

Subscription Information

Mesolithic Miscellany appears twice a year, in May and November, as an informal communication among individuals interested in the European Mesolithic. Subscriptions for 1989 are due. The yearly subscription is US\$3 or £2. European subscribers should send payment directly to Clive Bonsall, Department of Archaeology, University of Edinburgh, 16-20 George Square, Edinburgh, Great Britain. Individuals for whom currency exchange may be difficult should contact Clive Bonsall at the address above. North American subscribers should apply directly to the editor. Please make your check payable to T. Douglas Price.

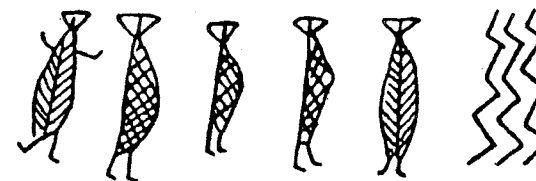
From the Editor

This is our tenth anniversary issue! One way or another, the newsletter has now been around for ten years. If you wish, we can probably go on for another ten. But it is your decision. If we do not get enough material to print, there is no need for the newsletter. Please remember to contribute. If you enjoy reading about the work of others, chances are they will enjoy reading about yours.

Mesolithic Miscellany publishes research reports, book reviews, national synopses of recent excavations and research, statements for debate, conference summaries, important radiocarbon dates, announcements and summaries or abstracts of recent publications to inform readers of current developments in the field. Recent Publications is a category that is particularly important and particularly difficult to keep up-to-date. Reprints or simple citations of your work would be most useful. Please prepare a brief abstract of the article or publication if one is not included in the text. We always need more reports, reviews, and papers from you, the reader.

The deadline for the November issue is 31 October 1989.

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The Mesolithic in Europe has Arrived !!

Clive Bonsall and the Department of Archaeology, University of Edinburgh, announce the publication of the long-awaited proceedings of the Edinburgh Symposium on the Mesolithic: **The Mesolithic in Europe. Papers Presented at the Third International Symposium, Edinburgh 1985**, edited by Clive Bonsall, Lecturer in European Prehistory, University of Edinburgh. John Donald Publishers, Edinburgh. ISBN 0 85976 205 X. The clothbound volume contains some 60 papers in 640 pages, with 333 illustrations and 76 tables, at a cost of £35.00. The contents of this volume are listed in the Recent Publications section of the newsletter. The volume will be available in July from the publishers. Authors and participants in the Edinburgh conference who pre-paid for this volume will be receiving their copies shortly. Congratulations are due to the editor and his assistants for the very successful completion of this long and difficult task.

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Research Reports

PRELIMINARY INVESTIGATION OF THE CONCHEIRO AT VIDIGAL (ALENTEJO, PORTUGAL)

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Surface evidence for the existence of an early Holocene shell midden (*concheiro*) on the plateau above the Lapa da Furna Cave at Vidigal was discovered on June 6, 1987, by J.A. Crispim and the senior author. Later it was learned that the site was known to other archeologists. Excavations in the cave revealed that it contained disturbed modern and Middle Neolithic cultural and human remains, but no evidence of Mesolithic occupation. It is even possible that the cave, formed in indurated sand dune (soft sandstone), which is the "bedrock" underlying the *concheiro*, may not have yet been open or large enough for human use in Mesolithic times. Consequently this brief report will deal exclusively with the open air site.

Vidigal is located a few meters south of the boundary between Sines (Estremadura) and Odemira (Alentejo) townships above the southern bank of the Barranco do Queimado stream, 3.75 km. south of Porto Covo and 10 km. north of Vila Nova de Milfontes. It is 1.9 km. east of the present Atlantic shoreline at the mouth of the Queimado and 0.8 km. west of the Milfontes-Porto Covo road, due south of a farmhouse called Leniscals at 37 degrees, 49 minutes north latitude and 0 degrees, 21 minutes, 40 seconds east of the Lisbon Meridian (on the 1:25,000 Mapa Militar de Portugal, No. 535—Porto Covo). Site elevation is about 45 m. above present sea level. At the time of Mesolithic occupation, in the Atlantic period, sea level was probably slightly higher and the Queimado (now a fresh-water stream) may have been estuarine at this point along its course. The surface scatter of faunal and cultural remains, covering an area of some 5,000 square meters, is presently defined by clumps of yellow flowered bushes pertaining to the subfamily Fabaceae of the Leguminosae. Visibility is, however, generally good because of the bare surface or thin grass cover among the clumps.

The site was investigated in July, 1988, by the authors with the aid of A. Quaresma, under a permit from the Portuguese Government to J. Arnaud and Straus and with grants to Straus from the National Geographic Society, the L.S.B. Leakey Foundation and the University of New Mexico College of Arts and Sciences. Permission to dig at Vidigal was graciously granted to Straus by the landowners, M.L.R. and A. dos Santos. The research formed part of Arnaud's regional study of the Mesolithic along the south-central Atlantic coast of Portu-

gal (Arnaud 1985, 1987, n.d.a, n.d.b). Other Mesolithic sites are known in the vicinity of Vidigal (vide Roche 1960; Silva & Soares 1981; Lubell & Jackes 1985; Lubell 1984) and many sites of the Mirian industry (now known to be post-Pleistocene in age) have been found along the shore both north and south of the Rio Mira estuary at Milfontes (e.g. Pernalva and Raposo 1987 with references).

The Vidigal *concheiro* occupies the top of a bluff that dominates the Queimado valley and the coastal plain, with a panoramic view that includes the Sines Peninsula 12 km. to the north and the Cercal Mountains (maximum elevation: 341 m.) 4 km to the east. Ocean breezes blow almost constantly across the site, providing relief from heat and insects. Greywacke is locally available in the form of large beach cobbles and milk quartz occurs in the sandstone. The Cercal Mountains are schist. There are no known local sources of flint. Besides the fish and shellfish resources of the littoral and estuary, the coastal plain, piedmont and mountains would have provided a variety of easily accessible plants and mammalian game species.

After mapping the site, all surface finds (shells, bones and lithics) were collected and plotted on the map (Figure 1). Survey in the vicinity of the site suggested that its boundaries to the south and west (although not marked by the bluff as they are to the north and east) are well defined. However there are isolated lithic artifacts (mostly greywacke flakes) scattered throughout the interfluvium to the south of the Queimado. To ascertain the horizontal and vertical extent, stratigraphy and contents of the site, twelve test pits were dug. These were laid out along one approximately north-south transect (A) running the length of the surface scatter and along two other transects (B & C) oriented perpendicular to A and running from the eastern bluff to points beyond the end of the surface scatter. Meter squares were selected for excavation so as to sample both the areas of densest surface materials and peripheral areas with few or no surface finds. Excavation was done with trowel and brush, and all fill (loose, dry and sandy) was screened through 2 mm. mesh. All possible features and stratigraphic sections were photographed and drawn to scale. The finds were turned over to J. Arnaud for storage by the city of Odemira for its planned archeological museum.

The test pits revealed three distinct patterns of finds: the shell midden per se (squares A31, A41, A51, C19 and the eastern half of C55), a stone paved area on the western edge of the midden (square C56 and the western half of C55), and peripheral areas of the site with lithic artifacts, no features and few or no faunal remains (squares A5, A21, A66, C70, B24, B55 & B70). A total of 771 lithic artifacts (including 37 formal tools) was recovered from the surface and from the excavations. Also found were one schist "button" (artificially rounded and perforated), 3 pieces of hematite, 49 pieces of unworked quartz crystal and 4 small, undecorated body sherds found (the latter at a depth of 12-20 cm below the surface in A5 in "association" with a microlithic triangle, 2 backed bladelets and other lithics) (Table 1).

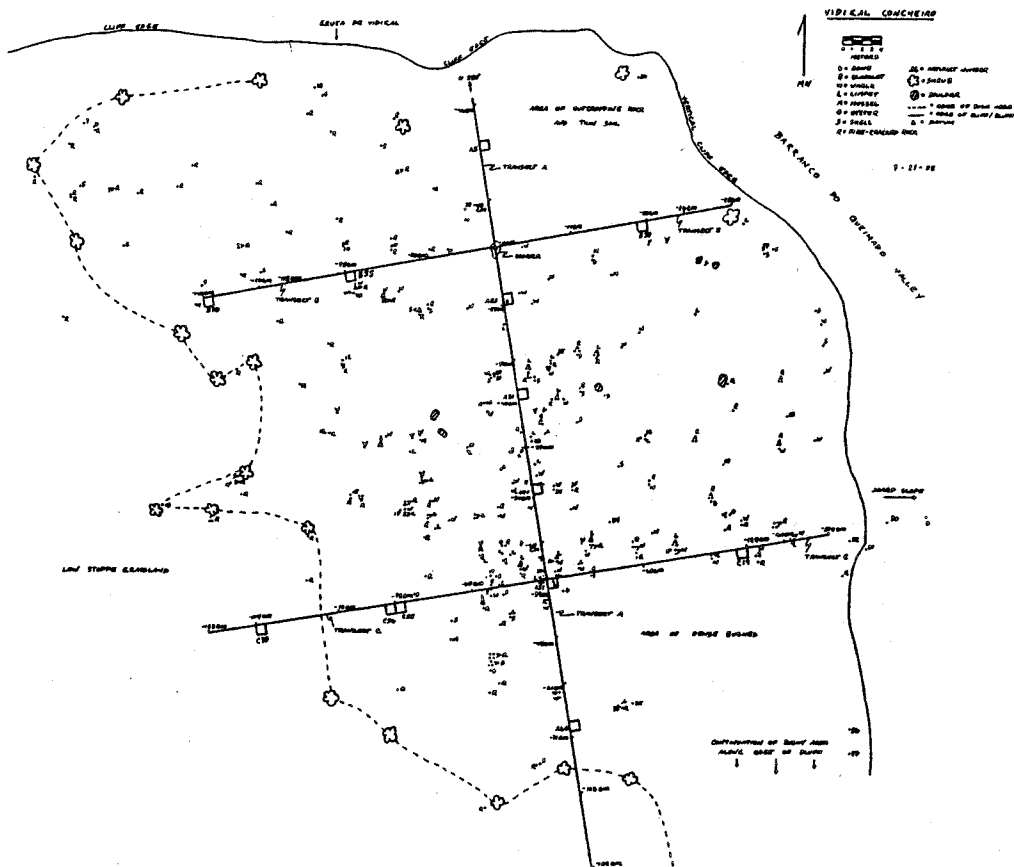


Figure 1. Map of the Concheiro at Vidigal, Portugal.

