Fårevejle Kro

A Mesolithic/Neolithic shell midden in eastern Denmark (Zealand)

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ABSTRACT

The shell midden at Fårevejle was first visited by A.P. Madsen in 1894 and later partially excavated in 1896-97 by the National Museum of Denmark. In 2004-2005 the shell midden was revisited; two trenches were put through the central part of the midden. The shell midden is clearly stratified with Ertebølle layers at the bottom; the main shell component of these layers is oysters. These layers contain stone-lined fireplaces, bone, diagnostic pot sherds, and flint artefacts from the Late Mesolithic. The top of the midden is mainly composed of crushed cockles and mussels, mixed with layers of charcoal and burned rocks. These upper layers contain fireplaces and ash dumps, as well as bone, flint artefacts and potsherds from the EN Ib/EN II and MNA Ib phases of the Funnel Beaker Culture (TRB). The sparseness of residential materials (flint, sherds, bone) in the Mesolithic component suggests that this midden was not a base camp but rather visited for short periods of use.

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Introduction

Køkkenmøddinger, the Danish shell midden sites, have long been a favoured type of locality for investigations into the spread of agriculture into areas occupied by Mesolithic fisher-hunter-gatherers (*e.g.*, Price 2000a, 260-300, 2000b, 301-318, 2022 and references therein). This is because of the favourable conditions of preservation for organic materials and the frequent presence of both Mesolithic and Neolithic occupations in the same location – allowing comparison of different lifeways in similar environments. The site at Fårevejle Kro (Figure 1) is a stratified shell midden with both Mesolithic (late Ertebølle) and Neolithic (late Early Neolithic/early Middle Neolithic Funnel Beaker Culture) layers, based on ^{14}C dates and diagnostic pottery and flint artefacts. It is found in the northwestern corner of the now fossil Lammefjord in western Zealand, Denmark, situated on the southern side of what was in late Atlantic times a small peninsula on the northwestern shore of the fjord (Figure 2). There are several natural fossil shell beds known around the former Lammefjord not far from the site, and there are also other smaller cultural shell middens and other sites in the area.

Figure 1. Location of Fårevejle Kro in Denmark.

The site was first recognized and investigated in the late 19th century (Madsen *et al.* 1900, 112-122).

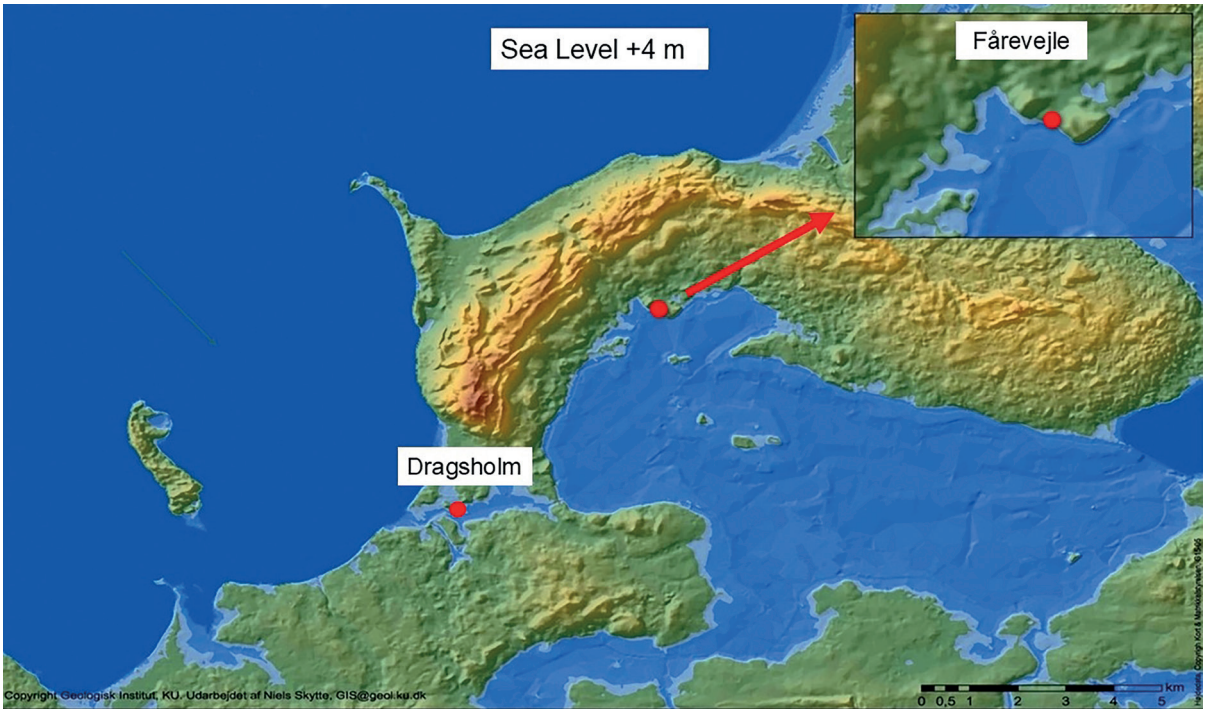

Figure 2. Location of Fårevejle Kro in the western arm of the former Lammefjord; sea level at +4 m asl. (Image: Niels Skytte).

This project revisited this stratified shell midden to collect data regarding the transition to agriculture during the Atlantic-Subboreal transition with modern excavation techniques as well as ^{14}C dating. The project addressed these research questions: was a pre-midden layer present, was the shell midden ever transgressed, how much of the midden is actually Neolithic, and finally, what is the nature of the dark cultural layer north of the midden?

Environment

The site sits at an elevation of 5-7 m asl. During the middle Holocene, sea level was approximately 4 m higher than today, and the site would have been almost directly on the coast (Mertz 924, 30-31). Figure 3 shows the location of the previous excavations at the site in black and the 2004-05 excavations in red in conjunction with elevation and a reconstruction of sea level at +4.0 m asl.

In the early part of the Holocene this area would have been dry land in the interior of what is today Denmark. As sea levels rose and the Storebælt flooded, the area was gradually submerged by a series of Littorina transgressions during the late Atlantic and early Subboreal periods (Berglund 1971; Christensen 1995, 2001; Christensen *et al.* 1997; Iversen 1937; Jacobsen 1981; Jessen 1938). As the seas rose the Lammefjord was created. This interpretation corresponds closely with the results of the analysis of cores from Trundholm Mose,15 km to the northeast (Christensen 1995; Kolstrup 1988).

About 2 km northwest of the Fårevejle midden rises the hill of Vejrbjerg, a prominent end moraine running along the western coast of Zealand. It is fairly steep and would have protected the whole western area from western and northern winds. These conditions, in addition to the relatively easy access to the open sea through Dragsholm, must have made this area attractive for settlement.

