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Lithic Experiments in Rescue Archaeology: a Case from Southern Norway

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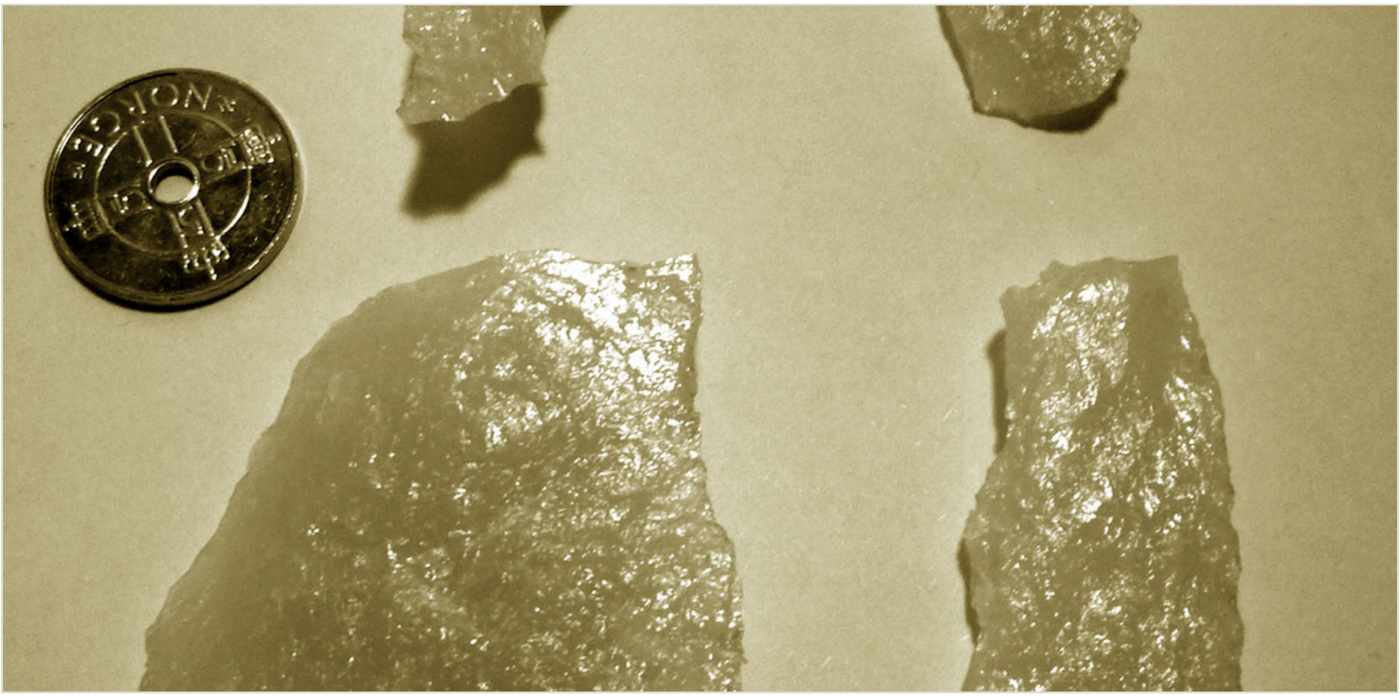

The institutional context in which Stone Age knowledge production takes place in Norway is structured by the current system of cultural heritage management (CHM). By virtue of the Heritage Act from 1978 and the regulations on professional responsibilities, the practical work of surveying and excavating prehistoric sites is divided respectively between the 19 County Councils and the five archaeological government museums (Glørstad & Kallhovd

2011). During the fall of 2012, the authors participated in a Stone Age survey conducted in Aust-Agder County where several prehistoric sites were discovered (Eskeland forthcoming). Both shoreline displacement, relative dating of the lithic assemblage and radiocarbon dating of organic material placed the sites in either a Mesolithic or Neolithic context. However, what became significant was the discovery of large quantities of fractured quartz – a poorly understood lithic raw material in Stone Age research.

> The aim of this paper was not to enter into a discussion of the hunter-gatherer category (...) On the contrary, the goal was merely to present an account of how lithic experimentation, understood as a communication of a material language, functioned in the context of a Stone Age survey. However, such a project must take into account both the political and scientific technologies at work.

To test whether or not the form of the discovered quartz was a result of prehistoric technological choices, a fracture analysis on collected vein quartz from Aust-Agder County was conducted[1] . Lithic experimentation is traditionally associated with either institutionalized academic research or post-production phases of excavations. However, within Norwegian Stone Age research there is a great need for local experiments on local rocks (Eigeland 2011). This article will demonstrate how lithic experiments can play an important knowledge producing role at all levels of Stone Age research through an account of how a comparative fracture analyses on quartz and flint functioned within the research questions of a County Council survey.

In his lectures on the philosophy of history, Georg Wilhelm Friedrich Hegel famously stated that "the secrets of the Egyptians are secrets for the Egyptians themselves" (Zizek 2009). Here, Hegel pointed out something essential to historical inquiries in general, namely that any kind of pursuit at revealing the secret of a culture is destined to failure. When the Slovenian philosopher and psychoanalyst Slavoj Zizek cites Hegel in his book *The Ticklish Subject*, it is to emphasize that 'the secret' preclude an intersubjective participation. The secret is an exclusively modern phenomena; it is *our* secret.

In order not to avoid the Hegelian argument, this article argues that insofar as landscape surveying and lithic reduction represent specific forms of dwelling traditionally associated with hunter-gatherers, replication of these practices also involve participation in the hunting and gathering way of life. Through participation, we engage in an intersubjective process of getting-to-know the other. In the following, the 'dwelling perspective' proposed by Tim Ingold (Ingold 2000) will function as the main theoretical influence, and consequentially, the aim and form of this paper is unconventional. However, the authors hold that experimentation should not be limited to lithic analyses.

Ethnoarchaeology and the Norwegian Mesolithic

If there are not secrets to prehistoric foragers, how are we to understand them? The Norwegian archaeologist Lotte Selsing recently proposed that any interpretation of the Norwegian Mesolithic (10 020 – 5230 BP) must depart from an ethnography of hunter-gatherers (Selsing 2010:277). It is the hunter-gatherer life form that we study, not 'prehistoric people'. Following this line of thought, Mesolithic research become part of the study of hunter-gatherers in a broad sense, and it is within this perspective that Selsing states: "It would be a serious mistake to interpret a lack of traces of hunter-gatherers in an area as a lack of presence of hunter-gatherers" (Ibid, authors translation). After nearly 150 years of Stone Age research (Shetelig 1944), it is well known that large parts of Norway – most notably the coastal line, were inhabited by hunter-gatherers through thousands of years during the Mesolithic period. However, following the argument made by Selsing, these Mesolithic sites enable only a gaze into a fragmented record of traces. Mesolithic research must presuppose that what we study is not a series of documented sites but a specific life-form.