Table 1: Summary Of All Vidigal Concheiro Artifacts

Debris		Tools	
Trimming Flake	76	Crescent	9
Shatter	23	Cocina Triangle	2
Plain Flake	166	Trapeze	8
Primary Decortication Flake	4	Asymmetrical Trapeze	1
Secondary Decortication Flake	91	Pointed Bladelet	7
Plain Blade	6	Retouched Bladelet	1
Secondary Decortication Blade	3	Backed Bladelet	3
Platform Renewal Flake	4	Sidescraper	1
Bladelet	253	Sidescraper + Perforator	1
Chunk	37	Scraper on Core	1
Bladelet Core	37	Microburin	3
Flake Core	34		
Other			
Schist Button	1		
Sherd	4		
Hematite	3		
Quartz Crystal	49		

Table 2: Basic Debitage And Core Metric Data

	Length (mm)			Weight (gm)		
	n	x	std	n	x	std
Flint & Crystal Bladelets	114	16.9	5.6	—	—	—
Flint & Crystal Bladelet Cores	30	20.7	4.1	28	5.4	2.9
Greywacke Flakes	84	35.1	11.5	—	—	—
Flint & Milk Quartz Flake Cores	31	27.2	11.2	28	35.1	11.5

We collected 12.4 kg. of mollusc shells (without saving small fragments), 3.75 kg. of mammal bones and 406 fish remains (mostly vertebrae). The excavations yielded 52.2 kg. of fire-cracked rock, almost all of it from the two "pavement" squares (C55-56).

The midden deposit lies below 15-20 cm. of brown sandy-silty loam with relatively few artifacts or faunal remains. The midden layer itself is generally 10-15 cm. thick (occasionally 20 cm.), and is essentially composed of shells and dark grey, organic silt. In some places this lay directly atop irregular, naturally potholed sandstone bedrock, but usually there was a layer of sterile red sand of variable thickness between the shell midden and the indurated sanddune bedrock. The contents of the midden include limpets (*Patella* 70-90%), whelks (*Thais* and some *Murex* [J.Arnaud, pers. comm.]: 5-20%), mussels (*Mytilus* 3-8%) and trace quantities of topshells, barnacles, oysters and a scallop. A sample of 100 limpets from C55 provided an average length of 28.75 mm., with a range between 41.7 and 19.0 mm. The fish remains—found both in the midden and in the paved area—are currently under study by O.LeGall (Universite de Bordeaux I); they are probably mostly of rays and/or sharks. The mammalian bones in the midden per se are rare and fragmentary. There are few lithic artifacts in the midden and almost all of them are pieces of debitage (with only 7 tools).

In the peripheral squares with neither shell midden nor pavement, the usual stratigraphic sequence consisted of a surficial brown (sometimes humic) sandy silt (5-15 cm.) atop a lighter brown sandy silt grading into red sand after about 20-30 cm. (or resting directly on bedrock). These areas lacked a significant organic component and yielded few shells or bones. However, the light brown sandy silt consistently produced lithic artifacts, including 14 geometric microliths among the 24 tools.

Squares C55-56 lay at the western edge of the shell midden, which was plainly visible on the floor and in the northern and southern stratigraphic sections of C55 (Figure 2). West of the midden edge and at the level of its base in the western half of C55 and in all of C56 there was a sandstone, schist and cobble-stone pavement with bones and shells (Figure 3). This pavement was at the base of a 20 cm. grey sandy-silty loam and was 5-10 cm. thick. It rested atop sterile red sand (20-45 cm.), in turn lying on bedrock. The pavement consisted of calcined or reddened stones (usually two layers) and included bones and teeth tentatively identified to an aurochs (*Bos primigenius*) and a red deer (*Cervus elaphus*). Neither animal was fully adult, judging from several unfused bones. Head parts (teeth, mandibles, maxilla) are present, as are parts of much of the rest of the bodies (thorax, upper and lower limbs). This fact might suggest that the animals were killed fairly close to the site.

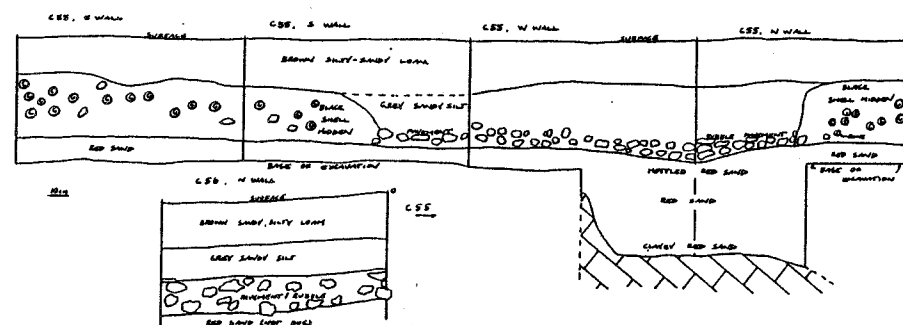


Figure 2. Stratigraphic sections of Vidigal Squares C55-56, showing the shell midden edge and the pavement.

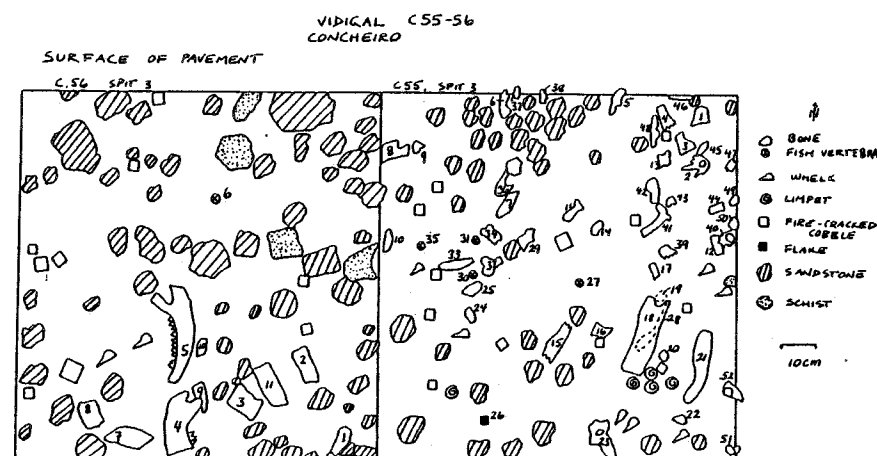


Figure 3. Plan of the pavement in Vidigal Squares C55-56.

The remains are being studied by J. Altuna (Sociedad de Ciencias Aranzadi, San Sebastian) and may yield information on the seasonality of the kills and the techniques of butchering and processing. It can be hypothesized, however, that the pavement represents a roasting floor. Other pavement contents included many large fish vertebrae, but relatively few mollusc shells (mostly whelks and limpets). Among the 6 tools from C55-56, 3 are scrapers (the only ones from the site), suggesting the existence of a distinctive set of activities perhaps related to the processing of the aurochs and red deer carcasses. The other tools are a crescent, a pointed bladelet and a backed bladelet (conceivably the armatures which felled the animals?).

A radiocarbon determination on bone collagen from the pavement (Level 3) in C55-56 yielded a date of 6640 ± 90 BP (Ly-4695) and another one from the midden fill above the pavement (Level 2) in C55 yielded a date of 6030 ± 180 BP (GX-14557). At the one standard deviation range the calibrated dates are 7579-7431 BP and 7169-6719 BP respectively, according to the University of Washington CALIB program Stuiver & Reimer 1986). These dates fall toward the more recent end of the overall distribution of radiocarbon dates for the Mesolithic shell midden sites of the Muge, Sado and other locations in southern Portugal; they are younger than the dates from Arapouco, Pocas de S. Bento, Moita do Sebastiao and Castelejo. However they are penecontemporaneous with the dates from Samouqueira, Cabecos da Arruda, da Amoreira and do Pez and Amoreiras, falling within the early-middle part of the Atlantic period (Arnaud 1987, n.d.b; Meiklejohn et al. 1986).

On the other hand, the Vidigal dates (like those of the other "late Mesolithic" shell middens, overlap temporally with "early Neolithic" assemblages from such sites as Caldeirao, Medo Tojeiro, Salemas and Casa da Moura (Straus et al. 1988; Zilhao 1988). This overlap (and the presence of the 4 banal sherds at Vidigal) leaves open the significant questions of the nature of the "spread" of "Neolithic" traits and of adaptations based on plant and/or animal domestication into the southwestern Iberian Peninsula, and of the nature of the relationship between "Mesolithic" and "Neolithic" sites in the early-middle Atlantic period (e.g., different "cultures" or peoples versus different seasonal or structural poses of the same diversified adaptive system) (see Zvelebil and Rowley-Conway 1986; Lewthwaite 1986).

The Vidigal artifact assemblage is typical of the Mesolithic of south-central Portugal (Figure 4 & 5). The numerous small bladelets cores are very similar to those of the contemporaneous Sado middens (c.f., Arnaud 1987, Fig. 4, No. 21). There are usually no more than 3-4 bladelet scars (sometimes only 1-2) parallel to the long axis of one surface and flake scar perpendicular to the axis on the opposite surface. There are microburins and, among the retouched tools, crescents, trapezes, a few La Cocina triangles, pointed bladelets, backed bladelets and retouched bladelets. There are no large blades in the Vidigal Concheiro like the ones found in the Vidigal Cave in association with apparently later Neolithic rimsherds.

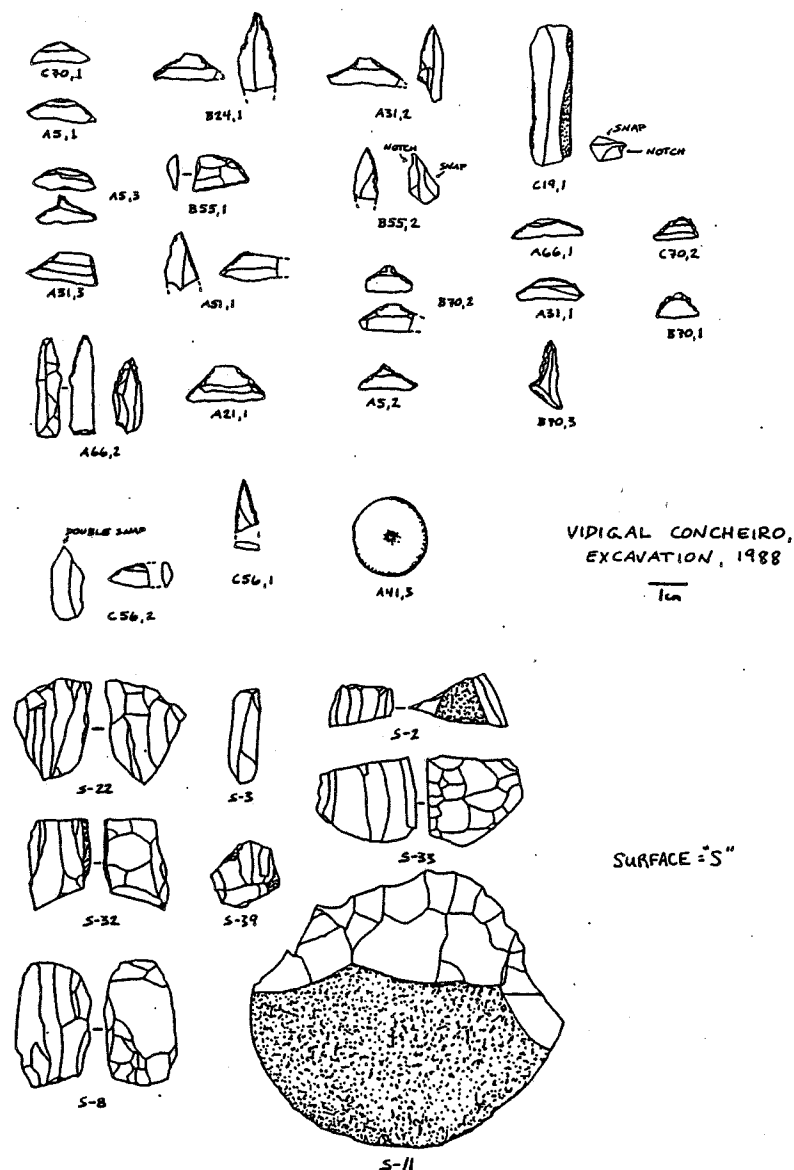


Figure 4. Lithic tools and shist button from the Vidigal excavations; cores and chopper from the surface.

