Proc Soc Antiq Scot, 115 (1985)

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THE EXCAVATION OF A MESOLITHIC HORIZON AT 13-24 CASTLE STREET, INVERNESS

J WORDSWORTH

CASTLE STREET, INVERNESS J WORDSWORTH

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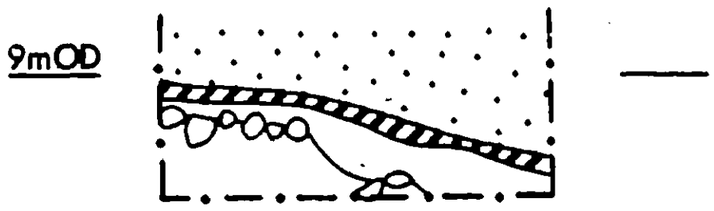
SECTION 1



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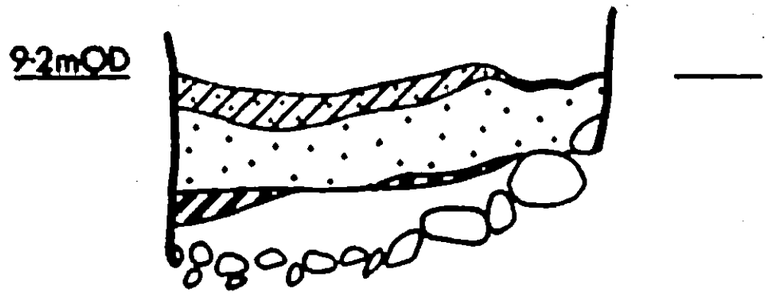

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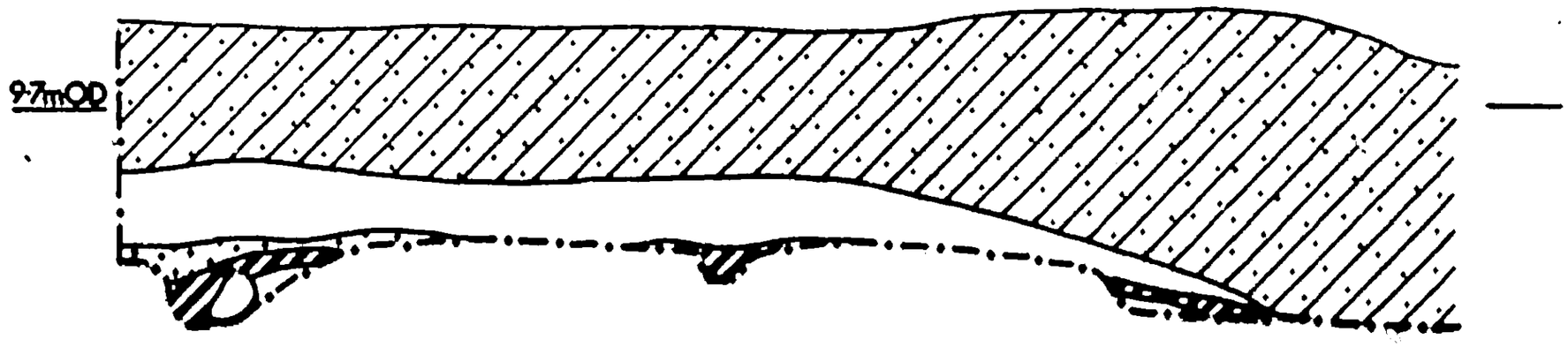
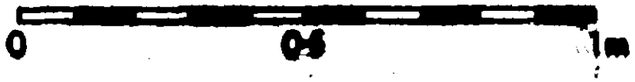
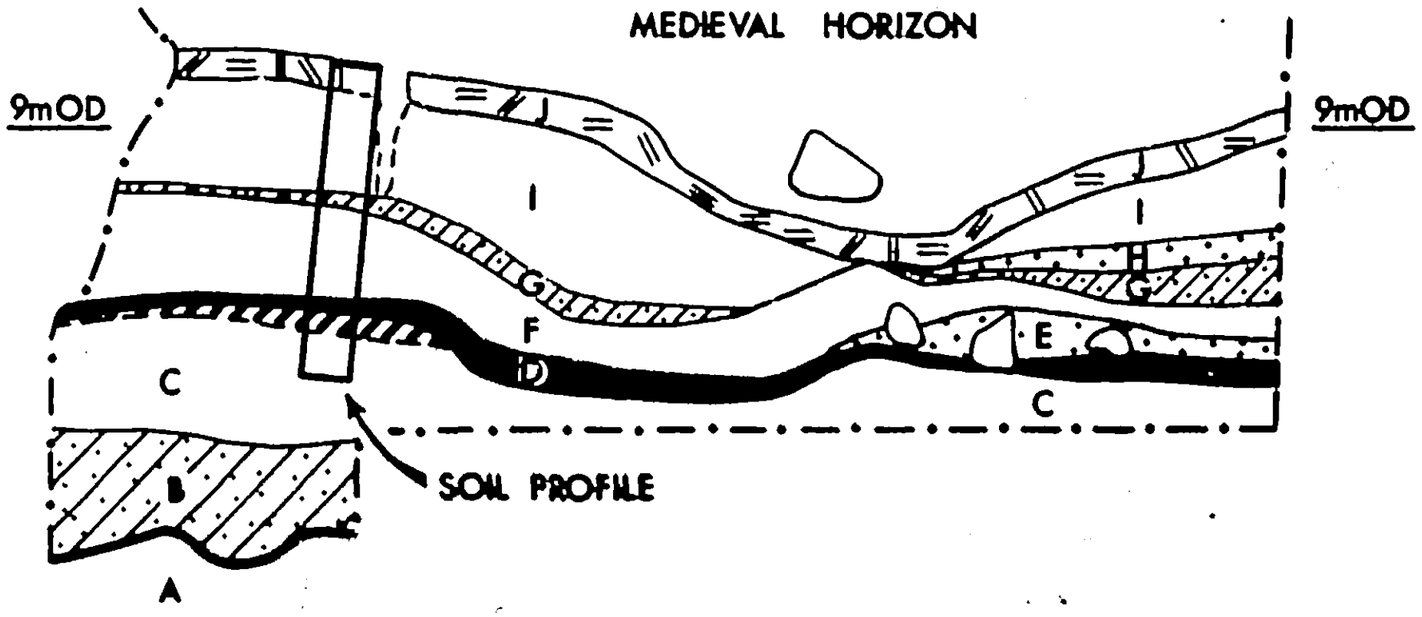