Landscape and remembrance

The execution of a Stone Age survey is rooted on the surveyors' perception of the environment. According to anthropologist Tim Ingold (2000), the practice of surveying is not solely a product of the intellect. Perceiving the landscape is an intuitive and participatory practice, or as Ingold writes: "… the landscape is constituted as an enduring record of – and testimony to – the lives and works of past generations who have dwelt within it, and in doing so, have left there something of themselves" (Ingold 2000:189). To perceive the landscape is to carry out an act of remembrance – this is a core point in what Ingold has termed a 'dwelling perspective'. When archaeologists survey an area they carry out an act of remembrance, and so it follows that the practice of archaeology is itself a form of dwelling (Ingold 2000:189).

However, the argument is not that dwelling is reserved for a specific life form, but that dwelling is a practice shared between all humans. Here, Ingold draws in the late writings of the German philosopher Martin Heidegger. Through etymological studies Heidegger argued that the form of being in general was dwelling. For instance, the Old English word *neahgebur* consists of: *neah*, near, and *gebur*, dweller. Neighbor means the near-dweller, he who dwells nearby (Heidegger 2001:144-145). In its High German origin, the word for dwelling is *bauen*, which signifies to build, to remain, and to stay in place. *Bauen* is also the form of bin, in the version *ich bin*. *Ich bin, du bist* means: I dwell, you dwell (Ibid:145).

Heidegger argued that within current Western culture, the meaning of dwelling had been forgotten. Through time the meaning of words change, and so does the nature of things (Heidegger 2001:144). In this respect, the dwelling perspective developed by Ingold can be read as an attempt at rehabilitating dwelling. By proposing a specific temporal ontology, that distance in time is not necessarily synonymous with distance in life form the dwelling perspective forces us to consider practice as a means of participation in different forms of dwelling. We would argue that this is the case not only with surveying, but also for lithic experimentation. The aim of this paper is thus to account for how a combination of surveying and lithic experimentation enabled a chronicling of the hunting and gathering life form in a specific area (Ingold 2000:189, with reference to Adam 1988:54).

Development led field archaeology

The knowledge production on Mesolithic hunter-gatherers implies the use of different technologies, and both the political and scientific technologies will be presented below.

The practice of surveying is a central part of the case-to-case practice at the County Councils (of which there are 19 in Norway). As the Heritage Act from 1978 enforces an automatic protection of all traces of human activity older than 1537 AD (the Reformation), surveys are initiated mainly by land use planning and building initiatives. The conflicting areas are then surveyed for prehistoric sites, which are then presented in an official report. If it is decided that the sites are to be exempted from the automatic protection, the Heritage Act enforces the archaeological government museums to conduct excavations of selected sites. With the current system of CHM in Norway it follows that the majority of fieldwork takes the form of rescue archaeology (see Glørstad & Kallhovd 2011 for a discussion of this system).

Methodological aspects of Stone Age surveying

In practical fieldwork, Stone Age surveys in Norway use manually dug test-pits as site indicators (Berg-Hansen 2009). The surveyor wanders through the area, and at places where there is reason to believe that hunter-gatherers would have settled, square holes at approximately 40x40 cm are dug. As organic materials easily decay in the soil, effective indicators for sites are mainly lithic material. The finds are then measured in relation to the depth of the test-pit, and each pit is marked on a map using GIS technology. Test-pits are the preferred method insofar the survey area is not dominated by modern agriculture, in which case an excavator may be used.

In addition to spatial information, a survey might be able to date the sites using three different methods. The first is radiocarbon dating of organic remains obtained from well preserved layers. While this is frequently used in surveys, the number of samples varies, and results are often received in post-production. The second is based on close studies of morphological qualities in the discovered lithic assemblages. For instance, studies have shown that Early Mesolithic flake technology was executed mainly by direct soft technique (i.e. using a soft hammer of antler, bone or wood) (Fuglestvedt 2012; Sørensen 2012). If the lithic assemblage from a site has the diagnostic traces expected to occur from direct soft technique, the site is dated relatively to the Early Mesolithic. However, the most common relative dating method is shorelevel displacement. After the last Ice Age, the shorelevel along the coast of Norway started changing drastically. As the isostatic land uplift and eustatic rise of the sea level differed in various regions, the use of shoreline displacement as a dating method for a specific region requires a local shorelevel curve, which can be established through a diatom analysis (Stabell 1980). This curve will show the shifting shorelevel in a specific landscape through the Holocene.

Lacking a curve for Aust-Agder County, the survey project had to use the curve for Telemark County (Stabell 1980), the neighboring county to the east. The use of shoreline displacement models in Stone Age surveys goes back to the 1920's, and is often referred to as the 'shore-model' (Berg-Hansen 2009:49).

The practice of surveying

Implementation of the shore model has led to an increased knowledge of the settlement pattern in the Norwegian Mesolithic and Neolithic (Berg-Hansen 2009). In Aust-Agder County, the maximum marine limit after the last Ice Age was estimated to c.70 meters above current sea level, and following the available shorelevel curve sites were expected to occur between 10-70 m. above sea level.

When performing a Stone Age survey, the main landscape factors are proximity to the old beach, closeness to marine resources, smooth and well-drained subsoil, good view of the surrounding landscape and shelter from the wind (Berg-Hansen 2009:47). But the surveyor has only limited access to these factors. Along the coastal line of Norway, the archipelago is often characterized by reefs and rugged terrain, a landscape formation that in Aust-Agder County re-occurred along the prehistoric shorelines. In this landscape, flat spots are often a rare commodity. Thus the research strategy of the survey consisted of searching for flat spots in the landscape, echoing what Robert Kelly noted about the Atsugewi in California, where "every small hill or flat" seemed to have its own name (Kelly 2003:46, with reference to Garth 1953:195).