The lithic artifacts are distributed among four major groups of raw materials: fine-grain flint, coarse-grain flint, greywacke and quartz (milk and crystal). The 101 pieces of greywacke are almost all plain and secondary decortication flakes, plus one flake core. There are no formal tools of this material. Of the 162 items of quartz debitage and cores (there are no quartz tools), 91 are crystal bladelets (plus 4 bladelet cores); the rest are flakes and 2 flake cores of milk quartz. All the retouched tools are made on flint (all but 2 on the fine-grain variety). The flint knapping debris are dominated by bladelets, trimming flakes and plain flakes, with 30 bladelet cores on fine grain flint and 20 flake cores on coarse grain flint. There are very few secondary decortication flakes (only one primary decortication flake and 3 secondary decortication blades) on flint, in marked contrast with the greywacke. Such flakes struck off greywacke beach cobbles are very common at Vidigal (and in the surrounding countryside). The greywacke and milk quartz are locally available, whereas the sources of the flints and crystal quartz are unknown, but probably non-local (see Hancock et al. 1989). Cores on flint and crystal quartz are small. Greywacke flakes and milk quartz cores are relatively large (Table 2).

It appears that there were four distinct lithic reduction strategies implemented at Vidigal. Geometric tools were all made on fine grained flint which exhibits a core-to-bladelet-to-geometric trajectory. The paucity of bladelet midsections and the presence of microburins indicate that the microburin technique was used to produce these tools. Bladelets were also made from crystal quartz. However the trajectory stopped at the bladelet stage, with no geometrics being manufactured from this material. In contrast, expedient flake "tools" were produced from coarse grained flint and greywacke, both of which exhibit a flake core-to-flake reduction trajectory. However the presence of more coarse grained flint shatter and chunks and an absence of greywacke flake cores may indicate that the latter material was initially being reduced at other locations. Vidigal residents had access to flints (presumably from calcareous areas of the interior of Alentejo) either through exchange or by actual visits to source areas. However, amounts were limited, so usage was essentially restricted to projectile armatures. In contrast, the locally available greywacke was used for simple extraction and/or processing implements for which no retouching was necessary.

Despite limited sample size from these test excavations, it can be hypothesized that there were at least three distinct "activity or use areas" at Vidigal during its centuries of visitation by hunter-gatherer groups. There was a paved butchering/roasting area at an early point in site use. The central part of the promontory was used as a bulk shell dump, which probably grew accretionally over time and which has little evidence of in situ activities. Peripheral areas of the site are characterized by scarce faunal remains and relatively many trimming flakes and microliths which could represent projectile arming and re-arming activities. Further excavations at the site would undoubtedly reveal more and different faunal, artifactual and structural evidence, and could serve to test these ideas and hypotheses on adaptations in this critical period of Portuguese prehistory when the transition to food production economies was underway.

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THE AZILIAN ASTRIDE: DATING THE DIVIDE AT DUFAURE

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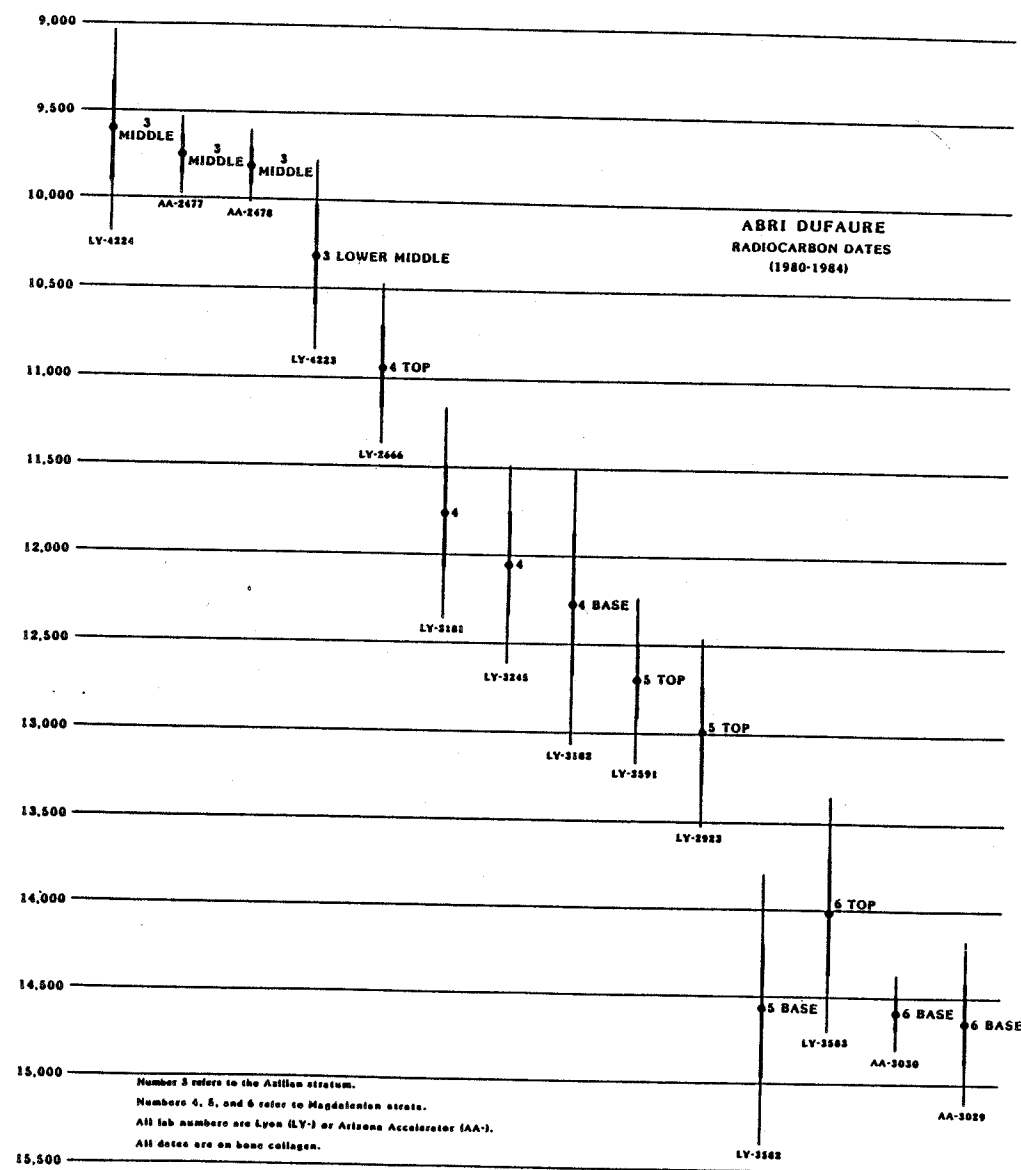
The Tardiglacial/initial Holocene stratigraphic sequence at the Abri Dufaure (Sorde-l'Abbaye, Les Landes, France) is now dated by a series of 14 coherent radiocarbon dates, four of which provide ages for the deposition of Azilian Stratum 3 (Table 1).

Table 1: Abri Dufaure Radiocarbon Dates. All dates are on bone collagen; "Ly" determinations are conventional dates done at the University of Lyon by Jacques Evin; "AA" determinations are accelerator-mass spectrometry dates done at the University of Arizona by A.J.T. Jull and Thomas Stafford.

Stratum	Period	Lab.No.	Date (B.P.)
3 middle	Azilian	Ly-4224	9,600±290
3 middle	Azilian	AA-2477	9,750±110
3 middle	Azilian	AA-2478	9,810±100
3 lower-middle	Azilian	Ly-4223	10,310±270
4 top	Upper Magdalenian	Ly-2666	10,910±220
4	Upper Magdalenian	Ly-3181	11,750±300
4	Upper Magdalenian	Ly-3245	12,030±280
4 base	Upper Magdalenian	Ly-3182	12,260±400
5 top	Middle Magdalenian	Ly-3591	12,690±230
5 top	Middle Magdalenian	Ly-2923	12,990±270
5 base	Middle Magdalenian	Ly-3582	14,570±390
6 top	Middle Magdalenian	Ly-3583	14,020±340
6 base	Middle Magdalenian	AA-3030	14,590±100
6 base	Middle Magdalenian	AA-3029	14,640±230

The dates are displayed in Figure 1 with one and two standard deviation ranges. The new Stratum 3 dates confirm what was argued earlier (Straus 1986a) on the basis of terminus post quem dating relative to dated Stratum 4, namely that the Azilian spans the Dryas III and early Preboreal. The Dufaure evidence strengthens the arguments made by Straus (1985, 1986b) that the Azilian is truly a transitional phenomenon, in terms of both its chronology (which straddles the Pleistocene/Holocene boundary) and its technology (which is a modified, "impoverished" version of the late Magdalenian).

Dufaure Stratum 3 is of variable thickness: 25-75 cm. Cultural remains are concentrated on the narrow terrace at the outer edge of the small rockshelter (itself excavated in 1900 by H.Breuil and P.Dubalen). But there are also scattered artifacts (mostly debitage) and faunal remains (mostly tritured bones) of Stratum 3 age on the talus slope in front of the terrace.



Stratum 3 contains large blocs which probably represent rockfalls from the shelter overhang at the base of the vertical Pastou Cliff provoked by the freeze-thaw conditions of Dryas III. This last cold fluctuation of the Pleistocene is well marked in the deep sea core record from the nearby Bay of Biscay (Duplessy et al. 1981). The Dufaure radiocarbon dates show that formation of Stratum 3 began at the onset of Dryas III (ca. 11 kyr) and continued well into Preboreal (<9.6 kyr).

The associated lithic industry is typical of the Azilian. In contrast to the Magdalenian assemblages, it has few burins, many small endscrapers, fewer backed bladelets and more Azilian points. There are no osseous implements, ornaments or weapons. The only (fragmentary) flat antler harpoon found at Dufaure was from the upper cultural horizon defined by Breuil and Dubalen, a level which corresponds to our Stratum 3. Analyses of the Dufaure lithic assemblages by S. Doggett and K. Kramer (UNM) show a marked shift in the relative use of nodular and tabular flints (both available locally) between the Upper Magdalenian and the Azilian. Tabular flints are much better represented among the knapping debris of the Azilian (25 vs. 13%), although the retouched stone tools of that period are not significantly less made of nodular flints than in the Upper Magdalenian (84 vs. 88%). This suggests a change in the organization of those lithic reduction activities conducted at quarry loci versus those conducted at the residential site of Dufaure.

