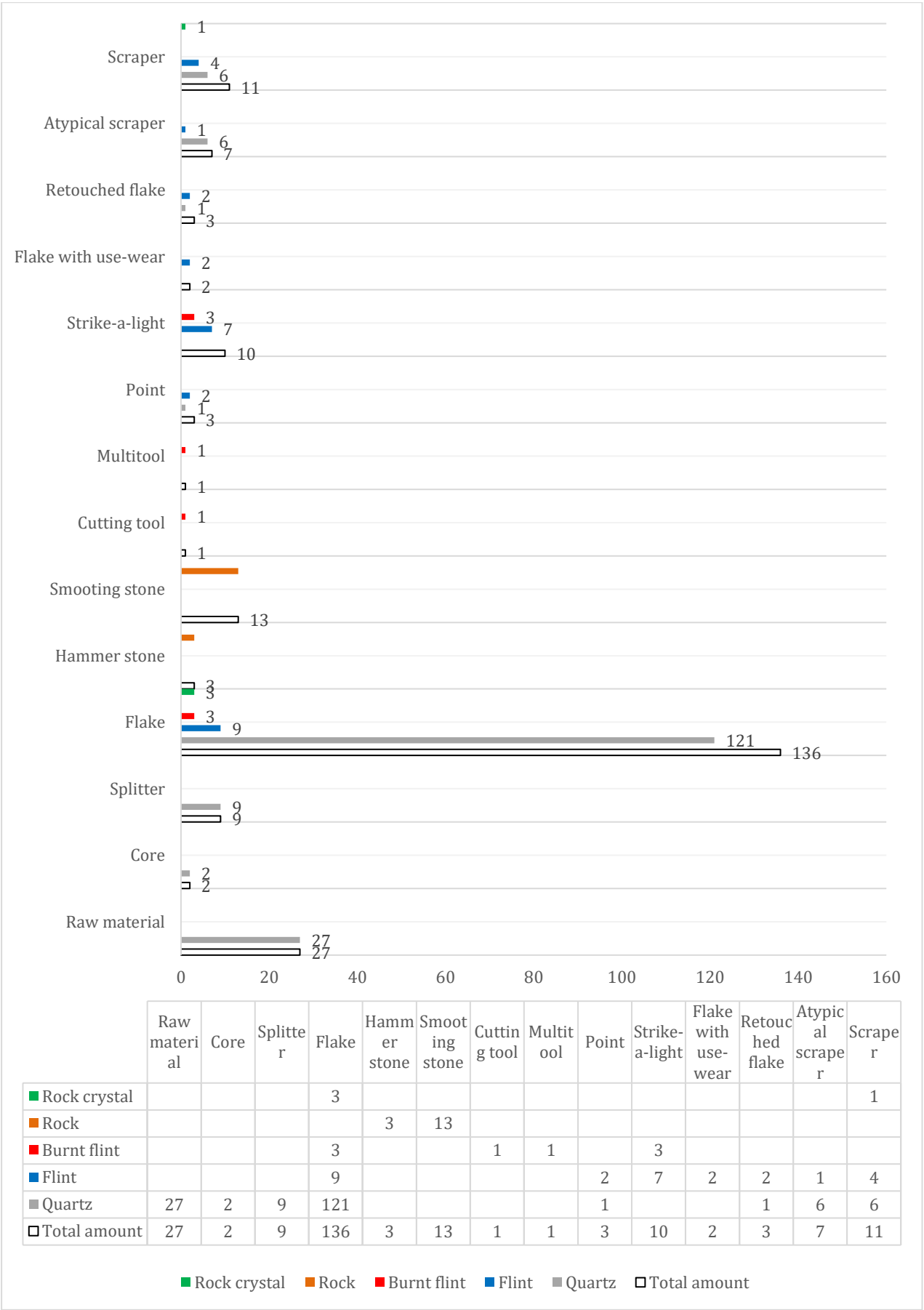
Atypical scraper
Nr:639
Quartz

Scraper
Nr:513
Quartz

3 cm

Figure 16

Scale 2:1



	Raw material	Core	Splitter	Flake	Hammer stone	Smooting stone	Cutting tool	Multitool	Point	Strike-a-light	Flake with use-wear	Retouched flake	Atypical scraper	Scraper
Rock crystal				3										1
Rock					3	13								
Burnt flint				3			1	1		3				
Flint				9					2	7	2	2	1	4
Quartz	27	2	9	121					1			1	6	6
Total amount	27	2	9	136	3	13	1	1	3	10	2	3	7	11

Figure 17: Finds of chipped stone in Skramle phase three

The lithic analysis shows that the most numerous tools in chipped stone were scrapers and atypical scrapers, the majority in quartz (12) followed by flint (5) and rock crystal (1) (figure 17). Furthermore, a tool (find nr 600, figure 14) was interpreted as a combined scraper and point. Identified were also ten strike-a-light flints and three points.

The scrapers seem to be relatively independent in appearance, not shaped after a typology but shaped after function. However, there are one feature seemed to be repeating in some objects: A convex hollow edge on nr 513 (quartz), 639 (quartz), 634 (flint), and 219 (flint).

Table 9: Use-wear analysis of material from phase three.

Nr	Interpretation	Interpretation after use-wear analysis	Result of use-wear analysis
433	Scraper	Retouched flake	No signs of use-wear
219	Scraper	Scraper (hollow edge)	Micro-retouches and chisel like edge might indicate use on wood
634	Scraper	Unused scraper (hollow edge)	Clear signs of polishes on two areas. However, the position of one of these does not fit with a scraping action and might be due to depositional processes. Similar chisel like edge as 219, but without micro retouches. Interpreted as an unused scraper for use on wood.
39	Scraper	Scraper	Clear signs of polishes. Probably from soft organic material
601	Scraper	Scraper	Clear signs of polishes. Probably from soft organic material
226	Scraper	-	Signs of presence of lipids and therefore excluded from the use-wear analysis

Six of the flint scrapers were subjected to use-wear analysis that confirmed the presence of polishes or characteristic micro-retouches on four objects, pointing towards that these were used as scrapers rather than strike-a-lights (table 9, attachment one). Tendentially the scrapers were used for two purposes, 1. For shaping wood (the convex hollow edge scrapers). 2. For scraping soft organic material, possibly skins.

2.1.3.4 Chipped stone tools compared to metal tools.

Comparing the chipped stone tools, with the metal tools found at Skramle, it is clear that the two materials complement each other (figure 18). No scrapers in metal were identified compared to 18 in chipped stone. However, nine knives in metal were present compared to one possible cutting tool in burnt flint. Also, five metal arrows was found but none in chipped stone. This further supports the Medieval origin of the chipped stone tools in Skramle. The only category that could be overlapping is points and awls, where four in metal and three in chipped stone was identified.

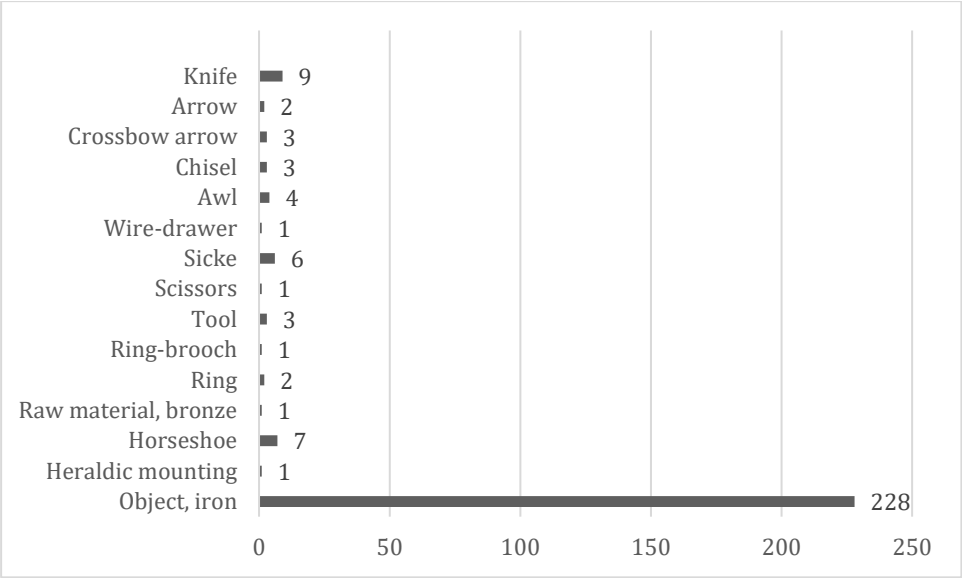


Figure 18: Metal finds form Skramle.

2.1.3.5 Distribution patterns: relations to the structures and features.

To widen the understanding how the chipped stone tools related to the houses and other associated finds, distribution maps was created (figure 19). For the chipped stone tools, including strike-a-lights, smoothing stones and hammerstones (excluding flakes and splitter), a detailed map with the original coordinates was created via documentation from the archive of Värmlands museum. For flint and quartz flakes, soapstone artefact and metal objects a simplified distribution map was created from the finds list in the report.

The distribution map of chipped stone tools and smoothing stones shows that there is a tendency that these are found inside or directly near the houses and outhouses. Especially house VII (top) and house VIII (top right) have clear concentrations. Furthermore, there is a tendency that they are found near the building walls. This fact might reflect that the farm was abandon to decay, rather then been dismantled. Therefore, many of the chipped stone objects was probably stored on shelf or nooks in the walls. There is also a concentration of tools in one of the departments in outhouse V, possibly a storage unit connected to one of the residential houses. Strike-a-light flints was found in all houses that had a fireplace, but logically, not in the outhouses.

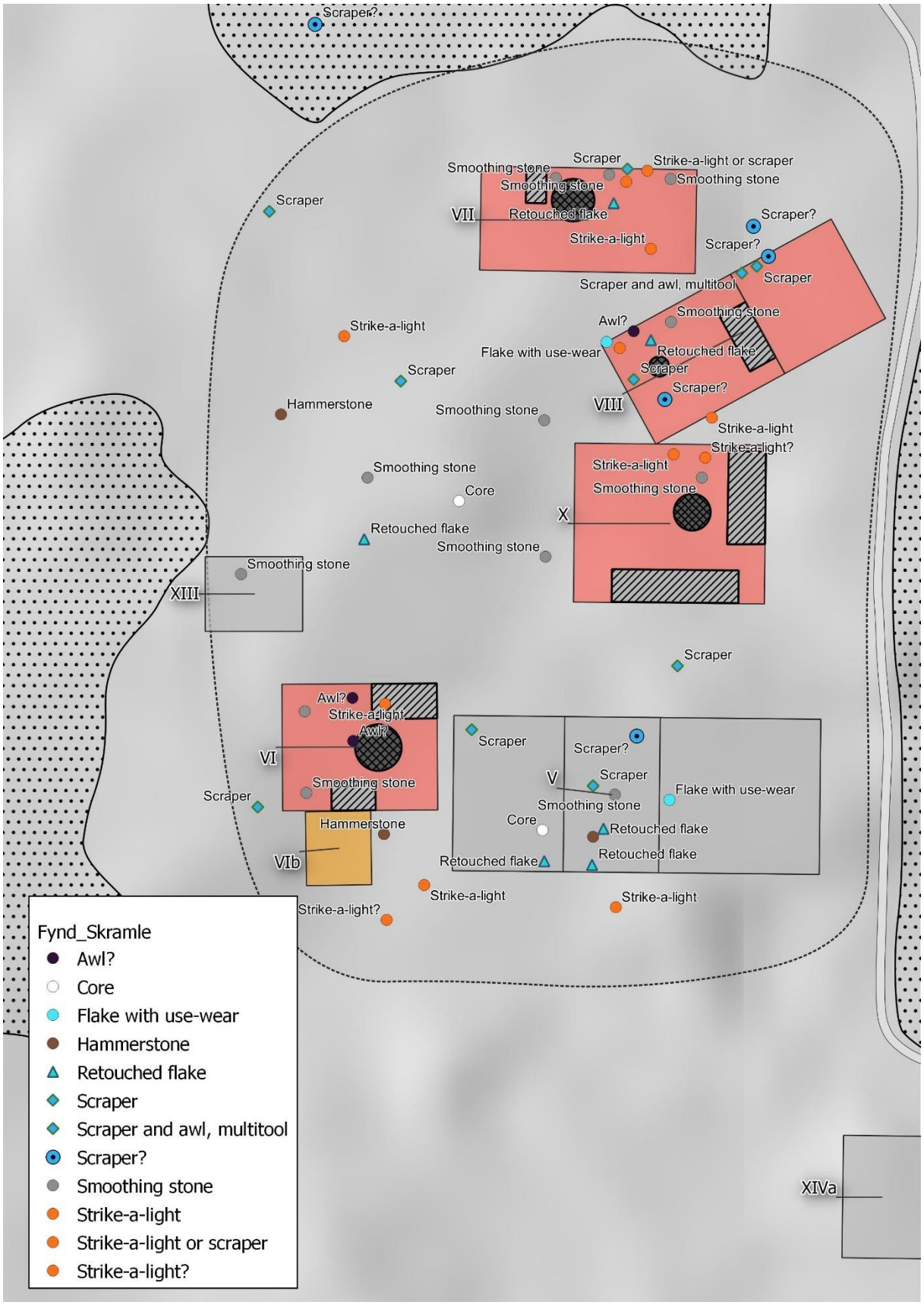


Figure 19: Distribution map of chipped stone tools and smoothing stones, background map "terränglutning" ©Lantmäteriet.

The other area with concentration of chipped stone tools was the yard between the houses. In this position one of the hammerstones was found. As the distribution map for flakes (vast majority in quartz), also show that the majority (40%) was found in the layers outside the houses, the hammerstone probably reflect that knapping was done in this area (figure 20). Similarly, the majority of soapstone handicraft debris and objects were found in the same area (figure 21).

The combined number of flakes and soapstone handicraft remains outside the houses, might reflect that napping or carving of soapstone is not an optimal indoor activity.

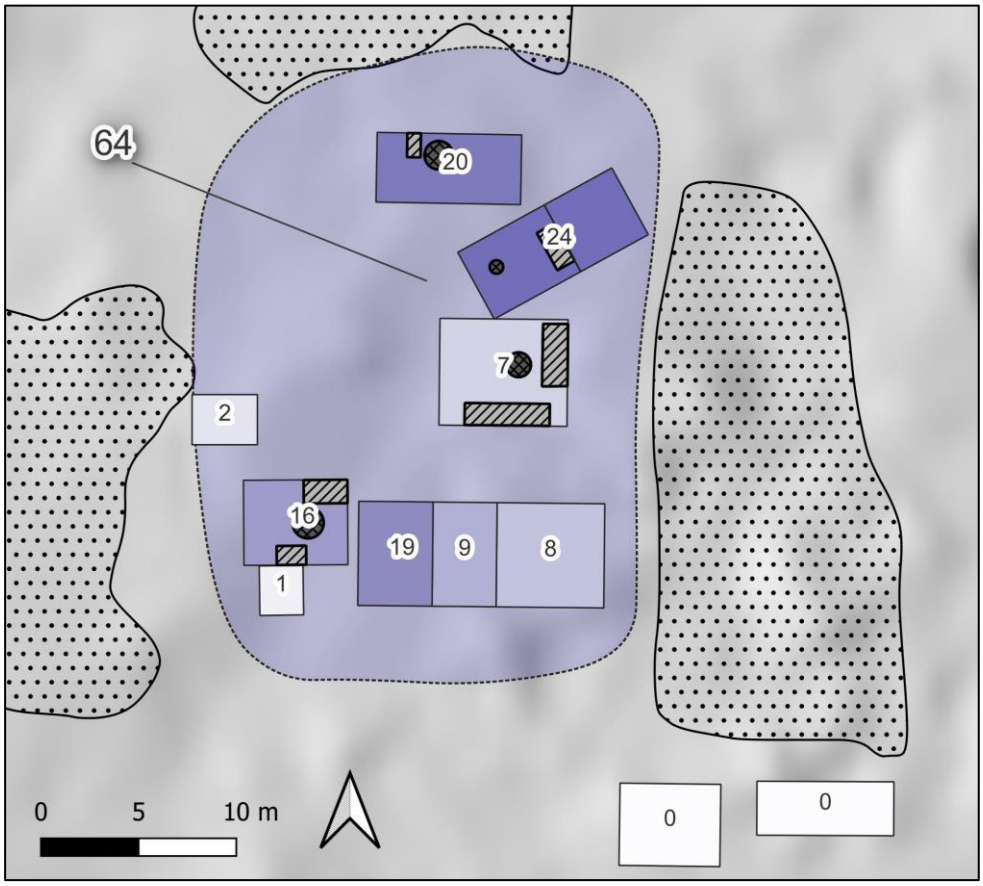


Figure 20: Distribution of flakes, background map "terränglutning" ©Lantmäteriet.

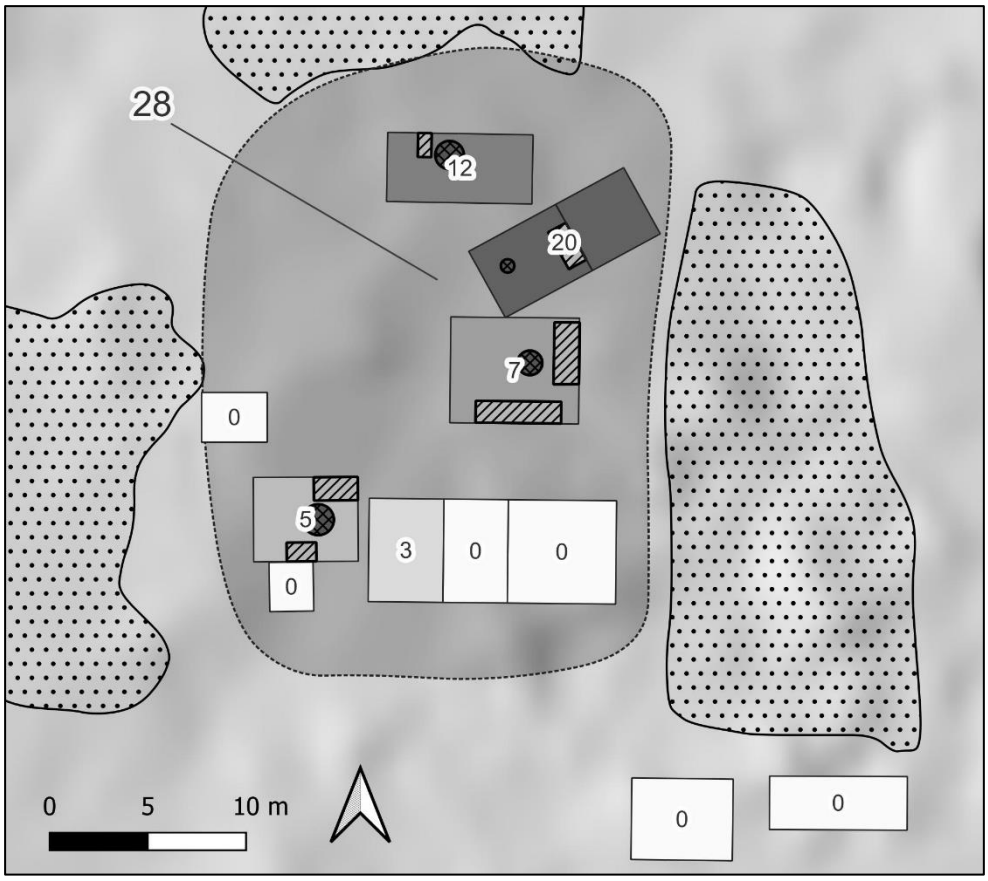


Figure 21: Distribution of soapstone handicraft remains, background map "terränglutning" ©Lantmäteriet.

2.1.4 Phase four

100 years later, around 1450, the farm is re-established and complemented with new residential buildings southwest of the old settlement (figure 22).

The cultural layers from this period are thin, and the find material sparce. The chipped stone artifacts are limited to two retouched flint flakes, one retouched quartz flake, and 15 unmodified quartz flakes. Most of the object found with in house XI. However, as house XI was built on top of the old settlement, it´s possible that some artifacts of phase three were infiltrated into the layers of phase four.

Phase four was shortly lived and Skramle was probably abandoned in the early 16th century (Andersson & Svensson, 2002, p. 53ff).

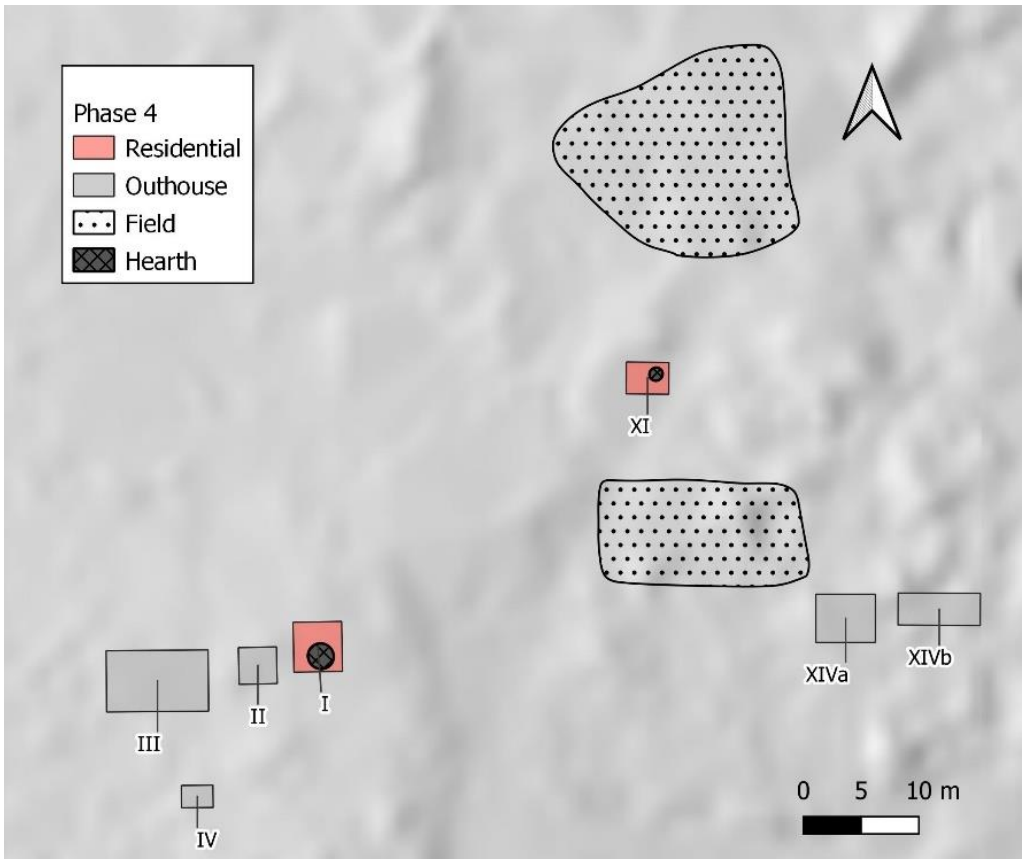


Figure 22: The Buildings and fields in phase 4, background map "terränglutning" ©Lantmäteriet.

