

QUARRYING IN WESTERN NORWAY

AN ARCHAEOLOGICAL STUDY OF
PRODUCTION AND DISTRIBUTION IN
THE VIKING PERIOD AND
MIDDLE AGES

Irene Baug

ARCHAEOPRESS ARCHAEOLOGY

ARCHAEOPRESS PUBLISHING LTD

Gordon House
276 Banbury Road
Oxford OX2 7ED

www.archaeopress.com

ISBN 978 1 78491 102 7
ISBN 978 1 78491 103 4 (e-Pdf)

© Archaeopress and I Baug 2015

All rights reserved. No part of this book may be reproduced, stored in retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior written permission of the copyright owners.

Printed in England by Holywell Press, Oxford
This book is available direct from Archaeopress or from our website www.archaeopress.com

Table of Contents

1 Introduction	1
1.1 Scope and objectives	1
1.2 Geological conditions in Hyllestad	3
1.3 Geological conditions in Ølve/Hatlestrand	3
1.4 The investigation areas	5
1.4.1 The Hyllestad quarries	5
1.4.2 The quarries in Ølve/Hatlestrand	7
2 State of Research	10
2.1 Quernstones and millstones within Scandinavian research	10
2.2 Quernstone and millstone research in areas of Western and Central Europe	11
2.3 Bakestones	13
2.4 Different forms of querns and mills	13
2.5 Bakestones and their use	15
2.6 An overall assessment	15
3 Theoretical Perspectives	16
3.1 Social dimensions of production landscapes	17
3.2 Technology	20
3.3 Trade, routes and 'routinisation'	21
3.4 Structural durability and change: which processes define stability and which cause change?	22
3.4.1 Innovation and change in the centre and periphery	23
4 Methodological Approaches	24
4.1 The quarries: definitions	24
4.1.1 Classification of the different quarry types at Hyllestad	24
4.1.2 Classification of different quarry types at Ølve/Hatlestrand	27
4.2 Methodological approaches on the micro level: the archaeological investigations	28
4.2.1 Dating and interpreting material in the trenches and test pits	29
4.3 Methodological approaches at the meso level: retrospective analyses	30
4.4 Methodological approaches on the macro level: provenance studies and distribution	31
5 Archaeological Investigations of Quarries at Hyllestad	33
5.1 Aims and methods	33
5.2 Archaeological investigations at Rønset (no. 71)	35
5.2.1 Rønset trench 4: quarry site for slab production	36
5.2.2 Rønset trench 5: quarry site for quernstone and millstone production	40
5.2.3 The rock shelter at Rønset	44
5.3 Archaeological investigations at Myklebust (no. 79)	48
5.3.1 Myklebust trenches 2-5: some temporal aspects	50
5.3.2 Myklebust trenches 6 and 7: production of quernstones and stone crosses	51
5.4 Archaeological investigations at Sørbo (no. 32)	62
5.4.1 Sørbo trench 1 - quarry with production of quernstones and millstones	62
5.5 Archaeological investigations at Sæsøl (no. 78)	65
5.5.1 Sæsøl trench 7: quarry with production of quernstones	66
5.6 Dating the quarries and their products	69
6 Archaeological Investigations of the Quarries of Ølve and Hatlestrand	75
6.1 Aims and methods	75
6.2 The quarry landscape at Fugleberg (no. 17), Ølve	76
6.3 The quarry landscape at Netteland (no. 29), Hatlestrand	78
6.4 Archaeological investigations at Fugleberg, Bakkhidlaren	79
6.4.1 Fugleberg trench 1	81
6.4.2 Fugleberg trench 2	81
6.4.3 The relationship between Fugleberg trenches 1 and 2	83
6.5 Archaeological investigations at Fuglebergåsen: Fugleberg trench 3	83
6.5.1 Fugleberg trench 3	84
6.6 Archaeological investigations at Fuglebergåsen, Fugleberg trench 4	91
6.6.1 Fugleberg trench 4	92
6.7 Kvitafjell	93
6.7.1 Test pit at Kvitafjell	93
6.7.2 The relationship between Kvitafjell and the Fugleberg quarry site, trench 3	97
6.8 Archaeological investigations at Netteland: Båtahidlaren	97
6.8.1 Netteland trench 1	97
6.9 Dating of quarries and products	101
6.10 Brief comparison of Ølve/Hatlestrand and Hyllestad	104

7 Spatial and Chronological Distribution of Products	105
7.1 Quernstones and millstones from medieval towns in Norway	105
7.1.1. Bergen	105
7.1.2 Borgund	108
7.1.3 Stavanger	108
7.1.4 Oslo	108
7.1.5 Tønsberg	109
7.2 Quernstones from rural sites in western Norway	109
7.3 Quernstones from rural districts of eastern Norway	110
7.4 Wreck cargoes of quernstones and millstones	110
7.5 Distribution of Norwegian quernstones outside of Norway	111
7.5.1 Denmark	111
7.5.2 Northern Germany: Hedeby and Schleswig	113
7.5.3 The North Atlantic region	114
7.6 Spatial and chronological distribution of bakestones	115
7.7 Distribution of stone crosses	116
7.8 The distributed material: an assessment	118
8 Who Controlled the Quarries?	120
8.1 The concepts of ownership	120
8.2 Private land or commons?	121
8.2.1 Quarrying: the documentary sources	122
8.3 Property structure in Hyllestad in the Middle Ages	125
8.4 Viking Age estates in Hyllestad?	132
8.5 Property structure at Ølve and Hatlestrand in the Middle Ages	135
8.6 Quarrying at Ølve and Hatlestrand	139
8.7 Quarry control from the Viking period to the Middle Ages	141
9 Organizing Production	142
9.1 State of control	142
9.1.1 Landowner impact on quarries and products	143
9.2 Professional or seasonal workers?	145
10 Forms of Transaction	147
10.1 A Viking Age trade?	147
10.1.1 Organisation of the Viking Age trade	150
10.2 Medieval trade: changes in forms of transaction?	152
10.2.1 Organisation of Medieval trade	153
10.3 Commissioned products	156
10.4 The medium of exchange	159
10.5 Stability and change in transactions and trade	159
11 Conclusions	161
Bibliography	165
URL (accessed December 2014)	176
Correspondence and personal communication	176