This shift coincides with (and may be related to) a major shift in subsistence strategies in the Azilian. Whereas reindeer, bovines (aurochs and bison) and horse dominated the Magdalenian faunas, the archaeozoological analyses by J. Altuna and K. Mariezkurrena (Sociedad de Ciencias Aranzadi, San Sebastian, Spain) show a clear shift to the hunting of medium size mammals that can be woodland-adapted and that generally live in smaller groups than reindeer. Stratum 3 as a whole yielded 673 identifiable red deer remains (MNI=8), 67 roe deer remains (MNI=3), 10 boar remains (MNI=2), 15 bovine remains (MNI=1), 7 horse remains (MNI=1) and 25 reindeer remains (MNI=4). The latter confirm the late survival of a relict population of *Rangifer tarandus* in the Pyrenean region, also observed in the Azilian level at the nearby site of Duruthy (Delpech 1978), and in old excavations in the Ariege (Bahn 1984). As at Duruthy, a few reindeer survived (presumably by summering in high mountain pastures) long enough to be hunted in the Preboreal: there are 15 remains in the lower part of Stratum 3 and 9 in the upper part. All major parts of the skeleton are represented except the thorax. Another more surprising survivor is the cave bear; there is an ulna of *Ursus spelaeus* in the upper part of Stratum 3. This is the second find of this species in an early Post-glacial context in the Bay of Biscay region: there is a premolar in Azilian Level V-III at Ekain in Guipuzcoa, radiocarbon dated to 9,460 ± 185 B.P. (Altuna & Mariezkurrena 1984). Finally the Azilian fauna at Dufaure is distinguished by the presence of 4 remains of a beaver. There are no fish remains.

Unfortunately, none of the faunal remains could provide seasonality information, unlike the reindeer, red deer, bovine, horse and fish data analyzed by Altuna, A. Spiess and O. LeGall from the Upper Magdalenian, that all indicate cold season human occupations (late fall through spring) at Dufaure (approximately equivalent to Duruthy). Further preliminary dis-

cussions of Dufaure can be found in several articles, including Straus et al. (1988) and Straus (1988).

A comprehensive monograph is in preparation. The Abri Dufaure Prehistoric Project, of which this is Publication No. 30, was supported by the National Science Foundation, the National Geographic Society, the L.S.B. Leakey Foundation and the University of New Mexico.

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**"KØKKENMØDDINGER"
A THREATENED GROUP OF FINDS**

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The archaeological investigations of "Køkkenmøddinger" ("Kitchen middens") have a long tradition in Denmark. Already in 1837 artifacts from the Krabbesholm midden, on the outskirts of Skive (Northern Jutland) were sent to the National Museum, and together with similar finds, this midden gave rise to lively discussion on the question of how to interpret these sites. Were they natural shell banks with chance alluvial deposits of artifacts? Or were they direct evidence of the activities of prehistoric peoples — settlements? As a result of this debate an interdisciplinary working party was set up, comprising an archaeologist, a zoologist, botanist, and an expert on molluscs, in an effort to clarify these questions. Originally called the "Leire Committee", the group was later named "The First Kitchen Midden Commission".

In 1851 J.J.A. Worsaae put these finds in their right context, i.e. from evidence contained in the Meilgård kitchen midden. The term "kitchen midden" was used for the first time in 1851 by the zoologist, J. Steenstrup, in connection with the Leire Committee's third report, but middens were also sometimes called "refuse heaps" and "shell mounds." At the close of the last century (1893-97) the excavation was carried out of the big kitchen midden at Ertebølle- the name later given to a phase of the Stone Age; the Ertebølle Culture, (The Second Kitchen Midden Commission). The fate of the Ertebølle midden is symptomatic of many Danish kitchen middens: their shells were originally used as chicken feed, and only after part of the midden had been dug away, was it recorded and systematically investigated.

The purpose of the Ertebølle excavation was firstly to recover a large assemblage of artifacts from one big settlement site, and secondly to try to date the period more precisely in relation to megalithic graves, dolmens, and passage graves. After both these targets were reached during excavations in the course of the 1890's, the remaining part of the Ertebølle midden was scheduled for protection. A far-sighted act of crucial importance, because it gave us the opportunity to carry out excavations between 1979 and 1984, in order to shed light on new problems by means of excavation techniques which are at our disposal today.

Since the first Ertebølle digs about a hundred years ago, other kitchen middens have been excavated from time to time although bigger, interdisciplinary excavations were not resumed until the 1970's/1980's, among which numbered the middens at Meilgård, Norsminde, Ertebølle, and Bjørnsholm.

Kitchen middens are a special type of coastal settlement with refuse layers dominated by mollusc shells: oysters (*Ostrea* sp.), cockles (*Cerastoderma*), mussels (*Mytilus* sp.), and Periwinkles (*Littorina Littorea*). They are particularly known from the close of the Mesolithic (late Kongemose- and Ertebølle cultures), but they also date from the Neolithic (Funnel Beaker- Single Grave and - Pitted Ware cultures), and the Early Iron Age (Pre-Roman and Early Roman Iron Age). However, it is primarily the Mesolithic kitchen middens which are taken up for discussion in the following, partly because the phenomenon was first identified in connection with them, and partly because kitchen middens of this period are the most usual- and often the most threatened by destruction.

"Køkkenmøddinger" in Denmark are almost only found in the most northerly and north-easterly areas, i.e. the Limfjord, the Djursland peninsula in east Jutland, as well as the east coast of Jutland down to Horsens Fjord; Samsø and North Funen, and North Zealand, especially on the shores of the Isefjord. The present distribution is due to many factors: first and foremost among which has been the warm salty waters of the Littorina Sea which, in the north and northeastern parts of the country, provided ideal conditions for the formation of mollusc banks, which the Stone Age hunter-gatherers were able to exploit. Also, later changes in the interaction between sea-level and the tilt of the continental shelf may have in some areas inundated kitchen middens or exposed them to erosion, whereas in other areas far from the coast, they would have been better protected; all this has had a bearing on the distribution today.

If we look at the occurrence of shells in a regional perspective, it is noticeable that they are typically, and more often, found in calm sheltered lagoons, fjords, and inlets - preferably close to the mouth - and almost always close to currents. In other words, localities where banks of molluscs formed in the Stone Age to provide a larder of shellfish ready for gathering. Yet occasionally shellmiddens are located by the open coast; this would have been more widespread in prehistoric times than the evidence suggests today, because such middens have been more at risk from erosion than localities in more sheltered coastal areas.

It is characteristic that kitchen middens - even in small fjords - can be found together with coastal habitation sites without shell layers. This is possibly because the position of the settlement has not been determined by the mollusc bank in its vicinity. If a bank of molluscs was found, it would obviously have been exploited (kitchen middens), but if this were

not the case no special effort was made to collect shellfish.

The biggest kitchen middens are located around the Limfjord, the finest examples being Bjørnsholm and Ertebølle. Other large kitchen middens are Meilgård in north Djursland, Langø by Funen Head, and Sølager and Kassemose in north Zealand.

The middens can be situated very close to each other, in some cases with only a distance of a few hundred meters between them. The big sites are found evenly spread at a distance of 5 to 10 km between them. If the former biotope has been a rich one there may be many middens in quite small fjords; for example, there are four kitchen middens along the c. 5 km long north shore of Norsminde Fjord and there are indications that, originally, there might well have been more. In limited areas by fjords such as this, only one of the middens will be large, the others small (e.g. Norsminde Fjord).

Shellmiddens lie along prehistoric coastlines where they are embedded in what has been the beach. The middens consist of mollusc shells mixed with earth, stone, ash, domestic rubbish, broken tools and weapons, as well as debris from tool manufacture, first and foremost flint debris. There are also stones split by heat (cooking stones).

Due to the fact that many of the kitchen middens have been close to the water's edge, varying amounts of "natural" mollusc shells have become incorporated in the sediments, as exemplified by the Ertebølle midden, but it also occurs in other localities. When middens have been in sheltered positions - by estuaries, coves, etc., rich refuse deposits can be expected with good conditions for the preservation of organic material, wood for example, in adjacent waterlogged alluvial layers.

By degrees a fair number of excavations have been undertaken of the area immediately behind the shellmidden (i.e. on "the land side"). These digs have shown that there is here an almost total absence of culture layers, artifacts and structures. Everywhere the limits between the shell layer and the spread of flints, animal bones, etc., appear to be sharply defined. Taken as a whole, the results at present do not seem to suggest traces of habitation in the areas behind the shellmiddens.

In some kitchen middens there are traces of fireplaces, pits, graves, and occasionally postholes, in addition to the areas where food was prepared and tools manufactured from flint, bone and antler, etc. Therefore kitchen middens are not only shell dumps but localities where everyday activities of a settlement took place. To what extent kitchen middens were also settlements is quite a different question - so far unanswered.

Kitchen middens are normally oblong with irregular contours and an uneven, undulating surface. There are also occasional sites where the middens are rounder and dome shaped. In other cases when the shape and contour of the midden is well preserved, it can clearly be seen that they consist of more or less clearly delimited heaps or small piles.

Today we know that the size and contour of kitchen middens depend on the kind of occupation and its duration. In size they vary from quite small, thin patches of shells up to middens about 2 m thick, about 350 m long, and 30 -40 m wide. Excavations in the Limfjord area suggest that there were once an even greater number of extensive kitchen middens, i.e. up to 500-700 m in length, and that these have either been partly or completely washed away. There are many examples of kitchen middens exposed to secondary marine erosion: at Ertebølle, for instance, where the northern and western part of the midden had been eroded by the sea, and partly re-embedded in at the southern end of the midden. Many of the better known kitchen middens are today, therefore, rudimentary in shape and size compared to their earlier dimensions.

Archaeological investigations combined with natural science dating show that the middens are not one solitary accumulation but composed of a number of refuse heaps, large and small, which have accumulated at the same spot over the course of time. Recent excavations have also revealed that the oblong shape of the middens is due to the fact that the middens were formed by a silting up process along the shoreline over a span of time - presumably because the population gradually moved further afield to avoid settling amid the refuse of earlier habitation. The majority of large kitchen middens have in this way slowly grown over the course of six or seven hundred years to their present dimensions. In other words, these middens are the result of neither a regular nor rhythmic process of deposition, but to the contrary, a series of deposits of varying thickness and extent. For example, the new excavation at Ertebølle revealed that the site consisted of an average of between six and ten layers from top to bottom.

However, the size of the occupational unit cannot be judged with any certainty, it has probably not been more than a couple of families. The examination of animal bones from middens shows that people visited these localities both in summer and winter, though whether the occupation has been more permanent remains an open question.

In spite of the overwhelming impression made by the sight of these millions of mollusc shells, it is unlikely that shellfish were of primary nutritional importance - but far rather a dietary supplement.

Calculations have been made on several occasions of the food value which mollusc shells in middens represent. And there is every indication that shellfish in those days, much as today, were only an addition to the staple diet - choice morsels - but not food enough to be a population's principal source of nourishment. The suggestion has also been put forward that the importance of shellfish is more likely to have been the nutritional value of their salts and minerals, such as iodine and zinc, rather than as a staple food.

Fisheries were a far more important source of food, and seal-hunting. Hunting and trapping animals of the forest, fowling, and fur hunting were likewise essential for subsisting.

