

Early rotary querns in South-Western Norway

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Abstract: This paper presents the *corpus* of prehistoric rotary querns stored in the Museum of Archaeology of Stavanger, the largest collection of this type of mill in Norway. Most are linked to excavations carried out of early longhouses by Jan Petersen in the early half of the 20th century. The study focuses in part on the question of the introduction of the rotary movement of mills in Norway and quern production based on surface materials predating the direct extractive process identified at the medieval quarry district of Hyllestad.

Keywords: Norway, Rogaland, surface blocks, quarries, petrography, rotary quern classification

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Introduction

The Museum of Archaeology in Stavanger possesses the largest collection (150) of prehistoric rotary querns in Norway. These small hand-driven grain mills comprising an upper and lower stone and driving fittings are for the most part finds from the extensive settlement excavations undertaken by Jan Petersen in the 1920's and 30's. Due to this large number of querns, the museum was invited to participate in the "The Norwegian Millstone Landscape" research project (2009-2012). Aspects of this project, in particular those related to quarries and extraction techniques, have been presented in the colloquia of Rome and Bergen (Heldal and Meyer 2011; Baug and Løland 2011; Baug and Jansen 2014; Grenne *et al.* 2014). Moreover, detailed versions of this study are published in both English (<https://www.ngu.no/>

[upload/Publikasjoner/Rapporter/2014/2014_002.pdf](#)) and Norwegian (<http://dx.doi.org/10.5617/viking.6478>).

The object of the present study, resulting in a short monograph (Hauken and Anderson 2014), centred on the question of the earliest rotary querns in Norway, the precursors of the querns and millstones extracted centuries later from the garnet and staurolite mica schist quarries, the main focus of the Millstone Landscape project. With the exception of a short article about the petrography of the querns at the settlement of Ullandhaug in Stavanger (Dahl 1986), these early mills have for the most part been neglected in Norwegian archaeology. This study is therefore the first major contribution to the subject.

The general notion for years was that rotary querns were introduced in south-western Norway in the 4th century AD. Furthermore, although Jan



Fig. 1: Map of Rogaland and the distribution of the rotary querns in the study. The numbers refer to the catalogue of querns in the study Hauken and Anderson (2014). Map by Theo Gil (AM).

Petersen cited a few examples in his study of tools from the Viking Age (1951, 438-440), he centred his interest on quern finds in burials. He noted, for example, several fragments re-used in a burial cairn dated to the 4th century AD (Petersen 1916, 9-10, pl. I, figs 11-13, pl. II). These finds indicated that this type of mill, more sophisticated than the saddle quern driven with a to-and-fro movement, preceded the Migration Period (i.e. before 400 AD). Yet the notion that the fragments antedated the construction of the 4th-century grave, proof that rotary querns were introduced in Norway before 400 AD, went unnoticed.

The present study focuses on the classification, chronology, petrography and production of rotary querns based on 85 stones from secure chronological contexts from 27 different sites (Fig. 1). All but one are from settlements of which about half (16) were explored by Petersen. The review of the excavation reports (Petersen 1933; 1936) proved to be a real challenge, since neither digging techniques, nor the recording method, follow modern archaeological standards.

Ullandhaug in Stavanger (numbers 4-21 in Fig. 1), excavated in 1967-1968 (Myhre 1980), yielded the largest number of stones (18). These finds confirm, on the whole, the datings derived from Petersen's

excavations. Yet a fine review of the archaeological record reveals that Ullandhaug's history is more complex than original thought and that it is not suitable for casting light on south-western Norway's earliest rotary querns. Querns from this site were nonetheless retained in this study due to their sheer number and to the presence of rough-outs suggesting quern producing at the site.

Although Norway is known for its fjords and high mountains, a large part of Rogaland's coastal area does not have these features (Fig. 2). The Jæren lowlands undulating landscape is today one of Norway's richest agricultural districts. By contrast, sixteen hundred years ago it was a mosaic of vegetation types nowhere near as green as today. While farms were on the top of the ridges, the slopes were reserved for grasslands and small fields of hulled barley and oats. The lowlands were marked by peat bogs, marshes or lakes. Yet its coastal heathland, marked by a particular variety of heather, dominated the landscape. This is the northernmost extension of coastal heathland, a type of cultural landscape was carefully administered through time and in former times dominated the Atlantic coast in regions as wide as northern Spain, France, the British Isles, the Netherlands, Germany, Denmark and Norway up to 690 N (Moen 1998). It was first and foremost used for pasture.



Fig. 2: Aerial view of the Jæren coastal lowlands and Lake Orreand Lake Orre, seen from the west.
Photo: Terje Tveit (AM).

Rotary quern classification

Anne Bloch Jørgensen's detailed study of the querns from the settlements of Vorbasse and Nørre Snede in Jutland, Denmark served as the cornerstone for the current rotary quern classification. The Danish scholar identified two main types of upper and lower stones and their subtypes (1990, 2002: fig. 3). Upper stone types (Fig. 3) are labelled Type I to III with roman numerals.

Type I upper stone is a thick, hemispherical and devoid of a handle socket. Type IIa has a straight (or occasionally slightly curved) steep edge and a marked transition to a flat or slightly convex upper surface. Type IIa1 has a handle socket. Type IIb has a curved or rounded, slanting edge with a smooth transition to a convex upper surface. This type is labelled the "doughnut". Type IIb1 has a handle socket. Type IIc has a short, rounded edge with a slightly marked transition to a slanting, slightly convex upper surface. It also, at times, has a handle socket. Common to all types is the flattish (or slightly concave) cross-section of the grinding surface and the absence of rynd cuttings.