List of Figures

Figure 1.1: Location of the two quarry areas Hyllestad and Ølve/Hatlestrand (Map: Irene Baug, 2013)	1
Figure 1.2: The garnet mica schist from Hyllestad. The dark-red garnets seen are c. 2-5mm in size (Photo: Øystein J. Jansen)	3
Figure 1.3: Location of major quernstone and millstone quarries in Norway (Map: Irene Baug, 2013)	4
Figure 1.4: Fragments of two different bakestones from Bryggen in Bergen (upper: BRM0/50627, dated to AD 1248-1332 by Mygland (2003). lower: BRM0/50119), most likely produced in Ølve/Hatlestrand (10-cm scale) (Photos: Marcin Gladki © Museumsenteret i Hordaland)	4
Figure 1.5: Location of major bakestone quarries (Map: Irene Baug, 2013)	5
Figure 1.6: Identified quarries in Hyllestad. Farm numbers are specified for the farms with quarries within their boundaries (Map: Irene Baug, 2013, Norge Digitalt. FKB-data, 1413 Hyllestad kommune, 32_1413eiendom_flate, 28.02.2009)	6
Figure 1.7: Identified quarries in Ølve and Hatlestrand. Farm numbers are specified for farms with quarries within their boundaries (Map: Irene Baug, 2013, Norge Digitalt FKB-data, 1224 Kvinnherad kommune, 32_1224eiendom_flate 21.11.2007)	8
Figure 2.1: Cross section of a hand quern and terminology related to the different elements	14
Figure 2.2: Left: mill with horizontal waterwheel with vertical axle. Right: mill with vertical water wheel with horizontal axle (Source: Berge 1979:7)	14
Figure 2.3: Complete and unused bakestone found in the quarries in Ølve/Hatlestrand (Photo: Atle Ove Martinussen)	15
Figure 4.1: Products extracted from shallow quarries. The figures show the numbers of quarries based on surface recovery (Heldal and Bloxam 2008: fig. 6-3)	25
Figure 4.2: Schematic figure of the two subtypes of bedrock quarries: shallow and deep (Grenne et al. 2008: fig. 18)	25
Figure 4.3: Products extracted from deep quarries. The figures show the numbers of quarries based on surface recovery (Heldal and Bloxam 2008: fig. 6-7)	26
Figure 4.4: Products extracted from combined shallow and deep quarries. The figures indicate the numbers of quarries based on surface recovery (Heldal and Bloxam 2008: fig. 6-10)	26
Figure 4.5: Different types of hand-worked quarries. (The 72 prospecting quarries are not included.) (Source: Heldal and Bloxam 2008)	27
Figure 4.6: Quarry types identified at Ølve/Hatlestrand	27
Figure 4.7: Explanation of symbols used in the drawings in Chapters 5 and 6	29
Figure 5.1: Map showing the location of the excavations (Map: Irene Baug, 2013, Norge Digitalt. FKB-data, 1413 Hyllestad kommune, 32_1413eiendom_flate, 28.02.2009)	33
Figure 5.2: Distribution of Hyllestad deep quarries. N=45 (Source: Heldal and Bloxam 2008: fig. 6-8)	34
Figure 5.3: Distribution of Hyllestad combination quarries. N=15 (Source: Heldal and Bloxam 2008: 6-11)	34
Figure 5.4: Distribution of Hyllestad shallow quarries. N=129 (Source: Heldal and Bloxam 2008: fig. 6-4)	35
Figure 5.5: Map of the different types of quarries at Rønset (Map: Irene Baug, 2013) (Map data for the Hyllestad quarries from a survey by Tom Heldal, NGU)	36
Figure 5.6: The carved rock wall at Rønset trench 1 (Photo: Kim Söderstrøm and Jørgen Magnus © Riksantikvaren)	37
Figure 5.7: Slab from Rønset trench 4 (Photo: Irene Baug, 2006)	37
Figure 5.8: Quarry with slab extraction (Photo: Irene Baug, 2006)	37
Figure 5.9: Rønset trench 4 during excavation (Photo: Irene Baug, 2006)	38
Figure 5.10: Section of Rønset trench 4 (Drawing: Irene Baug, 2006)	39
Figure 5.11: Multiple plot diagram of C14-analyses from Rønset trench 4	39
Figure 5.12: Path towards Rønset trench 5	40
Figure 5.13: The 6m-high carved rock wall north of Rønset trench 5 (Photo: Irene Baug, 2008)	40
Figure 5.14: Rønset trench 5 during excavation; the stone wall is visible at the southern end (Photo: Irene Baug, 2008)	41
Figure 5.15: Rønset trench 5 wall (Drawing: Anja Sætre/Åsne Helleve, Photo: Irene Baug, 2008)	42
Figure 5.16: Section of Rønset trench 5 (Drawing: Anja Sætre/Åsne Helleve, 2008)	43
Figure 5.17: Multiple plot diagram of C14-analyses from Rønset trench 5	44
Figure 5.18: Fragments of unfinished and broken quernstones and millstones from Rønset trench 5 (Photo: Irene Baug, 2008)	45
Figure 5.19: Rock shelter seen from the north (Photo: Irene Baug, 2009)	45
Figure 5.20: Sketch of the rock shelter (Drawing: Irene Baug, 2009)	46
Figure 5.21: Sections of test pit 1 (Drawing: Irene Baug, 2009)	46
Figure 5.22: Test pit 1: north (left) and south (right) sections (left) (Photo: Irene Baug, 2008)	47
Figure 5.23: Test pit 2 (Drawing: Irene Baug, 2009)	48
Figure 5.24: Multiple plot diagram of C14-analyses from the rock shelter, test pits 1 and 2	49
Figure 5.25: Map of different quarry types at Myklebust (Map: Irene Baug, 2013) (Map-data for Hyllestad quarries from a survey by Tom Heldal, NGU)	49

Figure 5.26: The quarry complex at Myklebust showing the location of trenches 2-5 (Photo: Kim Söderstrøm and Jørgen Magnus©Riksantikvaren)	50
Figure 5.27: Carved rock wall (4.3m long), with signs of slab production, from the eastern end of trench 6 (Photo: Kim Söderstrøm, Jørgen Magnus © Riksantikvaren)	51
Figure 5.28: Carved base of Myklebust trench 6, from the east (Drawing: Irene Baug/Åsne Helleve; photo: Irene Baug, 2008)	52
Figure 5.29: Section of Myklebust trench 6 (Drawing: Irene Baug/Åsne Helleve, 2008)	53
Figure 5.30: Trench 6 during excavation showing quernstones and cross in same deposit (Photo: Irene Baug, 2008)	54
Figure 5.31: Multiple plot diagram of C14-analyses from Myklebust trench 6	55
Figure 5.32: The stone crosses (Photo: Svein Skare, University Museum of Bergen)	56
Figure 5.32: The stone crosses (Photo: Svein Skare, University Museum of Bergen) contd.	57
Figure 5.32: The stone crosses (Photo: Svein Skare, University Museum of Bergen) contd.	58
Figure 5.32: The stone crosses (Photo: Svein Skare, University Museum of Bergen) contd.	59
Figure 5.33: Excavation of Myklebust trench 7 (Photo: Irene Baug, 2008)	60
Figure 5.34: Section of Myklebust trench 7 (Drawing: Irene Baug/Åsne Helleve, 2008)	61
Figure 5.35: Multiple plot diagram of C14 analyses from Myklebust trench 7	61
Figure 5.36: Myklebust trench 7 during excavation (Photo: Irene Baug, 2008)	62
Figure 5.37: Map of quarry types at Sørbø (Map: Irene Baug, 2013) (Map-data for Hyllestad quarries from a survey by Tom Heldal, NGU)	63
Figure 5.38: Section of Sørbø trench 1 (Drawing Irene Baug, 2006)	64
Figure 5.39: Sørbø trench 1 from the north (Photo: Irene Baug, 2006)	64
Figure 5.40: Map of the different quarry types at Sæsøl (Map: Irene Baug, 2013) (Map data for the Hyllestad quarries from a survey by Tom Heldal, NGU)	65
Figure 5.41: Overview of the area around Sæsøl trench 7 (marked with an arrow); taken from the earlier investigated quarry, Sæsøl trench 6 (Photo: Irene Baug, 2008)	66
Figure 5.42: Carved rock with circular quernstone extraction marks (Photo: Irene Baug, 2008)	67
Figure 5.43: Excavation of Sæsøl trench 7 (Photo: Irene Baug, 2008)	68
Figure 5.44: Section of Sæsøl trench 7 (Drawing: Irene Baug/Åsne Helleve, 2008)	68
Figure 5.45: Multiple plot diagram of C14 analyses from Sæsøl trench 7	69
Figure 5.46: Millstone fragment with traces of quernstone carving (Photo: Irene Baug, 2008)	70
Figure 5.47: Overview of production dates based on archaeological investigations	72
Figure 5.48: Multiple plot diagrams of C14-analyses of millstone production at Myklebust (TUa-2512) and Rønset (T-14534)	73
Figure 5.49: Diameters of quernstones and millstones (AD 900-1200) found during excavations.	74
Figure 6.1: Map of excavation locations (Map: Irene Baug, 2013, Norge Digitalt FKB-data, 1224 Kvinnherad commune, 32_1224eiendom_flate 21.11.2007)	75
Figure 6.2: Hedlebergshidlarane (Photo: Irene Baug, 2006)	78
Figure 6.3 (A and B): Upper Areskorshidlarane (Photos: Irene Baug, 2006)	79
Figure 6.4: Pillar separating quarries I and II (Photo: Irene Baug, 2006)	81
Figure 6.5: (A) wedge (23 x 4cm) and (B) scrape found inside the quarry (Photos: Atle Ove Martinussen, 2012)	82
Figure 6.6: Carving traces from the extraction of tiles and slabs, possibly for building stones inside quarry II (Photo: Atle Ove Martinussen, 2012)	83
Figure 6.7: The two large Bakkhidlarane spoil heaps from the south, with heap A in the foreground (Photo: Atle Ove Martinussen, 2012)	84
Figure 6.8: Fugleberg trench 1 (Photo: Irene Baug, 2006)	85
Figure 6.9: Section of Fugleberg trench 1 (Drawing: Irene Baug, 2006)	85
Figure 6.10: Fugleberg trench 2 during excavation, showing production waste: flakes, slabs and bakestone fragments (Photo: Irene Baug, 2006)	86
Figure 6.11: Section of Fugleberg trench 2 (Drawing Irene Baug/Marie Ødegaard, 2006)	86
Figure 6.12: The underground quarry at Fugleberg trench 3 viewed from inside. Production marks of bakestone extraction are visible on the wall to the right (Photo: Atle Ove Martinussen, 2012)	87
Figure 6.13: Traces of bakestone extraction from the underground quarry at Fugleberg trench 3 (Photos: Atle Ove Martinussen, 2012)	88
Figure 6.14: The investigated quarry at Fugleberg trench 3 (Drawing Irene Baug/Øystein J. Jansen, 2006)	89
Figure 6.15 a and b: Fugleberg trench 3 at different stages of excavation. Left (a): unfinished bakestone. Right (b): northern end of the excavated trench (Photos: Irene Baug, 2006)	89
Figure 6.16: Carved rock at the base of the southern part of Fugleberg trench 3, seen from the north (Drawing: Irene Baug/Halldis Hobæk, 2006, photo: Irene Baug)	90
Figure 6.17: Section of Fugleberg trench 3 (Drawing Irene Baug/Halldis Hobæk, 2006)	91
Figure 6.18: Multiple plot diagram of C14-analyses from Fugleberg trench 3	92
Figure 6.19: The ditch and slab covering (Photo: Irene Baug, 2006)	93