Illus 10 Sections: 1, north section in square trench in cellar 2
2, east section in side of pit between cellars 1 and 2
3, south section at west end of cellar 1

N SECTION



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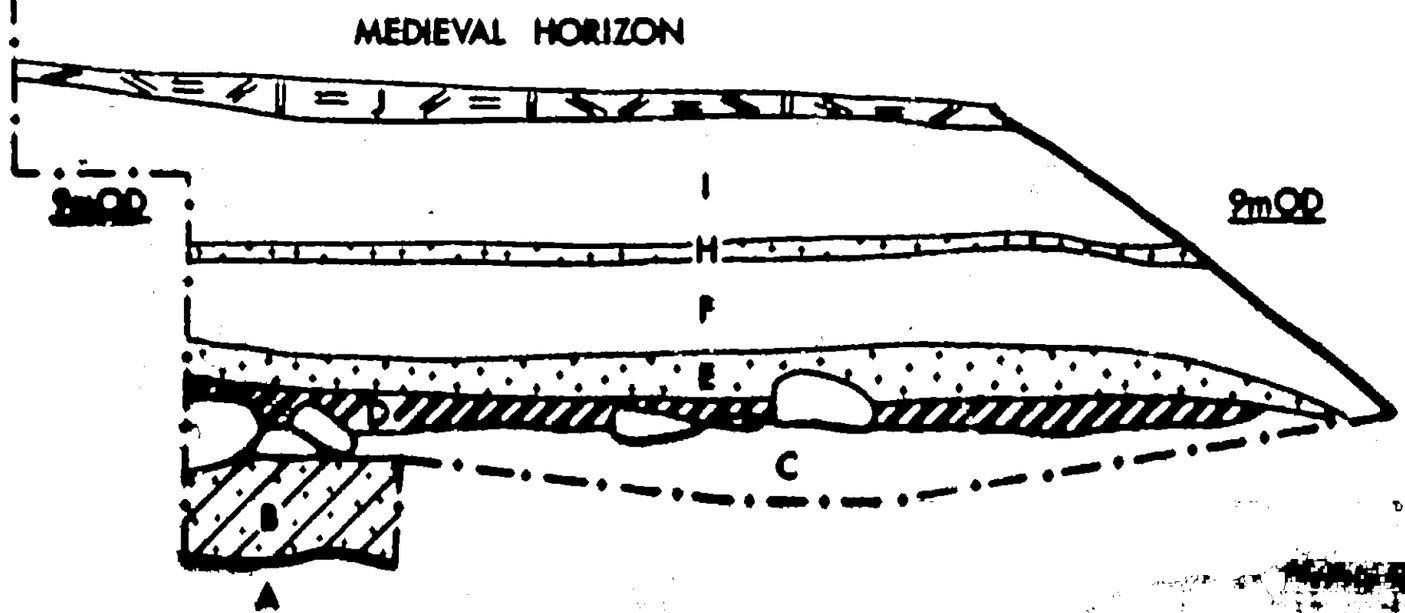
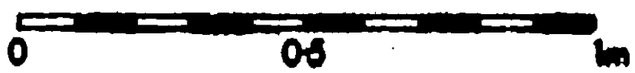




Illus 11 Location of soil sample profiles

The Soils

I Matè

INVERNESS: Area 5E (cellar 3), S-facing section, R1129 A, B and C (illus 11).

Three box samples, which together formed a continuous column, were received. The boxes were each 18 by 9.5 cm so the total column length was 54 cm. They are described below and given a laboratory horizon notation code, which must be considered unsatisfactory. Six samples were removed from these boxes for particle size analysis and a sample from the charcoal rich layer was analysed for pollen by Dr S Bohncke (at present at Groningen).

Soil column description

The descriptions are from top to bottom with depth in cm from the top of the highest box.

