3.6. LITHIC TECHNOLOGY IN AUST-AGDER, SOUTHEAST NORWAY

A diachronic study of raw material procurement strategies, blade production and concepts of core reduction and discard in Aust-Agder, Southeast Norway during the Early Mesolithic period and beyond

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INTRODUCTION

At present, the Stone Age of Aust-Agder, Southeast Norway (Norw.: *Sørlandet*), and particularly its lithic technology, is poorly understood. Hence, the collected material from the comprehensive excavations within the *E18 Tvedestrand–Arendal project* provides valuable material for the formulation of regional and inter-regional comparative studies. In the following, recorded material from the E18 Tvedestrand–Arendal project will be compared to results from similar analysis undertaken on previously excavated materials from East Norway (the counties of Østfold, Vestfold and Telemark) (Eigeland 2014b, 2015, 2016a, 2016b, 2016c; see also Damlien 2016), to reveal potential differences in technological behaviour and strategy (fig.3.6.1). It is anticipated that this undertaking will encourage a broader approach to, and further investigation of, problems concerning social prehistory.

A technological classification and analysis of blades and cores was initiated to gain an overview and to

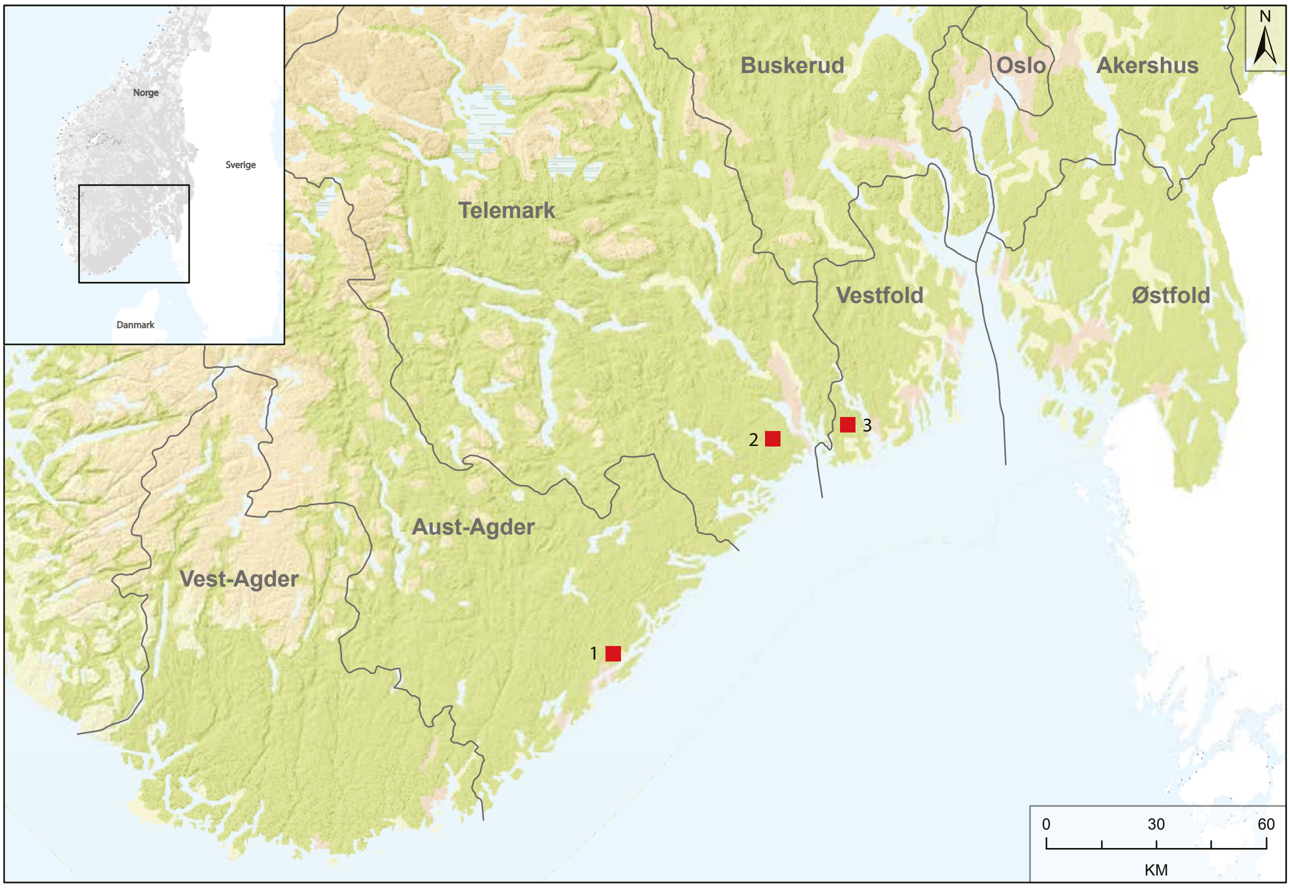

Figure 3.6.1: Map of southeast Norway with the E18 Tvedestrand–Arendal project in Aust-Agder county (1) and mentioned counties as well as other projects with reference material marked (2–3): the E18 Rugtvedt–Dørdal project in Telemark county (*cf.* Solheim 2017) and the E18 Brunlanes project in Vestfold county (*cf.* Jaksland 2012a, 2012b; Jaksland & Persson 2014). Ill.: L.S. Johannessen / G. Reitan / KHM.

