# A Regression-time Stone-workers' Camp, 33 ft OD, Lussa River, Isle of Jura

*by* John Mercer

## SUMMARY

Lussa River has yielded a prolific quartz-flint industry, the microlithic element characterised by a highly-evolved rod, and carbonised organic relics, red ochre, pumice and environmental evidence. Geological position and typology suggest sub-division of Jura's microlithic period into three major phases, with Lussa River in the last; this sequence is supported by C14 dates. Since the new industry is numerically dominated by over three hundred bifacial *éclats écaillés*, many showing bipolar action, together with peculiar, standardised hammerstones, it can also be inferred that Lussa River was related to the Oronsay 'Obanian' sites, whose stone-flaking seemingly involved little else. Assuming microliths were absent, or at least very few, at the Oronsay camps, then the most likely theory seems to be that these were occupied by a people who, though associated with the Jura sites (deer, boar hunting?), were temporarily or permanently engaged in a pursuit (sealing?) which expended harpoon-heads, bone-working chisels (*éclats écaillés*) and elongated bevel-ended scraper-rubbers (the latter made on pebbles and long bones, perhaps used either because most suitable or because of an Oronsay or, as Lussa River suggests, a regional scarcity of flint). On Lealt Bay evidence the land-recovery movement began about the middle of the Atlantic period (*c* 4250 BC); Lussa River, a dry-season camp partially or wholly autumnal, belongs to the time when relative sea-level had certainly fallen away over 22 ft and possibly not more than 30 ft from its Lussa Glen washing limit of 55 ft OD. Lussa River C14: 2670±140 BC (BM–556), 2250±100 BC (BM–555), corrected ages 3450 BC, 2940 BC. The earlier of these, coupled with the Lealt Bay evidence, suggests, very tentatively, a N Jura land-recovery rate of 1 ft per 25–35 years, with the present Lussa Glen washing limit, *c* 15 ft OD, reached between 3200–2800 BC.

## INTRODUCTION

This is the third paper in a series[1a] which the writer is preparing on prehistoric human activity in N Jura. The first[1b] and second[2] reports provide essential background: fresh information on the area's Post-Glacial vegetation and land-sea movements and descriptions of two widely-differing microlithic industries, Lealt Bay and Lussa Bay.

## REPORT

### (a) *Location and description of site* (figs 1–4)

The Lussa River site (NGR NR 644873) stands at 33 ft OD on a narrow bedrock terrace on the W side of Lussa Glen, some 550 yds NE or up-valley of the Lussa Bay site and 2 miles SW of that at Lealt Bay (the papers on these sites described the region and Lussa Glen).

Lussa Wood, a mature plantation of spruce and pine said to be some sixty years old (in the background of the photographs of Lussa Bay[2]), covers the immediate area of the site, which lies at the SE corner of the trees. The lowest conifers stand on the back of a gravel terrace which,

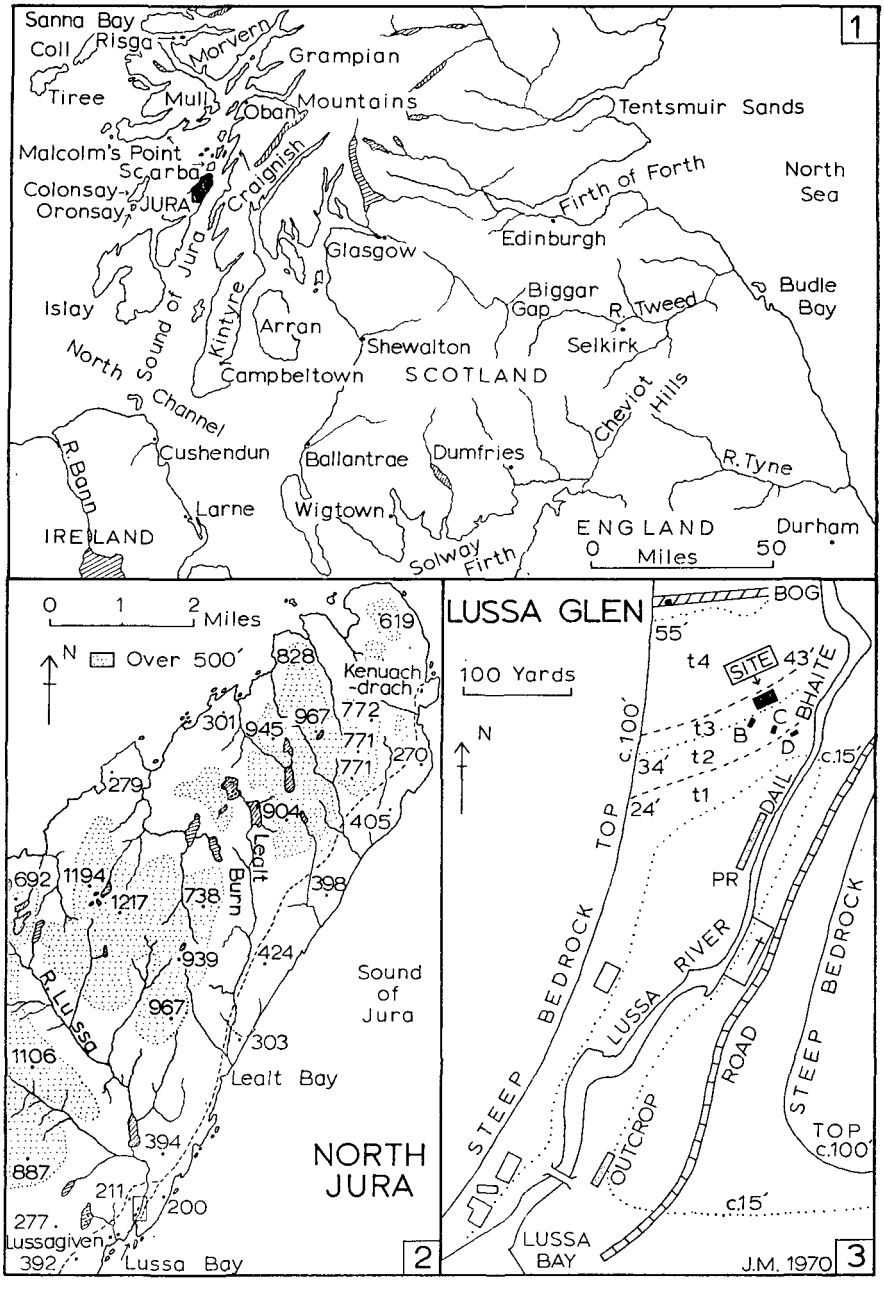



FIG 1 S Scotland with NE Ireland; FIG 2 N Jura; FIG 3 mouth of Lussa Glen

500 yd long, reaches to the foreshore at Lussa Bay; up the valley, the plantation continues far above the site, to about 100 ft OD. Local information is that, prior to the planting of the wood, the lower half of the area was cultivated, and traces of agriculture are in fact still to be seen there.

No caves or superficial relics of ancient habitation were noted in the valley.

*(b) Geological and pollen evidence* (pl 1a, figs 3–6)

Between OD and the 55 ft OD washing limit (described shortly) of the highest Post-Glacial transgression, Lussa Glen divides into four terraces. The lowest seems likely to consist of deep gravels, the three uppermost are bedrock forms comparatively thinly coated with more or less unconsolidated materials.

The upper end of the lowest and most extensive terrace (T1) has been mapped by the OS (6 in, 1878) as 'Dail Bhàite' or 'the Drowned Field'. To explain this suggestive name local people now point to the marshy corner of a large field about 100 yd S of the site, or just W of the porphyrite ridge. Yet, for a boggy island like Jura, the probably more extensive Dail Bhàite area is reasonably dry, not remarkably wet. In fact, where the river enters the upper region of the lowest terrace the latter bears long runnels parallel to the watercourse, and trench D, dug in one of the runnels, revealed 27 in of a mixture of sand and silt (on massive boulders, with 2 rolled flint artefacts, one heavily patinated, the other fresh) with its top at 18 ft OD; the runnels probably link with the inactive river-channel to the W of the porphyrite ridge. Probably then, Dail Bhàite was originally thus called after the area's tendency to flooding by the river, or just possibly by an extraordinarily high sea, or by one acting against the other. The archaeological significance of this is that any T1 riverside camps are likely to have been washed away, a point that will be returned to shortly.

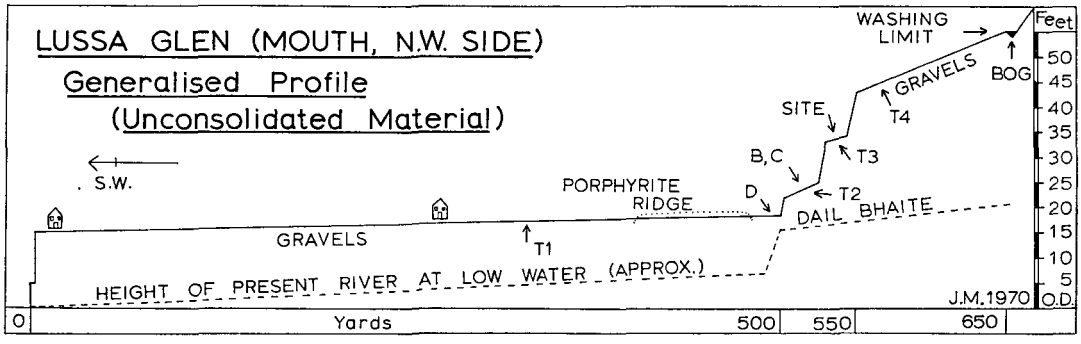



FIG 4 Generalised profile, Lussa Glen

The second terrace up (T2) is crescentic, the convexity seawards, and about 25 yd wide below the site. Trenches B and C revealed, upon bedrock, 15 and 30 in respectively of medium and fine gravel (holding a total of 29 flint artefacts, of which all but 9 minute chips were markedly rolled) with a maximum height of 25 ft OD and a minimum of 22 ft OD. The topography is such that neither this nor either of the two terraces above could feasibly be flooded by the river (*sensu stricto*) either at present or during any Post-Glacial land-sea adjustment, and all unconsolidated materials on them must be considered of estuarine origin (i.e. resulting from the highest Post-Glacial transgression).

The third or site terrace (T3) is crescentic, parallel to that below. The excavation showed that the site's zone of the terrace has a gully as its bedrock form. Its long axis along that of the valley, the gully dipped towards and was widest at the seaward end. It was found to be filled and levelled by a stony sand (described later).