Horizon	Depth (in cm)	Description
A_1	0-3	Dark grey (5YR 4/1) with 40% distinct mottles of brown (7.5YR 5/2) and some irregular patches of light grey, sandy silt loam. Compacted, uncemented with small (1 mm) iron concretions. Micaceous, stone free. The iron mottles are more abundant toward the irregular lower boundary (over 1 cm) to-
B(f)	3-4	Discontinuous, occasionally distinct but often diffuse pan
B(s)	4-7	Brown (7.5YR 5/2) with dark grey (5YR 4/1) mottles loamy sand. The dark grey material is found in elongate root channels coming/

coming down from above.

B2	7-15	Dark reddish grey (5YR 4/2) sandy loam with occasional iron concretions 1 mm d. Uncemented, uncompacted and micaceous. Diffuse (relatively) lower boundary to:-
B(th)	15-18	Dark reddish grey (5YR 4/2) with dark grey (5YR 4/1) mottles loamy sand. Compacted, uncemented. Irregular lower boundary (obscured by box base) to:-
2C	18-21	Brown (10YR 5/3) coarse sand. Uncemented, uncompacted, Wavy lower boundary to:-
2C(f)	21-31	Brown (10YR 5/3) sand. Compacted but uncemented. Some iron staining. Becoming coarser downwards to sharp but indistinct lower boundary to:-
2C(g)	31-37	Brown (10YR 5/3) sand with very dark grey (2.5YR 2/0) diffuse mottle (5%) with occasional stones (<0.6 cm) at upper boundary.
3b0	37-39	Very dark grey (2.5YR 2/0) charcoal with sand and rare stones (< 1 cm). Mica present. Irregular sharp distinct boundary to:-
3A	39-41	Greyish brown (10YR 5/2) sandy silt loam with some charcoal and mottles of humus-rich areas. Indistinct irregular boundary to:-
3A2(h)	41-41.5	Brown (7.5YR 5/2) sandy silt loam, discontinuous.
3B(f)	41.5-43	Yellowish red (5YR 5/8) irregular iron pan.

4bA	43-46	Dark grey (5YR 4/1) sandy silt loam with slightly clayer brown (7.5YR 5/2) mottles. Diffuse charcoal and humus content. Irregular sharp distinct lower boundary to:-
4bC	46+	Pinkish grey (5YR 6/2) compacted uncemented sand.

There are three surfaces within the column. The first, at the top of box A, is the top surface of a profile developing in a freely drained podzolic environment. There is some indication of iron movement but no distinct pan formed. In general it is a red brown colour though there is little indication of humus/clay translocation. The sands change their nature becoming coarser towrrds the middle where stones occur. These stones are not rounded, so suggesting fluvial origin rather than beach deposition. The medium sands sit over the 'Mesolithic' surface. There are indications of pan formation, suggesting that this surface existed for more than a brief period (this figure could be placed in the high tens or low hundreds of years). There is a transitory surface at 45 cm. Humus accumulation may have added to the 'appearance' of this surface. The bottom sands are much finer than those above.

J C C Romans (Macaulay Institute, Aberdeen) visited the site and made some provisional comments on the soils. He has suggested that the upper surface profile is a cross between a humus podzol and an acid brown soil, whilst the Mesolithic surface looked like a brown forest soil/acid brown soil after the loss of any humus surface layer. He also suggested that the area from which the monoliths were taken, has sustained severe secondary gleying, perhaps caused by water derived from the overlying medieval deposits. This contamination has reduced the value of chemical analytical work.