Previous investigations

The shell midden at Fårevejle Kro (aka Vejle Kro) was first discovered by A.P. Madsen in 1894, where he noted a few pieces of shell on the ground surface. Madsen put in four test pits and concluded that the shell midden was approximately 68 m long and 14 m wide; the shell layer itself was about

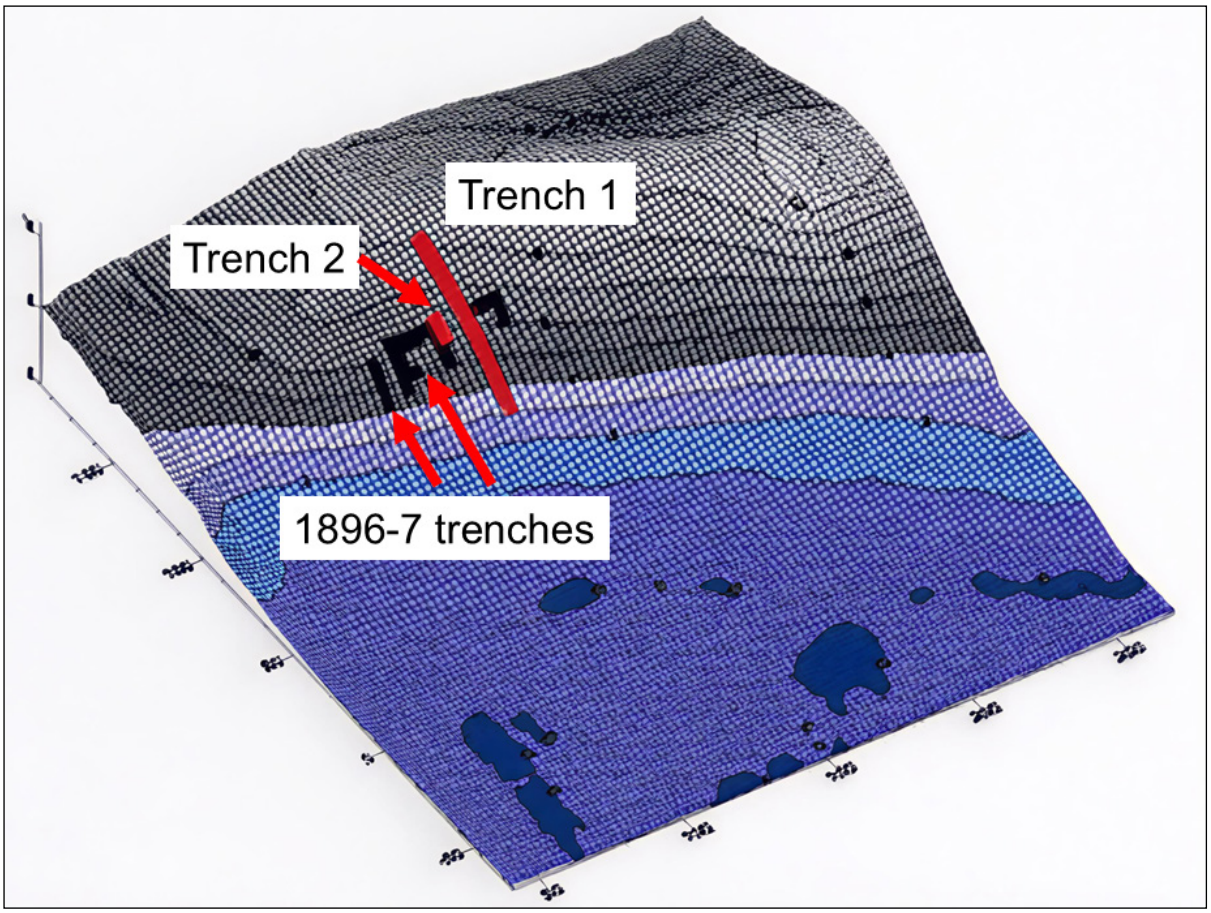

Figure 3. Fårevejle Kro. A plan of surface elevations, previous excavations (black) and 2004-05 (red); sea level is reconstructed in blue at +4 m asl. (Image: K. Ritchie).

75 cm thick. He also found well-preserved animal bones and teeth, flint debitage, and a flake axe.

This initial testing led to larger excavations at the site conducted by the National Museum, carried out over nine days in 1896 and 1897 (Madsen et al. 1900, 112-122). Four trenches were excavated perpendicular to the length of the midden, two of which crossed from one side of the midden to the other. At the north side of trench 2 and trench 4, a cross trench was excavated perpendicular to the main trench and roughly along the edge of the midden (Figure 3). Approximately 150 m² were excavated, and the size of the midden revised. The shell midden was now estimated to be about 56 m long, 10-11 m wide in the middle, and 0.7-0.9 m thick at a maximum, on average 0.5 m thick.

The shell layers were composed of oyster (*Ostrea edulis*), cardium (*Cerastoderma edule*), mussel (*Mytilus edulis*), and common periwinkle (*Littorina littorea*) shells, in some places identified as distinctive 'meal heaps'. In most places the midden layer was a compact mass of shells without much soil. Surprisingly few artefacts were found in the midden, which was one of the reasons why C. Neergaard indicated in a letter to the National Museum that he did not think it was a suitable object of study for "the Second Kitchen Midden Commission".

Further investigations in 1897 focused on the area behind the midden and revealed a dark, greasy cultural layer, 5 to 50 cm thick increasing toward the east, as a continuation of the shell midden. This layer mostly overlay and thus post-dated the shell midden. Both Mesolithic and Neolithic artefacts were found in this area as well as fireplaces. There were few artefacts found in the Mesolithic layers themselves and more from the Neolithic deposits in the dark cultural layer behind the midden. The overall conclusion was that the Fårevejle midden was a stratified shell midden, with layers and a few artefacts from both the Mesolithic and the Neolithic, but not rich enough for further investigations.

Figure 4. West wall of the northern portion of Trench 1 with shell midden exposed (Photo: T.D. Price).

The site was collected in 1982-83 by Knud Heinesen, a Danish politician and amateur archaeologist, who donated his collection to the Kalundborg Museum. In 1997, the site was visited and surveyed as part of the '*køkkenmødding-projekt* 1996-97' but no excavations were conducted. Their conclusion, however, was that the site should be protected if excavations showed well-preserved cultural layers.

Materials and methods

Odsherred Museum (Museum Vestsjælland) is responsible for the project documentation and finds. Materials are stored at Odsherred Museum, Nykøbing Sj., with bones at the Zoology Museum in Copenhagen.

2004-2005 excavations

Survey, coring, and datum

Initial efforts focused on mapping the field and coring to establish the exact position of the shell midden and to get a preliminary sense of the stratigraphy of the site. An attempt was made to determine the location of the excavations from 1896-97 using the plans and maps from that project. It was not possible to establish the exact position of the grid used in 1896-97. Coring was done every 20 m east-west in the area of the midden, and every 10 m north-south. Later, another line was cored at 145E from 100-120N. Using the depth of shell deposits measured during coring the midden area, we estimate that our grid line 100N is approximately 7-8 m west of the 0N line from the 1897 excavations.

Next, a 2 m trench was laid out at 140-142E/100-120N, believed to be between the central and eastern excavations from 1896-97. This position was confirmed after removing the topsoil of the trench when a relatively recent disturbance appeared at 141E/115N. It was 2 m wide from north to south, the edges cut straight. This must have been part of the third, easternmost trench from 1897. With this information it was possible to establish the exact position of the old excavations in relation to the 2004-05 excavations.