The fourth terrace (T4) is much more extensive than the previous two, a level square covering the 100 yd from the valley's W wall to the river (which, there, runs past about 30 ft below) and extending the same distance in the upstream direction. The terrace gravels (much

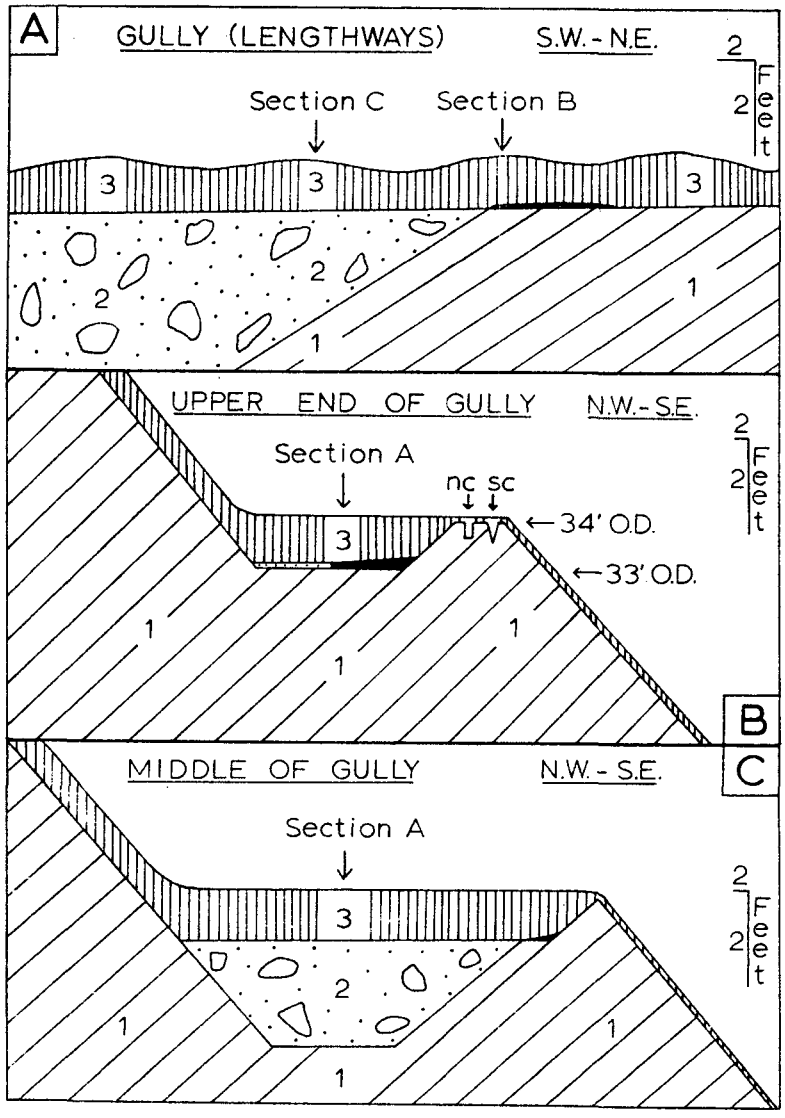



FIG 5 Sections, Lussa River

deeper than on T2 and T3, and panned to within a foot of the surface) must on topographical grounds and because they contain flint artefacts to a depth of several feet (under excavation) be considered to have been laid down by the transgression. These gravels, which reach their maximum (55 ft OD) as a mound just S of the E end of a narrow cross-going bog, are considered to mark the washing limit. Other evidence is that behind the strip of bog there is a change to a steeper slope, whilst there is no bedrock notch where the bog's stream falls into the river, suggesting such a drainage pattern is youthful.

Samples for pollen analysis were obtained from the bog at a point about 11 yd from the W wall of the valley, where the peat was 3 ft 6 in deep (fig 3, black square). Fig 6 suggests the peat began at the end of the Sub-Boreal period. Had conditions there remained unchanged

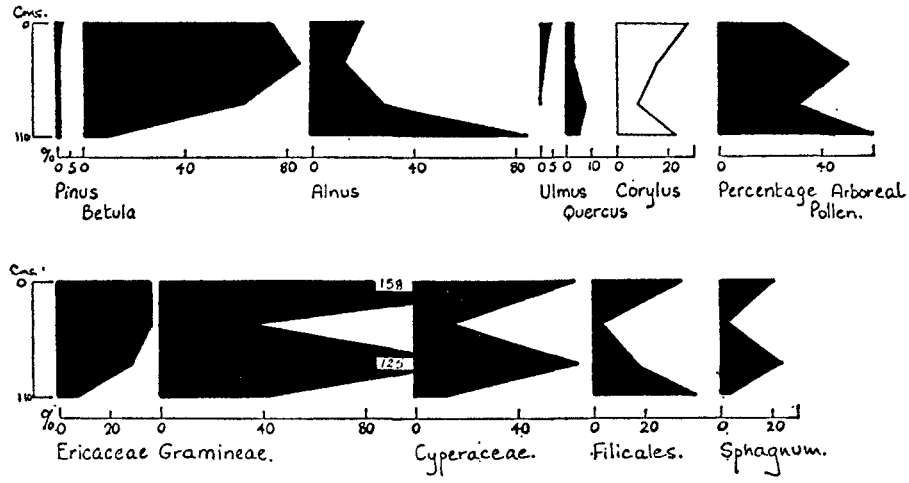



FIG 6 Pollen diagram, Lussa Wood bog

throughout Post-Glacial time this would be a surprisingly delayed start, and enforced cross-going, slowly-blocked drainage behind the Boreal-Atlantic transgression's washing-limit gravels seems more likely.

The evidence of this section allows the site to be dated in geological terms. The occupation belongs to that moment during the regression when the sea's storm reach had dropped from 55 ft OD to below the site-height of 33 ft OD (since the considerable quantity of buoyant organic occupation relics would otherwise have been washed away), but not below 25 ft (since trenches B and C, with a maximum height of 25 ft OD and immediately subjacent to the site, produced only a few very rolled artefacts).

In terms of absolute years, the Lealt Bay evidence was that peat had begun there at 47 ft OD during the Atlantic phase, and as a working date it was suggested that the transgression had started to fall away by the middle of that period (*c* 4250 BC). In Lussa Glen it had effectively dropped between 22 ft and 30 ft by the time of the occupation under discussion, so that one can expect this new site to be considerably later than mid-Atlantic (time-height land-recovery rates still need to be worked out for the region's isobases).

Peat did not overlie the site, so that direct dating by pollen analysis was not possible. Radiocarbon assay gave dates of $2670 \pm 140$ BC (BM–556) and $2250 \pm 100$ BC (BM–555) for the occupation material; corrected dates are 3450 BC, 2940 BC.[3a]

(c) *Correlation with Lealt Bay geology* (fig 4)

Lussa Glen closely follows the characteristics of the other and smaller N end valley-mouths as to height, but horizontal features are of course much expanded in area. Lussa Glen's T4 equates with the Lealt Bay Main Area terrace, and the back angle of T3 (on the lower arm of which stands the Lussa River site) corresponds to Lealt Bay's point 3, the back of the pre-Recent platform. However, where Lealt Bay has only a single well-defined terrace between points 2 and 3, Lussa Glen has three (T1–3).

The presence of a separate, sand-surfaced terrace at 33 ft OD in Lussa Glen may be expected to have encouraged comparatively late camps to move down onto it in the wake of the regression, when at Lealt Bay (where horizontal reclamation was much slower) such people

may be felt to have preferred to continue using the higher, much-occupied Main Area terrace. The typological consequences to be expected would then be that the new Lussa River industry would represent a late facies which at Lealt Bay would have been inextricable in the stratification from earlier occupations. As will be seen from the typology section, one can in fact feel that the new industry includes the tools hazarded as 'late' at Lealt Bay.

(d) *Physical relationship to the Lussa Bay site*

The excavation produced two items of evidence. Firstly, since at least that zone of terrace T1 which is adjacent to the watercourse has probably been much scoured by floods, a proportion of any T1 river-bank occupation material (locally 'late') is likely to have been carried down to Lussa Bay and thus to be included in the report on that site (yet, as will be seen, Lussa Bay and Lussa River are typologically strikingly distinct).

Secondly, trench C yielded a battered, rolled flint (nondescript typologically) bearing the dense orange skin (at the unusual stage of sloughing off) typical of many of the Lussa Bay specimens. Its condition strongly contrasted with the rest of the site's flints (including all other rolled specimens) and the obvious conclusion was that it was already very ancient at the time of the Lussa River occupation (supporting the writer's proposal of a pre-maximum-stand element in the Lussa Bay collection). The rejoicing at the find was cut across by a sceptical note from John Hewish, doubting such certainty at the flint's origin. A resident of Lussa Bay appeared a little later: the flint, deliberately mixed with several hundred others from Lussa River, was unhesitatingly identified. Of course, the specimen does not indicate *which* Lussa Bay artefacts were pre-maximum-stand. Since the Lussa River excavation was finished, a crack in the T3–T4 slope behind – under excavation as part of the site on T4 above – has yielded a specimen in identical conditions: a complete 'arched tip-heavy flake' with many parallels at Lussa Bay but only two at Lussa River (no. 17).

(e) *The excavation of the occupied area* (pl 1a, fig 5)

The ridges and furrows of cross-contour lazy-beds covered the site-zone of the now thinly-wooded terrace, except where the bedrock outer wall of the gully reached or came very close to the surface. A total of 133 sq ft of T3 trenches was dug and, in search of pockets and cracks which would have preserved material undisturbed, a further 25 sq ft of the near-surface bedrock was cleared.

The thin turf bore small self-seeded birches and rowans, with a few poorly-developed clumps of rushes. For the ridges, the trenches revealed a uniform *upper layer* (fig 5, 3) of about a foot of leached, brown, friable loam with many stones, mostly very rolled, and containing occupation material evenly distributed throughout; in the furrows the depth fell to a few inches. The whole of this upper layer material was taken the 50 yd to the river, which had been partially piped to a shelter on the bank, and there exhaustively washed in $\frac{1}{8}$-in mesh sieves.

Most of the trenches showed as a *lower layer* (fig 5, 2) a dun-coloured mixture of sand, silt and clay with stones similar to the upper layer. In the middle of the terrace and halfway down the gully to the latter's junction with the terrace below, this lower layer was found to be 28 in thick and to lie on bedrock (fig 5, 1). No artefacts were ever found in this layer, of which a small amount was sieved. It seemed likely that the present 'upper' and 'lower' layers were in origin a single homogenous deposit of marine origin, subsequent events altering the character of the upper part.

At the upper end of the soil-filled gully where, as described above, the bedrock outer wall reaches up to the surface, an *in situ*, dark reddish-brown hardpan[3b] (fig 5, black), up to 3 in

thick, coated the rock, lying directly below the standard upper layer. It adhered to the ledges and cracks in the inner face of the bedrock outer wall and was found to extend, gradually lessening in width, for at least 12 ft in a SW direction. Always covered by the upper layer, it occasionally lay upon an inch or two of sand. The pan's SW limit was not reached as that end of the gully was not excavated. Along the terrace north-eastwards the pan extended only a few feet beyond the head of the gully. Loose lumps of the pan were common throughout the upper layer of the immediate area, doubtless having been prised up by the makers of the lazy-beds. The square yard of *in situ* pan which was removed was all preserved for examination; a sample was found to be 'very rich in phosphate'[4] and the minute amount so far examined held a considerable quantity of occupation relics, in particular carbonised organic material. The latter concentration is thought to be camp-fire remains.

The partial clearing of the surface of the bedrock outer wall of the gully revealed a triangular crack (fig 5, SC), 12 by 12 by 6 in in area, which tapered downwards 6 in into the rock, and a square-cornered trough-shaped depression (fig 5, NC) 10 in across, 4 in deep into the rock and perhaps about 2 ft long (not yet fully cleared). In each case a plug of soil 2 in deep was removed (over the whole of SC and over 10 in length of NC) and discarded. The fillings below, to the bottom, were then each removed. Appendix 1 shows the large quantity of relics each sample held, in spite of their limited volume. Both depressions are closed-ended and probably waterlogged for most of the year, and therefore are unlikely to have been the dwellings of small mammals. The narrow, flat expanse of rock, raised a little higher than the adjacent hardpanned charcoal concentration, is the obvious place for preparing and eating food.