In a quite literal sense, this naming of hills and flats bears similarity to the phenomenology of surveying. Ethnography has shown that hunter-gatherers dwell in vast areas. For instance, the Inuit of North-Eastern Canada hunted in areas covering 15500 km², three times the size of Denmark (Selsing 2010). This area is small when compared to the Nunamiut in Northern Canada, whose hunting territories stretched over 250 000 km² (Selsing 2010, with reference to Kelly 1995:150, with reference to Binford 1983:206). The use of ethnographic analogies on prehistoric hunter-gatherers depend on a number of variables such as population density, the particular environment, and the cultural adaptation strategies that the people brought with them to new land (Kelly 2003). According to Ingrid Fuglestvedt, the role of ethnography in ethnoarchaeology is not to explain archaeological contexts by referring to observed similarities with known ethnographic cases, but rather to show what kind of cultural network of relations the archaeological context is part of (Fuglestvedt 2007a). Studying the distribution of lithic raw materials is one way of illuminating these cultural networks. Well known cases in Southern Norway are the quartzite from Lærdal, greenstone from Bømlo, diabase from

Stakaneset, rhyolite from Hordaland, and jasper from Eastern Norway (Bang-Andersen 1996; Selsing 2010).

A case in Southern Norway

During the two months of surveying in Aust-Agder County in 2012 approximately 1000 test-pits were dug, resulting in the discovery of 31 previously unknown Stone Age sites (Eskeland forthcoming[2]). The dwellings were located between 11-50 meters above current sea level, and all test-pits had debris from flint-knapping in the soil. However, on several sites the flint assemblage was discovered together with large quantities of fragmented quartz.

In the survey area, several visible quartz veins were known, many of which had been the object of local mining in modern times, and consequently quartz was repeatedly found lying on top of the turf, often tossed around the entrances to the quarries. Archaeological studies has shown that areas with natural deposits of raw material fitted for lithic tool production were often favored by prehistoric hunter-gatherers practicing a highly mobile lifestyle (Selsing 2010:281). For the survey project, the question arose whether or not the natural deposits of quartz had been exploited in prehistoric times.

Quartz

The uncertainty surrounding the discovered quartz developed into a defined research problem. If the quartz in Aust-Agder had been a useful raw material for tool production in the Stone Age, how could it be recognized in a survey? How did the quartz shatter, and what did it look like?

It has been hypothesized in earlier literature that local raw materials with a high content of silica, such as quartz, quartzite and rock crystal were used as an addition to flint in the Mesolithic (Selsing 2010:281). In contrast to quartz, flint is considered an ‘exotic’ material in Norway because there are no natural deposits, and hence the need for local experiments on local rocks (Stene et al. 2010:500; Eigeland 2011). Quartz and flint assemblages have traditionally been approached in essentially the same way without acknowledging the differences in the material – what has been termed the ‘flint syndrome’ (Tallavaara et al. 2010:2447, with reference to Knutsson 1998). Due to the uncertainties connected with quartz in Stone Age assemblages, in order for a survey to acknowledge its cultural historic significance, it needs to be found together with worked flint.

But this ongoing perception of quartz is not reflected in results from excavations, which have repeatedly demonstrated that quartz has in fact been used in tool production throughout the Mesolithic and the Neolithic. For instance, at the Gråfjell project in Eastern Norway, the lithic material from 29 Stone Age sites were made of several different raw materials; flint, jasper, rock crystal, slate, various types of volcanic rock, quartz and quartzite. Of the total lithic assemblage from the sites, about two thirds were different types of quartzite (Stene et al.

2010:500). Comparing only the flint and quartz/quartzite assemblage, the latter made up about 75 % (based on Table 4.7 in Stene et al. 2010:500).

In the Gråfjell project, lithic raw materials were organized into three categories: local, semi-local and exotic. Exotic referred to material that did not occur naturally in the local environment, such as flint. Local referred to material that was worked primarily at the site from original blocks to used artifacts. Raw material that was available in the nearby area, but had nonetheless been brought to the site in the form of cores or artifacts were considered semi-local (Stene et al. 2010:500).

Lithic experiments on quartz

The question concerning the morphology of shattered quartz has been discussed extensively in academic discourse (K. Knutsson 1988; Callahan et al. 1992; C. Lindgren 2004; Tallavaara et al. 2010; Driscoll 2011; K. Knutsson 1998). In the literature on lithic raw materials for tool production, there are usually five properties associated with those fitted for lithic reduction (see Eigeland 2007, with reference to Andrefsky 1998; Crabtree 1972; Inizian et al. 1992; Whittaker 1994). Besides having (1) a conchoidal fracture giving flakes a shell-like form, the material should have (2) a homogenous and (3) fine-grained structure, (4) elasticity, and (5) brittleness (Ibid).

Quartz is a silicate mineral with a conchoidal fracture, enabling a flintknapper to work with the material in a somewhat controlled manner, planning each hit and possibly foresee future steps in the reduction process. Being a silicate mineral, quartz can take several different forms (for examples in Eastern Norway see Stene et al. 2010). In a study of quartz in prehistoric Scotland, Torben Bjarke Ballin differed between milky quartz, greasy quartz, smoky quartz and rock crystal (Ballin 2008). The quartz found in Aust-Agder County – both at the quarries and surveyed sites, was characterized by a crystallized structure with fracture lines, resembling what Ballin termed milky quartz (see Illus 40, p. 47, and Illus 42 and 43, p. 49 in Ballin 2008). The quartz was hard and compact, with less elasticity and brittleness than flint.

According to Miikka Tallavaara et al., in theory quartz behaves essentially the same way as flint, and the basic diagnostic traces can be observed also on quartz flakes (Tallavaara et al. 2010). However, as Lotte Eigeland has argued, the differing qualities associated with quartz make the traces more diffuse (Eigeland 2007). This has also been highlighted in recent studies applying fracture analysis on experimentally shattered quartz (Tallavaara et al. 2010; Driscoll 2011). As fracture analysis on quartz assemblages has a long history (see K. Knutsson 1988; Callahan et al. 1992), recent studies have argued that the essential assumptions from this early research are still problematic (Tallavaara et al. 2010). Both flint and quartz tends to fragment during detachment, but fragmentation is much more common with quartz (See Fig 1.).

