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Lussa Wood 1: the Late-Glacial and Early Post-Glacial Occupation of Jura

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SUMMARY

This site, now at 53 ft OD (16 m), was originally made at the back of the tidal flat in the mouth of Jura's most desirable valley; the occupations cover the whole of the Jura stone age. A single tanged point, derived and rolled, is tentatively placed (as Jura's Phase 1A) in the recently-extended warm phase of the Late-Glacial period, a time when Jura would have been inhabitable (11,000/10,500–8800 BC). Three continuous-construction stone rings in a scoop, probably cooking places, yielded Phase 1B microliths and C14 dates of 8194 ± 350 BP (SRR-160) and 7963 ± 200 BP (SRR-159); this is the earliest dated Scottish structure and human occupation. The stone artefacts (including some 3,000 microliths) continue through Jura's Phases 2 and 3 into the Neolithic. A cobbled 'platform' appears to belong to the later occupations. The evidence implies that the sea was already at the level of the site (its maximum stand) by the mid-seventh millennium, of geochronological interest; the relationship of this to the low world sea-level and hypothetical Jura–Islay–Colonsay landmass of the Pre-Boreal period (8300–7600 BC) is discussed. The tanged point is compared to S British and European tools. The stone rings and their contents are shown to strengthen the already proposed participation of Jura's Phase 1B in a W European coastal Mesolithic.

INTRODUCTION

The writer's earlier papers in this series provide essential background (1968–1974c), in particular because the present report will only note, without discussion or illustration, those aspects of Lussa Wood I which have been fully described at other sites. Nor can much space be given up to evidence which, though customarily described in this field, does not at present appear to be diagnostic on Jura. Conversely, particular attention will be paid to both the new and the apparently significant at this extensive site.

REPORT

Location and description of site (pl 1a; fig 1)

Lussa Glen has been described in two earlier papers (Mercer 1970a, 1971). The present site (NGR NR644874) occurs on terrace T4 (1971, 3–5 & fig 4) as the hump in the gravels at the E end of the 55 ft OD sub-peat contour (Mercer 1971, fig 3). It is thus at the NE corner of the extensive terrace, now a plantation, with the valley wall 100 yd (90 m) away to the W, the river 30 ft (9 m) below to the E and the slightly lower cross-going strip of bog, considered the

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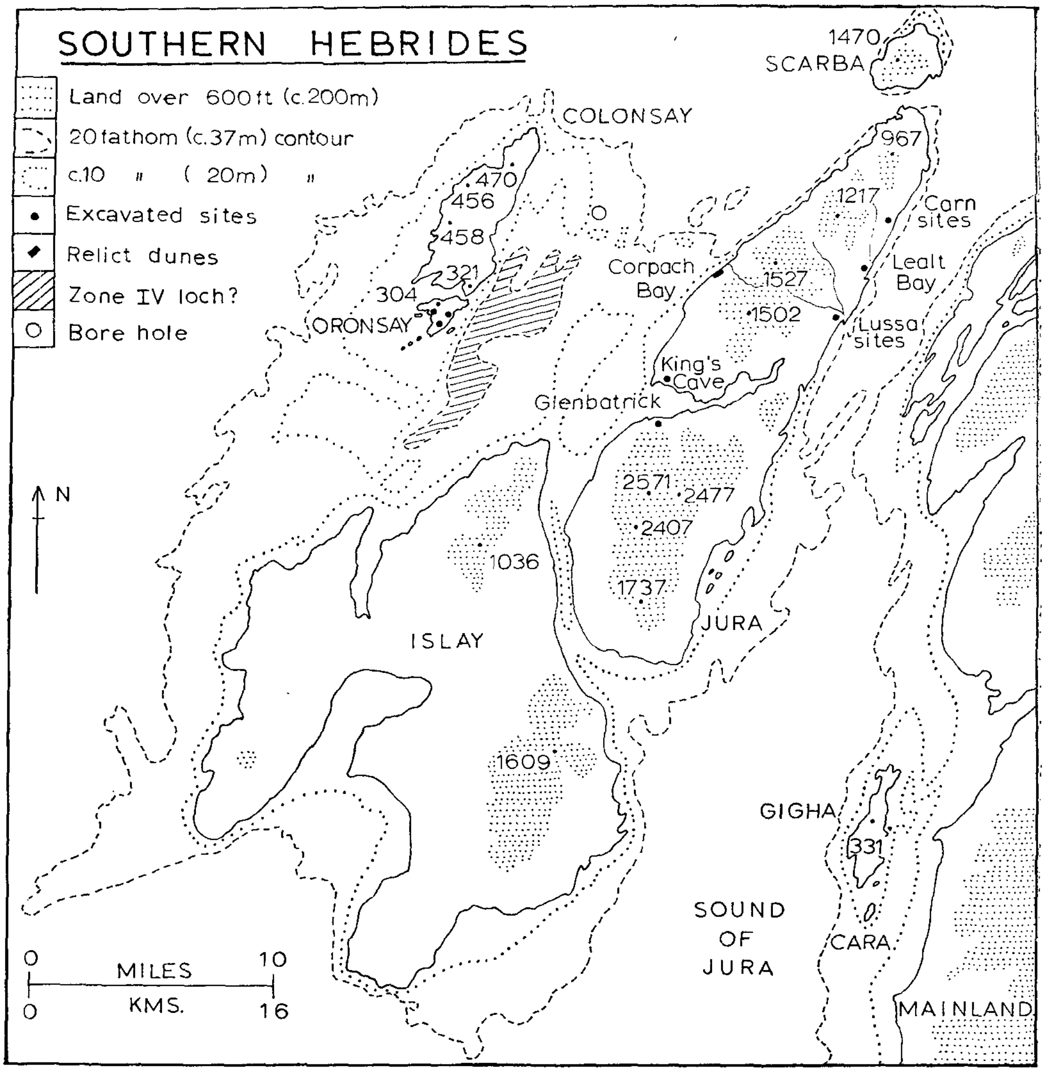

FIG 1 Location map, S Hebrides

washing-limit of the early post-glacial sea, immediately to the N (see pollen analysis of bog in Mercer 1971, fig 6).

The new site united the island's most desirable conditions as a habitat:

(a) it is reached by the shortest crossing from the mainland, then offering the island's most extensive estuary and tidal flats as a landing place (Mercer 1970a, pl 1b),
(b) it next provided a flat dry camp-site beside the main salmon river,
(c) the vast valley behind crosses the island,
(d) the valley's Grundale tributary (Mercer 1971, fig 2, the SE-running river joining the Lussa a mile (1·6 km) above the site) was the pass which would have led to the extensive northern beach of the hypothetical Pre-Boreal landmass formed from Jura–Islay–Colonsay, a subject considered, together with some field evidence, in the discussion part of this paper.

EXCAVATION (pl 1 & 2a; figs 2–4)

The general sequence, starting at the base (fig 2):

(1) Fine waterlaid gravel, at least 9 ft (2·70 m) deep, gleyed from at least 9 to 4 ft (2·70 m–1·20 m), so that it was loose, wet and difficult to trench, and iron-panned from about 4 to 1½ ft (1·20 m–45 cm), like a coarse almost set concrete, equally difficult to trench. No trace of occupation.

(2) Scoop made in the gravels, and in it were laid out three continuous construction stone rings (fig 4a), fully described shortly. The scoop base is now 2 ft 8 in (80 cm) into the gravels and about a foot (30 cm) into the panned level; the rings are in this lowest foot (30 cm).

(3) Probably by water action, possibly by normal terrestrial hole-filling processes, the scoop with its rings was buried.

(4) A further foot (30 cm) of gravels was deposited on top of the rings. It is not possible to say whether the scoop was made through these gravels and they merely slipped or were washed back in as it filled (original scoop then about 2 ft 6 in, 75 cm, deep) or whether they were pushed up onto the area and over the scoop by marine action (scoop originally then 1 ft 6 in, 45 cm, deep); however, the slight mound is comparable to the irregularities, always changing, left by high seas and spates on the present tidal flats in Lussa Bay. The cross-going burn-cum-bog behind, its sub-peat surface lower than that of the site, accentuates the mound (Mercer 1971, 3–5 & figs 3, 4, 6).

(5) This top foot of gravels now at least appears continuous with the scoop filling. The whole of the gravel (both in and above the scoop) contained stone artefacts, red ochre, wood charcoal, burnt hazelnut shell and minute pieces of marine-mollusc shell and burnt mammal bone. This 1 to 2 ft (30–75 cm) of gravel was without recognisable stratification.

(6) In places the lowest occupation gravels were panned, notably just inside the walls of the scoop. This could be mere contact-panning or could be the result of the recent planting of conifers or of the farming of the last few centuries; or, going right back, it could have begun at the time when the early post-glacial sea was just below the site. There appear no grounds for distinguishing panned from unpanned artefacts.

(7) An irregular area of the surface of the gravels, with opposed long axes of 4 ft 2 in and 3 ft 7 in (1·25 m, 1·05 m), was covered with flat stones. Described shortly, this structure (fig 4b) appears most likely to belong to the final stages of the prehistoric activity.

(8) Some 8 in (20 cm) of peaty humus now covers the gravels. Farming and planting had mixed a little of the gravel and its artefacts into this. Conversely, part of the household rubbish recently thrown on the present surface had made its way down into the upper gravel.

Figure 3 shows the trenches, the area totalling 188 sq ft (17 sq m). The irregular shape results from the roots of the living trees around the site. Pumps equipped with gravel filters were kept working continuously throughout each season. Water was piped to the site from halfway up the small burn in the face of the valley wall to the W, to fill the iron water-tubs in which the whole of the gravels (to 9 ft, 2·70 m down) was sieved. The riddles were of ⅛ in (3 mm) mesh, as used since 1966 in the Jura excavations. Gravels with charcoal for C14 were removed in a mass and sieved at the excavation's base.

The three stone rings (pl 2a; fig 2)

The gravels held a few cobbles here and there but their generally fine consistency can be seen in the plates. The rings are built mainly of bedrock slabs, many however waterworn on