Figure 6.20 a-d: Fragments of broken and unfinished bakestones from Fugleberg trench 3 (Photos: Irene Baug, 2006)	94
Figure 6.21: The carved rock at the base of Fugleberg trench 4, seen from the north (Photo and drawing: Irene Baug, 2006)	95
Figure 6.22: Section of Fugleberg trench 4 (Drawing Irene Baug, 2006)	96
Figure 6.23: The Kvitafjell workplace seen from the north (Photo: Irene Baug, 2006)	96
Figure 6.24: Sketch of the Kvitafjell overhang (Drawing: Irene Baug/Halldis Hobæk, 2006)	97
Figure 6.25: Section of the Kvitafjell test pit (Drawing Irene Baug/Halldis Hobæk, 2006)	98
Figure 6.26: Multiple plot diagram of C14-analyses from the Kvitafjell test pit	98
Figure 6.27 a and b: Flakes and bakestone fragments from layer 4 (Photos: Irene Baug, 2006)	99
Figure 6.28: Profile of the Kvitafjell test pit, with an unfinished bakestone at the base (Photo: Irene Baug, 2006)	99
Figure 6.29 a and b: Bakestone fragments showing different grooving patterns. Both fragments are less than 20cm in diameter (Photos: Irene Baug, 2006)	99
Figure 6.30: The underground quarry, Båtahidlaren (Photo: Atle Ove Martinussen, 2012)	100
Figure 6.31: Straight rock wall, probably the result of building stone extraction (Photo: Irene Baug, 2006)	101
Figure 6.32: Netteland trench 1. The entrance to the underground quarry can be seen in the upper left corner (Photo: Irene Baug, 2006)	101
Figure 6.33: Section of Netteland trench 1 (Drawing Irene Baug/Camilla Jacobsen, 2006)	103
Figure 6.34: Multiple plot diagram of C14-analyses from Netteland trench 1	103
Figure 7.1: Location of sites with finds of quernstones and millstones in Bergen. The socio-economic zones are indicated by light grey lines (Map based on Mygland 2007:14)	106
Figure 7.2: The Bryggen fire-layer chronology (Source: Herteig 1990:12, with corrections for the year of fire VIII)	107
Figure 7.3: Quantities of used and unused stones from Bergen	108
Figure 7.4: Quantities of used and unused stones from Oslo	109
Figure 7.5: Quantities of used and unused stones from Tønsberg	110
Figure 7.6: Wreck cargoes with quernstones and millstones from Hyllestad (Map: Irene Baug, 2013)	111
Figure 7.7: A small cargo with quernstones (32) and millstones (8) from Hyllestad, found at Rossodden (Gulen, Sogn og Fjordane). The millstones measure 1m in diameter and the quernstones c. 40cm in diameter (Photo: Atle Ove Martinussen)	112
Figure 7.8: Distribution map of quernstones from Hyllestad. Black dots indicate finds of Hyllestad stones. In Norway only finds from medieval towns are indicated (Map: Irene Baug, 2013)	115
Figure 7.9: Garnet mica schist crosses, most likely from Hyllestad, where several crosses occur at the same site. The quantities of crosses are indicated on the map (Map: Irene Baug, 2013)	117
Figure 8.1: Map of the medieval ownership structure in the parishes of Øn and Hyllestad - also including two farms within the parish of Bø (nos. 81 and 88) mentioned in the text. Farms owned by the King are marked with a K (Map: Irene Baug, 2013, Norge Digitalt. FKB-data, 1413 Hyllestad kommune, 32_1413eiendom_flate, 28.02.2009)	127
Figure 8.2: Map of the Munkeliv estate at Hyllestad. Farms shown in green are mentioned in the cadastre of 1175; farms shown in pink are recorded in cadastres of the 1400s. Farms partly owned by the monastery are shown in dark pink. Farms said to have been donated by king Magnus Håkonsson are marked K (Map: Irene Baug, 2013, Norge Digitalt. FKB-data, 1413 Hyllestad kommune, 32_1413eiendom_flate, 28.02.2009)	128
Figure 8.3: Map of the inlet to Åfjorden (Map: Irene Baug, 2013)	132
Figure 8.4: Map showing all identified burials and the medieval churches in the parishes of Øn, Hyllestad and Bø (Based on Fett 1954; Fasteland 1983 and https://askeladden.ra.no). As exact coordinates for many of the structures are lacking, the symbols give only an approximate location within the farms (Map: Irene Baug, 2013, Norge Digitalt. FKB-data, 1413 Hyllestad kommune, 32_1413eiendom_flate, 28.02.2009)	133
Figure 8.5: Map of the medieval ownership structure in the parishes of Ølve and Hatlestrand. The farm owned by the king is marked K (Map: Irene Baug, 2013, Norge Digitalt FKB-data, 1224 Kvinnherad commune, 32_1224eiendom_flate 21.11.2007)	136
Figure 8.6: Map with all identified burials in Ølve and Hatlestrand (Source: Fett 1956; E. Fett 1972; Iversen 1999:34 and https://askeladden.ra.no). As exact coordinates for many of the structures are lacking, the symbols give only an approximate location within the farms (Map: Irene Baug, 2013, Norge Digitalt FKB-data, 1224 Kvinnherad commune, 32_1224eiendom_flate 21.11.2007)	139
Figure 8.7: Overview of Kvinnherad showing the locations of farms mentioned in the text (Map: Irene Baug, 2013, Norge Digitalt FKB-data, 1224 Kvinnherad commune, 32_1224eiendom_flate 21.11.2007)	140
Figure 10.1: Quernstone regions in southern Scandinavia: (I) garnet mica schist from Hyllestad; (II) Mayen Lava from Rhineland in Germany; (III) schistose sandstone from Malung in Sweden; and (IV) gneiss from Lugnås in Sweden (Carelli and Kresten 1997: fig. 18).	149
Figure 10.2: The c. 4m freestanding cross at Korssund, Fjaler (Sogn og Fjordane). From its location along the sea route, it has been suggested that it acted as an aid to navigation (Gabrielsen 2007:196). The stone for the cross comes from Hyllestad (Photo: Astrid Waage, 2013)	156
Figure 10.3: Two medieval churchyard crosses in Hyllestad (Photo: Irene Baug, 2011)	157
Figure 10.4: Grave crosses from Skåla church produced in Ølve/Hatlestrand (Photo: Irene Baug, 2006)	158

List of Tables

Table 5.1: C14-analyses from Rønset trench 4	39
Table 5.2: C14-analyses from Rønset trench 5	43
Table 5.3: C14-analyses from the rock-shelter and test pits 1 and 2	48
Table 5.4: C14-analyses from Myklebust trench 6	54
Table 5.5: C14-analyses from Myklebust trench 7	60
Table 5.6: C14-analyses from Sæsøl trench 7	69
Table 5.7: C14-analyses from Rønset trenches 4-5 and the rock shelter test pits 1-2	71
Table 5.8: C14-analyses from Myklebust trenches 4-7	71
Table 5.9: C14-analyses from Sæsøl trench 7	71
Table 5.10: Sizes of quernstones and millstones found during excavations at Hyllestad	74
Table 6.1: C14-analyses from Fugleberg trench 3	88
Table 6.2: C14-analyses from the Kvitafjell test pit	95
Table 6.3: C14-analyses from Netteland trench 1	101
Table 6.4: C14-analyses from Fugleberg trench 3 and the Kvitafjell test pit	102
Table 6.5: C14-analyses from Netteland trench 1, Båtahlaren	102
Table 6.6: Sizes of quarries investigated	104
Table 8.1: Medieval ownership structure at Hyllestad	126
Table 8.2: Medieval ownership structure at the quarry landscapes of Ølve and Hatlestrand	135

Acknowledgments

This study has been financed by a scholarship from the Faculty of Humanities at the University of Bergen.

Several people have contributed to this work, first and foremost my supervisor Professor Ingvild Øye, who from the first scholarship application to the present volume has supported and contributed to my project. Ingvild's efficiency and professionalism is admirable, and her many hours of reading and commenting on my drafts (workdays, weekends and holidays) have been of the greatest importance. Thank you so much!

I am also grateful to the interdisciplinary project 'The Norwegian Millstone Landscape' (2009-2012) and to project manager Gurli Meyer and her colleagues, Tom Heldal and Tor Grenne, for allowing me to connect my studies to the project; this made an investigation of the distribution of the Hyllestad stones possible. Special gratitude goes to 'my' geologist Øystein J. Jansen for patiently sharing his knowledge in geology, and for being a good colleague and friend on our research trips and many hours spent studying museum assemblages, as well as for his contribution during my excavations in Ølve and Hatlestrand.