As noted in the 1896-97 excavations, the shell midden lies on the 5 m contour. In order to compare GPS registered data with the original excavations, the elevation of the yellow sand in the northwest corner of the old excavations that was exposed in the new trench was measured. The original plans show the elevation here as 4.12 m asl. Using a laser level and GPS fixed point, this spot at the top of the yellow sand registered 4.14 m asl; so the elevation measurements from the two projects are the same, ±2 cm, any difference possibly being the result of isostatic uplift between the two investigations (Astrup et al. 2020).

Excavation methodology

The excavations in 2004 were opened by hand with a 2 m wide trench through the thickest part of the midden (trench 1) at 140-142E from 100-120N (interrupted by a 2 x 2 m balk, 108-110N) (Figure 4). The topsoil was *c.*40 cm thick in the

upper part of the trench (around 110N) and *c.*80 cm thick in the lower part (around 106N). Behind the midden the ploughzone and subsequent layers were removed down to the moraine sand since finds were rare in these layers (only a very few flakes). The trench was extended to the north until the moraine sand appeared directly below the plough zone (*c.*90N).

The shell midden itself was excavated by hand using trowels in square meters. The layers were generally excavated in 10 cm 'artificial' levels, but the cultural layers were followed when possible (if they were more than 10 cm thick, they were split into two (or more) levels). The removed matrix was water screened through a 4 mm mesh. All features and interesting areas of shell, stone concentrations and ash dumps were mapped, drawn (scale 1:10 or 1:20), photographed and numbered.

In 2005, work continued in Trench 1 excavating the 2 x 2 m balk remaining from 2004 and cleaning the bottom of the trench under the midden to determine if an occupation layer was present. Additionally, a new trench (Trench 2) was excavated to sample more of the midden and to determine the nature of the dark greasy (Neolithic?) cultural layer to the north, partly covering the midden.

A location for Trench 2 was selected using the old drawings and descriptions from 1896; the dark, greasy layer was reported to be thickest in the area just east of old '*Tværgrav* 3'. Trench 2 (2 x 7 m) was placed in such a way that it included this layer north of the shell midden as well as the northern edge of the midden (131.5-133.5E/112-119N). The eastern edge of the 1896 trench appeared along the west section of Trench 2.

Results

The shell midden was present in about 11 m of trench 1, from 105N to 116N. There were clusters of bone in the midden deposits, especially in the oyster layer, that contained a variety of species. A total of 125 m^2 of the midden has been excavated out of an estimated area of 616 m^2, which leaves about 80% remaining.

As was also observed in 1896-97, there were surprisingly few finds from Fårevejle Kro. Today it is clear that several middens from the end of the Mesolithic contain few finds (*e.g.*, Norsminde, Krabbesholm) (Andersen 1989, 2005). There was some limited activity at the site prior to the establishment of the midden as evidenced by a few scattered pits.

Stratigraphy

The shell midden at Fårevejle Kro seems to have formed directly on an old beach. Some pockets and thin bands of large, intact oyster shells are found in the top of this layer. The lowest layers of the midden contain mostly whole oyster shells, but some crushed shell is also present. Small, yet distinct, "meal piles" were sometimes detected, usually dominated by one species of shellfish. The shells are mostly loosely packed, seemingly fairly quickly covered by subsequent deposits. These layers contain artefacts, including especially bone but also flint flakes, some stone tools and ceramics.

All the predominantly oyster shell layers are thought to be Mesolithic (*i.e.*, late Ertebølle), based on the presence of diagnostic Ertebølle sherds (one from a lamp) and flint tools such as transverse arrowheads, flake axes, and distally retouched blades. Much of the actual shell midden seems to be Mesolithic.

The upper and thinner layers of the midden are composed of crushed shell mixed with sediment, pebbles, and fragments of burned rock. These layers are mainly composed of crushed cockle and mussel shell mixed with some periwinkles (*Littorina* sp.) Oysters are occasionally found in these layers, but they are not dominant. One layer in particular appears as a fairly thick, greyish-black ash horizon with charcoal and a large number of burned rocks, many of which are part of features. This layer was recognized in both years of the excavations and seems to be present over the full width of the shell midden. The fact that the shells are crushed and the 'ash/charcoal horizon' is extensive may indicate that these surfaces lay exposed for a long time. It was clear that the oyster section of the midden

– beneath the blacker layer with crushed mussel, periwinkle, and cockle shells – was composed of more intact half shells of oyster, less sediment, and much more bone. Most of the pottery is found in the upper layers and appears to be of (middle) Neolithic date. Some flint flakes and tools are also present, but rare compared to the compact Mesolithic shell layers.

There is no sharp division between the Mesolithic and Neolithic layers based solely on the shellfish remains. The Mesolithic layers contain mostly whole shells, but these are not exclusively oysters as observed in other Danish shell middens; both cockles and mussels are present in these layers, and oysters, albeit smaller and fewer, are present in the topmost crushed shell layers thought to be Neolithic based on artefact typology.

Overall, the stratigraphy seems to be the same in the two trenches (albeit trench 1 contains a thicker part of the midden). As always seems to be the case with shell middens, deposits are sporadic in both time and space so that designation of layers or comparison of sections is difficult (Andersen 2007, 36). The following presents a generalized description of the stratigraphy of the midden from bottom to top.

a) Human activity on the old surface/beach before the midden was formed or right next to the midden while it was forming, leaving some scattered whole oysters, large flint flakes and some bone.
b) Deposition of piles of whole shells, mostly oysters but also cockle, fairly quickly covered. A lot of flint and bone artefacts and some pot sherds – diagnostic artefacts are Mesolithic.
c) Layers of crushed shell with flint, pot sherds and few bones.
d) Dark charcoal rich horizon with many burned rocks and pieces thereof, many of which constitute features and hearths.
e) Crushed shell with other sediment, gravel, and many pebbles mixed in. Contains pot sherds and few flakes. Diagnostic artefacts are late Early/early Middle Neolithic. The tops of these layers appear disturbed, perhaps due to transgression/regression, slopewash, and/or cultivation.
f) The shell midden and the area immediately behind it were covered by a dark greasy cultural layer (some of which washes under the shell midden) containing Neolithic artefacts. This layer could be an *in situ* deposit or slopewash containing artefacts coming down from the adjacent hill.
g) More slopewash or alluvial deposition. Cooking pit, date unknown but probably later than Middle Neolithic.
h) Modern slopewash/plough zone.

The bottom layers, composed of whole shells, can be ascribed to late Mesolithic (ceramic) Ertebølle, while the upper crushed shell layers belong to late Early Neolithic/early Middle Neolithic Funnel Beaker Culture (TRB). This observation is particularly based on the distribution of diagnostic artifacts, flint (tools) and ceramics. There is no indication in the artefact evidence that the site was used or material deposited during Early Neolithic (EN Ia). The overall pattern of sea level change is clearly visualized in the Fårevejle midden, where the Atlantic climactic period oyster midden is located slightly more inland and higher than the Subboreal Neolithic, more seaward cockle shell deposits.