A trench dug to the base of the very steep slope which leads up onto the fourth terrace showed, in the top layer against the slope, a faint multi-banding. Hillwash must have followed the departure of the sea, the occupation, the agriculture in particular, and finally the tree planting. This undoubted admixture of soil from above is unfortunate since, as has been mentioned, the fourth terrace has also been occupied: it is probable that the present industry includes a small proportion of artefacts from that upper occupation. However, these reports do attempt to base major conclusions only on general trends as shown by large percentages, and a little contamination ought not to alter the broad picture.

(f) *Summary of the finds*

(1) Organic remains from various soil samples (Appendices 1–4).
(2) One piece of (?) grooved charcoal (fig 13, no. 246), very base of upper layer.
(3) Two pounds (dry) of loose, upper layer charcoal. Wood identifications of these and next charcoals: Appendix 4.
(4) Charcoal in the *in situ* pan, a sample giving $4200 \pm 100$ BP (BM–555), and a large piece, not panned, lying on pan fringe in upper-lower layer's transition and also considered undisturbed, $4620 \pm 140$ BP (BM–556), both based on 5568 year half-life.
(5) Eight oz (dry) of upper layer, carbonised hazel-nut shells (approx. 1000 fragments). Very rarely ripening on Jura today, one wonders whether the nuts were not perhaps so unripe when picked as to need roasting; it is borne in mind that the region's climate was more favourable to the hazel during a part of Early Post-Glacial time than at present. Also noted throughout *in situ* pan. (Appendix 4.)
(6) A few carbonised acorns (*Quercus* sp.). Loose in upper layer. Roasting is one way of making acorns edible. (Appendix 4.)
(7) Eight pieces of soft red ochre, loose in upper layer (Appendix 5). The trace of red matter on a flat stone, reported at Lealt Bay, now seems likely to be red ochre. The

site to be reported next has yielded two pieces. Red-violet staining and loose colour also occurs naturally at all sites.

(8) A hard red stone (2 oz, possibly humanly rubbed and grooved) and three very small, hard, yellow-red stones (Appendix 5). All colour water red on mere washing. Upper layer.

(9) A nondescript flint artefact bearing a small patch of glossy red matter investigated for its superficial resemblance to a mixture of resin and ochre (Appendix 6). Upper layer.

(10) A piece of dark brown pumice, 1·5 in in maximum dimension (Appendix 7). Upper layer.

(11) Quartzite implements (fig 7). Upper layer.

(12) Quartz and flint artefacts (weight ratio 8 : 1) and five of green pitchstone. Figs 7–13. Throughout upper layer, a few in the hardpan.

(13) A black glass bead with latitude-wise parallel scratches (fig 13, no. 247). Site terrace (T3), extreme SW trench, loose in the upper layer. (Appendix 8.)

(14) A human hair, black (Appendix 9). A nondescript flint flake bore an iron concretion (perhaps deposited around a rootlet): the hair ran through the concretion. Loose in the upper layer (pl 1, b, c).

It is thought that a special investigation of the contents of the pan and cracks would provide valuable information, becoming the subject of a separate report. The listed items were extracted from less than half a cubic foot of soils in total (after grading by wet sieving, the material was slowly dried, then immersed again, the organic part thereupon floating and being easily removed as required for examination).

(g) *The Quartzite Implements*

Eleven have served as hammers and anvils.

| *Lenticulates Ref.:* | A | B | C | D | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Battered centre both faces | | Yes | Yes | Yes | ? | | | Yes | | Yes | Yes |
| Battered centre one face | End | | | | Yes | Yes | Yes | | | | |
| Circumference battered | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Weight (oz) | 11½ | 11 | 11 | 11 | 8 | 9 | 9 | 7 | 6 | 6 | 5 |
| Length (in) | 3·7 | 2·8 | 3·6 | 3·1 | 3·5 | 2·9 | 3 | 2·5 | 2·4 | 2·8 | 2·5 |
| Breadth (in) | 2·3 | 2·5 | 2·5 | 2·3 | 2·5 | 2·6 | 2·2 | 2·2 | 2 | 1·7 | 1·8 |
| Thickness (in) | 1·4 | 1·5 | 1·3 | 1·4 | 1·0 | 1·1 | 1·2 | 1·3 | 1·3 | 1·1 | 1·0 |
| Illustration no. (fig 7) | | | 2 | | | | | | | | 1 |

All look like beach cobbles, such as occur naturally in the terrace deposit. Specimen E has sloughed off about 2 oz and is fire-cracked, as is K (so were a few other cobbles). Specimens B, L are the most used, followed by C, H; specimen L is covered with a dirty gloss, suggesting it and presumably some or all of the others were held in the hand. The specimens range from certain to doubtfully acceptable.

A twelfth lenticulate, 7 oz and plano-convex, has two large chips out of each face (they go halfway only through the stone) at the middle of each long edge; a 1 in diameter plano-convex epidiorite disc also bears two large chips, similar except that they go right through, thus forming a waist; the pair suggest net-sinkers. Finally, a 6lb rolled cobble has chopper-like edge-flaking. All three are very doubtful.

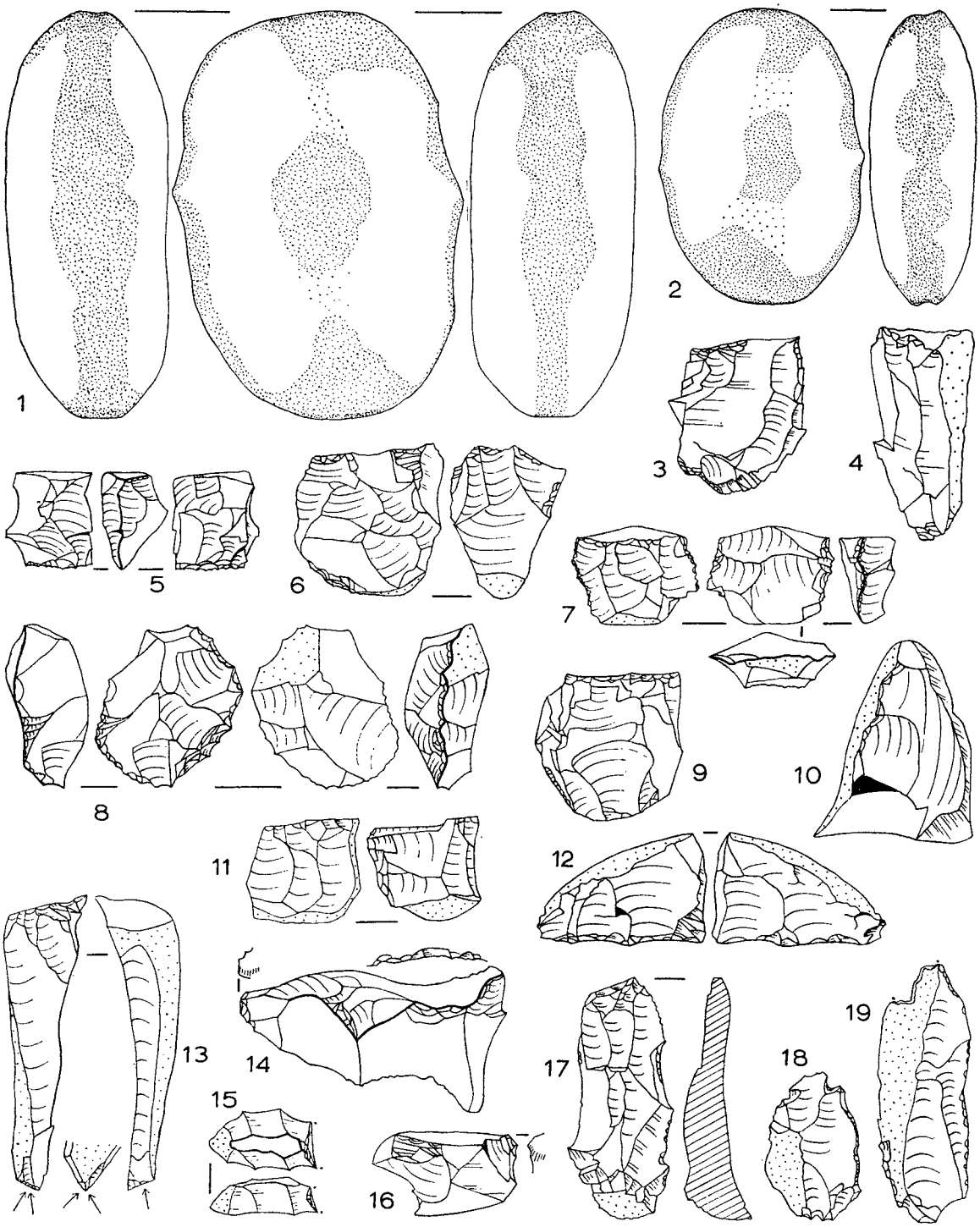



FIG 7 Quartzite tools, nos 1 ($\frac{1}{4}$), 2 ($\frac{1}{8}$), cores, knapping-technique evidence $\frac{1}{2}$

(h) *The Raw Quartz and Flint*

Artefacts from trenches B, C and D are not included.

There was 72 lb of milky quartz and ½ oz (40 pieces, no. 222) of broken-up colourless crystal, each of the qualities described from Lealt Bay. The quartz-flint proportions (72 : 9) contrast strongly with those at Lealt Bay (12 : 39), a point discussed in the final section of this paper. Lussa River's milky quartz consisted of many thousands of pieces, only a very few weighing over 4 oz, a fact in keeping with the typological conclusions: that the quartz was almost entirely turned into the same smallish tools as the flint, and not, as has sometimes been the case in Scotland, mainly into a heavy element. It will be seen that the quartz was primarily used to make 'chisels' (a few approaching chopper size) and secondarily for scrapers; most of the other categories held one or a few quartz specimens. At Lealt Bay the quartz tools were almost all scrapers, only 3 poor 'chisels' being amongst them.

There was 9 lb 5 oz of flint. Most of it was in a state of incipient patination, though all all stages, from unpatinated and translucent through to chalky white, were represented. As suggested in past papers, patina is likely to vary with one or another artefact's exposure to the weather (i.e. its period on the surface). Group patination statistics ought, however, to be reliable: in the case of Lussa River all tool-forms bore roughly the same patina, and only a few oddities need be considered as possibly intrusive.

The usual small rolled complete flint pebbles were recovered (7, weighing 3½ oz in total), much of the struck material appearing to stem from such pebbles. There were a dozen rolled flint artefacts (one an unclassified microlith, the rest nondescript); only three had been broken since rolling, the breaks looking very fresh; these rolled flints could all have been left there by the transgression, the fractures being due to the later farmers and planters (as are probably those on some of the two-patina, unrolled specimens).

