



THE PREHISTORIC SLATE ACQUISITION SITE AT DJUPVIK

Excavation report from activity areas investigated 15-18 June 2020

Alta municipality, Finnmark county

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Summary

The Djupvik site, located on the Altenes peninsula in Alta Fjord, Finnmark, represents the first formally excavated prehistoric slate raw material acquisition site in Arctic Europe. Investigations conducted in 2019 and 2020 revealed evidence of slate tool production, including bifacial and saw-and-snap techniques, alongside ochre concentrations and a hearth structure dated to approximately 6000 cal BP. Despite challenges in distinguishing natural from humanly worked slate, the excavation uncovered diagnostic lithic materials and activity areas, suggesting repeated short-term use. The findings emphasize the site's role in raw material procurement and its integration into broader technological and adaptive strategies.

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1 Introduction and background

As part of the fieldwork agenda and research objectives of the project “Stone Age Demographics: multi-scale exploration of population variations and dynamics” [henceforth: *StoneDem*] potential activity areas associated with the Djupvik prehistoric slate raw material extraction site at the Altenes peninsula in inner Alta fjord, western Finnmark, was investigated during two short field seasons of 2019 and 2020 – the results of which are presented here.

The site was originally discovered by Karin Tansem (Alta Museum) in 2016, on her hunch that the exposed face of the geological slate formation at Altenes might hold tool-grade quality slate. And indeed, Tansem identified likely tool preforms on the surface of the scree area below the exposed rock face. This instigated an official survey of the site by the county heritage authorities 24.08.2017 (report not existing – county survey data is included here) and the addition of the site to the national heritage database and the protection/enlisting of the extended area.

On the basis of positive identification of slate preforms at the site, *StoneDem* undertook a general survey of the area 20.05.2019, including two test pits for preliminary evaluation of lithic debitage and identification of activity areas. Permission to perform the test pits was obtained from the County authorities. Beyond bringing back slate material for further investigation, the 2019 survey identified several dwelling features (likely 4) at the Tapes beach ridge on the eastern side of the prehistoric bay – separated from the slate outcrop and the excavation area of 2020 by a stream.

The *StoneDem* project initiated a small-scale excavation of the site 15-18 June, 2020. The campaign requested permission by the Directorate for Cultural Heritage, and was permitted, to excavate up to 12 m² distributed across the western section of the site. The participants included: Charlotte Damm, Jan Magne Gjerde, Roberta Gordaoff, Karin Tansem and Erlend Kirkeng Jørgensen.

The fieldwork was executed during the initial year of the Corona pandemic and had to be approved by the University. We followed set hygiene procedures through fieldwork and travelled in multiple cars to maintain distance and stayed at separate rooms at a hotel in Alta city for the same reason.

All photos and figures are produced by the author unless otherwise noted.

2 Justification for the investigation: Knowledge status and objectives

An overall aim of the *StoneDem* project is to provide a more complete picture of human ecodynamic trends of a transect of Arctic Norway, using the extended Alta fjord region as a case study - covering the inland to the outer coast. The Alta fjord region is of particular interest both to the *StoneDem* project, but also of wider relevance to the study and reconstruction of past social systems, given the wide range of known site types and rich settlement data. The combination of rich habitation sites, rock art (communal ritual sites), well-studied palaeoenvironment, waterways connecting the area to inland economic activities (hunting pit-systems) and the multiple chert raw material extraction sites can now be complemented by the initial investigation of a slate raw material extraction site. In sum, we now possess vital pieces of the societal underpinnings of Stone Age western Finnmark – only lacking proper burial grounds and/or human osteological material.

Despite the previously established conception that inner Alta Fjord was more or less empty of prehistoric settlement sites due to the rock art sites being conceived of as a regional center for ritual aggregation, a recent review and ground-truthing of all known sites in Alta fjord region highlights the extensive and deep time settlement history of Alta Fjord (Gjerde; upcoming). Fieldwork and synthetic work carried out by the *StoneDem* project through Jan Magne Gjerde demonstrate that rich and large concentrations of habitation sites along the fjord. The recognition of such habitation sites within and among the rock art panels at Hjemmaeluft, combined with several known raw material extraction sites in the inner parts of Alta fjord, altogether point to Alta as being overlooked as a habitable and economically important ecotone.

Inner Alta Fjord represent a true ecotonal area (a transitional zone between geographically distinct ecosystems and species distribution) – forming the most direct connection between the outer coast of known extensive settlement and the maritime resource exploitation, with that of the properly forested inland low-lands, terrestrial game and riverine resources. The eponymous Komsa hill in Alta city, from where some of the best-known pioneer sites occur (Bøe and Nummedal 1936), would have constituted an island in a highly productive and complex brackish/estuarine environment at Mesolithic seal levels. The Komsa hill is also located at the outlet of the most significant waterway this part of Finnmark, with the Alta-Kautokeino river drainage connecting the outer coast with the deep interior, acting as a coast-inland connection for people and anadromous fish. It is worth noting that the physical geography of the inner Alta fjord affords an unusual

terrestrial productivity (facilitating agriculture) at these latitudes, both due to the location on/next to a glacial fluvial delta and the relatively warm summers. The area is characterized by Taiga-like forest conditions even today, which would have extended much further out towards the outer coast during the Holocene Thermal maximum of the Early/Mid-Holocene transition (Early/Late Stone Age transition). With increasing archaeological data and palaeoenvironmental understanding, the Alta fjord is looking all the more as a central hub for human activities throughout the post-glacial period, across the spectrum of economic and ritual.

The recent and now firmly corroborated knowledge that tool-grade slate material could be acquired locally, further substantiates the Alta Fjord as important region to the population of prehistoric Arctic Norway. The Djupvik excavations aim at contributing a piece to fuller understanding of the socioecological niche of Stone Age people utilizing and inhabiting the region. The social and adaptive features of any population converge through technology. Given the near total absence of preserved organic technologies, lithic technologies provide one of very few direct sources of human adaptive history in the region with significant time depth, making lithic technologies (their production sequence and affordance) a fundamentally important source of information. While finished/formal tools are fundamental to this understanding, their production sequence from raw material acquisition to finished tool is replete with technically informed and economically directed decisions. The raw material acquisition phase is particularly poorly understood concerning the slate tool tradition. While provenience, experimental and chaîne opératoire studies are frequent for cryptocrystalline lithics such as flint and obsidian, slate technology is poorly understood. This is a global phenomenon. The Djupvik excavations try to reduce this knowledge gap by contributing the first formal excavation of a slate raw material extraction site. This is additionally a pressing issue, as securing rich and contextually controlled debitage from initial reduction stages in slate tool production is rare in the local archaeological record. While rich slate inventories have been excavated throughout the research history and the set of finished/formal slate tools from excavations and stray finds handed in is great, slate debitage was overlooked in the early stages of disciplinary development in the region. As many of the most significant slate inventories were investigated prior to debitage collection, this constitutes a hurdle to our understanding of the technical organization and chaîne opératoire of the slate industry.

The 2020 excavation campaign was primarily directed at the following objectives:

- Initiate the first excavation and analysis of a prehistoric slate raw material extraction site known across Fennoscandia to date.

- Identify and delimit the spatial extent of slate working areas across the site.
- Collect and analyze lithic debitage from the early stages of slate tool production.
- Look for the presence/absence of various production techniques in the debitage and their chronology (percussively worked vs saw and grinding).
- Collect material suitable for a representative baseline of XRF-based provenience studies for future research.
- Discuss the function of the raw material extraction site within a greater settlement and economic system.

Slate sources are particularly interesting to investigate given the lack of positively identified sources (although several suspected) in Norway, combined with the fact that slate technology formed one of the most significant lithic traditions through the Stone Age of Arctic Norway. Reconstructing past behavioral systems would therefore benefit from a greater understanding of this major component. In fact, slate tool technology is the defining technological trait of the Late Stone Age (7000-4000 cal BP). Slate has two main technological uses, that is to produce projectiles (spear-/arrowheads and lances) and cutting tools (knives of great morphological and functional variety). Slate is thought to convey some particularly beneficial properties to lithic tool production, in which the plasticity of the material can facilitate high potential for standardization and serial production, given access to sufficiently homogenous slate. Such properties would also result in very different debitage and extractive indicators compared to other lithic industries based on cryptocrystalline rocks.

Previous studies have demonstrated the internal dynamics of slate tool technology and its peaking importance along with indicators of increased maritime intensification/specialization, elevated population densities and social complexity, with primary importance during the 6000 cal BP population peak – followed by ever reducing importance until being supplanted by metal implements approx. 2500 cal BP (Jørgensen 2020).

While slate tool industries are a hallmark of high-latitude maritime hunter-gatherers, distributed across most of the circumpolar region, formally investigated slate extraction sites are extremely rare. This is likely a combined effect of extensive prehistoric slate use being a predominantly high-latitude phenomenon, often associated with maritime adapted groups, and the high north being a less intensively investigated region. However, there are some very few exceptions:

- Most notably the “Massachusetts Hornfels-Braintree Slate Quarry” (Bowman and Zeoli 1977). While the hornfels material is in fact the heavily metamorphized

sedimentary rock “hornfels” which is significantly harder than slate and mudstone used typically associated with ground slate tool technology, the Braintree slate, which has been used in ground tool production, is more comparable to the slate used locally.

- XRF-based provenience studies of Maritime Archaic slate tools from Newfoundland and Labrador do exist (Wolff et al. 2014), yet based on excavated tools not stemming from an actual quarry site.
- Some basic discussion of the source of the Onega “green slate” at the Lake Onega region does exist (Nuñez 1998; Tarasov 2011), although this is strictly speaking not slate, and termed “metatuffite” in more recent Finnish literature (Nordqvist 2018:118).
- A recent thesis investigated the geochemical composition of Northern Finnish metatuffite sources in the Tervola-Rovaniemi region that is thought to have been exploited for prehistoric raw material sourcing (Eranti 2019). Although not slate, the local extrusions of metavolcanites share many of the same properties of slates and schists, yet have a very different formation history. It is generally less foliated and significantly denser, resulting in different properties and technological uses (mostly gouges and icepicks) and requiring a different production technique from slate proper. However, local pockets of grindable and foliated metavolcanites do occur and could be used in a comparable manner.
- The Caledonian mountain range on the Norwegian/Swedish border has been extensively surveyed for prospective slate outcrops of archaeologically relevant and tool-grade slate quality by Fredrik Hallgren. A few sites have turned up evidence active extraction in central Sweden (Hallgren 2012:142; Hallgren 2023). However, these have not been subject to formal excavation/investigation.
- Important raw material site identification and petrographic studies of western Finnmark chert sources done by Bryan Hood in the 1980-90s, located four chert sources in the Alta fjord region displaying signs of active extraction (Mathiselvbrua, Mathisfossen, Kvenvikvatn and Storhaugen) (Hood 1992). While being the only proper lithic resource study to date in all of Arctic Norway, it has recently been corroborated through a large-scale excavation of a large chert quarry at Melsvik, directly across the fjord from the Djupvik slate source (Niemi et al. 2019).

3 Site description and geology of Djupvik and Altene

3.1 Site description

The Djupvik slate outcrop is located at the northern shore of the Altene peninsula protruding into the Alta fjord, approx. 3 km from the nearby village of Leirby (Fig 1).



Figure 1 Area map. Upper: Finnmark county. Lower: Inner Alta fjord. Map data: GeoNorge.

The hill (107 masl) from which the slate source outcrops appear not to have been officially named. In the following it will be referred to as “*Djupvikberget*”. The hill and scree area slopes down into what would have constituted a significantly larger bay than at present, during previously raised shoreline levels. This lower elevation bay extends from the foot of the hill and scree area in a semi-circle with a diameter of approx. 250 meters across, containing galleries of fossil beach ridges down towards the current shore covered by vegetation (birch and salix). The extended Djupvik bay area is split by a stream running down the valley from the uphill area inland, flowing out into a bay. The slate formation and outcrop is located to the west of this stream and forms the area of interest for this report (Fig. 2-5). The four possible dwelling structures identified during the StoneDem 2019 survey are located on the eastern side of the stream.

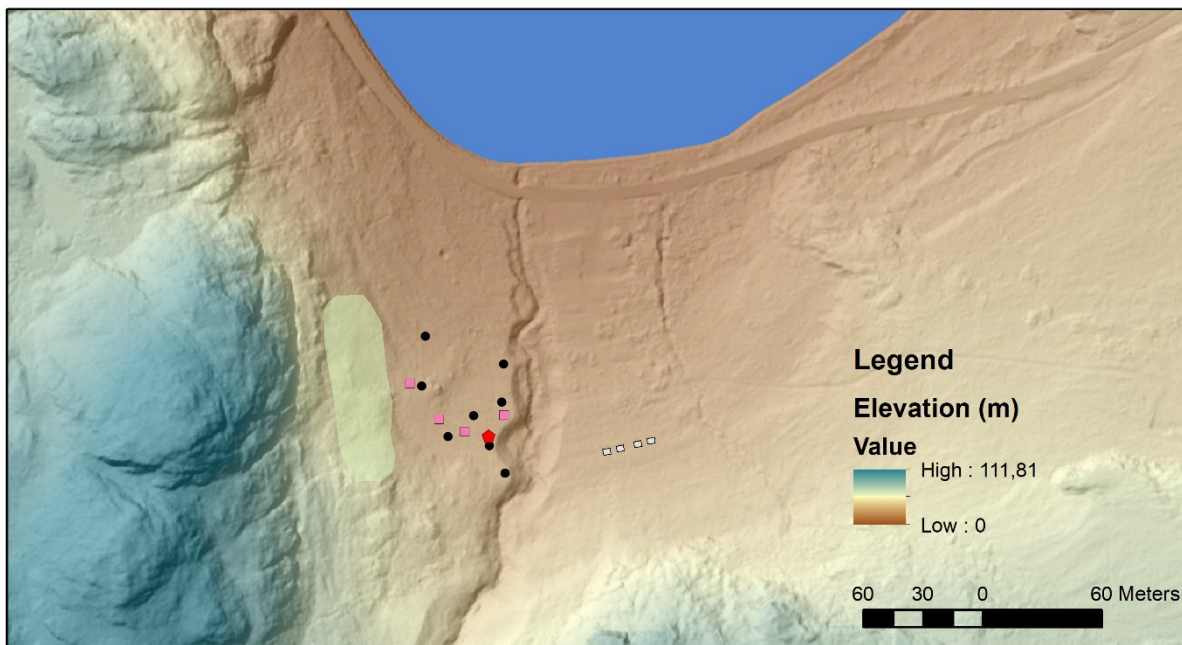


Figure 2 Digital elevation model of the site (actualistic and measurable distances and elevation). Site overview. Djupvikberget hill on the left. White squares east of the river denominate likely Stone Age house pits. Markers not to actual scale. Dots mark excavated areas. Green polygon designates the scree area with registered concentrations of likely tool preforms.



Figure 3 Aerial overview of the "Djupvikberget" hill in front. View towards the north and the Alta fjord. Årøya island is visible in the center of the fjord and the Djukvika bay extending into the front on the right.



Figure 4 Aerial overview of the "Djupvikberget" hill towards the south and interior of the Altenes peninsula. Note the scree desposits below the hill.



Figure 5 Vertical aerial photo of the scree deposits below the hill. The exposed rock face is situated just above the scree field, in the middle of the picture, trees growing on top of the exposed face.

The current bay is settled by a handful of standing and ruin buildings, all at elevations well below prehistoric levels. Two currently occupied houses, one cabin and an odd number of support buildings exist in the area between the fjord and 19 m.a.sl. on the eastern section of the site (east of the stream). Two ruin foundations of an older occupation exist below the excavation area on the western side of the stream, of what supposedly was a blacksmith's home and workshop. No modern disturbances were visible at prehistoric sea-levels. The property lines of a nearby farm and state backland cross the site. Site information is summarized in table 1.

Table 1 Site information

Askeladden site ID	238834
Site name	Djupvik
Gnr/bnr	43/34 and 43/1
Property name	"Åsgårdminne"
General orientation	North facing, with a view to the eastern part of Årøya Island and Mikkelby
Local topography	Bay situated between larger bay to the east and rocky outcrops to the west
Freshwater access	Stream running through the site
Terrain	Fairly flat terrace at 22-23 elevation (m.a.s.l.)

Given our interest in collecting debitage for technological analysis, the excavation targeted habitable raised shorelines below the steep slope of scree below the exposed rock face. This was considered the most likely area for working collected raw material nodules from the scree area or extracted from the rock face itself, as the steep terrain and unsure footing would make for poor working stations.

The information provided by the county heritage authority's survey (in the Askeladden database) suggests there were two different types of slate to be found in the scree area, that is, uniformly red and red-green banded slate. However, geologically speaking, the slate of the entire formation is the product of the same geological structure and should be treated as one raw material type – regardless of local variation in coloration and fissility (that is, the ability of a rock to split along flat bedding planes of weakness).

Upon scrutiny, the outcrop produces a spectrum of slate from homogenous deep red (almost brownish) to red specked with beige (occasionally white) bulbs, as well as distinctly laminated red and beige layers (Fig 6). Coloring of the layers depends on the oxidation and weathering of the surface. In its raw form, tending towards white and becoming increasingly greenish with the acquisition of patina.

Originally, it was thought that most, if not all of the scree material, was the product of human extraction efforts made at the hillside rockface (Tansem and County, pers. com.). Visual inspection of the rock face and the scree material did not produce any evidence of direct extraction from the face. Instead, the majority of the material likely stems from natural erosion and deposition through frost and thawing cycles. Considering that the marine limit approximates 69 masl at the site, and the fact that the rock face is at approx.

45-50 masl, it seems likely that wave action made the initial and most significant erosion agent on the rock face, driving the deposition of the main bulk of the scree material.

At the time of our field inspection, the entire rock face displayed signs of highly active erosion with loose and soon-to-be eroded material. This, however, does not undercut the possibility that raw material acquisition actually did occur directly at the rock face, as active erosion may have removed evidence of such.



Figure 6 Illustration of the rockface and active erosion. Left: Eroding rockface of the central section of the outcrop displaying fresh surfaces. Upper right: Slabs of tool grade material are dispatched directly from the rockface, mostly in the central/eastern section of the outcrop. Note color variety within same nodule. Lower right: Westernmost section of the rockface and scree area mostly consist of small (5 cm) thin sticks of material eroding directly off the bedrock in the hillside.

From the perspective of lithic tool production, only very specific portions of this outcrop are deemed of tool-grade quality. Although the main bulk of the material is visually reminiscent of known slate raw materials used in prehistoric tool production, variations in fissility, lamination, compactness, fracture patterns etc would impose great limitations as to what could reliably be made of the material. This is strikingly evident from the visual inspection of the scree deposits (Fig.7). The main scree area of exposed material

(excluding the boulder field) forms a belt approx. 90 long by 20 meters wide, in a NW-SE direction at the foot of the Djukvikberget hill. Although greater parts of the scree material is likely covered by vegetation, significant raw material differences were identified within the exposed transect. The SE section contained larger nodules of tool-grade quality, while the NW section of the scree area was characterized by highly fragmented, stick-like material unfit for tool production – being much more brittle and crystallized – likely from stronger metamorphic alteration.



Figure 7 Scree area: Left – the SE section contained larger nodules of tool-grade quality. Right – the NW section of the scree area was characterized by highly fragmented, stick-like material unfit for tool production.