Features

Several features were recognized in the excavations at the site, including ten stone lined hearths of varying sizes and a number of ash deposits and concentrations of burned, crushed shell, most likely representing another ten fireplaces. There were several post holes noted in the floor of the excavations and one or two features best described as pavements. These pavements may also have been surfaces for fires as they were usually associated with ash deposits.

Dating

Chronology is based on diagnostic artefacts in the layers supplemented by radiocarbon dates. Layer 1 appears disturbed but contains some flint flakes and tools. Layers 2-4 seem to be early Middle Neolithic. These layers contain a relatively large number of ceramics and very little flint – the latter is

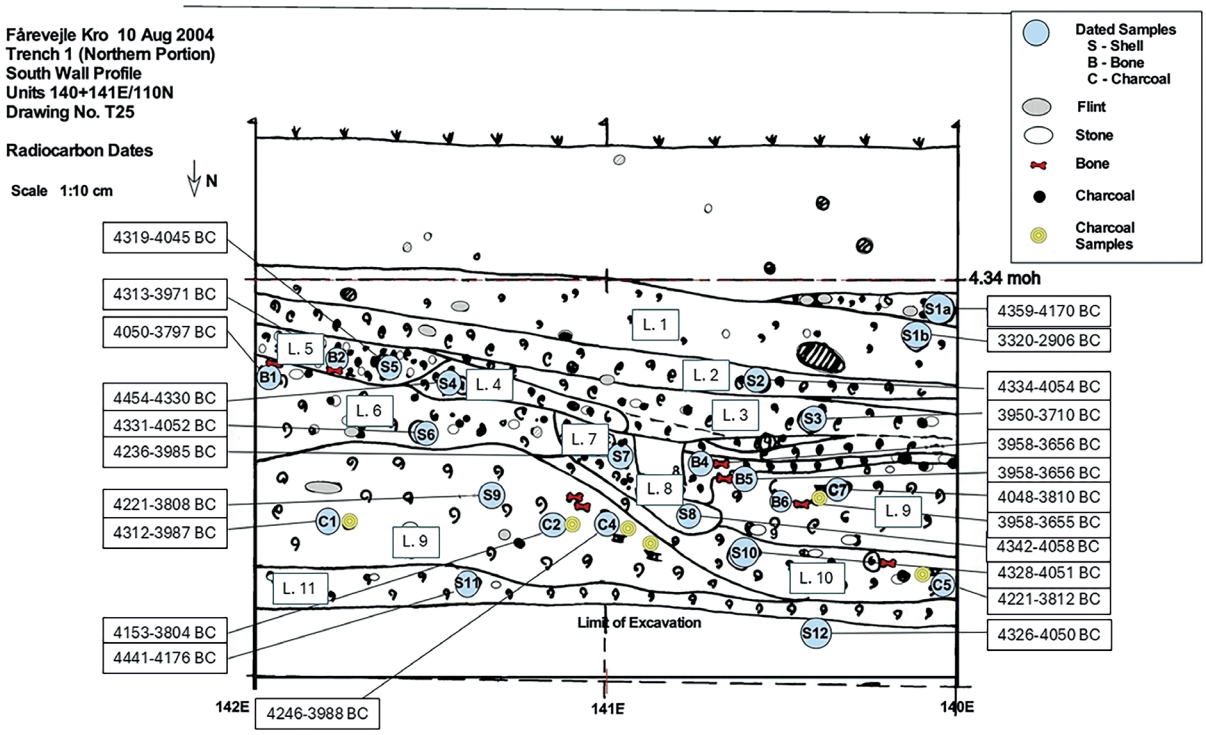

Figure 5. Section 140E/108-109 and the 14C samples (L. 1 = Layer 1, etc.) (Drawing: T. Slocum).

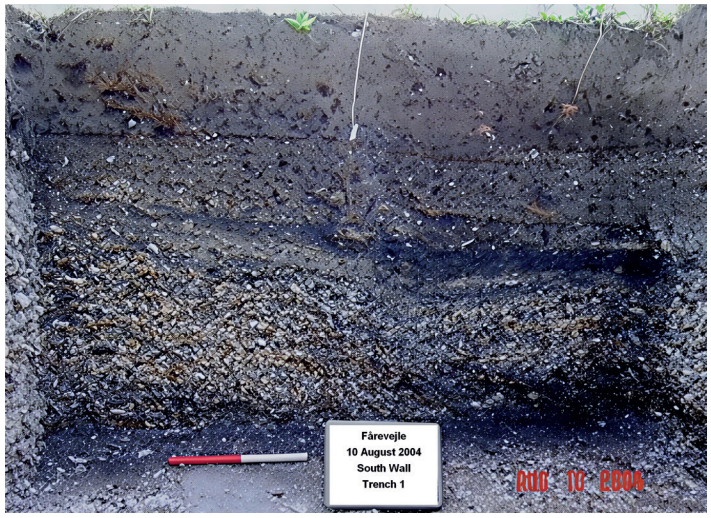

Figure 6. Section 140E/108-109 where radiocarbon samples were taken (compare with Figure 5) (Photo: T.D. Price).

most abundant in layer 4 and almost absent in layers 2-3. Layers 5-9 appear to be Mesolithic – compact shell layers composed of whole shells. Bone and flint are abundant in these layers, with some ceramics also present.

Radiocarbon samples were collected from all sections. Shells (*Cerastoderma edule*) were collected from all the main layers of the midden, as well as charcoal and bones when they were present in the section. The various samples are marked on the section drawing (Figure 5), which can be compared with a photo of the profile (Figure 6). ^{14}C samples from this section of the shell midden were submitted for dating at the NSF AMS facility in Arizona (Table 1 and Figure 7). Results were calibrated in OxCal v.4.4 (Bronk Ramsey 2009) using the IntCal20 calibration curve (Reimer *et al.* 2020).

The radiocarbon dates, in contrast with the material evidence, suggest occupation at the site before,

Lab #	Site code	Material	14C BP	1σ calBC	2σ calBC
AA72336	S1b	shell	4396 +/- 40	3087-2925	3320-2906
AA72334	B6	bone	5028 +/- 64	3945-3713	3958-3655
AA72333	B5	bone	5030 +/- 57	3945-3714	3958-3656
AA72332	B4	bone	5031 +/- 57	3945-3715	3958-3656
AA72338	S3	shell	5033 +/- 39	3944-3771	3950-3710
AA72331	B3	bone	5118 +/- 58	3980-3804	4046-3772
AA72329	B1	bone	5147 +/- 49	4039-3813	4050-3797
AA72349	C2	charcoal	5161 +/- 42	4044-3946	4153-3804
AA72354	C7	charcoal	5162 +/- 35	4039-3952	4048-3810
AA72344	S9	shell	5182 +/- 44	4044-3956	4221-3808
AA72352	C5	charcoal	5187 +/- 42	4044-3960	4221-3812
AA72342	S7	shell	5272 +/- 40	4226-3994	4236-3985
AA72330	B2	bone	5274 +/- 60	4228-3994	4313-3971
AA72351	C4	charcoal	5289 +/- 42	4230-4047	4246-3988
AA72348	C1	charcoal	5294 +/- 47	4230-4048	4312-3987
AA72340	S5	shell	5322 +/- 40	4239-4055	4319-4045
AA72347	S12	shell	5347 +/- 39	4314-4061	4326-4050
AA72345	S10	shell	5353 +/- 41	4318-4062	4328-4051
AA72341	S6	shell	5363 +/- 45	4323-4066	4331-4052
AA72337	S2	shell	5371 +/- 41	4326-4070	4334-4054
AA72343	S8	shell	5393 +/- 42	4330-4174	4342-4058
AA72335	S1a	shell	5439 +/- 41	4341-4255	4359-4170
AA72346	S11	shell	5464 +/- 41	4350-4260	4441-4176
AA72339	S4	shell	5538 +/- 40	4443-4344	4454-4330