Type III, in this current work, denotes garnet mica schist querns, not present in Bloch Jørgensen's collection from Denmark. Type III is not sub-divided as the few cases from Stavanger are too fragmented to serve for a finer classification. It is noteworthy, nonetheless, that they all have handle sockets on their upper surface and rynd cuttings.

Lower stones are simply classified with Arabic numerals 1 to 3 according to the circumference

of the grinding surface, either circular or oval (Fig. 4).

Type 1 has a circular grinding surface with a partially perforated (blind) eye, whereas the eye of Type 1a is pierced. Type 2 has an oval grinding surface and a blind eye, whereas the eye of 2a is pierced. The cross-section of the grinding surfaces is either flat or slightly convex. A few of the lower stones are very heavy suggesting that they were anchored in a permanent place in the house. If this were the case, they would have been equipped with a permanent flour-catcher, possibly of wood or dried clay. This type of feature has so far never been identified, probably because of its perishable nature. But most lower stones are lighter and probably portable. Type 3, like its upper stone counterpart, is of garnet mica schist and always has a circular, convex grinding surface and totally perforated eye.

This study has identified three different types of driving fittings (Fig. 5). The first is a circular vertical socket, probably pierced with a bow-drill, that held a wooden handle. The second, and most common, is inferred from the absence of handle cuttings and supposes either a rope or a leather strap snugly attached to the girth of the stone fitted with a handle loop. Three stones in the collection have a combination of a vertical socket and a radial slot, indicating more complex handle fittings, attached to the spindle and spanning the radius of the quern. More than one type of fitting could also be indicative of repair.

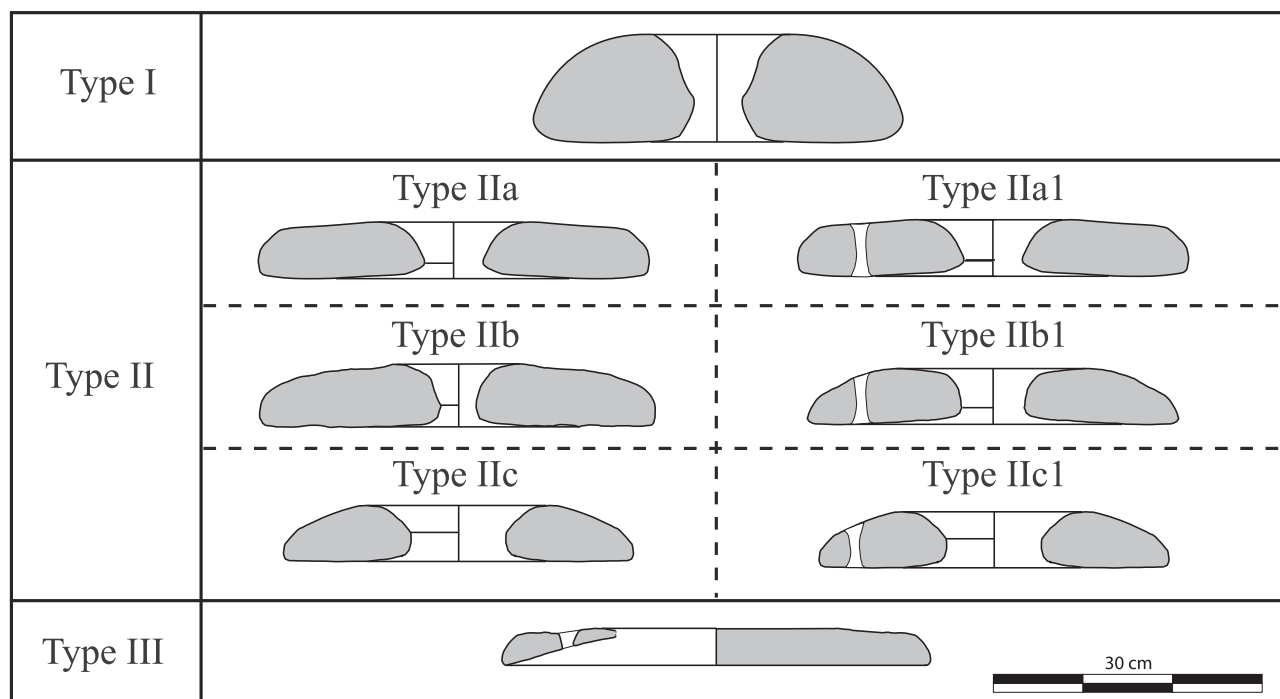


Fig. 3: The classification of the Rogaland rotary quern upper stones. Illustration by T. J. Anderson.