2.1.5 Case-Study one: Summary and Conclusions

As a settlement, Skramle has a long history from the 6th all the way until the 16th century. In the Medieval phase three, about 1250-1350 AD, a large number of scrapers was found, primarily in quartz but also in flint. As the majority of these tools where in locally sourced quartz, and that flakes and hammerstones where present, the knowledge of quartz napping must have existed at the site and point towards that the tools were made locally. The scrapers can together with smoothing stones be connected to leather and fur production. Due to the large number of scrapers its probable that the skin production was substantial.

As there also was a major soapstone production at the site, that due to its proportion can be interpreted as meant for trading, it's probable that also the skin production was partly intended to be traded. In this regard, Skramle can be interpreted as a part agricultural part handicraft settlement. The trading possibilities and income from the handicraft might be the reason why Skramle was a wealthy settlement, and could afford brick smoke ovens, that at the time were found in the trading-towns that Skramles inhabitants might have visited when selling their goods.

Also, it's to be noted that chipped stone was only sparsely used during the two Iron age phases. Admit, it's possible that the Iron age occupation was mainly situated outside the

excavated area. Further, the layers and might have been damaged by of the Medieval activities. Lastly, this could be due to low activity, as the layers from these phases was thin. However, the most probable explanation is that that chipped stone was not used during the early phases to a great extent.

2.2 Case-study two: Skinnerud

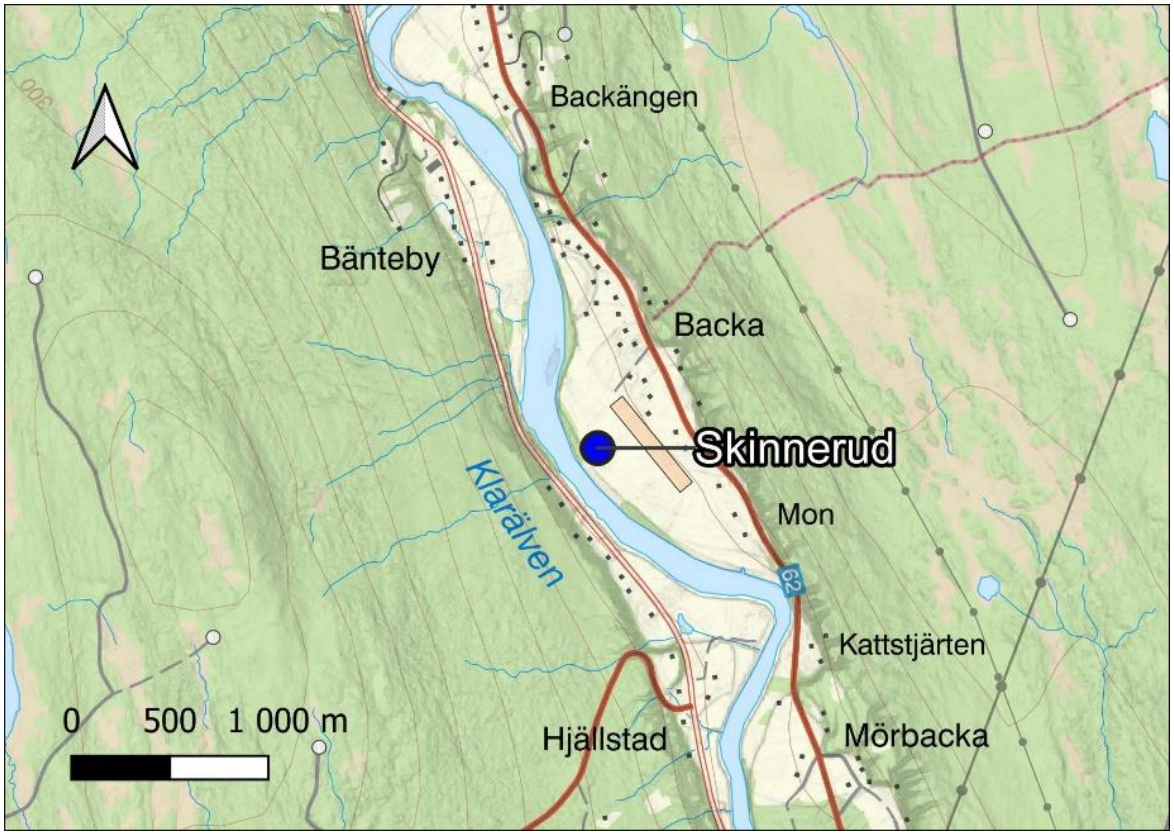


Figure 23: Skinnerud at the shore of river Klarälven, background map "topografisk webbkarta" and "Terränglutning" ©Lantmäteriet.

Skinnerud is situated at river Klarälven in Dalby parish in northern Värmland (figure 23). The settlement consisted of four buildings interpreted as a hall, a cooking house, and two outhouses (table 10, figure 24). The settlement was dated from the Viking age to the Middle age (9th to the 13th century) (Emanuelsson, 2003, p. 42f).

Table 10: Buildings in Skinnerud

Interpretation	Number	Dimensions	Heating	Features	Other
Residential / Hall	I		Heating pit	Earth bench	Contained most of the artefacts. Interpreted as a multifunctional building were handicrafts and household tasks were performed.
Residential/ Cooking house	II		Hearth	-	The area around the hearth contained most of the osteological material, but few artifacts.
Outhouse/storage	III		-	.	-
Outhouse / Cattle byre	IV		-	-	-

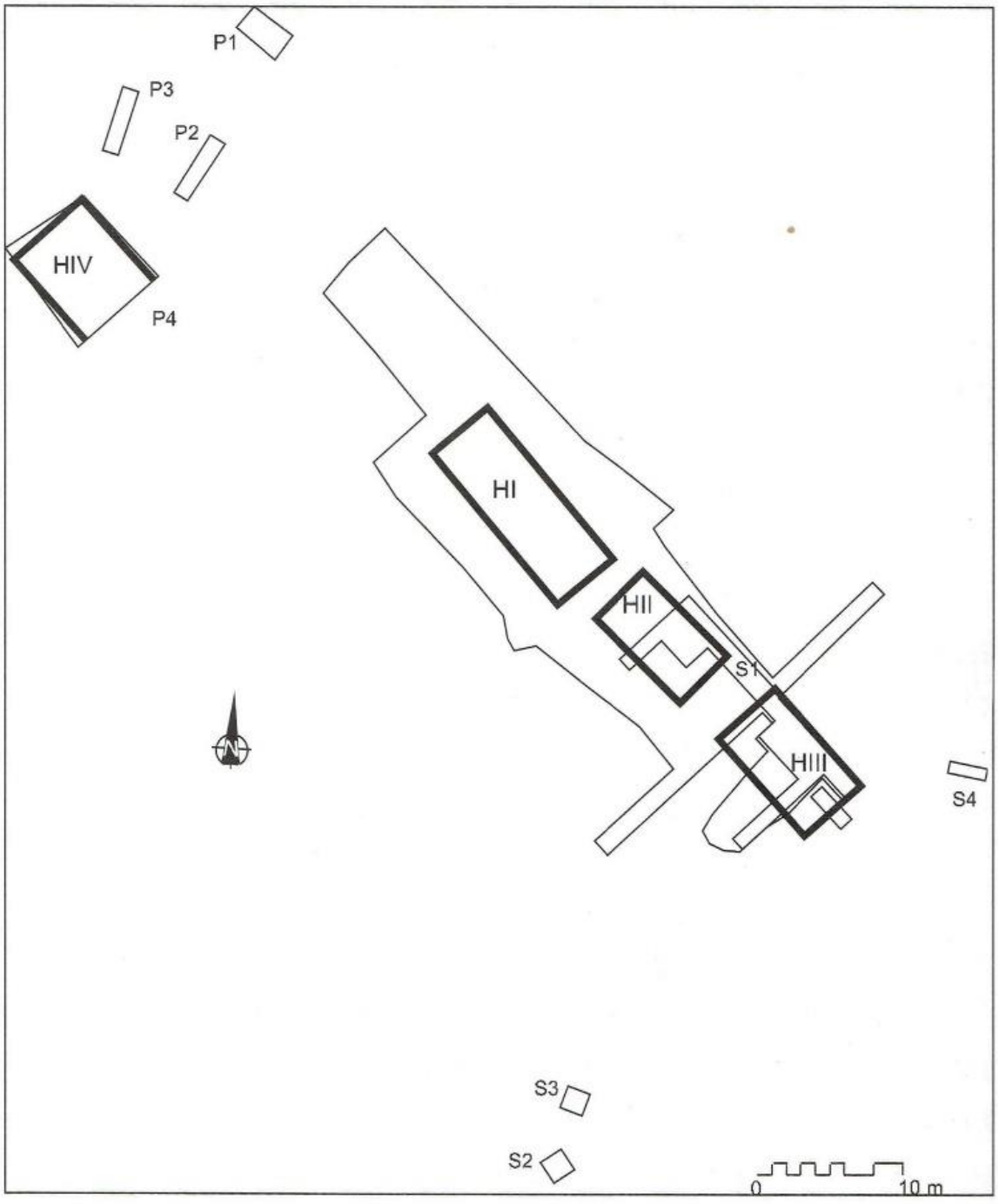


Figure 24: The trenches and identified buildings at Skinnerud. HI: The Hall, HII: the cooking house, HIII and HIV; outhouses. Plan by Annie Johannson (Emanuelsson, 2003, p. 42)

Skinnerud was interpreted as a single household, possibly an expansion of the nearby farm Backa that is believed to be the oldest settlement in the area. When Skinnerud was

abandoned, the buildings were probably left standing until the area was cleared with fire in early modern time (Emanuelsson, 2003, p. 43f).

2.2.1 Source critical issues

During the excavation, several objects of chipped stone was found. As residuals from earlier periods is a common objection to this type of material found in these context, source critical issues must first be addressed.

About 30 meters away from the hall building, a fireplace was discovered that was dated via c-14 to the early Bronze age (P1 in Figure 24). However, no associated building or structures was identified, but as the hearth was discovered in a small test trench, these could exist outside the excavated area (Emanuelsson, 2003, p. 42). As it is likely that early Bronze age communities were heavily dependent on chipped stone, it is possible that the finds could be residuals from previous activities.

However, the chipped stone tools at Skinnerud are interpreted as strike-a-light flints (see below), complemented with a Viking age strike-a-light steel. Therefore, these should be connected to the Viking age / Medieval settlement. Also, the finds list and distribution map of chipped stone (See below), shows that most of the material are within the Viking age-Medieval layers and in the direct vicinity of the two residential houses. Therefore, it is reasonable to assume that the chipped stone belongs to the Viking age-Medieval material culture at Skinnerud.

2.2.2 The Economy of Skinnerud

The economy of Skinnerud was based on agriculture, iron production and skin production. The pollen sample and macrofossil evidence point towards barley and oat was cultivated. Finds of slag points toward that iron production was practiced at the site (Emanuelsson, 2003, p. 53ff). The skin production is evident both in the placename and find material. The name Skinnerud is formed by two parts. “Skinner”, meaning person working with leather and fur. “Rud”, meaning clearing of land for the purpose of creating a new settlement. This type of name is generally dated to Viking age and early Middle age, fitting well with the archaeological dating’s (Emanuelsson, 2003, p. 53; Wahlberg, 2003, p. 261). The find material contains several tools that are interpreted as associated with skin production. However, in contrary to Skramle, these were made in metal and consists of two Scraper/cutting tools, three scrapers/carving tools and one knife specialising for cutting skin (figure 25). Also, as in Skramle, smoothing stones were found (fig 26).

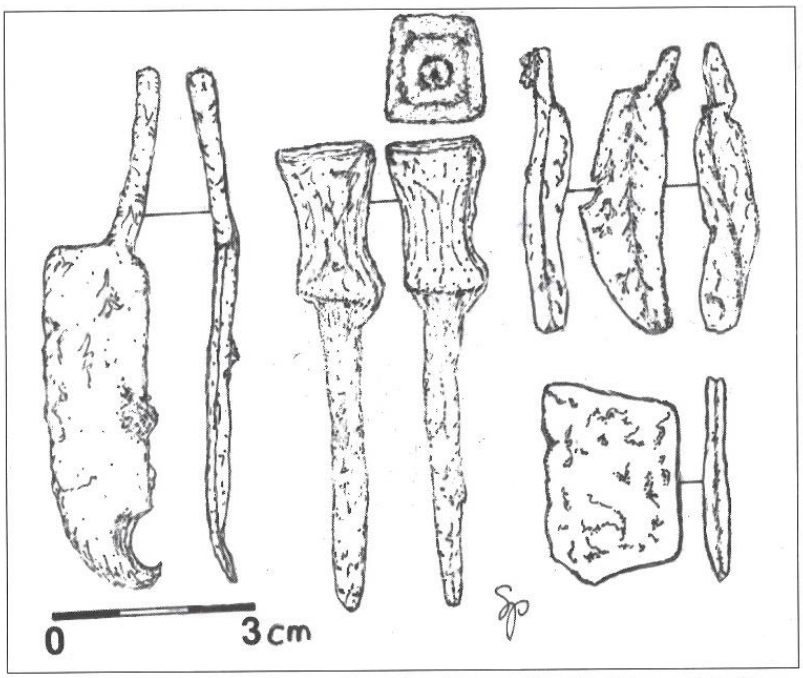


Figure 25: Tools interpreted as used for skin and leatherwork found as Skinnerud. left: scraping/cutting tool (nr 1) middle: awl (nr 101), top right: scrape/carving tool, (nr124), bottom right, knife (nr 133). Drawing by Sussane Pettersson. (Emanuelsson, 2003, p. 52)

Further, other materials and features in the surrounding landscape, that might be connected with the skin production is one iron hunting arrow and a large number of pitfalls (Emanuelsson, 2003, pp. 52f, 66). Compared to Skramle, a larger number of these can be connected to the Viking age and Medieval activities as 12 pitfalls have been c-14 dated to between 710-1293 AD (Svensson, 1998, p. 75). Therefore, it is probable that some of the pitfalls were a part of Skinneruds outland use, and fur and skin production.

However, as in Skramle, the osteological material does not contain fur-bearing animals other than domestic sheep/goat (and cattle). Further, the material was fragmented and was mainly found around the hearth at the cooking house and probably reflect the diet rather than skin production. It's to point out that few waste layers was found and that it's possible that bones from furbearing animals have been discarded outside the excavation area (Emanuelsson, 2003, p. 53f). However, as there are similarities with Skramle in this regard, this issue will be further addressed in the discussion.

2.2.3 Finds of chipped stone

The chipped stone material from Skinnerud consist of 47 finds, 43 in flint and 4 in quartz. These are depicted and discussed below.

Smoothing stone
Nr:172
Rock

Strike-a-light
Nr:223
Flint

Strike-a-light
Nr:227
Flint

Strike-a-light
nr:226
Flint

Retouched flake
Nr:118
Flint

Retouched flake
nr:238
Flint

Retouched flake
Nr 270
Flint

Retouched flake
Nr 109
Flint

Retouched flake
nr:56
Flint

3 cm

Figure 26

Scale 2:1

Retouched flake
Nr 10
Flint

Strike-a-light
Nr 119
Flint

Strike-a-light
Nr 96
Flint

Strike-a-light
Nr 166
Flint

Strike-a-light
nr 197
Flint

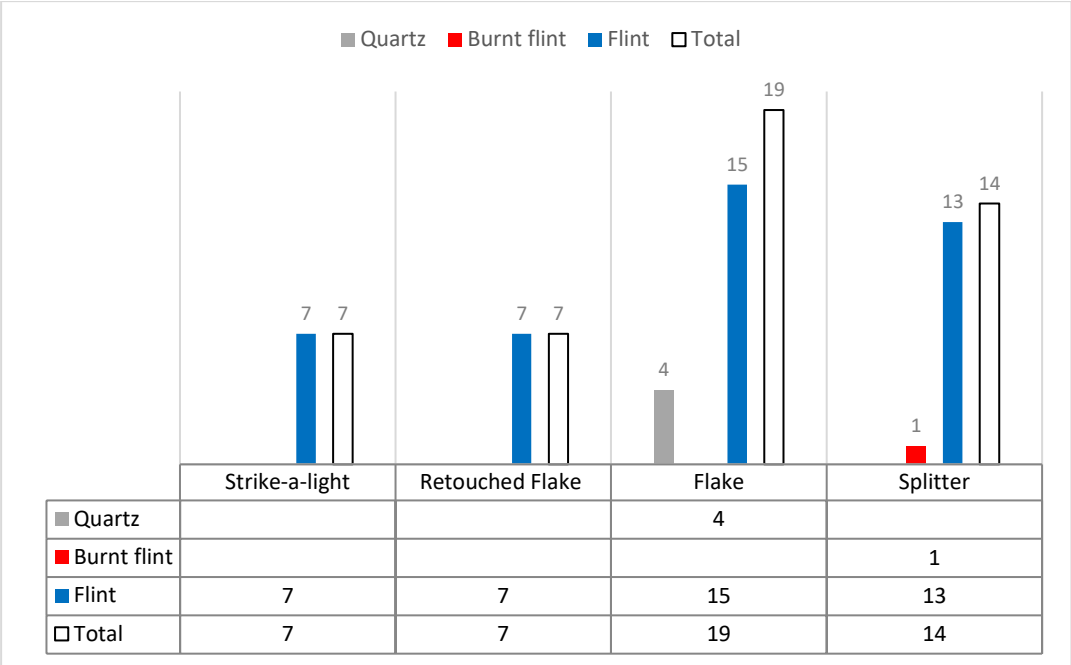
Retouched flake
Nr 214
Flint

Strike-a-light
nr 164
Flint

3 cm

Figure 27

Scale 2:1



	Strike-a-light	Retouched Flake	Flake	Splitter
Quartz			4	
Burnt flint				1
Flint	7	7	15	13
Total	7	7	19	14

Figure 28:Finds of chipped stone in Skinnerud.

The most common tool were strike-a-light flints of which nine was identified. Further, seven retouched flakes with an unclear purpose were identified (figure 26,27,28). Two objects fulfilled the requirement for scrapers and was subjected to use-wear analysis. One was without detectible polishes. The other object did have polishes on one part. However, comparing this with use-wear from the reference material, this was identified as possibly deriving from strike-a-light actions (table 11, attachment one).

Most of the chipped stone material was flakes and splitter. However, compare to Skramle, the amount is low and probably reflect minor napping activities, possibly related to the strike-a-light flints. Also, there seem to be no incitement to use quartz as in Skramle as only four quartz flakes were found.

Table 11: Use-wear analysis of material from Skinnerud.

Nr	Interpretation	Interpretation after use-wear analysis	Result of use-wear analysis
10	Scraper	Retouched flake	No sign of use-wear
214	Scraper	Strike-a-light	Signs of polish with scratches in the scraping direction. Identified as deriving from strike-a-light actions.

2.2.4 Chipped stone compared to metals

Comparing the chipped stone material to metal, it's clear that they do not overlap. No stone skin scrapers were identified. However, as mentioned there were several iron tools interpreted as related to skin production (figure 29).

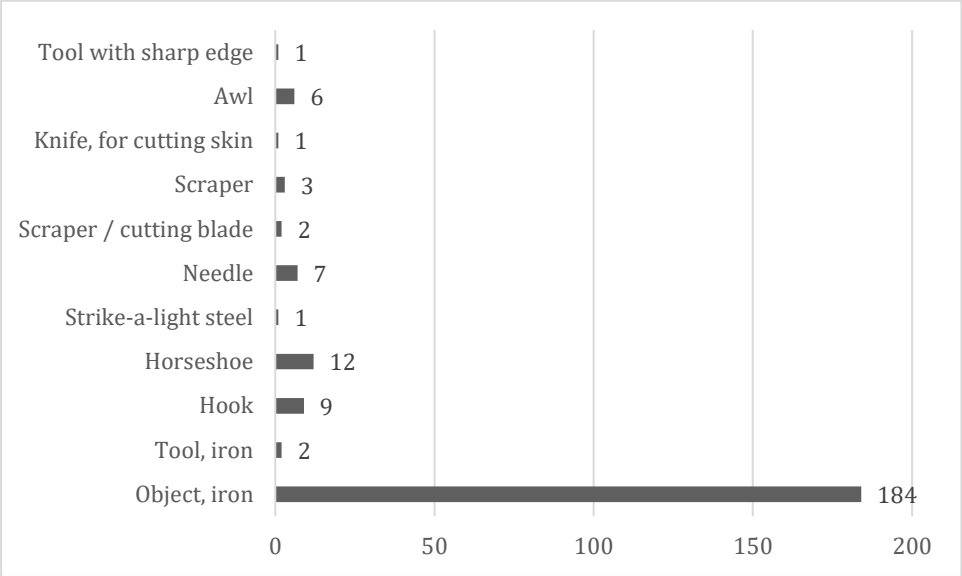


Figure 29: Finds of metal at Skinnerud

2.2.5 Distribution patterns: relations to structures and features.

To further understand the chipped stone at Skinnerud, a distribution map was needed. As the report was supplied with a for the purposes suitable map, this was reused (figure 30).