3.2 Terminology: “Slate”

Initially it is necessary to establish a fundamental problem of terminology concerning the type of rock in question here. From an archaeological perspective, the “material” is referred to as “slate” (NOR: “skifer”). Slate is the term for fine-grained, foliated and homogenous rocks that have been subject to some degree of metamorphism of what was originally a shale (NOR: “leirskifer”) type of sedimentary rock. While this is mostly correct

for the geological structure of the raw material outcrop at Djupvik, the archaeological term is a much wider catch-all phrase for rocks of a soft and foliated structure, often including a wide specter of rocks with very different origin, composition, and degree of metamorphism. Thus conceived, archaeological “slate” is more than anything a pragmatic term for naming materials that can be ground, as opposed to worked through percussive techniques, and therefore may encompass rocks with grainsizes from mudstone (NOR: “slamstein”) to siltstone (NOR: “siltstein”) to sandstone (NOR: “sandstein”).

In geology, slate has the very specific meaning alluded to above. However, from visual inspection only, it is not possible to make exact classification as there can be great similarities in appearance and physical properties between slate, shale, mudstone, mudrock, silt-shale, etc. Petrographic analysis aided by powerful microscope/electron-microscope is necessary to determine the actual rock type, given the very fine-grained quality of such sedimentary rocks.

For practical purposes, “slate” is used to term the material of the lithic raw material source at Djupvik in this report. Future research should investigate the geological properties and composition of the material in greater detail.

Regardless of geological terminology, there are some dominant parameters of slate-like rocks of tool-grade quality. Possibly the most important have been summarized in (Fig 8), displaying the deal composition of rock properties for ground stone tool production.

- Particle size: The smaller the better. Mud or potentially silt sized particles (often in some combination) appear to produce the most homogenous lithic raw material given the consistent particle size.
- Fissility: High degrees of fissility (the ability of a rock to split along flat bedding planes of weakness) is conducive to ground stone tool production given the aid provided by consistent fracture patterns, natural erosion into tablets etc – the very basis for standardized tool I production.
- Metamorphic grade: Low degrees most favorable, as to maintain or possibly enhance original bedding. The metamorphic progression of slate starts out as 1) shale (NOR: “leirskifer”), altered into the harder and more fissile 2) slate (NOR: “skifer”), then 3) phyllite (NOR: “fylitt”), 4) schist (NOR: “glimmerskifer”), and finally 5) banded gneiss (NOR: “båndgneis”).

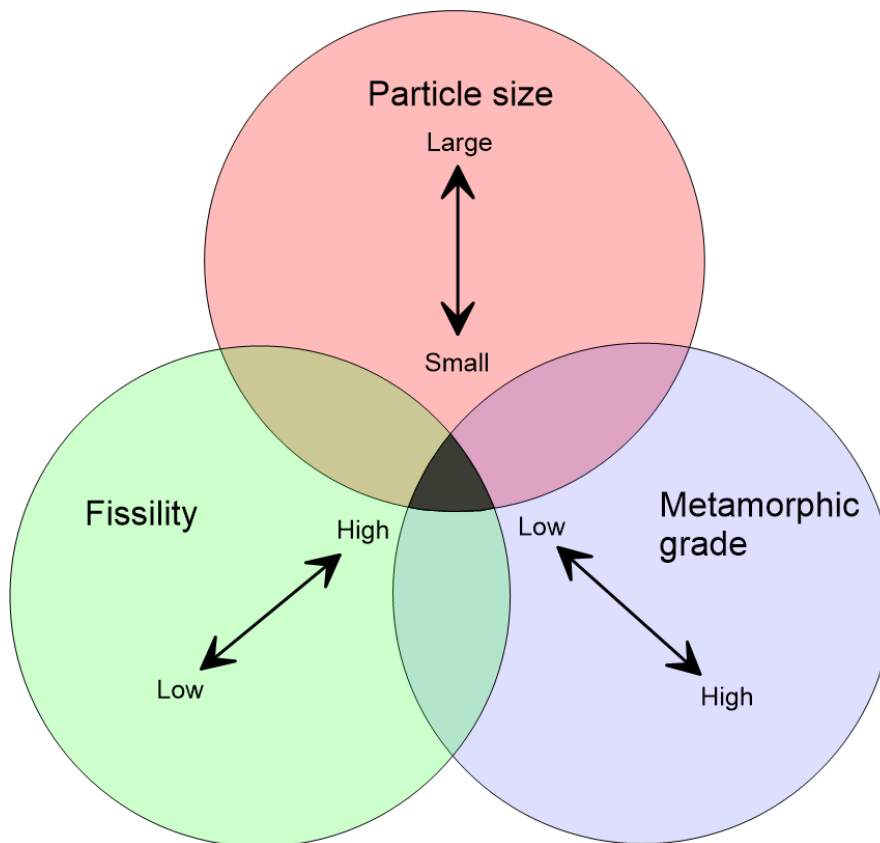


Figure 8 Schematic figure of ideal composition of raw material properties for ground tool production.

While the trend is that small particle size, high fissility and low metamorphic alteration (if any) is conducive to tool grade sedimentary rocks, this is not sufficient in itself. The sedimentary rock needs to be sufficiently compacted to maintain integrity when worked and used, while simultaneously not too fissile as to become porous and disintegrating – which make schists useless.

At least some degree of metamorphic alteration appears to be favorable to produce tool-grade sedimentary rocks, likely enhancing the fissility of the rock making it split more consistently than metamorphically un-altered sedimentary rocks such as silt- and mudrock, that lack distinct bedding planes and weather/break apart at oblique angles unrelated to bedding planes. This likely also applies to bedded variants of dolomite as well. Overly high degrees of metamorphic alteration along the slate spectrum produce very hard/dense and unworkable products such as gneiss, where the bedding planes have been stretched and compacted to be wavy or unrecognizable.

3.3 Geological context

The location and character of the Djupvik slate outcrop follow its placement within the larger geological structure of the Altenes peninsula (**Fig 9**) and needs to be given some explication.

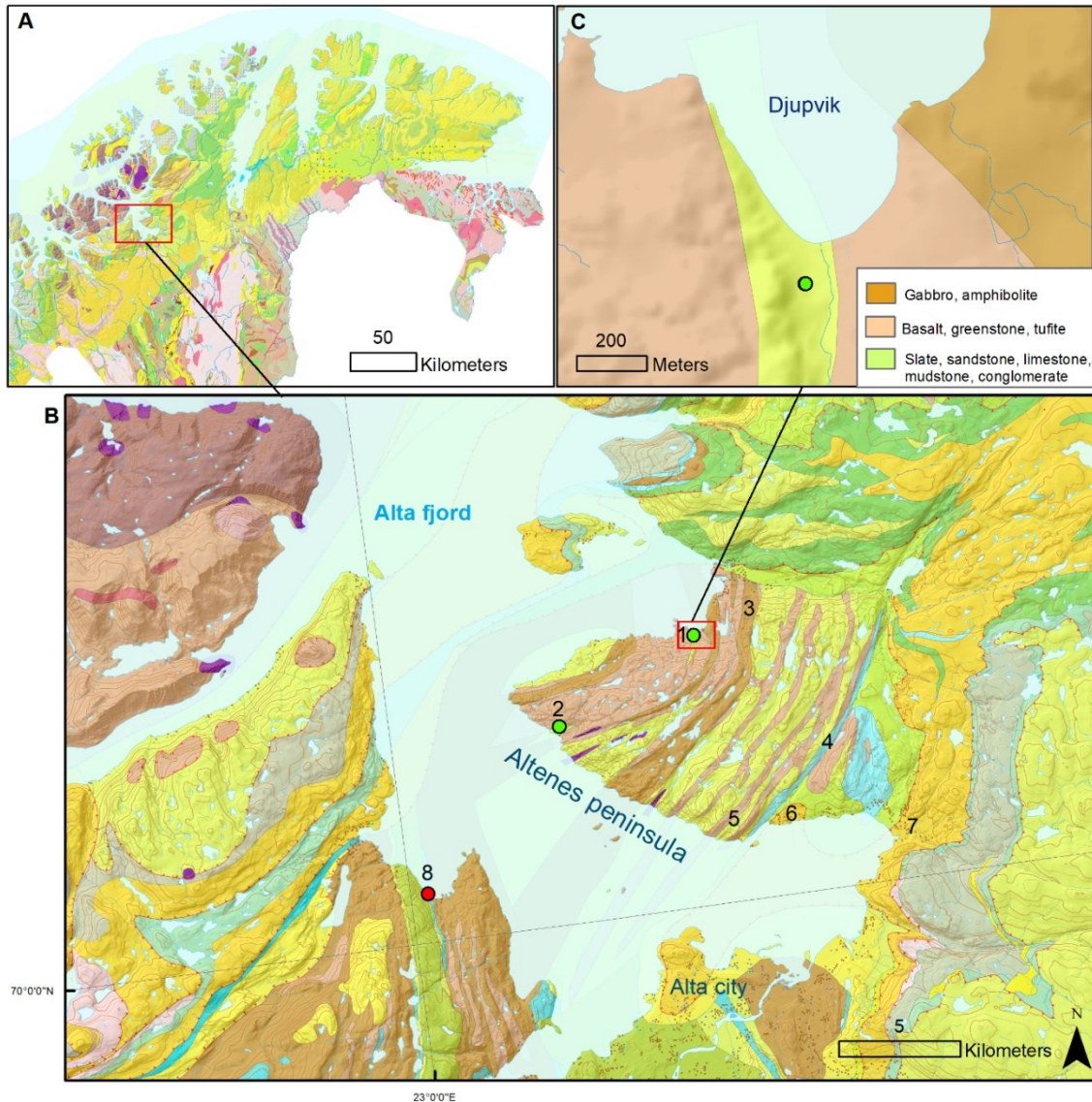


Figure 9 Geological map. A) Overview of Finnmark county. Note the distinct separation between the bedrocks of the Baltic shield (inner Finnmark) and the Caledonian range on the coast. B) View of inner Alta fjord, centering on the Altenes peninsula with place names mentioned in the text. Distribution of geological structures is visible through partly translucent fjord. 1) Djupvik, 2) Storvik, 3) Kviby formation, 4) Hansadalen fault line, 5) Russeluft formation, 6) Turelv formation, 7) Rafsbotn formation, 8) Melsvik chert quarry. C) Geological close-up map of the excavation area and surroundings at Djupvika bay. Map data from Geo.ngu.no and Kartverket.

Current knowledge of the geology of the Altenes peninsula primarily builds on the surveys by (Fareth 1979) in addition to some petrographic analyses of local materials (Pratt 1989).¹ The Altenes peninsula constitute what is known as the "Altenes tectonic window" – situated between the larger Alta-Kvænangen and Komagfjord tectonic windows - both referring to the preservation and exposure of Precambrian bedrock in these parts of western Finnmark, related to the Archaic basement rock of the Baltic Shield that dominate inner Finnmark. They provide "windows" into older bedrock formations that are typically superimposed by the formation of the younger Caledonian range and have all been subject to some level of metamorphic alteration. These windows combined are part of the so-called Raipas Supergroup², as described in (Pharaoh et al. 1983). Structurally, the Altenes peninsula is separated by a major fault line running along a SW-NE gradient at the inner section – recognizable in the landscape as the Hansadalen valley, composed of dolomite marble. Two formations have informally been recognized for the outer/western (=main bulk) section of the peninsula, that is, the Kviby³ formation, of which Djupvik is a part – consisting of basic volcanics. In addition, there is the more limited Russeluft⁴ formation in the southern corner of the peninsula, consisting of epiclastic sediments (Fareth 1979:15). On the inner (SE) side of the major fault are the so-called Turelv⁵ and Rafsbotn⁶ formations. The Turelv formation is dominated by greenstone, sandstone/phyllite and dolomites. The Rafsbotn formation is rich in low-grade metamorphic rocks of mud to silt to sand particles.

The slate structure outcropping at the Djupvik site from which archaeological materials have been extracted is part of the Kviby formation, consisting mostly of low-grade metamorphic, extrusive rocks, wedged between larger gabbro-dominated structures that are also classified as undifferentiated greenstone.

While the Djupvik slate outcropping is intriguing from an archaeological perspective given its easy access and high visibility from the fjord – features more common in eastern Finnmark - other sites of coastally bound outcrops of slate appear along the western shore of the Altenes peninsula: A minor outcrop of the same slate strata/structure outcropping at Djupvik can be found at the Storvika bay identified by Jan mange Gjerde,

¹ See also: <https://www.ngu.no/en/publikasjon/r-stoffunders-kelse-i-nord-norge-geologisk-kartlegging-altenes-halv-ya>

² https://aps.ngu.no/pls/utf8/geoenhet_SokiDb.Vis_enhet?p_id=179434&p_spraak=N

³ https://aps.ngu.no/pls/utf8/geoenhet_SokiDb.Vis_enhet?p_id=153987&p_spraak=N

⁴ https://aps.ngu.no/pls/utf8/geoenhet_SokiDb.Vis_enhet?p_id=153983&p_spraak=N

⁵ http://aps.ngu.no/pls/utf8/geoenhet_SokiDb.Vis_enhet?p_id=153991&p_spraak=N

⁶ https://aps.ngu.no/pls/utf8/geoenhet_SokiDb.Vis_enhet?p_id=150550&p_spraak=N

where active slate extraction has been observed (Fig 10). Also, a related formation of slate is to be found at Rafsbotn/Gammelheim, at the southeastern Altenes intersecting with the Caledonian/Kalak Knappe complex. In fact, this latter mudstone formation encloses the entire eastern section of the Altenes tectonic window – although not coastally bound. However, these are less well exposed and of a more complex structure, likely making them less suitable for archaeological-technological purposes.



Figure 10 Slate outcrop at the Storvika bay, western edge of the Altenes peninsula, discovered by Jan Magne Gjerde in 2018. Note the apparent percussive impact ripples on the right from what seems to have been extractive efforts. The exposed slate is homogenously darker red with minimal bright inclusions, as opposed to the clearly banded slate at Djupvik. Photos: Jan Magne Gjerde.

In archaeology, the tool-grade slate material used in prehistoric times come in two main color categories: red and grey. This has received some attention, and suggested preference for different colors have been proposed to follow various cultural and aesthetic perceptions by the prehistoric people making use of the material (ref). Geologically speaking however, color differences in slate result from different *diagenesis* – that is, differences in the formative history of how the sediments eventually petrify into rocks. All slates are sedimentary rocks whose parent material are sand to mud sized particles eroded from bedrock material and require low-energy waterlogged environments for the gently deposition into laminated structures to take place and form homogenous and fine-grade sedimentary rocks. Most slates therefore formed in past

oceans, acting as the sink for continental fluvial deposits. Watery environments are reductive, and while sedimentary rocks like slate can contain large amounts of iron or hematite minerals that produce dark/redish coloration in the material if exposed to higher concentrations of oxygen through elevation above sea-level, such will not form in sedimentary deposits that get compacted and petrify and/or get superimposed while submerged. This will produce monochromatic grey colors. However, reemergence from the water after laminated sedimentary deposits have been made but prior to petrification, can produce strong oxidation of iron rich sediments – and result in red coloration. Plate tectonics and sea level changes are the typical agents for exposing sedimentary deposits formed at the ocean floor to air. Archaeological slate in Norway is both of grey and red color and thus point to different slate sources that have been exploited in the past. The Djupvik slate formation consist of distinctly red material with bands and blubs of brighter/beige material, indicative both of a diagenesis in oxidizing environments, sediments eroded from an iron/hematite rich parent material – the combined result being high content of iron oxides that is visible as the red color. The brighter banding of the slate should therefore stem from periods of formation in more complete, anoxic conditions.

While red and grey are the dominant coloration of archaeological slate in Norway other colorations do exist in slate-like materials, such as phyllite of stark black color, stemming from high contents of organic graphite (e.g. “Otta slate”). Yet such is not known to have been exploited for prehistoric tool production, most likely as the metamorphic process of turning slate into phyllite will render it unsuitable for tool production. Black slate is however common at archaeological sites in NW America, such as at Kodiak. This is probably slate forming through the sedimentation and eventual petrification of volcanic ash. Such is also known more locally from the so-called “Onega greenstone/green slate” source in Karelia and circulated throughout Finland with small pockets of similar formations in Northern Finland. While often referred to as “slate”, this material is more appropriately referred to as “tuffite” with a dark green coloration. Green-ish coloration in slate found in Norway is also fairly common but is mostly the result of weathering of originally bright/grey materials.

4 Excavation design, methodology and documentation

The objective of identifying potential raw material acquisition, its relation to primary reduction and lithic debitage for technological analysis drove the priority of the habitable beach terraces below the actual slate source. The scree slope was originally planned for excavation but dropped as test pits would not maintain integrity when removing materials and thus be a hazard and not produce useful information.

The modelled shoreline displacement curve of the 24th Tapes isobase is considered most relevant to the area (Fig 11). The Marine limit is identified locally at approx. 69 masl. From then there was a continuous isostatic uplift in the area, characterized by great displacement rate of 20 m per millennium until 8000 BP / 9000 cal BP, when the displacement rate dropped to ca 3 m per millennium. While displacement was continuous throughout the Holocene, there is a potential, although minimal, standstill at the 24th contour line – corresponding to the elevation of the main beach ridge and majority of the positive excavation areas. Given the location of the find distribution on top, and slightly in front of the Tapes beach ridge, it is expected that the depositional/activity event took place *after* the Tapes transgression. This is in line with the general pattern observed across Tapes related sites in Northern Norway.

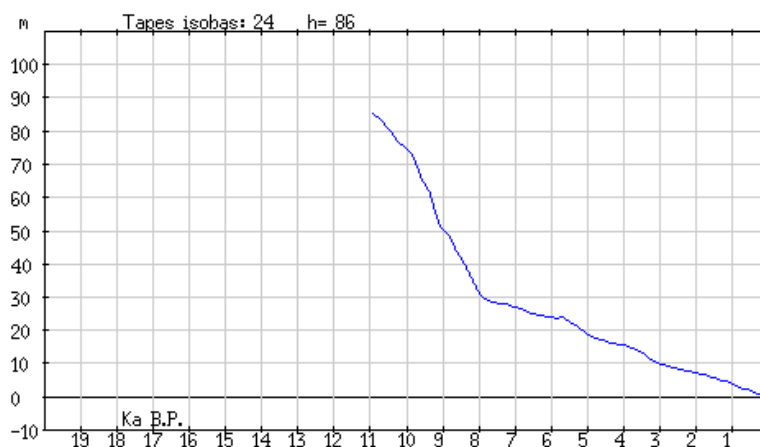


Figure 11 Modelled isostatic uplift at the 24th isobase, corresponding to the relative sea level change at the Djupvik site. From <http://geo.phys.uit.no/sealev/>

In terms of documentation, this excavation was subject to an explorative approach given the many uncertainties facing an excavation of lithic quarries. We set out a main grid line crosscutting the upper habitable terrace (Fig 13-14) and distributed test pits in line with this overall grid. Given the occasionally steep terrain, the coordinate system was directed south – demonstrated in (Fig 12), as opposed to the N-facing norm. This was to avoid

confusion and mix up in labeling when having to dig facing south due to the sloping terrain.

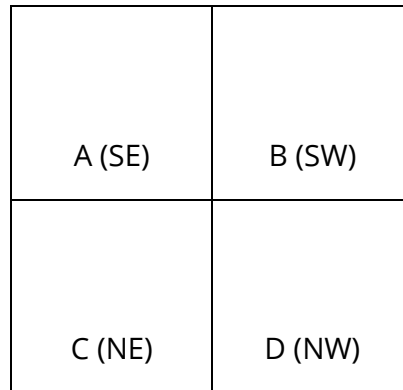


Figure 12 Schematic of the south-facing coordinate system used at the site.