Grants from the Melzer Foundation and from the Faculty of Humanities enabled me to carry out the excavations in Hyllestad and Ølve/Hatlestrand. Several students voluntarily helped during the excavations: Halldis Hobæk, Anja Sætre, Marie Ødegaard, Camilla Jacobsen, Glenn Heine Orkelbog, Henriette Børslid Hop, Silje Foyn, Tina Granados, Åsne Helleve, and Kristoffer Nerhus. Thank you so much to you all! In addition Kristoffer Nerhus, Knut Johan Nerhus, Gunnar Nygård, and Audun Oppedal contributed greatly with their local knowledge of the quarry sites and surrounding areas. Kristoffer Nerhus and Knut Johan Nerhus were also of great help during the identification and mapping of quarries in Ølve/Hatlestrand. Special thanks also go to Atle Ove Martinussen for support and help during my identification and mapping of quarries in Ølve and Hatlestrand.

I would also like to extend special thanks to Arne Solli, who, time and again, patiently helped and answered my many questions concerning GIS and maps.

I am grateful to Helge Askvik and Morgan Ganerød for their help with dating the whetstones found together in cargoes with quernstones and millstones. Arild Marøy Hansen was generous in providing information on cargoes and allowing me to take samples from whetstones.

Thanks are also due to Torbjørn Løland and Astrid Waage at the Norwegian Millstone Centre for many fruitful discussions and cooperation.

Several other colleagues have helped contribute to a pleasant working environment for which I am most grateful. Special gratitude must go to my friends and colleagues at Bryggens Museum, where I have carried out my daily work. I would also like to express my thanks to my present and previous fellow PhD students at Bryggens Museum: Sigrid Samset Mygland, Janicke Larsen and Ole-Magne Nøttveit, and to Associate Professors Gitte Hansen and Alf Tore Hommedal at Bergen University Museum.

Justine Parer (Australia) and Gloria Thomas (England) proofread the preliminary manuscript and I thank them for their help.

Working on a research project sometimes makes for logistical problems at home. A big thank-you therefore goes to my parents for taking care of my children when workdays suddenly became too long and too busy.

Finally, my largest debt of gratitude goes to my husband Per Terje and our two sons Arin and Tristan. Per Terje - thanks for your help during the excavations, and for taking good care of the boys in those periods when I was stuck in quarries or my office! Thank you for all your support and for giving me the time needed to finish this study. And to our two fantastic boys, Arin and Tristan: thank you for just being there and reminding me of what is important in life.

This present work is based on research defended for my PhD on 11 October 2013. Professor Dagfinn Skre, University of Oslo (Norway) and Professor Eva Svensson, Karlstad University (Sweden) were opponents. I thank them for their comments and for many interesting discussions. The thesis was first published in 2013 and minor alterations have been made to this present edition. Proofreading and layout work for this edition has been financially supported by the Department of Archaeology, History, Cultural Studies and Religion, University of Bergen.

Bergen, October 2014

Irene Baug

1 Introduction

Over large swathes of history, grain and grain products have been an indispensable source of food, with bread and porridge as vital elements in diets. In the Middle Ages up to 80 per cent of consumption could derive from grain and grain products (Øye 2002:323). To make grain digestible, it had, however, to be crushed. Consequently, querns and quernstones, along with bakestones, flat stones used for baking bread over fireplaces, have played an important role in both prehistoric and historic households. The demand for these tools eventually formed the basis for large-scale production, which is the theme of this study.

The production of quernstones, millstones and bakestones is only rarely referred to in medieval sources, and until recently has gained little scholarly attention. The aim of this study is to illuminate different aspects related to the quarrying of these products, such as extent, age, distribution and the organisation of production and export of these objects. The study is based on analyses of two different quarry landscapes in western Norway: Hyllestad and Ølve and Hatlestrand in the counties of Sogn og Fjordane and Hordaland (Fig. 1.1). The areas are comprised of different geological resources making it possible to extract these products.

The Hyllestad quarries with their products gain the main focus. Besides quernstones and millstones the products included stone crosses, grave slabs, vessels and smoke-vent stones. In Ølve and Hatlestrand tiles and building stones, as well as a few crosses, were extracted in addition to bakestones. In this project, the production and distribution of bakestones are emphasized. I have earlier (in my Master's thesis on the quarries in Hyllestad from 2001, published 2002) investigated four smaller areas. This study represented the first archaeological investigation into quernstone and millstone quarries in Scandinavia, and the first step towards knowledge of these quarries and this type of quarrying (Baug 2002). In this new project I follow up issues from my previous study, while additionally expanding the research area, as well as the objectives.

1.1 Scope and objectives

Several different but interrelated aspects of quarrying are central to this study. An important goal is to achieve a clearer understanding of the quarries as parts of comprehensive and integrated systems on many levels, technologically, economically, socially and culturally. A particular objective is to gain an insight into the production, transportation, trade and exchange, as well as the organisation of these activities, both locally and regionally. The study therefore has a multi-scale approach, where the quarries and productions are studied on a micro

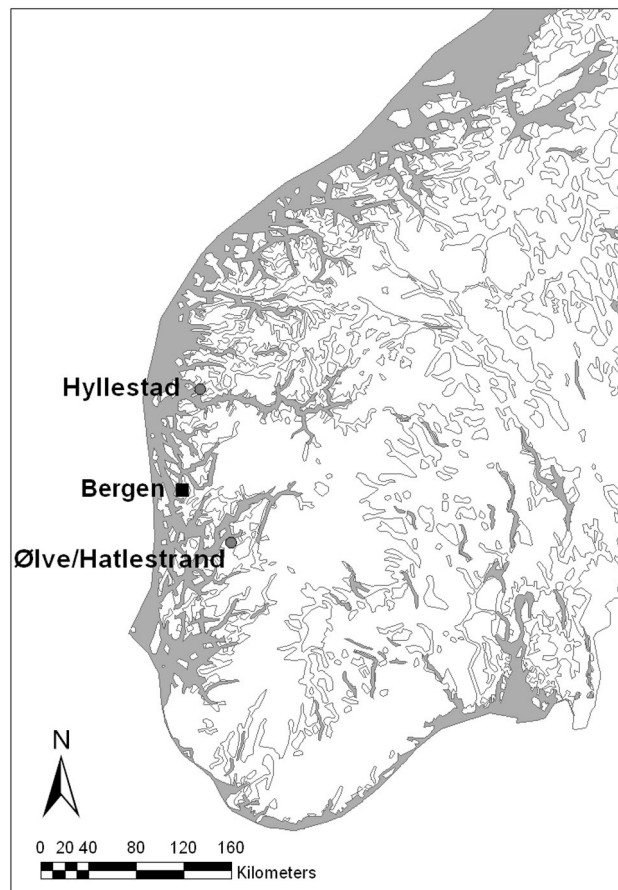


FIGURE 1.1: LOCATION OF THE TWO QUARRY AREAS HYLLESTAD AND ØLVE/HATLESTRAND (MAP: IRENE BAUG, 2013)

level in relation to the wider local communities on the 'meso' level, and related to issues such as control and rights of use, as well as provenance studies and distribution in a wider geographical context - the macro level.

For Hyllestad a larger area has been investigated than in previous research; furthermore quarries both in the central and peripheral parts of the production landscape are taken into account. Additionally, it has been important to incorporate different quarry types based on different technologies, and extraction of different product types from those investigated before. I also look more closely at the societal contexts of both production and distribution of the objects through time. Incorporating new types of production site, such as the quarries in Ølve and Hatlestrand, represents a new empirical basis for the study of quarrying, with regard to production, distribution and the organisation of these activities. The production sites for bakestones are different and smaller in extent and production, as well as distribution, is generally less studied. A special challenge

has been therefore to upgrade the empirical knowledge basis for both production and distribution, and to widen the perspectives. A comparison of the two different quarry landscapes, their products and geographical distribution may also open up a better understanding of trade, networks and actors involved on a broader basis. Seen together, the two quarry landscapes may illuminate the exploitation of different resources across a wider regional perspective.

Important issues to be assessed are socio-political conditions related to the exploitation of these resources, such as control of land and use rights related to production, as well as aspects concerning specialisation and professionalization. The two production areas represent two specialized quarry types, both with a limited range of products that seem to have been exported across shorter and longer distances. The productions most likely represented an important income for the people in control. Incorporating two different production areas, the analysis makes it possible to compare the two types of extraction and see to what extent they differ or concur in time, methods and organisation. A research question to consider, therefore, is: To what extent do the quarries indicate economic specialisation with activities controlled and organized by elites, or were they in the hands of local farmers on a seasonal basis? To what degree do the quarries indirectly reflect power and wealth?

I have earlier shown that the extensive production landscape in Hyllestad was located within several farms that were parts of larger medieval ecclesiastical estates. The estate structure may date to the Viking period, and should most likely be seen in connection with production (Baug 2002:90-105). Is it possible to trace similar conditions in Ølve and Hatlestrand? Other interesting questions concern the workers. Who worked in the quarries, and was the production based on seasonal activity carried out by the farmers, or people in the farmers' households, or by specialists?