In the kitchen middens from the Mesolithic oysters are the predominant species of mollusc (80%), but cockles and mussels (10-15%) are usual. Among snail species there are periwinkles, and to a lesser extent whelks and common garden snails. A marked change in the composition of kitchen middens occurs at the beginning of the Neolithic: cockles now predominate (70-80%) while oysters make up only about 10-15%, but as from the Middle-Neolithic oysters once again predominate.

The kitchen middens of the Iron Age, on the other hand, are characterized by mussels (about 90%). This division of species is characteristic, appears to be so generally valid that it can be used for making a rough dating of shell middens when datable artifacts are lacking.

The kitchen middens of different periods can be detected by means other than differences in shell accumulations. Mesolithic shellmiddens yield an even mixture of all types of domestic refuse and waste products from tool manufacture. Neolithic middens rarely contain much rubbish or fauna material; on the other hand, they contain a quantity of pottery, and the content of ash, charcoal, and scorched stones is often a very characteristic and predominant feature.

Iron Age shellmiddens contain a large quantity of ash, charcoal, and stones split by heat, whereas the quantity of artifacts is small. Pottery and animal bones, as well as a few worked flints are characteristic of the Early Iron Age.

Taken as a whole it seems as though the Mesolithic kitchen middens represent a wide range of all the artifacts and types of site which are normally linked with the concept: "settlement." While the shellmiddens from the Neolithic and Early Iron Age contain fewer objects at the same time have fewer types of find. These middens therefore have a far more "specialized" element than the Mesolithic middens.

The oldest known kitchen middens are from the late Kongemose culture/early Ertebølle culture, c. 4,700 - 4,200 B.C. (e.g. Norslund layer 4 and Brovst layer 11). It is characteristic of these early middens that, to date, they have only been localized in North and Eastern Jutland, and that all are small patchy sites in comparison with the later middens. The length x breadth is rarely more than about 10-20 m, and they are not more than c. 10 cm thick. Yet the composition of shell species and assemblages of artifacts correspond entirely with those of the later shellmiddens described.

From c. 4,700 B.C. until the close of the Mesolithic (c. 3,100 B.C.) the number and size of shellmiddens increases relatively rapidly, to culminate in 3,700 - 3,100 B.C. ("Ceramical

Ertebølle Culture"). The number of kitchen middens falls sharply as from the beginning of the Neolithic, and from then onwards they are smaller in size than during the Ertebølle period.

Why kitchen middens undergo such a sharp change in number and composition at the transition from the Mesolithic to the Neolithic, remains an open question. Most of the investigations would seem to suggest that the explanation lies in environmental changes, which caused a reduction in the number and size of the shell banks and the oysters. That it might have been due to changes in taste cannot be entirely ruled out.

The way in which kitchen middens have built up varies a great deal. The accumulation and frequency of the various forms of rubbish can be very different, they also show up periods where one particular activity has been carried out on the site, for example, cooking, cleaning fish, or flint knapping.

Normally, there are few artifacts and other finds among the mass of shells. In most cases the greatest number of these finds is in the upper and lower layers of the shellmidden. When the rhythm of accumulation has been slow, the midden will be characterized by a very compact mass of shells, very often level- perhaps due to erosion or human activity, and there will be a notably high concentration of artifacts and animal bones.

When the rate of accumulation has been high there are either no finds or very few, and with a loose mass of shells which will often be in distinct piles. Throughout these kitchen middens will be seen local heaps or layers of one particular species, e.g. oyster, cockles, mussels, or periwinkles. "Meal heaps" reveal that various species of mollusc each lived differently, and that only a single species was normally gathered and consumed at one time. Examination of the mollusc shells has shown that the biggest and most nourishing of these species were deliberately chosen. Modern laboratory tests of the growth rings indicate that the molluscs were collected in the summer months.

Many fireplaces are found in the kitchen middens, for example in the Ertebølle midden about one every square meter. Two types are known; one is the round stone-built hearth, and the other is fireplace comprising greyish/white pulverized and burnt shell mass. The latter type is by far the most usual. The ashes of fireplaces can often be followed as blackish/grey strata that gradually disappear the greater the distance from the fireplace. These ash layers are useful evidence of where the old surface levels of a midden have been, as well as showing that fireplaces were out in the open and not in huts. Fireplaces seemingly tend only to occur in certain parts of the shellmiddens and here often in a stratigraphical position one above the other. This might suggest that kitchen middens have had some form of internal structure that was maintained for a long time.

Graves, inhumations, are occasionally found in the middens, though rarely more than a couple graves even in the biggest middens. As the deceased are not normally furnished with grave goods, the graves have had to be dated by radiocarbon tests. This dating shows that they are in most cases contemporary with the kitchen midden in which they have been found. However, graves are too few and far between to represent more than just a few from the local population. Where the true cemeteries of the "kitchen midden period" (viz. 3,700-3,100 B.C.) have lain is as yet not known, and this problem is one of the most important targets for research within the next few years.

The archaeological technique used in the excavation of kitchen middens will not be touched upon here, and readers are referred to "Arkæologisk Felthåndbog". But in this context it should be mentioned that it is rarely possible, let alone rewarding, totally to excavate a shellmidden. In most cases the method is either to cut a section through the layers or sampling, both horizontal sampling across the entire area of the midden, as well as vertical column-sampling through the midden. It is of primary interest to localize structures, first among which are fireplaces, as experience has shown that most occupations have taken place round the fireplaces. In addition, the before mentioned ash layers can be of help in determining synchronous surface levels in the midden. On the question of large middens it is important to observe the way it has accumulated and its structure, and always to collect sufficient samples for eventual laboratory tests, e.g. datings, mollusc analyses, etc., just as wet sieving should be done as a matter of course.

From a regional point of view high priority ought to be given to new shell midden excavations in Funen and Zealand. Up to now more or less all the excavations of kitchenmiddens have taken place in Jutland. Also of great importance are localities where stratigraphical sequences include the transition between periods, for example from the Mesolithic to the Neolithic. Not should it be forgotten that kitchen middens cover valuable patches of ancient ground level.

Due to the rapidity with which shell middens build up, and in consequence the "sealing" of surface levels in the shell layers, insight is often provided into occupation patterns that have been obliterated on other types of settlement sites. By analyzing settlement activity and traces of wear on flint tools these "horizons" revealed by kitchen middens have in several cases been a source of much valuable information.

In the case of the large kitchen middens it is also of importance to establish the rate at which they accumulated and the size of the single parts. The immediate surroundings of the middens ought also to be given a high order of priority for excavation, especially for the purpose of locating traces of structures (particularly huts) and graves.

Investigations of large areas beneath the shell midden are especially interesting. It is here that a clear impression can be gained of activity (if any) on the site before accumulation of the midden. Evidence of fireplaces and rich occupation layers beneath the midden shows in many cases that there was settlement there before the midden piled up.

In spite of knowing more about kitchen middens there are nevertheless many open questions about these sites, especially as to their nature; this question springs directly from the ever lacking evidence of hut/dwelling remains.

Plainly, both problems and methods of investigation have changed, not only since the Ertebølle kitchen midden was excavated about a hundred years ago, but also in the course of the past thirty or forty years. Thanks to the foresight of past generations of archaeologists some of our most important kitchen middens were protected by law, e.g. Ertebølle, Meilgård, and Bjørnsholm. And, as a result, the scientific value of these major sites has remain intact and provided us with the opportunity of checking and revising the earlier excavations.

With this in mind, there is every reason to argue in favor of further measures to protect a greater number of kitchen middens. It is imperative because these types of site are very threatened by agriculture, and almost everywhere these distinctive ancient monuments are being ploughed up and destroyed. Along the former coastlines in the Limfjord area, along the east coast of Jutland, in north Funen and north Zealand, the traces of ploughed up kitchen middens are to be seen. In a few years a large number will be totally be demolished, and this important and characteristic archaeological source material lost for good. Therefore action must be taken now to save as much of these sites as possible, partly by extensive scheduled protection orders, and partly by increased research through excavation of specially selected localities. The experience of the past few years has shown that important evidence can still be found even on very damaged sites.

[From *Arkæologiske udgravninger i Danmark 1987*, pp. 28-43.]

THE LEUVEN CONFERENCE

Don't forget that registration for the IV International Symposium, The Mesolithic in Europe, is due before the end of December 1989. The symposium will be held from 18-23 September 1990 in Leuven. A third and final announcement will be circulated in June 1990. Please contact the Organizing Secretary, Pierre Vermeersch, Laboratorium voor Prehistorie, Redingenstraat 16bis, B-3000 Leuven, Belgium, if you are interested in attending and have not yet received information.

MESOLITHIC BARBED POINTS AND OTHER IMPLEMENTS FROM THE EUROPOORT

L.B.M Verhart

The important discovery of 434 barbed points and some other artifacts, but *without a single* flint implement, on the Maasvlakte in the Europoort area, proved to be so remarkable as to warrant an investigation into the nature, date, and archaeological interpretation of these artifacts.

The find consists mainly of uniserially barbed points (Figure 1). Other artifacts recovered, possibly having the same age, are two fish hooks and a piece of bone with decoration. The other artifacts, various bones and antlers with working traces, axe sleeves, a fragment of an antler axe, a piece of perforated antler and worked teeth, could not be dated accurately. They statistical analysis of 165 complete points showed the existence of two main groups. The first group, "small points", is characterized by:

- _ a maximum length of 85 mm
- _ a mean barb length of 4.3 mm
- _ the presence of barb types 1,2,4 and 5
- _ the predominance of a simple cross-section
- _ the complete absence of a sophisticated cross-section

The second group of "big points" is characterized by:

- _ a minimum length of 94 mm
- _ a mean barb length of 13.2 mm
- _ the presence of barb types 3,6,7 and 8
- _ the predominance of a sophisticated cross-section

When the working process was reconstructed with the aid of working traces still discernible on the artifacts, these two groups proved to be almost identical from a technological point of view.

Using a morpho-typological approach five types of points could be distinguished in the Europoort finds. The cluster "small points" can be sub-divided into two types: plain points without barbs and small uniserially barbed points. The cluster "big points" could also be subdivided into two types: big uniserially barbed points and one harpoon. The fifth type is represented by one fragment of a biserially barbed point.

Considering these five types out of Europoort from a Northwest European point of view they can be translated into three main morphological groups. The plain points [type 01.00]

and the biserially barbed point [type 06.03] remain independent, distinct groups. The small and the big barbed points and the harpoon on the other hand should be considered to constitute one main group, points with fine barbs [type 03.00].

Substantiated by technological homogeneity of the group plain and fine-toothed barbed points, the small area of provenance and the results of the C-14 determinations the assumption is justified that we are dealing with one homogenous group. Geologically, a dating could not be obtained since the exact layer containing the points could not be determined. The ages of layers likely to have contained the artifacts ranged from the Younger Dryas to Early Atlantic.

C-14 determinations of 3 points proved that the age of the fine-toothed [type 03.02] and the biserially barbed points [type 06.03] is approximately 9950-9700 BP. A fine-toothed small point [type 03.01] yielded a distinctly younger date of 6160 BP. Except for the point type 03.01, all dates are in agreement with the data from comparable points from Northwestern Europe.

In interpreting the find group first of all the traces of use on the points themselves were examined. A number of points still exhibit impressions of bindings, implying shafting by means of bark or other organic material on a split end of an arrow or spear/lance.