A total of 8.25 m² were excavated between the two campaigns, distributed among 9 quadrant (50x50 cm) test pits, 3 m² squares and a 3 m² excavation area. Their distribution across the site is demonstrated in (Fig 15). Test pits were distributed across the site with the aim of identifying potential activity areas, delimit such, as well as to cover both horizontal and vertical aspects of the site aiming to uncover typological distinct debitage and tools. As is visible through the results presented below, the negative results from the higher and lower terraces made us focus on the intermediate levels (Tapes).

Units were documented mostly in line with the procedures of Tromsø Museum, including photo documentation, description in structure forms and measured using a CPOS. All turf and excess soil was put back in place and the vegetation surface was reconstructed to the best of our efforts.

Units were excavated mechanically in 5 cm thick layers after de-turfing and the contents of each layer was dry sieved. However, most units contained only minimal (if any) soil at all below the turf layer. This combined with the dense packing of scree and naturally flaked slate in most squares made sieving obsolete. For the most part, the contents of each unit were picked through manually, piece by piece – trying to identify humanly worked slate – illustrated in (Fig 17). Finds were tentatively sorted into size and color classes while excavating, using a compartmentalized sorting tray.

We collected everything considered to be different stages of humanly worked lithic materials. While this was often difficult to determine in-field, we devised a sampling strategy of liberally collecting debitage from all units, while a selection of units were subject to complete collection. Both were systematically processed in the cataloguing procedure and acted as internal controls.

The prehistoric slate acquisition site at Djupvik



Figure 13 View towards the east showing the coordinate mainline following the Tapes main ridge and across the site along an east-west gradient. Note boulder field behind the trees on the right that form the eastern end of the boulder and scree area from the "hill name" slate outcrop. Photo: CBD.



Figure 14 View towards the west with the coordinate mainline slightly visible in the center and a view of the Djupvikberget hill slate outcrop in the back and boulder/scree area on the left. Photo: CBD.

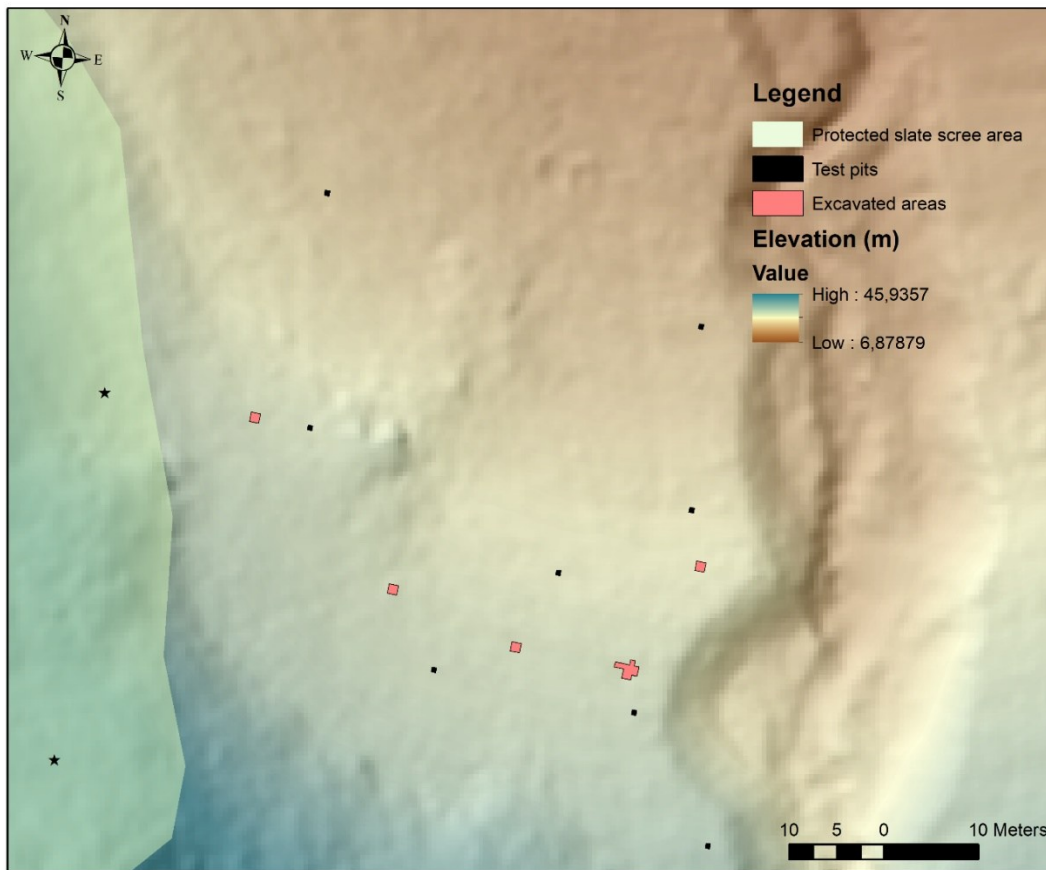
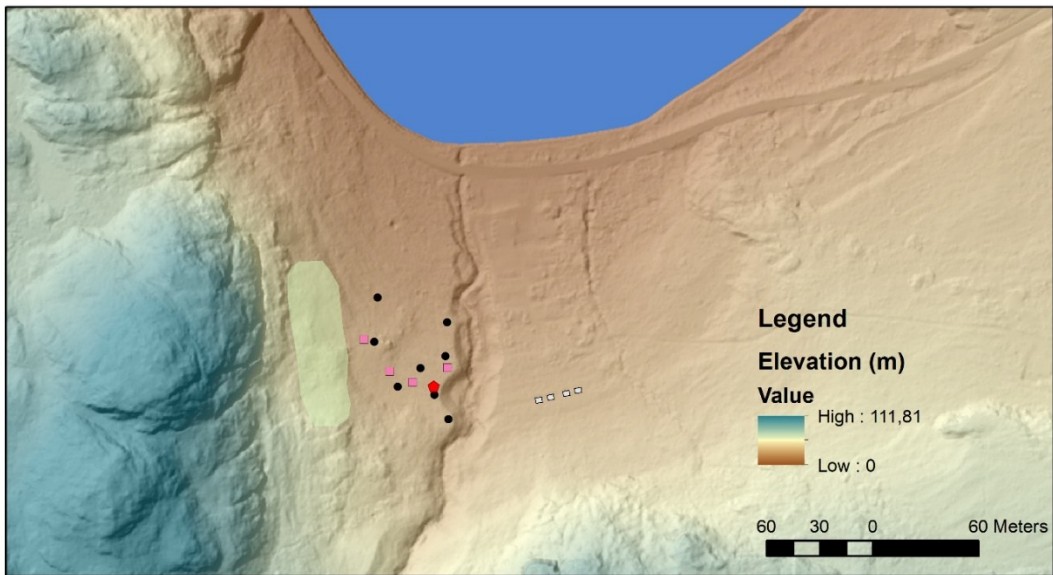


Figure 15 Digital elevation model of the site (actualistic and measurable distances and elevation). Upper: Site overview. White squares on the right side of the river denominate likely Stone Age house pits. Markers not to actual size. Lower: Detailed overview of test pits and excavation areas to actual scale. Star markers in the scree area show the positions of registered concentrations of likely tool preforms.

The numbering of the excavation units is given in (Fig 16), to make the catalogued material relatable to the units. The find distribution is plotted using this set-up in the results section.

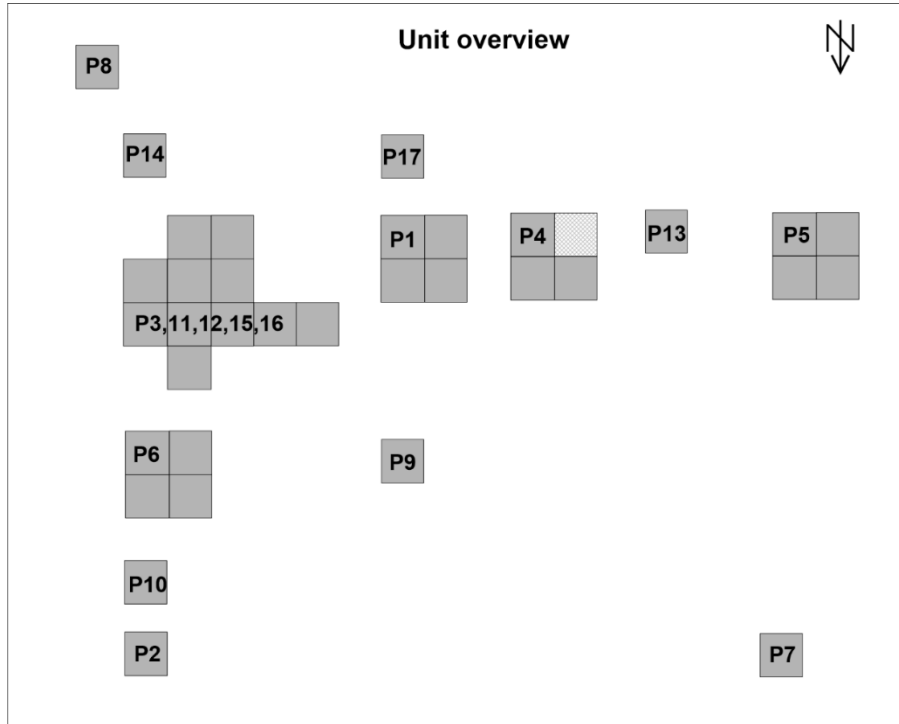


Figure 16 Overview of the excavation units and their numbering. Not to scale, but units are position in correct relative position to each other. Confer fig. 15 for the position of the units at the actual site.



Figure 17 Work in progress. Jan Magne Gjerde (left) collecting and sorting finds from unit P3. Charlotte Damm (upper right) and Roberta Gordaoff (lower right) sorting materials into size and color classes using a sorting tray.

4.1 Cataloging procedure

All excavated material from both the 2019 and 2020 investigations were cataloged together under the TS-nr: **TS15978**. Finds were catalogued directly into the MUSIT system.

The material was catalogued according to the standard system related to mechanical excavation units, so that material per layer-quadrant was ascribed separated sub-nrs, thus deviating from the standard size classes of 0-2, 2-5, >5 cm. This was an adaptation of the cataloguing procedure to the particular production technique and flake size of slate debitage compared to cryptocrystalline raw materials. Also, this adaptation is fit to cope with the fact that the excavation of quarry/raw material acquisition sites necessarily has to deal with much larger quantities of large-size nodules and primary production waste.

The finds were sorted into size classes (0-5, 5-10, >10 cm) and differentiated by raw material type and color. The material per size class was then evaluated for working traces. Formal tools and preforms are assigned separate Ts-subnumbers. Worked debitage are collected in bags and assigned a common Ts-subnumber. Leftover material is bagged under a common Ts-subnumber.

Lithic finds were subjected to the following evaluation routine during cataloging:

- Cleaning: Washed and subjected to minimal scrubbing when insufficiently cleaned by dry brushing. Initial attempts at dry-brushing were insufficient in bringing forth use wear and striation marks.
- Sieving and flotation of sieving samples using a particle sorter mesh stand.
- Measurements: Length, width, thickness measured in cm and weight measured in grams.
- Color differentiation between beige, dark red and red-banded slate

5 Investigated areas

The following section documents the individual excavation units. The most significant finds are illustrated and briefly presented, yet a full overview of the lithic inventory of the units is presented in the results section [5]. The various units are named after their extensiveness, test pit corresponding to 0,5x0,5 m², square corresponding to 1x1 m², and activity area corresponding to larger areas of more than 1 m².

P1 (square)

Quadrant (C) of P1 was one of the two test pits opened in 2019 at the upper/main elevation terrace. The 50x50 cm test pit was extended to a full square during the 2020

season. Two 5 cm mechanical layers were excavated (Fig 18). There were significant quantities of water-rolled slate on top of what is tentatively worked slate, as well as some potential evidence for fire-cracked rocks. Section A was excavated well into the sterile beach deposits of layer 2 to control potential downward mixing of the inventory. However, no such mixing was identified beyond the upper layers. The deeper deposits consisted of hardly packed beach gravel.



Figure 18 P1. Left top of layer 1. Mid: top of layer 2. Right: Bottom of layer 2.

P1 contained some larger, possible raw material slabs. One larger (25 cm L), blocky slab (Ts15978.137) was brought back to the lab. Through cleaning and low-angle lighting, a great number of striations became visible on the flattened upside. This surface was recognized in the field as a potential grinding stone and seems further corroborated by the identification of striation marks that run mostly in one direction, but with evidence of circular motion as well (Fig 19). Such combination should not occur naturally and indicate grinding/polishing. However, the use wear is highly limited compared to other known polishing stones that can be worn down into concave trays, suggesting low-intensity use. What is more, when removing the slab from its location, it revealed a small patch of ochre that was also partly attached to the bottom of the slab.

In terms of lithic inventory, P1 contained 208 finds, of which 201 were debitage. Most noteworthy is the fact that both bifacial and sawing techniques were evident from the lithic inventory.

- (Ts15978.161) a 13,7 cm long, bifacially worked, rectangular stick of red-banded slate, seemingly an early-stage preform of a lance point (Fig 20).
- (Ts15978.139) 1 flat piece of red-banded slate of superb homogenous quality with sawing marks and a fracture lip running perpendicular to the length of the slate piece. Example of chocolate plate production technique (Fig 21).



Figure 19 T15978s.137. Close-up of grinding stone/slab. Note striation marks in the center.



Figure 20 Ts15978.161. Edge trimmed lance preform?

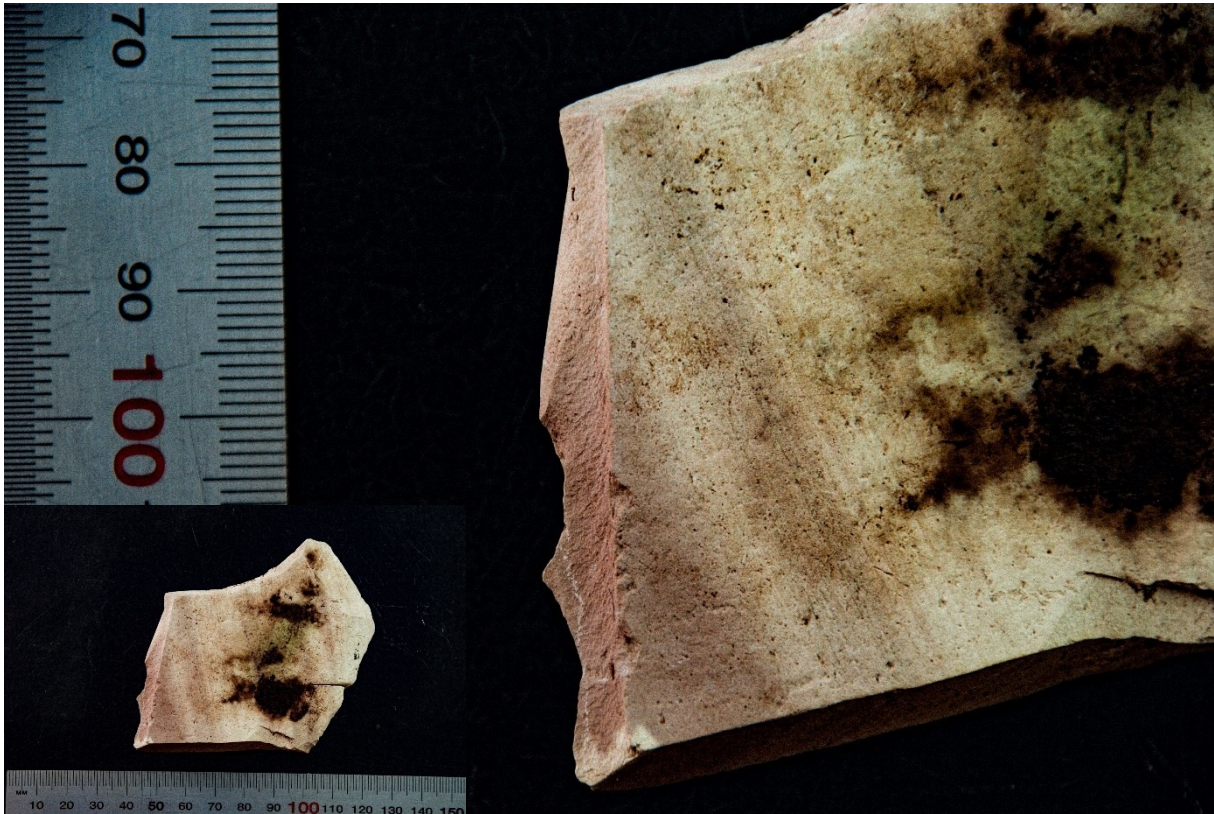


Figure 21 Ts15978.139. Fracture lip resulting from grinding and snapping.

P2 (test pit)

P2 was the second test pit opened in 2019 at the lower elevation terrace. The material was brought back to the lab and investigated. No distinct evidence of working was identified in the 2019 material. This season we opened up an additional 50x50 square as an extension of the previous investigation. No material of interest was uncovered. We hit sterile deposits immediately below the turf with clearly water rolled material, likely deposited by the stream cutting through the site at an early stage of site formation. The investigation was terminated.

Activity area 1: (P3, P11, P12, P15 and P16)

Activity area 1 was set of by a single square (P3). Due to dense lithic inventory and a potential structure, the square was extended in multiple directions in an attempt at delimiting the find distribution and structure. An overview of the excavation units in Activity Area 1 is presented in (Fig 23).



Figure 22 P2 End of Excavation



Figure 23 Overview of units in "excavation area 1".

The unit initially was selected for excavation on the impression that the surface was flattened in the otherwise sloping terrain and might have been cleared for occupation. Immediately after soil stripping it became clear that the area was rich in debitage. A compact layer (ca 5 cm thick) singularly comprised of slate was uncovered underneath the turf (Fig 24). Further excavation revealed two slabs strikingly different from the otherwise homogenous material of slate debitage, seemingly intentionally placed atop each other (Fig 25-26). Through further excavation the slabs seemed more and more out of place, and when the slabs were finally removed, they revealed a dense concentration of red ochre (Fig 27) - supporting the tentative interpretation of intentional placement. The ochre concentration was so rich as to be interpreted as a potential cache. As extensions were made to either side, the impression of area clearing were strengthened (Fig 28-29). Unit P3 seems to have been the very center of a cleared activity area, witnessed through the absence of larger slabs and rocks as was regularly distributed across the rest of the site. What is more, a small slab with charcoal attached to clay underneath was uncovered in P3.a (Fig 30). Charcoal was in addition found below the find bearing layer (bottom of layer 1), close to the ochre concentration in the neighboring square (P3.b) and should therefore represent a highly secure and relevant date to at least part of the superimposed lithic inventory. The sample preparation and dendro-taxonomic determination is discussed in section [5.3].

Intriguingly, the extension of P15.c/d resulted in a second concentration of ochre - this time yellow (Fig 31). Both concentrations were rich in ochre and sufficient samples were brought back for future analysis.



Figure 24 P3. Top of layer 1.



Figure 25 P3. Top of layer 2.