The changing political, socio-economical and ideological conditions in the Viking period and Middle Ages are relevant when assessing production and resource exploitation. An important issue is related to what degree external conditions outside the local communities affected the exploitation and product types. The long-time perspective from the early Viking period into the early modern period makes it possible to illuminate stability or changes through time related to production processes and product types, as well as trade and exchange. The transition from the Viking period to the Middle Ages was characterized by far reaching changes, from more loosely organized provinces on a regional level to a more centralized kingdom, and with market-oriented trade run through towns. New institutions, churches and monasteries, were established, and trades and crafts professionalized. How did these changes affect the production of these products?

An important precondition for studying the quarries over a long-term perspective is to be able to date production,

from beginning to end. When were the different areas used? Dating the extraction and products from different sites within the two quarry landscapes forms an essential part of the project, involving selected archaeological investigations within the two production areas. This has been necessary in order to assess the extent and time of the activity, and to place the production in societal contexts. The extent of the production landscapes, as well as the distribution of products, made it, however, difficult to cover all aspects and issues within the parameters of this project. A selection of quarries, product types and distribution areas has therefore been necessary. Do different quarry types represent different periods of production? To what degree were practical and functional aspects decisive for their location? And to what degree did socio-political aspects, such as property structure and control of land, have an influence on the location? Another central issue concerns how technological changes and possible innovations affected the range of products and distribution. The work also involves methodological challenges, as quarries represent a field that has rarely been investigated archaeologically. It was considered important to study the quarries and production without including large and destructive methods in the cultural landscapes. An important problem to come to grips with, relates to dating connected with this type of landscape.

Technological choices may involve more than the choice of carving techniques and tools. One of the aims of this study is to look into the technological know-how and organisation of the people who were directly or indirectly involved in the different production processes, including possible external entrepreneurs and actors who may have organized and also commissioned production of special products. Another important interconnected question concerns how the social and political situation in the Viking period and Middle Ages affected technology, and to what degree local agents or non-local elites affected the work and organisation in the quarries.

As for the distribution of products, it is necessary to identify and map their distribution both spatially, in larger geographical contexts, and chronologically. Do the products represent traded commodities or distribution through other means of transfer? What markets can be traced for the two production areas? Are there similarities or differences with regard to markets, transaction forms and possible trade networks for the two production areas and products produced?

During the last decade a renewed interest in production sites for quernstones and millstones can be seen, not least through the interdisciplinary project 'The Norwegian Millstone Landscape' -hereafter referred to as the Millstone project. It was funded by the Norwegian Research Council 2009-2012, and integrated the disciplines of geology, archaeology, history and cultural geography (www.millstone.no); my study has been connected to this project in the final stage.

This has made it possible to investigate the distribution of quernstones and millstones more thoroughly, based on

larger samples of materials within a wider geographical setting than would have been possible within the resources of a single project alone.

1.2 Geological conditions in Hyllestad

Stones suitable for grinding should not be too hard or too soft, and toughness and durability are important qualities. Both quernstones and millstones should have surface textures that neither became totally smooth, nor highly polished with use, which would result in gritty or discoloured flour, and would be too readily worn away or broken down. The quality of the stone was therefore dependent on their ability to maintain good grinding properties without frequent roughening of the grinding surfaces. In practice, a wide variety of rock types have been used for making both quernstones and millstones, but some were preferred to others and had higher value (Watts 2002:29). This is the case for the rock type in the Hyllestad quarries.

The geological condition for the production in Hyllestad was a specific variety of the rock type garnet mica schist. However, the mica schist in Hyllestad shows variations, and subtypes suitable for quernstones and millstones are recorded on the northern and eastern sides of the Åfjorden (Heldal and Bloxam 2008:15, 23; Grenne *et al.* 2008: 51). It was the combination of the soft schist together with the hard garnets that made the stone suitable for grinding. The hard garnets were worn down more slowly than the soft schist, meaning that the milling surface would remain a somewhat rougher surface for a longer period of use (Liebgott 1989:46; Carelli and Kresten 1997:115). At the same time the soft schist made it suitable and relatively easy to carve (Fig. 1.2).

The rock type targeted for quarrying in Hyllestad comprises coarse-grained aggregates of muscovite alternating with quartz-rich laminae, and with a varying amount of garnets and kyanite. The garnets also vary in size, and the extraction shows a preference for mica schist with garnets of 2-7 mm. There are instances of quarrying being ended when it reached garnet poor zones or zones where the garnets were too big. The presence of kyanite has generally been considered an identifying feature of Hyllestad stones. Variations in kyanite do not seem to have had an apparent value in terms of production (Grenne *et al.* 2008:51-52; Heldal and Bloxam 2008:15). The mica also varies in extent and texture, and two types of mica schist suitable for production are recognized. The most common form is a frequent occurrence of coarse aggregates of light mica, giving a characteristic silvery surface. This subtype was used when the products were carved directly from the bedrock. A second type consists of coarse-grained mica in more isolated corns. This type is also more quartz-rich, making the rock harder to carve, and it seems to have been exploited only in later periods when explosives were adopted (Grenne *et al.* 2008:52; Heldal and Bloxam 2008:15, 23).



FIGURE 1.2: THE GARNET MICA SCHIST FROM HYLLESTAD. THE DARK-RED GARNETS SEEN ARE C. 2-5MM IN SIZE (PHOTO: ØYSTEIN J. JANSEN)

Several quarries for extraction of querns and millstone are known in Norway. Characteristic of nearly all the Norwegian quarries is the exploitation of mica schist, however, with local variations. Five of the quarry areas, Hyllestad, Vågå, Selbu, Brønnøy, and Saltdal are larger than the others and thus considered particularly important production sites (Grenne *et al.* 2008:48; Fig. 1.3).

The geological survey of Norwegian quarries carried out within the Millstone project has made it possible to distinguish the rock type in Hyllestad in relation to the other quarries, and thus recognize the products from Hyllestad recovered within different archaeological contexts in Northern Europe. The rock type in the Hyllestad quarries is relatively easily identified, but in some cases more thorough geological analyses are necessary. Smaller geological differences, such as the size of the garnets, may also occur within one single quarry, making it difficult to trace the products back to the exact quarry where they were produced.

1.3 Geological conditions in Ølve/Hatlestrand

Rock types required for bakestones had to contain elements of soapstone, also referred to as steatite, making it possible to repeatedly heat and cool the objects without an imminent risk of fracturing. The geological precondition for the production of bakestones in the Ølve/Hatlestrand

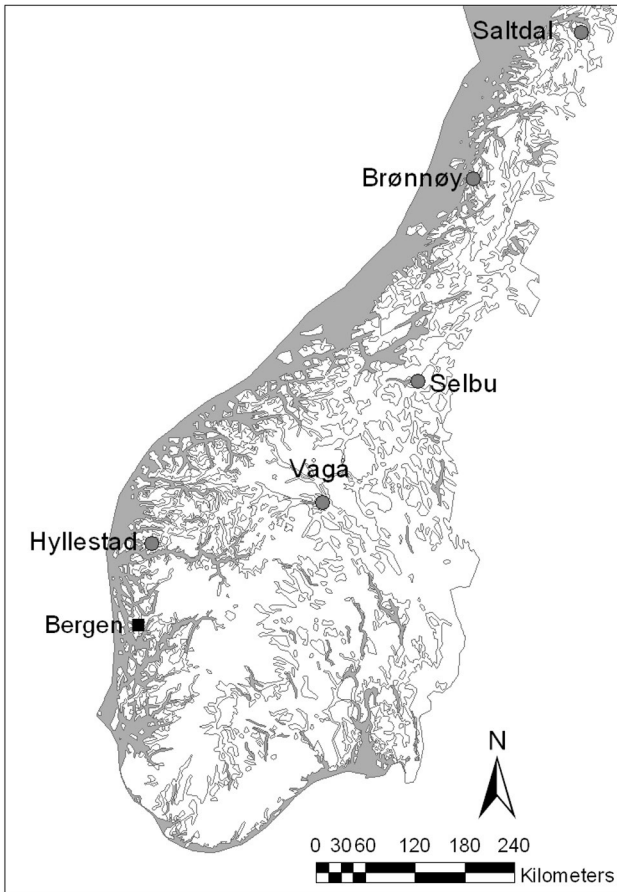


FIGURE 1.3: LOCATION OF MAJOR QUERNSTONE AND MILLSTONE QUARRIES IN NORWAY (MAP: IRENE BAUG, 2013)

area has been a chlorite-rich talc-bearing green schist with some variation in the amounts of the different minerals (Fig. 1.4). The rock type has been referred to as schistose soapstone (Naterstad 1984), but the content of ‘soapstone’, that is the mineral talc, is not thought sufficiently high to justify the term soapstone (Jansen 2013:77). The term Ølve/Hatlestrand is mostly used when referring to the bakestone quarries in this area, as, in most cases, there is no need to distinguishing between the two communities.