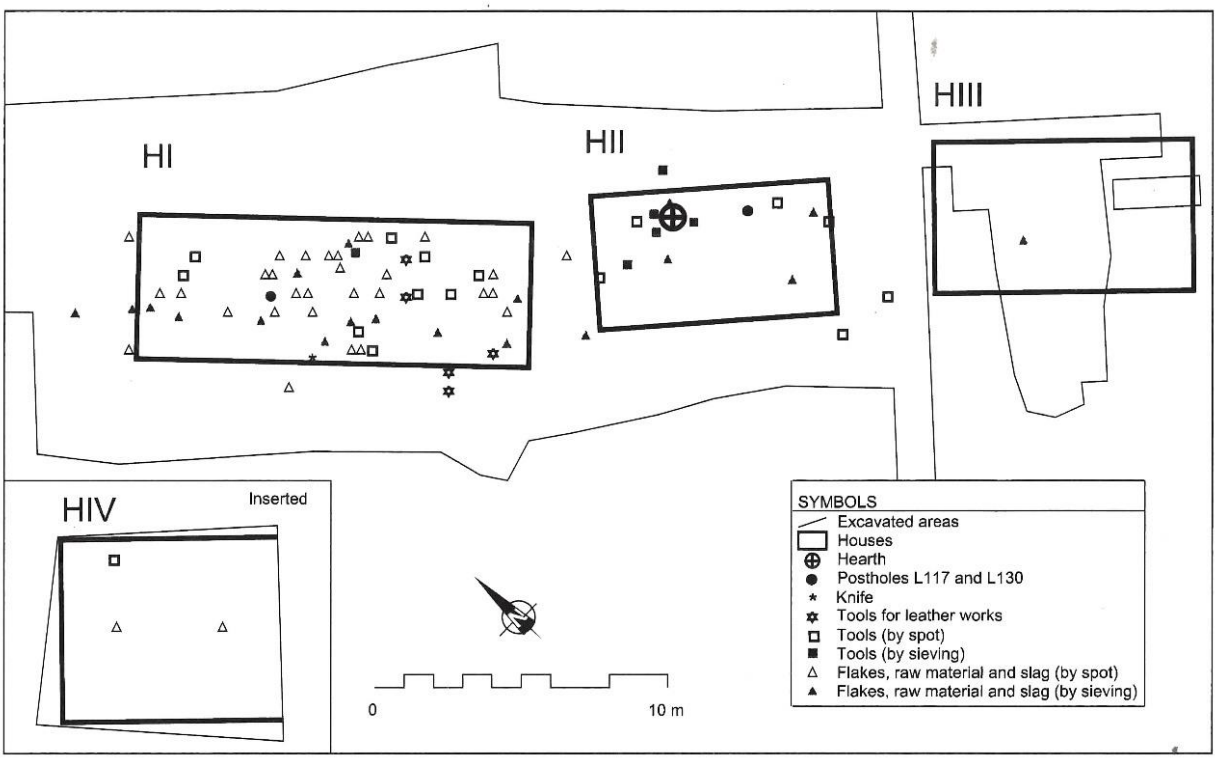


Figure 30: Distribution map of tools for leather working and flint flakes. plan by Sussane Pettersson,(Emanuelsson, 2003, p. 69)

The distribution map clearly shows that the chipped stone is delimited by the extent of the two residential houses and that they follow the same pattern as the other materials such as metal. Further concentration is seen in the interpreted hall building, fitting well with the interpretation that this was a multipurpose building where many different activities was performed.

2.2.6 Case-study two: summary and conclusions

Skinnerud was a single farm active from the 9th to the 13th centuries. As the name suggest, the farms economy incorporated skin-production, visible by the finds of smoothing stones and skin working tools such as scrapers and knives in iron, as well as pitfalls in the surrounding landscape. However, no scrapers in chipped stone were identified. The chipped stone was instead mostly attributed to strike-a-light activities and can be seen fitting well inside the establish interpretation of chipped stone usage during later periods.

2.3 Case-study three: Ivarsbråten

Figure 31: Ivarsbråten located on the hill surrounding lake Glafsfjorden, background map "topografisk webbkarta" and "Terränglutning" ©Lantmäteriet.

Ivarsbråten was a single farm situated in Stavnäs parish in western Värmland. The settlement was located on the hills surrounding the valley of lake Glafsfjorden (figure 31). Local traditions says that Ivarsbråten was an expansion of the nearby farm Skasås.

It was excavated as a research project from 2013-2019. The excavation revealed a Medieval settlement consisting of a residential house, a stone-paved yard and an outhouse (table 12, figure 32). C-14 samples dated the farm to the 14th century (1270-1415 AD) (Pettersson et al., 2021, p. 3f).

Table 12: Buildings in Ivarsbråten

Type	Heating	Dimensions	Features	Other
Residential	Built-up hearth, with a stone heating magazine	8,4x5 m	Earth bench, timber log construction sealed with daub on sill stones	Contained the majority of the finds. Built on an artificial terrace
Outhouse	.	6x6 m	Timber log construction on sill stones	Possible cattle byre

Figure 32: Map over the two houses in Ivarsbråten. The residential house with the stone heating magazine to the left, drawing by Sussanne Pettersson from Svensson et al., 2021, p. 45.

2.3.1 Source critical issues

The source critical situation at Ivarsbråten is strait forward. There were no contexts that was C14 dated to be older than 1050—1250, and no typologically dateable finds that was older than Middle age (Pettersson et al., 2021, attachment 6, p 2). Further, no Stone age settlement is registered in the surrounding area. Therefore, residuals from earlier settlements are unlikely.

2.3.2 The economy of Ivarsbråten

The economy of Ivarsbråten was based on agriculture, animal husbandry and textile production. The macrofossil analysis shows that barley, rye, oat, and flax were cultivated, as well as that raspberries and hazelnuts was collected. The pollen analysis points to a landscape affected by grazing animals, and the osteological material shows that cattle, pigs, and sheep/goats were consumed and probably held at Ivarsbråten. Further, a relatively large amount of spindle whorls points to textile production, that might have been used for trading in the local area. No part of the economy can be directly connected to chipped stone usage (Pettersson et al., 2021, p. 24f).

2.3.3 Finds of chipped stone

Strike-a-light
Nr:28
Flint

Strike-a-light
Nr:42
Flint

Strike-a-light
Nr:56
Flint

Strike-a-light
Nr:71
Flint

Strike-a-light
Nr 85
Flint

Strike-a-light
Nr:114
Flint

3 cm

Figure 33

Scale 2:1

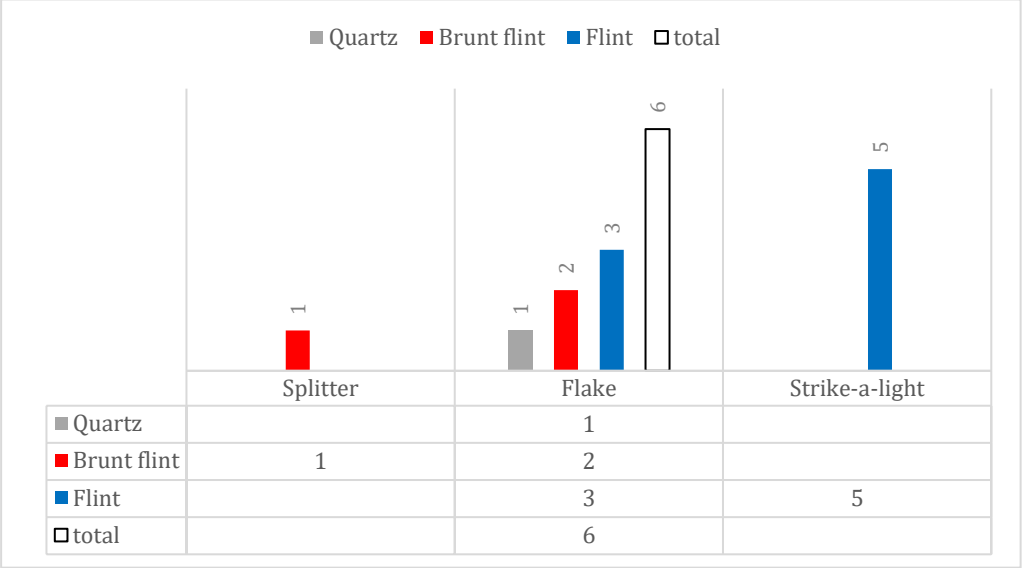


Figure 34: Chipped stone from Ivarsbråten

During the excavation, 136 finds were registered of which 12 was in chipped stone (figure 34). Six flints were interpreted as strike-a-lights (figure 33). One of the strike-a-light also had the characteristics of a scraper (nr 85) and was subjected to use-wear analysis (table 13). The analysis confirmed the presence of polishing on one edge. Comparing this with use-wear from the reference material this was identified as possibly deriving from strike-a-light actions, similar to the strike-a-light from Skinnerud (see attachment one). The rest of the chipped stone was flakes and splitter.

Table 13: Use-wear analysis from Ivarsbråten

Nr	Interpretation	Interpretation after use-wear analysis	Result of use-wear analysis
85	Strike-a-light	Strike-a-light	Signs of polish with scratches in the potential scraping direction. Was probably used on hard material.

2.3.4 Chipped stone compared to metal tools.

Comparing the chipped stone material from Ivarsbråten to the metal finds, its clear that they do not overlap in function (figure 35).

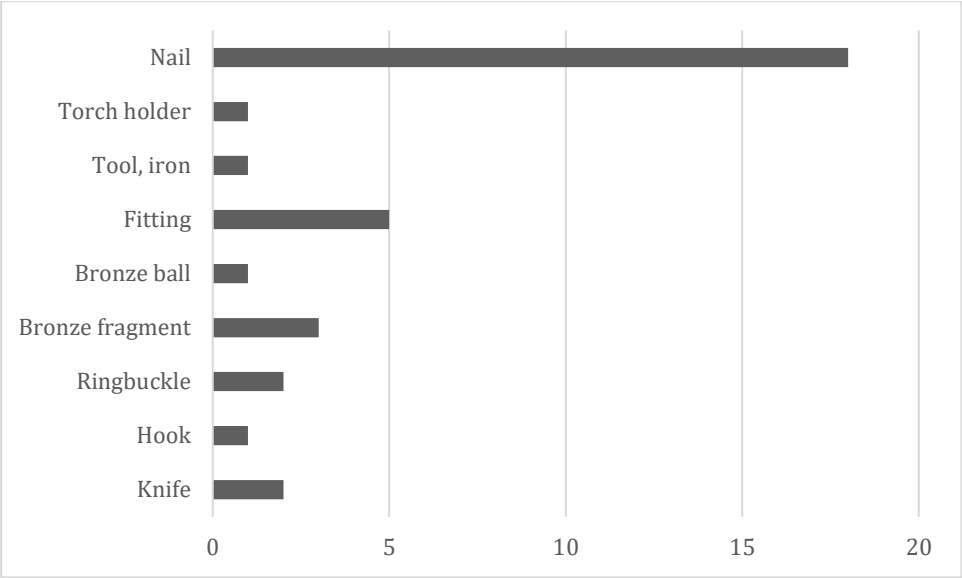


Figure 35: Metal finds in Ivarsbråten.

2.2.5 Distribution patterns: relations to structures and features.

The flint flakes and strike-a-light are concentrated around the hearth, and the earth bench at the western wall. When comparing the distribution pattern of the flints to the other find categories, Its clear that they follow the same pattern.

Figur 26. Fyndplan, spridningsbild i hus 1 (se även bilaga Ritningar). Figur: Susanne Pettersson.

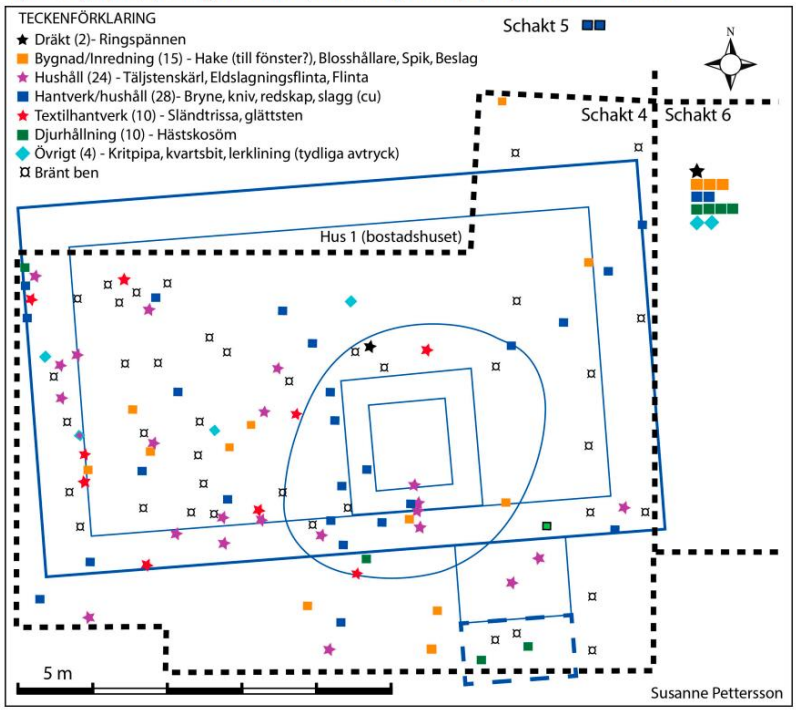


Figure 36: Distribution map over the residential building.

2.3.4 Case-Study three: Summary and Conclusions

The material at Ivarsbråten follows the established idea of flint usage during Middle age being mainly geared toward use as strike-a-lights.

2.4 Case-study four: Birka

Birka was an Iron age trading town on the island of Björkö in lake Mälaren, dated to 750-975 AD and comparable to Kaupang in Norway and Hedeby in Denmark. Birka was strategically placed in the crossroads of several transportation routes running from the inner parts of present-day Sweden towards the Baltics and vice-versa.

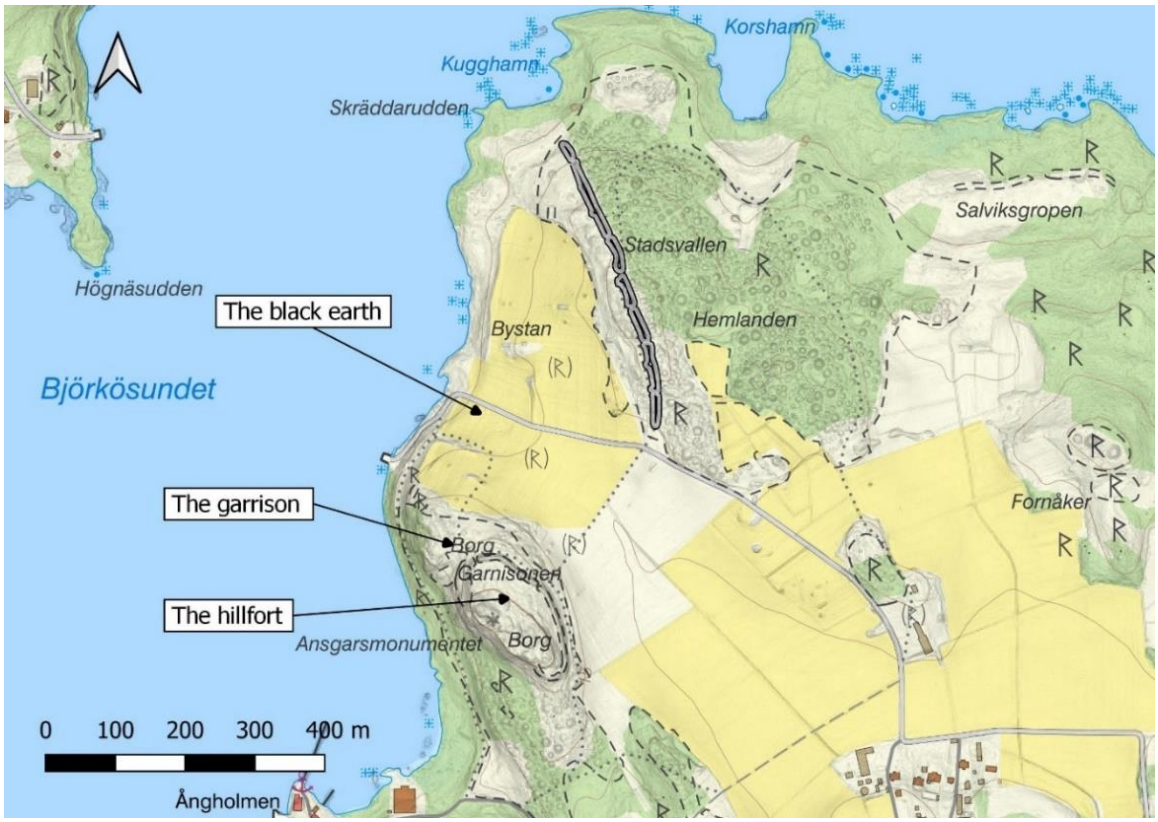


Figure 37: Map of Björkö

The site is divided into several areas. The town area and its harbour, called the Black earth, is surrounded by an earthen bank bordering large grave fields. South of the black earth, on higher grounds, is an area interpreted as a garrison, situated directly below a hillfort (figure 37, Kalmring et al., 2021, p. 7f).

During later years, Birka have repeatedly been the subject of archaeological excavations: The black earth between 1990 to 1995 (Ambrosiani, 2013b, 2021), the black earth harbour between 1970-1971 and 2015-2016 (Ambrosiani & Linder-Welin, 1973; Kalmring et al., 2021), and the garrison between 1997-2004 (Bergström, 2013; Hedenstierna-Jonson et al., 1998). During the excavations, large amounts of chipped stone, primarily flint, were encountered (The garrison, 1134 individual flints, The black earth 8 kg, the harbour 1971 23 kg, the harbour 2015-2016, 472 individual flints).

For this study, flint material from the black earth, the garrison and the black earth harbour (2015-2016) was subjected to a lithics analysis. However, due to the limitations in scope for a master's thesis, only material from the black earth 1990-1995 was included in the final study. However, as the material from the garrison and the black earth harbour has value as a reference material, the scaled depictions of a selection of the flint tools from these sites are accessible in the attachments (Attachment two and three).

2.4.1 The black earth

The excavation of the black earth comprehended an area of about 350 m2 (figure 38). The discovered town layout consisted of a dense urban area with alleyways connecting different parts. The town's plots were stable over Birkas lifespan and contained houses sized about 6x4 meter.

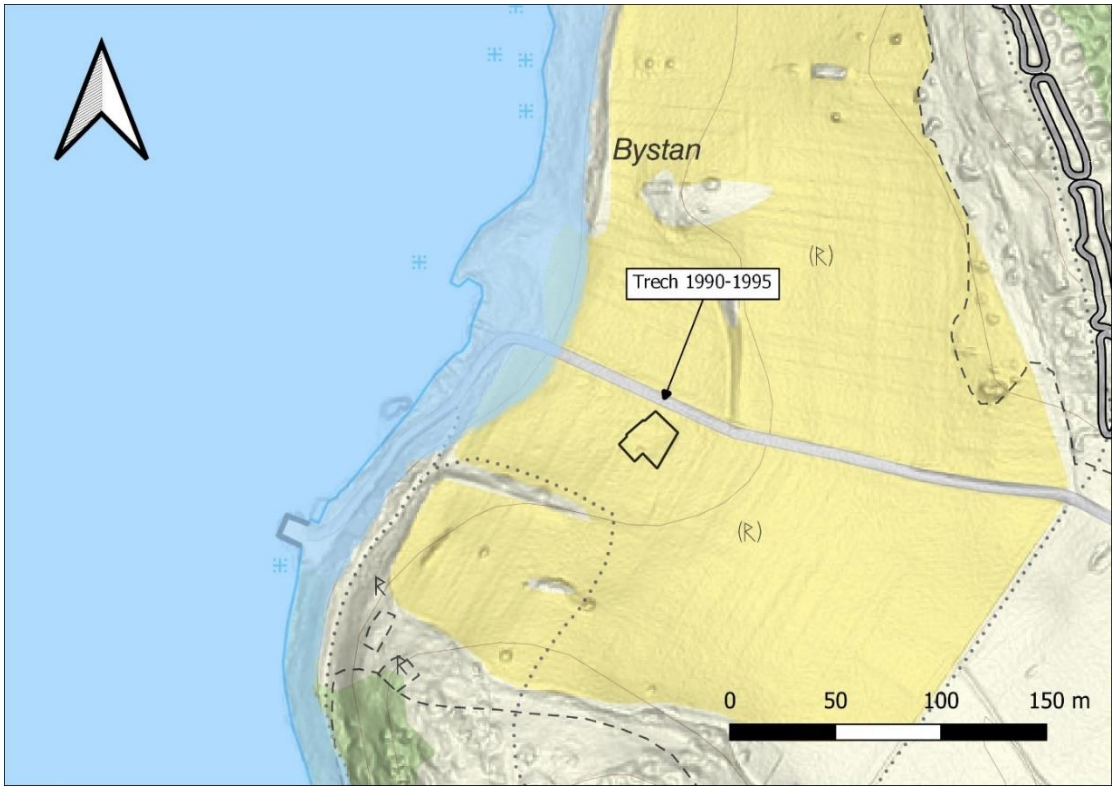


Figure 38: The black earth and the trench from 1990-1995. Viking age shoreline in transparent blue, background map "topografisk webbkarta" and "Terränglutning" ©Lantmäteriet.

The results from the excavation was interpreted into nine phases dated from 790 to 970 AD (table 14, Ambrosiani, 2013, p. 225, 2021, pp. 15f, 130, 324)

Table 14: Phases in Birka

Phase B1	-
Phase B2	790-815 AD
Phase B3	810-820 AD
Phase B4	815-840 AD
Phase B5	835-860 AD
Phase B6	870-900 AD
Phase B7	900-930 AD
Phase B8	920-950 AD
Phase B9	940-950/970 AD
Plough layer	950-970 AD

The flint material from these phases consists of about 4000 individual find posts with a total weight of about 8 kg. The main theory previously expressed is that the flint derives from ballast from visiting ships (Ambrosiani, 2021, p. 305). Due to the size of the material, the flint from one phase was selected: phase B7, containing 273 find posts.

2.4.2 Phase 7B

Phase 7B was built after a series of phases with handicraft related activities, mainly bronze casting. The area was divided in to a northern and southern plot. The southern plot consisted of three buildings in a row, interpreted as booths (table 15). The middle booth had an earthen bench and a hearth and was therefore probably also a residential building. Between the northern and southern plot was an alleyway. The northern plot consisted of one building with unclear purpose. Next to the building was a yard that mainly consisted of a massive waste layer. North of the northern plot was another alleyway (figure 39, Ambrosiani, 2021, p. 35ff).