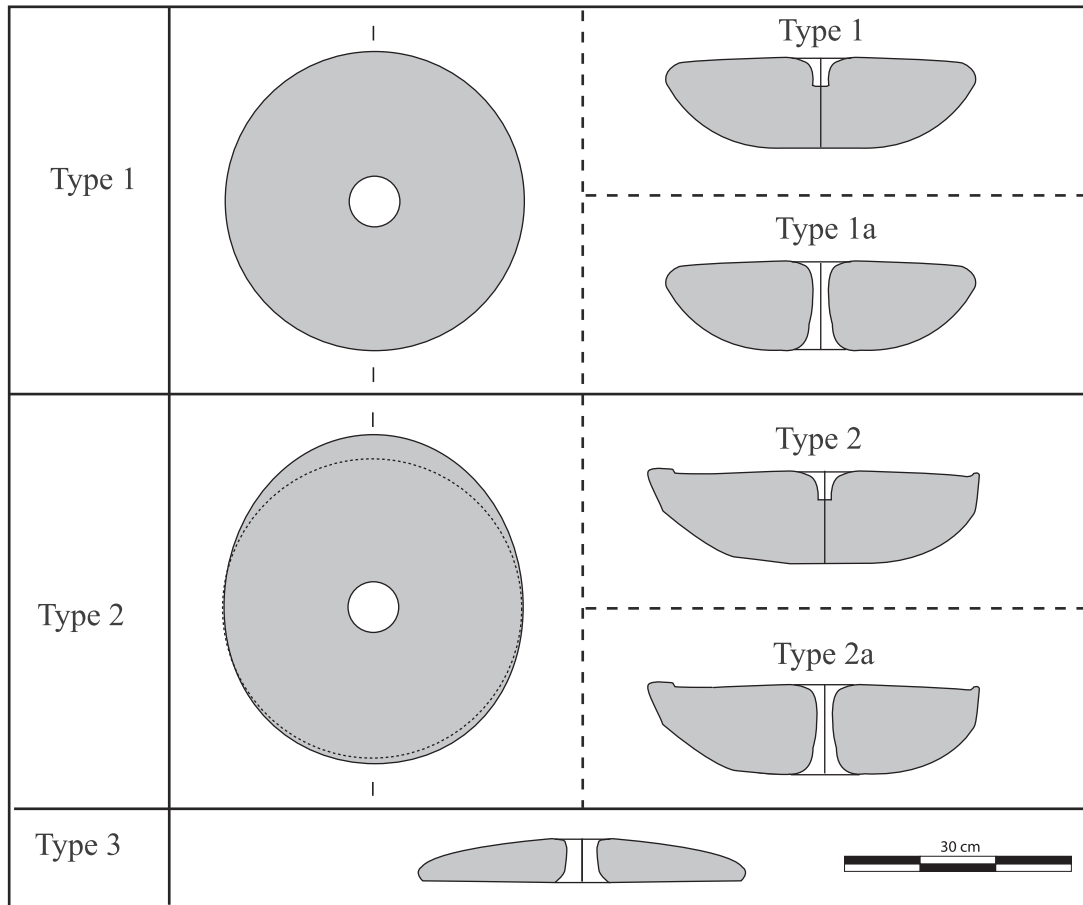


Fig. 4: The classification of the Rogaland lower stones. Illustration by T. J. Anderson.

Raw material and extraction production techniques

The main bedrock outcrops of Rogaland date from the Precambrian period and include gneisses and granites (Fig. 6). These are seconded by vast anorthosite and gabbro complexes in the south-east. Phyllite and mica schists, locally garnetiferous, are found in the Stavanger area and northwards. Gneisses and granites are also contained in the Caledonian thrust nappes overlying phyllites and mica schists. The Jæren lowlands along the western coastline are dominated by extensive Quaternary deposits, in particular moraines rich in erratic blocks deposited by the retreating glacier 12,000 years back. There are still areas that have not been cleared of these blocks, affording the impression of the prehistoric landscape.

Table 1 lists the rock types exploited for the rotary querns in Rogaland. Apart from the garnet mica schists from Hyllestad and Saltdal, all of querns are of local rock types. Mill makers favoured gneiss and mica gneiss, reasonably soft to carve, albeit hard enough to grind grain. Granite, 25% of the lower stones, was also sought, most likely due to its hardness.

Examining two zones, Stavanger in the north and Bjerkreim/Eigersund in the south, more closely

reveals that the material chosen by the mill makers reflects local rock types (Fig. 7). Gneisses and mica gneisses are common in the Stavanger area, whereas granite is more characteristic of the Bjerkreim-Eigersund area (in addition to gabbros, syenites and anorthosites).

Most of the querns were carved from erratic surface blocks or boulders. Some, most often mica gneisses, were cut from slabs formed by natural processes. The “quarry origin aspect” of a few granite and syenite querns (Fig. 8) is difficult to explain as these rocks that do not readily lend themselves to splitting into flat blocks by natural processes such as frost weathering. These do not only have flat upper surfaces and vertical edges, but are almost perfectly circular, which suggests the use of a sort of compass to define their contour.

The idea that certain Norwegian querns as early as the 5th century AD were the products of true extractive quarries (cut from bedrock leaving circular hollows) is controversial. Although there is no evidence of this extractive technique, known since Roman times in Central and Southern Europe, no field work has focused on this question outside the areas dominated by garnet mica schists. This is yet another aspect of Norwegian quern production that merits future research.