The rock used for extracting bakestones is located in a certain zone of a larger greenstone complex, situated on the southern and eastern side of Lake Kvitebergsvatnet, as well as on the western side of the Kvinnheradsfjorden, a section of the Hardangerfjorden. Due to the content of talc, the rock is somewhat similar to soapstone but has a larger degree of schistosity, making it more suitable for the production of bakestones than soapstone vessels. The rock in the quarries is at the same time nearly lacking in the minerals quartz and feldspar that are common in the more normal greenstone complex in the area, and this has formed the basis for the quality of the stone in terms of softness and durability, as well as the stone’s ability to stand repeated heating and cooling without fracturing (Naterstad 1984:161-162). The chlorite-rich talc-bearing green schist forms a certain stratigraphical level in the greenstone complex, and appears in a c. 5-6m thick

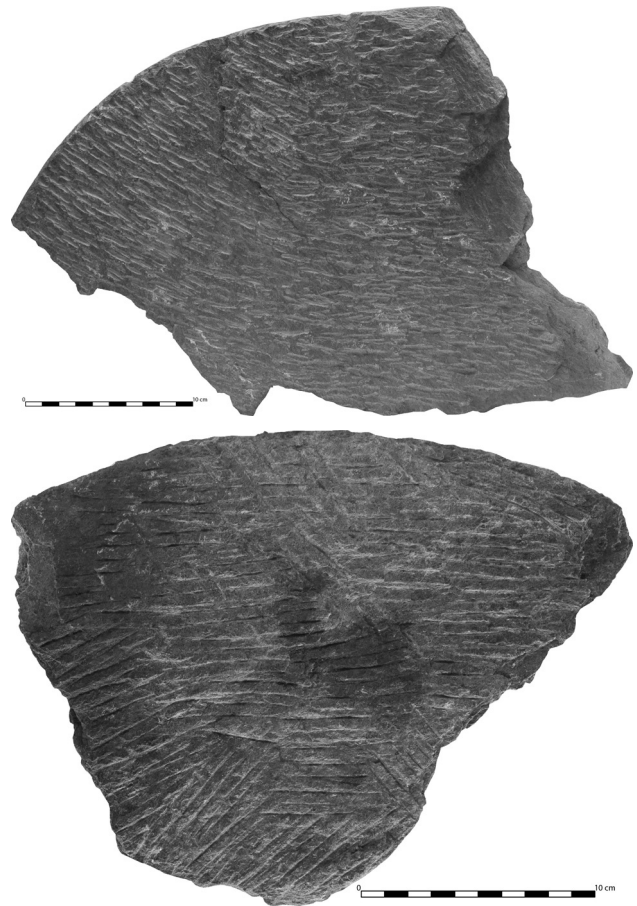


FIGURE 1.4: FRAGMENTS OF TWO DIFFERENT BAKESTONES FROM BRYGGEN IN BERGEN (UPPER: BRM0/50627, DATED TO AD 1248-1332 BY MYGLAND (2003). LOWER: BRM0/50119), MOST LIKELY PRODUCED IN ØLVE/HATLESTRAND (10-CM SCALE) (PHOTOS: MARCIN GLADKI © MUSEUMSSENTERET I HORDALAND)

layer, with a different rock type below and above. During production the layer of green schist had to be followed into the rock, with overhangs and underground quarries as a result.

The green schist in the Ølve/Hatlestrand area is rather more difficult to identify compared to the products from Hyllestad. A similar rock is also recovered in Øye in Melhus in the Sør-Trøndelag region, referred to as chlorite shale, and bakestones of chlorite-rich talc-bearing green schist are therefore likely to stem from one of these two quarry complexes. Bakestones were extracted in Øye, but seem to have been of minor importance, with building stones the main product. The quarry in Øye was most likely in use from the latter half of the 11th century until about AD 1200 (Lundberg 2007:86). A medieval quarry site for building stones also produced bakestones at the Ertenstein farm in Rennesøy, Rogaland (Fig. 1.5). The quarries at Ertenstein contain more mica and carbonate, and are thus easier to distinguish from Ølve/Hatlestrand. Additionally, traces from bakestone productions have been recorded in a few soapstone quarries, but where vessel production dominates (Jansen pers. comm. 2012). This production seems, however, to be of minor importance

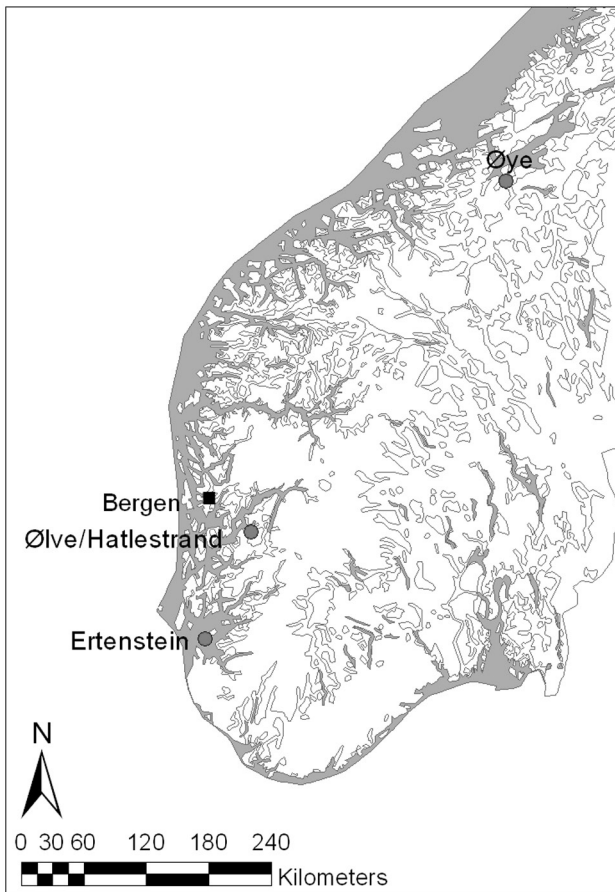


FIGURE 1.5: LOCATION OF MAJOR BAKESTONE QUARRIES (MAP: IRENE BAUG, 2013)

regarding bakestones compared to the quarries in Øye and Ølve/Hatlestrand.

As the same resources and geological competence as Hyllestad have not been available for the bakestone quarries, investigation of the provenance of bakestones could not be carried out with the same thoroughness as for the quernstones and millstones within the scope of this project. As for distribution, the main focus therefore falls on these two product types.

1.4 The investigation areas

The quarries in Hyllestad and Ølve/Hatlestrand both represent long-abandoned production landscapes with large-scale extractions that developed over hundreds of years, leaving quarries, spoil heaps, remnants of roads, harbours, etc. as visible traces. There are similarities in the production techniques, and the quarrying in both areas has to a large degree affected the landscapes. Both sites also produced objects for larger markets. Bakestones as well as quernstones and millstones were important tools connected to the use of grain and grain products in daily diets. Querns and bakestones were used at a household level, while millstones represent a more specialized and professional activity, with milling on a larger scale. When using the terms quern and mill, they denote hand-turned and water-

driven types respectively (Grenne *et al.* 2008:48). The Norwegian equivalent to quern (*kvern*) may also refer to minor water-driven constructions. I have used quernstone and quern to denote hand-driven querns and millstones, and mills for water-driven types, both smaller and larger mills. The many common features of the two production landscapes make it interesting to compare the social and socio-political backdrop connected to the production and distribution of these products. Both quarry landscapes are investigated in order to shed light on production and product types and to gain insights into temporal aspects of the activities, as well as the socio-economic and political contexts of which the quarries were part.

1.4.1 The Hyllestad quarries

The quarries are located by the Åfjorden, north of the outlet of the long Sognefjorden, roughly 90km north of Bergen. Innermost in Åfjorden, which is about 15km long, a small peninsula divides the fjord into two fjord arms, Sørefjorden to the north and Hyllestadfjorden to the south. The quarries are located on both the northern and eastern sides of Åfjorden, stretching from the shoreline into the mountains, about 200m a. sl. Altogether 367 quarries have been identified, spread over an area of about 20km² (Heldal and Bloxam 2008:47; Fig. 1.6), located at 15 different medieval farms. Most of the quarries are situated on the slopes above Åfjorden, less than 1km from the fjord. Not only did the rock type favour large-scale production in Hyllestad, but also the location, with its accessibility and proximity to harbours and transportation routes.

Visible traces of quarrying are found as carved bedrock and spoil heaps containing flakes, slabs, unfinished and destroyed products, located in front of the rocks and to a large degree covering them. The majority of the quarries is located in the 'outfield' (ON: *innan garðs*) or wasteland of historic farms, but some farms also have quarries in the 'infield' (ON: *utan garðs*) area close to the settlements. The vast production landscape and the large number of quarries have an industrial character. In some areas numerous quarries occur side-by-side and even on top of each other, and the density makes it difficult to recognize the original terrain. Large rocks have been quarried away, leaving severe changes to the landscape.

The extraction was carried out in open quarries, and two different extraction techniques have been recognized; with and without gunpowder. The oldest technique involved cutting the shape of the quernstones and millstones directly on the bedrock, then breaking the stone loose along its base. This is the quarry type investigated in this study. A detailed study of production techniques and tool marks was, however, outside the scope of this project and has been covered through the Millstone project, where technological aspects of carving techniques in Hyllestad are investigated (Løland in press). Parallels to the techniques used in Hyllestad can also be found in Ølve/Hatlestrand.