Figure 26 P3. Top of layer 2 + top of layer 1 in P11.b and P12.d. Note the placement of the two slabs.

The prehistoric slate acquisition site at Djupvik



Figure 27 After removal of slabs. Discovery of red ochre concentration.



Figure 28 Overview of activity area 1. Note the cleared surface in the center.



Figure 29 Activity Area 1 completed.

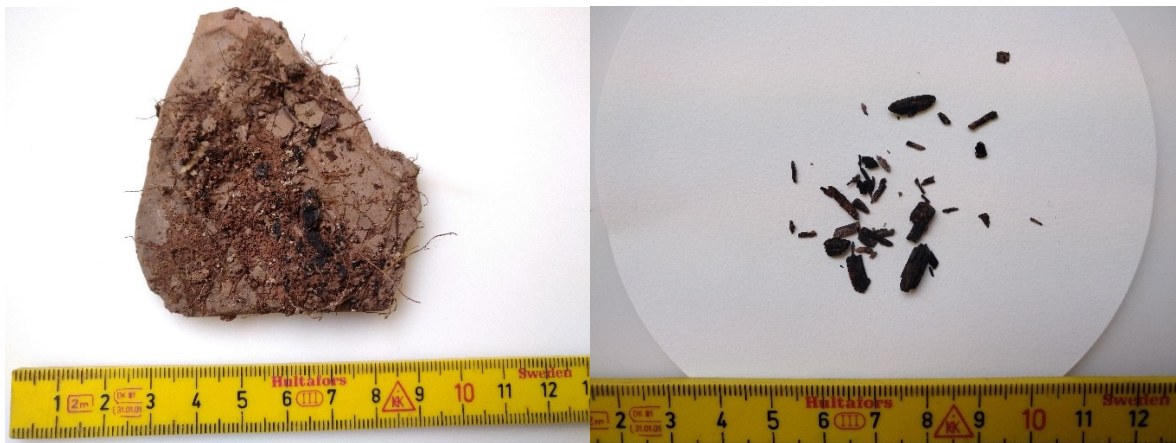


Figure 30 Left: Charcoal attached to the underside of a slate fragment brought back to the lab for extraction and cleaning Right: charcoal fragments after cleaning.



Figure 31 Artificially enhanced colors to draw out the two concentrations of red and yellow ochre. Overview of activity area 1, top of layer 2. End of excavation.

Lithic inventory: The lithic inventory of Activity Area 1 was one of the richest we encountered at the Djupvik site, consisting of 593 finds, of which 16 were diagnostic flakes or tool fragments. Although not overly large or rich in formal tools, the inventory presented multiple interesting finds worthy of some discussion and is illustrated with multiple pictures below. Note that the material was both water rolled and not. There was no discernible vertical separation between water rolled material and material not water rolled, making for difficult interpretation. The material consisted more or less exclusively of high-grade slate ideal for tool production, occurring in thin, plate-like slabs in various stages of fragmentation (Fig 32), centering around a rather consistent thickness of 0.6 cm and a material quality based on highly homogenous grain size and slightly softer slate – similar to what has been observed at other sites in Finnmark containing early stages of slate production waste (cf. Nordmannsvika area 1 (Hesjedal et al. 2009:24)) - and has been argued to follow from the high potential and suitability for standardization in slate tool production (Jørgensen 2020).



Figure 32 Ts15978.85: Raw material slabs of superb tool-grade quality, with highly homogenous grain size and uniform thickness. Similarly tool-grade material occurred in dark red color, e.g. Ts15978.66

Activity area 1 contained bucketloads of debitage smaller than 1 cm length. Yet as was the case across the site, it was not possible to ascertain whether and what proportion of this micro-debitage is the result of natural or intentional flaking. We were, however, successful in uncovering materials demonstrating the presence of various production techniques, both percussive and sawing.



Figure 33 Ts15978.73. Red-banded flake with three parallel blade negatives at the distal end and a minor platform at the proximal end. Interpreted as a thinning flake with remnant negatives of earlier thinning.

Evidence of percussive technique was suspected across the site as part of the initial testing of raw material blocks and slabs when people were looking for preform materials. Yet activity area 1 displayed several flakes with distinct and diagnostic percussive features, such as platforms, impact ripples, minor percussive bulbs and parallel negative ridges from flaking (Fig 33). Such features are not commonly recognized in slate debitage and should be of interest for future comparative study. There was also clear evidence of side flaking through percussive action (Fig 34). Based on earlier lithic studies and the review of the Djupvik material, side flaking appears to be a convenient way of producing projectile preforms. The slate raw material slabs naturally cleave and break up into slabs that frequently contain a slightly angled ridge running along the center – forming a slightly triangular cross section. As opposed to the downward/vertical hammering when producing flakes from cryptocrystalline cores, the ridge frequently occurring in slate slabs allow for sideways percussive action in primary reduction. While side flaking is also used in cryptocrystalline materials for instance in platform rejuvenation and thinning (e.g. Clovis fluting), such is mostly confined to later stage trimming/thinning rather than with the intent of making preforms – as is the case in slate.

This interpretation of the function of side flaking for efficient and opportunistic production of projectile preforms is corroborated by finding a typologically and morphologically complete Slettnes point in association with the side flakes in Activity Area 1 (Fig 35). This is interesting as Slettnes points are made on the basis of a side flakes – described in [6.2].

Several of the side flakes from Activity area 1 share size and shape with formal Slettnes points yet are catalogued as flakes as they lack side edge trimming and it is not obvious that they were made with the intention of producing projectiles. However, this is a likely scenario. Anyhow, the debitage gives the impression of arrowhead production taking place.



Figure 34 Ts15978.97 Note the distinct platforms on the left ventral side and impact ripples fanning out from the impact point into a semi-circle. See also Ts15978.187 for more examples.



Figure 35 Ts15978.88 Slettnes projectile point. Note the distinct ventral platform.



Figure 36 Ts15978.115. Perfect example of the chocolate plate (grind and snap) production technique.



Figure 37 Ts15978.97. Parallel sawing grooves. Incomplete grooves suggest testing of material in a part of a raw material piece/slab deemed unfit for further exploitation.

There is also striking evidence of chocolate plate (saw and snap) production technique in the lithic inventory from Activity Area 1. Several pieces contained irrefutable evidence of sawing, best illustrated in (Fig 36-37), of slate with parallel sawing furrows/imprints. Note the uniform width of the sawing lines – a trait only occurring through intentional working. Ts15978.115 is perhaps the most striking example: Two shallow and parallel sawing furrows run slightly angularly across the majority of the surface of the slate piece, ending abruptly at what appears to be a cut-off edge. Closer scrutiny of this edge reveals the remnants of possibly 3 additional sawing furrows parallel to the larger grooves and at similar intervals. All furrows display equal width. The piece gives the impression of standardized production of uniform blanks, and that this individual piece contains the imprint of production marks that were later cut through by working at an angle perpendicular to that of the grooves when the pieces were removed as part of the outer edge of later stage production. It therefore represents a rare case of highly informative slate debitage.

Activity Area 1 also contained several fragments of possible projectile points, considered likely, yet uncertain formal tools given their state of fragmentation/water rolling (Fig 38-41).

- Possible leaf shaped point (Ts15978.117): A possible base fragment of a leaf-shaped projectile point. The object is water rolled and damaged to such a significant degree as to make it difficult to know for certain. The width of the object is particularly reduced as the sides have broken off. However, the central ridge appears to have been subject to facett polishing at the base, which is a typical trait among ground slate projectiles. In favor of the interpretation as a projectile point is the fact that the object appears to be made from a slightly angular flake where the central ridge runs diagonally from the platform, and where the platform constitutes part of the base. Leaf-shaped point types are not overly frequent in the slate inventory of Arctic Norway and often lack association with properly dated contexts. Yet they have been suggested to be part of the early slate phase, 7500-5500 cal BP (Jørgensen 2020). This is in line with the expected date for Activity Area 1 based on shoreline displacement dating.
- Possible tanged spear point (Ts15978.118): A flake with a pronounced central ridge with the appearance of base fragments of a tanged, broad bladed projectile point with barbs. The thickness and width of the base is consistent with that of so-called "Sama" points (Gjessing 1942:139), yet the fragment is in such a fragmented state that it remains uncertain. Only one potential barb is preserved. Does not appear to have been water rolled and would in case of being an artefact, have been discarded at an early production stage due to unintended fracturing.

- Possible Nyelv point (Ts15978.96): A possible medial or /medial-tang fragment of a Nyelv point. The fragment is markedly different from all other finds, not similar to the debitage or natural flaking otherwise uncovered. It shares several striking similarities with Nyelv points such as the standard “little finger width” of 1,5 cm and a cross section being slightly rounded on one side and angular at the other. The fragment is severely water rolled and sections of the dorsal side is broken off and the fractures are abraded. While water rolled material is rather frequent in this context, the length and cross section of this particular fragment is unlike the rest of the inventory and seems unlikely to form naturally. While tentative, it could be mentioned that the shape of the object and angle of the banded slate is reminiscent of what dominates the slate inventory at the Gropbakkeengen site in Varanger. If free speculation is allowed, there might be some preference for distinctly banded materials in tool production for unknown reasons. Yet given the overwhelming majority of un-banded slate material at the site, targeting material from strata intersections to obtain clearly banded materials for tool production seems plausible.
- Unknown, retouched point preform (Ts15978.89): A special object, seemingly projectile point preform. The object is of interest both in being thoroughly edge-trimmed on one long side like a Slettnes point, with dimensions conforming to what is characteristic of the type, but also because it has been split in half by sawing that led up to the distal point. Upon inspection under a magnifying glass, the cross section of the sawing impression an ever so small fracture lip was visible – indicating sawing rather than unintentional breakage. This is also in alignment with the fact that the sawed surface slopes across the slate's lamination and in addition has an angle of about 25 degrees. Sawed slate is so far not known from the earliest slate-using phase, where Slettnespilene belongs. Found in close association with a typical Slettnes point (Ts15978.88) can challenge this if the inventory is from a single occupational event.

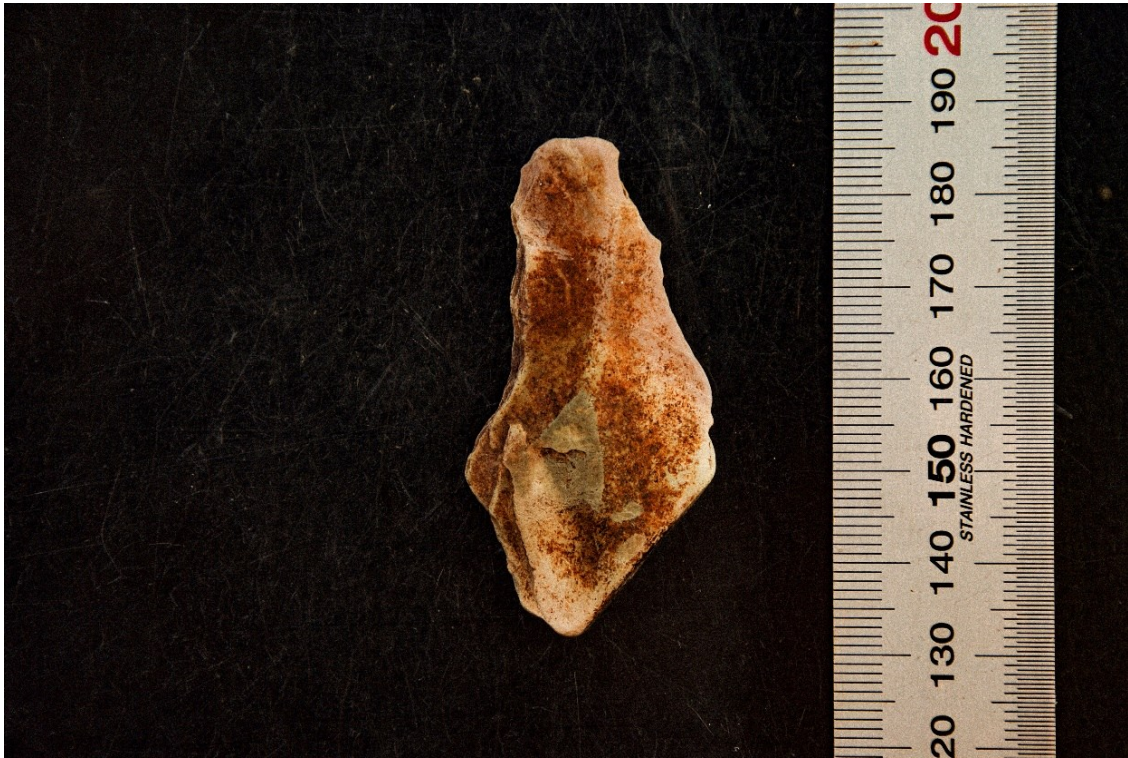


Figure 38 Ts15978.117 Facetted base of a severely water rolled leaf-shaped point?



Figure 39 Ts15978.118. Tang of a Sama/broad bladed, tanged point with barbs?



Figure 40 Ts15978.96. Proximal/medial fragment of a severely water rolled Nyelv point?



Figure 41 Ts19578.89. Front and back of the projectile preform displaying both edge trimming and a diagonal cut mark from sawing.

Interpretation: An activity area consisting of an apparently cleared surface area with remnants of a hearth structure preserved under two larger slabs. The area was covered by a 5 cm thick layer of unconsolidated slate in which all finds were made. We were unable to determine if the clear-out area represents a possible habitation structure, such as a tent, or an open-air workshop. However, the identification of both bifacially worked and sawed slate technologies suggest a palimpsest inventory resulting from multiple use phases. This may also be corroborated by the observation that the vertical distribution of differently colored slate appears to conform to some structure, as beige slate was only found at the intersection between the turf layer and layer one (cf. unit 3B). This could be indicative of a secondary use phase.

The location of the activity area was immediately recognized as a flattened area before soil-stripping, and its location right next to the stream likely made it an attractive spot on the site through time and thus subject to repeated use. We were not able to excavate any larger areas, but the find distribution (section 5.1) indicates that we delimited the main find concentration.

Two concentrations of ochre were identified: one red and one yellow. The distribution of the red ochre corresponds to the main find distribution, but at the transition into the beach gravel layer, while finds were mostly made slightly higher up in the unconsolidated slate layer. Their relation is somewhat unclear, but the vertical difference may be the result of post-depositional downward movement through water-saturation of the profile.

It is interesting to note that all the uncertain projectile fragments stem from projectile types of a consistent chronological phase, that fit well with the shoreline displacement and radiocarbon dates [6.3].

P4 (square)

A unit was placed around a boulder that made for comfortable sitting on the central terrace of the site. A decision was made to excavate here as it seemed a likely spot for a working station or dumping of waste material away from pathways across the site. To test this, the entire content of layer 1 from square C was collected and brought back to the lab for size sorting, sieving and flotation to look for micro-debitage and detailed study. Only larger pieces of non-slate material and clearly water-rolled slate nodules were excluded. The below-turf, find-bearing soil (layer 1) was collected in bags, floated and sieved in the lab using 8 and 4 mm meshes. Then weighed to give an impression of the micro-debitage produced from slate working. The results of which are presented in (section 5.5). There

was no definitive evidence of worked material beyond two possible worked fragments of slate (discussed below).



Figure 42 P4. Left: top of layer 1. Right: top of layer 2.

It is interesting to note however, that the top slate layer consisted almost exclusively of small and highly fragmented pieces of slate that superimposed the head-sized slate blocks making up the majority of layer 2 that were seemingly rock-fall material from the scree area behind rather than sourced raw material slabs. This interpretation was based on their morphology being mostly sub-angular and of non-tool grade quality. They were therefore not collected or catalogued. That the majority of small fragments superimpose the larger blocks is of interest as one might expect smaller fragments to trickle down between larger blocks, if deposited naturally. Given the unclear origin of the material (natural or cultural) it might be possible that some of the material indeed was dumped there secondarily. Wave action could potentially cause this effect, particularly next to the boulder, in which material was crushed and deposited above larger blocks. However, excavating further down into layer 2 (only in square C) identified significant water rolled material, which did not occur in layer one – thereby excluding the potential wave agent in causing the superposition. It is therefore not possible to conclude whether the lithic fragments and micro debitage collected from this unit is the product of natural or cultural

processes, given the frequently non-diagnostic way slate fractures and is abraded by mechanical and chemical weathering. The superposition of the small flakes on large and water-rolled material may be indicative of actual production waste, although undiagnostic.

The two possible flakes displaying intentional reworking are demonstrated in (Fig 43). Both are considered highly uncertain yet included as initial stage debitage from source localities are not readily available.

Ts15978.179 is a flake of red-banded slate reminiscent of a miniature single edged knife. It has a sharp edge at the correct position, but this appears to have resulted from the breaking/cleaving off the flake from the parent block/slab, showing no traces of sharpening. However, it should be kept in mind that minimal-investment informal tools like this do the trick in many cases, particularly when it comes to quick and uncritical cutting and slicing tasks. We are likely to overlook such informal tools frequently in slate inventories.

Ts15978.166 is a fragment of dark red slate with a furrow cross the surface, reminiscent of that resulting from sawing. However, the width and thickness of the line is irregular, which makes it unclear whether it might instead be the result of natural abrasion.

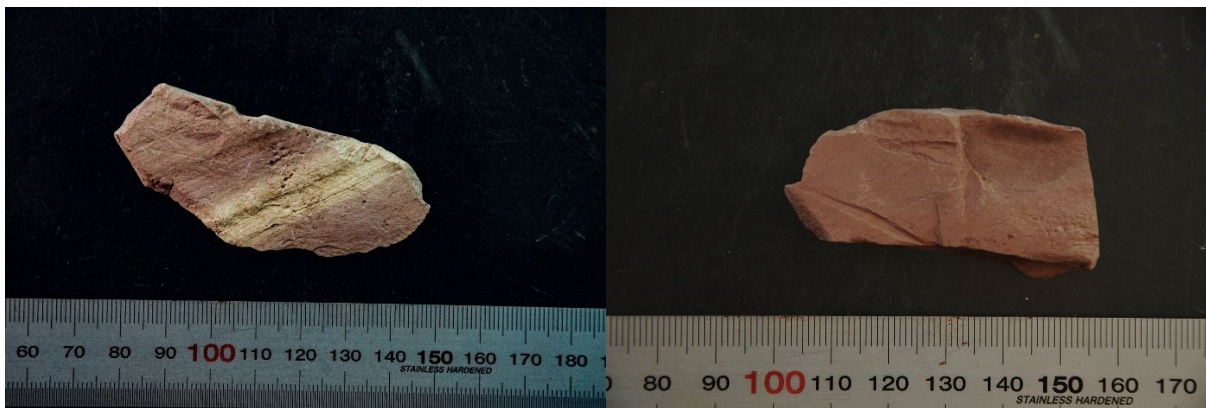


Figure 43 Left: Ts15978.179 Possible preform of a single-edged, straight-backed miniature knife. Unpolished. Right: Ts15978.166 Fragment of dark red slate with possible sawing imprint.

P5 (square)



Figure 44 P5. Left: Top of layer 1. Right: Top of layer 2.

A full m² unit was made at the western end of the terrace, as close to the scree area as possible, while still on top the flat ground of the fossil beach ridge. Excavated in two mechanical layers of 5 cm each. The intent was to investigate any potential difference in material along the gradient of the most prominent beach ridge. P5 was positioned approx. 5 meter away from the bottom of the most significant scree area where preforms had been identified during surveys, separated by an uninhabitable area consisting of boulders and uneven ground. The location was also thought to be favorable, forming a classic “saddle” on top a natural breakwater structure at prehistoric sea-levels and proving boat landings on both sides.