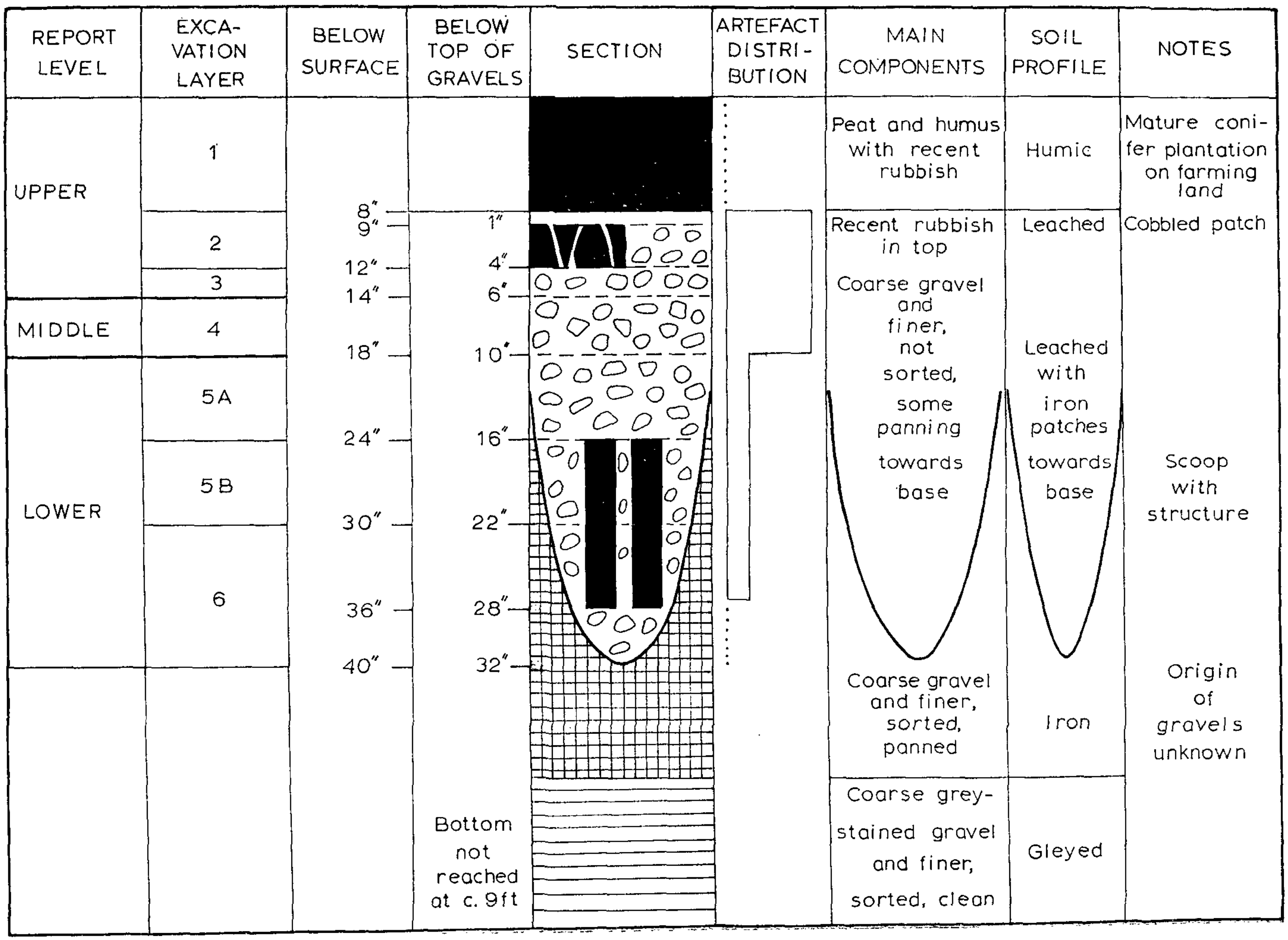

FIG 2 Lussa Wood I, section

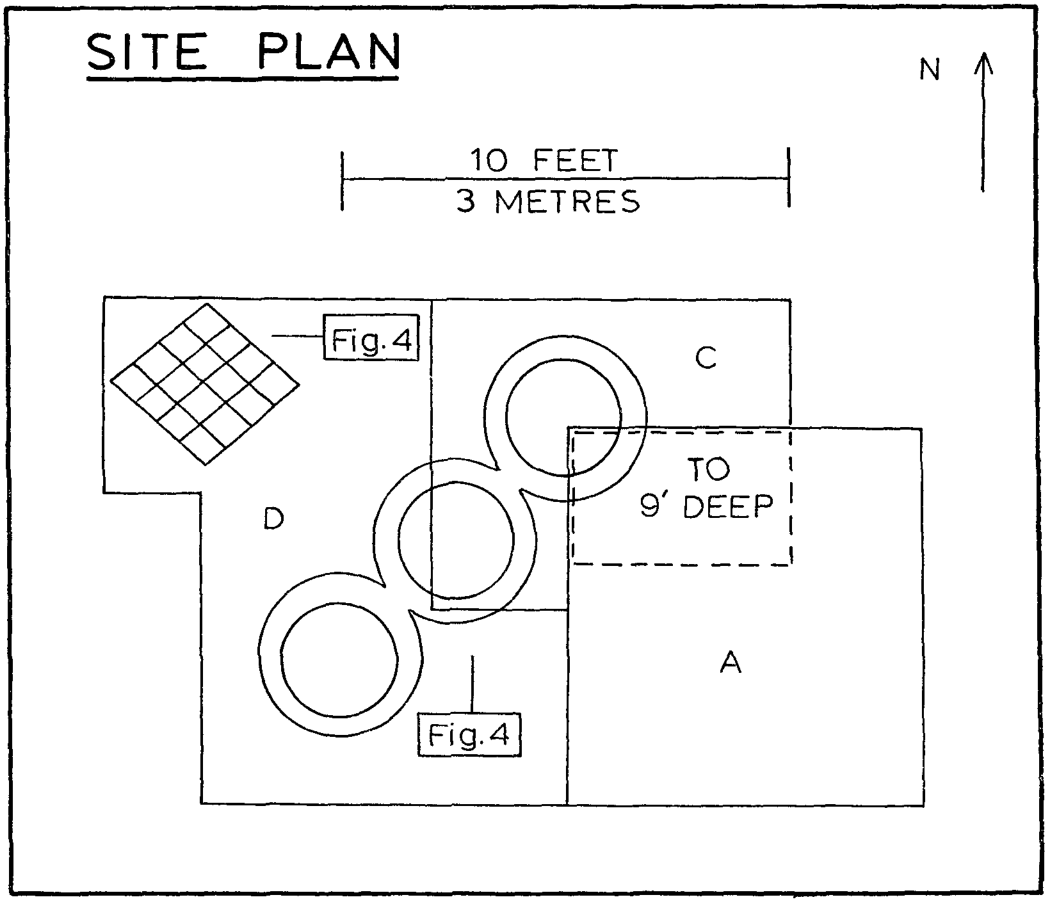

FIG 3 Lussa Wood I, trench plan

one side, with a few beach cobbles. The large lozenge-shaped stone third from the right (*in situ*) appears to be a plano-convex cobble shaped by ice-action; the striae on its planed face are visible. The rings' long axis lies NE–SW.

The excavation left the stones and packing of the SW ring and of half of each of the other two rings untouched, as in the plate (the stone on the further side of the centre ring has been lifted and replaced). The stones which formed the two removed halves stand against the back of the trench. The filling of each ring was removed to the bottom. Here and there a flat stone was found in one or other of the rings, perhaps having served as a base or cover for roasting meat. The ring to the right (NE) is reflected in the water which fills the trench dug down the further 6 ft (1·80 m) into the gleyed gravels; this trench, partially cutting into the NE ring, produced no artefacts, making it reasonably certain that nothing lay below the rings themselves; it did not seem necessary to dismantle and dig below all three rings. Half the centre ring, the least well-made, was removed in a search for basal charcoal, amongst the stones, and for bone chips; in fact, even so it was only by amalgamating its charcoal with that of the SW ring that there was enough for dating (below); as for bone, this ring did then yield 21 out of the site's 32 minute pieces. The continuous nature of the construction (the common stones are clear in the plate) allows the basal artefacts to be treated as contemporary.

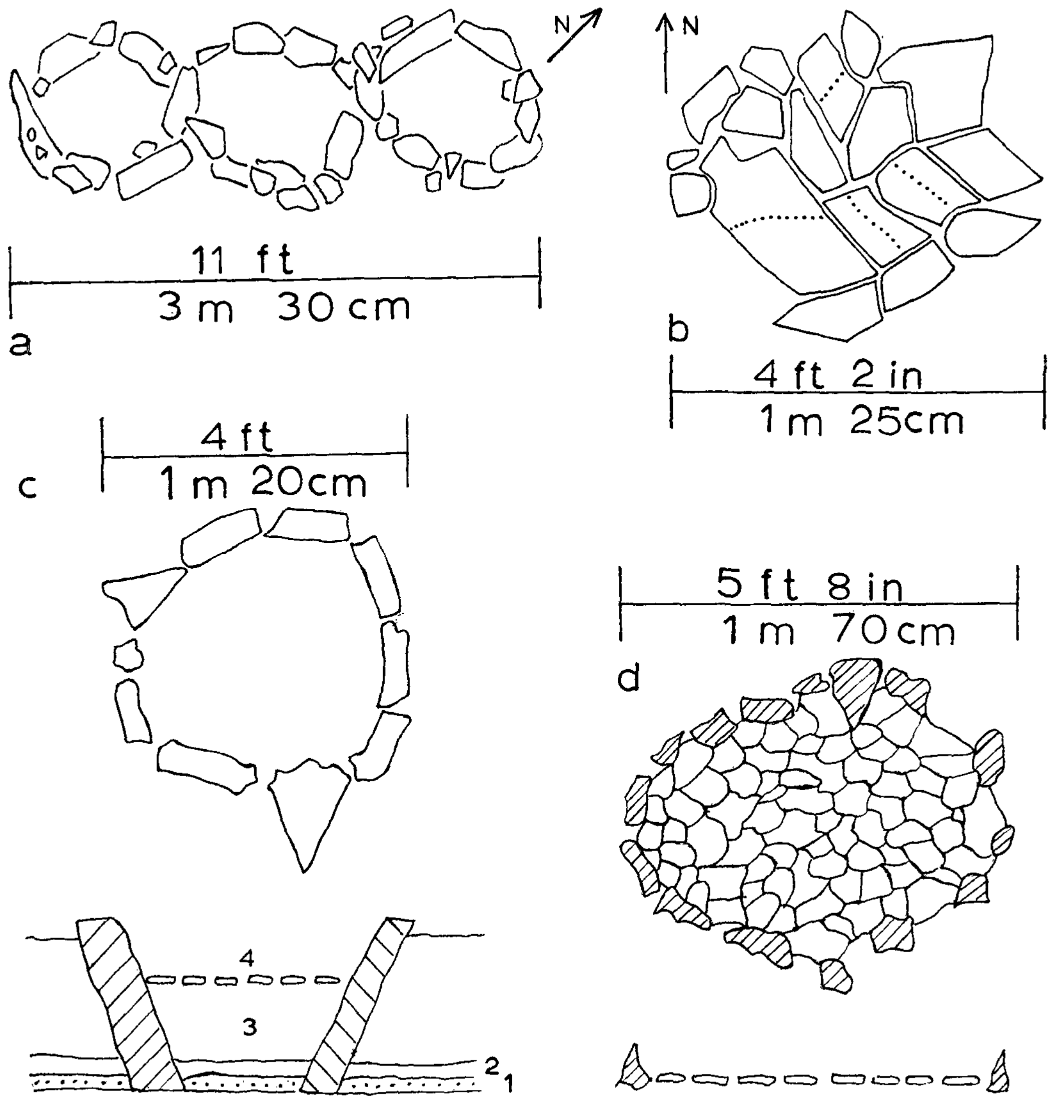

FIG 4 a, Lussa Wood I rings; b, Lussa Wood I cobbled patch; c, Isle of Téviec ring; d, Isle of Téviec cobbled patch

In detail, the organic finds associable with the construction of the rings were:

	SW	Centre	NE
Charcoal used for dating, after lab cleaning (gm)		1·1	0·7
Charcoal, wood determination	Maple?	Hawthorn	Hawthorn
Bone, small pieces	9	21	2

Four of the bone fragments were not as deep as the rest. A piece in the centre ring was naturally cemented to a non-diagnostic flint. Dr Juliet Jewell reported that all the bone chips were too small for identification. There was also a patch of charcoal just NE of the NE ring, collected but not used for dating; perhaps a burning stick which fell down between the stones and the wall of the scoop.

The charcoal from the base of the NE ring gave an age of 8194±350 BP (SRR-160), that from the other two rings combined 7963±200 BP (SRR-159), based on 5570-year half-life. It is supposed that the calendar age for the occupation fell in the period 6500–7000 BC.

Since completion of the excavation, the rings (left as in pl 2, though the trench is usually flooded) have been unprotected. The site has already suffered slightly during tree felling operations.

The patch of flat stones (pl 2a; fig 4b)

As the illustrations show, this is on a higher level than the rings, in fact outside the scoop and upon the surface of the gravels. The stones are similar in origin to some of those used for the rings. Below the stones were the usual artefact-bearing gravels; the stones themselves bore no sign of fire; there was no gravel, charcoal or other artefacts upon the stones; these were directly overlain by the peaty humus. The scale-flaked artefacts, 16 out of 17 in the top of the gravels, were not significantly close to the patch. The origins and purpose of the structure remain unknown.

The recording of the artefacts

Material haphazardly in the peat was recorded as layer 1. Apparently lacking inherent vertical division, the occupation gravels were divided as follows:

Level	Layer	Depth of Gravel – inches	Notes
Upper	2	3	Layers 1–3 were considered the surface of the gravels.
	3	3	Much recent rubbish.
Middle	4	4	Intermediate zone, ie movements on the final gravel surface might or might not affect this level. Lowest recent rubbish (chip of glazed pottery). Ten inches (25 cm) is about the depth of the artefact-holding gravels outside the scoop.
Lower	5A	6	Top of scoop as now distinguishable.
	A5B, 6	9	Base of scoop/ring, maximum depth in each trench.
	C5B, 6	16	
	D5B	6	

Within the rings, the maximum depths of occupations (below the final surface of the gravel) were thus 2 ft 1 in (65 cm) in NE, 2 ft 8 in (80 cm) in the centre and 1 ft 10 in (55 cm) in the SW ring.

Limit of interpretation of the artefact divisions

(a) The lower the artefact the more likely it is to stem from the ring phase (or earlier).
(b) The Lower material should be from the earliest occupations.
(c) The Upper artefacts can be expected to be a mixture of *all* periods, starting with those left by the earliest people upon the gravel surface before and during the ring period.
(d) Since the scale-flaked and supposed Phase 3 (Jura sequence) tools were found in the top of the gravels, it is likely that the late occupation material at least has not been seriously displaced downwards.

(e) The Upper flints are all clean, as are most of the Middle ones, but the Lower flints are all iron-stained.

THE EXCAVATED MATERIAL

Summary of the finds

	Upper	Middle	Lower
Recent household rubbish	much	trace	none
'Platform' of flat stones	x	–	–
Neolithic tools:			
Chips of Antrim porcellanite polished axe (two fit together), Group IX	3	0	0
Transverse arrowhead	1	0	0
Leaf-shaped points	1	1	0
Fragments of scale-flaked tools	11	0	0
Flint (lbs/ozs)	53/2	15/2	10/6
Quartz (lbs/ozs)	18/7	1/12	–/10
Lussa River/Oronsay quartzite hammerstone	1	0	0
Other quartzite tools	12	2	1
Quartz crystal (pieces)	99	20	14
'Brownstone' (pieces)	23	5	0
Pitchstones (pieces)	64	4	3
Rolled flints, no sign of use (whole pebbles, etc)	12	3	4
Rolled artefacts, no further use	5	5	1
Artefacts rolled and re-used	2	1	0
Artefacts (unrolled) with two-period use	57	12	2
Red ochre common	x	x	x
Charcoal in quantity (see Appendix)	x	x	x
Carbonised hazelnut shells	x	x	x
Limpet shell fragments	3	0	1
Oyster shell fragment	1	0	0
Bone pieces, minute	0	0	32
Three continuous-construction stone rings in scoop	—	—	x

Quartzite artefacts (fig 5)

Upper

A1 Half a Phase 3 (Lussa River/Oronsay) hammer-anvil stone, probably 4 in (100 mm) long, 2⅞ in (72 mm) wide, 1½ in (37 mm) thick at centre before battering (illustration no 1). Barrel-shaped beach cobble, 3 in (75 mm) long with battering around one end. Chopper, 4 in (100 mm) long, common Jura type (no 2). Elongated flattish-section beach pebble, 5 in (125 mm), deep pitting on flat face of broader end, other face missing.

C1 Ovoid cobble as used for Phase 3 hammer-anvil stones, well pitted on one face, trace on other, battered one end, other broken off; battered near centre of one long edge; now 3½ in (87 mm).

D1 Two ovoids as C1, including use traces; one (no 3) has no diagnostic use in Phase 3 double-notch area, other (4 in, 100 mm) has rotted edges.

A2 Shapeless rolled lump with pit in centre of one face and probably similar on the other; 3½ in (87 mm) maximum. Centre only of possible ovoid, light use at centre of each face, not on edges; 2 in (50 mm) wide, 1 in (25 mm) thick. Elongated flat-section beach stone with large chip out of side near end; other end lacking; now 3¼ in (80 mm).