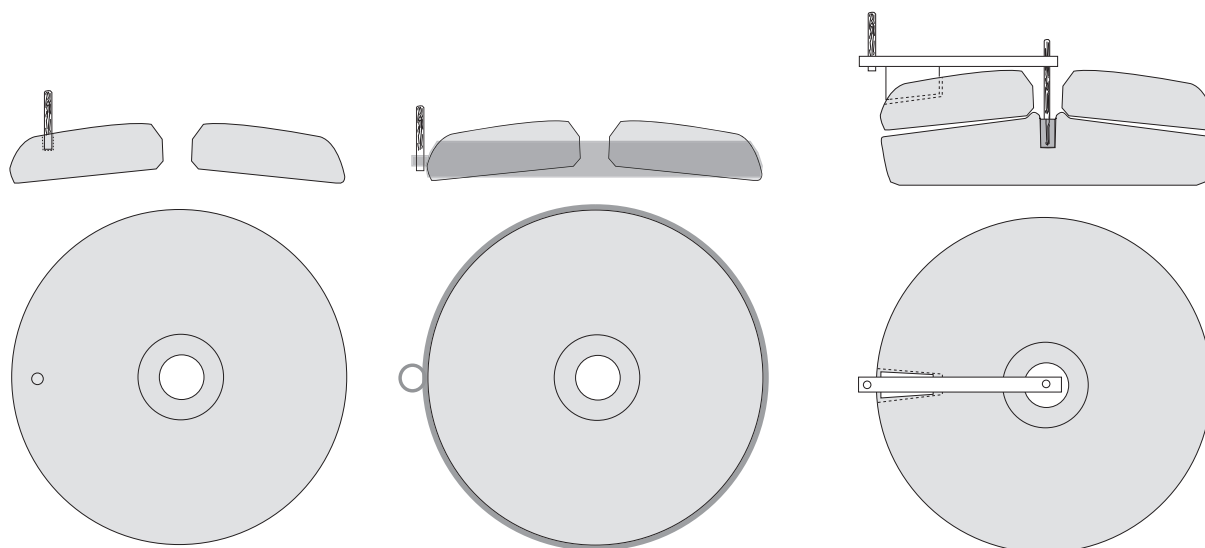


Fig. 5: Schematic representation of the rotary handmill driving fittings. a) vertical handle socket, b) "strap" type handle, c) radial slot handle. Illustration by T. J. Anderson.

Rotary quern chronology

The key site to establish the date of the introduction of the rotary quern in S-W Norway is Forsandmoen (Fig. 1, nos. 69-73). With its 285 buildings spanning 2000 years from c. 1500 BC onwards, it is Norway's only pre-historic site that can be considered a village. It was excavated by means of mechanical topsoil stripping between 1980 and 1990. Subsequent smaller-scale operations took place in 1992, 1994 and 2007 (see Hauken and Anderson 2014: 6). Fig. 9 is a simplified map of the site's southwestern sector, where the querns were brought to light. The assemblage comprises nine fragments from five rotary querns. Since all of the Forsandmoen querns were found in secondary position, their contexts can only serve as terminus ante quem. The calibrated 14C-datings of the features containing the querns are listed in Table 2.

The rotary querns at Forsandmoen include fragments of a Type IIa upper stone in Building XVI A [130-530], as well as one half of a Type I quern was in Building CLVII [210-570] while the other half was in Building CLVIII [130-540]. The quern was probably used as for its original purpose in Building CLVI [80-430]. Building CLV [20-400] provides a terminus post quem for Building CLVI, since the two constructions could not have stood at the same time, as they are far too close to each other.

The oldest rotary quern at Forsandmoen, also the oldest in the Rogaland region, comes from Building X A, dated between 130-390 AD. This find indicates that the introduction of the rotary quern can be pushed back to the mid or late 2nd century AD. This dating coincides with that of the oldest rotary

quern at Vorbasse in Denmark, estimated at 150-180 AD (Bloch Jørgensen 1990, 48). The introduction of the rotary quern, therefore, took place approximately 150 years earlier than previously thought (*cf.* Figs 10 and 11).

The querns in the diachronic charts (Fig. 11) have been arranged according to types, with their estimated time span displayed by means of bold horizontal lines. The chart for the upper stones indicates that the classification also is chronologically relevant. The schema is disturbed, however, by the two Type IIa stones from the Medieval period. These fragmented synite and a gabbroid stones were unearthed in the same building along with a fragment of a garnet mica schist lower stone (Hauken and Anderson: cat. 34-36). Unfortunately, the exact position of the different querns was not recorded; the report simply notes that they were found in different places. Their fragmented state indicates that they were probably in secondary position as building material. Since there is a building dating to the Migration period (400-550 AD) in the vicinity, it is reasonable that they were originally from the Early Iron Age. However, as they are flat, nicely circular and display a 'quarry character', it cannot be ruled out that their shape was influenced by Medieval garnet mica schist querns extracted directly from bedrock. This lacuna related to the typological development of rotary querns will only be resolved when more Rogaland Late Iron Age settlements are explored.

Conclusions

In spite of the many unsolved problems and unanswered questions, significant progress has been