Table 1. Radiocarbon samples. Calibrated in OxCal v.4.4 (Bronk Ramsey 2009) using the IntCal20 calibration curve (Reimer *et al.* 2020). Site code refers to numbers in section drawing (Figure 5) – note: not all samples' locations are in this drawing.

during, and after the transition from the Mesolithic to the Neolithic (Figure 7). By all accounts, the site seems to have been in use only during the last phases of the Mesolithic, although its use during the Neolithic seems more open to interpretation. Whether the apparent hiatus in use during the earliest Neolithic evidenced by material culture is real remains to be securely documented.

Animal remains

The bone specimens were found throughout the midden but appeared more commonly in the bottom part of the midden, where the shells were whole and more loosely packed. The bones were generally well-preserved here and sometimes found in clusters. As is common for Ertebølle assemblages (Enghoff 2011), there are a wide range of species represented, although some animals were clearly more a focus of procurement (Table 2).

Shell

The following marine mollusc species were present in the shell midden: oyster (*Ostrea edulis*), common cockle (*Cerastoderma edule*), blue mussel (*Mytilus edulis*), common periwinkle (*Littorina littorea*), peppery furrow shell (*Scrobicularia plana*), netted dog whelk (*Tritia reticulata*) and a few shells of needle whelk (*Bittium reticulatum*). The first four species occur in all layers of the midden, while the latter three are found more sporadically. Samples of the midden were taken from several sections and shells identified and counted by weight.

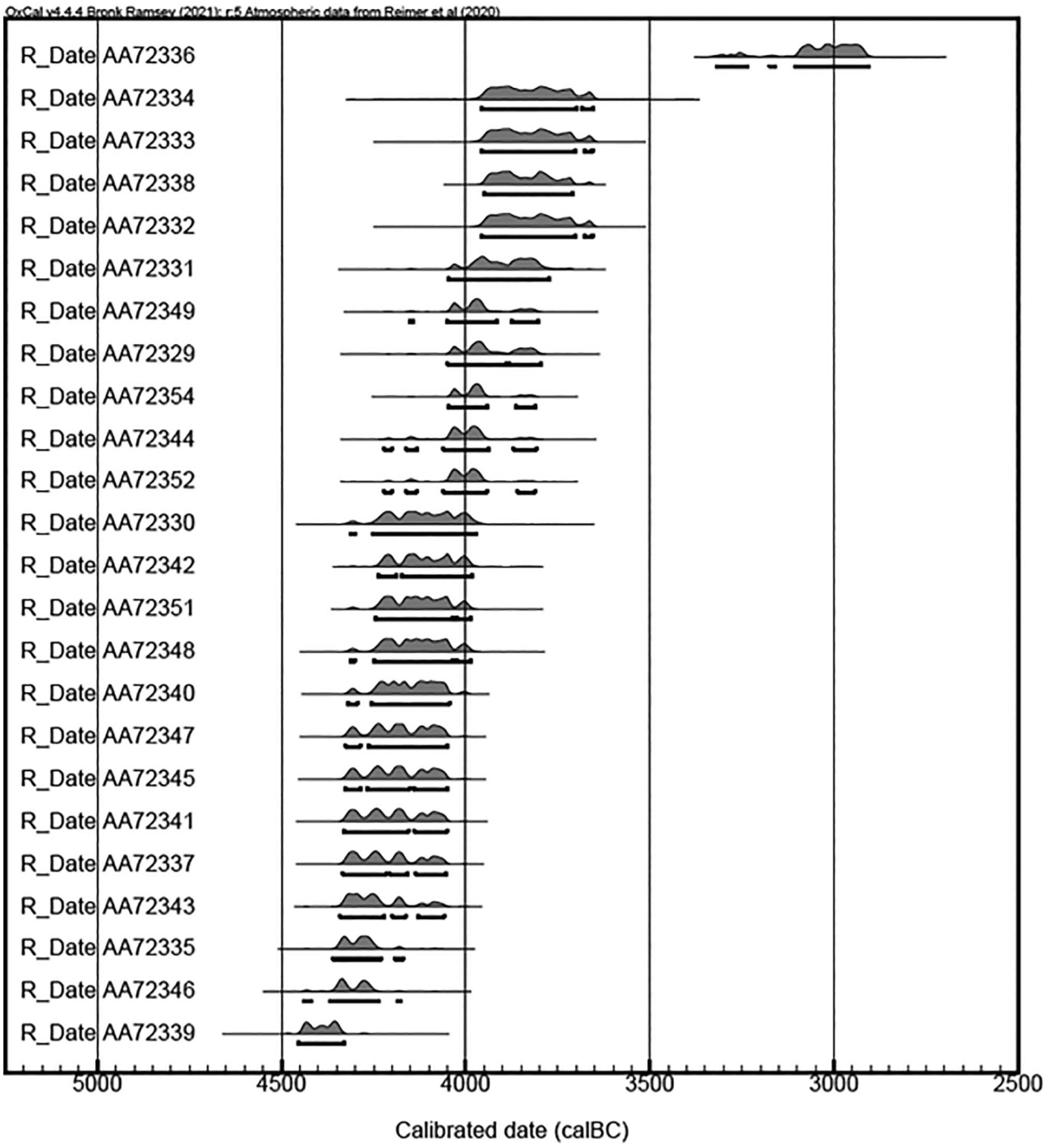

Figure 7. Calibrated radiocarbon ages from Fårevejle (Image: L.R. Andersen).

Table 3 is a representative tabulation of one of these sampled sections and lists the weight and volume of the sample for each layer along with the percent of the four most common shell species and unidentified shell as well as the percent of shell in each sample. 99 is the layer number used for the plough zone. As is apparent in the table, the amount of shell generally increases with depth, as does the importance of oyster.