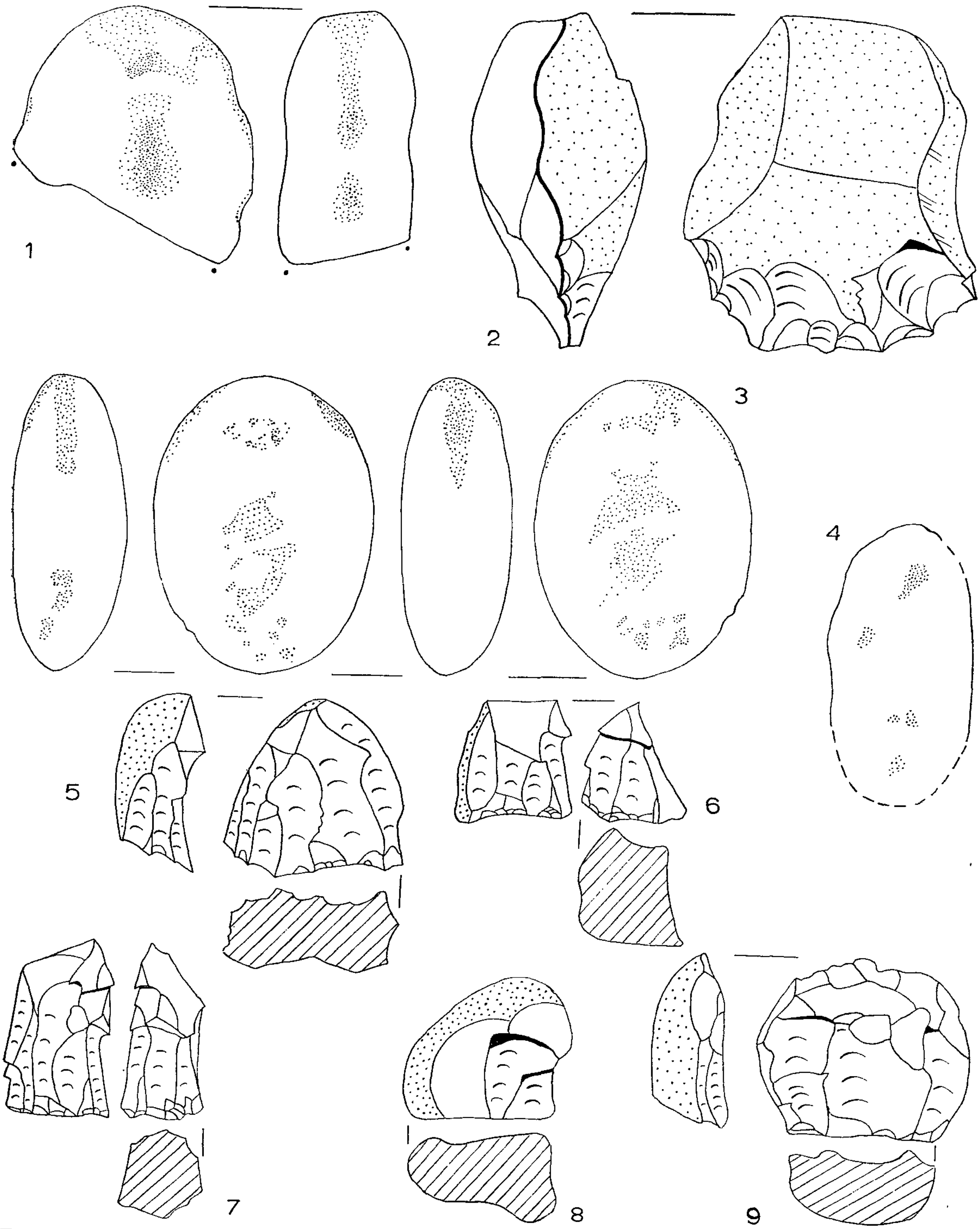

FIG 5 Quartzite tools (1 : 2), flint cores (1 : 1)

B2 Elongated flat-section beach pebble, 4½ in by 2 in (112 mm × 50 mm) at widest, battered towards each end on one face, as no 4.

C2 Massive elongated beach pebble, flattish section, thicker end missing, thinner with chopper edge (with use-chips) bevelled by two blows. Now 4¼ in (106 mm) long, 3¼ in (80 mm) wide, 1⅜ in (33 mm) thick.

D3 Ovoid with centre of one side pitted, 3 in (75 mm).

Middle

A4 Elongated thick-section beach pebble with each end smashed away, probably by several blows; now 3½ in (87 mm). Fragment of large piece of weathered quartzite perhaps flaked into steep scraper.

Lower

A5 Split away face of flat-sectioned beach pebble with pits towards each end, same positions as B2 above. Latter is certain tool but A5, though worn and smoothed, is illustrated in preference because it is the only likely early specimen (no 4).

Quartz crystal, 'brownstone', pitchstones

The quartz crystal, much of it very pure, the pieces up to 1⅝ in (40 mm) long, included three cores.

The 'brownstone' is buff coloured, becoming very soft and chalky as it deteriorates. Capable of normal flaking, the material found was limited to nondescript flakes. On the way to examine the flint gravels in S Mull (Mercer 1968, 46), the writer noted pieces of a superficially similar stone in the woods above Carsaig (approximately NGR NM 537222). Mr G H Collins, of the Institute of Geological Sciences (Edinburgh), wrote that this stone 'presents difficulties; it is so fine-grained, it may be the selvidge of a felsitic intrusion. On the other hand it may be a baked sediment (? silicified siltstone).' The excavator examined the rare felsite outcrops on Jura without finding comparable material.

Most of the pitchstone was green; an Upper piece was blue, two in the Middle were dun coloured. Much of the green pitchstone was fresh and, as usual, comparable to the Arran outcrop. There were also striped, spotted and margin-bearing pieces. Several specimens were highly weathered. Finds included small cores, an *éclat écaillé* on a fresh flake, a possible graver on a patinated piece; there were many well-struck flakes and bladelets. Mr G H Collins, having examined specimens of the different varieties, suggested Mull, Arran and the Argyll mainland (Craignish) as sources.

As usual in the Jura sequence, pitchstone was common late on, here with the felsite/siltstone. To judge by the present site and by Glenbatrick (also an *in situ* 1B occupation), it seems that, avoiding the poorer but ubiquitous milky quartz, the earlier Jura occupations sought out the crystal, more rewarding as knapping material.

Rolled flints, no sign of use

Upper: 6 pebbles (largest has 1¾ in (43 mm) long axis) and 6 chips
Middle: 3 pebbles (1½ in, 37 mm)
Lower: 1 pebble (1½ in, 37 mm), a tabular lump, 2 chips.

The volume of the Upper gravel was of course much greater than that of each of the other levels. Overall, 19 natural flints in 2 ft (60 cm) by 188 sq ft (17 sq m) of gravel seems too high for such deposits on Jura – where flint pebbles are extremely rare – and it is likely that the whole pebbles were brought there by the early people, but not struck, and that the chips are early artefacts rolled beyond recognition. There were also two pebbles discarded after removal of a single flake from each.

Rolled artefacts

Upper: 1 core probably rolled and then re-flaked; 1 flake which was rolled, then made into a nosed scraper and then rolled again; five flakes
Middle: 1 asymmetrical core (no 8), 1 nondescript core later broken up, a large part-cortex flake, a spatulate (no 21) and two small flakes
Lower: 1 tanged point (no 28)
Total: 14.

Artefacts (unrolled) with two-period use

Upper: 3 cores (Intermediate, Pyramidal, Shapeless), 1 platform flake (class 1), 7 microliths (1Bia, 1E, five unclassified), 9 scrapers (two class 1, one class 2, one class 3, five other), 1 *bec à encoche* graver, 10 *éclats écaillés*, 1 miscellaneous (point), 25 flakes

Middle: 2 core fragments, 2 scrapers (other), 1 *éclat écaillé* (plus 3 possibles), 4 flakes (perhaps *éclats écaillés*)

Lower: 2 flakes

Total: at least 68.

Weight distribution of Flint and Quartz artefacts (pounds/ounces)

Trenches:	A (68 sq ft, 6 sq m)			C (36 sq ft, 3 sq m)			D (84 sq ft, 8 sq m)			
Levels	Fl	Q	Factor	Fl	Q	Factor	Fl	Q	Factor	Inches deep
1				–/14	–/14	1	1/11	1/5	1·3	Peat
2	13/–	5/4	2·6	5/14	3/10	1·6	9/8	3/5	3	3
3				3/13	–/8	7·5	18/6	3/9	5	3
1–3 (Upper)	13/–	5/–	2·6	10/9	5/–	2·1	29/9	8/3	3·6	Peat+6
4 (Middle)	6/14	1/–	7	3/11	–/6	10	4/9	–/6	12	4
5A+5B	1/12	–/1	28	—	—	—	—	—	—	12
5A	1/9	–/1	25	2/4	–/4	9	1/8	–/1	20	6
5B	–/7	0	x	1/8	–/2	12	–/6	0	x	6
6	–/3	0	x	–/13	–/1	13	—	—	—	0–10
5–6 (Lower)	3/15	–/2	31	4/9	–/7	10	1/14	–/1	30	22–32

Summary:

	Fl	Q	Factor
Upper	53/2	18/7	2·9
Middle	15/2	1/12	8·6
Lower	10/6	–/10	16·6
Site	78/10	20/13	3·8

It must be borne in mind that the occupation deposit was deepest in the scoops and rings, these coming disproportionately within trenches C and D (fig 3):

Trenches:	A	C	D
Total flint and quartz weight, %	30	25	45
Total excavated area, %	36	19	45

Description of artefacts in flint, quartz, pitchstone and 'brownstone'

Summary:

		Upper	Middle	Lower
1	Cores (scraper use in brackets)	187 (39)	51 (5)	21 (9)
2	Platform flakes	154	57	34
3	Part-cortex flakes	286	95	54
4a	Large rolled tanged point (discussed in later section)	0	0	1
4b	Steeply trimmed, mainly microlithic	2125	555	289
5	Micro-burins	635	181	101
6	Scrapers (including cores above)	356	102	60
7	Blades over 1⅛ in (28 mm) long, end-narrowed in brackets	123 (37)	56 (13)	43 (16)
	Blades under 1⅛ in (28 mm) long, end-narrowed in brackets	745 (51)	199 (14)	153 (9)
8	Flakes with end-narrowing	71	19	12
9	Gravers	59	11	10
10	*Eclats écaillés*	227	23	1
11	Perforators	45	20	9
12	Transverse, not scraper-like	6	2	2

		Upper	Middle	Lower
13	Spatulates (no 21, Middle, rolled; no 24, Lower)	1	0	0
14	Teeth on a cutting edge	2	1	1
15	'Fabricator', highly-trimmed, battered (no 23)	1	0	0
16	Points with 45° trimming right round edge	4	0	0
17	Miscellaneous interesting artefacts	8	0	3
18	Neolithic and undiagnostic scaled artefacts	16	1	0
19	Undescribed trimming	x	x	x

1 *Cores* (scraper use in brackets)

	Upper	Middle	Lower	Total
Single Platform Asymm.	66 (15)	19 (1)	8 (2)	93 (18)
Intermediate	17 (4)	9 (3)	0	26 (7)
Single Platform Pyram.	23 (10)	6	3 (1)	32 (11)
Two Platform	39 (5)	8 (1)	7 (5)	54 (11)
Three Platform	4	3	1 (1)	8 (1)
Four Platform	1	0	1	2
Two Way	5	0	0	5
Shapeless, mainly One Platform	32 (5)	6	2	40 (5)
TOTAL	187 (39)	51 (5)	21 (9)	259 (53)

The Intermediate shape cores (no 6) – clearly distinguishable in the Middle level – have the cortex of the Asymmetrical class (no 5) reduced to a narrow vertical strip, the shape of the core following this and becoming longest from 'back' to 'front'. This shades into the cortex-free Pyramidial core (no 7). Nos 5–7 are all from the Middle level.

Upper. As the Asymmetric cores get flatter, so two-way flaking starts, producing 'chopper-head' artefacts; further study might be productive; each site has one or two, well-made, eg Glenbatrick no 6, Lussa River no 8; some cores have merely *écaillé* edges. Platforms are approximately opposed on 13 two-platform cores, but never actually parallel. Scraper-edges are most clear on single-platform Pyramidal cores. Three cores on large quartz crystals (faces to $1\frac{3}{10}$ in, 32 mm).

Middle. Asymmetric group holds a highly-rolled 'core' (no 8) and three with natural platforms. Three two-platform cores have opposed platforms. Scrapers would be increased if one included toothed edges, difficult to separate from flaking spurs. The three-platform cores have each had two-way flaking but not so as to produce the distinctive Upper level 'chopper-head' form.

Lower. No 9, found within centre ring, a typical asymmetric core as Lussa Bay nos 1–4. One elongated form, as Lussa Bay nos 7, 8. The cores with three and four platforms, well-flaked, are comparable to Lussa Bay no 12, Glenbatrick no 12; the four-platform example has unemphatic two-way flaking, like the Middle specimens.

2 *Platform flakes*

Upper held 106 class 1, 42 class 2 (16 obliquely from below) and 6 miscellaneous (evidence of three-platform cores, also a tip, ie base when flaking). *Middle* held 40 class 1, 17 class 2 (14 from opposed platforms). *Lower* held 23 class 1, 11 class 2 (mostly in fact obliquely from below, again in line with the absence of cores with parallel platforms).

3 *Part-cortex flakes*

Upper, left 32, right 22; *Middle*, left 53, right 42; *Lower*, left 32, right 22; as usual, these figures do not include a few part-cortex flakes grouped elsewhere. Many with nondescript trimming; those with end-narrowing are included here.