explain connections between individual sites and assemblages from the E18 Tvedestrand–Arendal project (see Eigeland 2015, 2016c for methodology and technological definitions). If diachronic changes were recorded in the archaeological material, this preliminary investigation would raise topics for future research. In the light of present knowledge of lithic technology, three areas of investigation were chosen for closer scrutiny: raw material procurement strategies, methods and techniques of blade production and concepts of core reduction and discard (Eigeland 2016c).

Within the E18 Tvedestrand–Arendal project several Stone Age sites have been excavated. The sites date from the Early Mesolithic through to the Late Neolithic. However, the majority of them date to the Early Mesolithic (table 3.6.2). The material is, therefore, particularly well suited for investigations into technological changes and developments during this period. In addition, transitions between Stone Age phases in general, ongoing trends in methods and techniques and obvious breaks with tradition will be identified.

An attribute analysis has been completed on 2754 blades from 14 sites and 208 cores from 16 sites (see table 3.6.2 for information on sites, assemblages and dating; see Eigeland 2016c for selection criteria for this study). A brief presentation of the results follows below.

RAW MATERIAL PROCUREMENT STRATEGIES

Flint availability and quality in Eastern Norway have been researched and discussed in some detail elsewhere (for overview, see Eigeland 2015: 45–53, 83–126; *cf.* Berg-Hansen 2009). There is no indigenous flint in Norway, but nodules of ice-transported beach flint of varied type, quality and size were available. Extensive knowledge of local beach flint has been attained through sourcing, collecting and experimental testing (Eigeland 2015: 83–126). Additionally, Early Mesolithic raw material procurement strategies have been investigated previously within the *E18 Brunlanes project* in Vestfold (fig. 3.6.1) (Eigeland 2014b; Jaksland

Site	Flint total	Analysed cores	Analysed blades	M.a.s.l.	Dating	Phase
Sagene B2	~ 6400	6	300	58,1–55,3	C. 9000 BC	Early Mesolithic
Sagene B4	~ 900	3	149	54,7–53,3	C. 9000 BC	Early Mesolithic
Sagene B6	~ 1500	5	220	51,8–48,1	C. 8900 BC	Early Mesolithic
Sagene B1	~ 12 700	9	310	50,0–48,2	C. 8900 BC	Early Mesolithic
Kvastad A9	~ 170	2	73	54,6–53,9	C. 8700 BC	Early Mesolithic
Kvastad A8	~ 430	5	53	54,8–53,7	C. 8700 BC	Early Mesolithic
Kvastad A1	~ 2200	3	161	53,5–47,8	C. 8500 BC	Early Mesolithic
Kvastad A2, south-west	~ 3200	4	234	50,7–48,0	C. 8500–8300 BC	Early Mesolithic
Kvastad A2, north-east	~ 5400	4	335	46,5–44,5	C. 8500–8300 BC	Early Mesolithic
Hesthag C4	~ 2500	16	230	33,8–35,5	C. 8200–7700 BC	Middle Mesolithic
Hesthag C2	~ 20 000	78	260	28–25	C. 6700 BC	Middle Mesolithic/ Late Mesolithic?
Krøgenes D2	~ 18 000	48	310	22,2–21,2	C. 5000 BC	Late Mesolithic
Krøgenes D1	~ 7100	18	63	20–18	C. 4000 BC	Late Mesolithic/ Early Neolithic?
Krøgenes D10	~ 4000	2	-	19,5–18,4	C. 4000 BC	Late Mesolithic?
Krøgenes D7	~ 570	1	-	17,9–17,4	C. 3600 BC	Early Neolithic
Krøgenes D5	~ 2600	4	56	13,1–14,1	C. 2700–2350	Middle Neolithic
Sum:	***~ 87 700***	***208***	***2754***	-	-	-

Table 3.6.2: Overview of sites and material from the E18 Tvedestrand–Arendal project included in the attribute analysis (*cf.* Eigeland 2016c).

2012a, 2012b; Jaksland & Persson 2014; Jaksland, *pers.comm.*). Here a number of sites, dating to various time intervals, revealed an intriguing pioneer narrative. The earliest Early Mesolithic site, *Pauler 1*, contained a flint surplus, including large blades and discarded cores which were far from exhausted (Schaller Åhrberg 2012). Such apparent wasteful use of flint was of little concern to the initial "scouting parties" entering the Vestfold region.