Table 15: Buildings during phase 7B

Type	position	Heating	Dimensions	Features	Other
Booth	Southern plot	-	3,5x? m	-	-
Booth / Residential	Southern plot	Hearth	5x4 m	Hearth and earth bench	-
Booth	Southern plot	-	5x5 m	-	-
?	Northern plot	-	4,5x? m	-	-

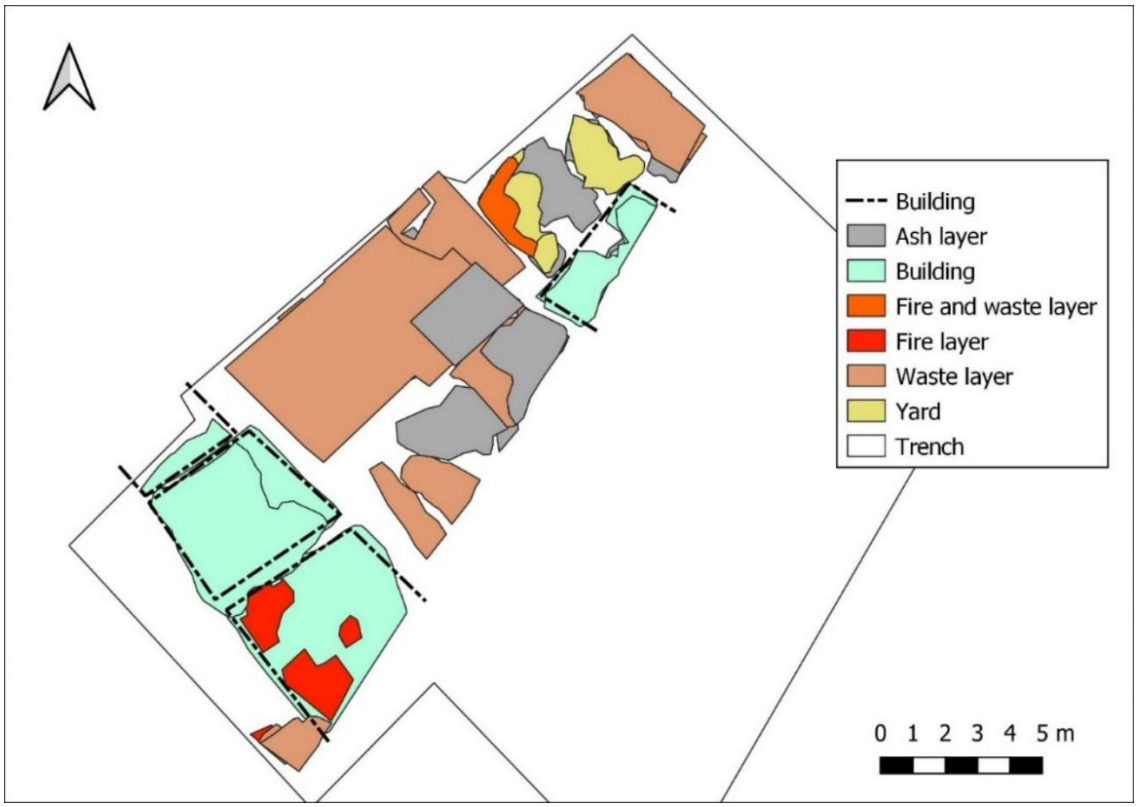


Figure 39: Contexts in phase 7B. The excavation of phase B7 comprehended only the north-western part of the trench due to disturbances of earlier archaeological excavations digitized from illustration from (Ambrosiani, 2021, p. 44ff).

2.4.3 Source critical issues

The source critical situation for Birka is straight forward. Due to the land uplift in Mälardalen, the flint from Birka must belong to Viking age or later activities. As the land uplift is about 51,4 cm per 100 years, and the black earth is about 5-10 meters over sea level, the site was under water before 0 AD (Risberg et al., 2007).

However, there are source critical concerns regarding the theory of that the flint material is related to ballast from visiting ships. Ballast has previously been suggested as source for Stone age contamination. During the 19 and 20th century, several typologically identifiable Stone age artefacts have been found in connection to ports, ranging from the palaeolithic to neolithic, along with coins and bricks with Roman and Medieval origins (Burström, 2017, pp. 27, 43). A similar argument can be made regarding Birka. However, it´s unlikely due to two facts. First, no typologically datable object has been found. Secondly, the large number of flakes, splitters and cores points to that flint napping was performed (see below). Therefore, it's likely that the flint objects found in Birka belongs to the local material culture.

2.5.4 The economy of Birka

The economy of Birka is a complex question. Its position as a trading town means that large amounts of goods was sold and bought, alongside a large number of other economical strains. The trading included wood, iron, bronze, pearls, furs and etc. (Ambrosiani, 2016, 2021, p. 316ff; Larsson, 2012). Further, slaves were bought and sold (Gustafsson, 2009; Raffield, 2019). This is visible in the archaeological material in the form of iron neck shackles, interpreted as meant for humans (Gustafsson, 2009).

Also, the archaeological excavations have shown that a number of handicrafts was performed at Birka. Metal handicrafts was used for creating different types of buckles, wires intended for crafting jewellery and other objects (Larsson, 2012; Wärmländer & Wåhlander, 2012). Another important handicraft seems to be fur production. The fur production is evident mainly in the osteological material. In Birka, about 7.4% of the osteological material consisted of wild animals, of which 90 % was from Squirrel, fox and pine marten, animals known for their qualitative fur. To a lesser degree, are Bear, wolf, lynx, wolverine, badger, hare, seal and goat represented. Of interest is that the preserved bones were of a specific part of the animal as mainly the feet bones were found. The interpretation is that skins of animals arrived to Birka, dried and semi processed, but with the paws and hooves still attached. These was probably imported from the inlands and northern Scandinavia, and the Baltic Sea. The reason why the paws and hooves were still attached might be that they made the stretching and final preparation of the skin and fur easier. The end product was then traded further, together with other goods via the eastern trade roots to the Khazar region, Byzantium and Arabia (Ambrosiani & Ambrosiani, 2005; Wigh, 1998, 2001, p. 120ff).

2.4.5 Finds of chipped stone

The visual analyses resulted in that a total of 823 individual flints was classified, where 59 objects were identified as tools or cores. A selection of these are depicted below.

Cutting tool
Nr:30209
Flint

Cutting tool
Nr:29182
Flint

Cutting tool
Nr:29182
Flint

Point with use-wear
Nr:29626
Flint

Point
Nr:59082
Burnt flint

Atypical scraper
Nr:51480
Flint

3 cm

Figure 40

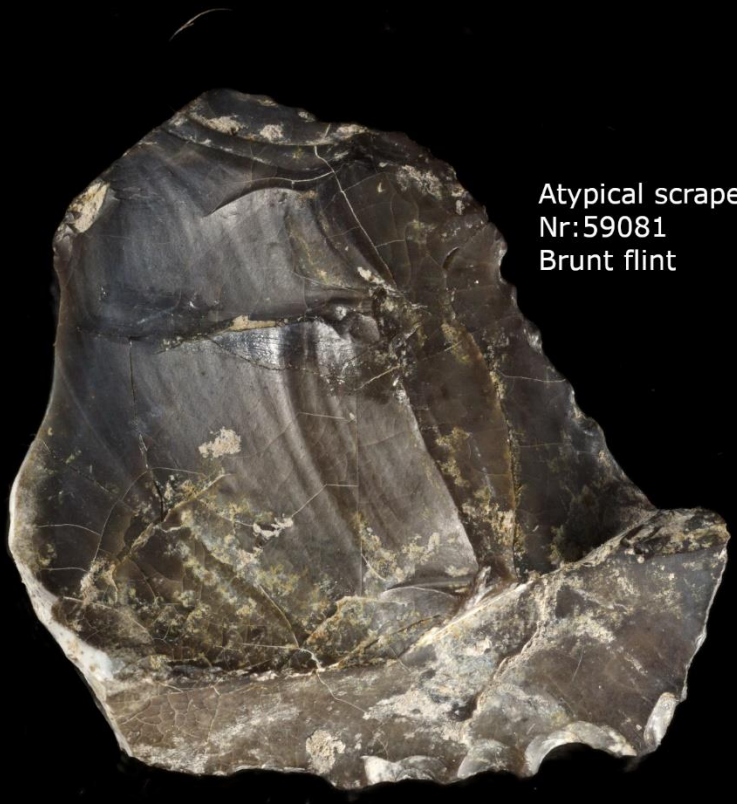
Scale 2:1

Atypical scraper
Nr:29801
Flint

Scraper
Nr:29801
Flint

Scraper
Nr:65077
Flint

Scraper
Nr:30209
Brunt flint



Atypical scraper
Nr:59081
Brunt flint

Atypical Scraper
Nr:74995
Flint

3 cm

Figure 41

Scale 2:1

Scraper
Nr:65199
Flint

Core
Nr:55083
Flint

Core
Nr:55083
Flint

3 cm

Figure 42

Scale 2:1

Strike-a-light
Nr:64739
Flint

Strike-a-light
Nr:73282
Flint

Strike-a-light
Nr:73567
Flint

Strike-a-light
Nr:65447
Flint

Strike-a-light
Nr:29710
Flint

Strike-a-light
Nr:29894
Flint

3 cm

Figure 43

Scale 2:1

Strike-a-light
Nr:29182
Flint

Strike-a-light
Nr:29182
Flint

Strike-a-light
Nr:30209
Flint

Strike-a-light
Nr:55083
Flint

Strike-a-light
Nr:30209
Flint

Strike-a-light
Nr:56190
Flint

Strike-a-light or
atypical scraper
Nr:29182
Flint

3 cm

Figure 44

Scale 2:1

Strike-a-light
Nr:59068
Flint

Flake with use-wear
Nr:59073
Flint

Strike-a-light
Nr 59080
Flint

Flake with use-wear
Nr:65633
Flint

Retouched flake
Nr:29182
Flint

Flake with use-wear
Nr:65295
Flint

3 cm

Figure 45

Scale 2:1

Flake with use-wear
Nr:30000
Flint

Flake with use-wear
Nr:30209
Flint

Retouched flake
Nr:30209
Flint

Retouched flake
Nr:29182
Flint

Retoched flake
Nr:65672
Flint

Raw material
Nr:65295
Flint

3 cm

Figure 46

Scale 2:1

Figure 47: Classification of flint in phase B7

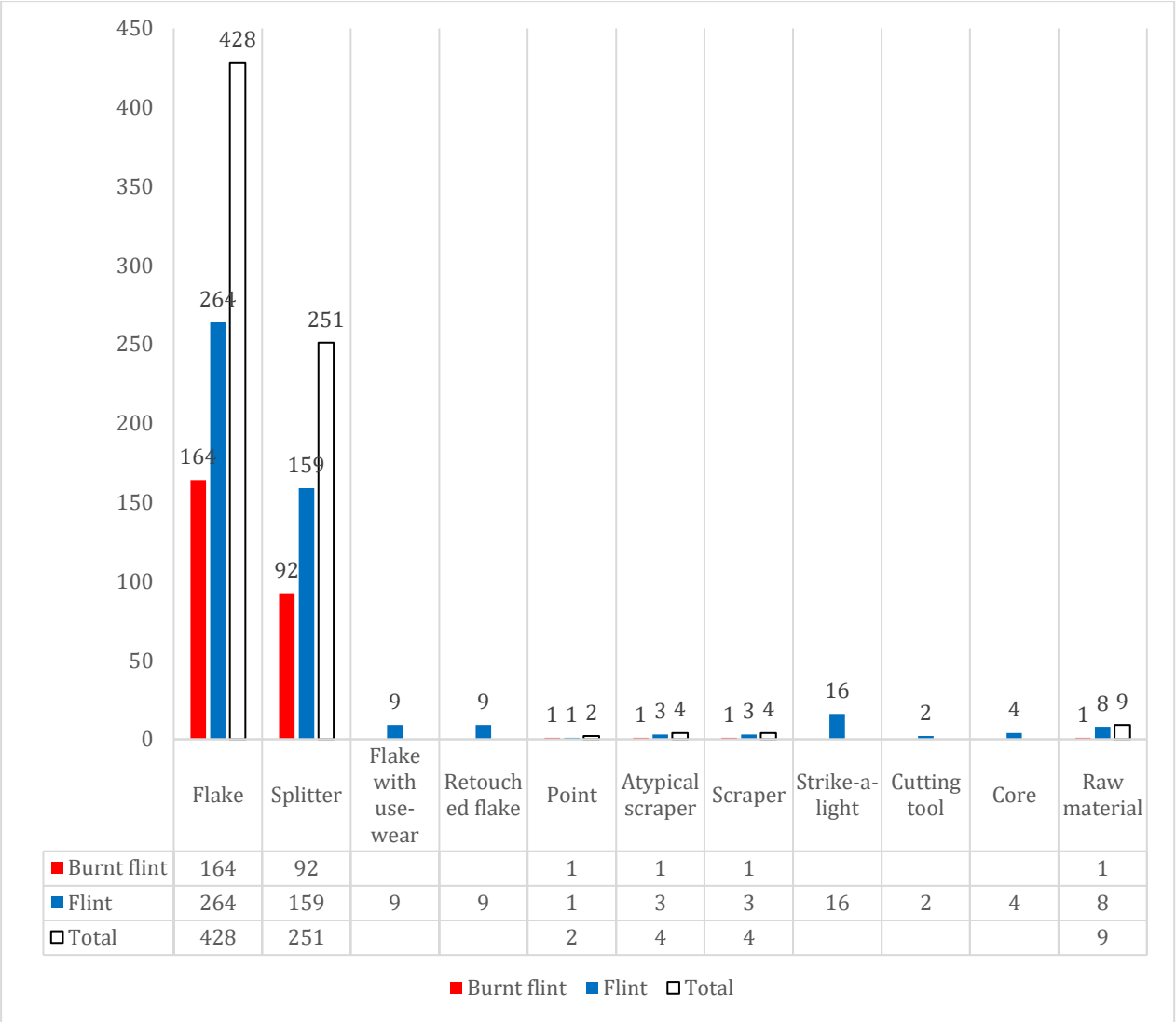


Figure 48: Finds of chipped stone in the black earth phase 7B.

Except strike-a-light flints, scrapers were the most common tool with a secure interpretation (table 47). However, as there where many retouched flakes and flakes with use-wear, more tools meant for both cutting and scraping probably exists in the material. This could further be evaluated with a use-wear analysis. However, as permission to perform this was only obtained for the material from Värmland, this have to be addressed in a future study.

The morphology of the tools seems to be without a clear idea of form outside its practical use except for two scrapers, nr 59081 and 74995, and two cutting tools 29182 (1, 2) that have a similar shape (figure 40, 41).

Also, it's to be noted that the material from Birka contains a very large number of flakes and splitter. Together with the tools and cores, and the findings of four possible hammerstones

(SHM, 2022), these represent a whole assemblage of flint that can only be seen as an example of Iron age flint napping, comparable to the quartz napping at Skramle (figure 49).

Figure 49: Flint assemblage from the black earth, find nr:30000

2.4.6 Chipped stone compared to metals

As the metal finds registered in the Birka online database is comprehensive, consisting of 18824 individual find posts just in iron, it was not possible and meaningful to create complete statistics on the metal finds (SHM, 2022). Instead, selected keywords were search for in the database to create a relevant sample of the metal finds (figure 50).

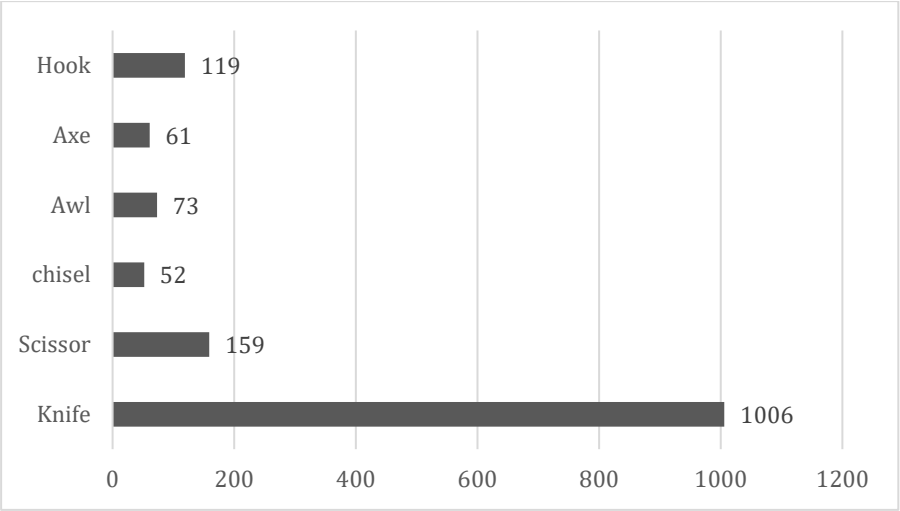


Figure 50: Metal finds from phase 7B.

When comparing the flint material to the metal material found in Birka, it seems that these does not complement each other in the same way as in the other case studies. This is most visible in the fact that several cutting tools were present in the flint material, as the same time as 1006 metal knives were found during the excavations. Also, points and awls seem to overlap as 2 in flint was identified and 73 in iron (It's to be noted that the metal finds are for the whole black earth excavation and not just for phase B7 as the flint material, therefor are the real flint to metal ratios different). However, no iron scrapers were identified, which is surprising considering the fur production. Its therefore possible that flint scrapers were used for this purpose. This will be further addressed in the discussion.

To conclude, the relation between flint and metal at Birka seems to be slightly different then in Värmland, as the use of flint partly overlaps metals, resulting in that flint are used more as an all-around material.

2.4.7 Distribution patterns: relations to structures and features.

The black earth project was one of the first fully digital excavations in Sweden. Therefore, the documentation has the potential of creating detailed distribution maps over different artifacts, including flint, as all layers was divided into sub-units to detect differences in distribution. However, the database where this information is stored was not available at the time of writing. Instead, the maps and the depicted layers in the report was digitalized and paired with a list of flint from the separate digital database over the finds. Through this, a simplified distribution map could be created. However, the map is crude and only depicts flint per context, regardless how large the context is. Therefore, it must be seen as a preliminary study that later can be extended when the full database is available.

Figure 51:Flint tools per context. The square context with most tools is waste layer B745

Figure 52: Flint per context. The square context with most flints is waste layer B745

Two maps were generated, one that shows tools per context, and one that shows flint in general per context. Both maps show the same trend; that both tools and flints are concentrated to one layer (B745, figure 51, 52) .

The layer was interpreted as a waste layer and was situated on the yard in the northern plot. The layer contents were comprehensive. As an example, about 600 kg of bone was recovered, along with thousands of pieces of pottery. Other finds were glass-pearls, hazelnut shells and coprolites. The amount of waste indicates that it does not belong to a single

household. Rather, it seems to be a waste pit for the surrounding area (Ambrosiani, 2021, pp. 37, 53, 160).

The fact that most of the flint was found in waste layers indicates that flint was a throw-away consumable, similar to household ceramics, further supporting that flint was a all-around material. This also points towards that flint was available and cheap material in Birka.

2.4.8 Case-study four: Summary and Conclusions

In Birka, flint seems to have been part of the material culture, as just by investigating a small sample of the black earth excavation, that in itself is a sample of the whole town area, several tools were discovered.

Except strike-a-light flints, the tools primarily consisted of scrapers and secondary of cutting tools and points, but probably there are more of these hidden in the large number of retouched flakes and flakes with use-wear that was found.

The flint scrapers might be connected to the massive fur production in Birka, which also is visible in the osteological material. Its presence can explain why no iron-scrapers have been identified in the find material. The cutting tools, however, seem to overlap its function with metal as a large number of iron knives was found.

The large number of flakes and splitter, together with the hammerstones registered in the database, points towards that flintknapping were a common practice.

2.5 Provenance studies of the flint raw material

The second part of the lithic analysis, that aimed to investigate the geographical source of the flint material from Värmland and Birka gave the following results (note that splitter was not included in the analyses as it would bend the results):

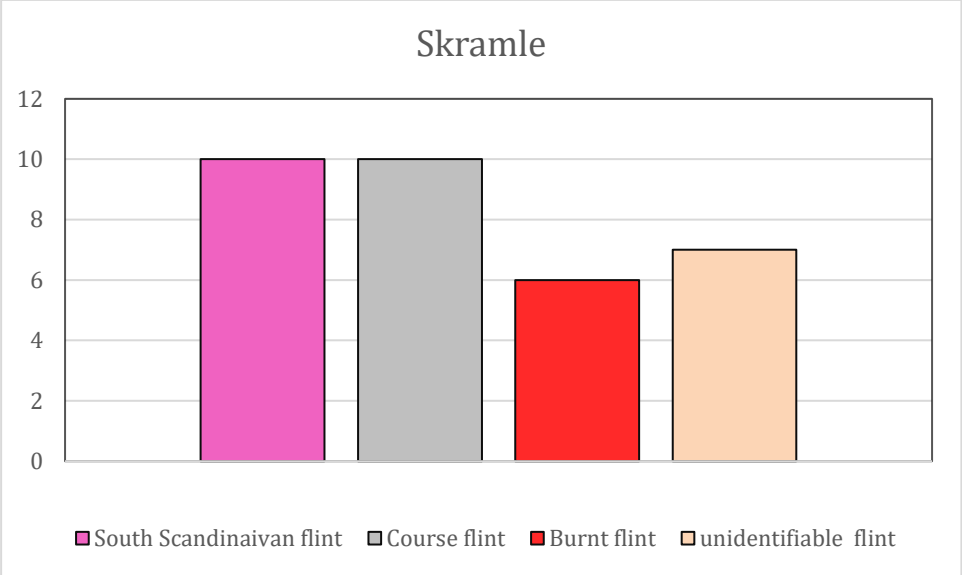


Figure 53: Flint provenance in Skramle.

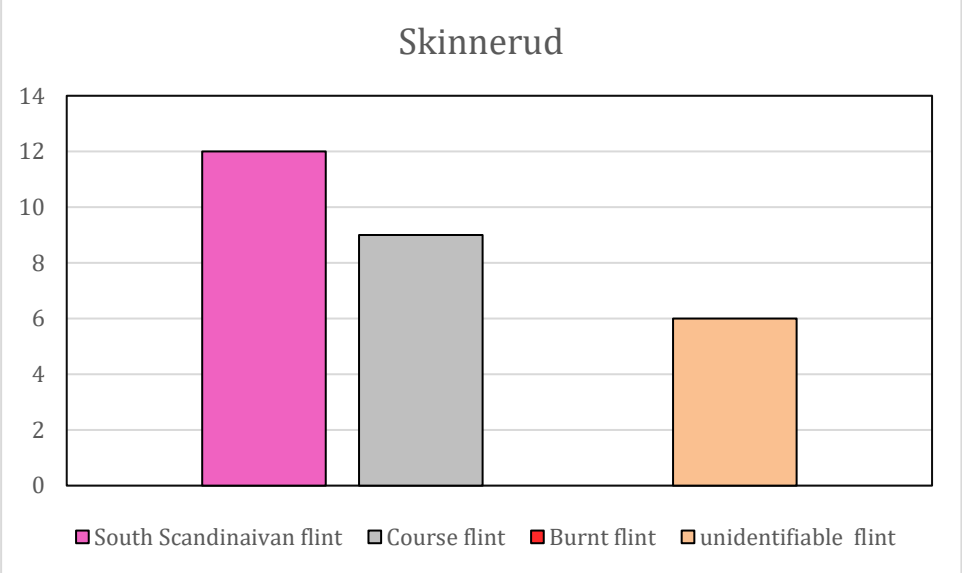


Figure 54: Flint provenance in Skinnerud.