PARTICLE SIZE ANALYSIS

Six/

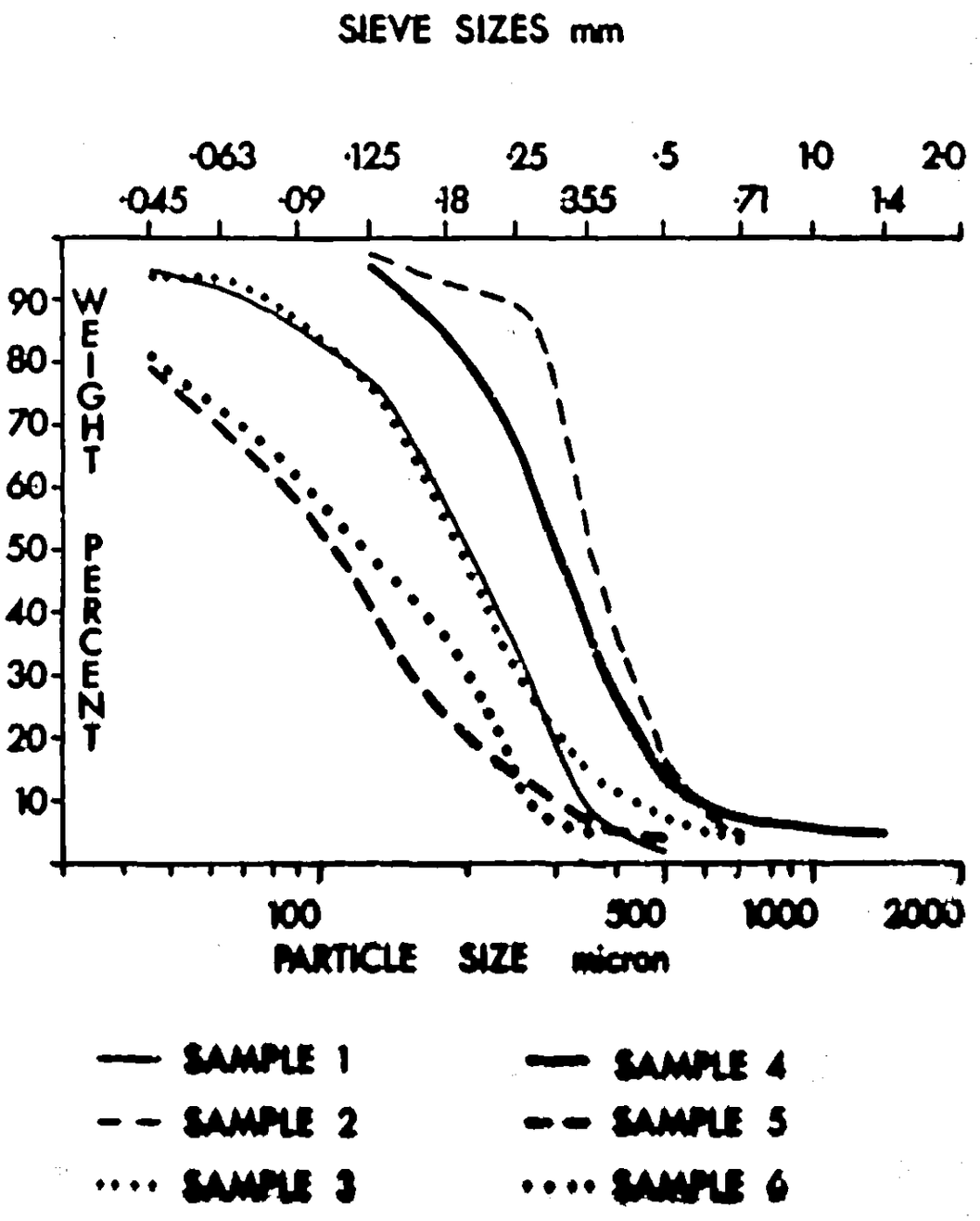
Six samples were taken for size analysis: one from the top and one from the bottom of each box. They represent the sands between the following distances from the top of box A, the upper box. 1, 0 - 6 cm; 2, 13 - 18 cm; 3, 18 - 24 cm; 4, 30 - 36 cm; 5, 36 - 42 cm; 6, 49 - 54 cm. The samples weighed approximately 50 g. They were dried, crumbled by hand, weighed and then sieved twice. The first nest of sieves contained the following sieves: 4 mm, 2.8 mm, 2.0 mm, 1.4 mm, 1.0 mm, 0.710 mm, 0.5 mm, 0.355 mm and a receiver. The second set of sieves contained the following sieves: 0.500 mm, 0.355 mm, 0.25 mm, 0.18 mm, 0.125 mm, 0.09 mm, 0.063 mm, 0.045 mm and a receiver. Using the following equation, the fractional percent in each sieve was calculated after the nests had been sieved for half an hour. The fractional percent of the sample in the receiver was calculated after the first sieve had been transferred to the top sieve of the second nests with the 0.355 mm and 0.5 mm residue.

$$\text{Fractional percent} = \frac{\text{wt of sieve + fraction - wt of sieve}}{\text{total weight of all fractions}} \times \frac{100}{1}$$