Research into the direct and indirect associations of these kinds of points with prey animals in Northwestern Europe revealed their use for catching fish and hunting seal aurochs, elk, red deer, wild boar, dog and man. Due to the geography of the Europoort area in the Early Preboreal hunting of seals can be considered impossible. The other animals and man constitute potential game.

The division among the group fine-toothed points in small and big specimens has a functional explanation. Explanations based on preservation state, age, cultural and ritual background can be excluded. Due to the absence of settlement debris the find at Europoort should be considered the result of fishing and hunting activities. The finding of two fish hooks supports this explanation.

The group "small points" is the reflection of hunting and fishing by means of bow and arrow. This is most likely linked to hunting small, fast animals which are hard to approach, especially birds.

The "big points" are associated with hunting and fishing using a spear or lance. This will have concentrated on the larger animals. The single harpoon must be connected to the hunt of large animals as well. The small points will have been used in a ratio of approximately 4:1 over the big-barbed points.

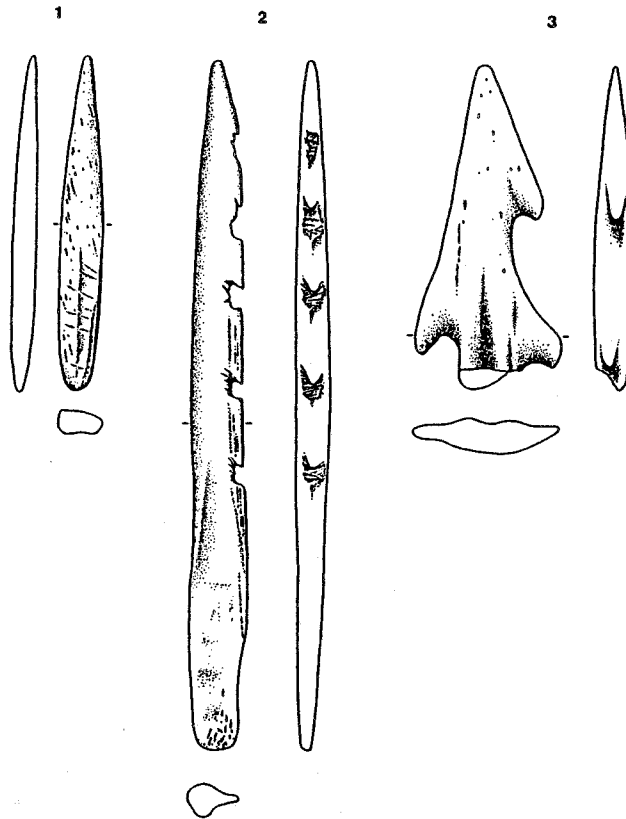


Figure 1. Three main types of points from Europoort:
1. Plain points, 2. Uniserially barbed points, and 3. Biserially barbed points.

MESOLITHIC ART FROM THE EUROPEAN NORTH EAST (U.S.S.R.)

by Grigoriy M. Burov
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In the region of the Sindor Lake (Vychevda basin), on the Vis I site, more than 160 wooden objects were found (Burov 1967; 1981a,b; 1989). These finds date to 6400/6300-5000 B.C. Mesolithic art is found in many of them.

Fourteen wooden artifacts - seven hunting bows of the Vis type (Burov 1981a), six small (boring or making fire) bows (Burov 1989) and one arched scraper haft - had almond-shaped projections. Of course, these projections had first of all a practical use - fixing the string (we have in mind bows of the Vis type without holes and the small ones without them), preventing bows with holes from breaking and making it easier to hold the tool in case of small bows and scraper hafts. At the same time we may speak about aesthetic and, probably, magic meaning of the projections.

Almond-shaped decorations are rather varied in cross-section. In three cases the cross-section is triangular (one hunting and two small bows), in two cases (small bows) - either three cornered with an edge (inside decoration) or approximately five-cornered with an edge of the same type. Four hunting bows have projections of trapezoid form, segment-shaped and pointed-oval cross-section, in particular with a bulge.

Flat or wider sides of the preserved carved ends are turned inside. Only in one case do the outer and inner sides not differ (the bow with decoration of pointed-oval cross-section). One small bow has an incomplete almond-shaped projection, while the other four tools have no such projections and we cannot determine their form. The decoration of the bows resembles the damaged brake of a runner of the Vis type (Burov 1981b) which is triangular in section with an edge on the inner side. Probably, this projection also had the almond-shaped form.

On the Mesolithic wooden and stone artifacts from the Sindor lake region we often come across an engraved ornament typical on tools and means of transportation. It is not found in the Neolithic and Bronze Age in Eastern Europe when only ceramics, objects of art and cult were decorated (Burov 1967:65-66). Fifteen wooden artifacts from the Vis I site and two stone polished tools for making ice-holes or woodworking, from Vis I (Bornhardt, above flood plain part) and the Simva III site had patterns (Burov 1967). These objects served for hunting (bows) and fishing (disk, hoops) and as domestic items (arched scraper haft, small bows, tools for making ice-holes or woodworking), or as means of transportation (skis and sledges).

Table 1. Motifs of the engraved decorations on the wooden objects and stone polished tools from the Vis I and Simva III sites.

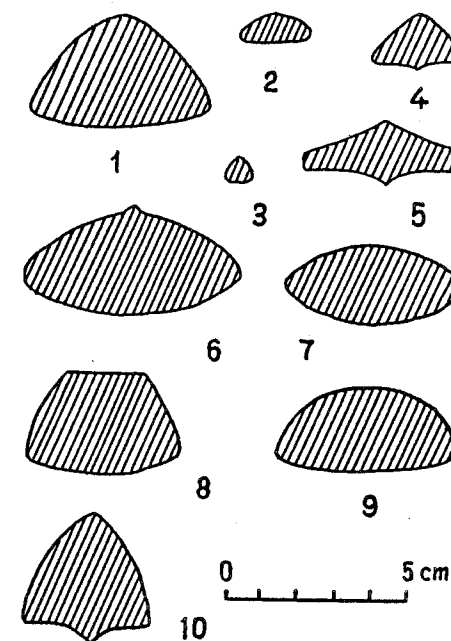
№	Artifact	Zigzag	Row of notches	Straight line	Skew net	Skew crosses	Row of V-shaped signs	Motives in all
I06	Bow of II (Vis) type	+	+	+	-	-	-	3
97	The same	-	-	+	+	-	-	2
I56	" " "	+	-	-	+	-	-	2
27	Bow of III type	-	+	-	-	-	+	2
I28	Small bow	-	-	-	-	+	-	I
92a	The same	-	+	+	-	-	-	2
I84	" " "	-	+	+	-	-	-	2
I00	Arched scraper haft (Fig.I:2)	+	-	+	-	-	-	2
45	Hoop	+	-	-	-	-	-	I
I4	The same	+	-	+	-	-	-	2
72	Disk for fishing (Fig.I: 3)	-	-	+	+	-	-	2
I68	Ski of I (Vis) type	+	+	-	-	-	-	2
II6	The same	+	+	-	-	-	-	2
52	" " "	+	-	-	-	-	-	I
I4I	Runner of II (Vis) type	-	+	-	-	-	-	I
-	Polished tool from Simva III	+	+	-	-	-	-	2
-	The same from Vis I	+	+	-	-	-	-	2
T o t a l		I0	9	7	3	I	I	3I

The ornament consists of thin lines, probably engraved with the corner of a flint blade, and in one case with a small instrument with two teeth. The number of motifs are limited: ten objects have an obtuse angled zigzag of short lines often turned into straight is marked; nine show rows of notches (on the edges and selvages); seven have a straight line, sometimes doubled (or broken and arc-shaped lines when they fringe the edges of an object or of an ornamental zone). Three artifacts have a motif like a skew netted by holes; they are tools of hunting and fishing, bows and disk. The rest of the motifs (rows of doubled skew crosses and rows of V-shaped signs) are found only on individual objects. Besides the almond-shaped projections and engraved ornaments, the sculptured elk head on the ski from Vis I site is characteristic of Mesolithic art of the European North East (Burov 1989).

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Figure 2. Vis I site. Cross-sections of the projections on the wooden objects. 1, 6-9. hunting bows (# 31/142, 97, 30, 86, 156); 2-5. boring or fire-making bows (# 128, 184, 189, 95), 10. sled runner of Vis type (#141).



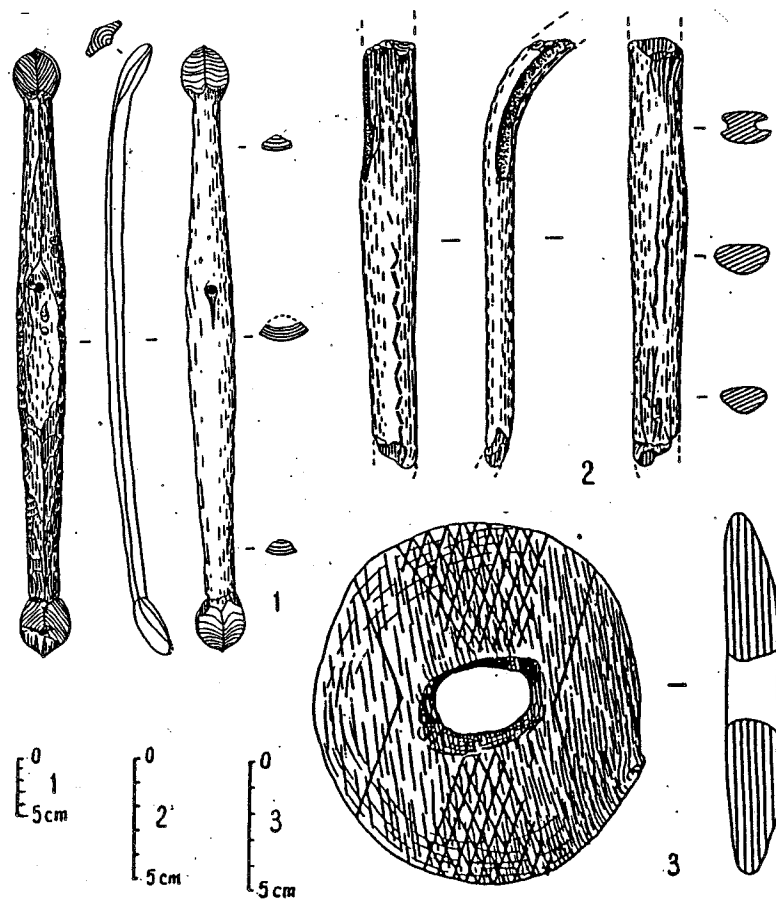


Figure 1. Vis I site. Wooden artifacts. 1. Boring or fire-making bow (#95); 2. Arched scraper hafr (#100), 3. disk for fishing (#72).

THE NEW MESOLITHIC SITE TASHKOVO IV IN THE FOREST-STEPPE URAL

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The site of Tashkovo IV is situated on a low sand terrace of the right bank of the Ileset river (Irtysh-Tobol basin) on the edge of a wide flood plain. The site was partly excavated (120 m²) in 1987, uncovering two hearths and a heap of little coals, which are likely the remains of three small, round huts situated in a row about 10 m apart. The hearths were 0.3 m below the ancient surface. One of the hearths had regular oval shape and flat bottom and the other was irregular irregular in form and with a trough-like bottom.