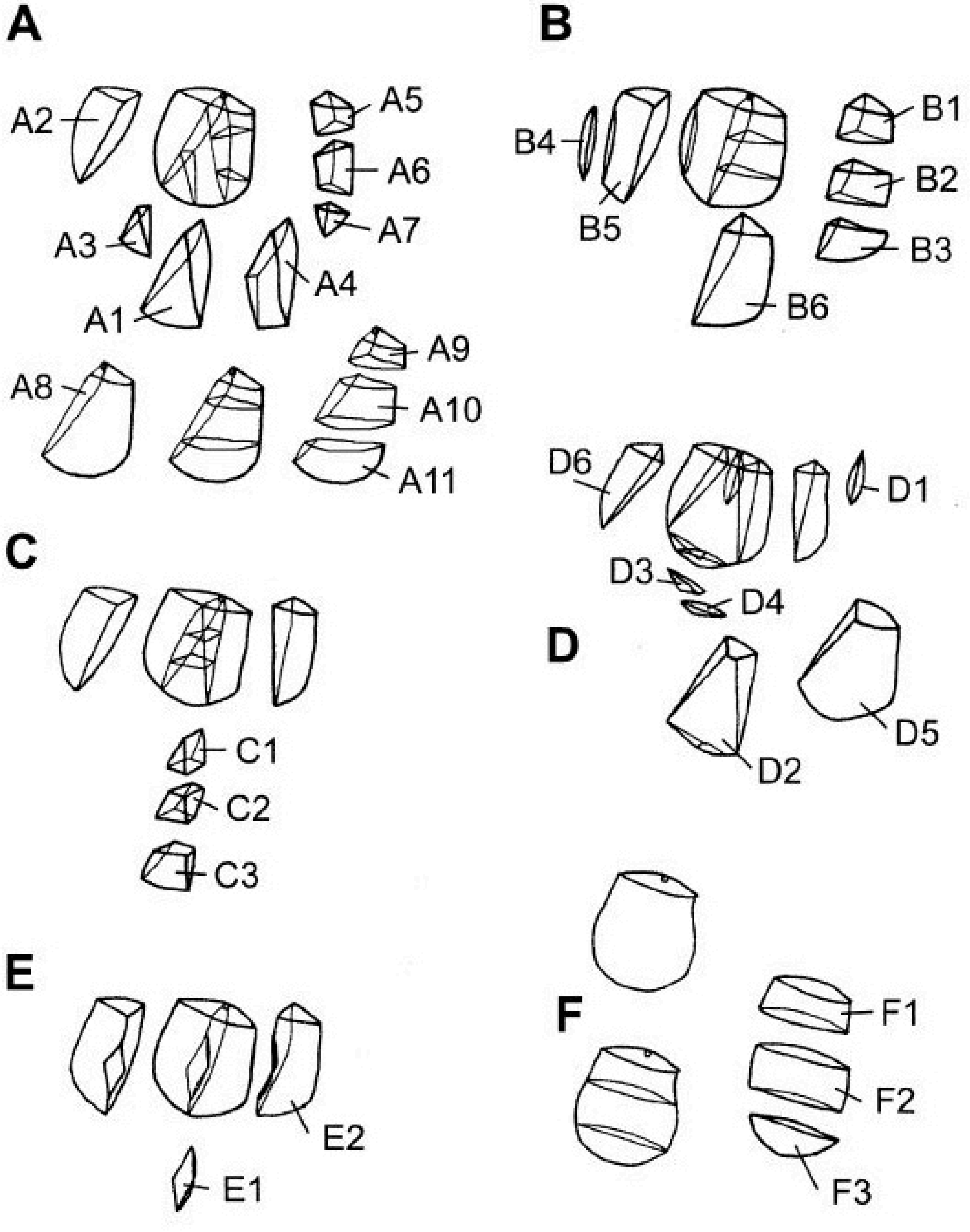

FIG 1. SCHEMA OF QUARTZ FRAGMENT TYPES (FROM TALLAVAARA ET AL. 2010)

In order to create a referential database for future analysis of the assemblage recovered from the survey in Aust-Agder, a fracture analyses was performed on a lithic assemblage derived from experimentally reduced quartz initially collected from quarries and veins in the survey area. As already mentioned, the traditional definition of culturally shattered quartz in Stone Age surveying follows the diagnostic schema adapted for flint (see for instance Helskog et al.

1976). By applying the fragment schema proposed by Tallavaara et al. (See Fig. 1) the aim of the experiment was to investigate (1) whether or not the recently discovered quartz was a result of Stone Age technological choices, and (2) what material is excluded in the traditional definition of culturally shattered quartz in Stone Age surveying. As the discovered quartz often occurred in large quantities (see Eskeland forthcoming), a (3) third aim was to document differences in knapping technique and amounts of debris from flint versus quartz knapping.

The experiment

Quartz was collected from three different sources located within the survey area. The first was a quarry with a history of modern exploitation; the second an exposed vein next to a path, while the third was a previously unknown vein discovered circa 10 cm beneath turf during the survey. This third source was not associated with any documented sites. Blocks in different sizes were collected and tested while at the quarries in order to check the quality. Flint was collected at Stevns and Falster in Denmark. The impactors used in the experiment were psammite cobbles and antler from elk and reindeer.

In order to fulfill the third aim of the experiment, similar sized cores of both flint and quartz were reduced and documented. A total of four cores were documented, and the experiment was performed by two knappers reducing two cores each; one of flint and one of quartz. The knappers had respectively seven and ten years of experience with flint knapping. Large blocks were initially reduced to suited pieces for flake production, what Killian Driscoll termed ‘child cores’ (Driscoll 2011:736). This process was not documented.

Only the reduction of child cores was documented. Debris from each event was bagged and instantly numbered with Block ID, Core ID, and Event No., following the method described by K. Driscoll, where each knapping is recorded as an event (Driscoll 2011, see Åkerstrøm et al. forthcoming). The survey applied a sieve with 4 mm wide meshes in order to detect artifacts and debris. In order to make the results from the experiment representative in relation to the surveyed material, only debris with the width of ≥ 4 mm was bagged. A third participant documented the experiment in an electronic database later to be used in post-production. Fragments were then categorized and re-fitted following the fragment type schema proposed by Miikka Tallavaara et al. (Tallavaara et al. 2010).