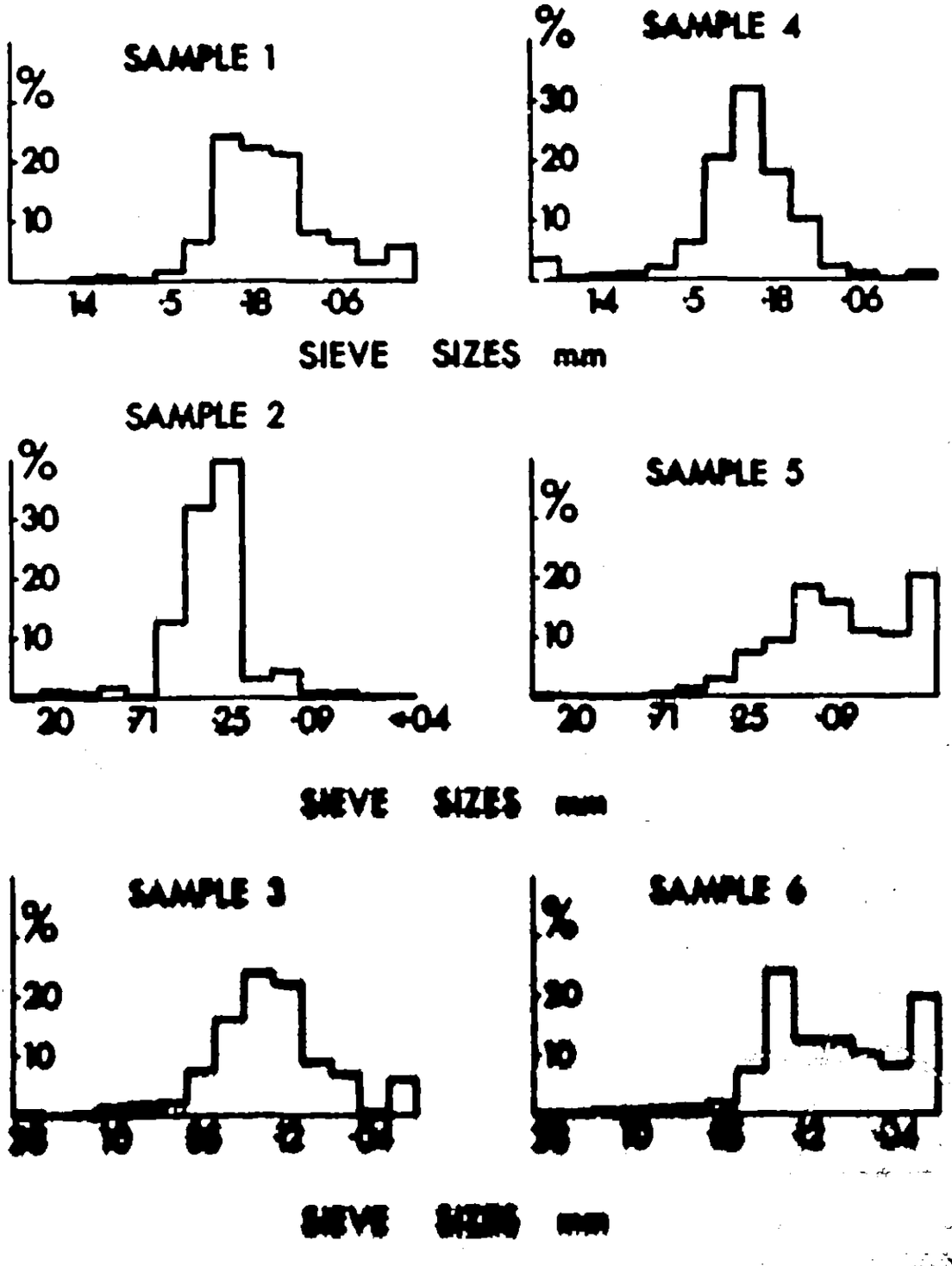
Results

Table 5 shows the fractional percents, ie the percent of the sample held by the sieves, and the cumulative percents used in the calculations following. A plot of the cumulative curve is shown in illus 12. Illus 13 shows the histograms of the fractional percents against sieve size and illus 14 is a smoother curve graph of the particle size distribution shown on illus 13. Illus 12 is used for the calculation of the statistical parameters, whilst illus 13 and 14 are for visual comparison. From the cumulative curve, the following statistical parameters have been calculated:-

The mean particle size, the standard deviation, the skewness and the kurtosis. They are calculated using the method proposed by Folk and Ward (1957). The 5, 16, 25, 50, 75, 84 and 95 percent points are read directly off the graph, so that/