Another notable feature was the exceptional quality and size (above fist size/250–500 g or more) of the nodules used on Pauler 1. The flint is fine-grained, uniform, translucent and lacking coarser impurities. In short, this is high quality flint that present-day flintknappers would aspire to and would have taken time and energy to collect from specific sources. The flint from Pauler 1 is markedly different from locally available beach flint, which consists of mostly small (50–100 g) and compact nodules of variable quality, often matt and less translucent (Högberg & Olausson 2007). Large nodules are often brittle and riddled with impurities (Eigeland 2015: 87). This suggests that flint was imported to the site from reliable and known sources elsewhere, most probably from the place of departure (*cf. e.g.* Högberg & Olausson 2007 for Scandinavian sources of high quality flint).

In contrast, the occupants of *Pauler 2*, a site dated a little later (Nyland 2012a), showed more restraint. In this second phase of the Early Mesolithic, they still had access to high quality flint, but reduced the cores more economically compared to cores found at Pauler 1. This can be seen in the production of blades with narrower frames and more regular shapes (Eigeland 2014b). In the following phases of the Early Mesolithic, the sites at Brunlanes entered a new phase of reducing raw material costs with the extensive use of local beach flint and local non-flint raw materials (Eigeland 2014b; Jaksland & Fossum 2014: 47–59).

On the basis of these results, it was relatively straightforward to visualize a pioneer behaviour pattern for the occupants of the Brunlanes sites during the Early Mesolithic (Jaksland & Fossum 2014: 53). The initial phase would consist of scouting or surveying parties moving into new territories and landscapes. A need for raw material was anticipated as high quality flint was brought to the sites from known sources and the technological tradition was maintained. As much usable flint was left behind on the sites, the first pioneers were probably returning to the place of departure, wherever that was, after surveying.

In the following phase, as pioneers stayed longer in the area and/or travelled further distances, they

Site	High quality flint	Matt flint	Patinated/burnt flint	Phase
Sagene B2	67 %	33 %	-	Early Mesolithic
Sagene B4	80 %	15 %	5 %	Early Mesolithic
Sagene B6	48 %	43 %	9 %	Early Mesolithic
Sagene B1	20 %	37 %	43 %	Early Mesolithic
Kvastad A9	52 %	48 %	-	Early Mesolithic
Kvastad A8	68 %	15 %	17 %	Early Mesolithic
Kvastad A1	23 %	67 %	10 %	Early Mesolithic
Kvastad A2 south-west	53 %	41 %	6 %	Early Mesolithic
Kvastad A2 north-east	22 %	77 %	1 %	Early Mesolithic
Hesthag C4	36 %	56 %	8 %	Middle Mesolithic
Hesthag C2	4 %	20 %	76 %	Middle Mesolithic/ Late Mesolithic?
Krøgenes D2	6 %	29 %	65 %	Late Mesolithic
Krøgenes D1	30 %	41 %	29 %	Late Mesolithic/ Early Neolithic
Krøgenes D5	91 %	2 %	7 %	Middle Neolithic

Table 3.6.3: Distribution of high-quality, matt or patinated/burnt flint on sites from the E18 Tvedestrand–Arendal project (*cf.* Eigeland 2016c). Sites from the Early Mesolithic are emphasized in grey colour.

had to make the high quality flint last longer. Thus their technology was modified as cores were more carefully shaped and reduced. However, a real sense of taking possession of new land, mentally or practically, was not visible in the raw material procurement strategy at this stage, as flint was still non-local. Next, the phase of real adaptation came, in which both local beach flint and non-flint raw materials were exploited. Usable cores were also removed from the sites in much greater numbers compared to earlier stages of the Early Mesolithic. This indicates a much stronger affinity and knowledge of place and resources in the area/region (Jaksland & Fossum 2014: 47–59).

Turning to the E18 Tvedestrand–Arendal project material, how does it fit into this narrative? What information can these sites contribute to the overall picture of pioneer behaviour patterns? Flint types were recorded during the analysis of the blades and cores (see table 3.6.3). Flint was divided between fine types (fine-grained, uniform and translucent) and matt types to differentiate and facilitate the discussion of access to high quality flint (Eigeland 2016c). In common with Brunlanes, the earliest Early Mesolithic sites from Tvedestrand–Arendal have mostly high quality flint available (table 3.6.3). After this, matt flint becomes more common. This indicates that similar procurement strategies were present in Vestfold and Aust-Agder during this period.

However, comparisons between blade size and dimensions in these two regions illustrate a difference in technological behaviour. The Aust-Agder blades are clearly smaller (table 3.6.4a, 3.6.4b). This could imply that Southeast Norway had access to smaller blocks of raw material. A possible interpretation is that cores brought into Aust-Agder were already used and had reached another stage in the reduction sequence. Potentially this indicates a travel route from north (Vestfold via Telemark) to south (Aust-Agder) (*cf*. fig. 3.6.1). This is perhaps among the most solid data on pioneer travel routes that exists at present, since a comparison of blade dimensions from different regions has not been available before now. This illustrates great research potential for the E18 Tvedestrand–Arendal material.