4b *Steeply trimmed, mainly microlithic*

The importance of the microliths in the Jura sequence requires detailed analysis of these specimens. The reader is however referred again to the section headed 'Limit of interpretation of the artefact divisions'. The Lower level microliths do probably represent only the seventh millennium ring-builders; more of

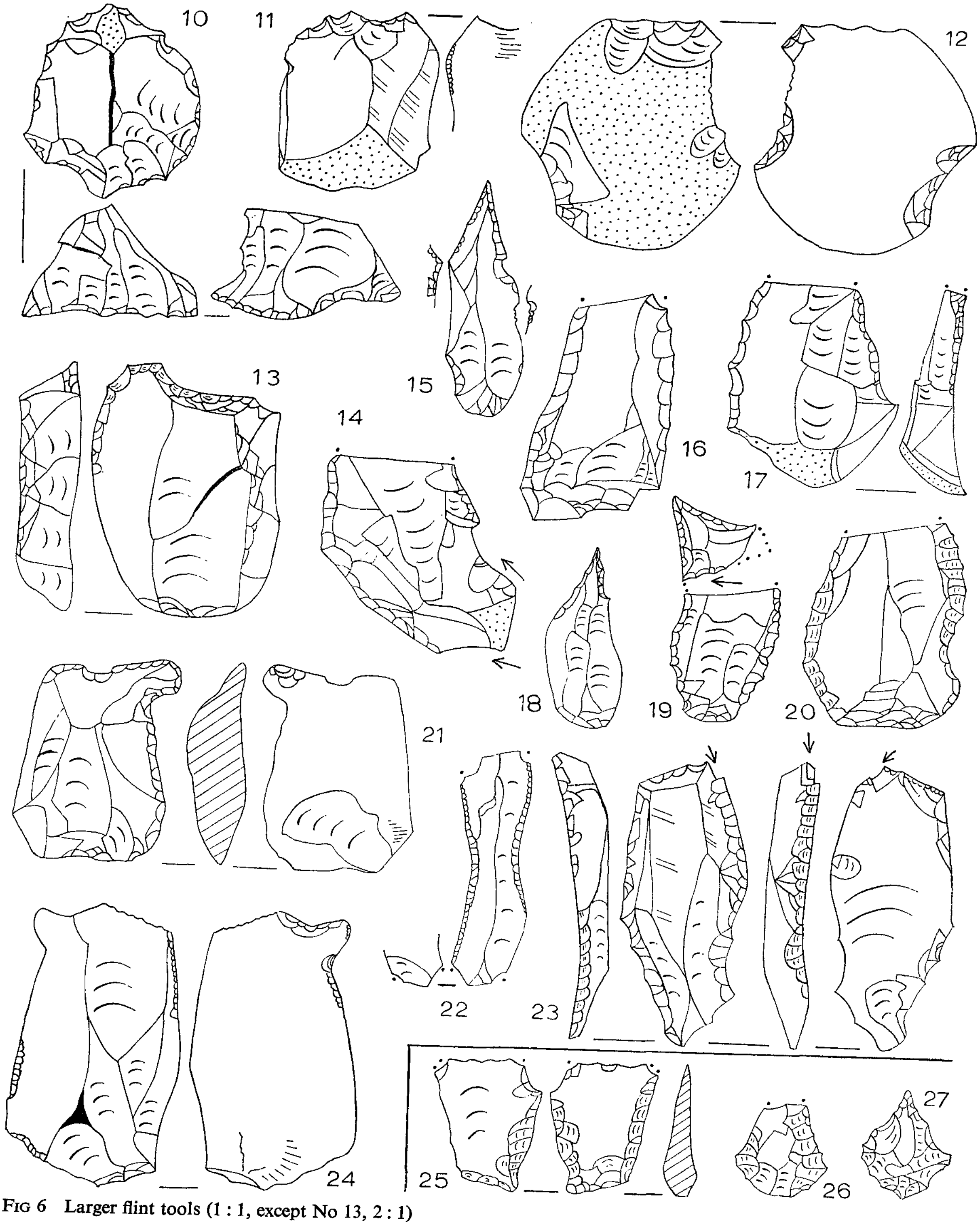

FIG 6 Larger flint tools (1 : 1, except No 13, 2 : 1)

their tools will be in the Middle and Upper levels. The Upper level, conversely, doubtless holds microliths from all occupations, covering perhaps from the seventh to the fourth millennia.

	Total	Described	Fragments described	Misc	Undescribed fragments
Upper	2125	582	424	20	1099
Middle	555	167	78	5	305
Lower	289	75	43	7	164
TOTAL	2969	824	545	32	1568

TABLE 1

Broad classification (%)

% Broad class	Described			Fragments			Broad description and notes on fragment recognition
	Upper	Middle	Lower	Upper	Middle	Lower	
1	45	41	46	31	29	24	Non geometric backed bladelets. Frags not easily recognised as few distinctive features
2	9	4	14	8	0	15	Rods. Square-section frags (Upper only) easy to recognise, flat less so
3	16	11	24	26	15	21	End-narrowed. Narrowed-end frags recognisable
4, 5, 6B–D, 7	33	41	19	40	51	42	Geometrics. Frags recognisable. Angular upper ends not further attributable (so in '6 Frags')
6 Frags	—	—	—	70	51	21	Sub-geometric. Most of '6 Frags' will be from 6A. Outside percentages, to avoid swamping
6A	40	42	27	—	—	—	Upper ends. Some will be 6B–D, and even 5, most will be 6A. Outside percentages

TABLE 2

Classes, summary (%)

% Class	Described U	Described M	Described L	Fragments U	Fragments M	Fragments L
1Ai	8	15	9	6	5	0
ii	5	6	5	0	10	0
1Bia	2	0	2	5	0	0
ib	3	6	2	2	2	3
iia	3	0	7	1	2	9
b	8	1	5	2	8	3
1C	2	2	4	1	0	0
1Di	4	3	4	1	0	6
ii	6	3	4	6	0	3
1E	4	5	4	7	2	0
2	9	4	14	8	0	15
3Ai	7	6	9	14	5	15
ii	0	0	2	0	0	0
Bi	1	0	2	1	0	0
ii	2	0	5	1	5	3
Ci	1	0	2	3	5	0
ii	1	1	0	1	0	0
D	4	4	4	6	0	3

% Class	Described U	Described M	Described L	Fragments U	Fragments M	Fragments L
4A	1	0	0	1	0	0
Bi	1	1	0	1	0	0
ii	3	4	2	0	0	0
5A	5	3	0	0	5	3
B	1	2	2	0	0	0
6	—	—	—	70	51	21
6A	40	42	27	—	—	—
Bi	1	0	0	2	0	3
ii	7	10	2	9	5	15
iiia	3	5	5	15	21	3
b	3	2	0	2	5	0
iva	1	1	0	2	2	0
b	1	1	4	5	0	6
c	1	0	0	0	0	0
6C	3	5	0	1	0	3
6D	—	—	—	2	13	9
i	0	1	0	0	0	0
ii	0	3	0	0	0	0
7	2	3	4	0	0	0

U – Upper; M – Middle; L – Lower

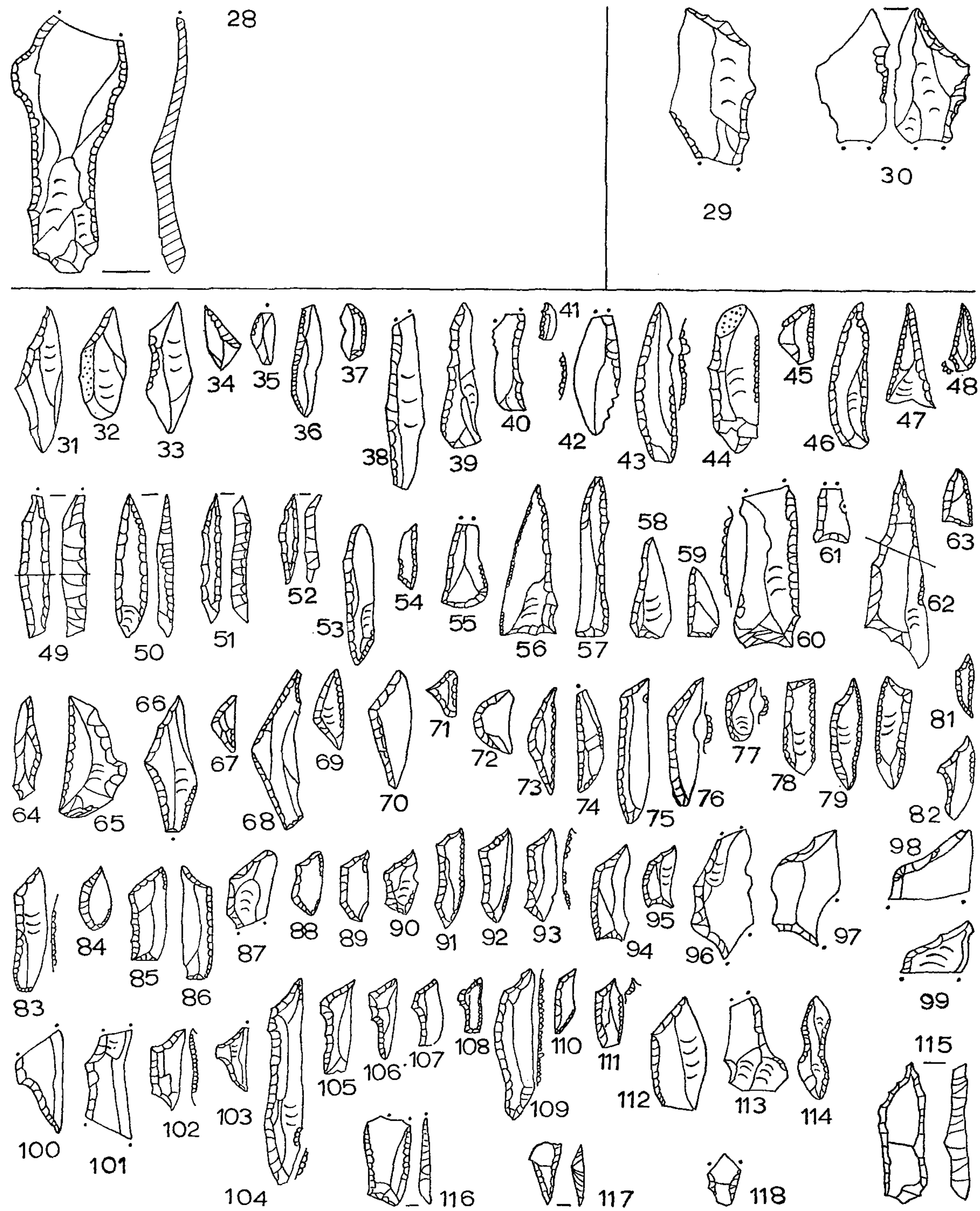

FIG 7 Tanged points (above, 1 : 1) and Upper microliths (1 : 1)

TABLE 3

Upper level microliths

Upper level	Quan-tity	Bulbar (b)	Prob Frag	Illustration nos and notes
1Ai	29	8	7	nos 31, 32 (b), 33 (lengthways trimming). Up to 1½ in (37 mm)
ii	17	7	0	Smallest are nos 34 & 35 (b)
1Bia	6	1	6	Poor. no 36
b	9	6	3	no 37, smallest, bulbar
iia	9	6	1	All straight. no 38. no 39 (b)
b	28	16	3	A few concave (no 40, b). no 41, complete (b)
1C	7	2	1	Mostly 1A, with a little opposed trimming (no 42)
1Di	14	7	1	Five convex (no 43), nine straight (no 44, b)
ii	21	15	7	no 45 (b)
1E	14	5	9	no 46 (b), no 47, no 48 (b). Cf 'Perforators'
2	31	4	10	Note 1. nos 49–52
3Ai	26	5	17	no 53 (b), largest, no 54, smallest. Varied
Bi	4	1	1	Poor. no 55
ii	6	0	1	Varied but well made. nos 56–9
Ci	2	2	4	nos 60 (b), 61 (b)
ii	3	0	1	Cf classes 5, 6. nos 62 (burnt, in two pieces), 63
D	13	4	8	Note 2. nos 64–5
4A	3	1	1	nos 66–7
4Bi	3	0	1	nos 68–9, much as last
ii	9	0	0	Note 3. nos 70–1
5A	16	0	0	nos 72 (patinated), 73 (typical shape; light patina)
5B	3	1	0	no 74. Well patinated
6	—	—	295	Note 4
A	231	78	—	Note 5. nos 75–82
6Bi	5	0	2	nos 83–4
ii	23	2	11	nos 85–6
iiia	11	1	19	Poor, small: nos 87–90. Frags are lower ends
b	11	2	3	Better than iiia. nos 91–3. Backs all trimmed (as iiia)
iva	3	0	3	nos 94–5
b	4	0	6	Note 6. nos 96–103
c	5	1	0	Note 7. nos 104–8
6C	10	3	1	Two large (no 109), rest small (no 110)
6D	0	0	2	Straight top edges (see N Carn)
7	7	2	0	no 111. Probably another form of perforator
TOTAL	582	180	424	

Notes to Upper microliths, Table 3:

(1) Class 2 are the most lightly patinated group; two at least have two patinas. The squarest in section are *mostly on good flint*, unpatinated or only lightly so. About two-thirds have been worked to produce sections more than averagely square. Fragments are flattish – square-sectioned pieces are recognisable and thus grouped with whole specimens. No 49 (longest, found in two pieces, poor flint), no 50 (flatter, fully patinated), no 51 (unpatinated pink flint), no 52 (one of smallest, fresh grey flint).

(2) Range from shouldered (no 64) to humped (no 65, b). Poor, varied specimens are probably varieties of other classes rather than standardised group. As N Carn nos 90–102.

(3) Nos 70 (inverse trimming), 71 (steeply trimmed all round, spurred). The larger microliths are well patinated (eg nos 66, 68, 70), the very small ones are comparatively fresh (eg nos 67, 69, 71).

(4) These are 6A–C upper-end fragments. The trimming of the top edge is often concave. Twenty-eight have concave backs.

(5) Concave backs: 37 (7 bulbar). Straight backs: 185 (67 bulbar). A further nine (4 bulbar) have miscellaneous

characteristics. Overall, only ten face left. An impression of the range is given by nos 75 (ideal specimen), 76–7 (notched), 78 (almost horizontal top, near class D), 79 (extreme top-edge concavity, with pointing, approaching class 7), 80 (faces left), 81 (smallest), 82 (concave back).

(6) The large trapezes all fall into this class in this level. No 96 is very unusual in having a trimmed back yet being so large, so that it could be an intermediate form (between Jura Phases 1B and 2). No 97 is perhaps the broadest trapeze yet found on Jura. Nos 98–9 (fragments) have similar workmanship. Nos 99–101 also had trimmed backs. No 102 is to be associated with nos 87–95. No 103 with untrimmed back may be simply unfinished (any of several classes).