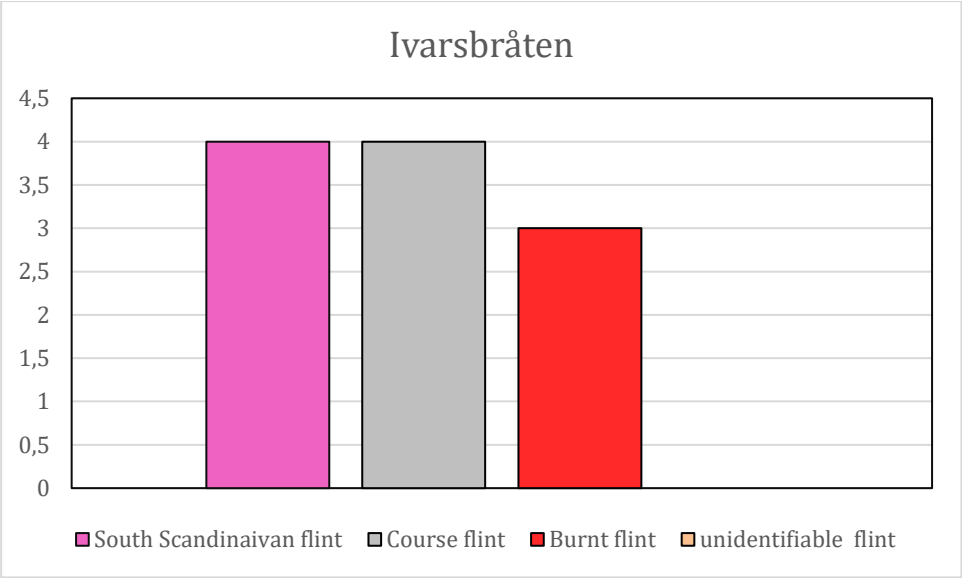


Figure 55: Flint provenance in Skinnerud.

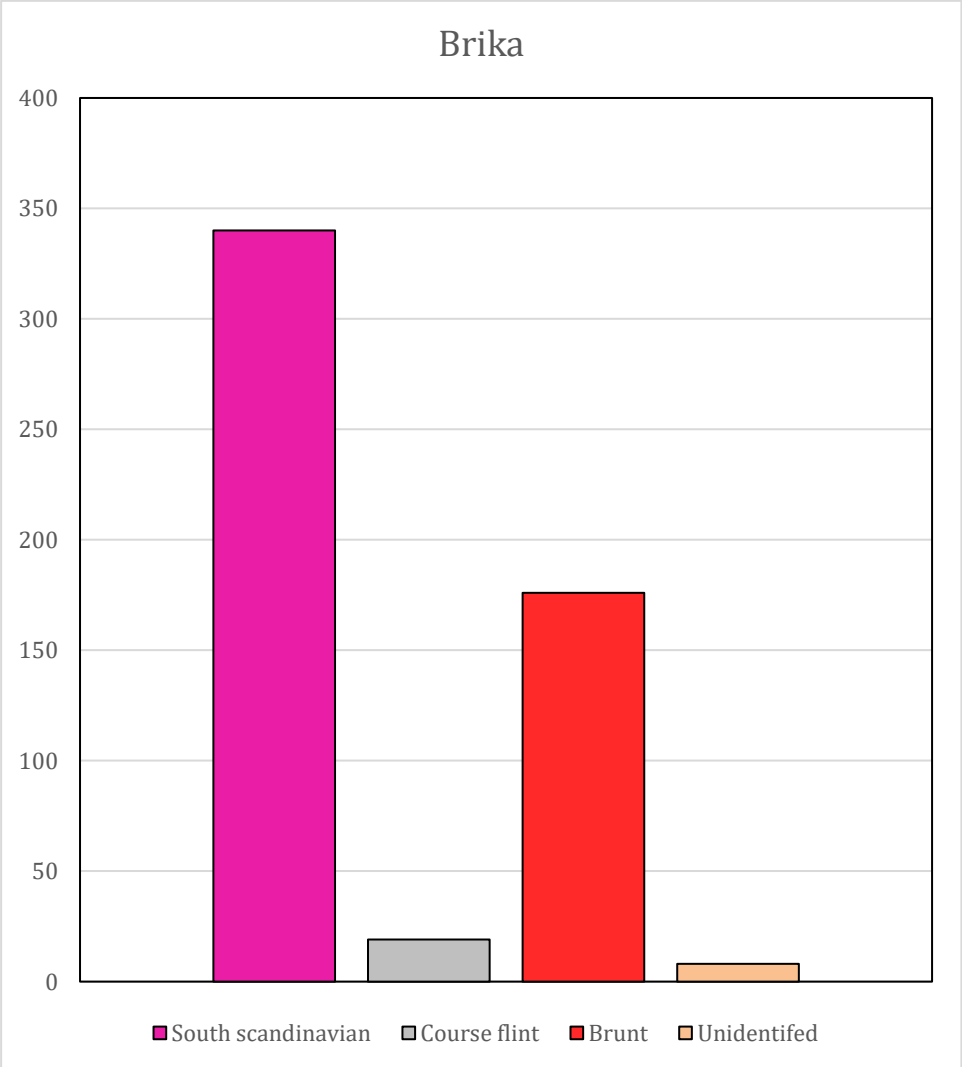


Figure 56: Flint provenance in Birka.

The flint raw material from Värmland displays one clear pattern: that there is about an 55/45 % ratio between south Scandinavian flint, and coarser flint that might originate from more nearby sources, such as the beaches of the west coast (figure, 53, 54, 55).

Regarding Birka, the south Scandinavian flint are totally dominant in all categories (figure 56).

2.6 Results: Case studies from Värmland and Mälardalen

In this study, four case studies have been executed. The combined results from these are concluded below.

The Settlement Skramle in Värmland has a long history from the 6th century all the way until the 16th century. In the Medieval phase three, about 1250-1350 AD, a large number of scrapers was found, primarily in quartz but also in flint. The scrapers, together with smoothing stones, can be connected to skin production (fur and leather). Due to the large number of scrapers its probable that the skin production was substantial. However, the fur bearing animals connected to skin production was not visible in the osteological material. There was also a major soapstone production at the site, that due to its proportion can be interpreted as meant for trading. Therefore, it's probable that also the skin production was partly intended to be traded. In this regard, Skramle can be interpreted as a part agricultural part handicraft settlement. The trading possibilities and income from the handicraft might be the reason why Skramle was a wealthy settlement and could afford brick smoke ovens otherwise found in the trading-towns at the time. Also, chipped stone was only sparsely used during the two preluding Iron age phases. Admit, this could be due to low activity, as the layers from these phases was thin. It's also possible that the Iron age occupation was mainly situated outside the excavated area. Further, the layers might have been damaged by the Medieval activities. However, the most probable explanation is that that chipped stone was not used during this phase to a great extent.

The settlement Skinnerud in Värmland was a single farm active from the 9th to the 13 centuries. As the name suggest, the farms economy incorporated skin-production, visible by hunting pitfalls in the surrounding landscape, and the finds of smoothing stones and skin working tools such as iron skin scrapers and knives. As in Skramle, the fur bearing animals connected to skin production was not visible in the osteological material. The chipped stone was mostly attributed to strike-a-light activities and can be seen fitting well inside the establish interpretation of chipped stone usage during later periods. The material at the settlement Ivarsbråten in Värmland follows the established idea of flint usage during Middle age, being mainly geared toward use as strike-a-lights. The flint raw material in Värmland was in all three sites about 55% / 45% south Scandinavian vs courser flint that probably was procured from more nearby sources such as the west coast.

In Birka, Mälardalen, flint seems to have been part of the material culture, as just by investigating a small sample of the black earth excavation, that in itself is a sample of the whole town area, several tools were discovered. Except strike-a-light flints, the tools primarily consisted of scrapers and secondary of cutting tools and points, but probably there are more of these hidden in the large number of retouched flakes and flakes with use-wear that was found. The flint scrapers might be connected to the massive fur production in Birka, which also is visible in the osteological material. Its presence can explain why no iron-scrapers have been identified in the find material. However, the cutting tools seem to overlap its function with metal in contrast to the sites in Värmland, as a large number of iron knives was found. The large number of flakes and splitter, together with the hammerstones registered in the database, points towards that flintknapping were a common practice in Birka. The flint raw material connected to this knapping could almost exclusively be sourced to southern Scandinavia.

3 Part three: discussion and conclusion

This far in the study, we have looked upon the usage of chipped stone in four case study sites from middle-Sweden, ranging from the Viking age to the Middle age. The results have shown that chipped stone was used to a varying degree, where some site follows the otherwise accepted usage as strike-a-lights, where in others chipped stone was also used as tools. The result will in the following discussion be used to fulfil the main aim of this study: *to critically review the late usage of chipped stone tools, with a geographical focus on middle Sweden,* and answer the four research questions.

1. What functions can be attributed to late chipped stone tools and how is it connected to its context*?*
2. Was late usage of chipped stone connected to local traditions or was it spread over a larger area?
3. How was flint raw material procured?
4. Why is the late use of chipped stone understudied within archaeology?

The following chapter will first discuss differences in function of chipped stone between the studied sites, and how widespread the use of chipped stone was during the studied time period. This first part of the discussion will mainly look upon the material from the perspective of affordance.

The second part will widen the scope and from the perspective of entanglement evaluate how chipped stone related to its surrounding contexts and the mechanics of flint and fur trading. In the last part will the question why late use of chipped stone is under studied be investigated. The combined discussion will then be used to answer the research questions.

3.1 Perspectives on late usage of chipped stone

3.1.1 Birka

The results show that the flint usage in Birka was substantial. The tools point towards that it was used for many tasks, such as scraping, drilling, and cutting. Further, the large amount of flint flakes and splitter together with hammerstones, shows that flint was napped, and tools was created at the site. The usage seems to have parallels to other settlements in its surroundings. As mentioned in the research background, in the nearby contemporary site Helgö, a similar flint use can be observed (Strinnholm, 2008). Also, in Sigtuna, the successor to Birka, large amount of flint has been found, but not analysed (Wikström, 2011, p. 152f).

This point towards that the flint usage in Birka was not a singular occurrence, but part of a larger flint usage in the Iron age early Medieval urban settlements in Mälardalen.

The source of this flint usage can be explained in several ways. As mentioned, the previous theory explains the large amount of flint in Birka as deriving from ship ballast (Ambrosiani, 2021, p. 305). This could offer the following explanation: that when visiting traders loaded their newly bought cargo, they unloaded their flint ballast and deposited it in Birka. This would mean that the material was not transported intentionally, other than in regard to that flint is a dense and heavy rock. From an affordance perspective, this could explain the flint usage in Birka. If large amount of raw material was present, the affordances of chipped stone might be discovered when meeting Birkas inhabitants (as an example, that it can create sharp flakes for cutting, or dull flakes for scraping).

However, when reviewing the material, deriving the flint from ballast, seemed less and less probable, as no proper flint nodules were identified, as one could expect if the flint derived from ballast. Rather, the majority was in the form of flakes and tools.

Further, two flint objects was discovered that might point to another explanation to the flint in Birka. These where two cutting tools, found in the same context (figure 57, find number 29182). The tools seem to be manufactured by using bipolar technique on a smaller flint nodule. By placing the nodule on an anvil, and hitting it with a hammerstone, segmented flakes could be created that are both sharp and easy to handle when cutting. These tools has similarities to Viking age flint material from Särslöv in southern Scania, previously analysed by Bo Knarrström (figure 58, 2001, p. 108ff).

Figure 57: Segmented flint cutting tools from Birka, find number: 29182

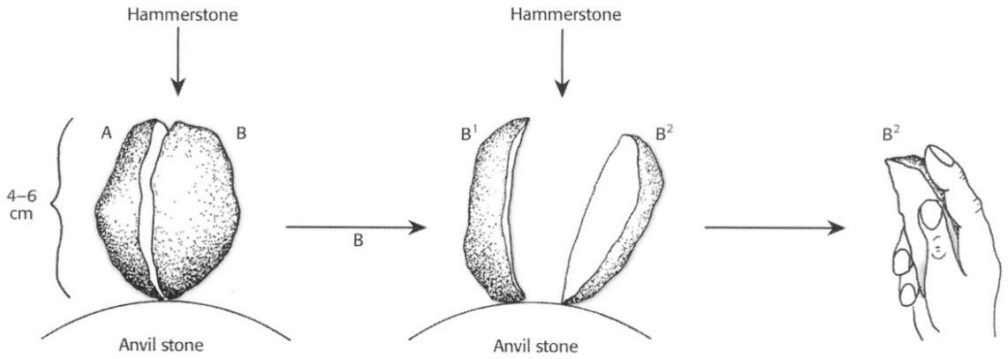


Figure 95. Suggested strategy for the production of segments. The knapping sequence starts with a locally procured moraine nodule. Rested against an anvil stone, the nodule is split in half with a hammerstone. One half (B) goes through the same procedure, and if the process is successful, one or more segments with functional cutting edges are obtained (B2).

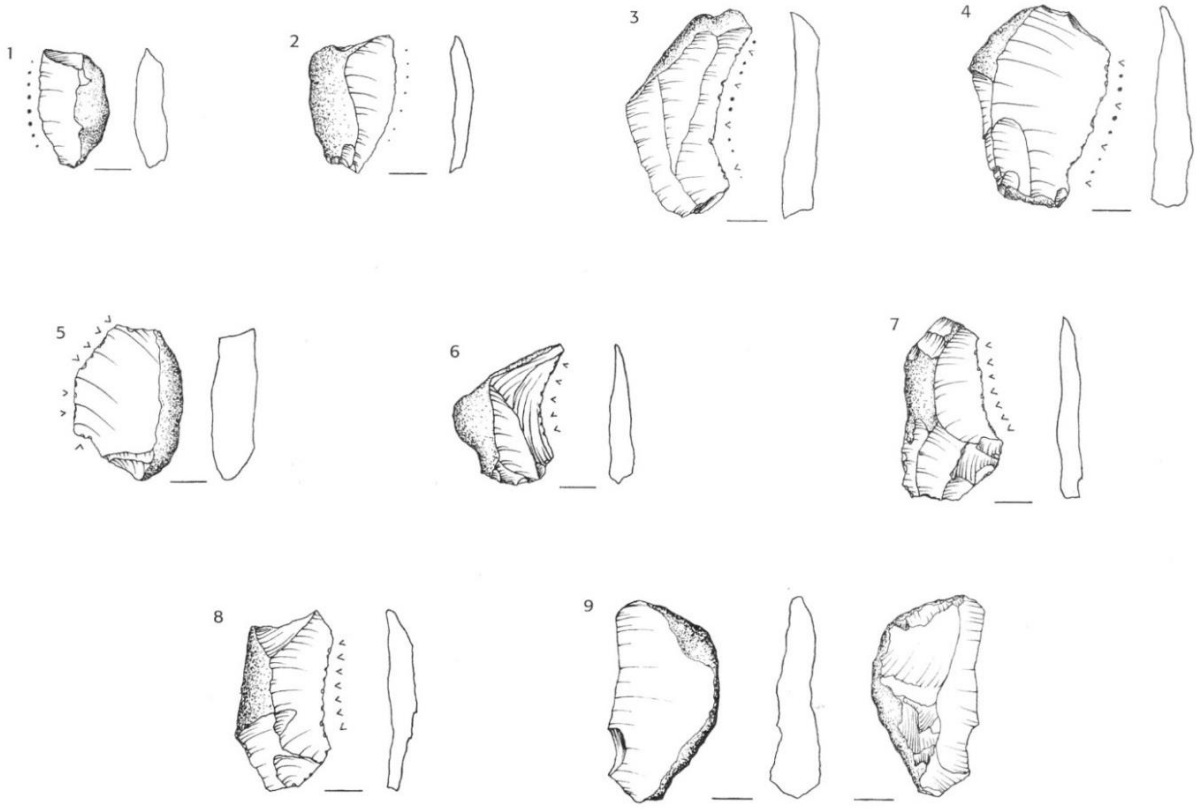


Figure 96. Segment knives from the farmstead in Särslöv. 1–2 Segment knives displaying polish. 3–4 Segment knifes displaying a combination of polish and double-sided micro-retouches. 5–8 Segment knifes displaying double-sided micro-retouches. 9 Probable segment knife without any use wear. Scale 1:2.

Figure 58: Segmented flint cutting tools found in Särslöv, Scania. From Knarrström, 2001, p 108.

As mentioned in the research background, Knarrström detected a higher quality of flint smithing during the Viking age in Scania. This was tangibly connected to the increase of slaves in the Scanian farms at the time. Knarrström argued that the property less slaves might not have had access to the iron objects of their owner, and as the flint was available in the surrounding topsoil, they developed a high level of flint craftmanship (Knarrström, 2001, pp. 116, 150).

Further, other researchers have suggested a connection between an increase of handicraft quality in Scania during the Viking age to early Middle age, and an increase of slaves in the society. In an article from 2006, Mats Roslund explores why the domestic Scanian ceramic tradition was replaced with west-Slavic ceramics (Östersjökeramik), during a short period of time in the late Viking age. Previous theories have referred this to increased trading with the south Baltics and that the west-Slavic ceramics was of a significantly higher quality. However, Roslund highlights that the swich was fast and stylistically homogenic, almost as if a group of people from the south Baltic settled in Scania. Roslund suggests that this is the material traces of slaves from the south Baltic being taken, bought and sold into the Scanian society, and forced to produce high-quality ceramic vessels (2006).

Slave trade have previously been suggested as a vital part of Birkas economy (Gustafsson, 2009; Raffield, 2019). Might the segmented flint cutting tools in Birka be a similar trace of movement of people, possibly slaves, originating from southern Scandinavia?

Further, the provenance study of the flint material from Birka, shows that the large majority of material originates from southern Scandinavia, supporting that there where connections to Mälardalen. However, it must be stressed that only two tools have been found that can be connected to Southern Scandinavia, and that further analysis of the flint material from Birka must be performed to verify this connection. Nonetheless, if correct, one can conclude that flint ballast is not a satisfactory explanation to the large occurrence of flint in Birka. It might reflect the accurate transportation of flint, but not the intention. Rather, it seems that the flint was transported to Birka due to the special properties it provides.

This might be reflected in that in some aeras of craftsmanship the use of flint tools seems to be exclusive in relation to other materials in Birka. As mentioned in the analysis, several possible flint scrapers were identified in the material. These can be set in relation to a corresponding lack of iron scrapers, tools that one would expect regarding the osteological evidence of fur production.

The reasons to this might be several. Iron scrapers might exist in the material but have not been identified, or that the fur production at Birka was specialised in a way that scraping was not needed. However, considering the interpreted large proportion of the fur-production, and the excavations otherwise high-quality methodology and finds processing, it’s not likely that scraping was not required or that iron scrapers have been misidentified in a larger scale. Therefore, its plausible that the flint scrapers were used in the fur production. This would support that the flint was imported due to its properties in first hand as it was

preferred over other materials in some areas. Accordingly, the flint was traded to Birka as part of a package that also included people with flint napping knowhow. However, this also means that the tools from Birka does not seem to originate in the meeting with flints affordances and the inhabitants of Birka. Rather, the flint tools in Birka might be part of practices originating from southern Scandinavia.

These practices can be illustrated by Anders Högbergs study regarding the use of flint during the late Bronze age in southern Scandinavia. As mentioned in the research background, Högberg identified a tradition of "ad hock" household flint tools in the late Bronze age Scanian society. These tools were made with the flint that was available in the topsoil, utilising a simple technology where its shape was controlled by its practical use, and intended for the domestic sphere, containing little ambition for shape and design other then what task the shape afforded (Högberg, 2009, pp. 219–251). Admittedly, the affordance of flint and the meeting with a human agency is one part of this add hock tradition. However, it's unlikely that this usage of flint was driven by affordances. Rather, the driving force behind these tools seem to be part of a practice of using flint for certain tasks, building on the affordances of flint, but also are deeper integrated within the culture (as contrast, on the other end of the spectra is the contemporary usage of large blade flint knives that were made with a high quality of stone smithing, that seem to be driven by the meaning that the social community knowingly imbued it with).

As an analogue to the Bronze age add hock flint tradition, the flint usage in Birka seems to be parts of a practice and tradition of using flint for certain tasks. This tradition originated in the Viking age south Scanian society and probably was a continuation of the late Bronze age add hock flint tradition identified by Högberg).

3.1.2 Värmland

The late usage of chipped stone in Värmland seam to differ widely between sites.

During the Viking age to early Middle age in Skinnerud, and the middle Iron age to Viking age in Skramle, chipped stone seem not to be used to a greater extent, except as for strike-a-lights. However, during the later Medieval phase in Skramle, a change can be observed, and chipped stone started to be used as scrapers and other tools. This was probably connected to skin production at the site. However, in Skinnerud, skin production was also performed, but instead using scrapers in iron.

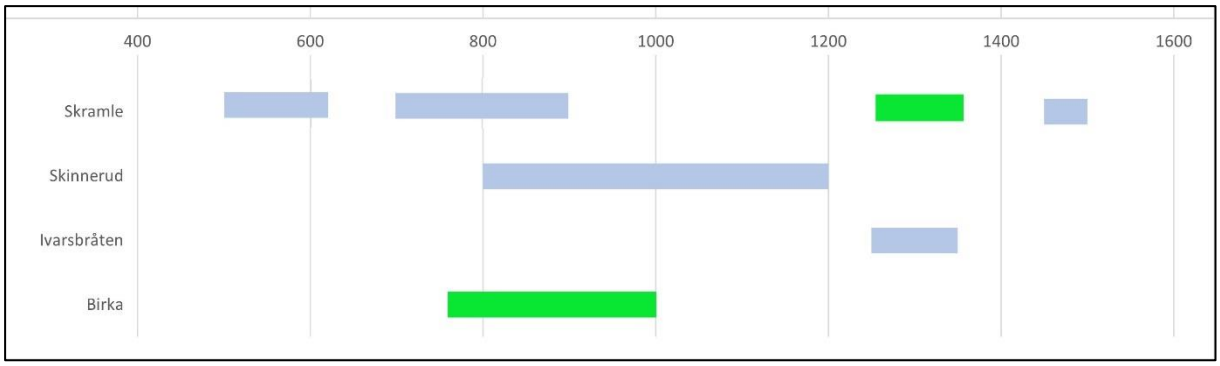


Figure 59: Timeline over the case study sites. Green indicates usage of chipped stone tools (excluding strike-a-lights)

With other words, the result shows that two sites with similar economy have employed two different material strategies. An older site using metal, and a younger site using chipped stone (figure 59). Further, it's to be noted that the structural remains and find material in Skramle points to that it was a wealthy settlement, tendentially due to trading with both furs and soapstone handicrafts. Also, as there were several other types of iron objects, such as iron knives, the choice of using chipped stone scrapers seem not to be due to a lack of metals, pointing towards that it was not a question of economy.