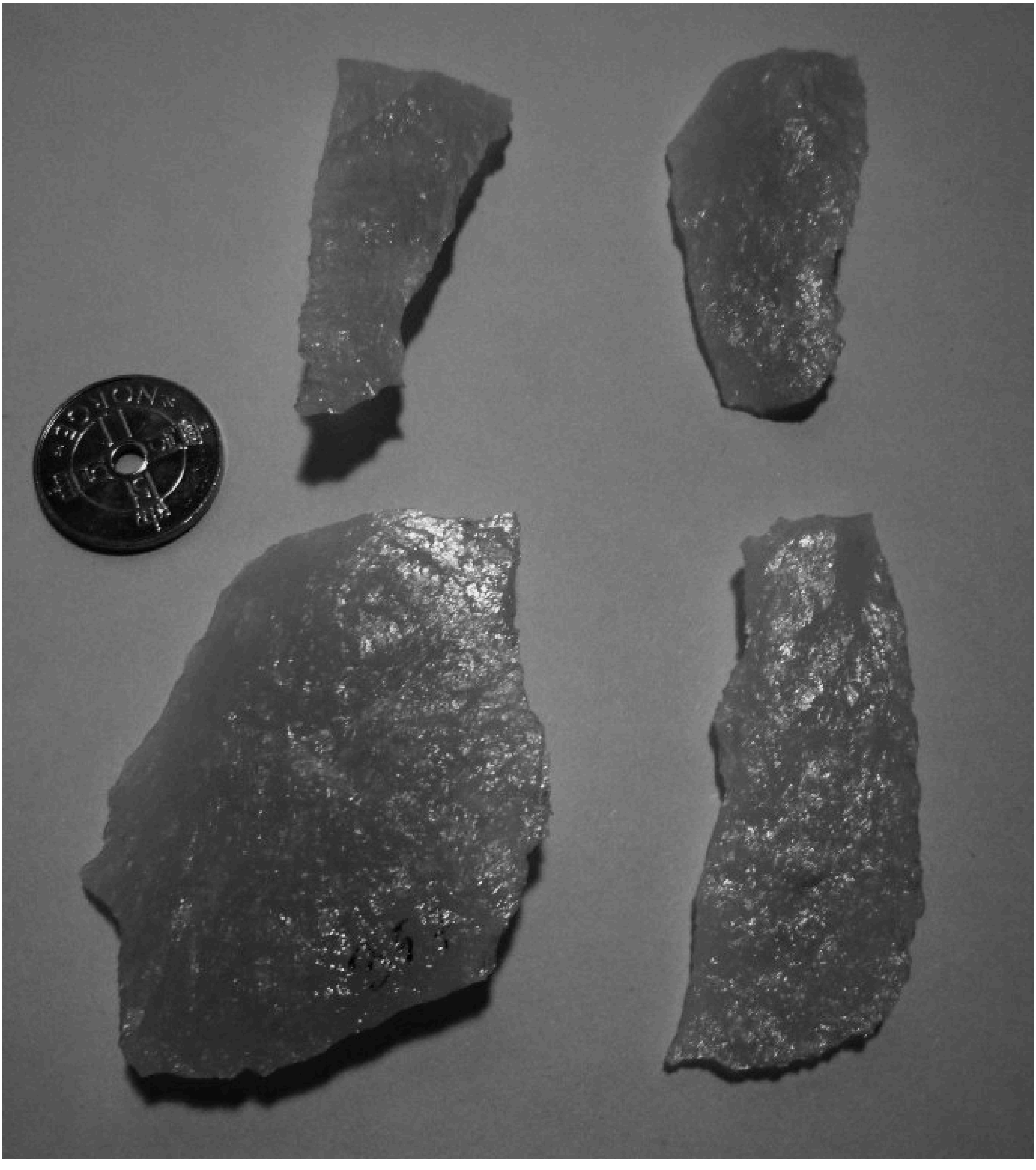

FIG 2. INTACT QUARTZ FLAKES.

As the aim of the experiment was to document possible differences between flint and quartz knapping, the occurrence of what the knappers experienced as 'mistakes' in the event was noted in the database. This was done in order to demonstrate statistically whether or not trained flint knappers made mistakes more often when knapping quartz than when knapping flint. It should also be noted that the *schema operatoire* of the knappers was blade-production utilized by the soft and/or hard direct technique. In Norway, this technique is traditionally associated with Early Mesolithic assemblages (10 000-9000 BP) (Fuglestvedt 2007b; Fuglestvedt 2012).

Preliminary results

As the experiment is yet to be published (Åkerstrøm et al. n.d.), only preliminary results will be presented here. The experiment could show that, because of the fracture lines in quartz, cores fitted for a controlled reduction should preferably not exceed hand size, c. 400-450 g. Even smaller cores had fewer fracture lines and were consequently more successful. With a larger core the fracture lines made flake production problematic, resulting in either instant fragmentation of flakes or breakage of the core. These findings indicated an interpretation of sites with large amounts of quartz as dwellings used mainly for the reduction of blocks, and consequently the production of child cores with a possible supplement of flake production. Combined with other surveyed sites where both quartz and flint (and eventually other raw materials) occurred together, and where the amount of quartz was smaller, the quartz as a raw material could be considered both local and semi-local.

It was also noted that flakes reduced form child cores had a cleaner structure and more easily recognizable diagnostic traces than flakes produced randomly while initially breaking the blocks into child cores. As Driscoll noted, the breaking of a block into suitable cores for flake production will result in massive amounts of debris (Driscoll 2011). Thus it was proposed that sites with large quantities of shattered quartz could be associated with this activity. Further on, sites with better quality flakes, and where the frequency of positively recognizing diagnostic traces on the quartz increased, could be interpreted as dwellings for activities other than production of suitable cores. This is on par with recent studies; considering the problematic nature of quartz, Tallavaara et al. argues that better quality quartz can be associated with mobile people, and vice versa (Tallavaara et al. 2010:2448). A hypothesized settlement pattern in accordance with technological choices showed to be fruitful when compared to the surveyed sites (see especially site no. 161288 and 160618 in Eskeland forthcoming).

Mistakes were registered more often when the knappers were working on quartz than on flint (Åkerstrøm et. al. forthcoming). Two main reasons for this were proposed; (1) because of the brittleness in the material the platform on quartz cores brakes more easily than on flint, resulting in an instantaneous fragmentation of the produced flakes, and (2) this makes the use of direct soft technique, which requires a thin and defined platform, more problematic on quartz. In a recent fracture analyses on chert and quartz, Driscoll (see especially Table 9 and 10 in Driscoll 2011) received similar results. Almost all experimentally produced chert flakes were complete, while more than half produced of quartz were fragmented.