(7) These are small shouldered points: nos 104–8. Compare with classes 3D (no 65), 6A (no 82) and the geometric trapezoids just described. Also with the large tanged points nos 28–30. Nos 105–6, 108, are unpatinated. No 108 is trimmed right around with great care.

(8) In addition there were 20 'Miscellaneous' specimens (10 bulbar). Five (no 112, see Lealt Bay no 45) had angular trimming but were not either of classes 1A or 6A. Nine had notches and spurs, probably for fastening and piercing; they differ from the humped specimens of 3D. One (no 113) may be a *pointe avec cran à la base* as N Carn no 167, rather than a micro-burin. No 114, complete, is a small *lame étranglée* (cf no 22). Four specimens are made across their basic material in *petit tranchet* fashion: nos 115 (? awl), 116, 117 (? unfinished), 118. *Petits tranchets* are found on Jura, eg Lealt Bay no 255.

Table 4

Middle level microliths

Middle level	Quantity	Bulbar (b)	Prob Frag	Illustration nos and notes
1Ai	15	7	2	Some good tools. nos 119 (b), 120
ii	6	0	4	no 121
1Bib	6	1	1	Poor. no 122
iia	0	0	1	no 123
b	1	0	3	Poor. no 124
1C	2	0	0	Poor. no 125
1Di	3	2	0	no 126 (b)
ii	3	2	0	no 127 (b)
1E	5	2	1	nos 128 (b, inverse trimming), 129, 130 (notched)
2	4	1	0	nos 131 (base shaped a little), 132, 133 (b), 134
3Ai	6	2	2	nos 135 (b), 136 (b)
Bii	0	0	2	no 137 (cf 6Bii base)
Ci	0	0	2	no 138 (cf 6Biva base)
ii	1	0	0	no 139, lightly concave
D	4	1	0	nos 140, 141 (? 1Aib), 142 (b, well-made notch)
4Bi	1	0	0	no 143
ii	4	1	0	nos 144, 145 (b), 146–7
5A	3	0	2	nos 148–9
B	2	1	0	nos 150–1
6	—	—	40	Four with concave backs
6A	70	20	—	Concave backs 14 (4b). Two face left (b). One notched.
Bii	10	2	2	no 152. Fairly similar set.
iiia	5	1	8	nos 153–7
b	2	1	2	nos 158 (b), 159
iva	1	0	1	no 160, well-made
b	1	0	0	no 161
6C	5	0	0	Well-made set. nos 162–6
6D	—	—	5	Upper ends, straight (no 167), rest concave (no 168)
i	1	0	0	no 169 (hinged at base)
ii	3	0	0	nos 170 (straight ends), 171 (concave/straight), 172 (convex/convex)
7	3	0	0	no 173
Total	167	44	78	

TABLE 5

Lower level microliths

Lower level	Quantity	Bulbar (b)	Prob Frag	Illustration nos and notes
1Ai	5	1	0	nos 174–5, 176 (b) One not oblique
ii	3	2	0	nos 177–8 (b), 179 (*écaillé* bulb)
1Bia	1	0	0	no 180
b	1	1	1	no 181 (b), 182
iia	4	1	3	nos 183, 184 (b, hinged), 185–6
b	3	3	1	nos 187 (b, hinged), 188 (b)
1C	2	2	0	Note 1. nos 189–90
1Di	2	1	2	nos 191 (b), 192–3 (fragments)
ii	2	1	1	nos 194 (b), 195, 196 (fragment)
1E	2	0	0	no 197 (hinged)
2	8	0	5	Note 2. nos 198–205
3Ai	5	2	5	Varied. no 206 (some trimming from above), 207 (b), 208, 209 (b)
ii	1	0	0	no 210 (complete)
3Bi	1	0	0	no 211, good example
ii	3	0	1	nos 212–14
3Ci	1	0	0	no 215, notched from above
3D	2	0	1	nos 216–17 (shouldered points), 218
4Bii	1	0	0	no 219 (*écaillé* bulb)
5A	0	0	1	Dubious
5B	1	0	0	no 220
6	—	—	9	Two (no 221) with concave backs (6A has three)
6A	20	9	—	nos 222, 223–4 (b), 225. Deepest (C5B). Highly trimmed
6Bi	0	0	1	no 226. Clearly distinguished from no 211 (3Bi)
ii	1	0	5	nos 227–30 (fragments)
iiia	3	0	1	nos 231, 232 (fragment?), 233
ivb	2	0	2	nos 234, 235–6 (fragments, dubious)
6C	0	0	1	no 237, dubious
6D	—	—	3	Upper ends, two concave (no 238), one straight
7	1	0	0	no 239
TOTAL	75	23	43	

Notes to Lower level microliths table 5:

(1) Notch on no 189 (*écaillé* bulb) may suggest micro-burin preparation yet notch and opposed retouch on no 190 suggest it is a finished tool (supported by N Carn nos 10–15).

(2) The clear tendency of this level's class I tools to be narrow reaches its extreme in class 2. However, these flattish forms are quite distinct from the square-sectioned rods of the Upper level. No 198, the squarest in section, has inverse trimming; nos 199–205. The fragments are just a little more dubious.

5 *Micro-burins*

Site / Class	LW1 U	LW1 M	LW1 L	LW1 U %	LW1 M %	LW1 L %	Lussa Bay %	Glenb. I %	Glenb. II %	N Carn %	Lealt Bay %	Lussa River %
1	391	112	56	71	70	64	66	54	75	64	71	69
2	19	5	?1	4	3	1	6	8	5	4	5	4
3	33	9	8	6	6	9	22	21	3	13	12	11
4	105	34	22	19	21	26	6	17	17	19	12	16
5	87	21	14	–	–	–	–	–	–	–	–	–
TOTAL	635	181	101	100	100	100	100	100	100	100	100	100
% to total microliths	30	32	35	30	32	35	24	16	30	35	27	28

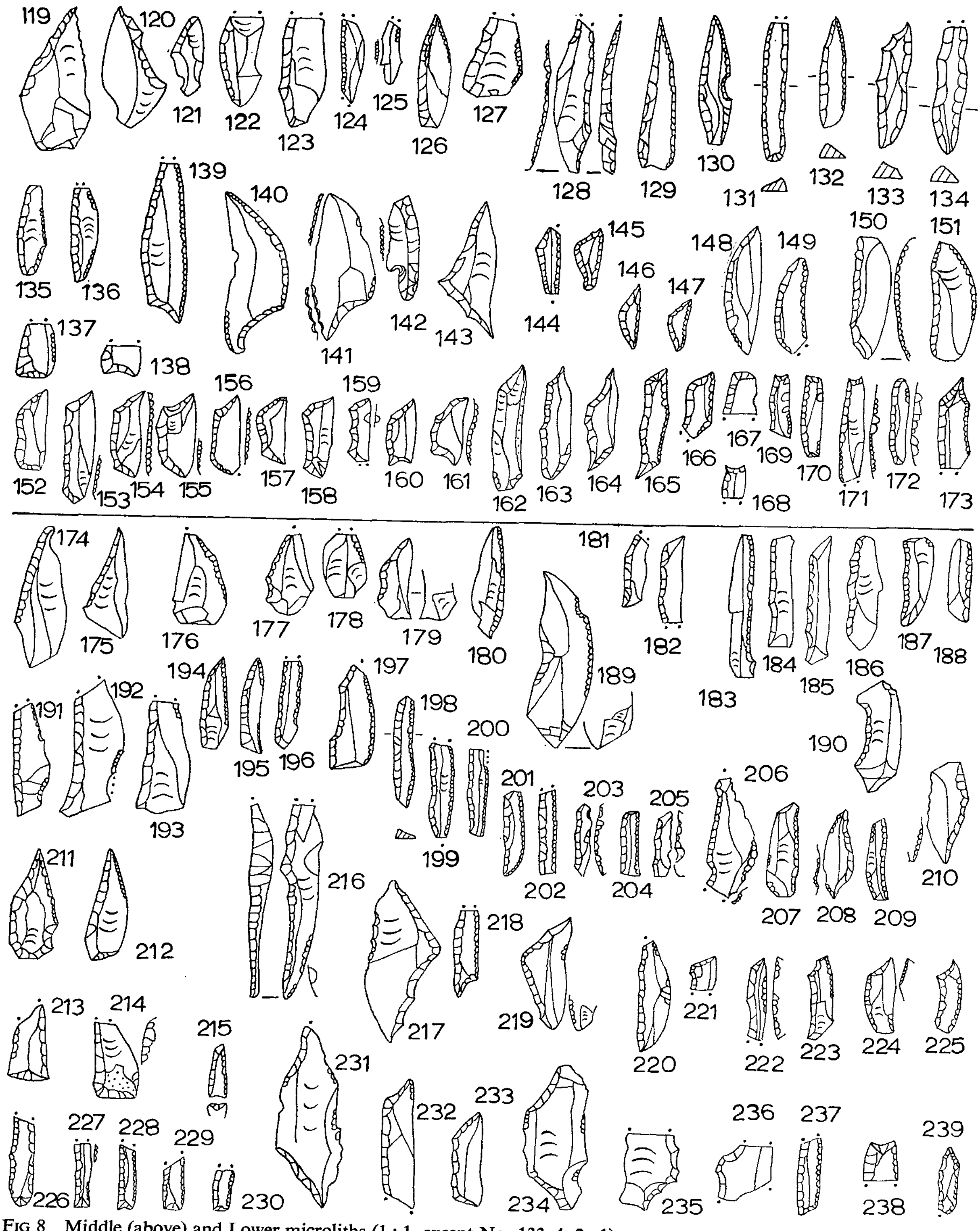

FIG 8 Middle (above) and Lower microliths (1 : 1, except Nos 133–4, 2 : 1)

Only very general preferences can be discerned in these statistics; no chronological trends can be distinguished. Assuming the material is fully representative, then one has to suppose that there were fluctuating factors (eg the types of microlith being made), with the micro-burin technique sometimes replaced by the thinning (*écaillé* technique) and chipping away of the bulbs. It would be possible to study the correlation between types of microlith and types of micro-burin at each site.

6 *Scrapers*

	End, Class 1A	End, Classes 1B, 2	End, Classes 3, 4, 5	End, Total	End %	Steep	On cores	Other	Total	Over 1 in (25 mm)
Upper	11	74	47 (2)	132 (2)	37	19 (4)	39	166 (12)	356 (18)	161
Middle	6	23 (2)	16	45 (2)	44	8 (3)	5	44 (4)	102 (9)	51
Lower	0	12	6 (1)	18 (1)	30	16 (7)	9	17 (2)	60 (10)	39
TOTAL	17	109 (2)	69 (3)	195 (5)	37	43 (14)	53	227 (18)	518 (37)	251

Toothed specimens in brackets; more than usual; often with two edges brought to a right-angle; on thick pieces; no attempt to count cores with teeth. Single-tooth (nosed) not counted in 'toothed'; worn specimens merge with 'perforators'.

Upper very varied, with many poor shapeless tools in lightly patinated or two-patina flint. End-scrapers poorer than in Middle, eg merely nibbled, though a few good ones. Class 2 has a fish-tailed tool. 'Other' includes three long side-scrapers, a fine 1½ in (37 mm) *lame étranglée* with *écaillé* bulb (no 22 – see also '4b Steeply trimmed' tools, Upper, Miscellaneous) and 23 in milky quartz, mostly large lumps.

Middle. Classes 1, 2 have many fine tools, comparable to Lussa Bay, including latter's nos 113, 140. 'Steep' includes a strong nosed tool and an example in milky quartz. 'Other' holds a double-nosed tool surely linked to the similar perforators at Lealt Bay (eg no 264); one quartz.

Lower. End-scrapers are varied, including one as Lussa Bay no 140. 'Steep' includes a tool on quartz crystal. Teeth on many. No 10 (steep, both convex and toothed edges), no 11 (toothed, on bulbar end).

Conclusions. End-scrapers proportionately poorer than at Lussa Bay and Glenbatrick (both Phase 1B sites), though there are many comparable tools; this was to be expected in the Upper level, thought to be a mixture of all periods. The scrapers are also rather larger than at the two mentioned sites. The Lower level has an unusually high proportion of steep scrapers, many with teeth.

7 *Blades*

	Total	Over 1⅛ in (28 mm)	End-narrowing	Under 1⅛ in (28 mm)	End-narrowing
Upper	868	123	37	745	51
Middle	255	56	13	199	14
Lower	196	43	16	153	9
TOTAL	1319	222	66	1097	74

Some end-narrowing may have been for perforator use but on many it is the butt which is reduced, without pointing (as on no 15). The trimming is angled at up to 30° to the long axis of the blade. Smaller versions occur amongst the microliths.

Upper blades are up to 2⅛ in (53 mm) long, broken; one with end-narrowing has two patinas. *Middle* up to 2⅜ in (58 mm), the two largest with *écaillé* bulbs; trimming varied, with the end-narrowing straight or with a single or double notch. *Lower* up to 2¼ in (55 mm), some good examples.

Conclusions. At Lussa Bay 47% were over 1⅛ in (28 mm), at Glenbatrick 46% and 50% (two floors), against lower proportions at all levels at Lussa Wood. The derived nature of the Lussa Bay collection could have caused non-retrieval of small blades but this can not be said of Glenbatrick.

8 *Flakes with end-narrowing*

Upper, 71; Middle, 19; Lower, 12. Continue the series of blades with similar trimming. A number are 'leaf-shaped', as usual.

9 *Gravers*

	Total	Corner blow	On thick pieces	*Bec à encoche*	Chipped nose	*Bec de flûte*	Centre blow	Shape-less
Upper	59	9	10	21	1	3	3	12
Middle	11	4	1	1	0	1	0	4
Lower	10	3	0	4	1	1	1	0
TOTAL	80	16	11	26	2	5	4	16

Upper. As usual, many do not fall into clear well-known groups. 'On thick pieces' is in fact a well-defined set: as Lealt Bay no 215. 'Corner blow' is limited to thin longish flakes and a piece of quartz. '*Bec à encoche*' has been kept, as in the past, to asymmetrical beaks, usually pointing sideways from the flake's long axis; symmetrical points are again treated as perforators. Centrally-placed working parts are in 'Centre blow' unless the facets intersect, when they are in '*Bec de flûte*'. Sharpening spalls were noted. One *bec à encoche* was on an older flake; this form is common late in the Jura sequence.