The small size of the huts, 3-4 meters in diameter, and general appearance permit us to reconstruct them as little round huts that can be easily transported and set up in a new place as well. We found the closest analog in the modern huts of seasonal sites, called *chums*, in widespread use by peoples in Siberia. *Chums* have a common shape and vary in details such as general size, height, construction of entrance, etc. These details depend on their intended season of use (for winter or for summer residence), upon the place they were located (forest or swamp), and so on.

All around the huts at Tashkovo IV were concentrations of large quantity of flint artifacts. These concentrations alternated with areas lacking any artifacts. The three artifacts assemblages were very similar and no doubt contemporaneous. The stratigraphical situation confirms that Tashkovo IV has not been only a single occupation site, but also was occupied only once, for almost all artifacts were lying between 0.45 - 0.55 m in depth.

The collection from Tashkovo IV consisted largely of around flint artifacts, a small number of animal bones (teeth), and 2 bone artifacts in fragments. The most common raw material for tool-making was dark-grey flint; one quarter of the artifacts were made of green, "sealing-wax" jasper from the Urals.

The flint complex was a blade industry and was divided by us into categories and types. Many of the artifacts are represented typologically by blades or their middle parts, as well as microforms, along with 25-30 pieces that are retouched all over the edges. The latter group comprises 15% of all the tools. They include scrapers, burins on the corner of a broken blade, notched tools, and simple retouched blades that probably were used as hafted knives. The most characteristic trait of the industry is its microlithic nature, which is confirmed by following: the largest group of artifacts are microblades with a general size, as a rule, not more than 2-3 cm in length and 0.7 - 1 cm in width. The type of blades is determined according to their size and parameters; the types of retouched tools - according to the quantity, position and form of their working edge.

From another perspective, we can evaluate the contents of tool assemblage from trassological investigations of different types of partly retouched and unretouched categories of blades. This analysis showed that 2/3 of the blades representing the tools of different categories including burins, scrapers, enclosed knives, etc. We find knives with one or 2 edges, along with some unique tools including a chisel, drill, adze. Twenty-two artifacts were used as double-tools; on one blade for example, there was double faceted burin in combination with a notch tool. Among the 199 tools were 177 utilized pieces.

Of special interest and importance are the enclosed projectile artifacts (typologically not retouched blades). They partly explain the absence of flint arrow points. This question always appears when one tries to explain what kind of hunting tool replaced bows and arrows, which were absent in Tashkovo industry. All sorts of instruments - drilling, hunting, scraping, sawing, manufacturing, and in every day life - were present in expected numbers.¹

The animal remains were represented by teeth. The largest number belonged to wild horse, which corresponds quite well to the artifact assemblage which suggests that hunting was a primary activity of the population of the site. In addition to the horse teeth, there were 3 shark teeth from either the Indian or Atlantic ocean. This is rather mysterious. How and for what purpose could such a shark of southern origin be caught here? It is not clear yet.

The evidence indicates that Tashkovo IV was a seasonal hunting camp. The industry of the site is rather original. One can find the closest analog to it in the forest steppe zone of the same Ileset-Tobol river basin where such sites form a compact group. All of them have the same complex of prismatic blades, deprived of a single innovation, for example arrow points of Sviderian or postsviderian types. The latter can be observed in the Mesolithic of the Urals forest zone where the influence of and connections with middle Russian Mesolithic cultures can be seen. There are also no geometric microliths in the south Ural (steppe zone) Mesolithic which covers the forest zone. Apparently the sites of Tashkovo IV type, located in forest-steppe Urals, represent a local, original way of cultural development, some sort of close unity. If there were some cultural connections they played only unimportant, passive role.

1. The trassological investigations were made in the trassological laboratory of the Archaeological Institute (Leningrad branch) under the general guidance of G.F. Korobkova.

Late Palaeolithic and Mesolithic bone and antler artifacts from Britain: First reactions to accelerator dates

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Conventional radiocarbon dating works primarily by *association*; traces of human activity are dated by their assumed associations with plant or animal remains. Hence its effectiveness as a dating technique depends largely upon the reliability of those associations. One of the most significant contributions of AMS radiocarbon dating is that it enables human activity to be dated *directly*, either in the form of human skeletal remains or of organic materials modified by man. By directly dating the humans themselves, or their actions, the accelerator has the potential to provide a far more rigorous temporal framework for Lateglacial and early Holocene settlement than has been available hitherto.

Since 1983 a number of programmes of direct dating relating to the Late Palaeolithic and Mesolithic of Britain have been developed using the AMS ¹⁴C dating facility at the University of Oxford. These have included the dating of hominid remains (e.g. Stringer 1986), animal bones exhibiting butchery traces (e.g. Jacobi 1986) and artifacts made from bone or antler (e.g. Smith and Bonsall, in press). It is with the last-mentioned category that this paper is concerned. Fifteen artifacts have so far been dated; they include barbed spear and harpoon heads of bone or red deer antler (Table 1), and a series of heavy-duty implements, variously referred to as "axes" or "mattocks", made from deer antler (Table 2). Some of these dates have been published previously (see *Archaeometry* datelists 2, 3, 4, 5 and 7); others are presented for the first time here. Also included in Tables 1 & 2 are conventional and accelerator dates for contexts from which such implements have been recovered, which have yet to be superseded by direct dates on the artifacts themselves.

Prior to the use of the Oxford accelerator, evidence relating to the development of bone and antler technology in the British Late Palaeolithic and Mesolithic was limited. The only well-documented assemblages were those from Star Carr and Thatcham, dated to the early tenth millennium BP, and the assemblages from the "Obanian" sites of western Scotland which on various lines of evidence have been assigned a time-range from ca. 6500—5400 BP. Attempts to date the very large number of isolated finds of bone and antler artifacts from Britain by seeking typological parallels in either the Star Carr or "Obanian" series or in the Mesolithic/Early Neolithic of the North European mainland, have often led to conflicting interpretations of the absolute and relative chronology of the different types.

A few of the isolated examples of barbed points, such as those from Shewalton in Ayrshire (Lacaille 1954) and Whitburn in Co. Durham (Mellars), have been linked with the "Obanian" series. The majority, however, have been compared to those from Star Carr or to early Maglemosian finds from Denmark and northern Germany. As a result, this latter group has come to be regarded as characteristic of the Early Mesolithic and attributed to the early stages of the Holocene (Godwin Zones IV—VI). Not all authors have accepted this interpretation. Wymer *et al.* (1975: 238—40), for example, argued for a Lateglacial age for some of the finds of "Maglemosian" type.

The dating of red deer antler mattocks has posed similar problems. Nearly a hundred examples have been recorded from Britain, most of them as isolated finds. They have usually been attributed to the Mesolithic on the basis of similarities to late Maglemosian and Ertebølle finds in Denmark, and the presence of at least one type in some of the "Obanian" shell middens. Smith and Bonsall (1985; Smith 1989) regarded these as part of a range of heavy-duty tools which also includes the Star Carr elk antler mattocks. They drew a basic distinction between *antler-base mattocks*, made from the basal portion of a red deer antler, and *antler beam mattocks*, made from a mid-section of the antler beam. They also proposed a chronological scheme in which the antler-base mattocks replaced forms made out of elk antler ca. 9000 BP and were in turn superseded by the antler-beam type towards the end of the Mesolithic.

A different interpretation was put forward by Jacobi (1982) who maintained that red deer antler mattocks and certain other kinds of artifacts traditionally assigned to the Mesolithic were in fact of post-Mesolithic date. On this hypothesis the "gap" in the archaeological record between the Star Carr and "Obanian"-type assemblages would represent a genuine hiatus in the development of bone and antler technology in Britain. Jacobi argued that as Britain became progressively isolated by the Holocene marine transgression, social contact with the European mainland effectively ceased and the bone and antler technology of the indigenous population went into decline. It was suggested that after ca. 8500 BP the range of tool forms decreased, with implements such as barbed points and antler mattocks disappearing altogether from the Mesolithic toolkit, to be re-introduced by an immigrant farming population in the sixth millennium BP. The corollary of Jacobi's hypothesis is that the barbed harpoon heads and antler-beam mattocks found in "Obanian" middens were acquired through contact with agricultural communities (Jacobi 1982: 20—21), or that the "Obanian" is a post-Mesolithic phenomenon.

The direct dates provided by the Oxford Radiocarbon Accelerator Unit (Tables 1 & 2) go some way toward resolving the issues discussed above. Taken together, the dates imply a strong element of continuity in the development of bone and antler technology in the British Late Palaeolithic and Mesolithic. They also demonstrate (*contra* Jacobi 1982) that both

projectile points and heavy-duty tools continued to be manufactured during the later stages of the Mesolithic. The fact that neither has been found in association with a microlithic industry is perhaps not surprising in view of the very small number of excavated Late Mesolithic sites with good preservation of organic materials.

The five antler mattock dates quoted in Table 2 are the initial results of a much larger dating program; some of their implications have been discussed elsewhere (Smith and Bonsall, in press). The dates establish beyond doubt that antler mattocks *were* characteristic of the British Mesolithic, and are in agreement with the typological sequence proposed by Smith and Bonsall (1985; Smith 1989). There is an indication in the date for the Splash Point mattock that the antler-beam type came into use earlier than was supposed on the basis of typological comparisons with finds made elsewhere in north-west Europe. The only mattock date which falls outside the expected age-range is that for an antler-base implement from Willington Quay, Northumberland. This indicates that the type may have continued in use into the fourth millennium BP, though the date remains anomalous and creates a problem requiring further investigation. Particular interest attaches to the barbed point dates, since they effectively increase the time-ranges previously assigned to both the "Maglemosian" and "Obanian" types. The "Maglemosian" forms, at one time considered to belong exclusively to the Early Mesolithic, can now be assigned a minimum time-range of ca. 12,400—9200 BP, which is more in accord with the considerable variation that they exhibit in both form and technique.

The dates on the "Obanian" series indicate that barbed points of this type were being manufactured at a much earlier date than was previously thought to be the case. It is also interesting to note that whereas the barbed points from the earliest dated site, Druimvargie Rockshelter, are of *uniserial* type, those from MacArthur Cave, dated to ca. 6700 BP, and the Oronsay middens, with radiocarbon dates in the range ca. 6200—5400 BP (Mellars 1987), are exclusively of *biserial* form. Whether this apparent typological trend can be shown to have general chronological significance will depend on the acquisition of further dates for both types of "Obanian" barbed point.

The results for the Druimvargie Rockshelter and MacArthur Cave points also provide the first radiocarbon dates for "Obanian" sites on the Scottish mainland. Not only do they indicate that the "Obanian" had considerable time depth, they provide clear evidence for a substantial chronological overlap in the west of Scotland between the "Obanian" and the latest securely-dated microlithic assemblages (cf. Morrison and Bonsall 1989: Table 1). This in turn negates the hypothesis that the Obanian is a post-Mesolithic phenomenon, and also seriously weakens the position taken up by some workers (e.g. Jacobi 1982; Woodman 1989) who have suggested that the "Obanian" sites represent a discrete phase at the end of the local Mesolithic characterized by the loss of the microlithic component of the toolkit.