The unit was completely packed with material from the scree area and lacked evidence of water rolling. It was generally characterized by larger plates at various stages of fragmentation and disintegration. This made it overly difficult to determine what was the product of natural and/or human action. In field this was more or less impossible, but greatly helped by the identification of 4 splinters of definitely worked black chert, positively demonstrating human action at the location.

Through investigation of the material during cataloging, a larger number of apparently worked material was identified. This was interpreted as debitage from initial/primary reduction sequences. This was further supported by the discovery of several larger chunks of raw material slabs of superb quality in both banded red and dark red slate (Ts15978.36,37,53). Most convincing is the apparently edge trimmed/tested nodules of what could tentatively be a large, single-edge knife preform (Fig 45).

The predominance of larger, only minimally worked material closest to the raw material source make sense in terms of the logistics and production sequence. One would expect more intensively exploited materials to be deposited at actual tool production sites, in this case suggested to take place at the opposite side of the site, closer to the stream (e.g. Activity Area 1).



Figure 45 Ts15978.50 Edged-trimmed knife preform?

P6 (square)

P6 consisted of a full m² unit on the eastern edge of the terrace, 10 meter in front (north/seaside) of P3/activity area 1, and at a slightly lower elevation – in front of the Tapes beach ridge.

After soil stripping, a dense layer of unconsolidated slate was uncovered and excavated as a 5 cm mechanical layer. The contents consisted of a 3-4 cm thin layer of unconsolidated slate fragments before hitting the compact beach gravel, and excavation was terminated. The material was significantly water-rolled, likely conflating what was originally a more distinct lithic inventory. As such, only flakes and debitage with seemingly worked edges were collected and brought back to the lab for further scrutiny. However, P6 contained several striking and definitively worked slate nodules and slabs. It is

interesting to note that the material in this unit was consistently of smaller size than the other units, and that the raw material was dominated by a very homogenous, red-banded slate of top-grade quality for ground tool production. This follows from the slightly softer quality of this material making it more amenable to grinding and polishing compared to the slightly more crystallized and harder slate variants that dominate the material at the main Tapes beach ridge. This apparent preference for softer, more easily grounded raw material at a lower elevation terrace is in line with previous suggestions that the later slate tool production technique seems to favor more sandy and softer slates for grinding purposes (chocolate plate production technique), while the early phase technology favors harder and “flakable” slates (Jørgensen 2020).



Figure 46 P6. Left: Top of layer 1. Right: Top of layer 2.

If time had allowed, this area should be excavated to a larger extent.

The lithic inventory of P6 consisted of 180 finds, of which 18 are considered formal tools or particular production waste. The most noticeable finds are summarily discussed below.

- Refitted chocolate plate production waste (Ts15978.22): A fragment with distinct sawing furrows was identified in the field. During cataloging, several other pieces were successfully refitted into what turned out to be a very rare object: multi-stage chocolate plate production waste (Fig 47). It is particularly informative of the production sequences, given its combination of both complete and incomplete sawing furrows, as well as their internal relation. The sawed through section contains the diagnostic features of sawing, including slight sloping and a miniscule fracture lip at the bottom – indicating that sawing was near completion before the slab was split.

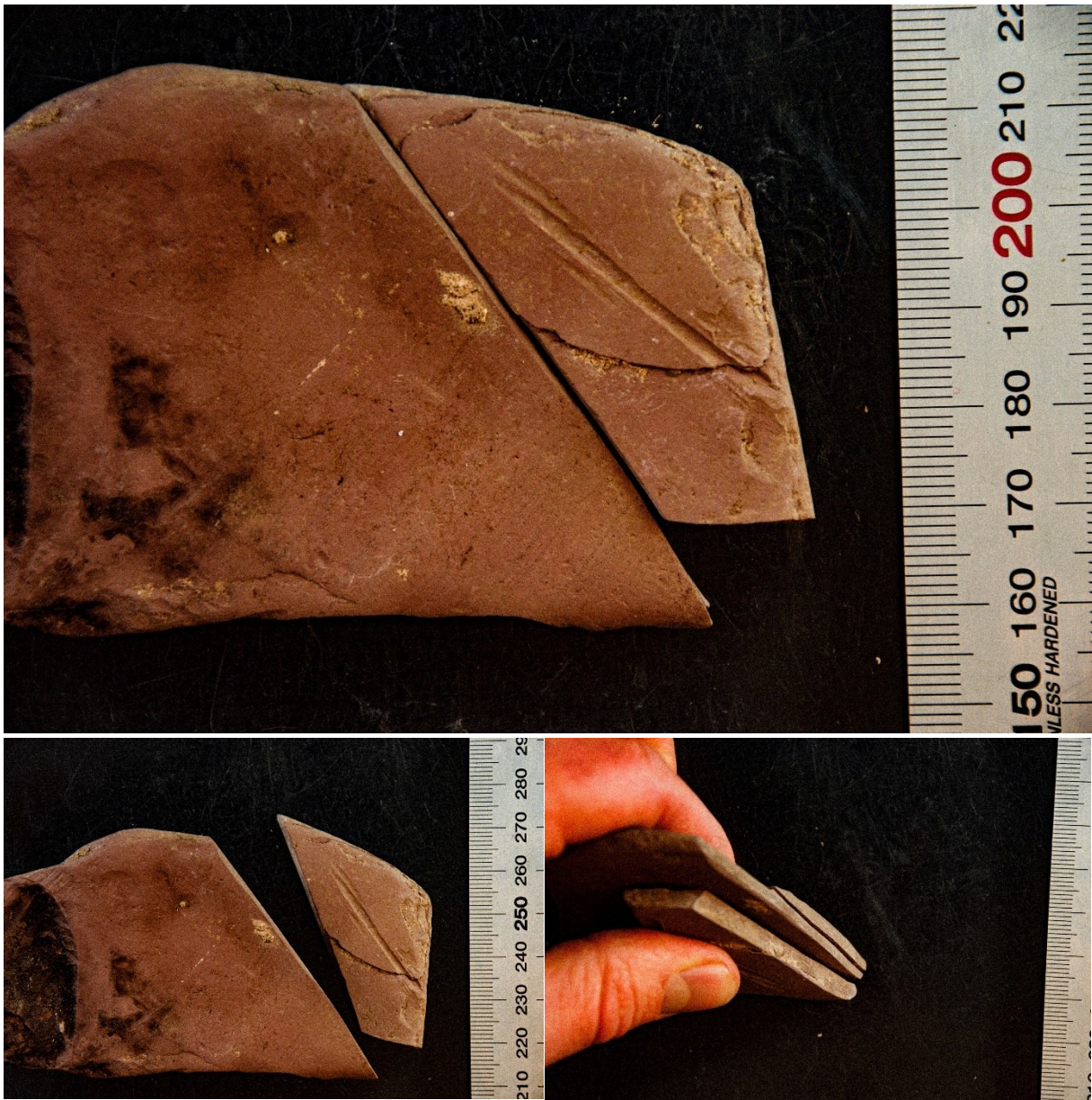
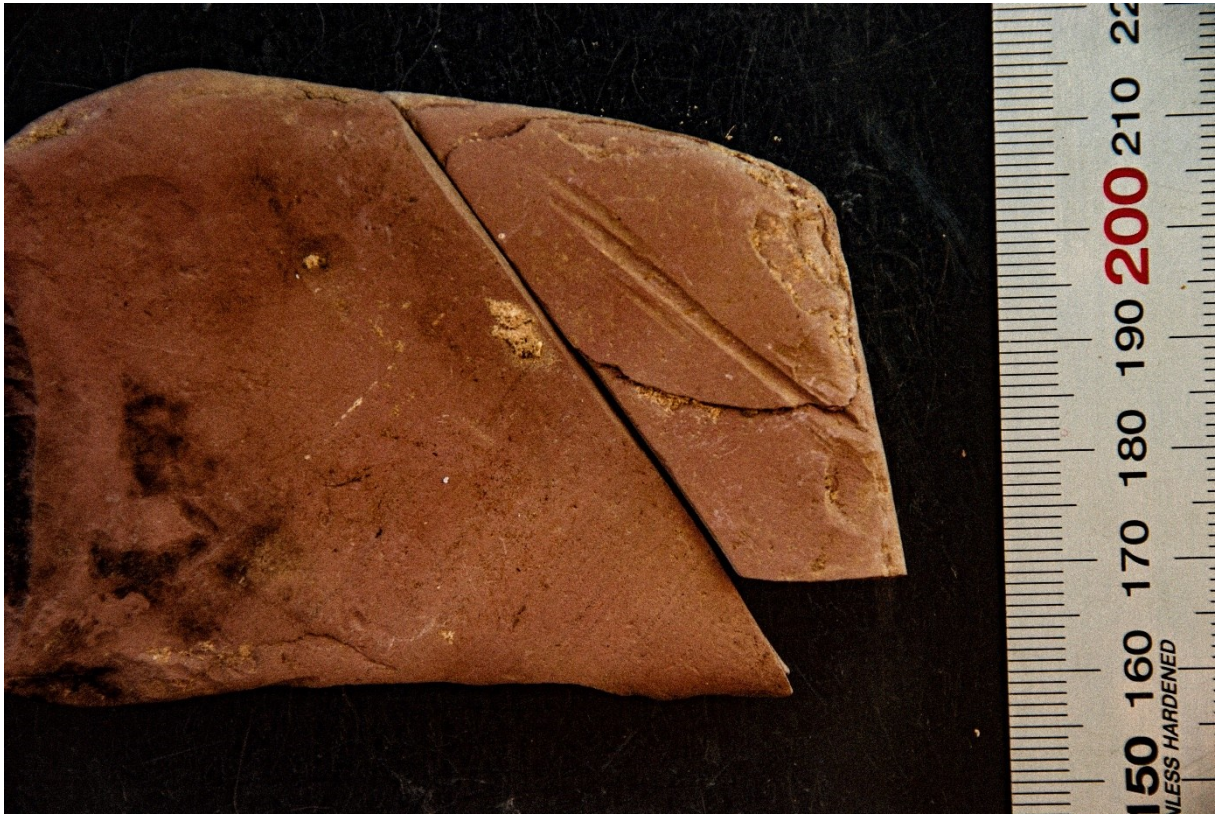


Figure 47 Ts15978.22 Refitted production waste from sawing and snapping technique



- Single-edged knife (Ts15978.10): A water rolled single-edged knife with blunt handle joint angle (ca 20 degrees). The knife appears to have been made from a larger, backed flake with the central ridge running parallel with the blade edge (which is typical), and the platform seems to remain as the handle attachment, which is also reworked on both sides to produce notches (Fig 48). The dorsal side seems to retain some of its original polishing, witnessed as minor striations visible through magnification. The edges are not preserved in a polished/sharpened state due to water rolling.



Figure 48 Ts15978.10 Water rolled single-edge knife.



Figure 49 Ts15978.18 Single edge knife preform?

- Edge-trimmed preform (Ts15978.18): A larger piece of beige slate that is clearly trimmed around at least 3 of the 4 edges (Fig 49). The intended tool to be made from this preform is not all clear, as there is significant overlap in the production

sequence of knives and spear heads – as well as potential shifts in tool function throughout use life (knife reworked into spear or the other way around). A large single-edge knife seems possible (based on shape), yet the edge trimming of what would in that case be the top side makes this questionable.

- Plate knife/Expedient cutting tool (Ts15978.15): An oblong piece of dark red slate where one of the longer sides has been taken off through sawing and the short end has been polished from both sides to form a cutting edge that is still functionally sharp (Fig 50). The object is interpreted as a plate knife given its rectangular form and no proper handle. It appears to be the reworked production waste from sawing and snapping of slate tablets, and suits as a handy example of an expedient cutting tool. The edge was likely only sharpened for short-time, informal use before being discarded.



Figure 50 Ts15978.15 Plate knife/Expedient cutting tool

- Multiple pieces with incomplete sawing furrows (Ts15978.16): Several of the pieces have multiple sawing furrows, all of the same saw thickness = 0,15 cm, and likely produced with the same sawing implement – and thus the debitage from the same event (Fig 17).



Figure 51 Ts15978.16 Examples of incomplete sawing furrows, all of the same width.

P7 (test pit)



Figure 52 P7. Left: Top of layer 1. Right: Top of layer 2.

In order to delimit the spatial extent of the site and control for variation in ground conditions, several test pits (0,5x0,5 m²) were open across the site. P7 was placed at one of the lower terraces still within Stone Age sea level, on the first flat area below the steep

beach ridge culminating at Tapes levels. P7 constituted the lowermost and easternmost unit at the site and was located at this spot to control for potential downward scree movement and wave action transporting matter down the slope to this lower terrace.

Two mechanical layers of 5 cm each were excavated. No finds and surprisingly little natural slate material was made. Below the turd, the soil consisted almost exclusively of compact and distinctly water rolled beach gravel, with the occasional slate fragment. Given the negative results, no further extension was made in the area.

P8 (test pit)



Figure 53 P8. End of excavation. 45 cm depth.

In line with P7, another test pit was opened at the upper brink of the stream, behind the Tapes ridge, and a slightly higher elevation. Here, a flat area protruding into a bend in the stream and overlooking the site had been carved by earlier fluvial action. A test pit was opened here as it seemed a favorable spot for camping and was also motivated by the intent to investigate whether activity at the site may have been focused along the stream at different elevations – as indicated by the most significant finds being made in P3 and P6. As demonstrated by the digital elevation model (Fig 13), several areas of the western edge of the site bordering the stream have been dug out and collapsed into the stream by fluvial action. It therefore seemed likely that parts of past human activity areas may

have been eroded. P8s location on the only surviving terrace protruding into the stream canyon, could potentially have preserved activity areas bordering the stream that was eroded at lower elevations at the site. However, the results from the test pit were negative. The profile consisted of a 30 cm thick topsoil layer of turf (unmatched by anything else on the site, mostly covered by only 1-4 cm of turf) that covered fluvial deposits consisting of sand and distinctly water rolled pebbles. We excavated 15 cm into the gravel. Total excavation depth ended at 45 cm.

P9 (test pit)



Figure 54 P9. Left: Top of layer 1. Right: Top of layer 2.

Situated at the same elevation terrace as P6, and down from P1, a test pit was made between these positive units to determine the extent of the activity areas away from the stream. Below 2 cm of turf, distinctly water rolled cobbles and beach gravel was uncovered. We excavated 12 cm into the gravel. Negative results.

P10 (test pit)



Figure 55 P10. End of excavation. Top of layer 2.

In line with P2 and P7, P10 was situated at a lower elevation terrace to delimit the spatial extent of activity areas at the site. Soil stripping immediately uncovered sterile beach gravel that was distinctly water rolled and almost devoid of slate. One mechanical 5 cm layer was excavated, producing negative results. Excavation in the area was terminated.

P13 (test pit)

P13 was positioned along the main Tapes ridge, following the east-west transect of the terrace and placed between P4 and P5. It formed an interesting spot on a flat area just behind a breakwater structure consisting of boulders that would have protruded in a direct line into the sea at prehistoric sea levels and thus provide a platform for overview, boat-landings on either side and short distance to the slate scree area and rock face.

This unit require some special attention as it was subject to a different sampling protocol than the rest of the excavated units, that is subject to particle size sieving like P4. As large amounts of raw material were collected, this skews the find distribution and therefore not

directly comparable to the other units. 27 flakes have been identified from this unit and marked as formal tools in the distribution map.



Figure 56 P13. Top of layer 1.

It was exceedingly difficult to distinguish natural from culturally produced material in this unit. The majority of the material was collected with the intention of forming a reference collection. The raw material was of tool grade quality and mostly in tablets, that should be suggestive of human selection yet lacking any definitive cultural objects. A large number of particular flakes were collected and catalogued as noteworthy flakes given their apparent side trimming, which was rather distinct compared to the norm at the site – suggesting human action. It is also interesting to note that while layer 1 was fairly rich in dark red slate, layer 2 contained almost no dark red slate. A possible interpretation is that this is indicative of human sorting, reflecting the use of differently colored raw material at different occupational episodes.



Figure 57 P13. Top of layer 2.

Overall, the lithic inventory of the unit gave the impression of being of the very initial slate phase given the predominance of edge-trimmed and side flakes, mirroring that of Slettnes point inventories. While side flakes with diagnostic traits such as ventral platforms and impact ripple fans are present, and usually act as evidence of human working, the lack of any definitive evidence of working cannot exclude the possibility that such features can be created naturally in scree areas. The lithics from this unit should therefore be treated with some caution.



Figure 58 P13. Bottom of layer 2. End of excavation.

Most noticeable finds:

- Ts15978.198: 10 possible retouched/edge-trimmed flakes with possible signs of platforms, percussive bulbs and edge-trimming (Fig 59).
- Ts15978.199: 14 potential side flakes with ventral platforms and impact ripples (Fig 60).



Figure 59 Ts15978.198 Most convincing edge-trimmed flakes



Figure 60 Ts15978.199 side flakes with impact ripples.

5.1.12 P14 (test pit)



Figure 61 P14. Top of layer 2.

Continuing the transect along the stream including P2, P10, activity area 1 and P8, test pit P14 was placed just above and behind Activity Area 1. One mechanical layer of 5 cm was

excavated into what turned out to be sterile and distinctly water rolled beach gravel. The results were negative.

P17 (test pit)



Figure 62 P17. Left: Top of layer 1. Right: Top of layer 2.

A final test pit was positioned at the back of the Tapes ridge at the cross section between P14 and P1. P17 mostly consisted of larger rocks, likely stemming from its position very close to the boulder and scree field. Not much material was obtained from this unit, but the material was of coarse quality and contained some plate nodules (e.g. Ts15978.57). The results were negative, and the excavation was terminated.

Scree area preforms

We also performed a general survey of the scree area to form background knowledge of how the slate behaves in scree, taphonomic processes and look for humanly worked material. As has been the case in every excavation unit across the site it was very difficult to positively separate natural from cultural flakes. Multiple likely cases of human worked material was encountered on the surface, yet the most convincing case was collected and catalogued as it was considered likely to be lost to or stolen if left on the surface. The object (Ts15978.205) is made of distinctly bright beige slate, and continuously edge-trimmed into what appears to be a straight-backed knife (Fig 63).



Figure 63 Ts15978.205. Retouched flake from the scree area. Object is approx. 5 cm long.

Of other observations made at the scree area worth mentioning was the discovery of a potential hammerstone (Ts15978.210). The object is a 10,3 cm long rock that has some small, potential crushing marks at one side, providing only minimal and uncertain signs of use as a hammerstone. However, the rock type and location in the scree area is strikingly out of place. The rock is made of compact granite, which does not occur at the site, and is properly water rolled – as opposed to the eroding slate of the scree area. Given its location within the unconsolidated scree masses exclusively consisting of slate, and at this elevation, the object is thought to have been brought there for extracting or testing slate raw material.

Rock shelters overlooking the site

During survey of the area, two rock shelters with dry-wall stone settings were identified in the vicinity of the archaeological site: One above the slate scree area overlooking the excavation area, and one at the eastern section of the site/river. Both are positioned at approx. 63 masl. Both are likely WWII German observation posts, given the considerable German presence in Alta Fjord.

Rock shelter 1: Overhang in the bedrock, net to a vertical fissure. (no picture taken. Already known from the previous survey by Tansem).