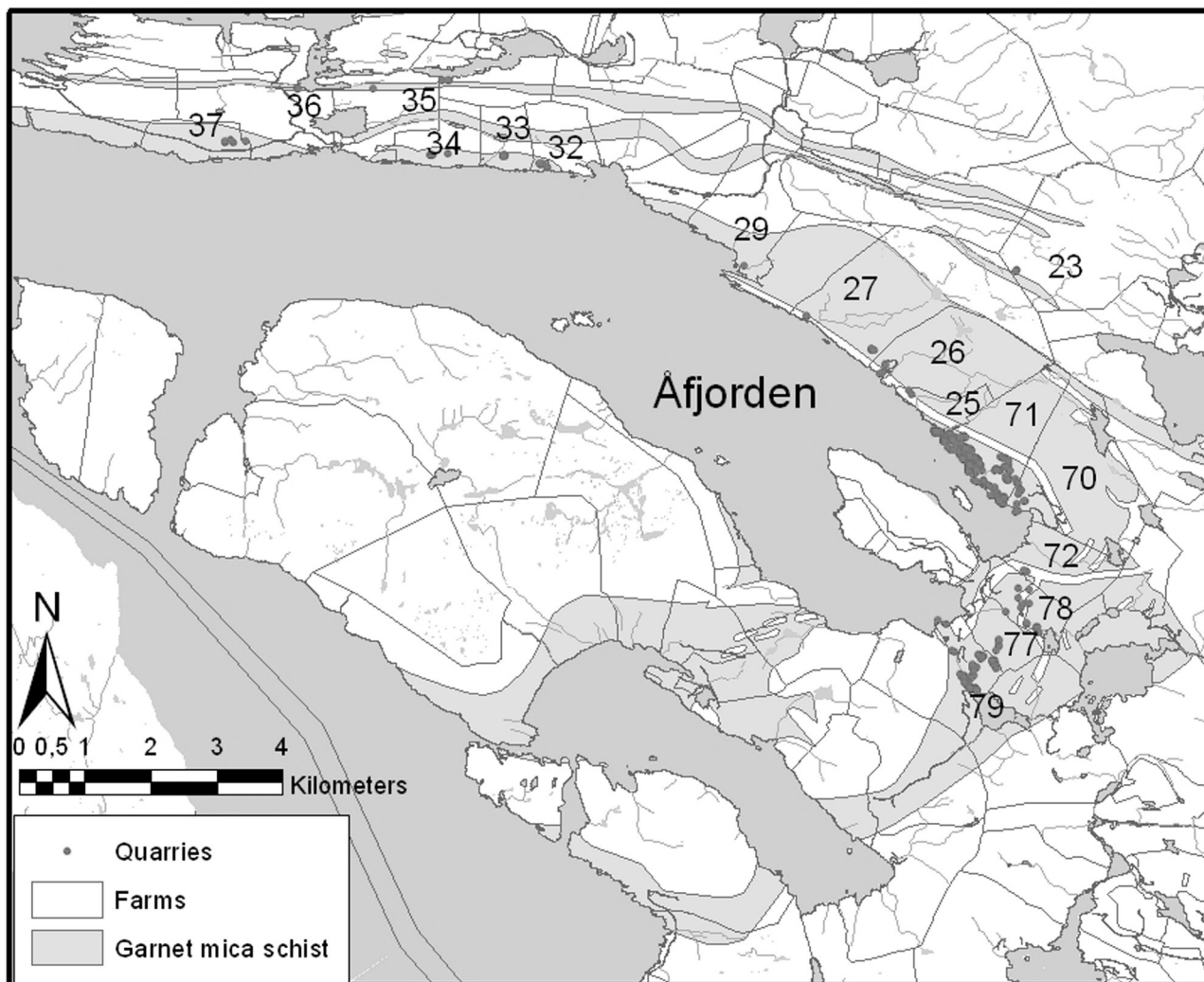


FIGURE 1.6: IDENTIFIED QUARRIES IN HYLLESTAD. FARM NUMBERS ARE SPECIFIED FOR THE FARMS WITH QUARRIES WITHIN THEIR BOUNDARIES (MAP: IRENE BAUG, 2013, NORGE DIGITALT. FKB-DATA, 1413 HYLLESTAD KOMMUNE, 32_1413EIENDOM_FLATE, 28.02.2009)

Sites investigated

In this project, altogether five different quarries within four different farms have been investigated in Hyllestad, two quarries at Rønset (no. 71) and one quarry at each of the Myklebust (no. 79), Sæsøl (no. 78) and Sørbø (no. 32) farms. Sørbø is the only investigated farm located in the parish of Øn, whereas the first three farms mentioned are located in the parish of Hyllestad. Compared to my earlier study (Baug 2002), the research area has been expanded and new types of quarries and products, as well as work places, have been investigated.

Sørbø (no. 32)

Sørbø farm is located on the northern side of the Åfjorden and borders the farms of Ulvika (no. 31), to the east, and Indre Gil (no. 33), to the west. Sørbø was a part of Ulvika until the end of the 16th century. The farm was divided into two holdings in 1851 and today consists of several smaller units. The farm is hilly, but with wide boggy areas between the hills. Today large parts of the farm have been built over

and comprise a rural centre, with a shop, nursing-home, and church (Førsund and Kellmer 1990:293-307), and the modern settlement development may have destroyed some of the quarries on the farm.

Rønset (no. 71)

The historical farm of Rønset is located on the northern side of the Søre fjorden, the small arm of an inlet furthest into the Åfjorden, bordering the Berge farm (no. 70), to the east, and the Leirpollen farm (no. 25) to the west. The latter is also the old border between the parishes of Hyllestad and Øn. The farm was divided into two holdings in 1610, and consists today of five units (Førsund and Kellmer 1993:219-229). Rønset has a shoreline of about 1.6km in length, along which four possible harbours have been identified, used for the distribution of quernstones and millstones. The settlement area and most of the infield of the two main holdings on the farm (holdings 1 and 3) are located on a flat stretch of land, just north of the road, about 50m.a.s.l. The buildings are still located as an agglomerated settlement. Most of the outer areas of the

farm are located west of the settlement, in a hilly region that slopes southwards towards the fjord.

I have earlier investigated two quarry sites at Rønset, and the production has been dated to the Viking period (AD 730-965), perhaps with a start in the early Viking Age, continuing into the 16th or 17th centuries (Baug 2002:34-51). An archaeological investigation of the fossilized remains at Rønset indicates that the farm may have been established during Roman times, probably also with a settlement near the historically known settlement area (Foyen 2008). The farm thus seems to be older than the quarrying, and an interesting aspect to look into is how the farming activity at Rønset relates to the large-scale production of quernstones and millstones.

Sæsøl (no. 78)

Sæsøl farm is located along the steep hill east of the Søre fjorden. The farm has a shoreline approximately 200m in length, south of Stigedalen (small-holding 2 at Søre fjorden, no. 72), with good harbour conditions, but the settlement and the central infield of the farm is on a plateau about 180m a. sl. Sæsøl borders the farms of Akse (no. 68) to the east, Søre fjorden (no. 72) to the north, and Hyllestad (no. 77) to the south. The farm was divided into two holdings in 1850, and consists today of five units (Førsund and Kellmer 1993:282-293). I investigated one quarry at the farm previously, indicating that the production may date back to the Viking Age, perhaps to the early Viking Age (AD 715-890) (Baug 2002:55-58). Farming activities in the form of arable and animal husbandry goes back to the 8th century AD at the earliest, and the farm may have been established contemporaneously with the quarrying activities (Sætre 2008).

Myklebust (no. 79)

Myklebust is situated on the eastern side of Hyllestadfjorden, the second arm of the Åfjorden, bordering the farm at Hyllestad (no. 77) to the north, where the border stretches up from the bay of Hyllestadvika, south of Kyrkjefjellet. To the east, the area borders Kleive farm (no. 80), extending to Lake Kleivevatnet. The first two farm holdings were separated in the 17th century, and the farm is now divided into several smaller units. Today the old farm has the largest concentration of settlements in Hyllestad, and the municipal buildings were established at Myklebust from the 1970s (Førsund and Kellmer 1993b:293-309). Consequently, some of the farm quarries may have been lost due to the recent development of the small centre.

In my earlier investigations at Myklebust, stone production was dated back to Viking times (AD 890-1015), and the extraction of millstones may also have begun this far back; output from the quarry continued until the late Middle Ages (AD 1315-1435) (Baug 2002:51-54). This project is revealing different quarry and product types from those studied previously.