Therefore, the chipped stone usage in Skramle was an active choice, but as its not visible in the preluding Iron age settlement and in the other sites, it was not part of a widespread practice of using chipped stone as in Birka. Rather, it's a local use confined to Skramle and tangibly the local community. Accordingly, its plausible that the inhabitants in Skramle discovered the affordances of chipped stone, and from these created tools. These affordances are suggested to consist of following possibilities and constraints (table 16):

Table 16: Suggested affordances of chipped stone

Possibilities	**Constraints**
Chipped stone is shapable in its raw state (compared to metals) - tools don't need to be made via complex processing.	Chipped stone is limited in the number of shapes and tools it can be formed into.
Chipped stone, in higher degree flint and lesser degree quartz, can be sharp – it can be used for cutting.	Chipped stone easily dulls – if used as cutting tools, it needs to constantly be replaced. Quartz affords less sharpness than flint.
Chipped stone can be dull – it can be used for scraping.	-
Chipped stone can make sparks – it can be used for making fire.	-

Chippable stone is naturally available in the surrounding landscape (flint in southern Scandinavia and quartz in middle and northern Scandinavia) - its easily accessible.	Flint is difficult to procure outside southern Scandinavia.

When meeting the inhabitants of Skramle, the above-mentioned affordances seem to make stone a preferable material compared to iron when used for tasks such as scraping. This could be due to that stone can afford the creation of dull objects but without complex processing, resulting in a tool that was both effective and easy to create.

The reverse relationship seems to be visible in tasks such as cutting. Only one possible chipped stone cutting tool was identified in Skramle, a burnt flint object reused as a strike-a-light (find nr 540, figure 15), compared to nine knives in iron. In this case, the material limitation of that flint easily dulls and needs to be replaced at the same time as it's a imported material, and that quartz has a lesser potential of sharpness, limits what chipped stone can offer the inhabitants in terms of cutting tools. This can be compared to Birka, where the availability of flint material afforded that chipped stone was used for cutting, even if it's meant that it often needed to be replaced.

Via this process, the affordances of chipped stone, met human agencies in Skramle and facilitated the creation of some tools, but limited the creation of others. However, it's important to keep in mind that there is no sharp border between a chipped stone usage driven by affordance, and a usage that is driven by a practice and tradition. A practice-based use of chipped stone is from the beginning based on that flint and quartz offer certain affordances. However, as time passes, the use of these affordances creates a deeper connection to the culture. Accordingly, a practice and tradition of using chipped stone tools are formed (and in some times and places are converted into an agency-based usage, where an imbued meaning are placed upon the objects).

Therefore, the difference between practice and affordance is a gradient where the other flows into the other. These concepts should therefore not be used deterministically (figure 60). However, at the same time, it's important to identify differences within driving forces, as this might affect how the archaeological records is formed (see discussion in chapter 3.3).

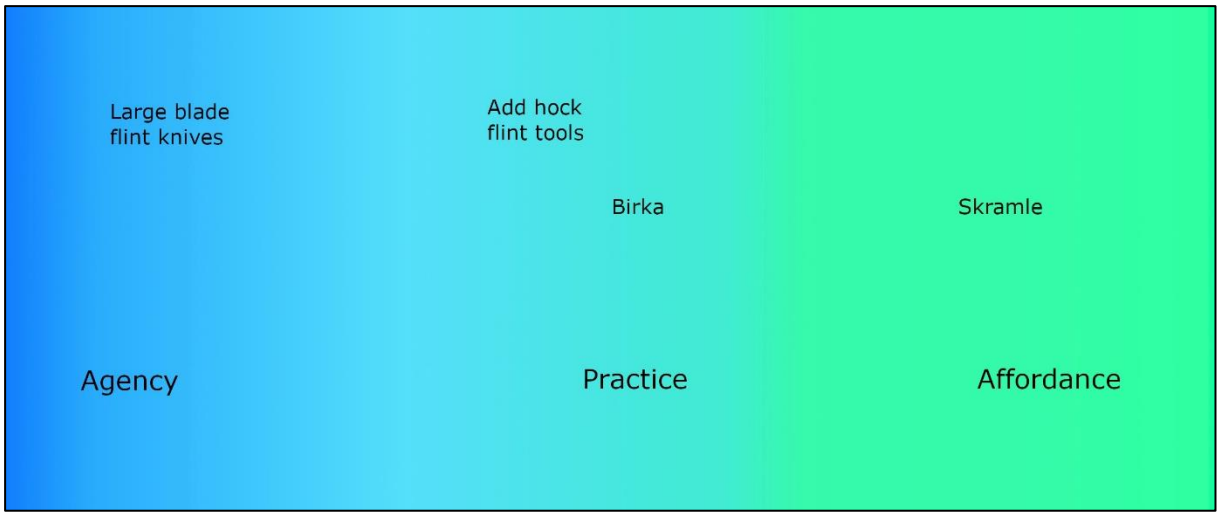


Figure 60: Suggested gradient driving forces behind late usage of chipped stone and the position of material included in this study.

Further, applying the concept of affordance in a deterministic manner on the chipped stone usage in Skramle, would result in an all too simplistic model. If done so, everything can be explained with its affordances, as chipped stone tools can theoretically be reinvented independently just by the existence of flint and quartz. In a matter of fact, it's more than likely that the chipped stone usage in Skramle, even if it is driven by affordances, has been initiated and inspired from other sources and practices. As an example: as the inhabitants in Skramle also performed soapstone handicrafts, they were aware of the plastic abilities of soapstone that facilitated the creation of objects such as vessels and spindle whorls. If stone is used in one way, it's not a large step to use it in another, and through this discover the material possibilities and restraints of chipped stone.

Further, Iron age and Medieval humans were like us, interested in their surroundings. They would inevitably discover stone objects from previous societies, investigating their purpose, resulting in the discovery of the material's potential. The material agency and affordance of a scraper with a Stone age origin could lead to its potential being rediscovered and reused. This reuse of Stone age artefacts during the Iron age is not unknown and have previously been reported in Iron age contexts in for example Blekinge (Persson, 2016). In Skramle, this is supported by the fact that a stone-axe was found and a neolithic blade was reused as a strike-a-light (figure 12). Therefore, the inhabitants could have been introduced to chipped stone via older objects, and then started making their own, but driven by the affordances that chipped stone provides.

Stimulus of using chipped stone as tools might also derive from other regions. As mentioned in the introduction, quartz scrapers have previously been discovered in Iron age and Medieval inland Saami contexts in both Sweden and Norway. These scrapers can as in Skramle be connected to the fur production that was an especially significant economy in the northern parts of Scandinavia. The use of chipped stone at these sites was not due to

lack of iron, as other iron tools was found such as knives (Zachrisson, 1976, 1987). Rather, as in Skramle, chipped stone seem to have been used due to its affordances that facilitated scraping. As Skramle is on the southern border of Sápmi, and that fur production was present in both communities and societies, it's not unthinkable that connection could have transfer knowledge of chipped stone scrapers. However, as this material have not been studied to a greater extent, one cannot conclude that the chipped stone usage in the Saami community are due to a long tradition of using chipped stone, as this usage could as well have its origin in the rediscovery of chipped stone affordances.

Another source that might have provided incentives of using chipped stone tools are urban centres such as Lödöse or Sigtuna. As mentioned, Skramle was interpreted as a wealthy settlement, partly indicated by brick smoke ovens in two of the houses that otherwise are found in Medieval towns. Accordingly, it's likely that connections between these towns and Skramle was in place, where material and know-how of building smoke ovens was transferred. If the chipped stone usage in the Medieval towns of western Sweden and eastern Norway was comparable to Birka (and Sigtuna), it's reasonable to assume that knowledge of chipped stones affordances was transferred to Skramle via these sites.

3.2 Entanglements between flint, fur and urban - rural settlements

So far in the discussion we have looked upon the differences in usages of chipped stone in Värmland and Mälardalen and the forces and motivation that might have driven them. With starting point in this discussion, a pattern can be identified of how urban centres such as Birka in Mälardalen and the rural settlements such as the farms and hamlets in Värmland, were thematically entangled via the trading of fur, flint, and other products. It must be pointed out that it's not likely that Värmland and Mälardalen had a direct contact as Värmland was closer to western Scandinavian urban centres such as Kaupang and Lödöse. However, I argue that the principles of their entanglement might have been the same and can therefore be transferred to other geographical regions. Accordingly, based on the results of this study, these entanglements are suggested to be situated as following:

3.2.1 Rural settlements

In the rural settlements of middle-Sweden, exemplified by Skramle, hunting activities were practiced. This included hunting with bow and arrow as well as traps and pitfalls, visible in both iron arrows in the find material and the archaeological features in the surrounding landscape. According to Medieval laws and tax records, some of the hunted animals belonged to fur-bearing species such as fox, squirrel, and marten (see chapter 2.1.3.2 the economy of Skramle for references). As the animals with the most coveted furs might not been part of the local diet, the meat was probably not recovered. Accordingly, the animals

were skinned in the forest leaving the body behind (Andersson & Svensson, 2002, p. 185). The skins were then treated at the settlements. In Skramle, chipped stone scrapers, primarily in quartz but also in flint, was exclusively used for this purpose. Accordingly, the skin production and the use of stone scrapers motivated mining from quartz-veins in the nearby local landscape. The raw material was then worked into scrapers and other stone tools used to process the skins. The result was a dried semi-finished product. The skins were then traded to the nearby urban centres, possibly together with soapstone handicrafts. In return, the rural inhabitants received goods and knowledge that they otherwise could not acquire. In Skramle, this included flint raw-material and bricks, evident in the find material as flint scrapers, flint strike-a-lights and brick smoke ovens. Further, this trade was probably complemented with knowledge about building said ovens, and tendentially also knowledge about the affordances of chipped stone as there seem to be an extensive usage of flint in urban settlements such as Birka and tendentially Sigtuna, Lödöse and Kaupang. The entanglements of things and human activities in rural settlements in sites such as Skramle are illustrated by figure 61.

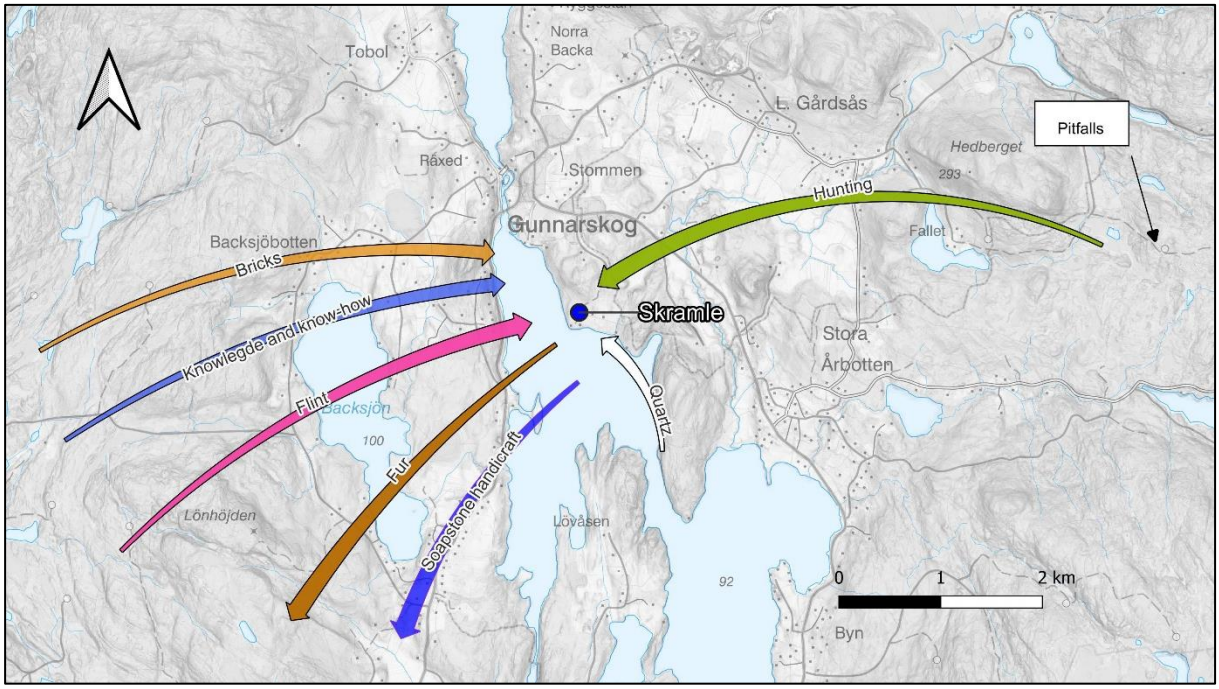


Figure 61: Entanglements of material and activities related to chipped stone usage in Skramle.

3.2.2 Urban settlements

In the urban settlements in middle-Sweden, exemplified by Birka, the dried skins were further refined. As in the rural areas, scrapers were needed for these task, evident in the large amount of flint scrapers in the find material. Due to that the flint raw material almost exclusively originates from southern Scandinavia, the flint was procured as parts of trading

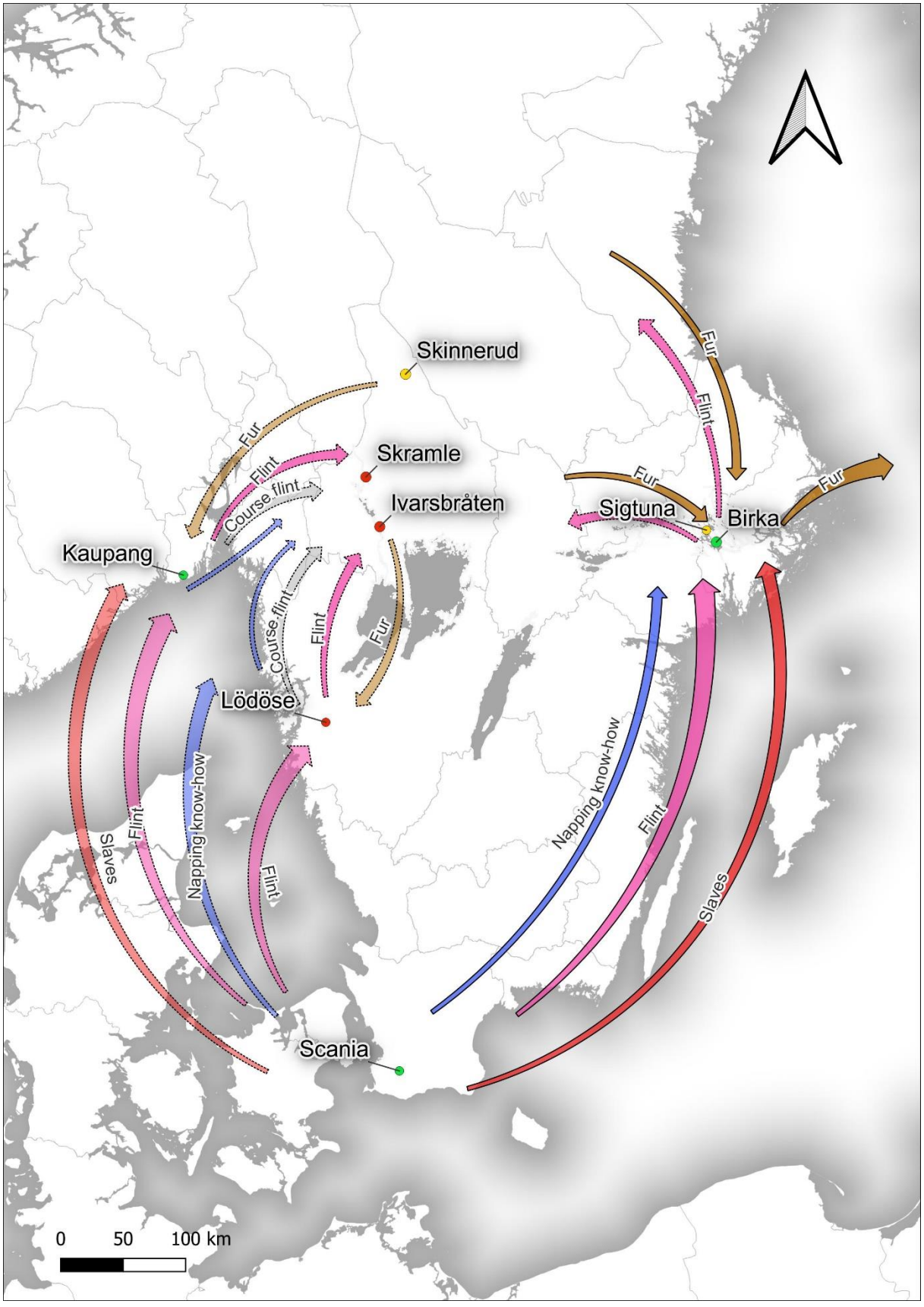


Figure 62: Entanglements of things and human activities in urban settlements in sites such as Birka.

towards the same region. Further, as there are morphological similarities between cutting tools found in Birka and cutting tools found in Scania, it's probable that the flint was accompanied by an import of flint knapping knowledge, possibly via slaves with origin in the south Scandinavian society. The flint was with this knowledge napped into the required tools. These tools were then used to process the skin. The fur was then transformed into garments or similar products that together with things such as pearls and jewellery was traded further outwards. In the reverse, the rural settlements received products and knowledge. The entanglements of things and human activities in urban settlements in sites such as Birka are illustrated by figure 62.

3.2.3 Comparing the suggested entanglements with previous research

To place these suggested entanglements in a context, it's in place to compare them with previous research addressing the topic of trade in middle-Sweden. Previously, trading networks have been targeted in a number of studies of early urban centres in northern Europe. These have traditionally focused on the long-distance trading routes from the urban centres to the outside world (Calmer, 1994; Hodges, 1982). The result from these studies points towards western connections (Bäck, 2007), southern connections (Ambrosiani, 2002a, 2002b) and eastern connections (Ambrosiani & Ambrosiani, 2005; Gustin, 2016).

However, fewer studies have focused on the internal trading relationships between the urban centres and the surrounding rural areas. These studies are of essence, as it's likely that the urban centres were heavily dependent on the rural areas for the supply of the consumables that was needed and other goods such as iron etc. However, the nature of these activities and products probably resulted in a limited footprint in the archaeological material compared to external trade, and are therefore difficult to detect (Kalmring, 2016, p. 16).

In later years, this topic has started to be addressed. Björn Ambrosiani, one of the main scholars on the material from Birka, argues that the rural landscape around Birka acted as a deposit area for the trade and handicrafts that Birka produced. In return, the rural sites supplied Birka with food, fuel, wool, elk-antlers and of interest for this study: fur products (2013a, p. 14). This fur trade is possible to observe in the osteological material from these urban centres. As mentioned, in Birka, paw bones from fur-bearing animals such as squirrel, fox, marten etc. have been found in waste heaps. Similarly, in the Medieval successor to Birka, Sigtuna, fur production was also evident in the medieval layers, as an excavation in the early 90s recorded paw bones from animals such as cat, hare, fox, in layers dated to 985-1230 AD (Hårding, 2011). These bones probably derive from the following process. When the fur-bearing animals where skinned, the paws were left attached to the skin. This might have eased the handling when the skin was processed and dried for transportation. Accordingly,

when they arrived at the urban centres and further processed in to refined products, the paws where cut off and discarded into the waste heaps in Birka and Sigtuna (see Wigh, 1998, 2001 for discussion on skin production).

However, Ambrosiani argues that the fur-trade visible in the osteological material, mainly should be connected to northern Scandinavia. In this area, the Saami communities hunted furbearing animals and produced dried skin and traded these towards the urban centres (2013a, p. 14). However, the result of this study suggests that the fur-trade from the rural areas of middle-Sweden existed and was of some volume. Accordingly, it's in place to ask the question of how the balance between the local and the long-distance fur-trade was situated. To answer this, I would like to introduce another material found in the layers of Viking age and Medieval urban centres: horn deriving from antlers of elk, reindeer, and red deer. The horn was as the fur products, traded towards the urban centres from the outside world, processed and refined into goods that could be sold or traded further. Accordingly, the horn-trade could be relevant to compare to the fur-trade. In Sigtuna, about two thirds of the horn material belongs to elk antlers, probably with a relative local origin, and one third belong to reindeer and red deer, with origin in northern respectively western Europe (Karlsson, 2016, pp. 44, 55ff, 71ff, 117, 120). A similar ratio of elk/reindeer/red deer antlers have been registered in Birka (Karlsson, 2016, p. 130f).

Accordingly, If the assumption that the elk antlers are procured close to Mälardalen, and the reindeer antlers are procured from the more northern parts of Scandinavia are correct, one can conclude the following: that there where a trade of animal products derived from the rural areas of middle-Sweden towards the Urban centres. This trade seems to be larger or at least equal to the trade with reindeer antlers. If correct, its logical to assume that fur-production, especially as it seems to be a lucrative business also was performed in the rural areas of middle-Sweden to a sizeable extent, and that these products were traded towards the urban centres.

As a matter of fact, the presence of paw bones in the Viking-age medieval urban centres, explains the lack of the same in the osteological material from the rural settlements in this study. As the meat from fur-bearing animals was not eaten, the animals were skinned directly in the forests they were hunted in. As mentioned, it's probable that the paws of the animal were left attached to the skin as it eased the handling (Wigh, 1998, p. 88, 2001). Accordingly, the animals did not leave any osteological traces in the rural settlement. The osteological material was instead deposited in the urban centres when the paws were cut off during the final treatment. As a matter of fact, if combined with other signs of skin production such as iron/stone scrapers and smoothing stones, the lack of osteological material from fur-bearing animal in rural settlements can be seen as an indirect sign of fur production.

Further, it's of value to point out that in the same excavation in Sigtuna where paw bones where identified, large amount of flint was discovered (Wikström, 2011, p. 152). As

mentioned earlier, this material has not been analysed. Therefore, it's not possible to conclude if the flint was napped as in Birka and if flint scrapers was used. Nonetheless, it might point to a continuity of entangled practices between the rural and urban centres, that included fur trade, flint trade and flint napping during the Viking and Middle Ages.

3.3 Studying late usage of chipped stone

This far in the discussion we have looked at two case study regions, their differences in flint usage, and how they can be entangled with each other. We now arrive at the question why the late use of chipped stone has previously gone under the radar.

This study suggest that the rural usage of chipped stone is mainly driven by the affordances that quartz and flint provide, aka, controlled what possibilities and limitation the material provide, and that the urban usage of chipped stone mainly are driven by a practice of flint-smithing with an origin in southern Scandinavia.