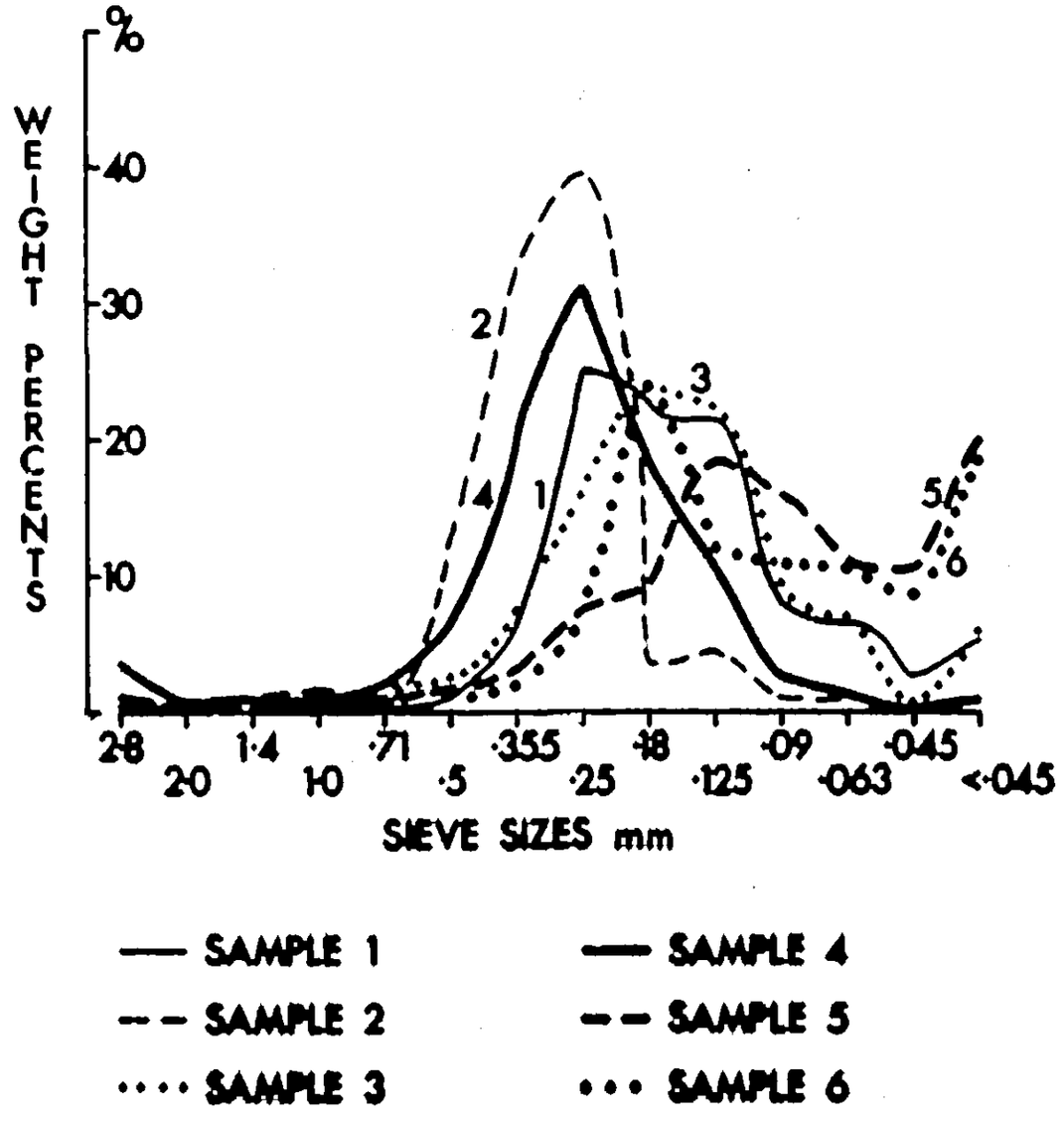
Illus 12 Plot of cumulative curve



Illus 13 Histograms of fractional percents against sieve size

mm Sieve Aperture Size	Sample 1 Inverness 0-6cm Percentages		Sample 2 Inverness 13-18cm Percentages		Sample 3 Inverness 18-24cm Percentages		Sample 4 Inverness 30-36cm Percentages		Sample 5 Inverness 36-42cm Percentages		Sample 6 Inverness 48-54cm Percentages	
	Fraction	Cumulative	Fraction	Cumulative	Fraction	Cumulative	Fraction	Cumulative	Fraction	Cumulative	Fraction	Cumulative
2.8	0.0	0.0	0.5	0.5	0.4	0.4	3.5	3.5	0.7	0.7	0.1	0.1
2.0	0.0	0.0	1.2	1.7	0.1	0.5	0.5	4.0	0.5	1.2	0.1	0.2
1.4	0.2	0.2	1.0	2.7	0.3	0.8	0.9	4.9	0.3	1.5	0.3	0.5
1.0	0.4	0.6	1.7	4.4	1.5	2.3	1.1	6.0	0.3	1.8	0.4	0.9
0.71	0.2	0.8	0.3	4.7	2.0	4.3	2.0	8.0	0.7	2.5	0.7	1.6
0.5	1.1	1.9	12.8	17.5	2.4	6.7	6.6	14.6	1.7	4.2	1.1	2.7
0.355	6.6	8.5	32.1	49.6	7.6	14.3	20.2	34.8	2.9	7.1	2.3	5.0
0.25	25.0	33.5	39.8	89.4	16.1	30.4	32.2	67.0	7.4	14.5	7.4	12.4
0.18	22.6	56.1	3.4	92.8	24.1	54.5	18.0	85.0	9.4	23.9	24.0	36.4
0.125	21.5	77.6	4.5	97.3	22.5	77.0	10.2	95.2	18.4	42.3	12.7	49.1
0.09	8.0	85.6	1.0	98.3	9.3	86.3	2.7	97.9	16.0	58.3	12.7	61.8
0.063	6.5	92.1	1.0	99.3	7.0	93.3	1.2	99.1	10.9	69.2	10.3	72.1
0.045	2.8	94.9	0.5	99.8	0.6	93.9	0.0	99.1	10.7	79.9	8.5	80.6
0.045	5.2	100.1	0.3	100.1	6.0	99.9	0.9	100.0	20.1	100.0	19.5	100.1

Table 5 Fractional percents (percent of sample held in the sieves) and cumulative percents used in subsequent calculations



Illus 14 Smoother curve graph of the particle size distribution shown on illus 13

that for instance 16% of sample 2 is 520 mm or 0.52 mm. These figures are then converted to a logarithmic scale, the ϕ ($\frac{1}{2}$) scale of Krumbein (1934).

The converation equation is $\phi = \frac{(1)}{mm} \log x \frac{10}{3}$

On this scale 1 mm - 0, smaller numbers are positive and larger are negative.

Table 6/

Table 6 shows the percentiles needed from the cumulative curve and conversion to ø.

Table 6

	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Sample 6	
	mm	ø	mm	ø	mm	ø	mm	ø	mm	ø	mm	ø
5%	0.405	1.31	0.695	0.53	0.610	0.72	1.25	0.32	0.425	1.24	0.355	1.5
16%	0.310	1.7	0.518	0.95	0.345	1.54	0.48	1.06	0.232	2.12	0.245	2.04
25%	0.280	1.84	0.45	0.16	0.275	1.87	0.405	1.31	0.173	2.54	0.213	2.24
50%	0.200	2.33	0.352	1.51	0.19	2.4	0.3	1.74	0.107	3.24	0.122	3.05
75%	0.135	2.9	0.3	1.74	0.13	2.95	2.18	2.21	0.051	4.31	0.057	4.15
84%	0.096	3.39	0.28	1.84	0.099	3.35	0.184	2.45	0.035*	4.85	0.035*	4.85
95%	0.044*	4.52	0.15	2.75	0.40*	4.66	0.126	3.00	0.02*	5.66	0.02*	5.66

*These figures are extrapolated from the curves of illus 12.