Fish

The fishbone assemblage consists of 2943 specimens, of which 2738 are identified to family, genus, or species level (Table 2). There are at least 13 different types of fish, which fits the pattern of Ertebølle assemblages that tend to have diverse fish taxa (Enghoff 2011, Ritchie 2010). The assemblage is dominated by marine taxa (*e.g.*, Gadidae) although the flatfish (Pleuronectidae and Scophthalmidae) may be mostly represented by

Taxon	Common name	NISP	MNI
Gadidae	codfish	1546	
Gadus morhua	cod	33	
Pollachius sp.	saithe/pollock	1	
Pleuronectidae	right-eye flounder	1028	
Platichthys flesus	flounder	3	
Scophthalmidae	turbot/brill	12	
Anguilla anguilla	eel	74	
Belone belone	garfish	17	
Clupea harengus	herring	8	
Cyprinidae	carps and minnows	7	
Esox lucius	pike	3	
Myoxocephalus scorpius	sculpin	2	
Scomber scombrus	mackerel	2	
Squalus acanthias	spurdog	1	
Salmo sp.	salmon/trout	1	
Total Pisces		**2738**	
Sus scrofa	wild swine	567	6
Capreolus capreolus	roe deer	425	8
Cervus elaphus	red deer	240	5
Vulpes vulpes	fox	27	2
Felis silvestris	wild cat	7	1
Phocidae	seal	5	1
Lutra lutra	otter	3	1
Ovis/Capra	sheep/goat	3	1
Arvicola terrestris	water-vole	2	1
Canis familiaris	dog	1	1
Martes martes	pine marten	1	1
Apodemus flavicollis	yellow-necked mouse	1	1
Total Mammalia		**1282**	**29**
Cygnus sp.	swan	4	1
Anas sp.	duck	3	1
Alca torda	lesser auk	3	1
Uria aalge	common murre	2	1
Mergus merganser	common merganser	1	1
Mergus serrator	red-breasted merganser	1	1
Total Aves		**14**	**6**

Table 2. Animal bones from Fårevejle (NISP – number of identified specimens, MNI – minimum number of individuals).

flounder (*Platichthys flesus*) that have a brackish or even freshwater tolerance. Eel (*Anguilla anguilla*) and salmon/trout (*Salmo* sp.) are diadromous fish that alternate between marine and freshwater environments. The pike (*Esox lucius*) and carps (*Cyprinidae*) are generally freshwater fish, but with a certain tolerance for brackish water. Taken as a whole, the assemblage is consistent with a fishery that took place in the immediate environs of the site in the Lammefjord, with possible occasional forays into the nearby Kattegat.

The mesh size of the sieving apparatus is an important consideration when evaluating the recovered fish bone assemblage. The size used at Fårevejle was large enough that it is likely that some bones passed through the screen and were lost, however, testing of the effects of sieve

Level	Weight (g)	Volume (liter)	Mussel	Oyster	Cockle	Periwinkle	No ID	Shell
99	1195	1.2	0.0%	0.1%	0.0%	0.1%	0.3%	0.5%
1	2360	1.7	0.6%	1.1%	0.6%	0.3%	5.6%	8.1%
2	1785	1.3	2.2%	0.0%	3.2%	0.6%	17.3%	23.8%
2A	1020	1.0	17.5%	5.2%	3.8%	0.0%	24.6%	51.2%
4B	3510	3.6	16.9%	5.2%	13.2%	1.0%	22.5%	58.9%
10	1370	1.5	25.5%	22.4%	8.9%	0.0%	28.4%	85.2%
7A	2230	2.2	15.6%	13.6%	4.3%	0.7%	29.6%	64.3%
7	2970	3.0	11.3%	40.4%	1.6%	0.0%	18.2%	71.7%

Table 3. Identified shellfish from one section (see Figure 5 for layer placements).

size at two nearby Ertebølle sites on northwest Zealand (Dragsholm and Asnæs Havnemark) demonstrated that the effect was only modest, and the results obtained here should be reasonably representative (Ritchie 2010, 132-143). Another consideration for discussions of the fishery is variability between different contexts of the midden. Although there seems to be a trend towards greater representation of gadids progressing deeper into the midden (Figure 8), whether this is due to cultural, environmental or taphonomic factors is not clear.

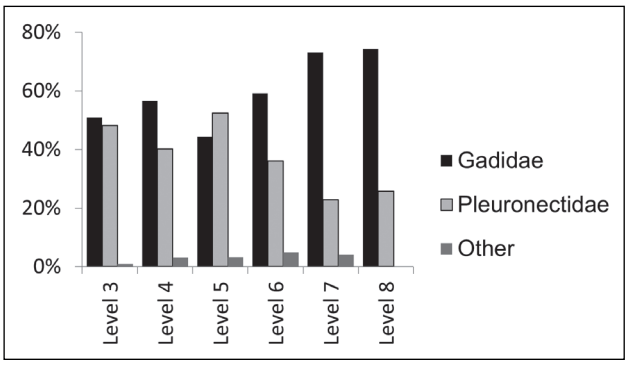

Figure 8. Variability in fish remains (vertebrae only) between levels of the midden.

Codfish dominate, with cod (*Gadus morhua*) apparently the most common, supplemented by a small number of saithe and/or pollock. Cod sizes were estimated from measurements of otoliths (Härkönen 1986, 90) and first vertebrae (Enghoff 1994, 93). The cod are of relatively modest sizes (Figure 9) as is common for Ertebølle assemblages (Enghoff 1994, 74-75).

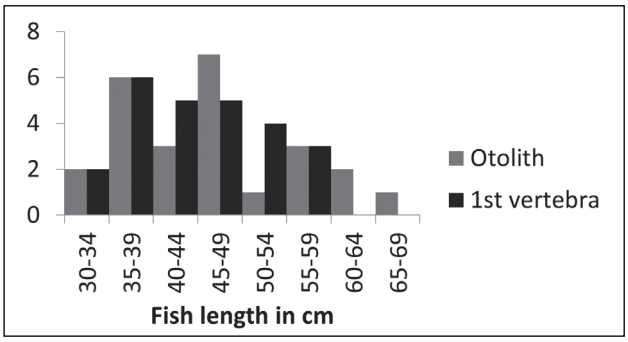

Figure 9. Length of cod reconstructed from measurements of otoliths and first vertebrae.

Flatfish, primarily from the family Pleuronectidae but with a few specimens from Scophthalmidae, are the second most common type of fish remains in the assemblage. As mentioned, flounder remains are definitely present in the assemblage and this species is capable of living in marine, brackish and freshwater environments (Muus et al. 2006, 268). Sizes of the flatfish (Figure 10) were estimated from measurements of first vertebrae and are in line with those from other Ertebølle sites (Enghoff 1994, 76 and 93).

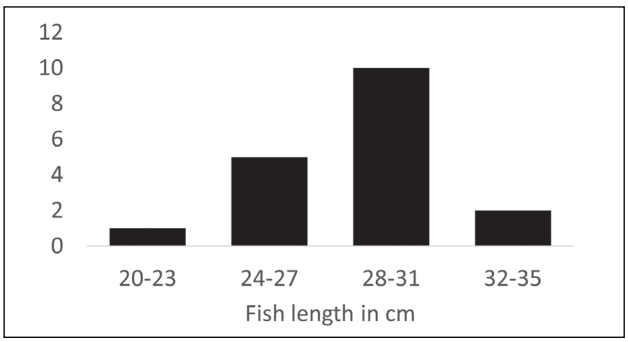

Figure 10. Length of flatfish reconstructed from measurements of first vertebrae.

Eel are in a distant third place regarding NISP. The sizes of eel based on measurements of cleithra and ceratohyals (Enghoff 1994, 91) ranges from ca. 35-108 cm, with the majority (6 of 9) around 50-65 cm. The rest of the taxa are represented by only a small number of remains each, but the diversity of fish suggests flexibility in the fishery to accommodate short- and long-term fluctuations in the availability of the main prey. Spurdog is only represented by a single dorsal spine that could be a tool (Noe-Nygaard 1971) brought from elsewhere that does not represent part of the site fishery.