1.4.2 The quarries in Ølve/Hatlestrand

The quarries are located at Ølve and Hatlestrand in the municipality of Kvinnherad, on the western side of the Hardangerfjorden, c. 100km southeast of Bergen. Altogether 71 quarries have been identified so far, located at nine historical farms: four in the parish of Ølve and five in Hatlestrand. Most of the quarries however are in Ølve, south and east of Lake Kvitebergsvatnet. The production landscape reflects large-scale production.

Unlike Hyllestad, where only open quarries are found, production at Ølve/Hatlestrand was carried out in open quarries, overhangs, and underground sites. The spoil heaps are located in front of, and partly covering, the rocks in the open quarries, as well as underneath and inside the overhangs and underground workings. Today many of the underground quarries have collapsed, leaving huge stone blocks in front of (or inside) the quarries, completely or partly blocking the access. However it is still possible to enter several of the quarries, and the sizes vary from only a few metres to c. 30m deep. The proportions of the quarries, together with the spoil heaps, bear witness to large-scale activity, and, like at Hyllestad, the production landscape and many of the quarries at Ølve/Hatlestrand have an industrial character.

As at Hyllestad, the output production of Ølve/Hatlestrand was diverse. Not only bakestones were produced. According to priest and writer Peder Claussøn Friis (early 17th century), thin oblong slabs 2 *alen* (= 1.20m) in length and 1.5 *alen* (= 94cm) broad were removed for drying corn and oats (Friis 1632:72). Tiles, building stones, and church crosses were produced at some quarries. Many of the sites produced different items at different periods, while others may have produced different objects at the same time. In this project, the production of bakestones is the main focus, but other objects are also considered so as to give an idea of activity as a whole.

Written evidence from the 16th century onwards gives information on the production of bakestones and roof tiles (NRJ IV:474; Friis 1632:71-74; Hoff and Lidén 2000:156). In the late 19th century the quarries are also thought to have supplied building material for Danish castles, as well as cornerstones and blocks for window- and door-frames for parish churches, and for the manor house at Rosendal (Haukenæs 1888:68, 135). Grave crosses were also extracted from some of the quarries. In the 20th century it was believed that soapstone vessels were extracted from the quarries as well (Vaage 1972:125-128), but this kind of production has not been verified.

These quarries have not been the object of detailed archaeological investigations before this current research. In 1931, four quarry sites at Ølve were surveyed by Kristen Lindøe: Bakkhidlaren, Tuftahidlaren, Lambagarshidlaren and Kvitebergana. Test pits inside the underground quarries of Bakkhidlaren and Lambagarshidlaren revealed production waste. The fourth site mentioned,

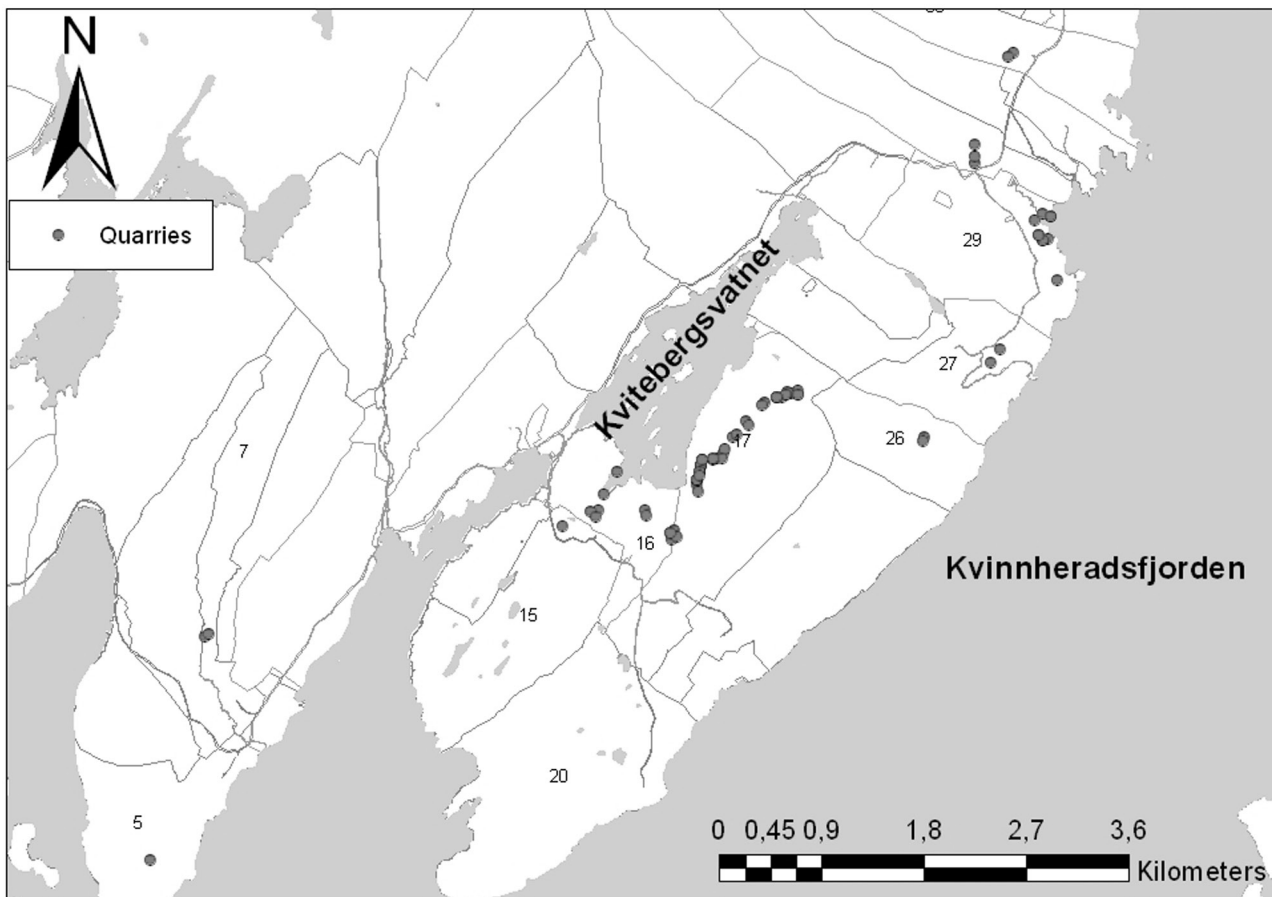


FIGURE 1.7: IDENTIFIED QUARRIES IN ØLVE AND HATLESTRAND. FARM NUMBERS ARE SPECIFIED FOR FARMS WITH QUARRIES WITHIN THEIR BOUNDARIES (MAP: IRENE BAUG, 2013, NORGE DIGITALT FKB-DATA, 1224 KVINNHERAD KOMMUNE, 32_1224EIENDOM_FLATE 21.11.2007)

Kvitebergana, is not known today, but it was allegedly located not far from Kvitafjell. No quarries or spoil were identified here (Top Ark, University Museum of Bergen). In the 1980s, archaeologist Birthe Weber conducted small-scale investigations at a work site in Kvitafjell and in the Bakkhidlaren quarry, finding a pickaxe and an iron fitting (Top Ark, University Museum of Bergen), but unfortunately the documentation is unavailable. Most knowledge of the quarries has thus come only indirectly through geological surveys and finds of bakestones in urban contexts from around AD 1050-1100 onwards (Naterstad 1984; Weber 1984:159). Therefore my investigations of the quarries in this current project represent a new empirical basis for the study of quarrying.

The sites

The archaeological investigations focused on two different farms, Fugleberg (no. 17) and Netteland (no. 29), where four quarries and one site for the finishing of bakestones were investigated.

Fugleberg (no. 17)

Fugleberg farm is in the north-eastern part of the Ølve community, east and southeast of the 3km-long Lake Kvitebergsvatnet. Fugleberg lies next to the farms of

Tufta (no. 16) to the west, and Skarvatun (no. 18) to the east. Fugleberg was divided into five holdings in the 18th century and today consists of six units. From the 18th century, tiles for private use were extracted from the farm’s quarries, however there is no record of production of bakestones here in this period (Vaage 1987:172-179).

Netteland (no. 29)

Netteland (Hatlestrand), on the western side of Kvinnheradsfjorden, part of Hardangerfjorden (Kvinnherad), borders on three farms: Ask (no. 27) to the south, and Atramadal (no. 23) and Hjortland (no. 30) to the north-west. The farm was divided into four holdings in the 18th century and now consists of seven units. Netteland has a long shoreline with good harbours on the bays of Netlandsvågen and Hellebergsvika in the Kvinnheradsfjorden. In the 1600s Netlandsvågen was used as a harbour for timber exports to Scotland (Vaage 1987:230-242). Many of the quarries at the farm, such as the investigated quarry Båtahidlaren, are located within a fairly short distance to Netlandsvågen, and most likely large amounts of stone products were exported there.

Overall, this study, therefore, takes in three levels of research: at the micro level, with a focus on the quarries and productions of Hyllestad and Ølve/Hatlestrand; at the

'meso' level, where social and socio-political relations within the local and regional communities are studied in relation to organisational aspects; and at the macro level,

investigating distribution and trade from the supra-regional perspective.