Rock shelter 2: Fissure in a 20-meter-tall protruding rock near the top of the hill, east of the Djupvik site. -a small chamber with room for 2-3 people sitting out of weather exposure, but otherwise a minimal room for extended use. A dry wall stone setting has been made in from of the chamber. Provides ideal views across the bay and north out across the Alta fjord.

No archaeological finds were made, only containing children's toys. A larger roof-slab covers majority of the floor space and may have covered up older indicators of human presence.

The prehistoric slate acquisition site at Djupvik



Figure 64 Rockshelter 2. Note dry-wall stone setting in front of the chamber and outlook over the Djupvika bay from the interior.

6 Results

6.1 Lithic find distribution

A total of 3260 finds and a formal tool/particular flakes-count of 59. Note that 1390 are sieving control samples from P4.c, and 528 from P13 similarly. Their distribution across excavation units is displayed in (Fig 65). The distribution rather clearly corroborates the in-field impression of activities being focused on or near the Tapes beach ridge. Beyond unit P6, no positive finds were made above or below the Tapes ridge, despite targeting seemingly prospective flat ground suitable for working stations. Comparing the distribution of debitage and formal tools, recognizable evidence for tool manufacture is limited to the eastern (stream bound) section of the site with the remnants of a possible hearth structure within a likely cleared activity ground containing rich production waste and ochre concentrations. However, several likely side flakes and edge trimmed flakes were uncovered in unit P13 that are greatly reminiscent of bifacial slate projectile types (e.g. Slettnes point). Yet the extent of investigation of this area does not provide conclusive evidence.

The total overview of find distribution per excavation unit is provided in (Figure 65).

There appears to be spatial differences in the raw material quality deposited along the east-west transect of the main Tapes beach ridge. Naturally/geologically deposited slate appears to be of a more plate-like form and with minimal traces of water rolling closer to the scree area and rock face on the western side of the site, while being more nodule based and water rolled on the eastern side (furthest away from the scree and rock face area). This is likely the result of less physical erosion and remodeling of material sliding directly down from the scree area and settling on the beach ridges below, compared to material that have been transported from the scree area and redeposited through wave action further to the west on the site. This pattern is therefore in line with higher degrees of water rolling at lower and western parts of the site.

Row Labels	Debtage	Preform knife	Preform arrowhead	Preform, spearhead	Hammer stone	Plate knife	Sample other	Sample charcoal	Particle size sieving	Raw material nodule	Grinding stone	Preform (diagnostic)	flake	Grand Total
Screen 1	2	1	1											3
Screen 2	1	1	1	1										3
P1	201	1	1	2	1					2	1	1	1	208
A	70			1						2	1		1	74
B	69													70
C	11													11
D	51		1	1										53
P3	376	1	1	7	2	1	1	6	3	9	3	9	9	405
A	61	1		5	1	1	1	3	1	2	1	2	2	75
B	90				1		1	3	1	4	1	4	4	99
C	136			2					1	3	1	3	3	142
D	89													89
P4	72							5	1390	2	5	2	2	1469
A	11												1	12
C	20							5	1390	5				1415
D	41											1	1	42
P5	201			2				3		1	3	1	1	207
A	32													32
B	29													29
C	113							3					1	117
D	27			2										29

Row Labels	Debitage				Punice				Point				Grand Total
	Preform knife	Preform arrowhead	Preform, spearhead	Hammer stone	Plate knife	Sample other	Sample charcoal	Particle size sieving	Raw material nodule	Grinding stone	Particular flake (diagnostic)		
P6	164	2			1	1					15	183	
A	34				1						2	37	
B	20	1										21	
C	64	1				1					6	72	
D	46										7	53	
P7					1							1	
P11	75				4							79	
B	43			3								46	
D	32			1								33	
P12	31					1		2				34	
C	13											13	
D	18					1		2				21	
P13					3			1			24	556	
P15	80					2					1	83	
C													
D	80					2					1	83	
P16	17				1							18	
P17	6				2			3				11	
Scree 1	2		1									3	
Scree 2	1		1	1								3	
Grand Total	122				2	2	1	22	1	3	53	3260	
Total	3	5	2	1	3	5	1	1918	1	3	53	3260	

Table 2 Find distribution per excavation unit

The material was sorted into size and color classes to test whether these variables structure the distribution and whether we could identify a preference for certain variations of the local slate (Table 3). There is a strong predominance of banded material, with only minimal quantities of dark red and beige material. This results in a slightly higher tool-to-debitage index (Table 4).

Table 3. Find distribution per raw material type and coloration plotted crosschecked with tool type

Sum of Antall	Column Labels						Grand Total
Row Labels	Beige slate	Granite	Dark red slate	Red-banded slate	Black chert	(blank)	Grand Total
Rock		1					1
Hammerstone		1					1
Chert					4		4
Debitage					4		4
Ochre						5	5
Sample						5	5
Pumice						23	23
Pumice						23	23
Slate	62		389	2773		2	3226
Debitage	54		133	1032			1219
Preform, knife	1		1	3			5
Preform, arrowhead				2			2
Preform, spearhead			1	1			2
Plate knife			1				1
Raw material fragment			246	1672			1918
Raw material nodule	3		1	16		2	22
Grinding stone	1						1
Projectile point				3			3
Particular flake (diagnostic)	3		6	44			53
Charcoal							
Sample							
Grand Total	62	1	389	2773	4	30	3259

Table 4 Tool to debitage ratio. Note that debitage is here reported excluding sieving samples.

Type	Debitage (D)	Tools (T)	N of D per T	T/D*100 index
Red-banded	1101	53	20.8	4.8
Dark red	143	9	15.8	6.3
Beige	52	4	13	7.7

6.2 Evidence of various production techniques

The lithic inventory so far discovered at Djupvik attests to several slate tool production techniques, which in itself is a major result.



Figure 66 Examples of finds that demonstrate different production techniques. Objects to scale. Upper row: Saw-and-snap. Middle row: Percussive. Lower row: Knife preforms showing evidence of early stage edge-trimming and some polishing.

It is generally assumed to be a chronological difference between production techniques, with bifacial slate products constituting a rather limited, initial phase, while saw-and-snap

dominates the rest later period. Evidence of both production techniques have been found throughout the site with the most telling examples being:

- Early: Bifacial, side-flaking. Slettnes points P3(A) Ts15978.88
- Later: Grinding and snapping (chocolate plate production technique). Telling examples from P6(A) Ts15978.1 and .7. P6(D) .22

Examples have been collated and displayed in (Fig 66).

Different production techniques and stages are also witnessed in the few projectile points uncovered at the site. As illustrated in (Fig 67), the Slettnes point on the left exemplify what is likely direct or indirect percussive technique with minimal edge trimming. Ts15978.89 display a combination of sawing and more extensive edge-trimming. Ts15978.96 demonstrate more overall late-stage polishing, while Ts15978.117 display what is likely fasett-polishing of the base to comply with hafting technology.



Figure 67 Production techniques and stages in projectile points.

It is interesting to note that Activity Area 1 and P1 both contained a combination of bifacially worked and sawed slate, with distinct evidence of both production techniques. Activity Area 1 also contained both Slettnes point(s) and what is likely a proximal/medial fragment of a water rolled Nyelv point. The question then is whether the material is

- a) Contemporaneous, suggesting older age of saw-and-snap technique, or
- b) A palimpsest, with bifacial and sawing techniques being present at separate occupational events

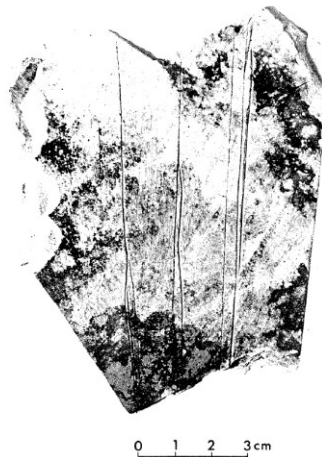


Fig. 54. Skiferplate fra fallgrav E. Ts.8198 ad.

Figure 68 Raw material tablet with distinct evidence of the saw and snap-production concept (Ts8198.ad). Reproduced from (Andreassen et al. 1987:169).

- There are difficulties associated with the identification of saw-and-snap production waste. This follows from overlapping features in naturally produced planar fracture surfaces from manmade grooving and snapping. Determination of grooving and snapping was made using a macroscope. The horizontal back-and-forth motion of sawing techniques imprint striation marks in the cut surface of the slate blank, if not eroded by mechanical or chemical agents after deposition. Mechanical abrasion through water-rolling and/or lateral/horizontal movement through beach material is a particular source of error at coastal sites positioned at transgressed isobases or on rocky beach-ridge surfaces. The only way of determining actual working is through identification of diagnostic traits induced by sawing; such as multiple parallel grooves, cutmarks perpendicular to bedding planes, occupationally striation marks are visible in the groove, and snapping action can produce a remnant “fracture lip” at the distal end of the cross-section (sagittal plane).

A wonderful example of saw-and-snap (chocolate plate) production technique is illustrated in (Fig 68): a slate tablet with multiple distinct, incomplete and parallel sawing incisions that are evenly dispersed for the production of stick blanks from the Čávžu site on the Alta canyon river (see Andreassen et al. 1987:169–70). Such marks do not occur naturally. What is also telling of this object is the material quality and thickness (0,4 cm) – which corresponds to the raw material frequently observed at late slate phase sites where the production of fluted Sunderøy points have taken place.

6.3 Radiocarbon dating result

Dateable organics were retrieved from a single context during our investigation. The samples were collected from underneath a small slate slab in square P3.a, bordering P3.b, next to the intentionally placed slabs within the cleared area, covering the concentration of ochre. Scattered charcoal fragments occur in this area and is interpreted as the remnant of a hearth structure.

Several <5mm pieces of burnt wood embedded in clay and sticking to a slate slab (see Fig 69). Material for radiocarbon dating was carefully retrieved from the slab and cleaned in ionized water using sterile equipment. Weight of cleaned sample prior to dendrotaxonomic evaluation = 0,218 g. Although mostly in highly fragmented form, the charcoal contained several pieces of clearly visible wood structure suitable for dendrotaxonomic identification. Minor fragments of pumice were observed during cleaning of the radiocarbon sample.



Figure 69 Origin of the radiocarbon dated charcoal, attached to a slate slab fragment within Activity Area 1.

Charcoal was subjected to dendrotaxonomic species determination by Helge Irgens Høeg. This resulted in 4 potentially datable samples. Unfortunately, all were of *pinus* and thus of potentially significant inherent age – subject to the old-wood bias. Although all samples are assumed to be of the same firing event, two different samples were radiocarbon dated in order to control for potential age variation in the firewood used. The remaining two samples are stored together with the lithics. The selected samples were made on the basis of one being a single piece of charcoal, with the other being made up for a larger number of individual fragments. This was done to test for age variation between single and multi-piece samples. The radiocarbon dating results are presented in table 5. Both samples produce consistent ages and align perfectly, in accordance with the expectation that the charcoal only stem from one firing event.

Tabell 5 Radiocarbon dating results

Sample ID	Ts-nr	LabID	Material	Result: Age +/- error	Result: calibrated age (95.4%)	IRMS d13C
Djup001	Ts15978.92	BETA568197	1 pinus	5530+-30	4449 - 4336 cal BC (6398 - 6285 cal BP)	-27.1 o/oo
Djup002	Ts15978.92	BETA568198	17 pinus	5520+-30	4449 - 4331 cal BC (6398 - 6280 cal BP)	-25.9 o/oo

The combined results of the two dates, when also considering the likely old wood effect induced by the firing of *pinus* genera, suggest that the activity area was in use some time between 6300-6000 cal BP. We are not able to distinguish driftwood from local sourcing of pine. The potential old-wood effect introduced by the firing of *pinus* can be rather significant, in the multi-centennial scale. It should be noted, however, that pine forest was most more widely distributed in the area during the mid-Holocene and in fact, stands of pine trees probably grew on site (Sjögren and Damm 2019). If locally sourced, a minimum inherent age of pine wood for firing purposes of approx. 20-30 years would present the lower range, with driftwood of 400 years form the upper biasing range.

The results of the radiocarbon datings are consistent with the expected age from shoreline displacement, 7500-6000 cal BP, when not considering the old wood effect. Although habitation can occur at higher grounds and thus is not bound by shoreline displacement, prior investigations repeatedly demonstrate a strong tendency of human activity at coastal sites to cluster just above the tidal zone. On the more speculative side,

the correspondence between shoreline displacement and radiocarbon dates might suggest only minor old-shifting of the dating result from the inherent age of the Pinus charcoal – although this remains purely tentative.

In a sense, finding datable material from solid archaeological context is fortunate in itself. However, the lack of more than one datable context makes for incomplete interpretation of the site.

6.3.1 Radiometric vs shoreline displacement date

While displacement was continuous throughout the Holocene, there is a potential, although minimal, standstill at the 24th contour line – corresponding to the elevation of the main beach ridge and majority of the positive excavation areas. Given the location of the find distribution on top, and slightly in front of the Tapes beach ridge, it is expected that the depositional/activity event took place *after* the Tapes transgression. This is in line with the general pattern observed across Tapes related sites in Northern Norway. The expected age for materials at the site is therefore estimated to be between 7000-5000 cal BP.

The dated charcoal samples stem from the activity areas just in front of the main terrace, elevated at 25 masl. The modelled age based on the local shoreline displacement curve (Fig 70) provides a time interval of 6500-5500 BP = 7500-6000 cal BP when the terrace became habitable. The upper end of this spectrum corresponds directly to the radiocarbon dates. Both dating methods provide coherent results and seemingly mutual confirmation.

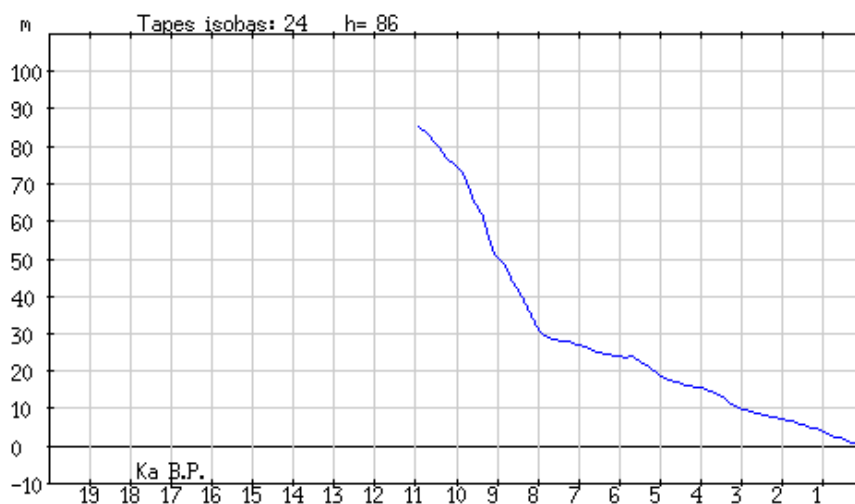


Figure 70 Modelled isostatic uplift at the 24th isobase, corresponding to the relative sea level change at the Djupvik site. From <http://geo.phys.uit.no/sealev/>

It is worth noting that water-rolled debitage occurred across the site. This is potentially helpful in determining the use and temporal span of site reuse. That debitage both affected and unaffected by water-rolling seem to co-occur, suggest that activity areas at the site have been at least partially shore bound – and thus affirmative of the dating of the activity area. It might further suggest that multiple visits have occurred at singular activity areas through some stretch of time while the relative shoreline retreated.

However, given the difficulty of separating natural from intentionally worked flakes in the first place, this is made even more obscure when the diagnostic features softer material such as slate so easily are ground away through water rolling. It is therefore to be expected that we missed out on what was worked material due to being unrecognizable after mechanical abrasion through wave action.

6.3.2 Radiometric dates compared to typological chronology

Relying on the raw date output, or inferring some age shift correction towards the younger spectrum, fit within the expected typo-chronological unit of YSA phase 1 (7000-6000 cal BP), as emphasized by previous research (Andreassen 1985:126; Hesjedal et al. 1996:174; Simonsen 1976:267–8).

There are some features of the excavated material that can go some way in delimiting the main use period of the site:

- Lack of positively late slate phase evidence: While the absence of evidence does not amount to evidence of absence, we actively targeted lower elevation beach terraces with the aim of identifying later slate phase materials. This was unsuccessful. While few diagnostic tool types or production waste has been established within the slate industry, fluted so-called “Sunderøy” points and their production waste make up the hitherto best-case evidence specific to the late phase. The apparent lack of such suggests an early slate phase date, or at least main use.
- Based on the tentative chronological scheme presented in (Jørgensen 2020), all the uncertain projectile fragments stem from projectile types of a consistent chronological phase, that fit well with the shoreline displacement and radiocarbon dates. The only potential exception is the uncertain base fragment of a Sama point. If correctly interpreted, it may point to also final Late Stone Age activity at the site. Yet this is problematic at best, given both the highly uncertain type ascription to this object /which may very well be wrong) as well as the highly uncertain boundary dates for this projectile type.

- All Identified knives at the site are medium-sized singled-edged knives with blunt handle/blade-joint angles. Although this knife type occurs through the majority of the Stone Age chronological phases and thus not a robust marker, blunt joint angle tends more towards the early phase – with ulu and boot-shaped knives (with or without heel production) trending towards the later spectrum (Jørgensen 2020).
- The most important chronological marker however is the Slettnes point.

Reviewing the contextually dated Slettnes points from the original Slettnes site, the Slettnes points mainly date to 7500-6000 cal BP (see examples in (Hesjedal et al. 2009:30,209,223)). The dates presented here therefore help conserve, cement the Slettnes point as a typochronological marker. However, it is often incongruous what is termed and defined as Slettens points – sometimes including bifacially worked point preforms.

The most precise technical description of the Slettnes type might be something like: a “symmetrically pointed ellipsoid” with an off-centered, triangular cross section. The general outline of the type is like an elongated almond, with equally pointed proximal and distal ends, and with one side having a higher cross section bulk slanting across the middle to form the ventral side which is occasionally edge-trimmed along with the pointed ends – illustrated in (Fig 71). These attributes follow from its production sequence: Fan-shaped side flakes taken off the central ridge or from the cross section of backed raw material tablets. This produces some diagnostic traits: 1) fan-shaped side flake, 2) centered dorsal platform and 3) impact ripples moving outwards from the ventral platform and following the fan-shape of the flake.



•
Figure 71 Bifacial and partly polished Slettnes point from the Normannsvika site at Melkøya island (Ts11407.115). Drawing by Andrea Balbo©Tromsø Museum. Reproduced from (Hesjedal et al. 2009:68).

Looking at Slettnes points proper, they generally occur in slate assemblages lacking evidence of grinding/polishing. There have been reports of 4 Slettnes points occurring in the significantly younger contexts though, e.g. house F70 at Slettnes dated 5600-4250 cal BP (Hesjedal et al. 1996:174). It is however open to debate whether the contextual dates accurately represent the duration of the Slettnes point type. One suggestion made by the report is that if correct, the very young Slettnes points may have been bifacial preforms to be ground into similar forms (Hesjedal et al. 1996:174), or been displaced through post-depositional disturbances resulting in downwards migration, e.g. through peat extraction for hut construction at a lower elevation significantly later.