Forty specimens had two patinas, two dozen at least due to two-period use (at Lealt Bay there were about a hundred, most being clearly two-period artefacts). A core (no. 9) had been flaked further, and there were two untrimmed flakes off earlier cores; another core (no. 7) and

(i) *The Typology of the Quartz and Flint Artefacts*

| | | |
|---|---|---|
| 1 | Cores (2 made into chisels, 1 into scraper) | 30 |
| 2 | Platform rejuvenation/repositioning evidence | 20 |
| 3 | Flakes part-backed (lengthways) with cortex | 12 |
| 4 | Arched, tip-heavy flakes | 8 |
| 5 | Not trimmed but damaged as by use | 160 |
| 6 | Microliths | 254 |
| 7 | Micro-burins | 70 |
| 8 | Scrapers (inc. 1 core) | 149 |
| 9 | Blades with haft trimming | 16 |
| 9 | Other blades (31 used, 5 of these trimmed) | 89 |
| 10 | Leaf-shaped flakes, with haft trimming | 16 |
| 10 | Other leaf-shaped flakes (23 used, 11 of these trimmed) | 40 |
| 10 | Miscellaneous non-microlithic pointed flakes | 16 |
| 11 | Gravers | 30 |
| 11 | Chisels (inc. 2 cores) | 334 |
| 12 | Bifacially-flaked choppers | 4 |
| 13 | Transverse specimens not scraper-like | 9 |
| 14 | Perforators | 16 |
| 15 | Toothed flakes | 7 |
| 16 | Scale-flaked specimens | 6 |
| 17 | Miscellaneous forms | 5 |
| | Trimmed but not classified (26 quartz) | 209 |
| | Total | 1,500 |

8 flakes (no. 213) had been made into chisels; 8 flakes into scrapers (nos 140, 143); one flake into a non-microlithic point, class 5 (no. 178); the others various (no. 238).

(1) *Cores (2 made into chisels, one into a scraper).* Poor and unstandardised work; several are just battered lumps lacking recognisable platforms and scarred from all angles; 5 others (no. 10, one platform) use natural platforms (a few corresponding flakes were noted e.g. nos 162, 240, 245). Quartz not included (no. 4 is exceptional for its flint-like treatment).

| | *Total* | *No. of platforms* | | | *Angle* |
|---|---|---|---|---|---|
| | | 1 | 3 | 2 | 80°–100° |
| 1. No trace of cortex – nos 3, 5 | 6 | 3 | 0 | 3 | 0 |
| 2. Cortex tip – nos 6, 7 | 3 | 2 | 0 | 1 | 1 |
| 3. Flaked only part of the way round – nos 8–12 | 21 | 13 | 0 | 8 | 1 |
| Totals | 30 | 18 | 0 | 12 | 2 |

(a) Total weight was 12 oz; one lump weighed 3 oz, the rest thus averaged $\frac{1}{3}$ oz, nos 5, 7 being amongst the smallest.

(b) No. 5, light-patinated overall, has been made into a single-ended chisel. No. 7, a double-ended chisel, has been comparatively-recently shaped from a neat well-patinated single-platform core, more ancient. No. 9 (2 recent platforms not 80°–100°) is also two-period, several negative facets on the back being earlier.

(c) No. 8, classed as two-platform, has in fact been bifacially-flaked from a single edge; the flaked edge is very sharp except for the part well prepared for scraping. No. 14 is the only rejuvenation flake to suggest this type of knapping. See 'choppers' (and compare Lussa Bay no. 158).

(d) Other specimens illustrated: nos 6, 12 (one platform), no. 3 (two platforms not 80°–100°), no. 11 (two platforms as between 80°–100° as any).

(e) An absence of roughly-parallel platforms is reflected in the next section.

(2) *Platform rejuvenation/repositioning evidence.*

| Classes and comment as at Lussa Bay | *Lussa River* | *Lealt Bay* | *Lussa Bay* |
|---|---|---|---|
| 1. Nos 14, 16 | 16 | 43 | 42 |
| 2. No. 13 | 1 | 13 | 18 |
| 3. No. 15 | 1 | 1 | 4 |
| 4. – | 2 | 3 | 2 |
| Totals | 20 | 60 | 66 |

No. 16 is as typical of class 1 as any. No. 14, though twice as large, does not look intrusive; its edge has been bifacially-flaked; the hollow bears signs of use. There was also a specimen resembling Lealt Bay no. 6, but twice as large; white-patinated and slightly glossy, it does look intrusive. One specimen had been made into a perforator, another into a scraper.

The class 2 figures do suggest that, in N Jura, roughly-parallel platforms gradually became less and less usual; however, Lussa River no. 13, lightly-patinated, bulbless and seemingly made into a graver, does compare to Lussa Bay no. 17 (found in that site's upper zone).

(3) *Flakes part-backed (lengthways) with cortex.* Half were backed on the left, half on the right. No. 19, the finest and probably used as a hafted blade, is from the same core as side-scrapers nos 127, 141. Two (no. 18) have been minutely edge-trimmed right down one side.

(4) *Arched, tip-heavy flakes.* Unstandardised. Most side edges show use. No. 17 and the graver no. 189 are much the largest.

(5) *Not trimmed but damaged as by use.* The 160 specimens (11 quartz) are not classifiable elsewhere.

(6) *Microliths.*

| | |
|---|---|
| Classified (Table I) | 143 |
| Miscellaneous form (Note 3) | 1 |
| Not classified | 110 |
| Total | 254 |

TABLE I

DESCRIPTION OF MICROLITHS

| | Description | *Heavy patina* | *Quantity* | *Bulb* | *Illustration nos and notes* |
|---|---|---|---|---|---|
| *Basal end not separately trimmed* | | | | | |
| 1Ai | Partially trimmed one side, 1–$\frac{3}{5}$ in. | 0 | 1 | 0 | no. 20, burnt |
| ii | Partially trimmed one side, under $\frac{3}{5}$ in. | 3 | 10 | 5 | five very oblique, nos 21–2 five less so, nos 23–6 |
| B | Fully trimmed one side | | | | |
| ia | Trimmed side convex, 1–$\frac{3}{5}$ in. | 0 | 1 | 0 | no. 27 |
| ib | Trimmed side convex, under $\frac{3}{5}$ in. | 1 | 7 | 2 | nos 28–30. One burnt. Merge with poor 5A, 6A |
| iia | Trimmed side straight, 1–$\frac{3}{5}$ in. | 0 | 1 | 0 | no. 31, untrimmed side hinged, i.e. not a cutter (compare class E). |
| iib | Trimmed side straight or concave, under $\frac{3}{5}$ in. | 2 | 5 | 4 | no. 32; nos 33–4, compare nos 20–2; no. 35, never pointed |
| Di | Fully trimmed one side, partially the other, 1–$\frac{3}{5}$ in. | 1 | 2 | 0 | no. 36, light patina |
| ii | Fully trimmed one side, partially the other, under $\frac{3}{5}$ in. | 2 | 4 | 1 | nos 37–8 |
| E | Fully trimmed each side, maximum width over a quarter of length | 0 | 4 | 0 | no. 39 light patina; no. 40 (compare Lealt Bay no. 61); others only prob. frags., two burnt |
| 2 | Fully steeply trimmed each side, maximum width under a quarter of length | 1 | 19 | 0 | nos 41–6 (nos 44–5 two of three in quartz); three burnt; up to $\frac{7}{10}$ in.; four prob. frags. |
| *Basal end separately trimmed* | | | | | |
| 3Ai | Base tapered by trimming from below | 0 | 1 | 1 | no. 47 (and no. 37?) |
| ii | Base tapered by trimming from above | 0 | 1 | 0 | no. 48 |
| Bii | Base trimmed straight or nearly so | 0 | 3 | 0 | nos 49, 50 (Ai-Bii hybrids), no. 52, assumed basal |
| Ci | Base trimmed concavely, symmetrically | 1 | 2 | 1 | no. 51, bulbar, light patina; no. 53, assumed basal |
| D | Miscellaneous shouldered forms | 3 | 5 | 1 | no. 54, heavy patina, bulbar (?unfinished); no. 55, light pat., no. 56 transparent |
| *Triangles* | | | | | |
| 4A | Isosceles | 0 | 1 | 0 | no. 57, no Jura parallel |
| B | Scalene (angle at upper left) | 0 | 4 | 1 | nos 58–60, poor work |
| *Crescents* | | | | | |
| 5A | Median spine towards arc | 2 | 9 | 1 | nos 61–5 (no. 63 bulbar, heavy patina); one quartz, one burnt; see 1Bib. |
| B | Median spine towards chord | 0 | 2 | 0 | nos 66–7 (the nearest to 5B!) |
| *Quadrilaterals* | | | | | |
| 6 | A–C upper end fragments. See Note (2) | 8 | 24 | 0 | four concave backs (nos 68–71); no. 72 back untrimmed; one burnt |
| A | Sub-trapezoid, sub-trapezium, base not trimmed | 9 | 21 | 7 | nos 73–83; no. 78, bulbar, trimmed on right; no. 83 near right-angle; one with inverse trimming, two improvised; see 1Bib. |
| B | Trapezoid, trapezium, base trimmed | | | | |
| i | Base trimmed convexly | 0 | 1 | 1 | no. 84, basal trimming not emphatic; back lightly concave |

| | | | | | |
|---|---|---|---|---|---|
| ii | Base trimmed straight or nearly so | 4 | 10 | 0 | nos 85–6, 87 (?6C), 88 (?6Biii), 89–90; includes 2 frags.; one burnt |
| iii | Base trimmed obliquely | 0 | 3 | 0 | nos 91, 93, backs concave; no. 92; poor work |
| C | Rhomboid | 0 | 1 | 0 | no. 94, good specimen |
| *Pentagons* | | | | | |
| 7 | Irregular, symmetrical, abruptly pointed | 0 | 1 | 1 | no. 95, well patinated, bulb at blunt end (at point on Lealt Bay no. 134) |
| *Totals* | | 37 | 143 | 26 | |

(1) Burnt and quartz specimens were not considered in 'Heavy patina' count and (below) percentage.

(2) Class 6, the easiest to identify whether complete or fragmentary, is probably always a little over-represented proportionally. As usual, borderlines between classes were blurred: 1B merges with 5 and even 6A, the various class 3 specimens partake of each others' characteristics, as do 6Bii, iii.

(3) Miscellaneous form: no. 106, lightly patinated, upper edge trimming inverse, and perhaps broken by the blow in the middle.

SUMMARY

| *Site* | *Class* | 1A | 1B ia, iia | 1B ib, iib | 1C | 1D | 1E | 2 | 3Ai | 3A ii | 3B | 3C | 3D | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lussa | Total | 11 | 2 | 12 | | 6 | 4 | 19 | 1 | 1 | 3 | 2 | 5 | 5 | 11 |
| River | % | 9 | 2 | 10 | | 5 | 3 | 16 | 1 | 1 | 2·5 | 2 | 4 | 4 | 9 |
| Lealt | Total | 11 | 57 | 13 | 4 | 26 | 3 | 6 | 8 | 8 | 6 | 3 | 15 | 34 | 51 |
| Bay | % | 3 | 16 | 4 | 1 | 8 | 1 | 2 | 2 | 2 | 2 | 1 | 4 | 10 | 15 |

| *Site* | *Class* | 6A | 6B i/ii | 6B iii | 6B iv | 6C | 7 | *Total* | *Heavy pat.* | *Bulb* | *Micro-burin* | *Micro-burin heavy pat.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lussa | Total | 21 | 11 | 3 | | 1 | 1 | 119 | 29 | 26 | 70 | 20 |
| River | % | 18 | 9 | 2·5 | | 1 | 1 | 100 | 27 | 22 | 28 | 29 |
| Lealt | Total | 54 | 17 | 9 | 11 | 4 | 1 | 341 | 252 | 54 | 346 | 266 |
| Bay | % | 16 | 5 | 3 | 3 | 1 | 1 | 100 | 74 | 16 | 27 | 77 |

(1) Because of the small quantities found at Lussa River, its comparative figures include all probably-attributable fragments (except those of class 6); the Lealt Bay figures do not include fragments. However, statistics such as these, depending in so many ways upon chance, can be relied upon only to demonstrate mere presences and marked preferences. For comparison, all that need be recalled about the Lealt Bay fragments is that they suggested that class 2 was too low at 2%; about 6% seems more realistic.