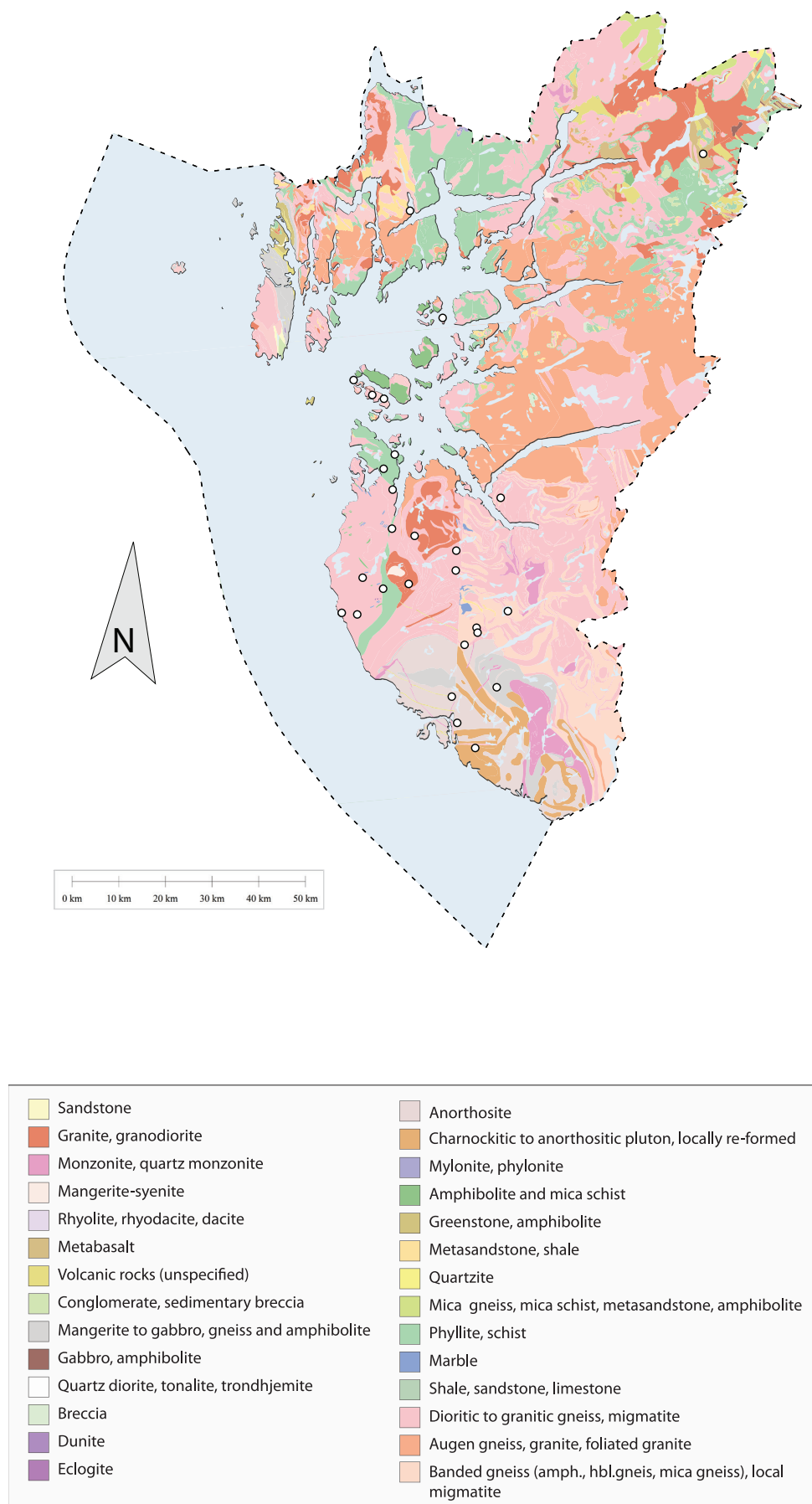


Fig. 6: Geological map of Rogaland. The sites referred to in Hauken and Anderson 2014 are marked with white circles. Map by NGU, adapted by Theo Gil (AM).