If we look at the distribution of flint types in later periods of the Stone Age in Aust-Agder (see table 3.6.3), there are notable differences. The late Middle

Site	County	Dating	Macroblades	Narrow blades	Microblades	Phase
Pauler 1	Vestfold	9400–8800 BC	65 %	25 %	10 %	EM
Pauler 2	Vestfold	9300–8700 BC	53 %	22 %	25 %	EM
Sagene B2	**Aust-Agder**	**C. 9000 BC**	**23 %**	**25 %**	**52 %**	**EM**
Sagene B4	**Aust-Agder**	**C. 9000 BC**	**48 %**	**22 %**	**30 %**	**EM**
Sagene B6	**Aust-Agder**	**C. 8900 BC**	**23 %**	**26 %**	**51 %**	**EM**
Sagene B1	**Aust-Agder**	**C. 8900 BC**	**28 %**	**38 %**	**41 %**	**EM**
Kvastad A9	**Aust-Agder**	**C. 8700 BC**	**40 %**	**25 %**	**36 %**	**EM**
Kvastad A8	**Aust-Agder**	**C. 8700 BC**	**19 %**	**38 %**	**43 %**	**EM**
Tinderholt 3	Telemark	8800–8600 BC	60 %	27 %	12 %	EM
Tinderholt 2	Telemark	8700–8600 BC	65 %	23 %	12 %	EM
Pauler 6	Vestfold	8850–8550 BC	29 %	18 %	51 %	EM
Pauler 7	Vestfold	8800–8500 BC	48 %	21 %	32 %	EM
Skeid	Telemark	8500–8400 BC	36 %	49 %	15 %	EM
Kvastad A1	**Aust-Agder**	**C. 8500 BC**	**13 %**	**35 %**	**52 %**	**EM**
Kvastad A2 south-west	**Aust-Agder**	**C. 8500–8300 BC**	**18 %**	**29 %**	**53 %**	**EM**
Kvastad A2 north-east	**Aust-Agder**	**C. 8500–8300 BC**	**29 %**	**27 %**	**44 %**	**EM**

Table 3.6.4a: Overview of Early Mesolithic blade types from E18 Tvedestrand–Arendal sites (Aust-Agder), E18 Brunlanes sites (Pauler, Vestfold) and E18 Rugtvedt–Dørdal sites (Tinderholt and Skeid, Telemark). Macroblades: (≥ 1.2 cm), narrow blades: (0.9–1.1 cm), microblades: (≤ 0.8 cm). E18 Tvedestrand-Arendalsites are in bold. "EM" = Early Mesolithic.

Mesolithic and Late Mesolithic assemblages tend to have considerable instances of patination and burning. Can this be diagnostically relevant? Was flint handled and deposited differently in these phases compared to earlier and later phases?

Research carried out on material from Østfold county (*cf*. fig. 3.6.1) indicates that variation in flint type, quality and availability varies with basic period transitions in prehistory (Eigeland 2015: 363–372). The Late Mesolithic/Early Neolithic transition is noted for a sudden change in high quality flint use, with similar raw material procurement strategies evident in the Early Mesolithic period of Vestfold and Aust-Agder. Immigration of hunters/farmers from the Continent, unfamiliar with local raw material conditions, could explain why there is a new "pioneer phase" at this stage (Eigeland 2015: 383). Material from the E18 Tvedestrand–Arendal sites shows a similar leap in the Middle Neolithic at the site *Krøgenes D5* (see Reitan & Solberg, chapter 2.5.3, this volume), which comprises 91 % high-quality, fine flint (table 3.6.3). Future research should pursue these apparent changes in raw material availability and quality.

METHODS AND TECHNIQUES OF BLADE PRODUCTION

The Early Mesolithic method of blade production is well documented (Jaksland & Persson 2014; Damlien 2016). Blades are produced by direct percussion techniques from one/two-sided single-platform or dual-platform cores with one-sided single-platform cores being the most common (see Berg-Hansen 2017 for discussion). Generally, there is a gradual reduction in core size, producing first wide, then narrower, blades. Microblades were not an intentional aspect of blade production at this time.