(2) Micro-burin percentage is based on total microliths found.

(7) *Micro-burins.* With the bulbar end of the original flake downwards:

| | *Heavy patina* | *Total* | % |
|---|---|---|---|
| 1. Notch on the right, butt end (nos 96–9) | 12 | 40 | 57 |
| 2. Notch on the right, tip end (no. 100) | 0 | 2 | 3 |
| 3. Notch on the left, butt end (nos 101–2) | 2 | 6 | 9 |
| 4. Notch on the left, tip end (nos 103–4) | 3 | 9 | 13 |
| 5. Indeterminate (no. 105) | 3 | 13 | 18 |
| Totals | 20 | 70 | 100 |

Except nos 96, 101, the latter however broken above the notch, none were over $\frac{3}{5}$ in long. Class 3 holds three specimens with a right, lesser notch (nos 101–2). The heavy patina proportion (29%) is close to that of the classified microliths (27%, unburnt flint only).

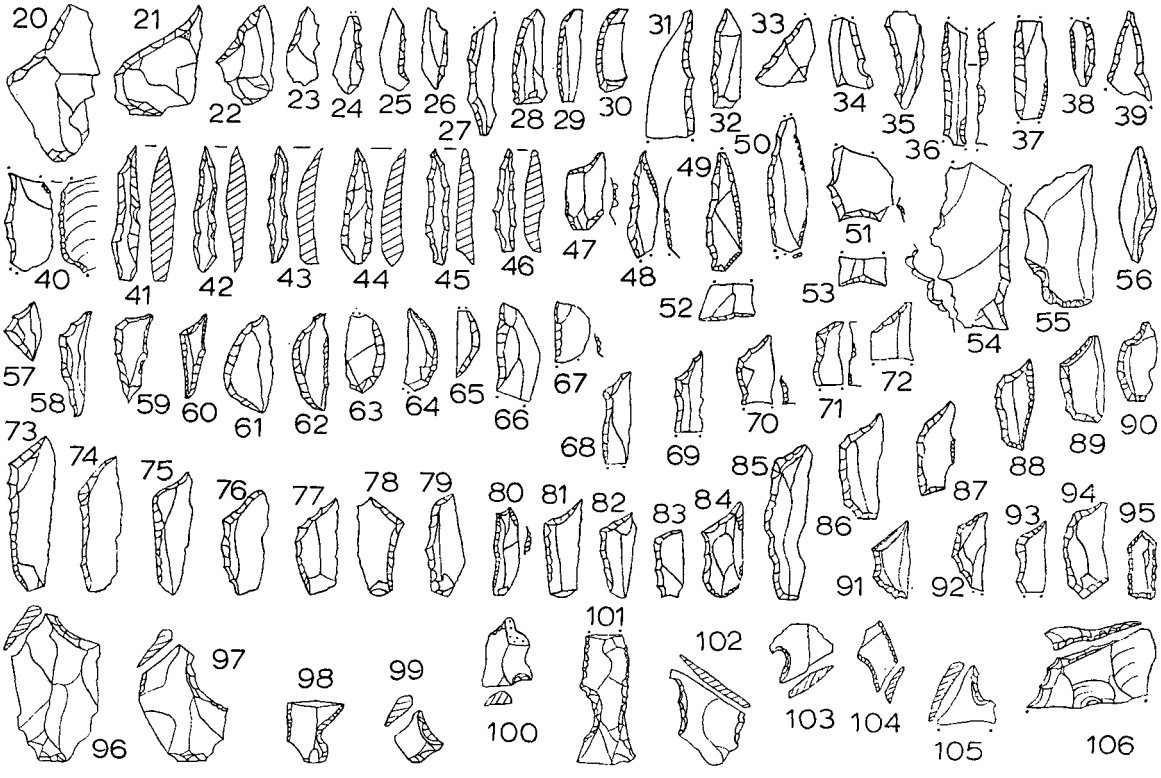


FIG 8 Microliths, micro-burins (½)

(8) *Scrapers* (*inc. one core*). Classification as at Lealt Bay. Poor, unstandardised work.

| *Class* | *Description* | *Convex* | *Straight* | *Concave* | *Total* | *%* |
|---|---|---|---|---|---|---|
| | *Flint* | | | | | |
| 1A | End of blade (nos 107–8) | 0 | 1 | 1 | 2 | 1 |
| B | End of flake (nos 109–115) | 4 | 2 | 1 | 7 | 5 |
| C | Broken-off working ends, possibly 1A, B (nos 116–9) | 7 | 0 | 0 | 7 | 5 |
| | Sub-totals | 11 | 3 | 2 | 16 | 11 |
| 2A | Side of blade (no. 120) | 0 | 0 | 1 | 1 | 1 |
| B | Side of flake (nos 121–3) | 1 | 0 | 2 | 3 | 2 |
| 3 | Other | | | | | |
| A | Over 1 in (nos 124–130) | 10 | 1 | 2 | 13 | 9 |
| B | Under 1 in (nos 131–145) | 52 | 6 | 4 | 62 | 40 |
| 4 | Core (no. 8) | 1 | 0 | 0 | 1 | 1 |
| 5 | Arched tip-heavy flake | 0 | 0 | 0 | 0 | 0 |
| | Sub-totals | 75 | 10 | 11 | 96 | 64 |
| | *Quartz* (nos 146–152) | 42 | 9 | 2 | 53 | 36 |
| | Totals | 117 | 19 | 13 | 149 | 100 |

(a) 1A, B have the feeble ragged trimming of the majority at Lealt Bay; one (no. 118) of 1C has the steeper working characteristics of Lussa Bay. No more than four specimens in 1A, B convex suggests few of the seven in 1C come from those two classes (Lealt Bay 32 : 11). Included in 1C are two corner-trimmed fragments (no. 117).

(b) The only elongated group 3 specimens with their working edges markedly on an end were nos 124, 128, 136, 138. No. 127, with flattish trimming, is a clear side-scraper (no. 141

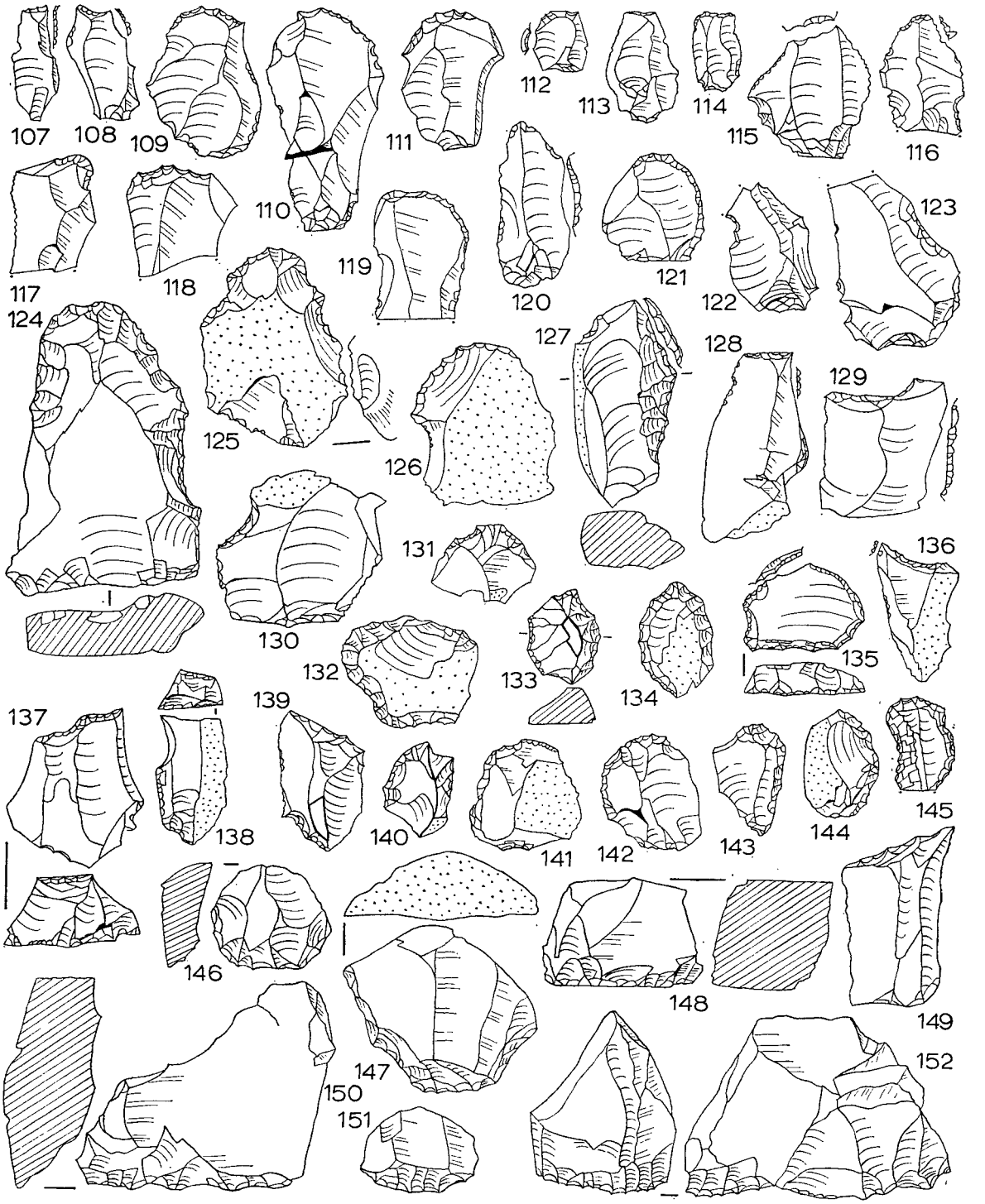



FIG 9 Scrapers (no. 148 $\frac{1}{2}$, others $\frac{1}{1}$)

from same core). Most 3B specimens have indifferently-placed working edges. See also gravers, group 2B (no. 188).

(c) From 3B convex are illustrated: nos 131–35, 140–45. Many could be described as biconvex side-scrapers. No. 134 is too squat to be treated as no. 173 type. Nos 140, 143 are made on older artefacts. Many, including no. 131, were made in origin on fragments; there were also 20 broken-off working edges.

(d) No. 124 with chalky patina, looks intrusive. The rhomboid-like no. 139 (chalky patina) and no. 137 (incipient patina), both thick-sectioned and in 3B straight, have opposite end convex trimming; the former has a tang or spur.

(e) Quartz: nos 146–7, 151–2 (convex), nos 148–50 (straight). The obliquely-truncated no. 149 is unique at this site (compare Lussa Bay no. 143); its trimming is as steep as the thickness of the flake allows, and it could have been classed as a huge obliquely-blunted point.