This leads to the problem of positively recognizing remains of quartz knapping in the archaeological record. Driscoll (2011) noted that almost all chert flakes were regular with visible bulbs of percussion and compression rings. However, on quartz almost all intact flakes were irregular, and both bulbs of percussion and compression rings were rare. To a large extent, the presented experiment on flint and quartz received similar results (Åkerstrøm et al.

forthcoming). A consequence for surveying would be that diagnostic traces should not be expected to occur on all archaeologically recovered quartz flakes, not even on half of them. In any case, regular flakes with percussion rings should not be expected at all. However, an intact platform and a slightly apparent bulb of percussion should occur on some of the flakes.

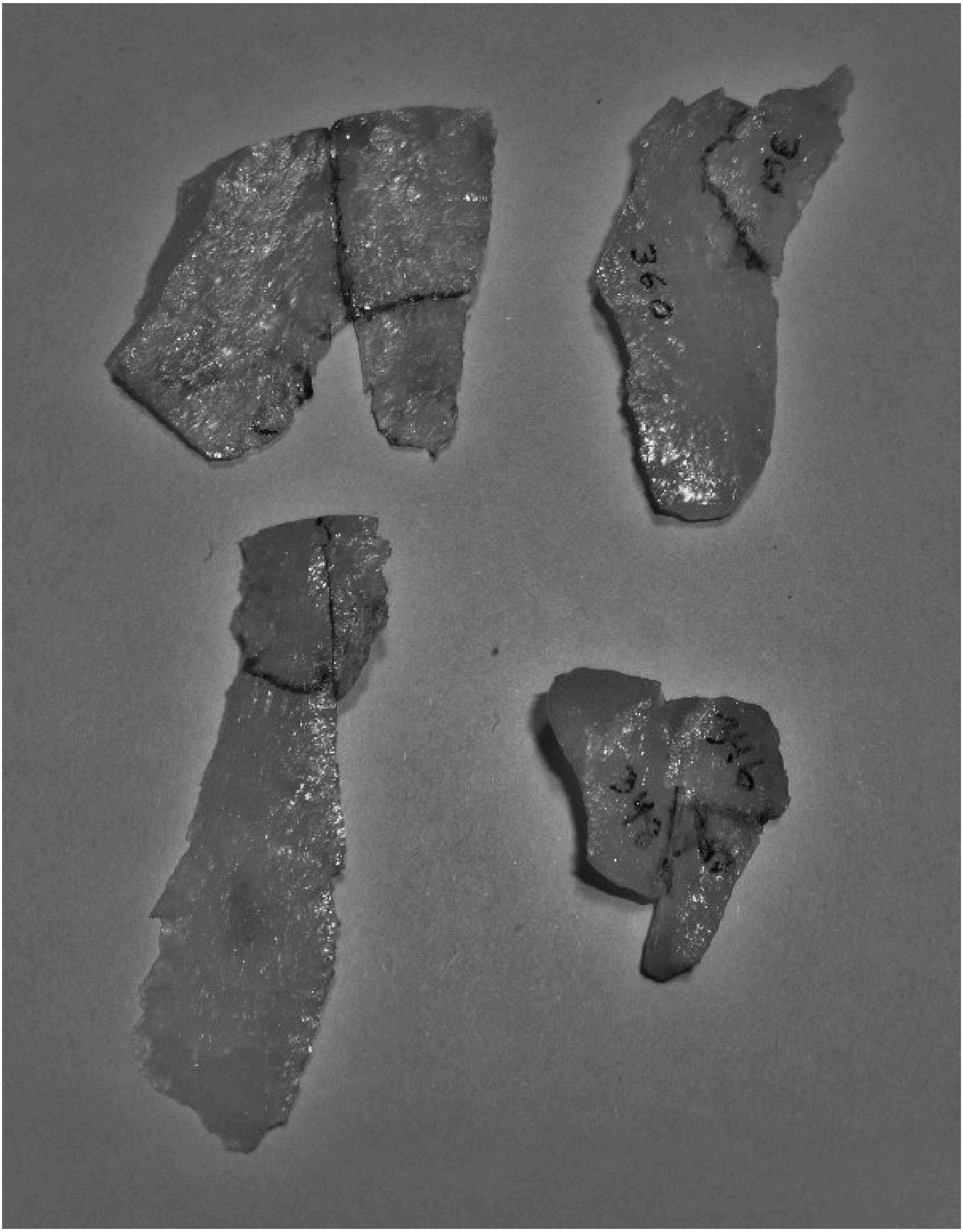

FIG 3. REFITTED QUARTZ FRAGMENTS.

Conclusion

The aim of this paper was not to enter into a discussion of the hunter-gatherer category (but see H. Knutsson 1995; K. Knutsson 1998). On the contrary, the goal was merely to present an account of how lithic experimentation, understood as a communication of a material language, functioned in the context of a Stone Age survey. However, such a project must take into account both the political and scientific technologies at work. The transformation of 'shattered quartz' into 'prehistoric heritage' has consequences beyond the specific scientific knowledge produced. When a lithic assemblage from a survey is proven to be a result of prehistoric technological choices, it has not only a potential discursive effect within academic circles; in a quite literal sense, it mediates the contemporary social and legal situation in which the survey is enacted.

Most definitions of experimental archaeology focus on the modes of presentation of evidence and falsification of hypothesis (see Eigeland 2011:100). As demonstrated here, experimental archaeology can also become a *political technology*. The concept of political technologies encompasses the different ways that scientific knowledge is included in politics, the consequences of which has hitherto only been studied by historians (Asdal 2011:211).

Political technologies are part of the technical arrangements and procedures that help to enable and shape policy, and in this sense experimental archaeology can be highly constructive. The argument could even to extended to the act of excavation itself, as Gavin Lucas argue: "... we cannot resurrect the dead – all we can do is to perform a kind of ghostly repetition, yet one in which, in doing so, brings something new into our world and alters its material configuration by its presence" (Lucas 2001:42). Apart from certain morbid connotations, we would argue that this is true also for experimental archaeology, where the latter can be considered one of the technical arrangements available for the performance of archaeology. Or in the presented case from Southern Norway, flint knapping became knowledge, while the archaeologist became the technology.

The alterations from the presented case included the enforcement of a legal protection on the surveyed sites, enabling subsequent excavations of them by the archaeological government museums. In this sense, experimental archaeology has the potential to enact in both academic and political fields.