The blade material from the E18 Tvedestrand–Arendal project sites is in keeping with the Early Mesolitihc method and techniques of production. Worthy of note is how the chronological span between the sites can denote important individual variations and motivations within the same phase (Eigeland 2016c). For example, turning to the sites *Sagene B2*, *Sagene B4* and *Kvastad A9*, dating to the first part of the Early Mesolithic (see Darmark, chapters 2.2.1, 2.2.2 and 2.2.4, respectively, this volume), this is evident (table 3.6.2). At Sagene B2, the oldest site (c. 9000 BC), there are different techniques of production for

Site	County	Dating	Length	Width	Thickness	Phase
Pauler 1	Vestfold	9400–8800 BC	5,5 cm	1,8 cm	0,6 cm	EM
Pauler 2	Vestfold	9300–8700 BC	5,1 cm	1,3 cm	0,4 cm	EM
Sagene B2	**Aust-Agder**	**C. 9000 BC**	**2,3 cm**	**0,9 cm**	**0,2 cm**	**EM**
Sagene B4	**Aust-Agder**	**C. 9000 BC**	**3,2 cm**	**1,1 cm**	**0,4 cm**	**EM**
Sagene B6	**Aust-Agder**	**C. 8900 BC**	**2,2 cm**	**0,9 cm**	**0,3 cm**	**EM**
Sagene B1	**Aust-Agder**	**C. 8900 BC**	**3 cm**	**1 cm**	**0,3 cm**	**EM**
Kvastad A9	**Aust-Agder**	**C. 8700 BC**	**3,8 cm**	**1,1 cm**	**0,3 cm**	**EM**
Kvastad A8	**Aust-Agder**	**C. 8700 BC**	**2,2 cm**	**0,9 cm**	**0,2 cm**	**EM**
Tinderholt 3	Telemark	8800–8600 BC	3,7 cm	1,3 cm	0,4 cm	EM
Tinderholt 2	Telemark	8700–8600 BC	4,2 cm	1,3 cm	0,4 cm	EM
Pauler 6	Vestfold	8850–8550 BC	2,9 cm	0,9 cm	0,2 cm	EM
Pauler 7	Vestfold	8800–8500 BC	3,4 cm	1,1 cm	0,4 cm	EM
Skeid	Telemark	8500–8400 BC	3,2 cm	1,1 cm	0,3 cm	EM
Kvastad A1	**Aust-Agder**	**C. 8500 BC**	**2,5 cm**	**0,9 cm**	**0,2 cm**	**EM**
Kvastad A2 South-west	**Aust-Agder**	**C. 8500–8300 BC**	**2,4 cm**	**0,9 cm**	**0,2 cm**	**EM**
Kvastad A2 North-east	**Aust-Agder**	**C. 8500–8300 BC**	**2,8 cm**	**1 cm**	**0,3 cm**	**EM**

Table 3.6.4b: Overview of Early Mesolithic blade dimensions from the E18 Tvedestrand–Arendal project (Aust-Agder), the E18 Brunlanes project (Pauler, Vestfold) and the E18 Rugtvedt–Dørdal project (Tinderholt, Skeid, Telemark). E18 Tvedestrand–Arendal sites are in bold. "EM" = Early Mesolithic.

macroblades (≥ 1.2 cm) and narrow blades (0.9–1.1 cm) (Eigeland 2016c). The macroblades are regular in shape, best prepared and have more lips and ridges than the narrow blades. A direct, soft percussion technique might have been used for this production of macroblades.

In the material from the nearby and contemporaneous site Sagene B4 (*c.* 9000 BC), on the other hand, a different approach is evident, in which the same technique, mostly direct percussion technique with a medium hard hammerstone, is applied to all blade types. Here the narrow blades become much more regular than has been noted for the blades from Sagene B2. Finally, on site Kvastad A9 (*c.* 8700–8300 BC), there is a further development in this direction. The blades are even more regular and carefully prepared. A consistent direct percussion technique seems to have been applied, possibly with less use of soft hammers.

As noted above with regard to raw material procurement strategies, this change of methods through the Early Mesolithic period could be motivated by a desire to economize resources. More predictability in reduction would produce thinner and more regular blades. This development could also increase the level of technical skill required to make blades. This feature was also present in the E18 Brunlanes project in Vestfold, where the material from the site Pauler 2 displayed a marked difference in skill to sites dated before and after (Eigeland 2014b). Whether there really, in what we could term the "modification phase" of the Early Mesolithic (see above), exists a skill peak in blade production requires further investigation.

The assemblages from the other six Early Mesolithic sites from the E18 Tvedestrand–Arendal project show similar individual variation (table 3.6.2). The occupants of site *Kvastad A1* (see Stokke *et al.*, chapter 2.2.5, this volume), for example, produced regular blades, but the raw material was more intensively used than at other sites based on the number of exhausted cores. *Sagene B6* (see Darmark, chapter 2.2.2, this volume) displays a visible drop in the number of regular blades, suggesting a less uniform approach to method and technique. The later Early Mesolithic sites appear to have more regular blade production than the earlier sites (Eigeland 2016c). A drop in blade regularity was discovered for the E18 Brunlanes project during the later phases of the Early Mesolithic (Jaksland & Fossum 2014; *cf.* Eigeland 2014b). This was interpreted as a result of use of local beach flint with less predictable properties compared to tested and preworked nodules and cores of imported fine flint. The development in Aust-Agder could be different.

The Middle Mesolithic blade concept is also well investigated (Eigeland 2015; Damlien 2016). Methods and techniques of blade production involved a high degree of standardization. Blades were primarily produced from single-platform conical and sub-conical cores using indirect percussion or pressure techniques with continuous platform rejuvenation. This concept is distinctly different from that of the Early Mesolithic, suggesting a serious break with the ongoing technological tradition (Damlien 2016).