(9) *Blades.* Defined as in the previous N Jura papers.

| *Over 1⅛ in long* | *Description* | *Total* | *%* |
|---|---|---|---|
| 1 | 1 Without use or trimming | 58 | 53 |
| 1 | 2 With use only – nos 159–60 | 26 | 24 |
| 4 | 3 Haft trimming – nos 153–8 | 16 | 15 |
| 0 | 4 Other trimming | 5 | 5 |
| 0 | 5 Scrapers (without haft trimming) – nos 107–8, 120 | 3 | 3 |
| 6 | Totals | 108 | 100 |

With one or two exceptions, the 40 smallest specimens (⅗–¼ in) fell into class 1, suggesting they were exclusively intended as microlith-yielding blades. The specimens over 1⅛ in long of classes 1 and 2 both look intrusive; the latter's, stained and battered, may be rolled. As discussed for Lealt Bay, the class 3 end-narrowing (usually basal) takes the form of oblique work on from one to four corners, presumably to aid hafting; the largest and finest are illustrated. No. 158 has been shouldered. No. 155, translucent pink flint, compares to Lealt Bay no. 141. Included in 'Trimmed but not classified' are six narrowed butt-ends which may have been blades.

(10) *Non-microlithic pointed flakes*

| | | |
|---|---|---|
| 1. Leaf-shaped, without use or trimming – no. 161 | | 17 |
| 2. Leaf-shaped, with use only – no. 162 | | 12 |
| 3. Leaf-shaped, haft trimming – nos 163–7 | 13 | |
| Haft-trimmed fragments – nos 168–9 | 3 | |
| | — | 16 |
| 4. Leaf-shaped, other trimming – nos 171–2, 176 | | 11 |
| 5. Miscellaneous – nos 170, 173–5, 177–9 | | 16 |
| Total | | 72 |

Classes 1–4 probably parallel the 'blades' (with which they have a common shape boundary) as tools; they appear quite unstandardised. Included in 'Trimmed but not classified' are a number of narrowed butt-ends from flakes unlikely to be leaf-shaped, whilst more butt-narrowing is to be seen in several other categories of tools, as the illustrations show (e.g. scrapers, gravers); the limitations of the present class 3 are, of course, to allow comparison with NE Ireland's Larnian-Bann leaf-shaped flakes. Four of class 4 above have minute edge-trimming obliquely at the point (nos 171, 176). Nos 161–2, 164, 171 are the only specimens with 'massive' butts. Classes 3 and 4 include 3 (nos 163, 166) and 2 respectively of quartz.

Even more varied is class 5, which includes the trimming of Lealt Bay class 3 type. No. 170

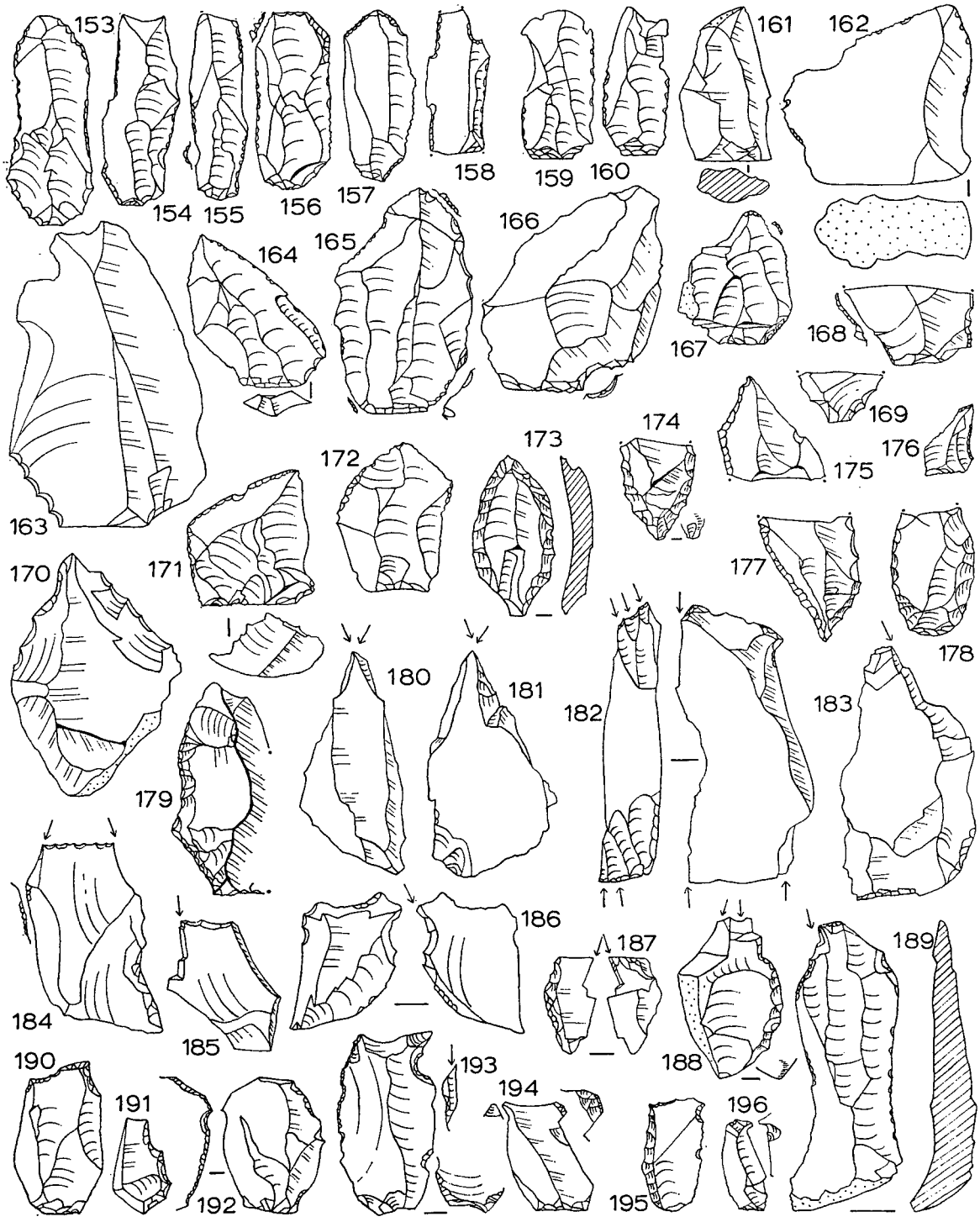



FIG 10 Blades, leaf-shaped flakes, gravers ($\frac{1}{1}$)

is the only quartz specimen. The steep-sided, burnt no. 179, perhaps a platform-edge flake, has been extensively trimmed (45°) on the spurred side; the other side is almost all missing. Nos 173–4, 178, all unpatinated and bulbar, have bold 45° trimming (no. 178 is made on an older artefact); nos 175, 177, unpatinated and the latter bulbar, have neat edge-trimming. Three others were burnt, the rest lightly patinated.

(11) *Gravers and Chisels.* Under 'gravers' are the forms which have their *corners-cum-narrower-faces* struck or chipped. 'Chisels' (Lealt Bay no. 209, Lussa Bay no. 156) have on the other hand been struck on their *broader* faces (i.e. the arris and bulbar sides in the case of regular flakes); the blows are from the end into the working edge, rather than, *tranchet*-wise, from the side across the edge. It should be added that the following figures probably understate the quantity of 'chisels', since only *bifacially*-flaked specimens have been classified; this is to avoid confusion with the scars of primary flaking, particularly in the case of quartz.

In transverse section, the tools' working ends may be either straight or dished (as the modern chisel and gouge, respectively). Apart from their possible function as chisels, the straight-ended specimens would make good splitters, used with hammerstones; or grooves could be cut with a motion parallel to the long axis of the working edge, in this case the tool being hafted. The dished edges would not, however, be usable for any function other than gouging, unless they were a form of hafting preparation, the opposite end then being the only working edge. The name 'chisel' used here for convenience, is not, any more than is 'scraper', intended to exclude other functions. Striped profiles (broken where twisted): right edge corresponds to right drawing.

| *Gravers* | | *Total* | *Flint* | *Quartz* |
|---|---|---|---|---|
| 1 | Centre – no. 13, nos 180–1 (quartz) | 6 | 3 | 3 |
| 2 | Corner | | | |
| | A Blow, nos 184–5 (5 have trimmed transverse edge), nos 186–7, 189, nos 182–3 (quartz) | 13 | 9 | 4 |
| | B Blow, but perhaps to haft side-scraper – no. 188 | 2 | 2 | 0 |
| | C Chipped vertical edge (class A shape) – nos 190–1 | 3 | 3 | 0 |
| | D Chipped beak – nos 192–6 | 6 | 5 | 1 |
| | Totals | 30 | 22 | 8 |
| *Chisels* – Bifacially flaked – nos 5, 7, 197–214, 216 (flint), 215, 217–222, 224 (quartz) | | 334 | 177 | 157 |

1. Class 1 gravers are *bec-de-flûte* types; class 2A no. 187, microlithically backed (like no. 195), approaches the *bec-de-perroquet*; class 2D are *bec-à-encoche* kind.

2. Graver no. 186 has also been used at the most pointed corner (note corresponding finger-rest trimming). No. 193 is transparent dark-brown southern-type flint, very rare in N Jura. Some of classes 2C, D have their corners or beaks stained red-brown.

3. Eight chisels at least had been made from earlier people's artefacts (no. 7 on a core, no. 213 on a flake), one from a contemporary core (no. 5).

4. Seventeen chisels had trimming apart from the bifacial edge-flaking. Nos 210-12 illustrate a small homogeneous group: trimmed right along one side, steeply to fairly flatly, with a salient halfway, in the case of no. 212 the shape partially due to a graver-blow. Very few specimens are both 'gravers' and 'chisels' (no. 216). Nos 213–14 show other trimming.

5. No. 197 is the largest flint chisel and the only one which compares to Lealt Bay no. 209. No. 198 compares to Lussa Bay no. 156.

6. The quartz chisels are typologically identical to the flint specimens, though some 20 are a little larger. No. 221: profile is also massive butt of original flake. Six are of colourless crystal (no. 222).