While a full presentation of the experiment is yet to be published (Åkerstrøm et al. forthcoming), observations made during the experiment could prove that the quartz assemblage from several of the surveyed sites had been formed by prehistoric flint knapping (for a presentation of the sites see Eskeland forthcoming). Considering the diagnostic traces detected on the experimentally produced assemblage, a realistic view of what traces are to be expected to occur on a material obtained by surveys was made possible. This could also illuminate what is discarded by force of the so-called flint syndrome.

This leads on to the role of the surveyor. It has been argued here that if Stone Age research is to be considered part of the anthropological study of hunter-gatherers (Selsing 2010), the practices associated with the hunting and gathering ways of life represent a means of participation and repetition. Through entangling these practices with current scientific methods, we might get to know the prehistoric dwellers a little better, as well as enabling a stronger management of their monuments.

1 For a rigorous presentation of the lithic experiments, see Åkerstrøm et al. forthcoming.

2 The survey project is not yet finished, and a final report will be published at the end of 2013.

Keywords flint
stone
post depositional process
experiment

Country Norway

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Gallery Image

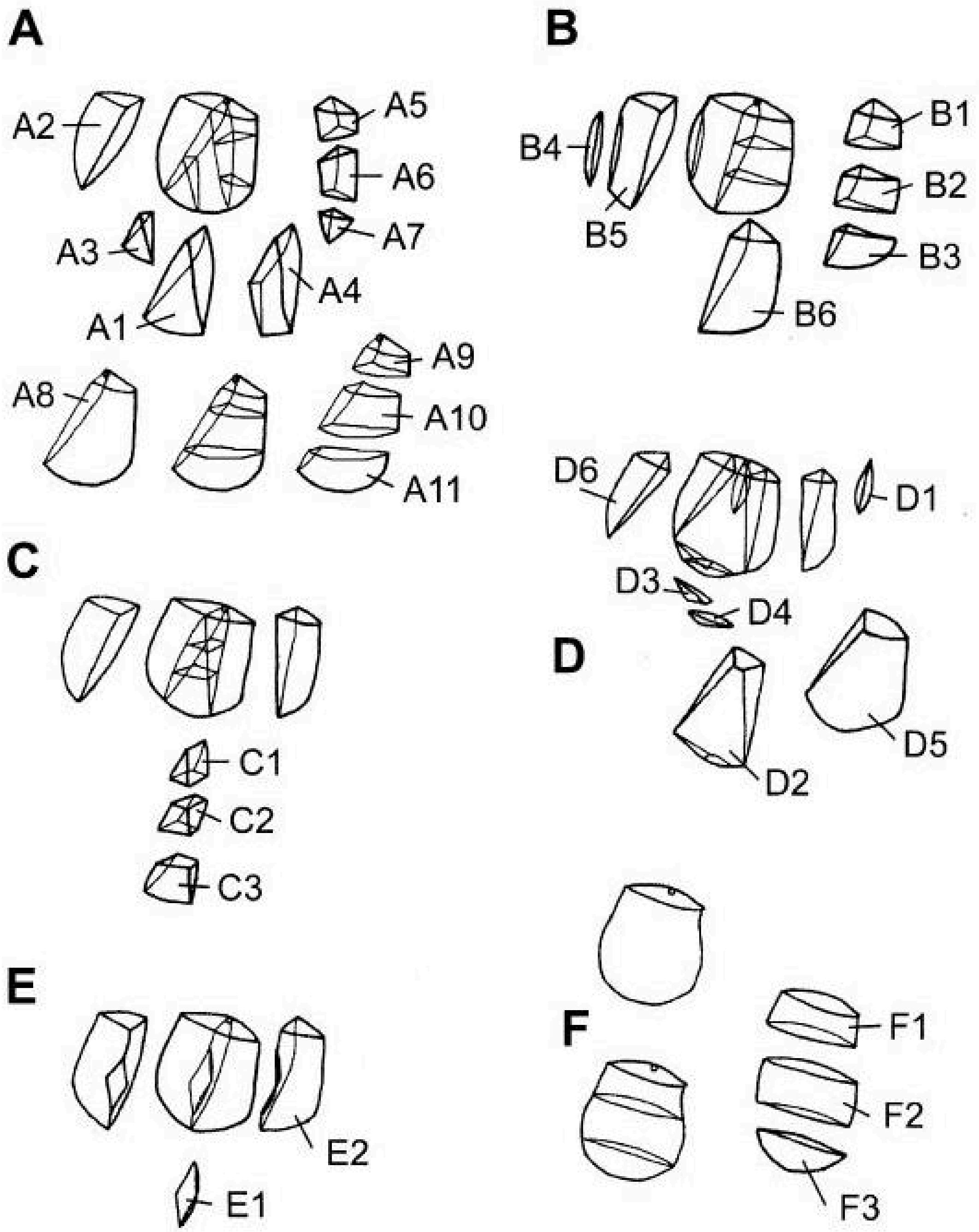

FIG 1. SCHEMA OF QUARTZ FRAGMENT TYPES (FROM TALLAVAARA ET AL. 2010)