Only two sites from the Middle Mesolithic were analysed from the E18 Tvedestrand-Arendal project (table 3.6.2). The sites *Hesthag C4* (*c.* 8200–7900 BC) and *Hesthag C2* (*c.* 8000–6700 BC?) (see Viken, chapters 2.3.1 and 2.3.2, respectively, this volume) both display a close affinity to the common Middle Mesolithic template of production, underlining the general "cultural sameness" across the East and South Norwegian regions during this period (*cf.* Ballin 1999c; Eigeland 2015: 60–64; Damlien 2016). However, the sites Hesthag C4 and Hesthag C2 date to different phases of the Middle Mesolithic and demonstrate changes within this standardized concept. Hesthag C2 exhibits considerably more microblades than Hesthag C4, and the blades are less fragmented, have fewer bulbar scars and are more regular (Eigeland 2016c). A difference in attributes can be explained by a change in raw material availability as well as technique. Different tools and holding devices for cores may have been applied.

Later Stone Age periods in the E18 Tvedestrand–Arendal project were only represented by single sites in the attribute analysis (Eigeland 2016c). However, all demonstrate distinct concepts of blade production that will be useful for reference in future studies (fig.2). At the site *Krøgenes D2*, for example, dating to the Late Mesolithic (Mansrud *et al.*, chapter 2.4.1, this volume), blades are produced from conical cores, a concept usually found in the Middle Mesolithic (see above). Compared to the Middle Mesolithic blade concept, which has some variation in blade size and techniques, the concept at Krøgenes D2 is dominated by microblade production and pressure technique.

The fact that technological concepts start to blend, indicates that the cultural "sameness" found in the Early and Middle Mesolithic periods is not necessarily found in the Late Mesolithic. As it stands, the Østfold and Vestfold counties of eastern Norway are bound to the "handle core concept" in the Late Mesolithic (Eigeland 2015: 64–69), whereas Telemark county, closer to Aust-Agder (see fig. 3.6.1), has an "atypical handle core concept" (Eigeland 2016a). Thus, East and South Norway are probably expressing some real regional differences during this period. Further investigation on the blades and cores from the Krøgenes D2 site will benefit investigations concerning the development and final disappearance of blade production from conical cores.

CONCEPTS OF CORE REDUCTION AND DISCARD

How a core is reduced and in what state it is discarded or abandoned provides evidence of technological tradition and strategy, raw material availability and onsite activity (see Eigeland 2015, 2016c for definitions of core types and core categories). Table 3.6.5 compares Early Mesolithic and Middle Mesolithic core types from sites from Aust-Agder, Vestfold and Telemark counties. The Early Mesolithic core material from Aust-Agder has many similarities with cores found in Vestfold and Telemark (Eigeland 2016a, 2016c). Diagnostic one-sided/two-sided single or dual-platform cores dominate, in addition to irregular cores and bipolar cores (table 3.6.5). A few differences can be noted: in the Vestfold site material, there are more "undiagnostic" platform cores - meaning cores that are

Site (n)	County	Diag. Pf.	Undiag. Pf.	Conical	Bipolar	Anv.	Irreg.	Nodule	Phase
Sagene B2 (n=6)	**Aust-Agder**	**50 %**	-	-	**17 %**	-	**33 %**	-	**EM**
Sagene B4 (n=3)	**Aust-Agder**	**100 %**	-	-	-	-	-	-	**EM**
Pauler 3 (n=42)	Vestfold	38 %	26 %	-	-	2 %	33 %	-	EM
Sagene B6 (n=5)	**Aust-Agder**	**80 %**	-	-	**20 %**	-	-	-	**EM**
Sagene B1 (n=9)	**Aust-Agder**	**55 %**	-	-	**33 %**	-	**11 %**	-	**EM**
Bakke (n=24)	Vestfold	71 %	17 %		4 %	-	8 %	-	EM
Kvastad A9 (n=2)	**Aust-Agder**	**50 %**	-	-	-	-	**50 %**	-	**EM**
Kvastad A8 (n=5)	**Aust-Agder**	-			**100 %**	-	-	-	**EM**
Tinderholt 3 (n=1)	Telemark	-	100 %	-	-	-	-	-	EM
Tinderholt 2 (n=1)	Telemark	100 %	-	-	-	-	-	-	EM
Kvastad A1 (n=3)	**Aust-Agder**	-	-	-	-	-	**33 %**	**67 %**	**EM**
Kvastad A2 sw. (n=5)	**Aust-Agder**	**40 %**	**20 %**	-	**20 %**	-	**20 %**	-	**EM**
Kvastad A2 ne. (n=4)	**Aust-Agder**	-	-	-	**25 %**	-	**75 %**	-	**EM**
Hydal 8 (n=10)	Telemark	-	20 %	40 %	-	20 %	20 %	-	MM
Hydal 7 (n=2)	Telemark	-	-	-	100 %	-	-	-	MM
Hydal 3 (n=8)	Telemark	-	38 %	25 %	13 %	-	13 %	13 %	MM
Hegna Vest 1 (n=19)	Telemark	-	-	47 %	37 %	-	11 %	5 %	MM
Hegna Vest 3 (n=38)	Telemark	-	13 %	29 %	42 %	-	13 %	3 %	MM
Hegna Vest 4 (n=68)	Telemark	-	13 %	12 %	66 %	-	4 %	4 %	MM
Hegna Øst 5 (n=112)	Telemark	-	1 %	2 %	95 %	1 %	2 %	-	MM
Hesthag C4 (n=16)	**Aust-Agder**	-	**6 %**	**6 %**	**75 %**	**13 %**	-	-	**MM**
Hesthag C2 (n=78)	**Aust-Agder**	-	**6 %**	**15 %**	**60 %**	**8 %**	**1 %**	**9 %**	**MM/ LM?**