Middle were a very poor mixed group.

Lower are varied, some well-made. No 13, on a platform edge, has a cutting nose; it is comparable to no 211 of type F at Lealt Bay, there heavily patinated. At Lussa Bay the rolling had made graver identification difficult, assuming these were made there; Glenbatrick produced a few good gravers; the rather later N Carn had the best gravers so far excavated.

10 *Éclats écaillés*

Upper, 227 (35 milky quartz); Middle, 23 (1); Lower, 1 (0). Proportion to microliths: Upper 10%, Middle 4%, Lower negligible. The technique was also used for thinning bulbs and other parts of various classes of tools, as noted under these.

Upper. The use of milky quartz – available in large quantities all over Jura – is further evidence that the artefact is not merely a form of core left after intensive flaking of material in short supply. One is a flake off a rolled pebble of pitchstone, green with golden impurities. Sixteen flakes with *écaillé* bulbs, in addition. Ten *éclats écaillés* were clearly on older material, with as many again probably so – otherwise, many had their surfaces flaked all over by the *écaillé* technique, so that these would have lost any older patina. Some were scrapers also, or were originally so.

Middle. Some good examples but many just show flaking on a single face with the use of this sharpened edge. Again a high two-patina figure.

Lower specimen, no 12, in level 5A, is not typical. It anyway has a graver-like nose.

Conclusions. Agreement with general Jura theory: the form increases towards younger end, underlined by double-patination figures, by increasing proportion to microliths (though lower than at Lussa River, Jura's only site seemingly purely Phase 3) and by increasing use of milky quartz (this generally coming into greater use late in the sequence).

11 *Perforators*

Upper, 45; Middle, 20; Lower, 9. Only emphatically-worked tools are grouped here. Perforators have had to be distinguished from toothed scrapers (several points close together), nosed scrapers (single blunt snout), *bec à encoche* gravers (asymmetrical point on corner of flake, notch on one side only) and from spatulates (flat round-edged nose). The loss of the working tip by breakage or weathering hampers identification. Blades and flakes with very feeble trimming on their points are treated as 'Unclassifiable'. The 74 tools are unstandardised, made either on tips of naturally-pointed flakes or by accentuating spurs between flake facets on the edges of core-platforms and of scrapers.

About a third have steep trimming but are otherwise varied. Heavy specimens like nos 20, 17 (Upper, latter on a 'Larne Pick' flake) and nos 16, 14 (Lower, latter perhaps a graver too) are paralleled at other sites (Lussa Bay nos 65–6, N Carn nos 47–50) and recall the Star Carr 'awls'. No 19 (Upper) has a broken edge retrimmed (arrow) into a smaller point. No 18 (Upper) and no 15 (Middle) have microlithic trimming (class 1C), as have a number of the smaller steeply-trimmed 'perforators'.

16 *Points with 45° trimming right around edge*

These highly-worked points are similar to Lussa River no 173.

17 *Miscellaneous interesting artefacts*

Upper are longish flakes and blades which are highly trimmed but not classifiable, including a big triangle, a large crescent, two humped tools and a small specimen like a chopper head. *Lower* holds two short broad flakes trimmed into triangles (transverse use?) and also a humped tool.

18 *Neolithic and undiagnostic scale-flaked tools*

The polished axe chips were determined as Antrim porcellanite, Group IX (implement petrology no JRA 1); the raw material was thus from Tievebulliagh or Rathlin Island, both N Ireland. Two of the chips fitted together (D2, D3, with that sectioned coming from A2). A transverse point (no 25) was found in C2. Leaf-shaped points nos 26–7 came from C2 and A4 (latter the only Middle specimen); no 27 has the protrusion left for grasping the tool during manufacture (Stevenson 1957) and so may never have gone into use.

There were three upper tips from leaf-shaped or barbed-and-tanged points (Mercer 1974b, no 4); four quite shapeless scaled pieces (one on an older flake and one on milky quartz); three pieces seemingly with rough scaling; a complete tool so shapeless and ill-flaked as to be near an *éclat écaillé*.

The height distribution of scale-flaked work on Jura has been summarised (Mercer 1972, 8), the entries at 55 ft OD (17 m) being from Lussa Wood I. So far, on the island, only Neolithic tools have been identified on terrace T4, later scaled forms occurring at a lower height.

THE TYPOLOGICAL AND OCCUPATION SEQUENCE AT LUSSA WOOD I

Phase 1A. Tanged point, derived and rolled, believed to be made before the stone rings. Discussed shortly.

Phase 1B. Three stone rings with large trapeze-triangle microliths. Quartz crystal and pitchstone used. The rings held bone, limpet shell, hazel nut shell, red ochre. Date to about 6500 BC.

Phase 1B and/or 2. *Flat* narrow highly-trimmed microlithic bladelets. Also the 'Carn variants' (type 6D); from about 6000 BC at N Carn (Mercer 1972).

Phase 2. Heavy occupations and/or long period. Tools normal to this phase. Much milky quartz. Felsite/siltstone, hazel nut shell and red ochre.

Phase 3. Limited occupation, separated from Phase 2 on typology alone. Square-section rods, a double-notched hammerstone, *éclats écaillés* (light or double patination of these last supports late dating). Maximum of milky quartz. Late fourth millennium BC at Lussa River (a camp nearer the sea, available by this date and thus perhaps resulting in the lesser use of Lussa Wood I).

Neolithic. Arrowheads (leaf and transverse), polished axe fragments. First farming, perhaps – terrace T4 would be very suitable.

Unascribed. Platform of flat stones on the surface of the gravel and right below the peat.

There are three other notable features of the stone tools. Rolling and double patination, taken overall, show a long period is represented. It has been possible to discern a range of cores: Asymmetrical through Intermediate to Pyramidal. Finally, the wide range of trapezoidal tools should be noted: the large tanged point, the medium sized trapezes with untrimmed backs, the small fully trimmed trapezes, with a very few intermediate between the last two types.

NEW EVIDENCE FOR DISCUSSION

The unstratified nature of the occupation deposit has meant that division of the industrial sequence within Jura has been little advanced: some long proposed aspects have yet again been confirmed, a few new possibilities have been dimly discerned.

The greater contribution of the site lies in the four new elements it brings to the Jura investigations:

(1) the large rolled tanged point with late-Glacial British and European affinities (Jura Phase 1A).
(2) a mid-seventh millennium dating for an occupation at 53 ft (16 m) OD – to be considered against the Pre-Boreal (8300–7600 BC) sea-level, believed to have been perhaps 20 fathoms (120 ft, 37 m) below that of the present.
(3) the three stone rings, the earliest dated human occupation and structure in Scotland and apparently without British parallels.
(4) the close affinities between Lussa Wood I and the Isle of Téviec site (NW France).

LATE-GLACIAL JURA AND THE TANGED POINT

Several recent papers have shown that W Scotland was suitable for human colonisation from 11000 or 10500 BC. Kirk and Godwin (1963) described an organic level at Loch Droma (Ross and Cromarty) which, with a C14 date of 12810 ± 155 BP (Q-457), had not since been overlain by ice, although in a through valley. Kirk commented: 'In view of its location on the exposed, north-west Atlantic rim of Scotland one would expect . . . an onset of milder oceanic conditions at an earlier date than localities in the English Lowlands or the North European Plain'. He concluded his contribution: '. . . it would appear that in Northern Scotland the process of deglaciation was not unlike that established for Scandinavia, namely an early and rapid melt of the ice in western fjords and a longer survival in uplands east of the Atlantic watershed. The significance of such a possibility for plant, animal and human colonisation needs no stressing'.

Coope (summarised in Pennington 1974), working on beetle remains, noted that early in Zone I (12380–10000 BC) there was a rapid rise in temperature, from less than 10°C as a July average to almost 17°C, though winters may have remained cold.

Birks (1973) worked on the Isle of Skye, proposing a 'progressive amelioration from about 13,500 to 10,800 BP, perhaps with a temperature rise of 4–5°C . . . *Betula pubescens* at about 11,800 . . . implies that the mean July temperature was at least 12°C . . . *Littorella uniflora* . . . 14°C or more . . . about the present July values for lowland Skye'.

Pennington (1974) brought together the evidence for juniper surges from 13,000/12,500 BP at Loch Droma, on Skye, in the Lake District and in N Wales; these imply the onset of warm conditions 1,000 years before the opening of Zone II (Allerød). These appear to continue into the Allerød (12000–10800 BP) without a break.

Direct local evidence comes from a bore-hole sunk by the Institute of Geological Sciences (Binns *et al* 1974) between Jura and Colonsay; four other cores were taken near Skerryvore, Iona and Eigg. At the point sampled (present fig 1, lat 56° 4·93′ N, long 6° 3·75′ W) the water was c 16 fathoms (30 m) deep upon three sediment groupings totalling c 140 ft (43 m) in thickness. At the base was 30 ft (9 m) of till. Other cores next held sandy muds 'deposited in close association with ice' but these were lacking in the Colonsay sequence. Here, upon the till, lay 95 ft (29 m) of rather different sandy muds, broken down, on their micro-faunal (foraminifera) content, into three climatic zones: warm (considered Zone II), cold (III) and warm (post-III). A C14 age of 9961 ± 25 BP (SRR-117) was obtained for the top of this last sub-division, adjusted to eliminate derived material (Mesozoic) to 8680 BP. The paper considered the whole of the second grouping to have been deposited 'at some distance from the ice front'; even during the Zone III deposition there may well have been 'a continuously high level of suspended matter', suggesting melting and thus comparatively warmer conditions in the S Hebrides. On top of the second grouping came a thin deposit of modern sediments. These broad indicators are in line with the recent theory summarised above.

Clearly, then, Jura could have been occupied by man between 11000/10500 and 8800 BC; the Zone III comparative cold of 8800–8300 BC then intervened, to be followed by the Post-Glacial amelioration. Considering now sea-land relationships, the world-wide low sea-level of the full Devensian (Weichselian) glaciation would have continued into Zone I – but the position of this sea-level on the N Jura landmass, itself still greatly depressed by the ice, has not been established. However, the abrupt onset of the warm conditions, summarised above, early in the eleventh millennium BC, following by other local oscillations such as the Bølling, would have caused a small but rapid rise in world sea-level, bringing about a transgression of N Jura. Though the melting of the island's own ice would have led to isostatic recovery, the latter is thought to lag behind a related rise in sea-level; and this *was* a rapid melting. Thus any human occupation during this warm period of 2000 years would have been for most of the time on the beach of a rising sea-level. Shore line camp sites of the period will thus have been washed away and so only rolled stone tools will now be found, in the current versions of the old marine deposits. This aspect will be more fully examined in the next section.

Before describing the evidence for an actual human presence in N Jura during the warm phase of rising sea-level within the dates 11000/10500–8800 BC, the stone industry to be expected can be considered. Mellars (1974) wrote: '. . . it would appear most likely that the majority of the later upper palaeolithic occupation horizons in Britain occupy a comparatively short span of time which coincides with the later part of the Older Dryas phase and the succeeding Allerød interstadial (ie late Zone I plus Zone II of the Late-Glacial)'. This conclusion was based upon archaeological material in England and Wales, the known NW limit of European Upper Palaeolithic sites. The following dates (from S to N) mark the end of the British Upper Palaeolithic: Kent's Cavern, Torquay, 12325 BC (uniserial harpoon) and 10230 BC (biserial harpoon); Sun Hole, Cheddar, 10428 BC; Robin Hood's Cave, Derbyshire, 8640, 8440 BC; Anston Cave, Yorkshire, 7990, 7900, 7800 BC. These are all associated with Creswellian/Cheddarian tools, compared to the Allerød Zone II Tjongerian of Belgium and the Netherlands in some aspects and to the Older Dryas Zone I Hamburgian of Germany in others.

However, a second British industry, still without C14 dates, specialised in tanged points. The sites are mainly in S Britain, the best being on Hengistbury Head (fig 9, nos 10–12) near Bournemouth. Similar tanged points occur in NW Europe, for example in the Zone II Ahrensburgian industry (no 3) of coastal Germany and the Netherlands, also in the Zone II Bromme industry of Denmark. Nos 7–8 are from the French Magdalenian; C14 dates for this run on until around 8000 BC (Delibiras & Evin 1974). Other British specimens have been found in Kent (no 9) and on the Hebridean island of Tiree (no 13), 45 miles (70 km) NW of Jura.