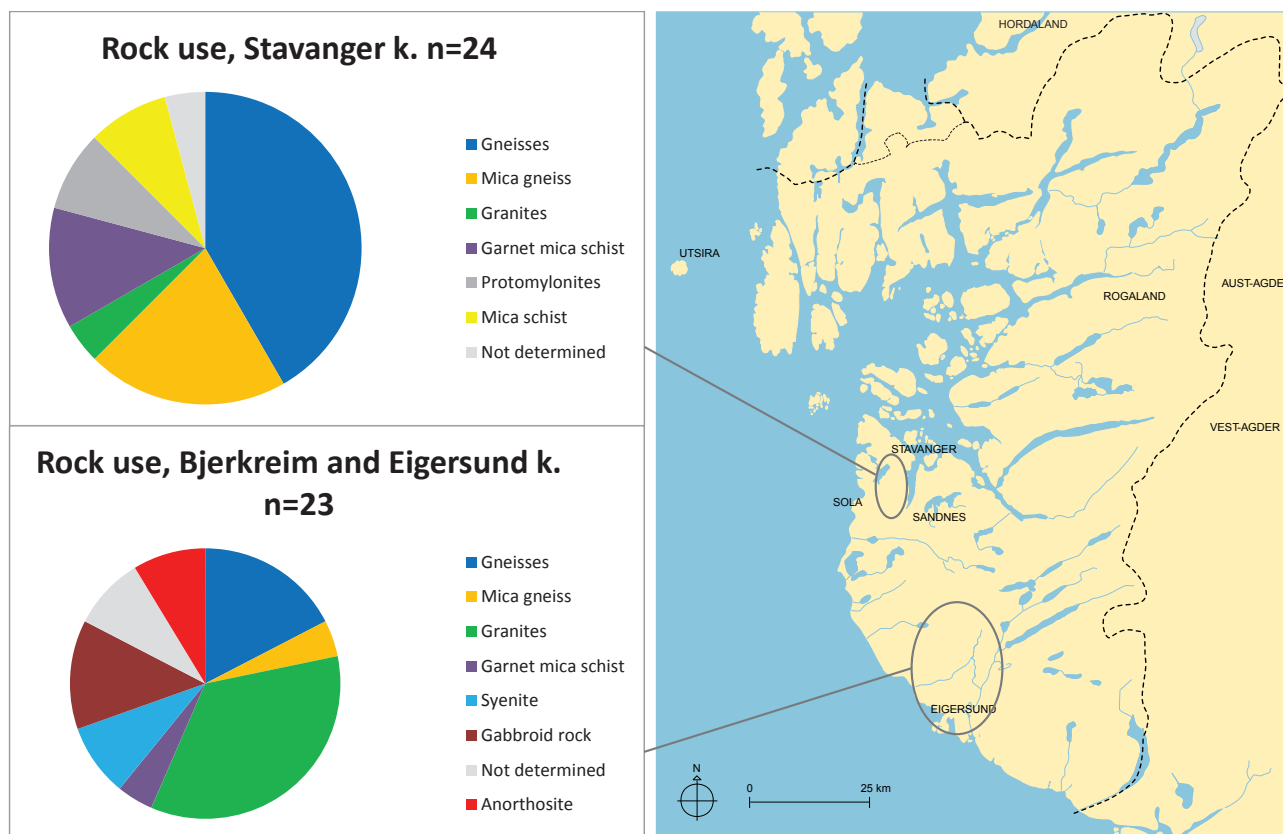


Fig. 7: Pie charts of the types of rocks exploited for rotary querns in the Stavanger and Bjerkreim/Eigersund areas.

made in the framework of the Millstone Landscape Project regarding the earliest rotary querns in S-W Norway. It is now clear that the rotary quern was introduced in the second half of the 2nd century AD, about two centuries earlier than established previously. Furthermore, the rotary quern rapidly replaced the saddle quern as there is no evidence suggesting that saddle querns and rotary querns coincided (Hauken and Anderson 2014: 57). Moreover, a separate study in the framework of the Millstone Project has shown that the introduction of the rotary quern was not related to the adoption of certain cereal crops - specifically the transition from naked to hulled barley - as this change took place much earlier (Prøsch-Danielsen and Soltvedt 2011).

Except for the upper stone Type I, the oldest, the different rotary quern types appear to be contemporary. Type Iic, and possibly Type Iia, appear to carry on into the Late Iron Age and Medieval Period. But this notion merits further research, as the number of excavated settlements in the Rogaland from the Late Iron Age (550-1050) is very limited.

An important technological detail is the introduction of the rynd, as seen by opposite cuttings by the eye on the stone's lower surface. This technological feature, probably introduced during the Viking Period, provided the mill with more stability and the option to regulate the amount of "light" (space) between the upper and lower stones so as to maintain a higher degree of control over

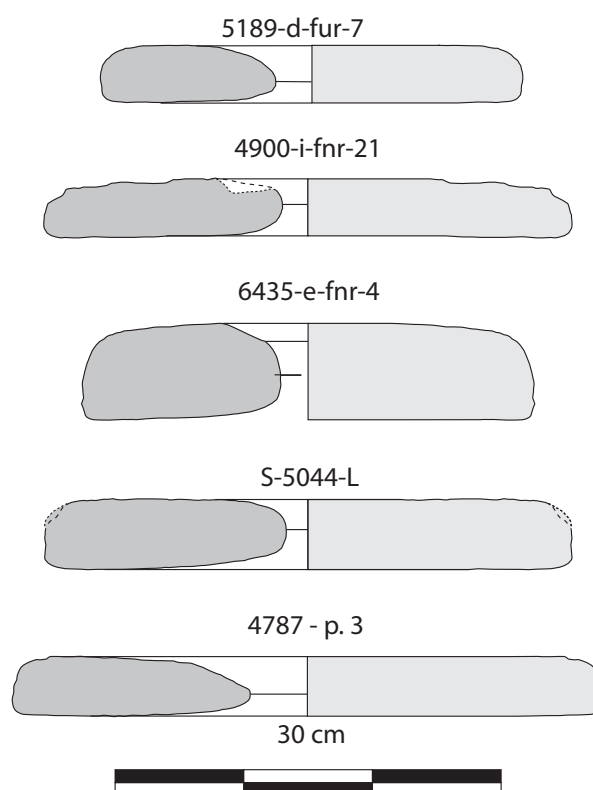


Fig. 8: Quern fragments of granite and syenite with a morphology that suggest a quarry origin.

querns and millstones of volcanic rocks were being traded over long distances as early as Roman times. Garnet mica schists, an exogenous rock exploited in quarry districts such as Hyllestad, only arrived in the Rogaland in Medieval times, after 1050.

Acknowledgments

The petrographic analyses of the querns were undertaken by Gurli Meyer, Tom Heldal and Øystein J. Jansen of the Norwegian Geological Survey (NGU).