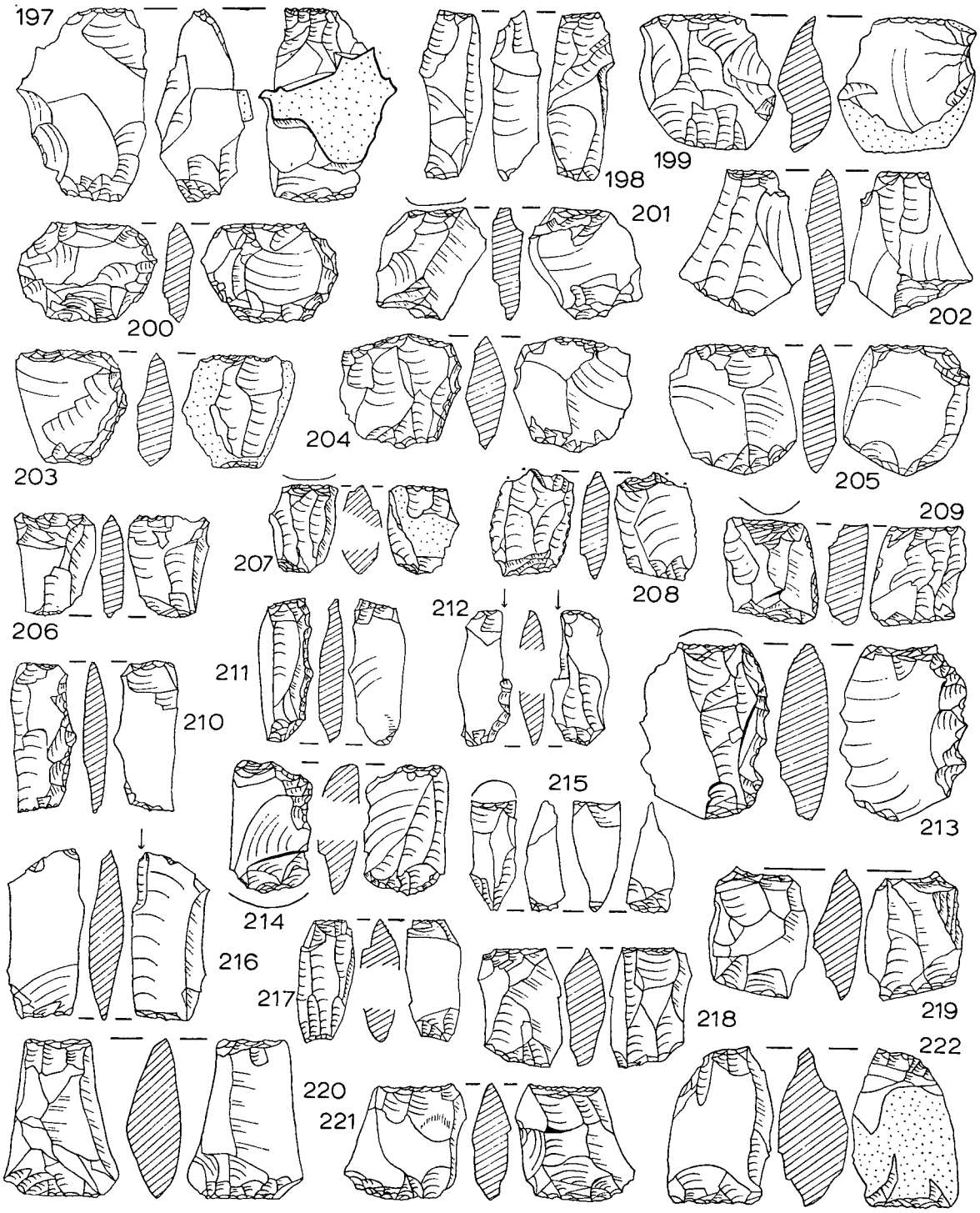



FIG 11 Chisels (½)

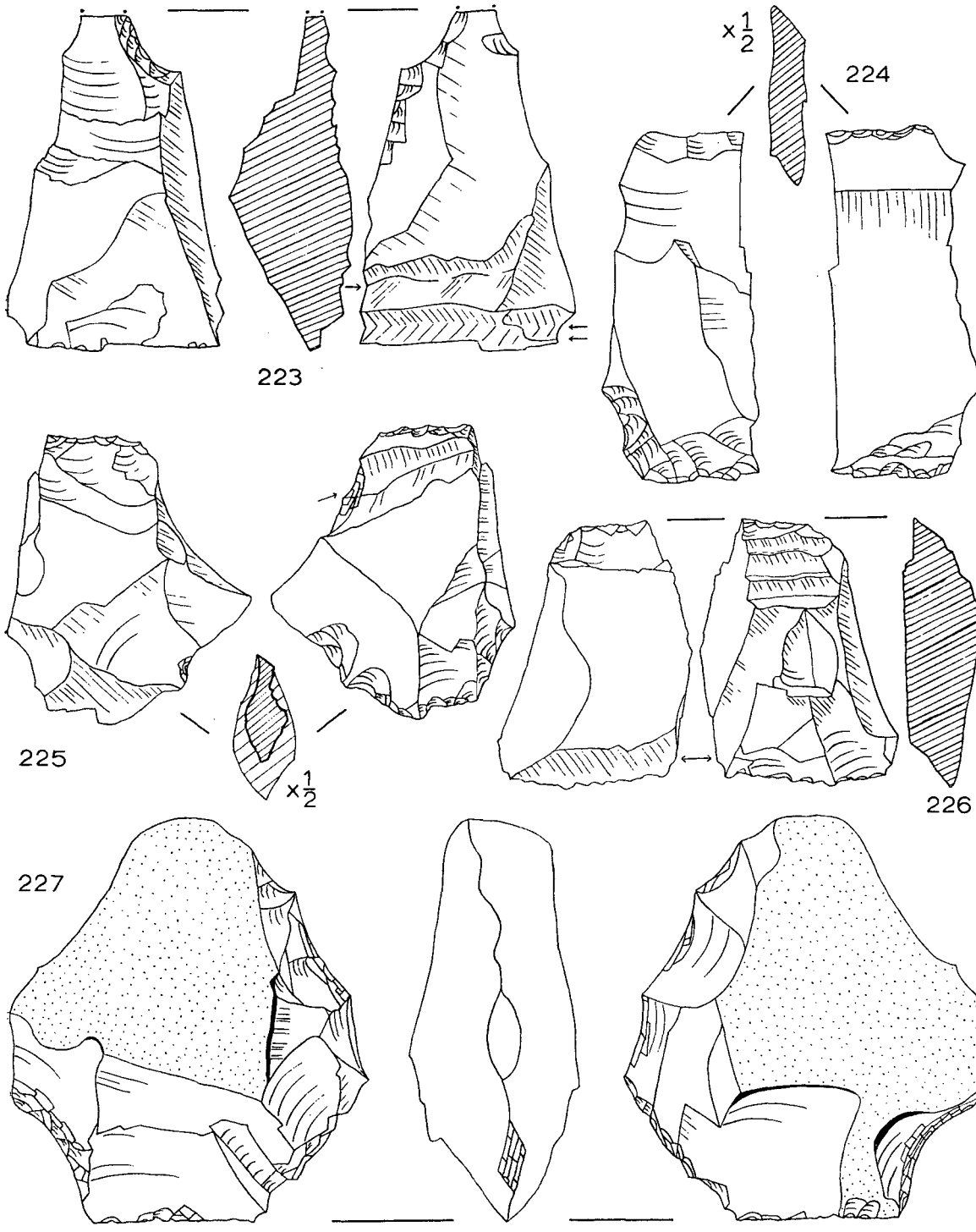



FIG 12 Choppers, chisel (¼)

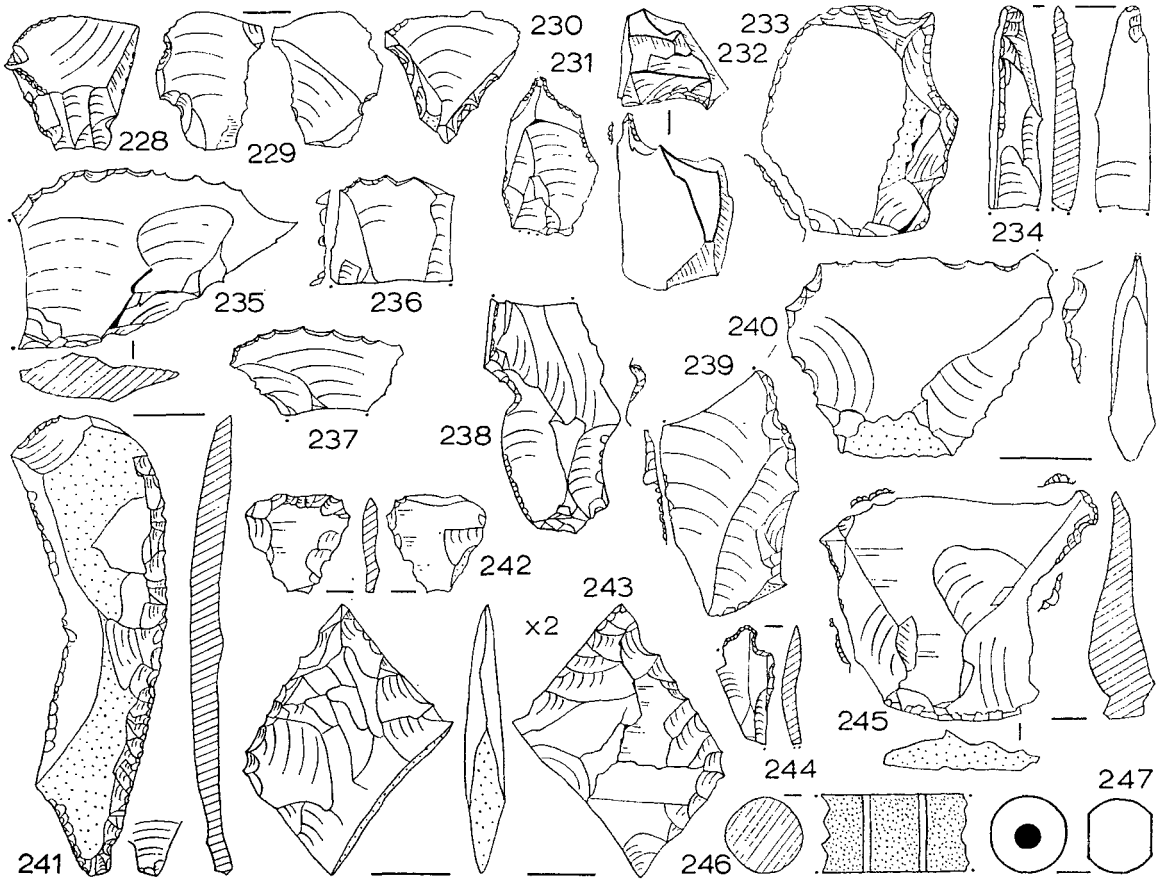



FIG 13 Miscellaneous flint tools, grooved wood, bead (no. 243 $\frac{2}{1}$, others $\frac{1}{1}$)

(12) *Choppers.* Nos 223, 225–6 (quartz) are the only specimens perhaps prepared by *tranchet*-like blows from the side. No. 223 has its upper end thinned by 'chisel' blows and tapered by strong edge trimming. On no. 225 the *tranchet* blow, with chisel thinning, has been used to thin the upper end, and the lower end has been well trimmed: it must have been either a chopper with a blunted hand-hold or a hafted steep scraper. No. 226 has been chisel-thinned at upper end.

The pebble-tool no. 227, 4 oz, is made from a flattish quartz nodule; the lower part of each 'side' edge has been heavily battered (?shaping), the 'working' edge hardly at all. The chisels (the largest 20 being all quartz, none reaching 2 oz) are of course just small-scale choppers.

At Lussa Bay a few small chopper-heads were doubtfully proposed. No. 8 from Lussa River (see 'cores') is similar, but it can be seen to bear no chopper-type wear (the Lussa Bay material was of course rolled). So the grouping is still dubious.

(13) *Transverse, not scraper-like.* Unstandardised, improvised, patination very light, two of quartz. Some perhaps transverse arrowheads, they are much like those which, at Lealt Bay, were furthest from the true *petit tranchet* in aspect. Nos 228–30 (and perhaps no. 242, with flat edge-trimming).

(14) *Perforators.* Haphazardly improvised. No. 233 may have been a scraper with a point

halfway down the right side; when the point broke the present one was shaped on the corner of the scraper face. No. 232, a thick lump, also has steep treatment. Nos 231, 234, the former one of five on the ends of small flakes.

(15) *Toothed flakes.* Nos 235–7 (all bulbar end downwards). One quartz.

(16) *Scale-flaked specimens.* No. 241, unpatinated good-quality translucent grey flint, flatly trimmed down the right side (no gloss), the angle of the basal pressure rings suggesting removal of the bulb, was found 18 ft SW of the hearth zone during examination of the turf capping; it is unique in N Jura, the nearest specimen being no. 290 at Lealt Bay. No. 243 ($\frac{2}{1}$), lightly-patinated poor grade grey flint, was found in the hearth zone; it appears to be a small ill-made version of the lozenge-shaped arrowhead. No. 242, poor unpatinated brown flint, seems to be complete; if it is a transverse form, it is the only one at the site to have flat edge-trimming (in N Jura the only possible comparison is to Lussa Bay no. 188); chisel no. 203 is of very similar flint. Three chips which might be scale-flaking waste were noted.