Mammals

As is usual for Ertebølle settlements, the majority (96% of the NISP here) of the bones come from the 'big three' – roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), and wild swine (*Sus scrofa*). Wild swine was most common, followed by roe deer with red deer a distant third. Fox (*Vulpes vulpes*), wildcat (*Felis silvestris*), otter (*Lutra lutra*), and marten (*Martes martes*) suggest hunting (or trapping) to obtain furs, while the presence of seal (Phocidae) bones show that aquatic mammals were also pursued. The three sheep or goat bones (*Ovis/Capra*) almost certainly result from the Neolithic occupation of the site. The other domesticate, dog (*Canis familiaris*), is only represented by a single specimen (a second phalanx). Butchery evidence in the form of cutmarks (15 specimens) and bones fractured to extract marrow (333 specimens) attest to the exploitation of mammals for food as well as probably for raw materials (Gron 2013, 100-115).

Birds

Although only 14 bird bones were identified in the material (Table 2), taphonomic losses are suspected to be especially high for these animals and they could well be underrepresented compared to their actual importance (Gron 2013, 100-115). This is especially true as their value as raw materials (*e.g.*, feathers and bones) may have been higher than their role as food. All the birds are waterfowl, which accords well with a coastal settlement and a subsistence base focused on aquatic resources.

Seasonality

Based on the presence of two migratory fish species, mackerel and garfish, that today appear in Danish waters only during the warmer months of the year (Muus *et al.* 2006, 149 and 238), at least some of the fishing must have taken place in the late spring to early fall. However, three cod otoliths were sampled for oxygen isotopes to determine the season of catch for the fish and results from two of them indicated fishing during the late winter/early spring (Ritchie *et al.* 2013, 100). Although the rest of the faunal remains show mainly summer occupation at Fårevejle (Gron 2013, 114), the cod otoliths show winter activity as well. Whether this means the site was inhabited year-round or was subject to periodic visitations in different seasons is an unresolved question.

Worked Bone and Shell

Other than the butchery marks noted above, there is no evidence for modification of the animal bones apart from one roe deer 2nd phalanx that had a circular hole drilled in it. No bone tools were identified.

Among the more unexpected finds was a shell bead from Trench 1. It is circular and ca. 8 mm wide with a whole drilled in the middle and is probably made from oyster (Figure 11). The date is thought to be Mesolithic since the bead is made of oyster shell and the layer in which it was found is superimposed by layers containing Ertebølle ceramics.

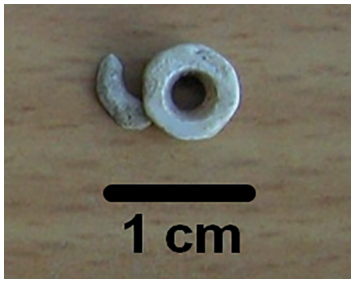

Figure 11. Oyster shell bead from Layer 5 (Photo: T.D. Price).

Lithics

A total of *c.*91 kg flint was recorded from the 2004-2005 excavations, 75 kg from Trench 1 and 16 kg

	Trench 1	Trench 2	Other	Total
Flakes	7549	1880	2	9431
Blades	457	85	0	542
Flake cores	67	16	0	83
Blade cores	5	4	0	9
Retouched flakes	49	7	0	56
Retouched blades	15	3	0	18
Projectile points	32	5	0	37
Point preforms	3	2	0	5
Flake axe	13	1	0	14
Core axe	5	1	0	6
Blade knives	1	1	0	2
Scraper	11	2	1	14
Borer	4	0	1	5
Burin	4	0	0	4
Total	**8213**	**2007**	**4**	**10224**

Table 4. Flint artefacts from Fårevejle.

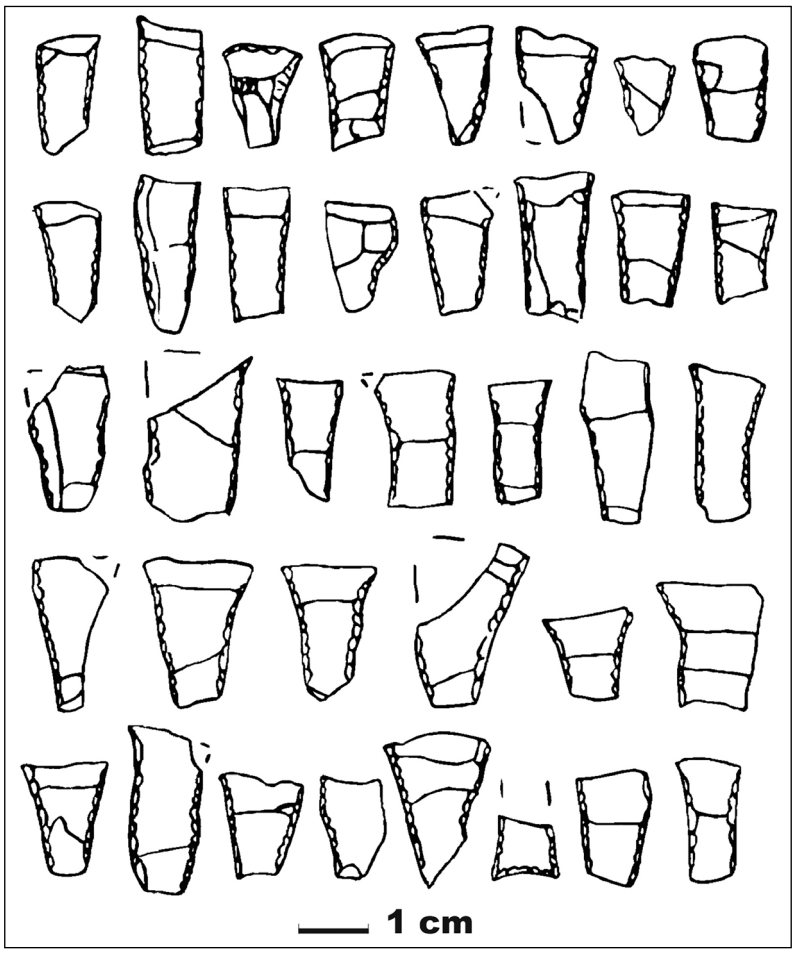

Figure 12. Transverse arrowpoints from Fårevejle (Drawing: T. Slocum).

from Trench 2, totalling 10,224 pieces (Table 4). The Mesolithic artefacts (small transverse projectile points (Figure 12), flake axes, blade knifes, blade scrapers and burins) are found in the lower layers of the midden, and Neolithic artefacts (very large transverse projectile points, circular flake scrapers) are found in the upper part (flake axes and transverse projectile points are known from

Figure 13. Groundstone axe (trindøkse) from Trench 2 (Photo: T. Slocum).

EN I but that period does not appear to be represented by any other evidence in the midden). Flint artefacts were also recovered from the dark cultural layer behind the midden and most of these seem to be of Neolithic age. A polished axe fragment was found in this layer right above the midden. Unfortunately, this axe was damaged and undiagnostic as to type or age.