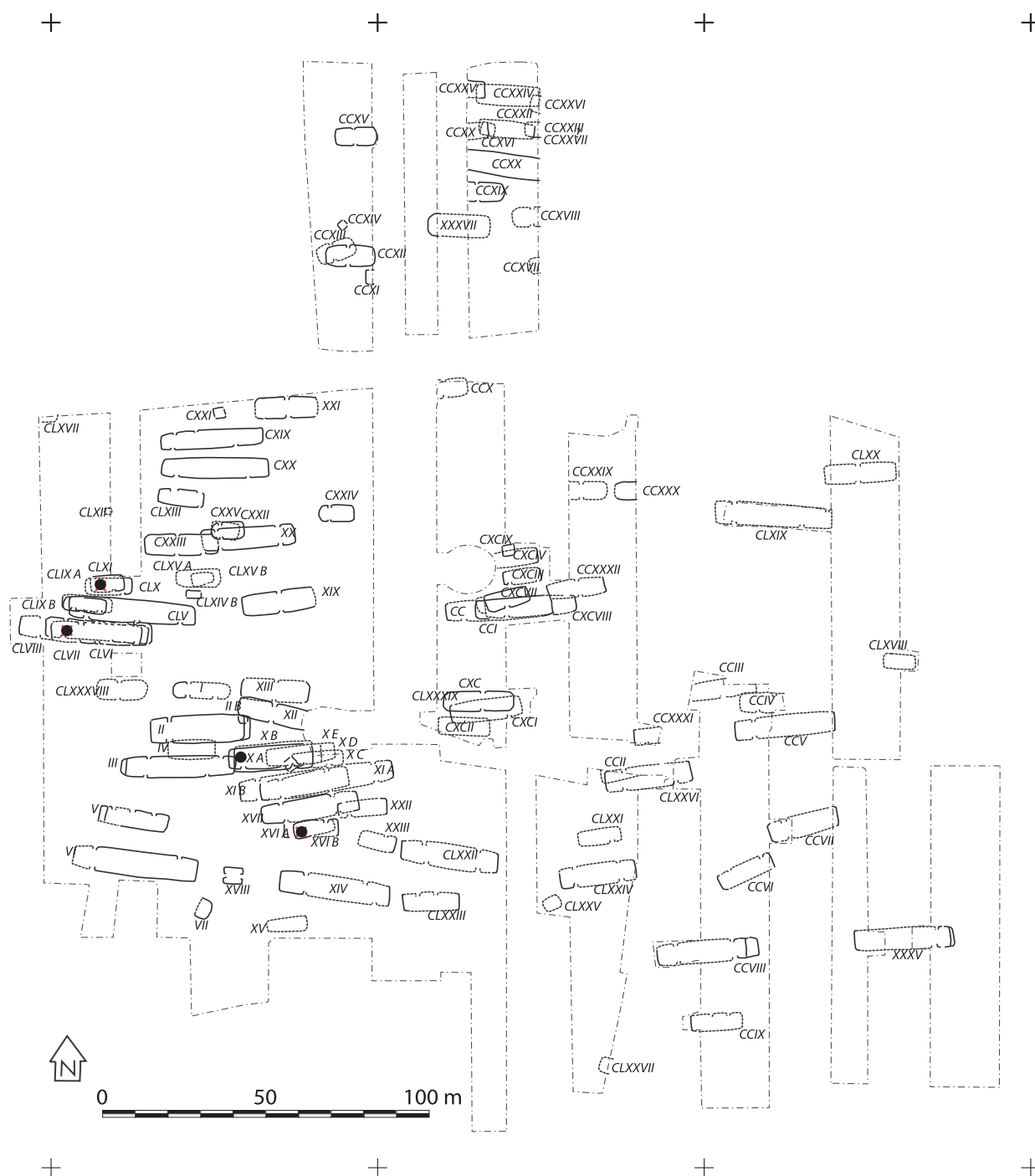


Fig. 9: Simplified map of the south-western sector of the settlement of Forsandmoen. Buildings with quern finds are marked with a circle. Original map by the Forsand project, vectorised by T. J. Anderson.

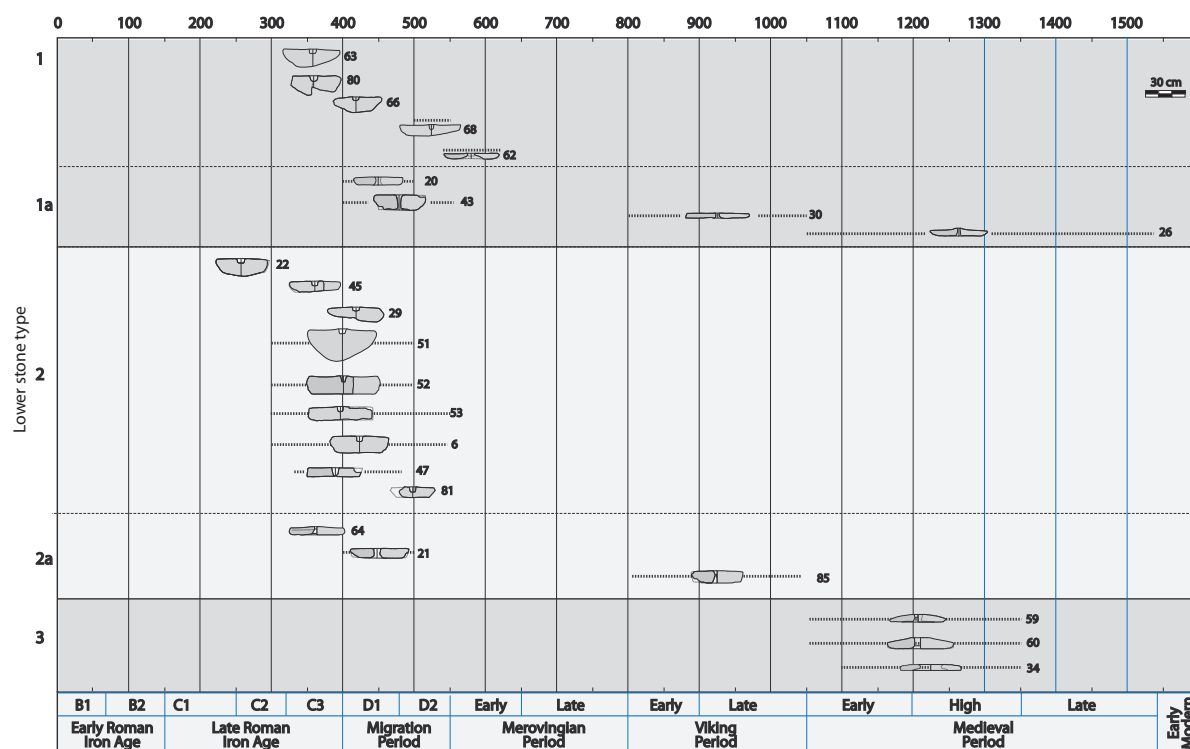


Fig. 10: Diachronic chart of the cross sections of the lower stones from Rogaland arranged by type and chronology. Illustration by T. J. Anderson.