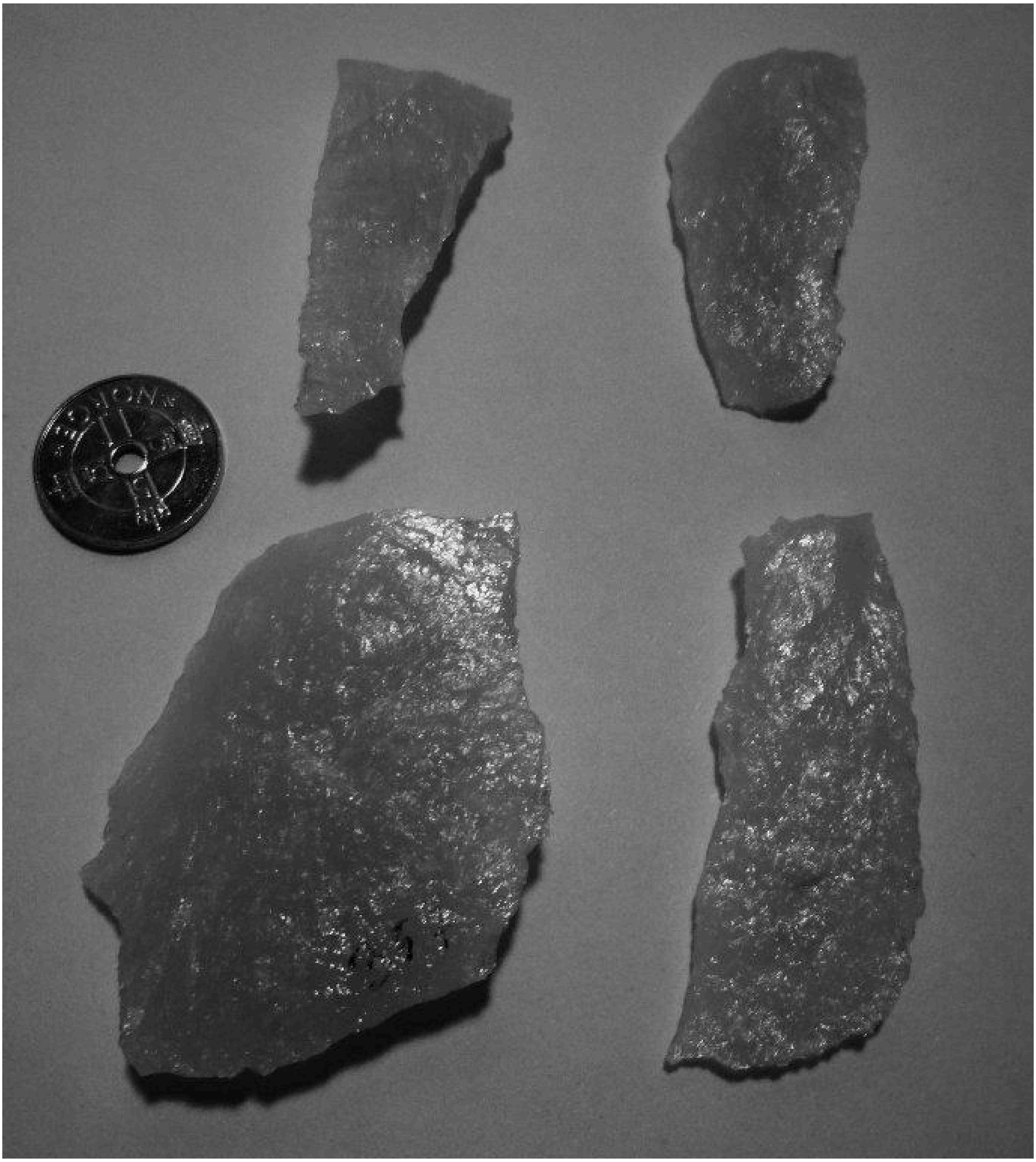

FIG 2. INTACT QUARTZ FLAKES.

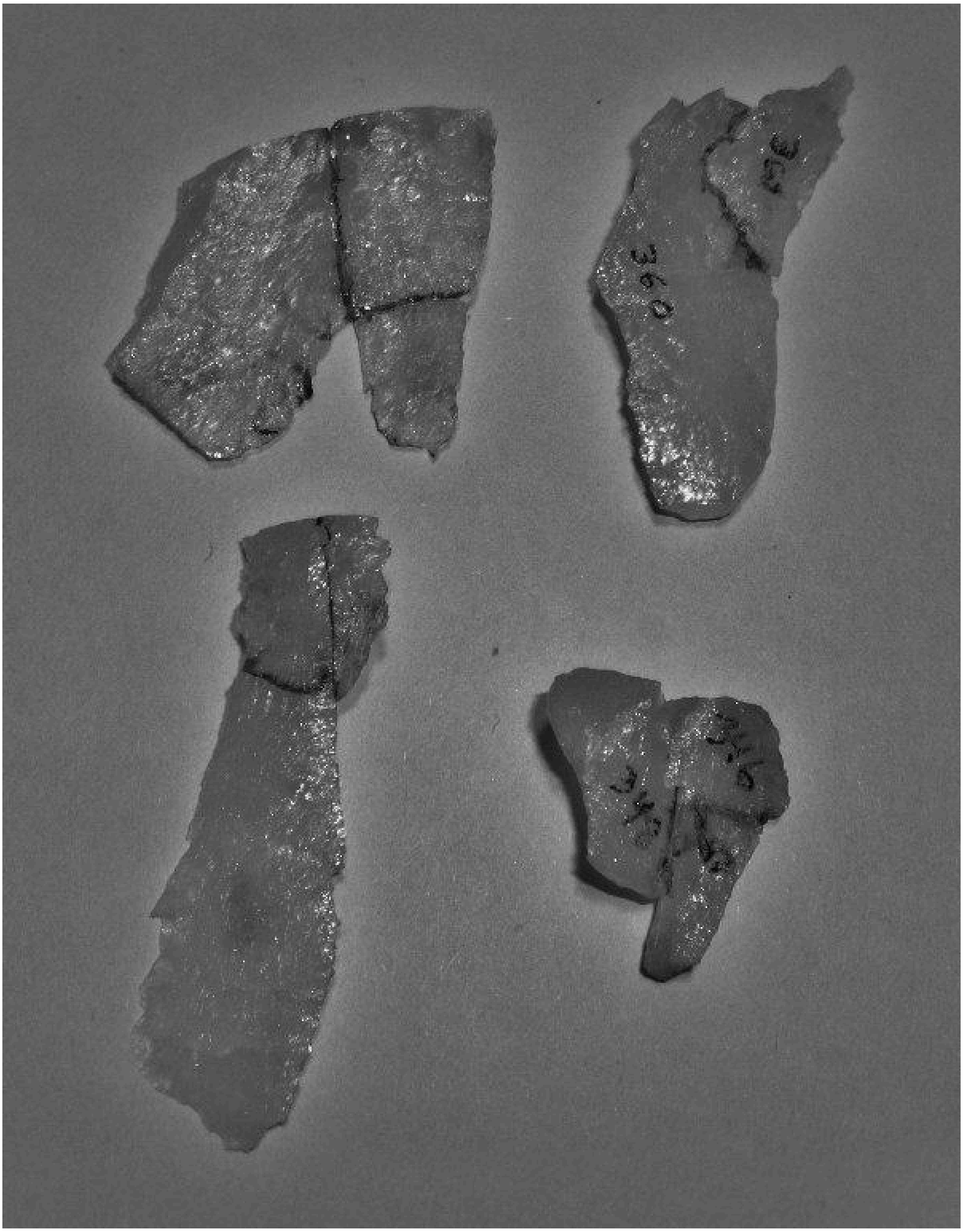

FIG 3. REFITTED QUARTZ FRAGMENTS.