The equations for the statistical parameters are the following:-

Mean size M_Z $$= \frac{\phi 16 + \phi 50 + \phi 84}{3}$$

Standard deviation s d $$= \frac{\phi 84 - \phi 16}{4} + \frac{\phi 95 - \phi 5}{6.6}$$

Skewness $SK_1\phi$ $$= \frac{\phi 84 + \phi 16 - 2(\phi 50)}{2(\phi 84 - \phi 16)} + \frac{\phi 95 + \phi 5 - 2(\phi 50)}{2(\phi 95 - \phi 5)}$$

Kurtosis $K_G\phi$ $$= \frac{\phi 95 - \phi 5}{2.44(075 - 025)}$$

The definitions of these parameters are:-

M_Z is mean particle size.

s d is a measure of sorting.

SK_1 measures the symmetry of distribution.

K_G measures the normality of the distribution by comparing the sorting in the central part of the curve with the sorting in the tails.

Symmetrical curves have $SK_1\phi = 0.00$ with a theoretical value of +1.00. If the curve is Gaussian normal the ratio of sorting between the central part of the curve and the tail is a constant. Using the equation above, K = 1, therefore, a curve where $K_G\phi = 1.2$ is 1.2 times better sorted in the central part of the curve than in the tails. This would be a leptokurtic curve. Below $K_G\phi = 1$ are platykurtic curves and round about 1 they are mesokurtic (Folk & Mason 1958). Table 7 shows the results of performing the equations.

Table 7/

Table 7

Parameter	1	2	3	4	5	6
M_Z	2.47	1.44	2.43	1.75	3.4	3.31
σ_d	0.91	0.56	1.05	0.85	1.35	1.34
SK_1	0.31	-0.07	0.09	-0.11	0.14	0.27
K_G	1.25	1.55	1.49	1.52	1.03	0.89

Sample 1 is a medium-to-fine-grained (Shackley 1975, 90) moderately well-sorted sand with positive skewness (fine skewed). It is leptokurtic.

Sample 2 is a medium well-sorted sand with negative skewness (coarse skewed). It is strongly leptokurtic.

Sample 3 is as sample 1, although less fine skewed and more platykurtic.

Sample 4 is a medium moderately sorted sand, coarse skewed and strongly leptokurtic.

Sample 5 is a fine poorly sorted positively skewed mesokurtic sand.

Sample 6 is as 5 but is platykurtic.

Discussion

When sampling the monoliths it was necessary to leave material for further analysis by the Macaulay Institute. In order to obtain enough material for particle size analysis using the sieve method, samples with a vertical interval of 6 cm were taken. The centres of the monoliths were not sampled. Developed layers of each soil profile were ignored in the sampling process and it was assumed that sedimentation changes would be visible.

Analysis/

Analysis of the parameters requires us to accept the assumption that unimodal sediments should have a normal curve and that skewness and kurtosis away from 0.0 and 1 respectively are caused by the addition or removal of small amounts of sediments.(Folk & Mason 1958, 223). It has also been found that beach sediments are usually negatively skewed and dune sands positively skewed. Various mechanisms are used to explain this. (Mason & Folk 1958; Friedman 1961).

Samples 2 and 4, on the evidence available, are beach sands. Firstly, they can be compared to the Iona raised beach sands. Friedman (1961) analysed 250 beach sediments, finding them to be negatively skewed, and Mason and Folk (1958) had the same result for 30 beach sediments from the Gulf of Mexico. Their beach samples were also compared to dune sands and aedian flute sands from the same area and these were never negatively skewed. Other aeolian samples from the raised beach at Iona analysed by the writer were also negatively skewed (Maté in Barber 1981, 286).

Samples 1, 3, 5 and 6 fall into two pairs: 1 and 3; and 5 and 6 (illus 12). There are indications that at the 31 cm mark the sediments are of fluvial origin. The angularity of the stones does not suggest prolonged beach abrasion. The coarser material is expressed in illus 12 where 3 and 4 leave their respective partners (1 and 2) at the coarse tail-end of the curve and in spite of this apparent coarse tail they are still positively skewed, indicating non-beach material. So 1 and 3 are not beach material, and contain some apparently river-transported stones, originally close to their present position.

Samples 5 and 6 are positively skewed, so neither are beach sediments. Sample 5 may include a proportion of sediments from the beach sands of sample 4 but this does not show in the histogram and would increase the positive skewness of the sample.

On/

On illus 14 samples 5 and 6 appear to be bimodal, but 0.045 mm, it must not be forgotten, is an open category, ie from 0.045 to (almost) infinity.

The fraction in the retainer containing this sample was found to contain little clay (no smear) and thus is all silt. Both the main coarser peaks taken as unimodal sediments are positively skewed and their mean particle size values of 3.4 and 3.31 (0.95 mm and 0.102 mm respectively) suggest wind deposition. This would require an approximate wind average of 3.6 kph or 2.24 mph (Read & Watson 1968, 153). The wind required for their 0.25 fractions (the first fraction of any notable percent for both samples (7.4%)) is 10.8 kph or 6.7 mph. This suggests very light breezes and is well within the limits of wind speeds experienced.