Considering the now well-established practice of repeatedly reusing house features, and that the detection rate of such habitation phases seem to correspond to the number of dates from individual house features, it seems highly likely that the F70-case represent a palimpsest assemblage containing Slettnes points of significantly older age than the existing dates. It should be noted, however, that a more or less identical pair of bifacial and ground Slettnes points have been found at the Hamneidet 1 site. This occurrence had not previously been pointed out and was discovered by the author during the technological study of slate tools at the TMU collections (Fig 72-73). Although ground slate points of morphometric resemblance to bifacial Slettnes points are rare, the twin pair occurrence may suggest that bifacial Slettnes-like points acted as preforms for what was in fact ground points. More data is needed to conclude on this matter, particularly as the site assemblage lacks radiocarbon dates (charcoal samples exist, yet remain undated) (cf. Vollan 2007:51).

However it is a potential link to the “Vestnes” point type described by Gjessing, which suggested this to be an infrequently occurring type with main distribution in Nordland (Gjessing 1942:167–8). The specific Vestnes point pictured in Gjessing’s publication (Ts3562) is more informative however, and might suggest a family resemblance to Slettnes points in that it appears to have been percussively worked prior to polishing and of the typical morphometric values of Slettnes points.⁷

⁷ “Spissoval pilespiss av lys grågrønn skifer. Bladet er rygget, og jevnt tilspisset mot begge ender. Slipt, men et par arr etter oprinnetlig tilhugging. Lengde 8,8 cm, største bredde på midten 1,6 cm”<https://www.unimus.no/portal/#/things/e16aa236-4743-4f4e-8bbe-b1cfbb9ff9e6>



Figure 72 Bifacial and ground Slettnes(?) points of shared morphology from the Hamneidet 1 site in Nordreisa municipality.



Figure 73 Slettnes point back and front. Right: Polished point highly reminiscent of Slettnes points. Photo: Mari Karlstad. UMAK

6.4 Lithic analyses

In order to test for potential preferences for particular components of the slate material at the slate source, figure 74 displays the breakdown of color-sorted debitage and plots the abundance and average weight per size class of each color class. The figure is based

on debitage data only, excluding slabs and larger raw material blocks, as well as formal tools.

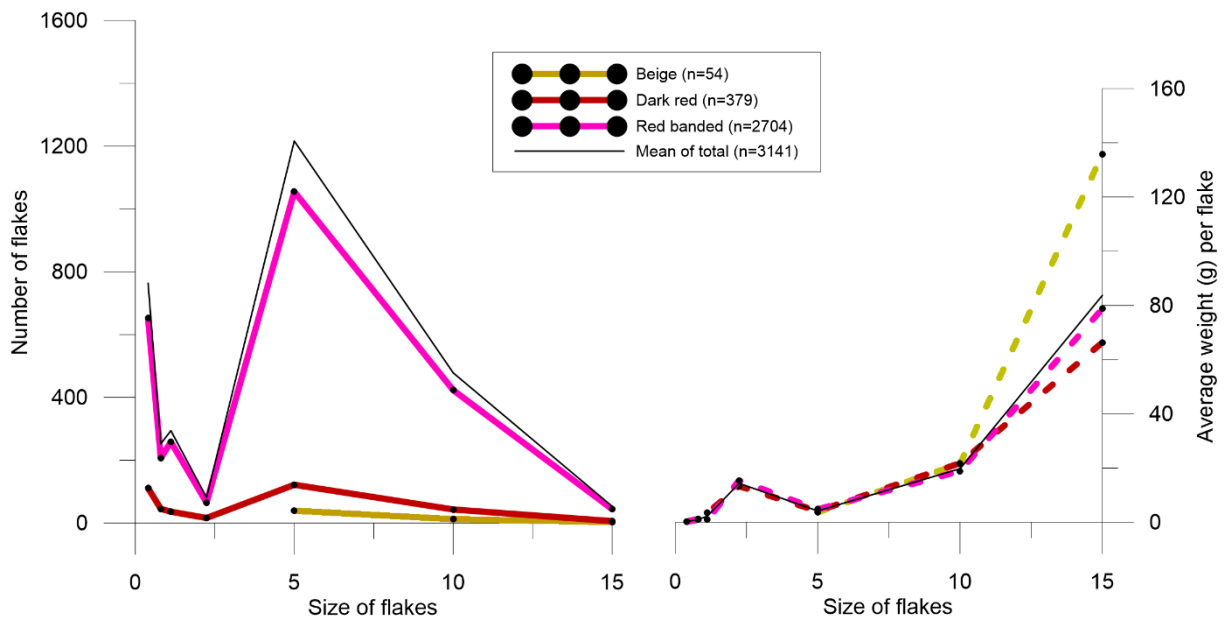


Figure 74 Distribution plot of color variations in slate materials uncovered from the site. Number, size and weight breakdown. Size measured in cm.

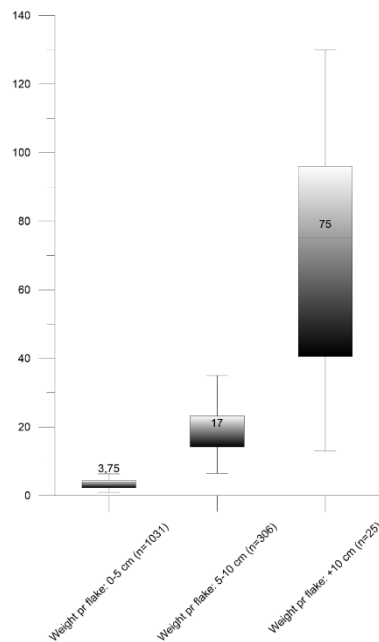


Figure 75 Boxplot demonstrating the distribution of weight per flake size classes., with median values displayed in the figure. Debitage, not including particular sieving component.

The results demonstrate that material is greatly dominated by red-banded slate. Very little beige material was encountered, and nothing from the units that were subject to particle size analysis - thus the lack of data points for the minimal size range (sub 5 cm range). However, the debitage is analyzed at interval ranges of 0-5, 5-10 and +10 cm, meaning that small beige flakes do occur in the 5 cm size class. Yet the overall sample size is miniscule. Beyond the dominance of red-banded slate, the size and weight distribution of the various colors follow the same pattern. The total weight distribution within flake size classes is presented in (Fig 75) – showing, quite naturally, the very wide weight spectrum within the +10 cm size class.

In combination, this is interesting as a backdrop for comparing the material patterning of initial stage reduction debitage from extraction site with slate debitage from non-extraction sites. With these data it is possible to form a baseline for what to expect from primary and early stage reduction in slate tool production, made all the more significant at this is the only analyzed slate extraction site known from Arctic Europe.

The contents of P4.c was brought back to the lab and subject to particle size sorting through sieving in a mesh stand. The results are displayed in (Fig 76).

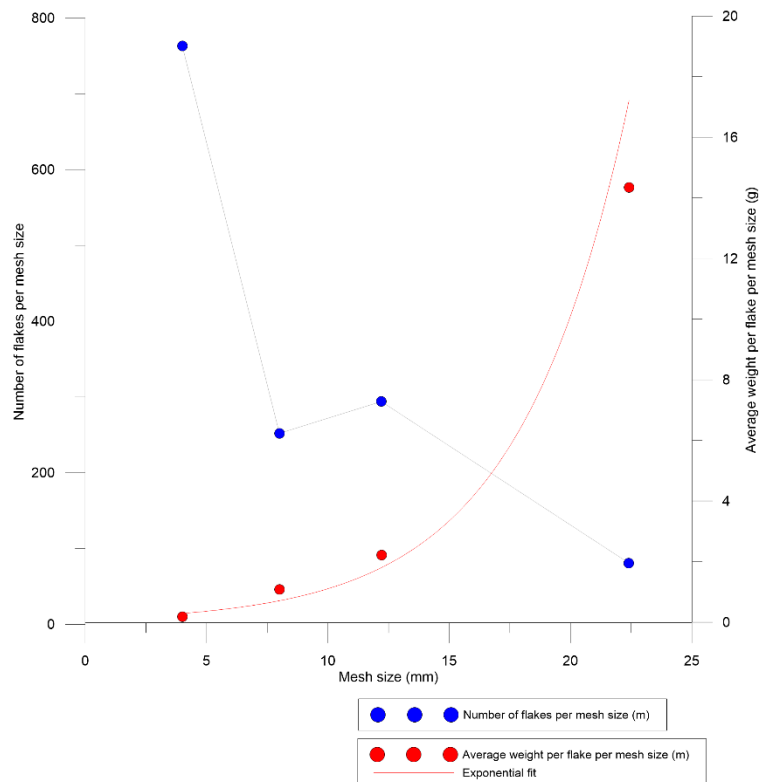


Figure 76 Results from sieving size distribution analysis from P4:c, plotting size distribution against average weight of flakes per size class. Demonstrating an exponential increase.

7 Discussion

7.1 Raw material acquisition vs extraction

We were successful in identifying positive confirmation of prehistoric slate raw material acquisition at the site. This is the first known slate acquisition site to have been investigated and proven to contain positive confirmation of prehistoric activity in Arctic Europe. More so, we retrieved material evidence that the site very likely had been subject to repeated use, through typologically distinct debitage and formal tools belonging to temporally separate events. Although the excavation was of a highly limited character, the identification of typologically and chronologically distinct lithic material, that also correspond to the shoreline displacement as well as radiocarbon dates from the site, contributes to the establishment of a firmer understanding of the typo-chronological development of the slate industry in the area.

However, we were not able to pinpoint direct *extraction* (removal of material from the rock face). As such, the Djupvik site may not be a proper quarry. The activities at the site may more accurately be understood as focused on raw material *acquisition*. The lacking evidence for direct extraction at the rock face does not in any way exclude the possibility, as ongoing mechanical erosion was apparent and would likely have removed evidence of extraction. Either way, the consistent loosening of material from the rockface and the massive buildup of the scree area in front would undermine the need for any extractive efforts such as fire and water cracking or direct mechanical extraction – prehistoric extraction techniques identified at the Melsvik chert quarry on the other side of the Alta fjord (Niemi et al. 2019:125–153). At Djupvik, great quantities of unconsolidated raw material were likely eroded and deposited during the late-glacial period, through glacial mechanical erosion as well as wave action during and following marine limit water levels. It seems highly likely that sufficient and high-quality material could be collected from the scree area, undercutting the need for direct extraction efforts. Given the great quantities of the readily available material, there was every reason to be picky.

Active slate extraction from rock faces does seem to have been practiced at the Storvika bay outcrop, with visible traces of direct hammering off the rock face (cf. Fig 10). It seems likely that similar extractive efforts have taken place at Djupvik as well, although not preserved given the highly active erosion of the rock face. Regardless, both Djupvik and Storvika sites lack evidence of anything resembling the high-investment extractive efforts made at the Melsvik chert quarry across the fjord. Considering the close proximity and overlapping chronological use phases of these sites, the same people likely made use of

both the chert and slate sources, and lack of knowledge concerning extractive techniques seems highly implausible as an explanation. The minimal evidence of active extraction is therefore inferred to result from the natural flaking and active erosion at the slate source, naturally providing highly favorable blanks for tool production.

7.2 Technological organization: Socioecological implications

As stated initially, the social and adaptive features of any population converge through technology. This means that raw material acquisition and tool production are fundamentally linked to the wider socioecological context of which they are a part. The socioecological context act on technology through selective pressures, of which human adaptive measures respond to. Accordingly, tools are made to solve particular tasks, which again feed into the overall adaptive strategy and everyday life of the people making use of the tools – see figure 2.1 in (Nelson 1991:59). In essence, this is what the study of “technological organization” is all about, *sensu* (Binford 1979; cf. Spry and Stern 2016).

Binford distinguished curated (planned) vs expediency (situational) in procurement modes - what Binford also referred to as functionally different in that household and personal gear tend to be heavily curated, while situational gear mostly is not (Binford 1979:269).⁸ This may also correspond to the distinct between formal and informal tools. The proportion of these tool groups is informative of site use and function, and helps us understand the discard behavior that produces the lithic assemblages we encounter at Stone Age sites.

Slate technology has a strongly coastal distribution, both locally and globally, and has been argued repeatedly to provide particular benefits to the processing and hunting av marine resources – including marine mammals and fish. The uptake and increasing reliance on slate technology during the Late Stone Age, in which lithic inventories at the coast frequently are composed of up 80% slate, have furthermore been taken to indicate maritime intensification along with population growth (Jørgensen 2020). So, the procurement of slate raw material is part of the extended production line and “gearing up” in maritime resource exploitation. This is not necessarily very different from the established procurement patterns during the Early Stone Age when chert sources were exploited in the same manner, raw material availability restricted to specific occurrences in the landscape that provided tool-grade lithics and likely influencing mobility patterns.

⁸ A third category of technological organization – “opportunistic” – was introduced by (Nelson 1991:62)

However, a notable difference is that slate tools are subject to significantly higher curation than chert tools, as well as slate tools being almost universally part of multi-component tools. One of the foremost technological qualities of slate is its high tolerance for maintenance and resharpening/reworking without significant mass loss, which result in potentially very long use lives. Dull edges can be resharpened, and partly broken tools can be reshaped through polishing.

Increasing curation may result from limited resource availability (in absolute terms or limited by mobility for instance). The overall very high curation level of slate technology might possibly be such a response to geographical limitations on tool-grade raw material availability during yearly mobility patterns. The increased potential for curation in slate tools may also fit with the asserted association between increased sedentism, elevated population densities and technological investments. However, it is not precisely known how tool-grade slate availability fitted into and potentially impacted the technological organization of the people in question. This should be studied in its own right.

Slate assemblages in the interior do occur yet are significantly smaller compared to coastal assemblages. Possibly the richest interior slate inventory was found at Čávžu interior site on the Alta canyon river, which included the slate slab with distinct sawing marks (Ts8198.ad) (cf. Fig 68). It is currently not known whether interior slate assemblages were locally sourced (*sensu* central Swedish slate quarries in the interior) or brought to the interior from coastal slate sources – e.g. Djupvik. Given the often small-scale slate assemblages and apparent lack of primary reduction waste at interior sites, trimmed tablets and tool preforms may have been brought into interior by distribution networks or logistical mobility for production and maintenance of toolkit at hunting sites. Another option is that local material was opportunistically/expediently sourced at sites like Čávžu, which in fact is positioned right within the spot where the river canyon has exposed an underlying strata of slate. The exposed belt is very restricted just around the Čávžu site, before the geology is increasingly metamorphic further upstream towards the Alta river dam and the Virdnejavri sites (Fig 77).

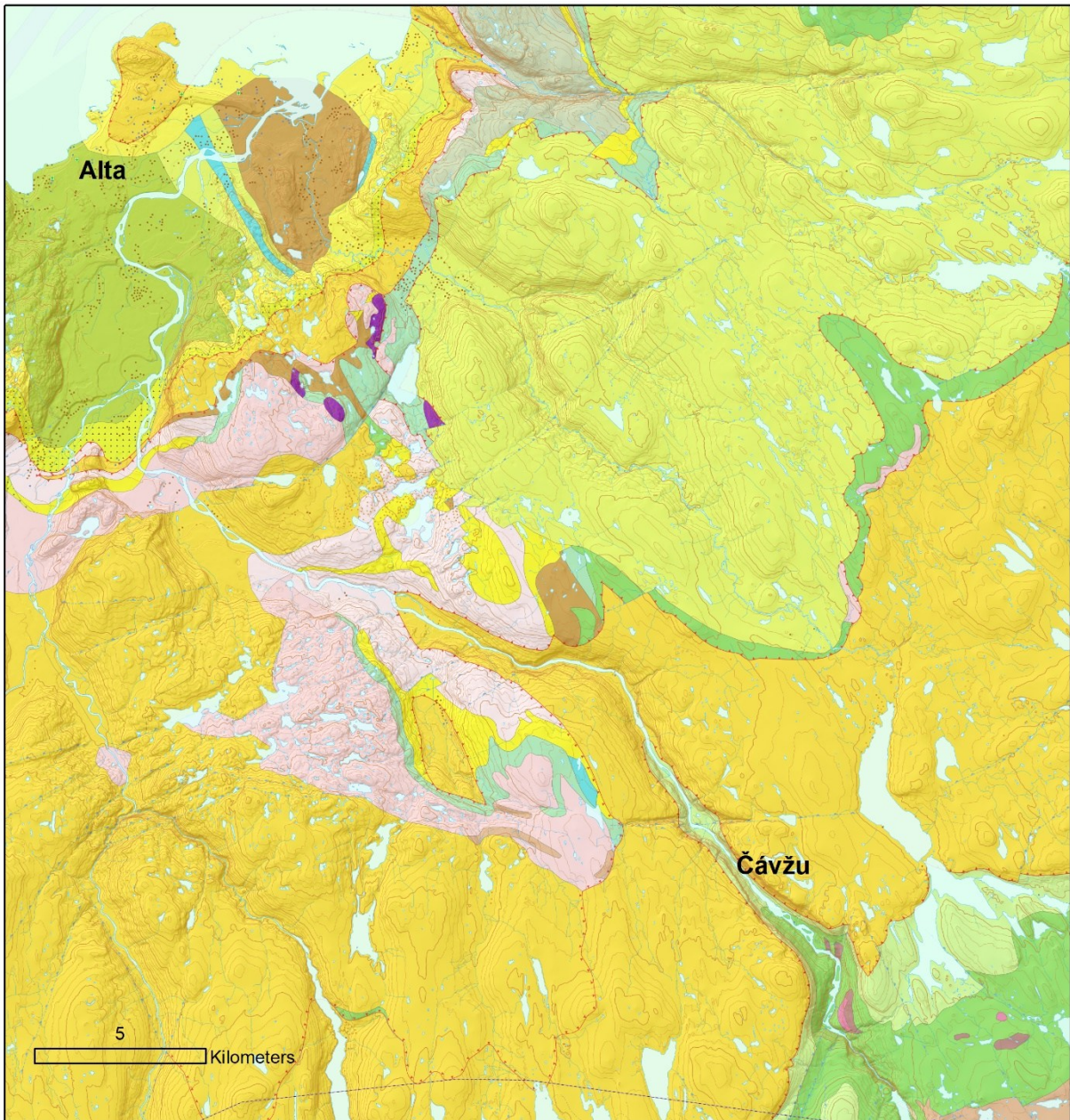


Figure 77 Geological map of the Alta-Kautokeino river canyon. Note the band of light green strata (corresponding to potentially workable slate) running into the river valley along the yellow top-strata (meta-arkose) dominating the western section of the Finnmarksvidda mountain plateau. Map data: GeoNorge.

Following Binford's distinction and the assumed maritime function of most slate tools, it is not surprising that we find few curated (finished or used) tools at Djupvik, but instead large quantities of testing flakes, primary reduction flakes as well as preforms. The lithic inventory collected at Djupvik contained several informal tools, such as highly expedient cutting implements (e.g. plate knives), and Slettnes points may arguably be conceived of

as expedient projectile points. Such observations align with the argument Binford made that raw material acquisition is not undertaken as a single purpose expedition requiring extensive mobility: “procurement of raw materials is embedded in basic subsistence schedules. Very rarely, and then only when things have gone wrong, does one go out into environment for the express and exclusive purpose of obtaining raw material for tools” (Binford 1979:259). While several cases of long-distance travel to obtain desired raw materials are known (e.g. Labrador “Rama chert”), the Djupvik slate formation is positioned nicely within important travel routes of western Finnmark and would. This would likely contribute to short stops and deposition of only minimally curated materials at the site.