Three of fourteen scrapers and two of five borers are on blades. A noteworthy find from Trench 2 is a groundstone axe (*trindøkse*) from underneath fireplace A34 (Figure 13).

Pottery

Ceramics were encountered throughout the layers and the sherds represent at least two periods: late Ertebølle pots (67 sherds) and Funnel Beaker (TRB) vessels (54 sherds) from the late Early Neolithic period EN II (Virum group) + MN AIb. An additional 16 sherds could not be assigned to either group.

Ertebølle pottery (67 sherds) was tempered with crushed granite, grog or chamotte, and plant remains. The maximum size of visible temper grains was 0.6-0.8 cm. Thickness of the vessel walls varied from 1.0-2.1 cm, with an average of 1.68 cm. The pots were constructed either with round clay coils in U-structure or more compressed coils in H-structure. Several coils showed finger imprints along the top. The ware was porous, often cracked along the coils, and crumbled easily. At least four different pots were represented. The typical shape of Ertebølle vessels with a short, flared neck, a smooth transition to a slightly curved belly and a pointed bottom was reflected in the fragmented ceramics. Two thick sherds represent the pointed bottoms of Ertebølle pots. Diameters of the vessels, varying from 22-36 cm, indicate the use of medium and large vessels. No food crusts were observed on the Ertebølle ceramics. The two Ertebølle lamps found in 1896-97 are in museum displays, one sherd recovered in 2005 may be part of one of these but could not be refitted (Figures 14a and 14b) (Madsen et al 1900, fig. 10, 119).

1896-97 pottery

The pottery excavated in 1896-97 and housed at the National Museum in Copenhagen was re-examined as part of the investigations in 2004. No clearly Ertebølle ceramics were observed in the two boxes curated there, so these boxes probably did not contain the full set of ceramics excavated at the site (as noted above, two Ertebølle lamps are on display). The four apple pip impressions originally reported in the pottery were also not encountered (a note indicated these had been moved). Box One contained pieces from two pots, a large lugged, undecorated jar and a medium-size funnel beaker with rim and belly decoration There were also two rather flat burned pieces of clay of unknown function. Box Two contained 6 smaller boxes with sherds sorted according to vessel. The TRB pottery belongs to the late Early Neolithic period Ib or perhaps EN II but was not decorated in Virum style.

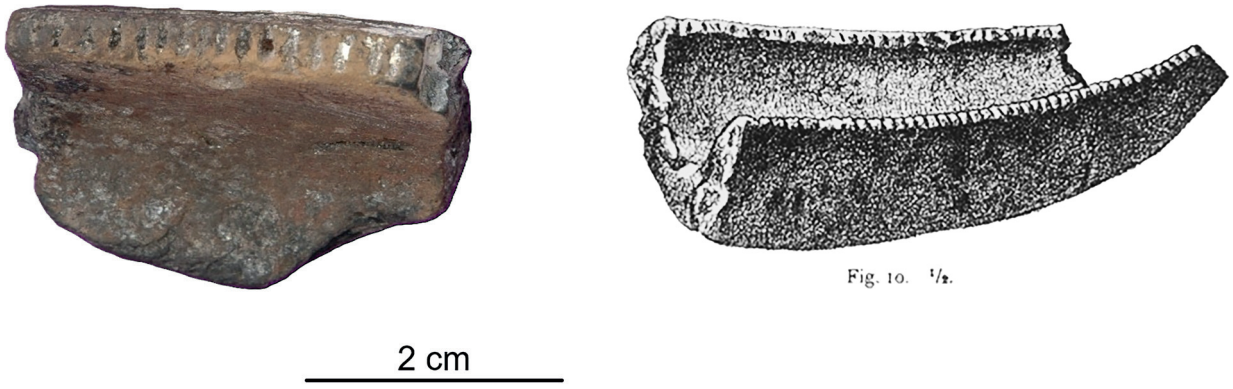

Figure 14. The lamp sherd excavated in 2005 (left, Photo: T.D. Price) compared with a drawing of the lamp from 1896-97 (right, Madsen *et al*. 1900, fig. 10, 119).

Discussion

The recent investigations at Fårevejle Kro are important for the data that were recovered during excavation and analysis – and those that were scarce or lacking. The relatively few flint and ceramic artefacts recovered, especially in the Mesolithic layers of the midden, support the idea that shell middens are not a uniform phenomenon. While some of them may well have been 'base camps' occupied for much or all of the year, others such as Fårevejle appear to have had more limited residency, perhaps serving as resource exploitation camps that provisioned base camps in the vicinity. As with the other stratified shell middens, the discovery of Mesolithic and Neolithic occupations at the same location, despite the strong cultural differences – and recent DNA evidence suggesting discrete populations (Allentoft *et al*. 2024) – is an intriguing example of the power of specific locations to attract human populations. Given the Neolithic occupation at a clearly marine-oriented site, it also contributes to the ongoing debate about the role of aquatic resources during this period (*e.g.*, Lidén *et al*. 2004; McLaughlin *et al*. 2025; Milner *et al*. 2004).

Faunal remains are a relatively abundant material from the excavation and both confirm and challenge preexisting knowledge about animal exploitation during these periods. The diverse fish taxa are consistent with the wide variety of fish seen at other Ertebølle sites (Enghoff 2011), while the focus on gadids, and to a lesser extent flatfish, agrees with the general pattern seen in northwestern Zealand (Ritchie 2010, 209). The focus on the 'big three' (roe deer, red deer, and wild swine) is also in accord with that known from other Ertebølle assemblages, with the addition of fur-bearing mammals that were probably more important for their pelts than meat (Enghoff 2011). Noteworthy is the substantial presence of shellfish taxa other than oysters in the Mesolithic layers and the oysters present in the Neolithic ones.

Although the material recovered during the recent and previous excavations at the site are not extensive, they do contribute to an understanding of shell middens as complex phenomena that played important and diverse roles in many periods of prehistory (Andersen 2007). They are clear evidence that the sea and its resources shaped cultural adaptations over a period of many millennia. This is significant not just from the standpoint of how people secured their subsistence, but also as a means to come somewhat closer to understanding their worldview (see, for example, Živaljević 2025 – though discussing inland rivers instead of coasts). The great period of shell midden exploration in Denmark has largely passed, but limited revisitation of previously excavated sites with improved archaeological methodology, coupled with the discovery of currently undiscovered ones, can play a crucial role in advancing understanding of the way in which they contributed to prehistoric lifeways.

Conclusion

The results of the 2004-2005 excavations demonstrate that the Fårevejle midden is still well-preserved and contains important information about the Mesolithic – Neolithic transition. In light of this, in 2010 the site at Fårevejle was purchased and protected and several information signs were added in connection with the project *Danmarks Oldtid i Landskabet*. The large part of the midden remaining means that it is preserved as a potential resource for future investigations, ideally of a non-destructive or only minimally intrusive nature. The material presented here adds one more site to the relatively scarce dataset of Stone Age shell middens excavated with modern techniques and perspectives. We advocate strongly for a continuation of the long tradition of archaeological investigations of this type of site in Denmark and surrounding areas.

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Declaration of interest

The authors declare there are no conflicts of interest.

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