Table 3.6.5: Overview of different core types from sites dated to the Early- and Middle Mesolithic from the E18 Tvedestrand–Arendal project (Aust-Agder), E18 Brunlanes project (Pauler and Bakke, Vestfold) and E18 Rugtvedt–Dørdal project (Tinderholt, Hydal and Hegna Vest, Telemark). Sites from the Early Mesolithic are emphasized in grey colour. E18 Tvedestrand-Arendal sites are in bold. Abbreviations: "EM" =Early Mesolithic, "MM" = Middle Mesolithic, "LM" = Late Mesolithic. "Diag.Pf." = Diagnostic platform core (one-sided/two-sided single/dual platform core). "Undiag.Pf." = Platform cores which are not defined as one-sided/two-sided single/dual platform cores. "Anv." = Anvil supported cores. "Irreg." = Irregular cores. "Nodule" = small nodules with 50 % or more surface cortex with evidence of short or disconnected reduction sequences on the core front (cf. Eigeland 2015: 138–139).

defined as platform cores, but cannot be placed in the one-sided/two-sided single or dual-platform category. This indicates that the latter diagnostic core category has been reworked into different platform core types prior to discard. This is a flexible reduction strategy in which cores get a longer use -life. The Aust-Agder sites lack this feature. The need for reworking platform cores appears less pronounced in this region.

The Telemark sites have very few cores, and the number of sites is too small to draw conclusions. Aust-Agder is the only region of the three counties where nodules of local beach flint are exploited in the Early Mesolithic.

In the Middle Mesolithic, the conical core is introduced as a new diagnostic core type, replacing the one-sided/two-sided single or dual-platform cores from the Early Mesolithic (Damlien 2016). Furthermore, the Middle Mesolithic sites display a greater core diversity compared to the Early Mesolithic ones, and the number of cores greatly increases on sites during this phase (table 3.6.5). One core type is of particular note: the bipolar core. This core type dominates over others. Bipolar cores are usually very small (< 2 g) and have a standardized shape (Eigeland 2016c). The activity in which these cores have been exploited must be different from how they were used in the earlier period, since the bipolar cores in the Early Mesolithic were larger and less standardized.

Looking at core categories and discard patterns will provide further insight into the Early and Middle Mesolithic periods (table 3.6.6). Tested and discarded nodules that have been abandoned due to poor raw material quality are, with few exceptions, rarely found in these regions. This applies to both the Early and Middle Mesolithic and is probably the result of large-scale importation of high quality flint and preworked cores (Eigeland 2015:51). Cores that have been discarded without being exhausted in the Early Mesolithic are mostly bipolar cores in the Aust-Agder site material. On the Vestfold sites, however, other types of cores are discarded although they still have usable flint mass. This could mean that at this stage, flint availability was more precarious in South Norway.

A discovery worthy of further investigation for the Early Mesolithic is that several cores have been discarded due to repeated technical errors such as stacked hinges, mis-strikings and other poor choices in reduction strategy. Many of these cores are in the final stages of reduction, meaning that these mistakes could be a consequence of small size: small cores with steep angles are more difficult to hold and work. However, some cores exhibit so many stacked hinges and other knapping errors that it is plausible these cores were produced by inexperienced knappers, possibly children or beginner/novice knappers (see also Viken & Darmark, chapter 3.7, this volume). This offers potential insight into on-site demography. In contrast, very few cores have been discarded due to knapping errors in the Middle Mesolithic (Eigeland 2016c). A possible explanation is that Early Mesolithic groups consist of family units whereas the Middle Mesolithic groups mainly consist of "professional" hunting parties. Alternatively, the difference in skill-levels mirrors a difference in division of labour on sites dated to these early periods of the Stone Age.