The tanged point at Lussa Wood I (fig 7, no 28 & fig 9, no 14) was found at 53 ft (16 m) OD, on terrace T4 that is. It is lightly but clearly rolled, this water action being uniform on all parts, including upon the break-face of the missing tip. Its colouring is of marbled blues and greys, a state of medium patination. The tool is trimmed right around except along the bulb;

this is retained. The trimming is not steep, but nibbled – it is a very thin blade. It is not felt that the 'trimming' and thus the shape could be due to the rolling. The tool was 18 in (450 mm) below the surface of the gravels, level 5B, and – a further complication – lay within the central stone ring. Below it lay a considerable number of unrolled stone artefacts and 16 out of the 32

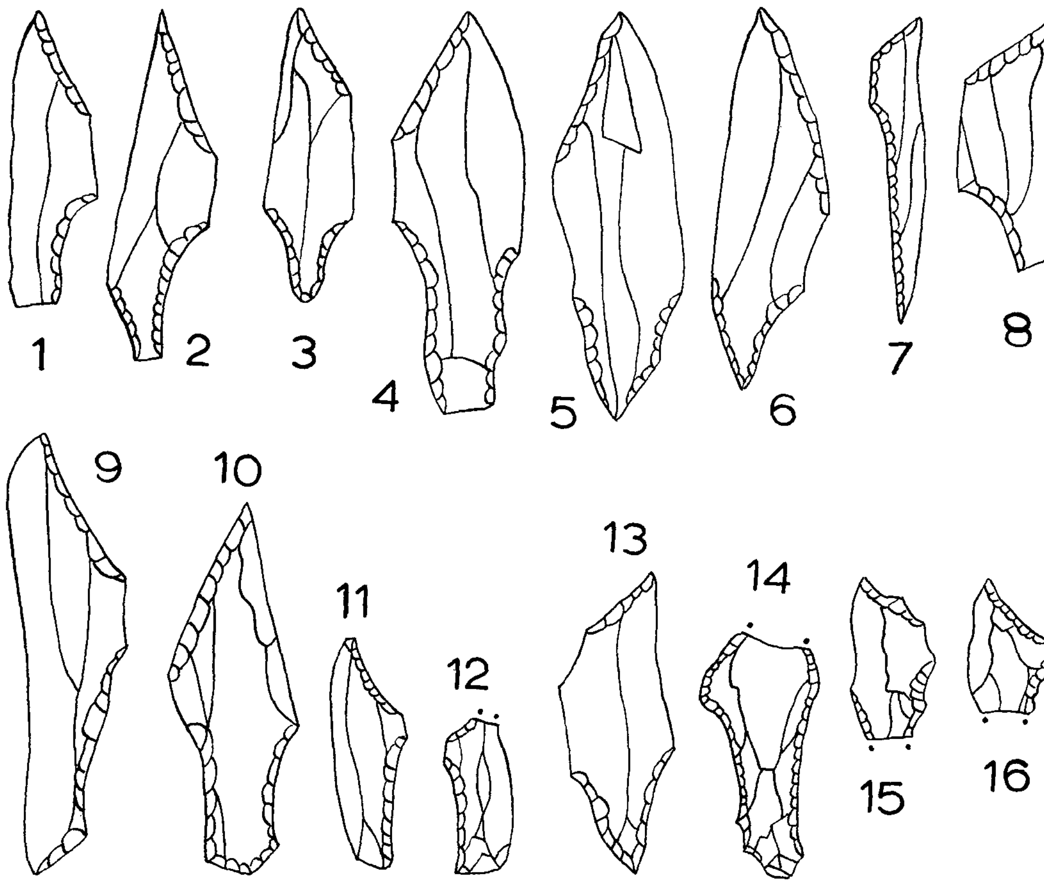

FIG 9 Some European tanged and shouldered points. Nos 1–2, Hamburg type; 3, Ahrensburg; 4, Lyngby; 5–6, Rissen (no scale). Nos 7–8, Magdalenian (Le Martinet, 5 : 6). No 9, Oare, Kent (5 : 6). Nos 10–12, Hengistbury Head (5 : 9). No 13, Isle of Tiree, Argyll (5 : 6). No 14, Lussa Wood I. Nos 15–16, Lussa Bay (5 : 6)

pieces of bone found in the rings. The normal exterior of the Lower level flints ranged between medium brown staining absorbed by heavy patina and light brown staining on light or no patina; the suggestion that at these sites it is length of exposure on the surface which decides patination, rather than age, is recalled (Mercer 1970, 28). The exterior of the tool, then, is not similar to that of the other flints; possibly the gloss and lack of patination kept off the staining.

Moving again from fact to hypothesis, it is suggested that the tanged point pre-dates the stone rings and their C14 dates, these supposed to be between 6500–7000 BC; the tools associated with the rings (medium-sized trapezes) are likely to represent a quite different industrial stage (Mercer 1970, table 3, for a summary of this aspect) and consequently are unlikely to have co-existed regionally, suggesting a good interval between them (Phases IA and IB). The presence of the tanged point in the ring can be accounted for by various combinations of factors:

(1) Manufacture upon the terrace or elsewhere.
(2) Rolling upon the terrace or elsewhere.
(3) Water or human transportation to the ring.
(4) These last contemporary with or later than the construction of the ring.
(5) Occurring by the ring by one means or another and, as this filled up, the tool was naturally incorporated in the filling.

Without more ado, the writer opts for discarding or loss of the tool on the terrace, rolling there and casual incorporation in the filling of the ring, this last possibly carried out by water action too.

Typologically, the tool is put forward as a tanged point (fig 9, no 14) related to those of S Britain and Europe, these probably centred on Zone II. It is suggested that its user migrated up the W coast of Britain during the long warm phase of 11000/10500–8800 BC. The tool was rolled in a subsequent short rapid transgression during that period. Following the Zone III cold to about 8300 BC, the least likely time for human presence in Scotland – though Eskimo-like summer expeditions to the always warmer Hebrides could have occurred – the fourth terrace was occupied by Phase IB people making the medium-sized trapeze-triangle points; the tanged point was casually included in their central ring, possibly by the action of the Early Post-Glacial sea, the terrace being the tidal flat during the period of maximum stand. The evidence for this is not only the number of rolled flint artefacts but that it would have been much easier to have made the ring-holding scoop in loose gravels than in, say, a wood; the final section will describe other Mesolithic scoops in tidal gravels. An alternative origin for the rolling of the tanged point is that this took place immediately before the rings were made (ie not long before 6500 BC), the rolling agent being the Early Post-Glacial transgression on its arrival at the fourth terrace.

Jura's only other tanged point of Late-Glacial aspect is Lussa Bay's no 88 (Mercer 1970a), shown again now on fig 7 as no 29 (1 : 1) and on fig 9 as no 15 (5 : 6). It is smaller, stouter, more steeply trimmed and more 'geometric' than the new Lussa Wood 1 point – and thus, taken overall, typologically later. Found derived and rolled on the *present* tidal flat, its origin is even less clear than that of the larger tanged point. Since the Lussa Bay report was written, no 30 (fig 7), also shown as no 16 on fig 9, has been washed up: though it has no recognisable opposed trimming on the tapering left lower edge (very thin), the difference in the angles of the two right-side trimmed edges suggests a tanged point rather than a Phase 1B trapeze. These three tools at present make up Jura's Phase 1A.

SHORE-LINE EVOLUTION AND THE EARLY SITES

Since this paper proposes human occupation of N Jura both within the period 11000/10500–8800 BC and again from at least about 7000 BC, a tentative perspective on the whole period should be attempted. After the climatic sequence, the major and related factor influencing the human settlement pattern – and the archaeological recovery of its remains – was the land-sea relationship. This also played its part in the distribution of animal life, further influencing human movement.

As fig 1 shows, if present sea-level were lowered 11 fathoms (20 m), this would join S Jura to Islay at two places and, effectively, Islay to Oronsay-Colonsay; a 20-fathom (37 m) regression would link N Jura direct to N Colonsay. A drop of only 30 fathoms (55 m) – not shown on the figure – would join SW Mull to N Ireland by a ridge linked to but W of a Jura–Islay–Colonsay landmass. However, reconstruction is hampered by lack of knowledge on the extent and chronology of the isostatic depression and recovery in the S Hebrides.

The first animals to reach the islands (and Ireland) may have crossed on ice-filled sounds or have come by way of Mull. Though, as noted, during the late Zone I and Zone II warmth the S Hebrides themselves would still have been isostatically depressed, in the earliest part of the period the sea-level may still have been low enough to have left exposed the Mull-Ireland corridor. This was well away to the W and thus perhaps always comparatively ice-free and, if so, correspondingly less depressed; certainly land-recovery has been much less on say Oronsay than around N Jura, the former correspondingly further from the Grampian ice-centre.

Unfortunately, the absence of caves on Mull and the Jura group (other than caves up to about 30 ft (9 m) OD, washed out by the Early Post-Glacial high sea) means that there is little hope of locating the bones of the early animals of the S Hebrides. In Ireland the remains of the brown bear, wolf and other species still pose questions on their approach route and time of arrival. If the animals survived the last main glacial stage in a refuge zone somewhere in the Hebrides–Ireland region, then the Mull–Ireland corridor may have led to their re-dispersal during the late Zone I and Zone II warmth. The animals would have been the quarry of the tanged-point hunters proposed in the previous section.

Moving forward in time, Zone III (8800–8300 BC) is usually considered too cold to allow human occupation of Scotland. Nevertheless, the final Palaeolithic dates for central England, given earlier, cover this period and the Zone III Hebridean summer at least would probably have been no more intolerable to hardy hunters than that of Derbyshire. If, to accord with the traditional climatic interpretation of Zone III, the tanged-point presence has been limited to the preceding warm period, it must be recalled that the French Magdalenian, producing at least shouldered points at some stage in its currency (fig 9), has C14 dates to about 8000 BC.

It is generally accepted that in Zone IV (8300–7600 BC) world sea-level stood about 20 fathoms (37 m) below that of the present. As stated, isostatic recovery since the melting of the ice has varied across the S Hebrides. N Jura has risen about 40 ft (12 m) since 6500 BC (as the terrace holding Lussa Wood I was then the tidal flat). Thus, in Zone IV, sea-level around N Jura would not have been 120 ft (37 m) lower against the land than at present, but probably less than 80 ft (25 m); the variation in recovery rate is a further unknown. But, as noted, a drop of only 11 fathoms (20 m) would allow passage between the S Hebrides.

However, a striking physical feature of present Jura leads one to wonder whether there may not in fact have been a shoreline around the present 20 fathom (37 m) mark, with implications for searchers for sites of the Zones IV–V periods (8300–7000 BC). Following the Grundale River from Lussa Wood to the W coast, one emerges at Corpach Bay: here a group of massive relict dunes (fig 1), without parallel on the Atlantic shore (and significantly not in the main Corpach Bay but on a nondescript stretch of coast to the S) could be the remnants of sands blown by the prevailing E-going (now at least) wind along Zone IV's hypothetical E–W shoreline between Jura and Colonsay. And it is exactly at Corpach (fig 1) that the Admiralty Chart brings ashore the present 20 fathom (37 m) line joining N Colonsay to Jura.

Decisive evidence could be sought in various ways. The Corpach bedrock is formed of quartzite, N Colonsay of sandstones, limestones, mudstones and grits, so that analyses of their respective sands (N Colonsay is ringed by extensive dunes) would probably produce similar results no matter whether those of Corpach had been blown along the NE beach of a common landmass or had formed from eroded local rocks. Determination of their transport by wind or water would be useful. The best proof of the existence of the landmass may await recovery in the hypothetical loch E of Oronsay (fig 1, hatching): sedimentary cores would show up brackish and freshwater phases, with datings. It was unlucky that the boring described in the last section was put down just N of the supposed loch; there the sediments, their surface at present c 16 fathoms (30 m) below sea-level, gave no recognised evidence for the landmass (ie an old land surface) but such material would anyway be unlikely to have survived the return of the sea – the 'loch' sediments are much more likely to retain the complete sequence of events.

Contact points and routes between the islands have been considered but only those of Jura have been examined in the field. It will be appreciated that it is the striking nature of the Corpach dunes which proposes them as the stub of an old shoreline and that evidence at other contact points will be different, perhaps less obvious; the relations between shores and wind will have been different, a major variant.

If a landmass existed in Zone IV, then it would have been transgressed from Zone V (opened 7600 BC), the water reaching its N Jura maximum stand by 6500 BC (in Zone VI), a very rapid rise. The next millennium's rise in sea-level – since the sea is thought to have gone on rising until the end of Zone VI (5500 BC) – was roughly balanced by the continuing land-recovery. Subsequently the land has risen to its present position against sea-level.

The Corpach dunes are banked from sea-level up to about 60 ft (18 m) OD. Perhaps there were massive dunes built up to around the present height against the cliffs during the hypothetical Zone IV landmass and these were too high and too extensive to be removed by the subsequent Zone V–VI transgression. The present fossil dunes would then be the undercut and slumped remnant. The obvious alternative theory for the origin of the dunes, invoking the Zone VIIb dune-forming conditions (3000–500 BC) has to explain why comparable dunes did not form along the rest of the W Jura coast.

The implications for archaeological work in the S Hebrides can now be summarised. Beach-sites earlier than about 6500 BC will have been washed away; fig 1 shows that, other than around N Jura, most of the present dry land would have been far from the sea and is correspondingly less likely to have been used as camping ground. Present Oronsay, with its sites dating from about 4600 BC, would have been well inland; on the modern dunes of Colonsay the author has found only a few *éclats écaillés*, probably from the same period as the Oronsay sites. Even slightly extended islands, not forming a single landmass, would result in the loss of the sites.

The presence of derived and rolled Phase IB artefacts (about 6000 worked flints have now been recovered) in the *present* tidal gravels of Lussa Bay is explicable in this way (Mercer 1970a). The rapid rise in sea-level from the washed away site (height unknown) to its maximum stand at Lussa Wood I (now at 53 ft (16 m) OD) presumably accounts for the lack of easily-discernible evolution between the stone industries.

Finally, this and the previous section can be summarised together. Caused by the rapid melting of the ice-sheets in the second half of Zone I and in Zone II, a fast transgression occurred; during this time, 11000/10500–8800 BC, the animals and the tanged-point users (Phase IA) reached Jura. Zone III, cold, saw a minor re-advance of the ice and corresponding minor fall in world sea-level; this is the least likely period for human presence on Jura (8800–8300 BC). The phase of comparatively low sea-level and of the existence of the S Hebridean landmass or at least of islands larger than at present would have reached its maximum in Zone IV (8300–7600 BC); Jura was again certainly habitable but, with the tanged point probably no longer current in NW Europe (and there are no datings yet for the S Britain examples), there is no evidence for the occupation of Jura in this period, or in Zone V (7600–7000 BC). Up to this date, most sites will have been washed away. Rather before 6500 BC, with sea-level still rapidly rising, Lussa Bay was occupied by Phase IB people; were it not for the subsequent land-recovery, higher in N Jura than anywhere else in the S Hebrides, their tools would probably now be in deep water. With sea-level at its maximum stand around the present 50 ft (16 m) mark, the Phase IB camp was made on the Lussa Wood tidal flat; the Glenbatrick IB camp at 59 ft (18 m) OD on the exposed W coast appears to have been made within the spray zone (Mercer 1974c, 15). The continuing land recovery against a comparatively-stationary sea-level brought the sites to their present heights.