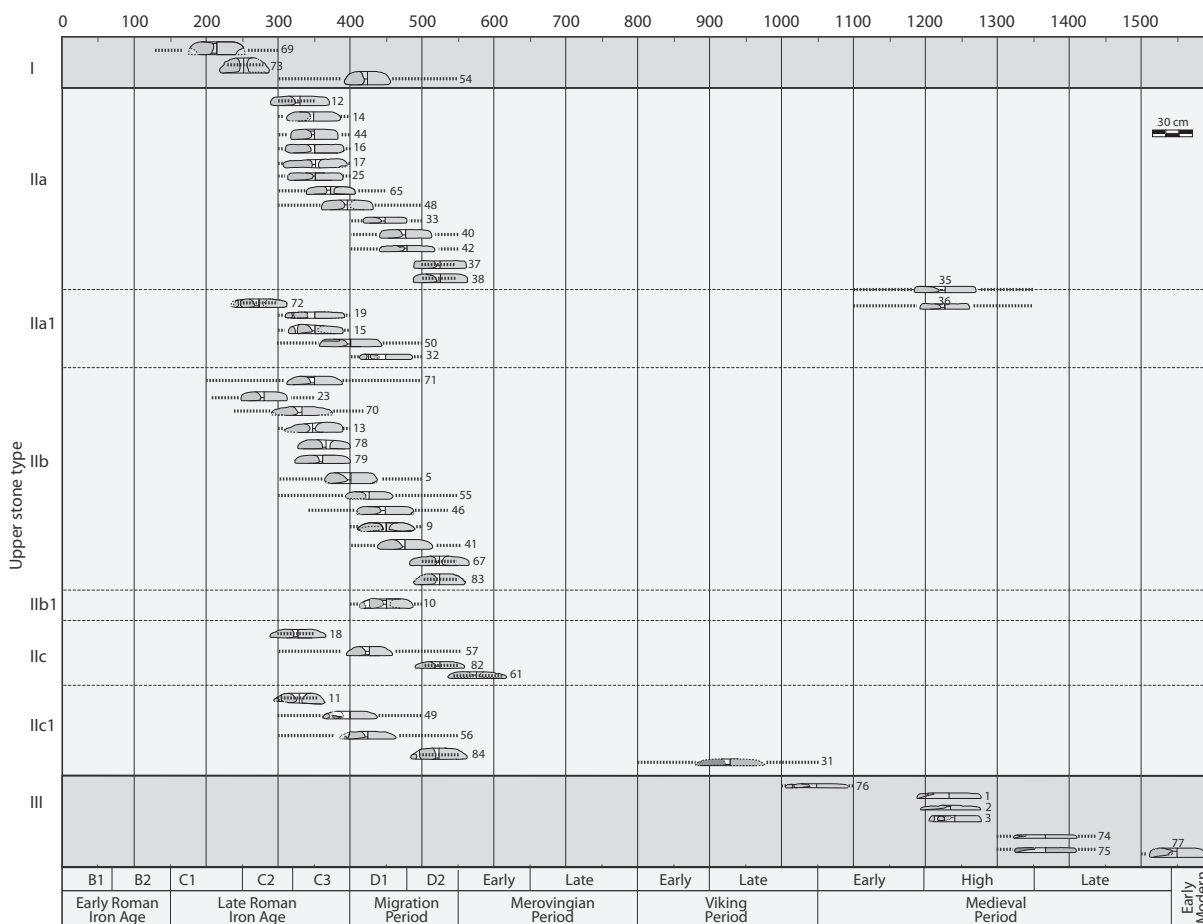


Fig. 11: Diachronic chart of the cross sections of the upper stones from Rogaland arranged by type and chronology. Illustration by T. J. Anderson.

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Table 1. Table of Rogaland querns by rock type and morphology.

Rock type	Number of stones (n)	Types Upper	n	Types Lower	n
Gneiss		I, IIa1, IIb, IIb1	13	1, 2	
Mica gneiss		IIa, IIb, IIc	14	2a	
Granite		IIa, IIb, IIc	6	1, 1a, 2	
Garnet mica schist	11 (3 Hy, 4 Sa)	IIc1, III	8		
Mica schist		IIb, IIc1	2	1, 2	
Augengneiss		IIa, IIb	3		
Gabbro		IIa, IIb, ND	3		
Anorthosite		IIa, IIb	2		
Mica gneiss/schist		I, IIb	2		
Syenite		IIa	2		
Gneiss, granodioritic				1a, 2a	
Granitic protomylonite		Roughout	1		
Granodioritic protomylonite		ND	1		
Gneiss, granitic				1a	
Not determined*		ND, IIa	3		
TOTAL	85		60		24

Table 2. Calibrated 14C-datings (OxCal 3.9) from Forsandmoen.

Lab. ref.	Building	Uncalibrated date BP	Calibrated date AD (2σ)	Calibrated date AD (1σ)
T-5903	Building X a	1760+/-70	80-430	130-390
T-5905	Building XVI a	1710+/-70	130-540	240-420
T-8716	Building CLV	1820+/-80	20-400	80-390
T-8692	Building CLVI	1760+/-70	80-430	130-390
T-8694	Building CLVIII	1705+/-80	130-540	240-430
T- 8714	Building CLVII	1670+/-75	210-570	250-530