TOPICS FOR FUTURE RESEARCH

A preliminary diachronic study of blades and cores from the E18 Tvedestrand-Arendal project has raised several important topics for future research. The truly groundbreaking result is the notable difference in blade size and dimension between Aust-Agder (Southeast Norway) and Vestfold/Telemark (East Norway). This raises questions concerning raw material availability, transportation/importation, pioneer mobility patterns and travel routes. Until now, there has been little evidence that links the archaeological material to a geographic origin. A decrease in blade size between the north and the south along the coast could very well be a sound argument for pioneers travelling in a north-south direction, carrying reduced blade cores along the way (Hofman 1992; Blades 2001; Odell 2004: 193–202). Since the flint is of high quality in Aust-Agder during the Early Mesolithic, the use of smaller nodules of local beach flint can be ruled out as an explanation for the difference in blade size and dimension between the regions. The reworking of diagnostic platform cores found on sites from Vestfold during the Early Mesolithic (see above), could possibly be explained by a general need to preserve other cores or raw materials for transportation.

Furthermore, the distribution of different flint types and a thorough assessment of flint quality raise interesting questions about mobility patterns and procurement strategies. There was, for example, a distinct decline in the use of high quality flint during the Early Mesolithic period, suggesting a gradual adaptation to a new raw material condition in which local beach flint was put to use. Even more intriguing is the change in flint availability through time and through different phases, potentially demonstrating new waves of "pioneers". Different raw material procurement strategies are documented within and between all periods of the Stone Age.

Site (n)	County	Tested , discarded	Discarded, poor quality	Discarded, knapping errors	Discarded, still usable flint mass	Exhausted	Phase
Sagene B2 (n=6)	**Aust-Agder**	-	-	**29 %**	-	**71 %**	**EM**
Sagene B4 (n=3)	**Aust-Agder**	-	-	-	-	**100 %**	**EM**
Pauler 3 (n=42)	**Vestfold**			12 %	40 %	48 %	EM
Sagene B6 (n=5)	**Aust-Agder**	-	-	**20 %**	-	**80 %**	**EM**
Sagene B1 (n=9)	**Aust-Agder**	-	-	**22 %**	**22 %**	**56 %**	**EM**
Bakke (n=24)	Vestfold			8 %	25 %	67 %	EM
Kvastad A9 (n=2)	**Aust-Agder**	-	-	-	-	**100 %**	**EM**
Kvastad A8 (n=5)	**Aust-Agder**	-	-	-	**60 %**	**40 %**	**EM**
Tinderholt 3 (n=1)	Telemark				100 %		EM
Tinderholt 2 (n=1)	Telemark			100 %			EM
Kvastad A1 (n=3)	**Aust-Agder**	-	**67 %**	-	-	**33 %**	**EM**
Kvastad A2 sw. (n=5)	**Aust-Agder**	-	-	-		**100 %**	**EM**
Kvastad A2 ne. (n=4)	**Aust-Agder**	-	-	-	**75 %**	**25 %**	**EM**
Hydal 8 (n=10)	Telemark		10 %		10 %	80 %	MM
Hydal 7 (n=2)	Telemark				50 %	50 %	MM
Hydal 3 (n=8)	Telemark		12 %			88 %	MM
Hegna Vest 1 (n=19)	Telemark		11 %	11 %	16 %	63 %	MM
Hegna Vest 3 (n=38)	Telemark		8 %		30 %	63 %	MM
Hegna Vest 4 (n=68)	Telemark	1 %	9 %		15 %	75 %	MM
Hegna Øst 5 (n=112)	Telemark				10 %	90 %	MM
Hesthag C4 (n=16)	**Aust-Agder**					**100 %**	**MM**
Hesthag C2 (n=78)	**Aust-Agder**		**9 %**		**12 %**	**79 %**	**MM/ LM**

Table 3.6.6: Overview of different core categories from sites dated to the Early and Middle Mesolithic from the E18 Tvedestrand–Arendal project (Aust-Agder), the E18 Brunlanes project (Pauler and Bakke, Vestfold) and the E18 Rugtvedt–Dørdal project (Tinderholt, Hydal and Hegna Vest, Telemark). Sites from the Early Mesolithic are emphasized in grey colour. E18 Tvedestrand–Arendal sites are in bold. "EM" = Early Mesolithic, "MM" = Middle Mesolithic, "LM" = Late Mesolithic.

Known methods and techniques of blade production were recognized in the material from the E18 Tvedestrand–Arendal sites. For both the Early and the Middle Mesolithic, individual variation between sites was observed. This data can be applied to ongoing discussions on technological change through time. The regional continuation of blade production from conical cores into the Late Mesolithic in Aust-Agder needs to be better explained. Comparative studies are needed to fully understand why, in some regions, technological concepts have longevity, but not in others.

Finally, studies of concepts of core reduction and discard have obtained interesting data that highlights less emphasized core types like bipolar cores and irregular cores – these require attention. It was demonstrated above that absence of discarded cores with repeated knapping mistakes could potentially offer information about site demography and a better understanding of social prehistory.