THE AFFINITIES OF THE STONE RINGS

The rings have the earliest C14 datings in Scotland and are amongst the oldest stone structures in the British Isles. Extensive dug-out areas have occasionally been recorded at British Mesolithic sites but stone rings in small scoops appear unknown. The nearest parallel, geographically, is at the Island of Téviec site (Péquart 1937), off the Morbihan coast of NW France. Here there were many such rings (present pl 2b, fig 4c). The excavator described them as especially well-made and positioned on their own away from the many graves; 'First a hole of perfectly regular diameter was dug in the soil. Then, using material undoubtedly specially chosen . . . good stones, usually rectangular, 60–80 cm long and 20–30 cm wide . . . were placed on end, perfectly fitting, to form a regular circular facing.' That illustrated now was 50 cm deep. It held kitchen refuse (marked '3' in the figure) including burnt bone, charcoal (oak and wild pear) and also a wild pear fruit itself (Lussa River yielded a possible pear pip, Mercer 1971, 29). Halfway up there were flat burnt stones (4) lying on the burnt debris. The lowest deposits were 'cinders' (1) and 'charcoal earth' (2). 'These hearths served without doubt for the cooking of venison' (Péquart 1954). Two of the Téviec rings were contiguous (shown on the site plan). There were also even cobbled patches (the present fig 4d) similar to that at Lussa Wood I (fig 4b); the French structures were near graves and the excavator therefore considered them to be ritual hearths. The graves (the bodies laid out with antlers, red ochre, etc) did not resemble either of the two forms of construction found at Lussa Wood I. Téviec's stone tools were similar to those of Jura's Phase IB except that the trapezes included some squat types (Mercer 1970a, Table 3). Taken overall, greater similarity between two such distant sites could hardly be expected.

The Muge sites, on the Tagus, held many grave and hearth pits; sunk in the gravel and sand, these were not lined, due perhaps to the lack of large stones. At Moita do Sebastião (Roche 1960), for example, the cooking hearths were recorded as averaging 75 cm (2 ft 6 in) diameter and 40 to 65 cm depth (1 ft 4 in–2 ft 2 in); most were regular ellipses in shape, as one might expect of unlined scoops. A trapezoidal sunken area, 11·60 m by 3·20 m (38 ft by 10 ft), with post holes, sounds comparable to that at Low Clone, Wigtownshire (Cormack & Coles 1968). The Muge burials bore traces of red ochre. The Portuguese tools were also in turn comparable to those of Jura's Phase IB, other than for some squat specimens (Mercer 1970a, Table 3).

Both the Morbihan and the Tagus sites appear likely to be later than Jura's Phase IB. One of the most clear links between Jura and the continent's W coast occurs on Caldey Island, off S Wales; in typology and age, sites such as Daylight Rock (Lacaille & Grimes 1955) are similar to Jura's Phase IB. The association of all these and other sites in a microlithic but axeless W European coastal early Mesolithic phase has already been projected (Mercer 1970a).

This association having begun before 6500 BC, it may be that navigation between Brittany and SW England had been made easier by the lower sea-level and by the closed channel resulting from the land-bridges between E and SE England and the continent. It is still not known when exactly Jura's Phase IB industry was replaced by the Phase 2 tools but the island's varied evidence has already suggested that this had occurred by 6000 BC (Mercer 1972, 18). Jacobi (1976) has summarised the data for the arrival time of Britain's 'micro-triangle' industry (eg Jura's Phase 2, typified by class 6A microliths): it had crossed just before the land-bridges were broken (about 6400 BC), being dated by recent C14 assays to the first quarter of the seventh millennium BC, in N Ireland (but with axes) and NE England, and to the second half in the Pennines. In the latter, as the 'Narrow-blade' industry, it replaced the 'Broad-blade' industry, the latter now dated to the eighth millennium – the two industries and their interaction are paralleled on Jura (but for the existence of axes in the earlier period in the Pennines). On the comparatively remote island the exchange of industries appears to have taken place rather later, as one can expect.

However, in N Ireland the 'micro-triangle' industry is the earliest unambiguous evidence so far discovered (Mount Sandel: Woodman 1974); its C14 dates are 8725 ± 115 BP (UB–912) and 8555 ± 70 BP (UB-913). These dates, for an industry which would perhaps be termed Phase 2 on Jura, are earlier than those of Lussa Wood I for Phase IB: 8194 ± 350 BP, 7963 ± 200 BP. Once Mount Sandel's tools have been published it can be considered whether Jura's Phase 2 could have come from N Ireland – though the Irish site is said to have axes and none have been found on Jura (hunters only?). It is only 35 miles (55 km) from Mount Sandel to Islay – many cultural influences have certainly passed across this stretch of sea since this period. At any rate the Mount Sandel microliths utterly disappear from Ireland (Woodman 1977) around the time they appear on Jura, to be replaced by an industry ('Larnian' of Movius, 'Late Mesolithic' of Woodman) without parallel on Jura at any time.

However, since in NE England and the Pennines the 'micro-triangle' ('Narrow-Blade') industry is not accompanied by axes, these areas appear the more likely sources for Jura's Phase 2. In these regions the intrusive industry continues for several millennia, as it does on Jura.

In summary, then, Jura's Phase IB appears to have had contemporary W European coast associations linked by the west coast of Britain whilst Phase 2 may have arrived by way of south-east and central Britain. The origins and affinities of Phase 3, typified by the long square-sectioned fully-trimmed rod, await further evidence.

APPENDIX

Charcoal determination

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The material submitted was from the same horizon as that used for C14 assay. Three batches (2JA6/1, 2JA5, 2JC5B) were 'from members of the family Rosaceae, possibly Hawthorn, *Crataegus* species'. The fourth (2JD5A) was 'much harder to identify. Dr Cutler and I feel that it matches *Acer campestre* L. well in many features and would suggest this as a possible source'.

Pennington writes (1974) that 'the history of the . . . Rosaceae is still incompletely known, because only the most recent refinements in pollen recognition can separate the species of *Sorbus*, *Pyrus* and *Prunus* on pollen morphology. Macroscopic remains of the trees of these genera are known from the second half of the Post-Glacial but it seems likely that further refinements in pollen recognition will show that they were present in Britain in earlier periods'. *Acer campestre*, the maple, 'does not seem to be native in Scotland or Ireland' and was 'first recorded from England in Neolithic times' (Pennington 1974); both before and after the determinations, Dr Moore's attention was drawn to the seventh millennium C14 age of the charcoal.

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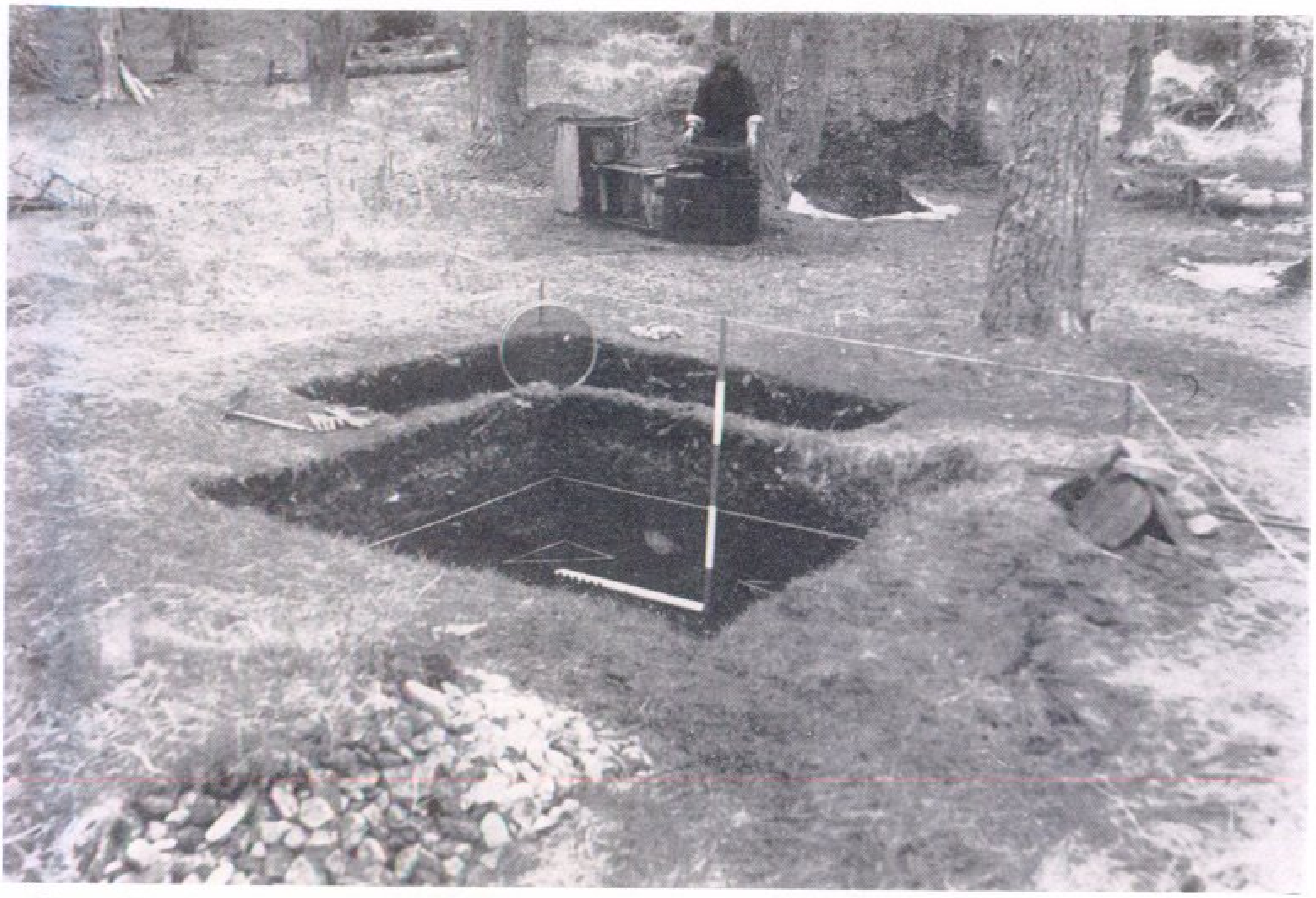
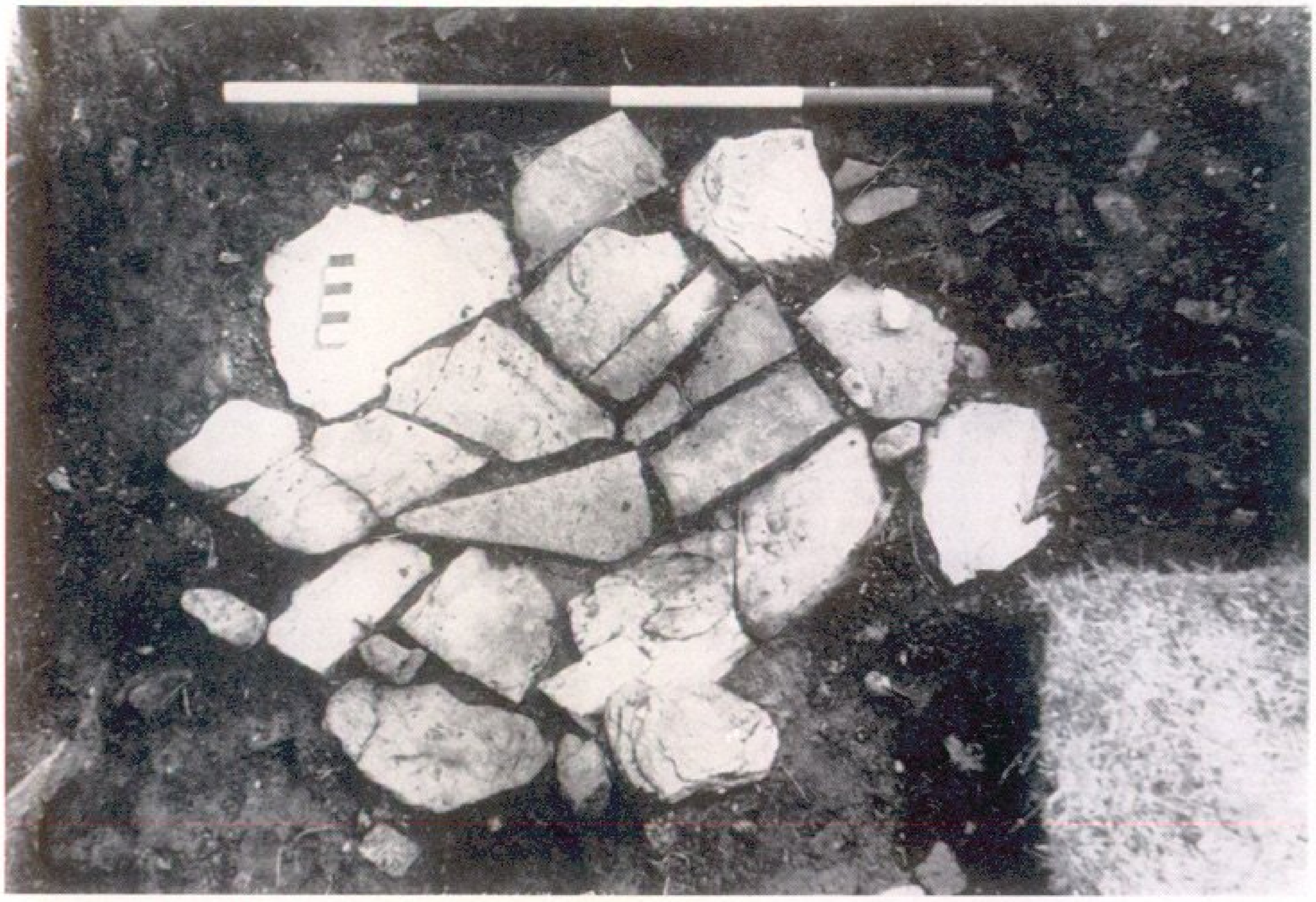


a Lussa Wood I, general view, first season

b Lussa Wood I, after excavation



a Lussa Wood I, cobbled patch

b Isle of Téviec, hearth (1930s)