The location of the Djupvik slate “quarry” has been mapped in relation to other important sites in Alta fjord (Table 6). Looking at its placement, the Djupvik quarry is positioned at the center of some of the largest and most important nodes in the Stone Age landscape and travelling routes of western Finnmark. Given the lack of known tool-grade slate outcrops on the coast of western Finnmark, the Djupvik site seems a convenient candidate for raw material sourcing within the region as the Altenes tectonic window provides workable slate in an area where such is seemingly in short demand. This should be tested through geochemical elemental analysis (e.g. XRF and petrography) for determining likely provenience of slate tool raw materials.

Table 6 Distances from Djupvik directly across water to other important sites in the Alta fjord region

Site name	Function	Distance from Djupvik (km)	Travel time in hours (average speed 5 km/h)
Årøya island	Settlements and rock art	5.5	1.1
Isnestofte	Major settlement area, rock art	13.5	2.7
Storekorsnes	Major settlement area	14	2.8
Hakkstabben	Major settlement site	21.5	4.3
Melsvik	Chert quarry	18	3.6
Komsa	Major settlement and rock art area, Alta/Kautokeino drainage system access point	22	4.4
Hjemmeluft	Major rock art site	25	5

All the while, we should not overemphasize single raw material outcrops as conditional on the movement of people and lithic resources in the process of either acquisition or distribution, as we are very likely only aware of a miniscule set of the raw material sites actually used for acquiring the necessary lithic materials.

Ongoing excavations in the inner Lofoten/Vesterålen region as part of the Hålogalandsvegen project and undertaken by the Arctic University Museum of Norway, have identified some of the most extensive slate tool inventories found in several decades, which consist almost exclusively of grey slate and clearly metamorphic material (likely phyllite) not known from previous sites. Considering that the mainland connection into Lofoten and Vesterålen is dominated by mica schists and phyllites from the Kölli Nappes, it may tentatively be the case of local raw material sourcing. Remnants of Caledonian slate outcrops can be found locally many places along the majority of the Norwegian coast, despite the great distances many places to the actual Caledonian allochthons. This suggests a high potential for unrecognized slate sources, even in areas considered geologically distant from slate. The picture is, however, complicated by ongoing provenience studies on Northern Fennoscandian slate tools and the attempt at tying them to known slate sources. Results suggest wide distribution networks within and between known slate sources (Hallgren 2020).

7.3 Methodological considerations when excavating/analyzing quarry sites

One of the most important lessons from this investigation has been the great difficulties in separating natural flakes from intentionally worked flakes at a site situated atop a small mountain of potential raw material nodules. In most cases of Stone Age archaeology, the humanly worked lithics are non-local materials that purely through their identification is indicative of human presence and tool production/maintenance. Raw material acquisition sites are simultaneously blessed and cursed by the abundance of lithic debitage from all stages of procurement and tool production. The rich inventory is potentially highly informative of production stages mostly lacking from other archaeological site assemblages, yet also a potential hazard in terms of information overload making it almost impossible to distinguish intentionally worked from natural flaking. The main bulk of unconsolidated materials from lithics quarry necessarily turn out to be undiagnostic, and therefore not informative of production sequences or skill-related choices. Yet a

particular obstacle to the advancement of our understanding of technological organization of slate tool production, is the exact properties that make slate a wanted lithic source, that is, its inherent softness and malleability – which make for a poor medium for preserving use wear and production traces induced by taphonomic processes. This hinders not only a firm understanding and reconstruction of the production sequence, but also the estimation of how much of the unconsolidated masses have actually been produced by human extractive efforts.

A major learning point concerning quarry site excavations and the production sequence of slate tools, was to recognize the value of large samples of lithic debitage. After excavation, the rather rich and liberally inclusive lithic inventory collected at the site, was brought back to the lab for detailed scrutiny, following a strategy of collecting more rather than less material to enable a holistic study of the debitage. The rather liberal collection of slate debitage and raw material nodules turned out to be necessary to form a sufficient control sample for the identification of humanly worked materials. While highly time consuming, the result of the excavation might have been more or less nothing without detailed scrutiny of both inter- and intrasite slate inventories. This is most clearly expressed by comparing the results of our excavation with the pre-existing county survey.

The County heritage authorities performed a larger number of test pits across the site yet reported that no distinct lithic material was uncovered besides a few possible preforms in the scree area that were not collected (pers. comm. no written report exist from the site).⁹ The current investigation however, returned several distinct archaeological objects and features. Reviewing the distribution of the county investigations against what was performed by our field campaign showcase a striking overlap between area selections (Fig 78). This raises some questions as to why the two investigations arrived at disparate conclusions.

One potential explanation is that the activity areas of the site either:

- A. have a minimal spatial extent and that we got lucky hitting the very spot of activity with some of our units, or
- B. are nearly omnipresent yet minimally distinguishable from the geological “background noise”.

⁹ Several test pits not accounted for by the County survey were identified at the lower-most terrace and eastern side of the site. Uncertain origin.

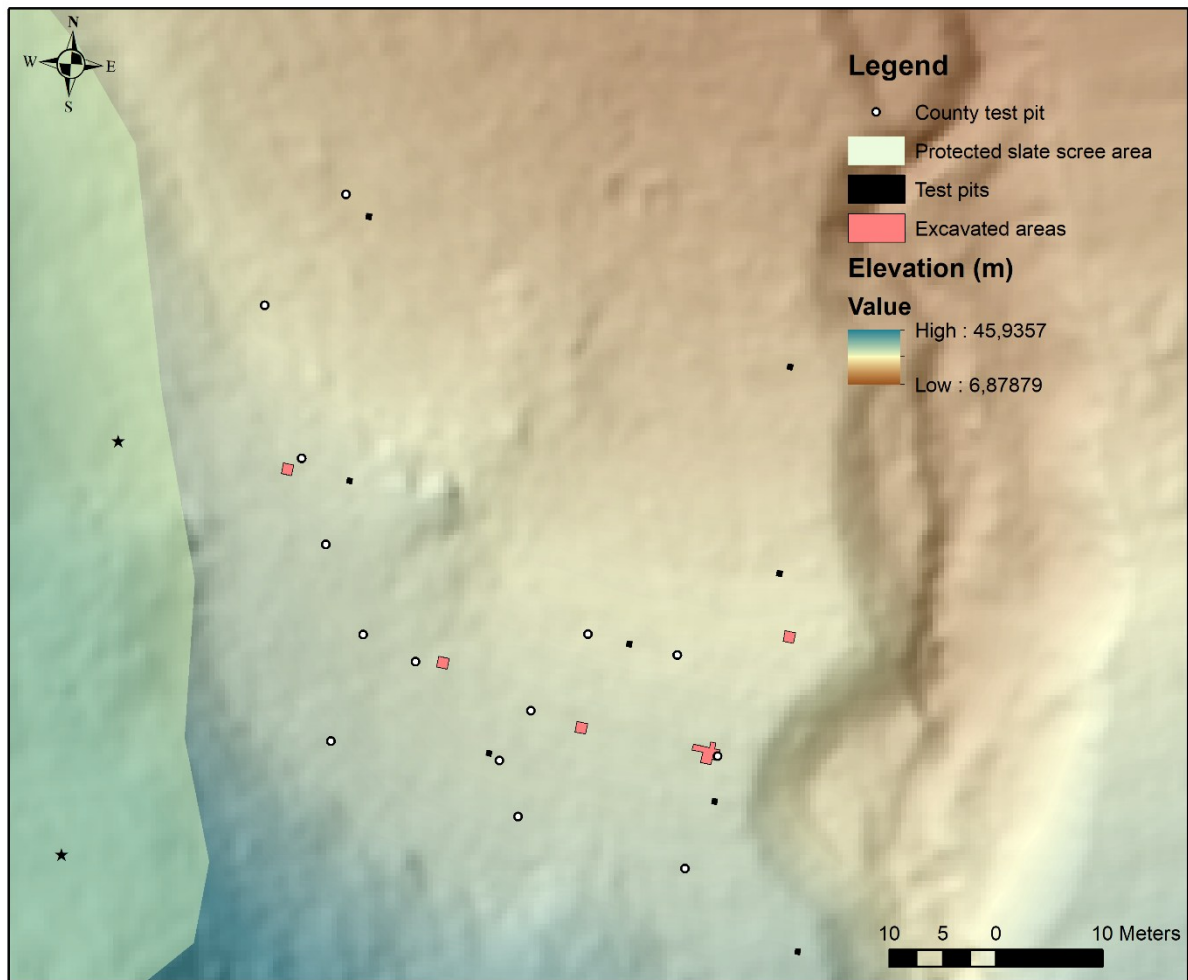


Figure 78 Site map including the test pits made by the county heritage authorities.

A combination seems most likely, in the sense that the site probably contains a generally profuse distribution of humanly worked lithic material, yet predominantly of an undiagnostic character. Certain areas at the site likely contain more easily recognizable archaeological materials; however, such seems to be hard to identify without excavating larger units and obtaining larger control samples of slate material. Either way, this disparity highlights some of the methodological issues and pitfalls in the excavation and analyses of raw material extraction sites – facing nearly endless amounts of lithics of minimal archaeological distinctness. Other quarry /raw material extraction site excavations have also remarked upon this particularly challenging property (Niemi et al. 2019).

Another example of the necessity of larger control samples is illustrated in (Fig 79). In the overwhelming majority of cases, we faced a situation of uncertainty concerning the cultural origin of the material. However, in one case the situation was turned on its head

as we encountered what were undiagnostic sawing marks. A fragment of beige slate had incision grooves on both sides, and gave the impression of being production waste from an incomplete sawing session. The sawing marks were untypical in being slightly uneven the raw material was not of the quality typically targeted for sawing, which made us suspicious. Yet the placement and width of the sawing grooves seemed consistent with previously investigated materials, as well as being unparalleled in the naturally occurring slate material at the site. Eventually, cataloguing revealed the parent material for this flake, which was a raw material nodule with several similar grooves that turned out to be natural fissures/weaknesses in the rock.



Figure 79 Un-numbered slate piece with apparent sawing marks that turned out to be natural weaknesses in the rock. Recognizable only after finding multiple specimens of similar fracture patterns that could be refitted and demonstrate the natural origin.

7.4 Ochre: Symbolic or functional element to maritime adaptive strategies?

Finally, there is the issue of the concentrations of ochre within Activity Area 1 which contained rich deposits of red and yellow ochre (Fig 80).



Figure 80 Artificially enhanced colors to draw out the two concentrations of red and yellow ochre.

Why do we find ochre at archaeological sites? Suggestions have mainly focused on ritual and symbolic uses of ochre (Andreassen et al. 1987:197–8), particularly concerning graves covered in ochre. This phenomenon is widely documented across the globe, through the history of behaviourally modern humans. Locally, ochre graves have been identified in Stone Age NW Russia at Kubenino (Ahola et al. 2020), Hartikka, central Finland (Ahola et al. 2016), as well as the painted slab in the Nyelv (burial?) cairn (see Simonsen 1961:432). Ochre has also been demonstrated as a color pigment in ritual and symbolic means of communication, through rock paintings (Søgaard 2018) and Inuit ethnographic accounts demonstrate the use of ochre for decoration of boats and clothing. While all such suggestions make likely candidates that are internally complementary, there are also functional uses of ochre.

A whole range of practical uses of ochre has been proposed, ranging from sunscreen, insect repellent, mineral supplement (geophagy), color pigment and hafting mastic (Rifkin

2001:132). Most interesting in this case however, is that experimental work demonstrate antibacterial properties of certain ochres that are useful for the tanning of hides to make them, flexible, preserve better and increase use-life (Rifkin 2011). Saline red ochre has been shown to be the most effective tanning ingredient, only surpassed by modern ingredients, and produce the same pliability score in tanned hides as the most effective modern application (aluminum sulphate) (Rifkin 2011:147). Red ochre appears to be uniquely suited to tanning purposes, as the high iron oxide content of red ochre neutralizes collagenase, make the leather pliable and preserve it through time – as opposed to iron-depleted yellow ochre and white kaolinite (Rifkin 2011:149).

Considering the character of the Djupvik site, its likely short term stops and single-purpose function in raw material extraction, it seems less likely that symbolic action was the main contributor to the deposition of ochre at the site. If slate technologies were mainly part of a maritime affordance and particularly useful in marine skin processing (as argued by (Fitzhugh 1974; Jørgensen 2020), it seems more plausible that the occurrence of ochre at a slate extraction site was part of the gearing-up within a maritime economy. As such, the ochre may either have been prepared at the site for later use, or used directly at the site, associated with slate tools in the processing of marine skins. As red ochre is made up of clay-ish minerals rich in iron oxides such as hematite, which is highly related to geological slate formations, it is not unlikely that ochre was extracted locally from the Djupvik slate outcrop area. Given the natural co-occurrence of slate and ochre, as well as the identification of humanly processed slate and ochre in archaeological association, the Djupvik site appears to be a potential source of multiple resources sought after during the Late Stone Age of Arctic Norway. Pursuing the geological and functional relation between slate technology and ochre looks like a promising venue for future research.

If ochre was commonly used in tanning, ochre should be correlated with hunting and processing sites of particular hide resources were processed. This could include both marine and terrestrial hides, and we should expect the clustering of ochre to most strongly to mass/bulk processing of seal and ungulate (reindeer and moose) hides, as these were the skin products needed in greatest quantities and with requirements on annual replenishment. Based on current archaeological distribution patterns, ochre predominantly occurs at coastal habitation sites. Minimal ochre is known from the interior besides the Early Northern Comb Ware (ENCW) sites in Pasvik. This is in line with evidence from Finland, where comb ceramic sites are strongly associated with large deposits of ochre. However, even ENCW sites in Norway contain minor quantities. However, the inland sites along the Alta-Kautokeino River fit the predicted parameters of sites that

should contain ochre given the massive amounts of scrapers and likely site function as specialized hide processing sites.

In fact, such great quantities of burned ochre were purportedly found at the marshland section of the Čávžu site, as to make up an orange strata altogether (Andreassen et al. 1992:68). The site was peppered with dozens of hearth structures and several round/oval shallow depressions mostly 0,5 m in diameter filled with ochre, a few cm thin layer of ochre (Andreassen et al. 1987:285). Possibly the most interesting case was a circular concentration of ochre 2 meters in diameter, in which the ochre was thoroughly mixed with charcoal. This and several of the smaller ochre concentrations were originally suggested to be the outcome of ritual activities, possibly connected to hunting rituals (Andreassen et al. 1987:197).

Given the extensive firing activities, density of hunting and skin processing tools, combined with the association of widespread ochre in distinct features, it seems reasonable to assume that ochre was integral to the hunting and processing activities at the site. Instead of being the result of rituals, I would rather see this as a possible extractive effort (roasting) of iron oxide minerals to produce ochre for tanning purposes. If the ochre and “orange layer deposit” at Čávžu truly was the result of human firing and extractive efforts, this aligns perfectly with the prediction of finding large concentrations of ochre at hide processing sites.¹⁰ As ochre samples were collected and stored in the museum, this could be analyzed in future research.

7.5 Future research avenues

Performing a follow-up excavation of some of the habitation structures and surrounding areas on the eastern section of the site is viewed as the most prospective and important avenue for advancing our knowledge of the Djupvik slate quarry, as a lithic inventory of secondary production waste may be expected at the habitation area. This may function as an important supplement to the mostly initial stage production waste from the activity areas closest to the slate source that is covered in this report.

Second most important, efforts should be made to look more closely at the evidence of active raw material extraction from the rock face at Storvika on the western section of the

¹⁰ Note that what is possibly the richest inland slate inventory as of yet in Arctic Norway was found at the AG section of this site, see (Ts8198.dy) (cf. Andreassen et al. 1987:274–7).

Altenes peninsula. As part of the same geological slate formation, this would provide highly valuable comparative material for that of Djupvik.

A research collaboration has been established with the Norwegian Geological Survey (NGU), through Tom Heldal. Raw material samples across the slate outcrop will be subject to various petrographic and high-resolution XRF analysis. Ochre samples from the rich concentration in Activity Area 1 will be analyzed for lipids and geochemical composition with the aim of establishing whether the ochre may in fact be locally sourced at the quarry whether it has been mixed with fats etc. The results will be published elsewhere.

In addition, future efforts should look into the possibility of estimating the volume of extracted/worked lithic material at the site. However, this would require some innovation in how to properly control the natural flaking and fragmentation of the raw material, as opposed to human intentional working of the slate. As opposed to the estimation of the extraction/production volume made at the Melsvik chert site where the raw material was not so prone to physical erosion and the cumulation of scree material, the Djupvik slate material seems inherently problematic to control in a similar fashion. The chert source at Melsvik is also located at a slightly higher elevation (approx. 65 masl) and not forming a direct wave break, resulting in less mechanical stress from wave action and thus likely reduced potential for scree formation.

8 Conclusion

In summary, the excavations at Djupvik have uncovered an informative slate inventory, despite the moderate size of the investigations. The results most notably comprise the successful identification of a prehistoric slate raw material acquisition site, with attendant production waste and activity areas at the site below the slate formation.

Secondly, a radiocarbon dated and seemingly cleared activity area with a hearth-structure, dense ochre concentrations and diagnostic slate debitage and tools – the combined evidence pointing to main use centering on approx. 6000 cal BP. Given the natural co-occurrence of slate and ochre, as well as the identification of humanly processed slate and ochre in archaeological association, the Djupvik site appears to be a potential source of multiple resources sought after during the Late Stone Age of Arctic Norway.

Detailed scrutiny of the debitage from across the site and scree area demonstrates the cooccurrence of both percussive/bifacial and saw and snap production techniques. Lithic and raw material analyses suggest there might be some preference for distinctly banded materials in tool production at the site. Given the overwhelming majority of un-banded slate material at the site, targeting material from strata intersections to obtain clearly banded materials for tool production seems plausible.

Activity appears to be concentrated on the main Tapes beach ridge, with minimal evidence of human activity below from our investigations. Activities seem to have been centered around short-term stops given the anonymous material and the low-investment character of the hearth structure and cleared area of Activity Area 1. It should be noted that we can only comment on the western side of the site as our investigations were limited to this section. The use of the eastern side may have a different character given the presence of what likely are 4 habitation structures at Tapes level.

The Djupvik slate source is presented as utilized expediently during short-term, low-investment stops, as part of a technological organization where raw materials were extracted, transported to habitation sites and worked into highly curated tools for primarily maritime resource exploitation.

While tool grade slate obviously could be obtained at the Djupvik site, the material properties of this slate formation may be instructive as to why there is an apparent priority of the site during the early slate phase (and lacking evidence for late phase exploitation as of yet) – being more suitable for the early slate phase production technique.

It has previously been suggested that the overall of evolution of the Arctic Norwegian slate industry developed from high type and raw material variability towards increasing specialization and priority of a few tool types based on highly standardized production sequence, facilitated by a strong selection for overly homogenous raw material slabs/blanks of standard thickness (Jørgensen 2020). Given the great heterogeneity of the raw material quality at Djupvik and the often-fragmented state of raw material tablets/blanks, later phase priority of easily standardized production and uniform material blanks might have resulted in Djupvik material being less relevant.

Critically though, we only excavated a very limited area of the site and may have missed important activity areas altogether, including distinctly late phase materials. All we can say from our investigations so far is that activities at the site appear to be less extensive than might have been expected. This could well be explained as a scenario in which the

environment providing a surplus of tool-grad raw materials, resulting in an opportunistic/expedient technological organization and procurement strategy.

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