Samples 1 and 3 can, from this, be considered to be aeolian sands. Winds required for the deposition of their first notable fractions are 28.8 kph (17.9 mph) while the average wind speed required would be approximately 3 mph. These figures would ofcourse be only relevant to the direction of source, a direction unknown. A very major problem is the possibility that other environments that have not been considered could possibly have laid down the sands of samples 1, 3, 5 and 6. In the instances of samples 1 and 5 we can see podzol 'A' layer-development and there is one transitory surface between samples 5 and 6, so it can be inferred that they were above sea level for some time. We also have the charcoal deposit sitting at the top of sample 5 and below sample 4. Sample 5 is in fact encapsulated between two land surfaces, high enough above sea level to be considered as freely drained. So a terrestrial origin for the sands, above flooding levels, is necessary.

CONCLUSIONS

The top of box A is 9.16 m OD (30.05 ft). This is very close to the height of the so called '25' raised beach' level, although/

although this is now recognized as a defunct term. The raised beach at this height is now called 'the main post-glacial beach' (Sissons 1976).

From the charcoal surface at 37 cm below the top of Box A, (8.79 m OD) approximately 3100 flints of a Mesolithic type were recovered (see flint report in printed section). This charcoal layer has been dated to 7080 ± 85 bp (GU 1377). This corresponds very well with generalized isobases for the main postglacial raised shoreline (Sissons 1976, 130, Fig 9.6) and with the relative sea-level change-curve from the Carey Gordon area, Lower Strathearn extrapolated to the Inverness area (Cullingford et al 1980, Figs 4 & 5).

The following sequence of events is thus suggested. Firstly the lower deposits (samples 6 & 5) are 'dune deposits' above the intertidal zone. There is some evidence for a transitory surface tentatively described by J C C Romans as having acid brown/brown forest soil profiles. A 'charcoaliferous flint settlement' is established on one of these surfaces. This is then inundated with a further slight rise in sea level and a beach environment is indicated by sample 4. Above this there is an influx of slightly coarser material (beach stream perhaps) and then a return to aeolian sand deposition. There is then a renewal of beach conditions with a further very slight inundation and sample 1 represents a withdrawal of the sea and a further renewal of aeolian sands. It could ofcourse be argued that this last is merely the sand building up out of the water, but it is none the less a return to wind-sorted sand.

The high positive skewness of sample 1 may be attributable to clay and humus translocation down the profile.

ACKNOWLEDGEMENTS

I would like to thank Mr J Hamilton for sieving and SDD(AM) for providing the facilities and J Wordsworth for these excellent samples.

A preliminary microwear analysis of a small sample of Mesolithic struck flints from 13-24 Castle Street, Inverness

Rosemary Bradley

A total of 19 pieces was submitted for microscopic examination of their use-wear traces. Most of these fell into the typological class of backed blades while the rest were unretouched pieces and one (one of G68) was a chip of quartz. The remaining 18 artefacts were flint of various types.

Each piece was cleaned with acetone to remove finger grease and in some cases warm 5% HCl acid was used to remove extraneous mineral deposits. The piece was then examined under a Leitz Epivert binocular microscope with incident lighting and magnifications of 50-525x. The examination and interpretation of the microwear traces followed closely those of Keeley ( ) and were based on the traces seen on my own set of experimentally used tools.

Almost all the flintpieces showed cortication (white patination) of the surface to various degrees. Some (eg D3 and G13) had incipient cortication with a mottled surface appearance, others were more completely whitened (E81) with a few having a very porous surface and the edge eaten away (E18/9 and G19.9). In addition G18.8 was slightly burnt, which had caused surface whitening and crazing. These surface changes, when severe, mean that much of the original surface has been destroyed and with it often evidence of use-wear. Replica casts were made using Triafol acetate peels in order to produce dark specimens of the surface for examination to detect whether any evidence of polish had been preserved. This was done as the intense glare from the whitened pieces made investigation of the archaeological pieces impossible. In several cases areas of gloss were found but in many instances these could not be ascribed to a form characteristic of use. These were almost certainly produced while the pieces were in the soil and are due to natural/

natural causes. In such cases of surface alteration by natural factors faint traces of use on softer materials, eg meat, would be lost.

I have never done any experimental work involving archery of any type nor am I familiar with the microwear traces found on pieces used as armatures on arrows. It is therefore plausible that the scattered polish seen on a number of these tools could be due to use and not natural causes. In addition the following observations on three of the artefacts can only be taken as highly tentative. Tool G13 has concentrated bright patches of polish which may be due to friction against wood. Microliths have been generally considered as the armatures for arrows and a number of methods of mounting have been reconstructed. If this tool was hafted in a wooden shaft and for some reason friction occured with the wood, perhaps from loose binding, such traces could be left.

Tool F4 has a longitudinal spall detached from the distal tip area down the right ventral edge which is like those impact fractures produced by Bergman at the Institute of Archaeology in his archery experiments with microliths. If this is so the piece may have been returned to the site in the meat of the animal or else the shaft together with the broken point was brought back for replacement.

Tool 78/9 has strong shiny polish tracks running almost parallel to the left distal retouched edge about half a millimetre from it. These could have been produced during impact after being fired from a bow. It is unlikely that they were the result of poor retouch technique.

In conclusion the general surface condition and my own lack of experience in the field of flint arrow points and barbs has precluded the formation of any definite statements on the possible uses of these artefacts. In the case of three of them there may be some evidence for their use in archery but this is only hypothetical. The main problem with this is the very poor surface preservation of many of the tools. The/

The lack of clear diagnostic microwear patterns on the remainder, despite the use of replica casts which make examination easier, means that no firm conclusions can be drawn on their functions.