Accordingly, the reason why chipped stone is understudied might be different depending if it was based on affordance or if it was part of a practice. Therefore, it's important to separate these two in the discussion. As a matter of fact, I argue that late usage of chipped stone might be missed or misinterpreted due to that we try to look at it via an incompatible perspective. To illustrate this, one can take a modern category of object as an example: If one tries to describe a tractor via the lingo used in a sales pitch of a Mercedes seller, the result might provide a false image. Admittedly, they have similarities, as they are both vehicles based on iron, plastic, and rubber. However, the physical appearance of the Mercedes is shaped by the high status its imbued with, while the tractors physical appearance is shaped by what affordances it can provide. Naturally, describing a tractor with Mercedes-lingo results in a defunked image of the real usage and the contemporary perception of the tractor.

Therefore, if starting with the rural usage of chipped stone, driven by affordance, it might be understudied due to that it is looked upon via a perspective that implies its driven by a practice and tradition of using chipped stone, resulting in a similarly distorted image. This has an effect on both an object scale and on a settlement scale.

On the object scale, affordance driven tools might not as easily be identified as it does not conform into categories, as it would if it was part of a practice and tradition of using stone tools, making the lithic analysis an imprecise method.

On a settlement scale, the problem lies within that the affordance based chipped stone usage can differ widely between settlements. As this study shows, in Värmland one site deployed chipped stone tools, the other only using chipped stone as strike-a-lights. Accordingly, affordance driven chipped stone usage can't be generalised over larger areas

and several settlements. As archaeology is largely dependent on seeing patterns and comparing material between sites, affordance driven chipped stone usage that only occurs in case to case, are not detected or misinterpreted.

This results in the circular argument mentioned in the introduction. As only some sites contain chipped stone, this material is not expected. As its not expected, it's not addressed in research questions regarding excavations of Iron age and Medieval settlements, resulting in that the required methodology needed to find chipped stone are not applied, reducing the likelihood that chipped stone is found. Following, if chipped stone is found, as its not expected, its interpreted as strike-a-lights or Stone age residuals.

To counter this issue, when excavating rural Iron age and Medieval settlements where affordance driven chipped stone usage might occur, its recommended to have a readiness to apply the required research questions and methodology needed to detect this material. Further, when late chipped stone tools are found, one need to conduct a lithic analysis that are based on what tasks that these tools can afford (scraping, cutting etc.) rather than strictly using flint sorting nomenclatures. Further, this analysis needs to be in a higher degree confirmed with use-wear analysis to verify the tools functions.

Regarding the chipped stone usage in urban areas, where its use seems to be part of a practice, one can conclude that the required methodology has been applied and the material have been recovered, at least within most research excavations (however, there might be a difference compared to contract archaeology). Therefore, the reason chipped stone has not previously been studied in urban settlements are due to that archaeology has a blind spot, rather than an incompatible theoretical perspective. As argued in the introduction, in archaeology there exist a confirmation bias that creates a tendency to focus on materials and technologies that are seen as "trademarks" for the respective time periods. This results in an unintentional sociocultural evolutionary perspective on material, where objects of chipped stone are seemed as not fitting in to the picture of the Iron age and Medieval society. Also, in Birka, where the find material are extremely rich, the flint material "drowns" in the other objects connected to the Viking age, such as pearl, buckles, arrows, swords, game pieces etc. Therefore, a way to solve the presence of chipped stone without the need to further evaluate the material, is to label it with sweeping designations such as ballast, or it being Stone age residuals. By this, many complex questions and relationships that otherwise needs to be addressed are avoided.

To counter these issues, when excavating Iron age and Medieval urban settlements where chipped stone usage is driven by a practice, I suggest as with the affordance driven usage: to have a readiness to apply the needed research question to study this material. Further, with in contract archaeology, one must also add a readiness to apply the correct methodology. One must also perform the same type of analysis as with affordance-based tools, however with the added possibility that these tools might have parallels in material to other urban centres and to material from southern Scandinavia.

Finally, the result of this study points towards the importance that we see our way of looking on archaeological material not as objective, but part of a history of ideas that affects how we relate to materials and techniques, and that this can create biases and ungrounded assumptions. In this case, an unintentional sociocultural evolutionary perspective imbedded in how we organise and talk about time, affect how we look on certain chemical compositions and on certain technologies. This result in that we project our ideas of primitivity upon them, creating situations where information is lost. Instead, we must recognise that this seemingly mundane material is a possibility to extract valuable knowledge about past societies.

3.4 Conclusions

This study aimed to *critically review the late usage of chipped stone tools, with a geographical focus on middle Sweden.*

To fulfil the aim, four objectives were set out to be met:

- Execute case studies of late chipped stone usage in middle-Scandinavia.
- Evaluate if the late chipped stone usage was connected to local traditions or was widely spread over a larger area.
- Evaluate what tasks chipped stone was assigned to and how chipped stone tools related to its contexts.
- Evaluate the procurement strategies of flint in middle Scandinavia.
- Evaluate why late usage of chipped stone tools is overlooked by archaeology.

The objectives were converted to four research questions that are answered below.

3.4.1 What functions can be attributed to late chipped stone tools and how is it connected to its context*?*

Except for strike-a-lights, scrapers were the most common chipped stone tool in Iron age and Medieval contexts. These were probably used as the affordances of chipped stone made them equal or superior to metal scrapers. In the medieval farm Skramle in Värmland, the scrapers are connected to fur and leather production that in turn are entangled in activities such as hunting. The skins were worked into a prefabricated product that was exported to medieval trading towns similar in function as iron age Birka. In Birka skin were processed into fur products, probably with the use of flint scrapers. The fur products were then exported to other regions. In Birka, chipped stone was also used as cutting tools. However, this was less common in Värmland. This might reflect that chipped stone used for cutting easily dulls and needs to be replaced, pointing towards that chipped stone material was in a higher degree available in Birka and could therefore be handled as a single use material.

Further, chipped stone was used as points in both Värmland and Birka but seem to share this function with points in metal.

3.4.2 Was late use of chipped stone connected to local traditions or was it spread over a larger area?

In Värmland, the chipped stone usage was confined to one Medieval settlement, Skramle, that used flint and quartz scrapers. As there are other settlements in the area that also produced fur, but instead used iron scrapers and are of an older date, chipped stone was probably not part of a general material culture in the area.

However, In Birka, the usage of chipped stone seems to be part of a larger tradition within the Iron age and possibly Medieval trading towns and centres in Mälardalen. Also, there are material from Birka that might reflect common ideas of design, as two cutting tools have similarities to contemporary flint tools from southern Scandinavia. This could point towards a transfer of flintknapping knowledge from southern Scandinavia to Mälardalen, tangibly via the slave trade. It's unclear if this stone using culture can be extrapolated to other contemporary Iron age and Medieval towns in Scandinavia. However, as large amount of flint has been found at these settlements, it's possible that a material culture of using flint existed in Scandinavian urban centres.

3.4.3 How was flint raw material procured?

The flint found in Birka, seem to a large degree have its origin in Southern Scandinavia. However, the previously suggested theory of the flint deriving from ship ballast is not satisfactory. It might reflect how flint was transported to Birka, but as few flint nodules was found, and most of the flint was napped, its questionable if it reflects the intention. Rather, the main reason to why flint was transported to Birka, are suggested to be used with in specific tasks, and to be traded further inlands.

In Värmland, the flint material seems to be about 55% of south Scandinavian origin and 45% of a courser flint, possibly originating from the Swedish and Norwegian west coast. This could point towards two possible explanations. The two types of flint can be derived from two separate trade networks, one regional, focusing on coarser beach flint and one inter-regional, focusing on finer south Scandinavian flint. It's also possible that all flint derives from the nearby Iron age and Medieval trading towns such as Kaupang and Lödöse in exchange for products such as fur.

3.4.4 Why is the late use of chipped stone understudied within archaeology

This question has two intertwined answers. In Värmland and possibly other rural areas, the following reason are suggested: If chipped stone usage were mainly controlled by the materials affordances, its use might be sporadic, where one settlement or a smaller area used chipped stone tools, but other sites with similar date and economy did not. Therefore, this type of usage of chipped stone can't be generalised over larger areas. As archaeology tends to generalize material culture and through this look after patterns of societal changes, an affordance driven use of chipped stone might not be detected as required excavation methodologies are not applied. Accordingly, the main reason why chipped stone are understudied within rural contexts are that we look at its distribution from a generalised rather than a particular perspective.

Regarding the urban sites in Mälardalen, the result points to the opposite. The material analysed in this study suggests that there existed a general flint-using practice in middle Scandinavia's urban centres (as well as in southern Scandinavia). Further, as chipped stone has been retrieved in several excavations, the reason why it's not detected is not due to excavation methodologies. Rather, the problem seems to be situated later in the process when the material is analysed: as chipped stone tools are not expected to be a part of Iron and Middle age urban material culture, the material are not analysed but explained with sweeping explanations such as ship ballast, strike-a-light stones, or if the site was not under the sea level during the stone age, as stone age residuals. Accordingly, the reason why chipped stone tools are understudied in Urban sites is a predetermined notion that it does not belong in these contexts.

Mutually for both rural and urban Iron age and Medieval contexts are that archaeology are stuck in a circle of confirmation biases regarding chipped stone:

> As chipped stone is not expected, the adequate methodologies are not applied and the material is not retrieved. As its not retrieved, the knowledge potential of chipped stone is not explored but explained with sweeping classifications. As its not explored, the material is not expected.

The foundation for this circle of confirmation biases is the argument made in the introduction. That archaeology still employs a sociocultural evolutionist perspective on chipped stone: that is a material that without critical review are associated with the stone age.

3.5 Research outlook

The material from Birka has potential for further studies. The Results from an extended study of flint material from all the phases in the black earth, could be compared with an analysis of the flint material in Sigtuna. Also, as Stockholm were the successor to Sigtuna,

there is a possibility that worked flint might be present in the Medieval layers in Helgeandsholmen or the ongoing excavations in Slussen. Similar studies could be made regarding the material from both Lödöse and Kaupang. The combined result could be compared with the Viking age material from Scania and used to evaluate the flint usage in Viking age – Medieval Scandinavian urban settlements.

Further, a provenance study incorporating XRF-analysis of flint from a selection of rural settlements in middle and northern Scandinavia, could further shed light on the Iron age Medieval flint trade. If compared with an XRF-analysis of material from the urban centres, detailed outlines could be drawn of the trading patterns to and from the urban and rural areas in Viking age and Medieval Scandinavia. As an example, if the ca 55/45% ratio of south Scandinavian vs course beach flint in Värmland is reflected in the material from the nearby urban centres, this could point towards a connection between these areas.

Lastly, as Iron age and medieval chipped stone tools is difficult to classify via typologies, its suggested that a new protocol for analysing these tools are developed. This protocol should focus on identifying the inherent affordances (cutting, scraping, drilling etc.) of each individual tool via a detailed ocular attribute analysis of retouches. The result should then to a high degree be verified via microscopic use-wear analysis and lipid analysis.

Figures

Tables

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Attachment one: Use-wear analysis

Reference material

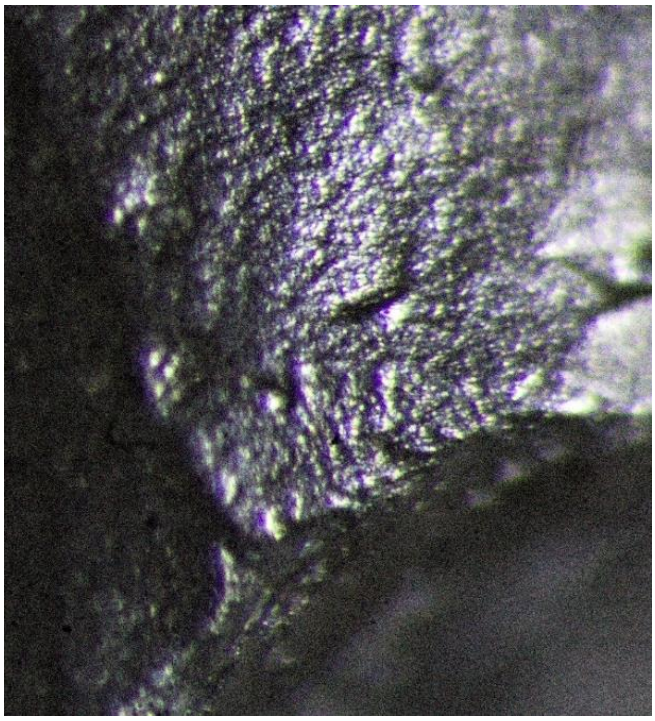

Figure 63: Use-wear from 10 min of scraping dry hide (63X)

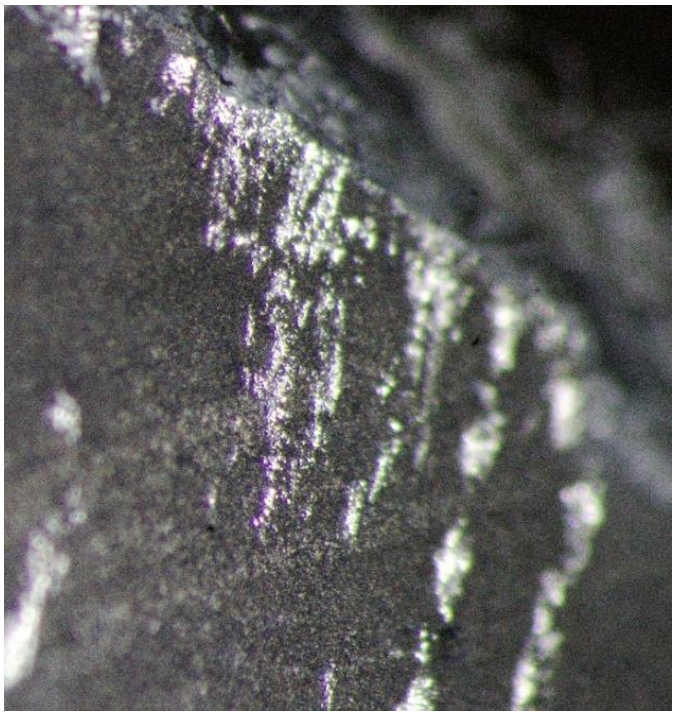

Figure 64:metal residue from a strike-a-light steel (63X)

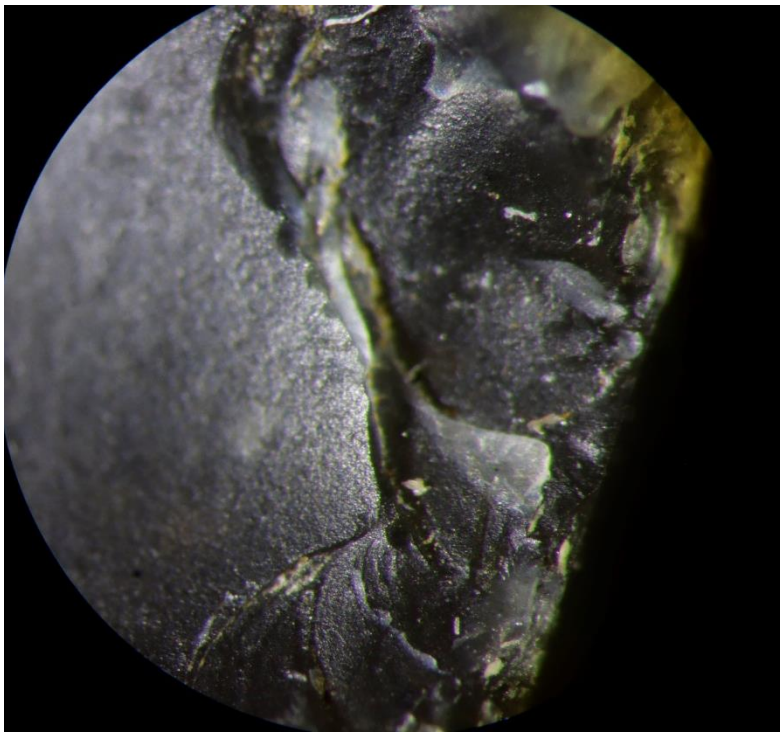

Figure 65: Micro retouches from 10 min of scraping wood (63x)

Figure 66: Use-wear from a strike-a-light (100x) (Knarrström 2000, p.110).

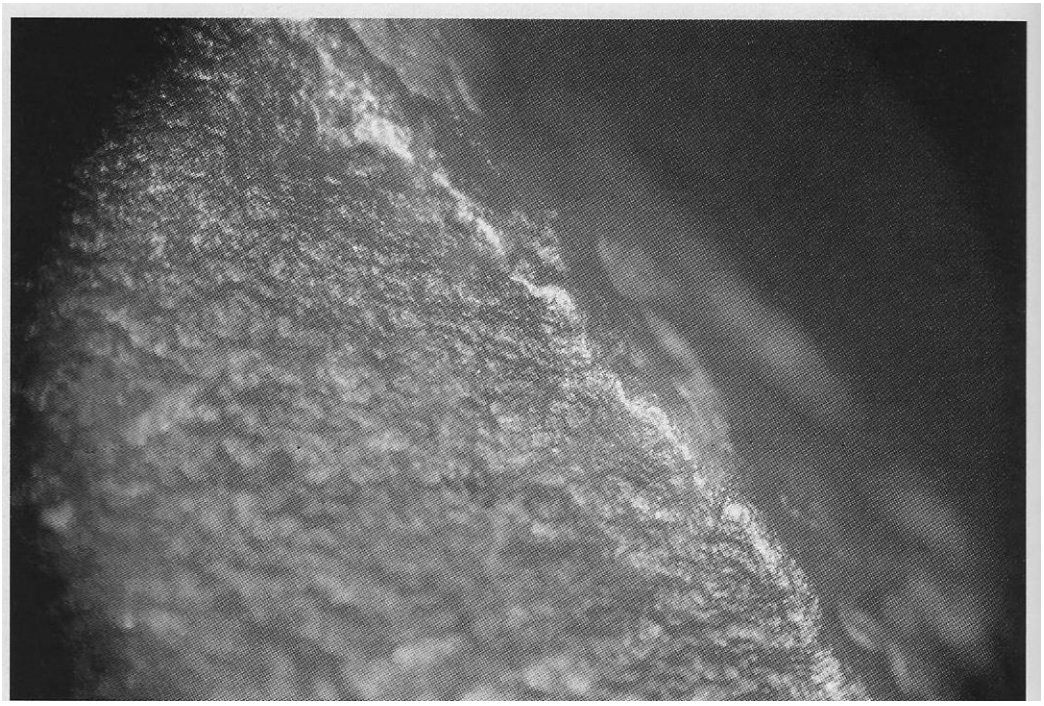

Figure 67: Use-wear from dry hide (100X) (Knarrström 2000, p. 142)

Figure 68: Use-wear from strike-a-light (100x) (Knarrström, 2000 p. 142)

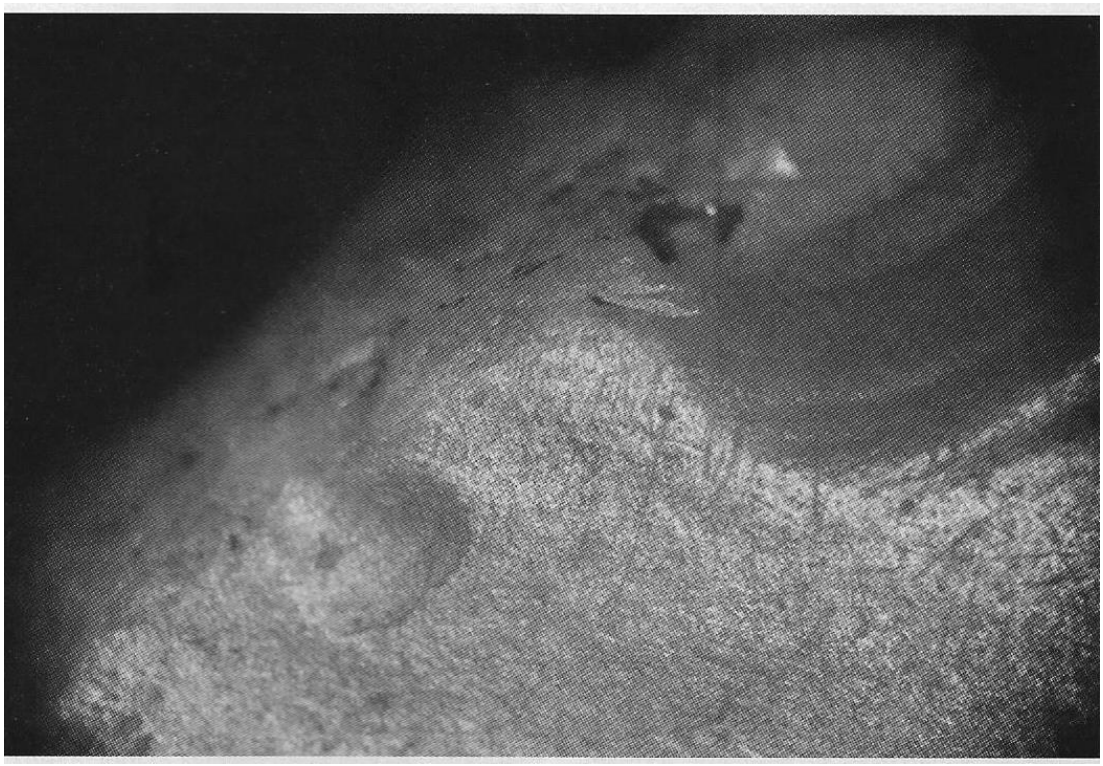

Figure 69: Use-wear from strike-a-light (100x) (Knarrström 2000 p. 143)

Skramle: Flint scraper, nr 39

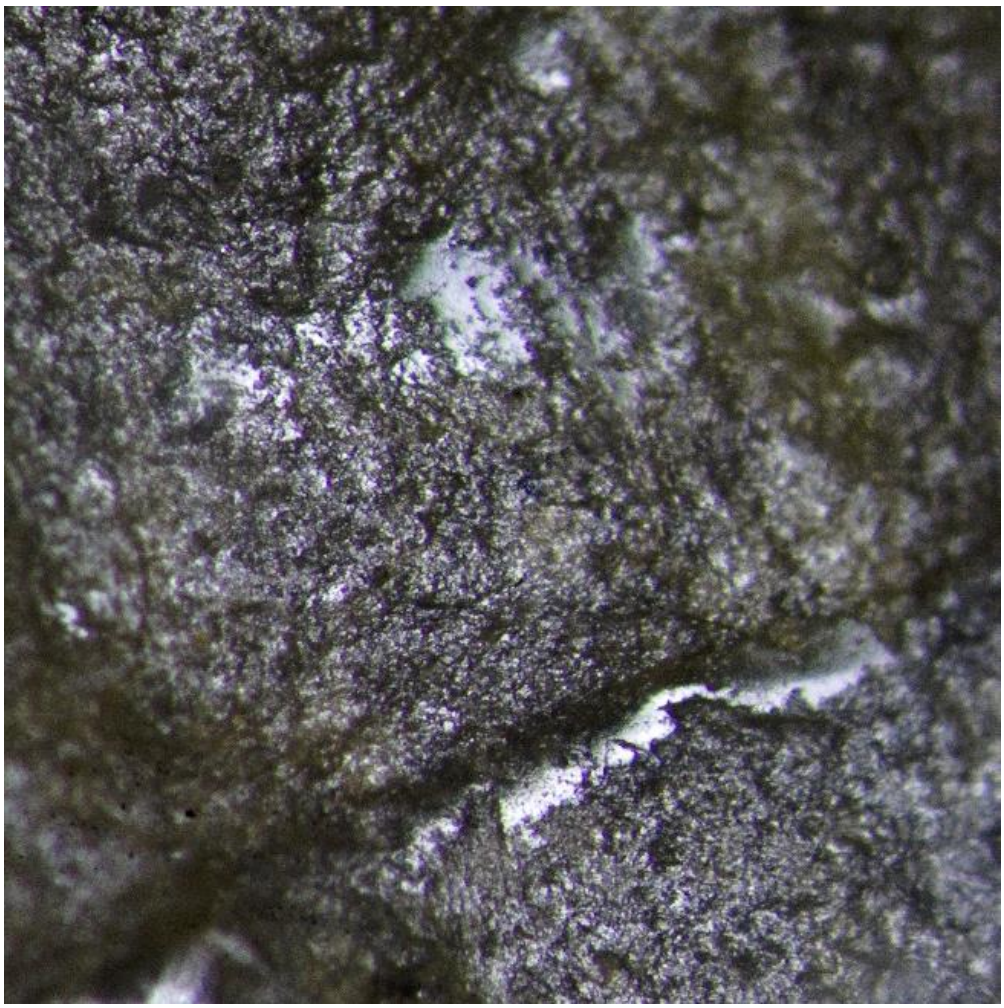

Figure 70: Use-wear on flint scraper nr 39 from Skramle (63x).