The fact that a chronological overlap can now be demonstrated between the "Obanian" and microlithic assemblages for at least the period ca. 7800—6100 BP demands consideration of other explanations (Bonsall, Smith and Sutherland, forthcoming). A possible interpretation is that the two assemblage types represent different aspects of the same cultural adaptation. The differences may be, in part at least, a reflection of different patterns of behavior within a single settlement—subsistence system which operated throughout the later Mesolithic of western Scotland.

The dates presented in this paper represent a first step towards establishing the chronological context of a range of bone and antler implements which have received comparatively little attention in studies of the Late Palaeolithic and Mesolithic of Britain. They serve both to illustrate the advantages of the accelerator over conventional radiocarbon dating, and to underline the inadequacy and potentially misleading nature of chronological schemes based on typological considerations. More samples are currently being dated by the Oxford laboratory, and the full series of dates will form the basis of a much fuller discussion of the implications of accelerator dating for our understanding of Lateglacial/early Holocene settlement (Bonsall and Smith, forthcoming).

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Table 1. Radiocarbon determinations for British Late Palaeolithic and Mesolithic barbed points. Direct dates on actual artifacts are shown in bold. Key: B=biserial point; U=uniserial point; M=point of "Maglemosian" type; O=point of "Obanian" type.

Site	Type	Material/Context	Lab. No.	¹⁴ C Age BP
Poulton-le-Fylde	U,M	Amino acids from elk skeleton associated with two barbed points.	OxA-150	12,400. ± 300
Leman and Ower	U,M	Antler. Unassociated find from bed of the North Sea.	OxA-1950	11,740 ± 150
Porth-y-Waen	U,M	Antler. Unassociated find.	OxA-1946	11,390 ± 120
Sproughton 1	U,M	Bone. Unassociated find.	OxA-517	10,910 ± 150
Sproughton 2	U,M	Antler. Unassociated find.	OxA-518	10,700 ± 160
Waltham Abbey	U,M	Antler. Unassociated find.	OxA-1427	9790 ± 100
Star Carr	U,M	Wood. "Brushwood platform" associated with Early Mesolithic flint and bone/antler industries including large series of barbed points	Q-14	9557 ± 210
Earl's Barton	U,M	Antler. Unassociated find.	C-353	9488 ± 350
Druimvargie Rockshelter	U,O	Bone. Artifact recovered from "Obanian" shell midden.	OxA-500	9240 ± 160
MacArthur Cave	B,O	Antler. Artifact recovered from "Obanian" shell midden.	OxA-1948	7810 ± 90
Shewalton	B,O	Antler. Unassociated find.	OxA-1949	6700 ± 80
Cnoc Sligeach	B,O	Shell (<i>Pecten maximus</i> , inner fraction). Associated with a barbed point. ¹	OxA-1947	5840 ± 80
			Birm-465	5605 ± 155

¹ The barbed point and the shell sample were recovered from a layer of redeposited (?) midden material and are therefore not securely associated (Mellars 1987). The radiocarbon determination, however, probably provides a reasonable approximation of the age of the barbed point.

Table 2. Radiocarbon dates for British Late Palaeolithic and Mesolithic heavy-duty bone and antler implements. Direct dates on actual artifacts are shown in bold.

Site	Type	Material/Context	Lab. No.	¹⁴ C Age BP
Earl's Barton	Antler club	Reindeer antler (Lyngby axe) Unassociated find.	OxA-803	10,320 ± 150
Thatcham	Worked antler	Red deer antler beam. Associated with Early Mesolithic flint industry.	OxA-732	9760 ± 120
Star Carr	Elk antler mattocks	Wood. "Brushwood platform" associated with Early Mesolithic flint and bone/antler assemblages.	Q-14	9557 ± 210
Kew Bridge	Antler-base mattock	Red deer antler. Unassociated find.	C-353	9488 ± 350
Druimvargie Rockshelter	?Antler-beam mattock	Bone. Barbed point.	OxA-1160	8820 ± 100
Splash Point, Rhyl	Antler-beam mattock	Red deer antler. Unassociated find.	7810 ± 90	
Meiklewood	Antler-beam mattock	Red deer antler. Unassociated find.	OxA-1009	6560 ± 80
Staines	Antler-beam mattock	Red deer antler. Unassociated find.	OxA-1159	5920 ± 80
Priory Midden	Antler-beam mattock	Charcoal from midden containing bone/antler assemblage	OxA-1158	5350 ± 100
Willington Quay, Wallsend	Antler-base mattock	Red deer antler. Unassociated find.	Q-3001/Q-3004	5870 ± 50/5470 ± 50
			OxA-1157	3880 ± 80

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Bang-Andersen, Sveinung. 1988. New Findings spotlighting the earliest Postglacial settlement in northwest Norway. *AmS-Skrifter* 12: 39-51. Stavanger.

Within the last decade 10 settlement sites of supposed Preboreal age, with artifact inventories and flint technology in clear conformity with the Fosna tradition, have been located on the coast line of southern Hordaland and northern Rogaland. These new findings seem to determine a far more southerly extension of the Fosna tradition along the western coast of Norway than generally believed. The lack of early Postglacial on the coastline of southern Rogaland is most probably illusionary, caused by a complicated and only partially understood shoreline regression history. Now, however, an extraordinarily well preserved 9000-year old settlement site - recently investigated at Myrvatnet in the interior of southern Rogaland - indirectly sheds light on this question.

Frayer, David. 1987. The supra-acetabular fossa and groove: a skeletal marker for Northwest European Mesolithic populations. *Human Evolution* 3: 163-176.

A non-metric trait, known as the supra-acetabular fossa and groove, is described for European Upper Paleolithic and Mesolithic populations. This morphological feature consists of a pit posterior or superior to the anterior-inferior iliac spine and an associated groove which arcs over the roof of the acetabulum. Presence of the trait seems to be primarily related to the origin of the reflected head of rectus femoris. The trait is variable in expression, shows an increase in definition with age, and occurs equally in males and females.

Although the trait is commonly found in pre-Upper Paleolithic hominids, it is extremely rare in the Upper Paleolithic limited to a single occurrence in the Oberkassel 2 female. In the Mesolithic, except for two innominates from Vlasac (Yugoslavia), the trait is found only in NW European populations, especially Skateholm (Sweden) and Henriksholm-Bøgebakken (Denmark) where it occurs in more than 50% of the known pelves. Given the trait's restricted geographic distribution and high occurrence in Skateholm and Henriksholm-Bøgebakken it is suggested the supra-acetabular fossa and groove represents a skeletal marker for NW European Mesolithic populations. As such, it provides evidence for the development of social territories in the early Holocene.

Larsson, Lars. 1988. The use of the landscape during the Mesolithic and Neolithic of southern Sweden. In *Archeologie en Landschap*, edited by M. Bierma, O.H. Harsema, and W. van Zeist, pp. 31-48. Groningen.

Larsson, Lars. 1988. A construction for ceremonial activities from the Late Mesolithic. *Meddelanden från Lunds universitets historiska museum 1987-88*. New Series 7: 5-18.

A rectangular construction, measuring 4 x 4 m which both in shape and composition with archaeological investigation of a find-complex comprising settlement remains and graves at the site of Skateholm II in southern Scania, Sweden, dated to an early part of the Ertebølle culture. Its outer limits were demarcated by a belt of sand-admixed red ochre on all sides, enclosing an area of soot-admixed sand. A trapezoid-shaped, thin layer of red ochre underlay the latter in the western half, where post-hole colorings were also documented, as well as a hearth. The latter is most probably of later date than the remainder. The circa 16 m² large area could have been covered by a roof-construction which was colored by red ochre. The abundant occurrence of red ochre, the deposition of bone and flint concentrations in the outer belt, and its location in the grave-field are factors which lead to the conclusion that the construction had primarily a ritual function. No similar constructions are known from the Mesolithic period, but certain parallels are obtained through the study of constructions from both the Late Paleolithic and Neolithic periods.

Legge, A.J., and P.A. Rowley-Conwy. 1988. *Star Carr Revisited: A Re-analysis of the Large Mammals*. Astralagus Publications, Archaeology Laboratory, Centre for Extra-Mural Studies, Birkbeck College, 26 Russell Square, London WC1B 5DQ. Paperback, 153 pp., 42 text figures, 13 tables. £9.50.

In recent years the site of Star Carr has been reviewed and reinterpreted perhaps more than any other, yet no new study of the bones has been done in order to re-examine the question of seasonal occupation. This book is based on a full study of the large mammal bones, and much new information is presented. From a study of the deer mandibles, the season of occupation at the site is argued to be the summer. The age structure of the deer cull suggests certain specialized aspects of hunting practices. Dogs, though present at the site, were not active in the taphonomic process. Some joints may have been removed from the site for consumption elsewhere. Large comparative samples of deer jaws with known dates of death, which were used for the seasonal determination of the archaeological specimens, are tabulated in the appendices as well as bone measurements from the three deer species, cattle and pig. Contents: 1. Introduction 2. Quantification and Recovery 3. Ecology and Behaviour 4. Seasonality 5. The Age Structure of the Cull 6. Measurements; Age and Sexual Dimorphism 7. Body Size, Meat Weights, and Scale of Occupation 8. Body Part Representation 9. Conclusions.

Noe-Nygaard, Nanna. 1988. Taphonomy in archaeology with special emphasis on man as a biasing factor. *Journal of Danish Archaeology* 6: 7-52.

Nygaard, Signe E. 1989. The stone age of northern Scandinavia: a review. *Journal of World Prehistory* 3: 71-116.

Throughout most of the Stone Age, which covers the time period between ca. 10,000 and ca. 3,500 B.P., the majority of groups in northern Scandinavia were hunter-fishers with a strong orientation toward the coastal environments. Three areas, southwestern and northern Norway and northern Sweden, have been singled out for more detailed discussion of the social and cultural developments in different types of marine environments. Differences can be discerned between the societies in the southern and those in the northern regions, as the northern groups seem to have developed more complex social and cultural systems than in the south. These differences have been related partly to a greater emphasis on maritime sea hunting in the north. Agriculture was introduced twice. The first time, in the early Neolithic, agriculture was tried but apparently did not manage to compete with the better adapted local hunting-fishing practices. The second time, in the late middle Neolithic, agriculture resulted in drastic social, economic, and cultural changes.

Sørensen, Søren A. 1988. A Maglemosian hut at Lavringe Mose, Zealand. *Journal of Danish Archaeology* 6: 53-62.

Welinder, Stig. 1988. The landscape of prehistoric man. *Memoranda. Soc. Fauna Flora Fennica* 64: 50-56.

When the "New Archaeology" was introduced in the 1960s, and spread during the 1970s, the fields of concern within prehistory were primarily the hunting-gathering societies of the Paleolithic and Mesolithic and the introduction of Neolithic farming. During the theoretical debates on post-processual archaeology beginning in the 1980s, these areas have not been in focus. Rather the neolithic and later historical periods have been the time of concern. The study of the Mesolithic has continued to be basically systemic, although with increasingly more pronounced consideration of social, versus, ecological variables.

The present paper tries to discuss prehistoric landscapes in post-processual terms using largely mesolithic examples. The difference between a reconstructed and a perceived landscape is stressed. The significance of the present theoretical debate in archaeology for environmental deterioration is touched upon.