The preliminary analysis points toward it were used on a softer organic material. Similar to figure 67.

Skramle: flint scrapers, nr 219

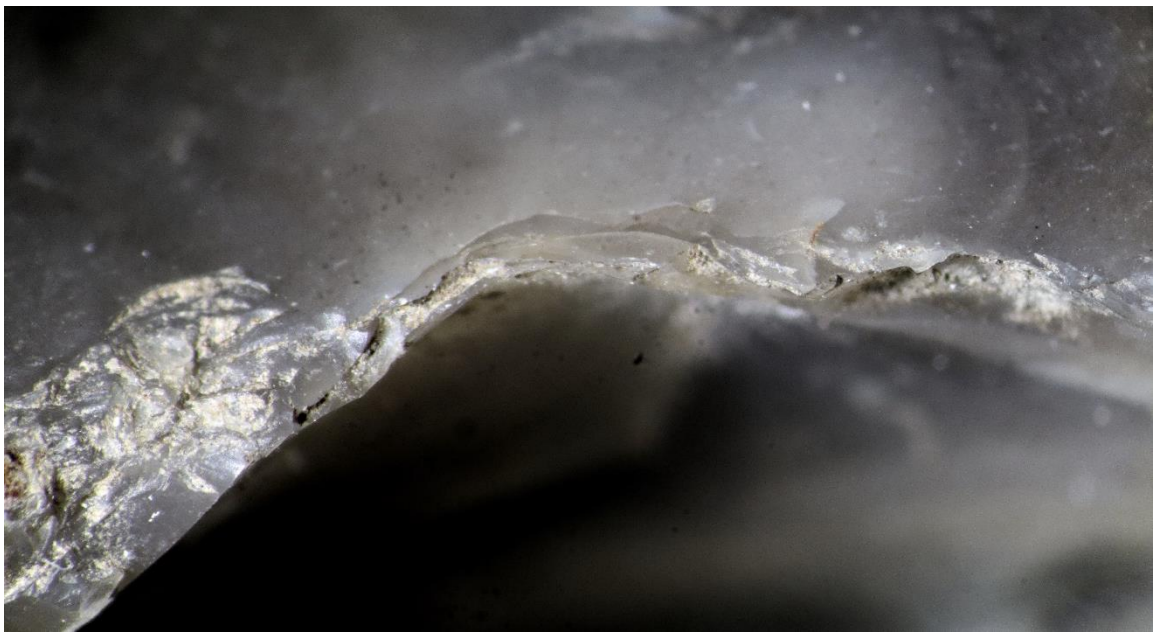

Figure 71: Micro retouches on flint scrapers nr 219 from Skramle (63x).

The small micro retouches, and the hollow edge point toward it been used on hard organic material similar to figure 65.

Skramle: flint scraper, nr 226

Figure 72: Possible traces of lipids on flint scrapers nr 226 from Skramle (35x).

Not analysed as there might be traces of lipids and the object was too small for cleaning a restricted area.

Skramle: flint scraper, nr 601

Figure 73: Use-wear on flint scraper nr 601 from Skramle (63x).

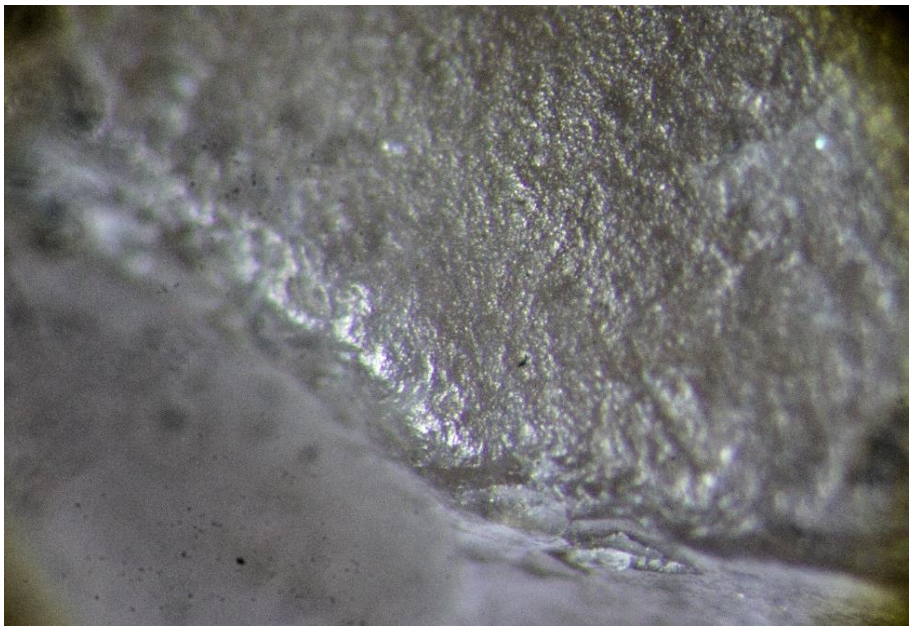

Figure 74: Use-wear on flint scraper nr 601 from Skramle (63x).

The preliminary analysis points toward it were used on a softer organic material. Similar to figure 63 and 67.

Skramle: flint scraper, nr 634

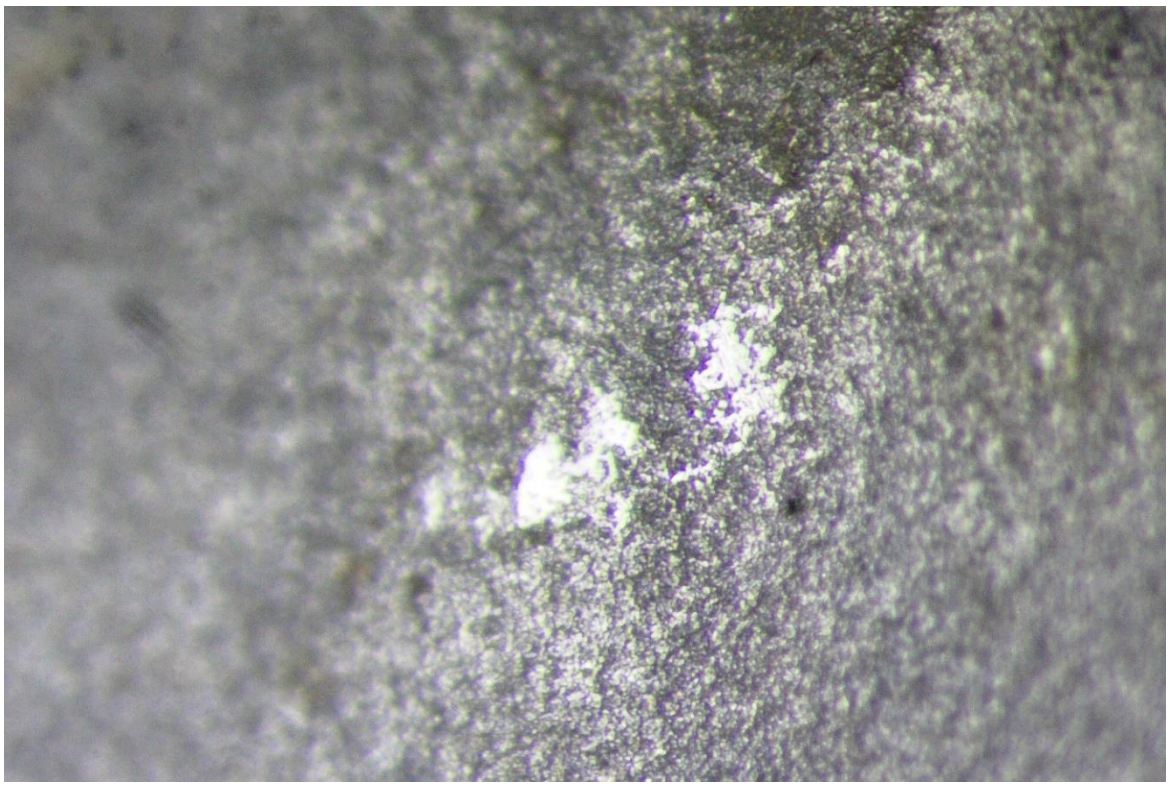

Figure 75: Polishes on flint scraper nr 634 from Skramle, interpreted as derived from post-depositional processes (63x).

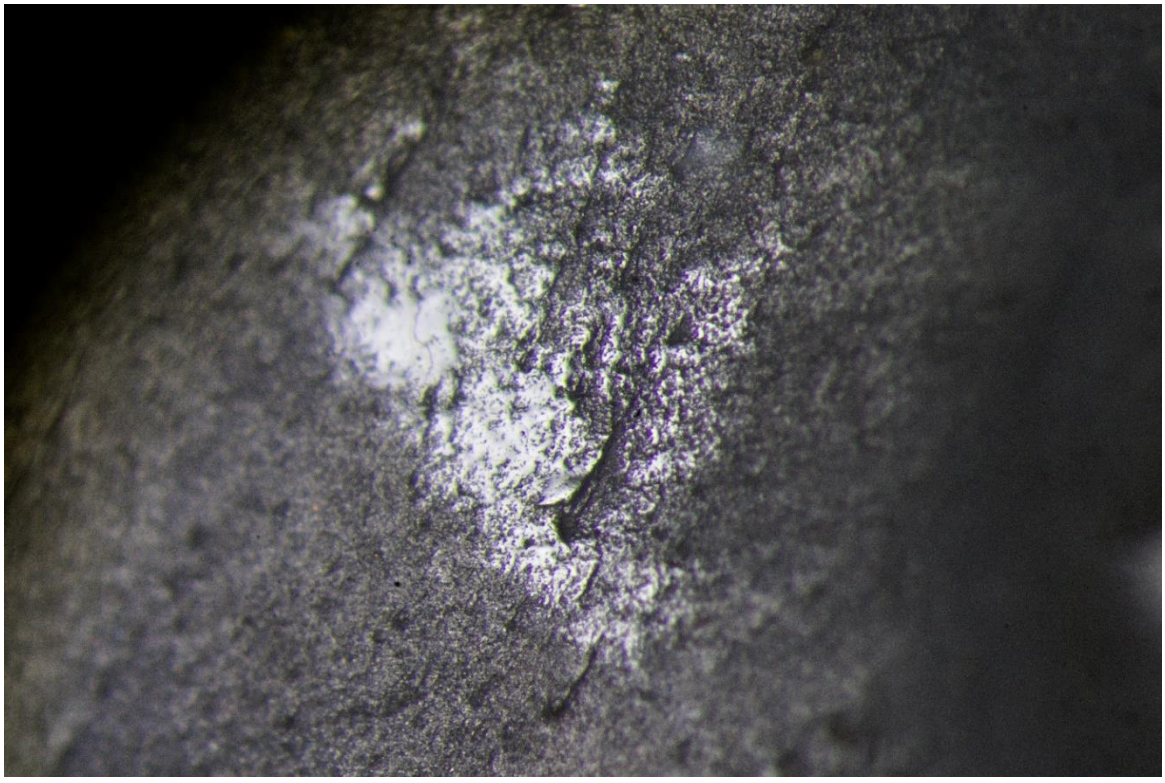

Figure 76: Polishes on flint scraper nr 634 from Skramle, interpreted as derived from post-depositional processes (63x).

Figure 77: Retouches on flint scrapers nr 634 from Skramle (63X).

Polishes was detected on both sides of the scrapers. However, one of the polishes was placed to it could not derive from scraping. Therefore, these might be due to post-depositional processes. The hollow edges similarity to nr 39 points towards a similar use. The edge is retouched, However, lacking micro-retouches. Therefore, its interpreted as unused.

Skinnerud: Strike-a-light, nr 214

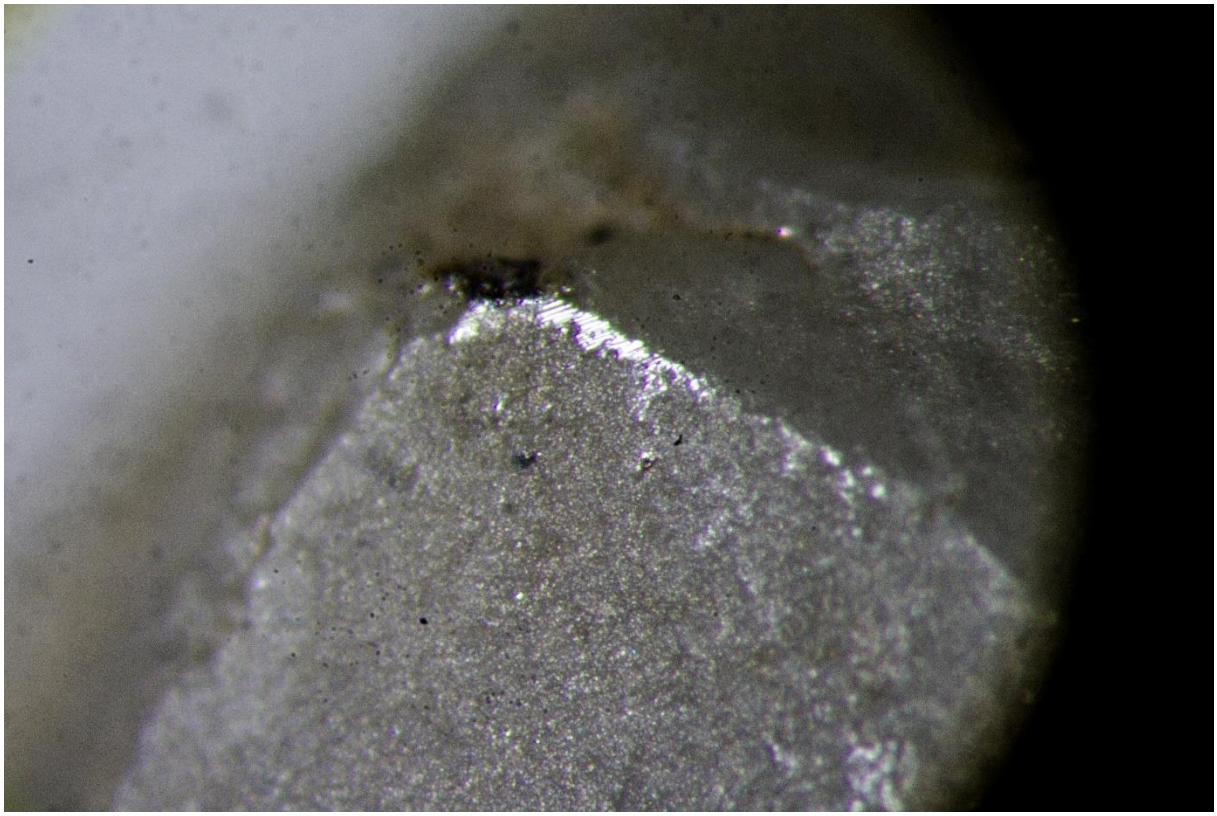

Figure 78: Use-wear on strike-a-light nr 214 from Skinnerud (50X).

Polish with diagonal stripes, similar interpreted as deriving from strike-a-light actions similar to figure 66, 68 and 69.

Ivarsbråten: Strike-a-light, nr 85

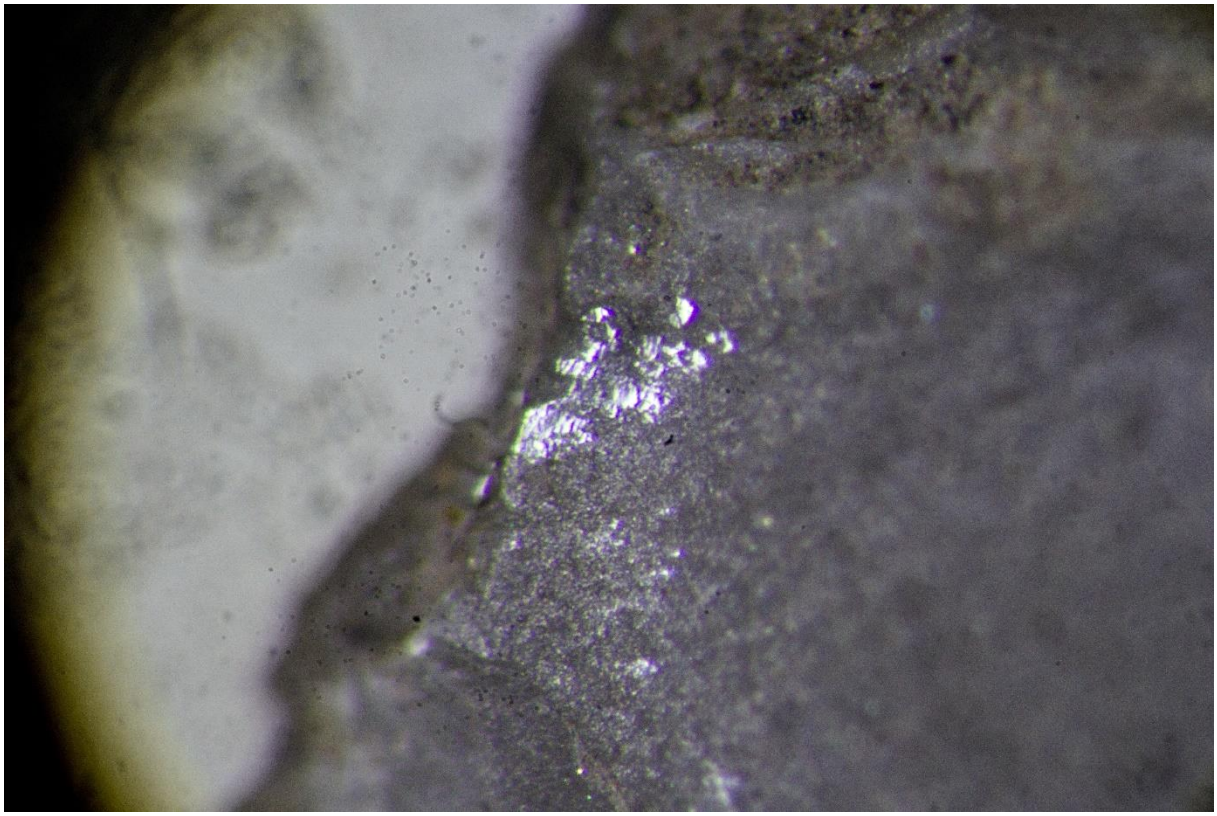

Figure 79: Use-wear on strike-a-light nr 214 from Ivarsbråten (63x).

Polish with diagonal stripes, similar interpreted as deriving from strike-a-light actions similar to figure 66, 68 and 69.

Attachment two: Selection of flint tools from Birkas garrison

Scraper
Nr 13366
Flint

Atypical scraper
nr 11981
Flint

Atypical scrapers
Nr 13583
Flint

Scraper
Nr 14170
Flint

Atypical scraper
Nr 16075
Flint

Scraper
Nr 14181
Flint

Scraper
Nr 14771
Flint

3 cm

Scale 2:1

Retuoched flake / Atypical scraper
Nr 15398
Flint

Retouched flake
Nr 11835
Flint

Retouched flake
Nr 15436
Flint

Retoched Flake
Nr 12814
Flint

Flake with use-wear
Nr 13193
Flint

Flake with use-wear
Nr 11964
Flint

Flake with use-wear
Nr 13004
Flint

3 cm

Scale 2:1

Core
Nr 15408
Flint

Strike-a-light
Nr 13306
Flint

Raw material
15423
flint

3 cm

Scale 2:1

Point
Nr 12924
Flint

Strike-a-light
Nr 12814
Flint

Stike-a-light
Nr 11828
Flint

Strike-a-light
Nr 13420
Burnt flint

Strike-a-light
Nr 12867
Flint

Strike-a-light
Nr 12695
Flint

3 cm

Scale 2:1

Attachment three: Selection of flint tools from the black earth harbour (2015-2016)

Atypical scraper
Nr: 1209
Flint

Atypical scraper
Nr: 539
Flint

Atypical scraper
Nr: 523 (1 of 2)
Flint

Scraper
Nr: 2184
Flint

3 cm

Scale 2:1

Cutting tool / scraper
Nr: 1674
Flint

Cutting tool
Nr: 1058
Flint

Cutting tool
Nr: 777
Flint

Cutting tool
Nr: 1091
Flint

Cutting tool
Nr: 539
Flint

3 cm

Scale 2:1

Cutting tool
Nr: 1028
Flint

Flake with use-wear
Nr 257
Flint

Retouched flake
Nr: 342
Flint

Retouched flake
Nr: 1077
Flint

Flake with use-wear
Nr 563
Flint

3 cm

Scale 2:1

Strike-a-light
Nr: 152
Flint

Strike-a-light
Nr: 1664
Flint

Strike-a-light
Nr: 523 (1 of 2)
Flint

Strike-a-light
Nr: 2669
Flint

Strike-a-light
nr: 322
Flint

3 cm

Scale 2:1