(17) *Miscellaneous forms.* Three had spatulate protruberances: nos 240, 245, both with cortex butts, and no. 244 with microlithic side-trimming (less like transverse forms than Lealt Bay nos 244–5, with which, however, they ought probably to be grouped). No. 238 is an earlier knapper's white-patinated second-platform flake which, much later, has been notched (without scraper use) and then the tip broken off (compare Lussa Bay no. 166 and Lealt Bay no. 165, both double-notched). No. 239, bulbar, has crude edge work; it is of hard, dark-green pitchstone similar to Lealt Bay no. 293 (a small scale-flaked point).

(j) *Summary of Diagnostic Site Evidence*

Chronologically, Lussa River belongs to the moment when sea-level had fallen back between 30 and 22 ft from its maximum Post-Glacial stand. Therefore, on Lealt Bay evidence, the site should be considerably later than mid-Atlantic, to which conclusion may be compared the corrected Lussa River C14 dates of 3450–2940 BC.

A relatively-late age in N Jura is indicated for Lussa River by the finding of rolled and then re-used flint artefacts amongst the site relics, and possibly by the locally-light patina of about three-quarters of the fresh artefacts. The implication of the 'Lussa Bay' flint artefact found in trench C is also recalled.

Typologically, the Lussa River industry is characterised by the overwhelming quantity of bipolar 'chisels' and the standardised hammer-anvil stones, the high proportion of quartz, the microlithic rods and poorly-made small geometric microliths, the lack of non-microlithic blades, the small shapeless scrapers.

(k) *Jura comparisons and sequence*

*Microliths (Table I)*

Overall, both standardisation (especially outline-definition) and finish seemed at their lowest in the small-size Lussa River industry. Lacking at Lussa River were Lealt Bay's large blunted backs (classes 1Bia, iia) and hollow-'based' trapezoids-trapeziums (6Biv); at Lealt Bay these fell towards 'early' on patination. Small blunted backs (1Bib, iib) were twice as common at Lussa River as at Lealt Bay. About halved proportionately at Lussa River were Lealt Bay's triangles (4), the few found all having upper-left angles, and crescents (5), both classes very irregular in finish; the 6Biii 'trapezes' were very poorly represented as to quality. Lussa River's only positive peculiarity was the importance of the square-section rod (16%, compared to say 6% at Lealt Bay, where most were markedly flatter). The 6A sub-quadrilateral form was as common as at Lealt Bay, and it is important to note that a single pentagon (?N Jura only) occurred at each site.

The Lussa River microliths are all but utterly distinct from those of Lussa Bay, the only notable overlap being the bulbar obliquely-blunted points (a few at each of the three sites, in fact).

*General typology.* Table II compares the typology summaries of the three sites, and notes the most significant differences. The effect on the figures of the rolling of the Lussa Bay artefacts must be borne in mind.

TABLE II
SIMPLIFIED TYPOLOGICAL COMPARISON

| *Artefacts* | *Lussa Bay* | *Lealt Bay* | *Lussa River* | *Differences* |
|---|---|---|---|---|
| Cores | 134 | 129 | 30 | Minor. Tendency to asym. at LUB. No parallel plats. at LUR |
| Platform rej./rep. evidence | 66 | 60 | 20 | Minor: class 2 decreases LUB>LEB>LUR |
| Use, no other features | – | 1279 | 160 | |
| Microliths | 84 | 1283 | 254 | Major: LUB is peculiar, LUR includes 'Late' element at LEB. Three facies in all |
| Micro-burins | 20 | 346 | 70 | Minor: proportion increases LUB<LEB –LUR |
| Blades with haft-trimming | 6 | 53 | 16 | Minor: proportionally smaller LUB>LEB >LUR |
| Other blades | 303 | 218 | 89 | |
| Leaf-shaped flakes, haft-trimming | 25 | 61 | 16 | |
| Other leaf-shaped flakes | 90 | 81 | 40 | |
| Misc. non-micr. pointed flakes | – | 23 | 16 | |
| Scrapers | 127 | 346 | 149 | Major: end-scraper decreases LUB>LEB >LUR |
| Gravers (exc. chisels) | 6 | 44 | 30 | Major: discussed below |
| Chisels | 8 | 106 | 334 | Major: chisels 'Late' LEB and dominate LUR |
| Bifacially-flaked choppers | 3 | 5 | 4 | |
| Transverse not scraper-like | – | 60 | 9 | |
| Perforators | – | 81 | 16 | |
| Toothed flakes | – | 13 | 7 | |
| Scale-flaked specimens | 5 | 33 | 6 | |
| Arched, tip-heavy flakes | 37 | 44 | 8 | |
| Flakes part-backed (length) cortex | 137 | 58 | 12 | Minor: proportionally less imp. LUB>LEB>LUR |
| Misc. forms | 1 | 4 | 5 | |
| Trimmed but not class. | 19 | 392 | 209 | |
| Flint weight (lbs) | 24 | 39 | 9 | Major: LEB–LUR flint-quartz proportions |
| Quartz weight (lbs) | – | 12 | 72 | vary widely (?LUB) |

*Sequence.* It is now suggested that the evidence of the two preceding papers and of this report so far (together with the discussion of the 'chisels', below) allows three N Jura microlithic phases to be distinguished, in the following order:

1. Lussa Bay. Overwhelmed during transgressing period and thus not later than about Boreal-Atlantic transition (*c* 5500 BC). Similar N Jura industry, Lussa Wood I (report in preparation), in fact dated 8194 ±350 BP (SRR–160) and 7963 ±200 BP. (SRR–159) in C14 years, implying a calendar date approaching 7000 BC. On typology, divisible into 1A (proto-trapeze tanged point no. 88 at Lussa Bay, not dated by Lussa Wood 1 assays) and 1B (the other Lussa Bay artefacts excluding those Neolithic or Bronze Age).

1–2. Gap in typological evolution, notably a scarcity of intermediate-form trapezes (a few specimens in forthcoming paper).

2. Lealt Bay 'Early'. Maximum-stand time, this probably *c* 5500–4250 BC. Another site

in maximum-stand-time gravels, N Carn, [5a] has yielded a comparable industry; below and contiguous, a few tools (two similar to Lussa Bay nos 65–6) in the top of the Old Land Surface were perhaps associated with a stone setting, probably made from the OLS-charcoal from the setting gave 7414 ±80 BP (SRR–161) in C14 years, implying a calendar date around 6000 BC.

2–3. Develop from one to the other without a break.

3. Lussa River and Lealt Bay 'Late'. Former *in situ* well below washing limit so regression time; its typology decides that of phase. Includes Late Atlantic (3450–2940 BC). By now utterly distinct from Lussa Bay Phase I typology.

(l) *Relationships with the 'Obanian'*

Due to lack of field investigation, and in spite of hints that the picture was not complete, 'the Obanians in the West' have long been said adequately to represent the region's stone industries. Now that it is clear that W Scotland (to say nothing at present of the SW) did in fact pass through the standard European early Post-Glacial microlithic period, with its own variants, reappraisal of the position of the Obanian is needed.

There are difficulties. One cannot place full reliance on the Obanian reports,[5b] with Risga being obviously dubious: since both rolled flints[6] and bone tools are amongst its material, a fair period is likely to be involved. Another significant point is that the stone industries of the three areas – Risga, Oban, Oronsay – are seemingly quite distinct from each other. That published by Lacaille from Risga is different from those from the Oronsay sites, the more so once Coles had indicated the substantial proportion of 'backed blades' at Risga, not further described; one wonders whether the Oronsay excavators would have recognised microliths (that the Castealnan-Gillean 'micro-burin' does not in fact look to be a micro-burin does not clarify the situation). By contrast, the occupations around Oban produced, in flint, only a few atypical artefacts. There is thus no cultural identity about the Obanians' knapping industries.

This brings one to the 'Azilian' harpoon-heads, a main diagnostic tool used to group these W Scotland sites. The only recent addition to their discussion stems from Thompson's hypothesis[7] that the heads of the French Azilian harpoons – about twice as old as the Obanian ones – gradually become smaller with the hole proportionally higher up the shaft in order to hold toggle-wise in the flesh of the quarry: one might feel it suggestive that only one Scottish head, and a very long specimen at that, should have a hole. But rather than accept this as a ground for separating the Obanian from the Azilian, the present writer has to say that, for the following reasons, he finds Thompson's paper unconvincing.

There has never been doubt of the existence and efficacy of the toggle harpoon-head, but it is another matter to prove that the Azilian heads were employed in this way. To the writer some short Azilian heads[8] appear likely to be broken and then re-shaped pieces of longer ones, and this to be the reason for the hole (the original one) being proportionately higher up the shaft, for there being a second, minute cramped hole at the very base of Thompson's no. 9, for the hole (the original one) being sometimes well to one side (the width of the broken specimen having been narrowed, into proportion with the remaining length, by whittling away at that side), and so on. Thompson notes that unilateral barbing favours toggling, yet 203 (of all sizes) out of 234 French Azilian heads are bilaterally barbed. Further, there seems no reason to accept that the original non-toggling heads (Magdalenian), seemingly evolved especially to hunt reindeer, should be less effective against red deer; nor that the toggle-action should work better with a flat head rather than a round one. Although reindeer antler would of course yield a flat head, the highly-successful Eskimo hunters make it into round toggle-heads; obviously because their heads have basal sockets. Thomson's contention that the Azilian head never evolved to the

socket stage because it succumbed to the fixed microlithic arrow-head must be considered in the light of the lack of survival of bone tools at the later microlithic sites, mostly open-air, of the large 'Azilian' heads found with the Tardenoisian industries of the two Hohenzollern caves[10] in S Germany and the Birsmatten cave,[9] Switzerland (above three Sauveterrian levels at the latter) and, now after perhaps surviving as a type through a long W Scotland microlithic period, of the presence of heads at the Obanian sites. In summary, the present writer feels there is no case for sub-dividing Europe's 'Azilian-type' harpoon-heads into toggle-forms and others, nor, thus, for firmly separating the Obanian from the Azilian.

However, this is not to accept the traditionally-close Azilian-Obanian linkage either. All that appears clear to the writer is that the European heads roughly grouped as 'Azilian' had a long Post-Glacial life and covered a wide geographical range; it is a position similar to that of Lussa Bay's trapeze. There seems at present no evidence for attaching the Obanian specimens – and hence the Obanian itself – to Mas d'Azil, Birsmatten (the harpoon-heads, including two holed and one not holed, were dated to Late Atlantic by C14) or Hohenzollern. A more informative European typology looks unlikely.

This makes it easier to ask the next question. Could the Obanian – given culture status for its harpoons, its few mattocks and its many elongated bevel-ended pebble-bone tools – stem from the microlithic people reported in these papers? The artefact levels of MacArthur's Cave and Risga would not have been occupiable during the maximum of the transgression, and thus at least their bone material is regression-time (Oronsay, with comparable heads, yielded no unchallenged dating evidence). Correspondingly, on the N Jura sequence proposed earlier it is at Lussa River especially – in Jura's most inviting, though cave-less, valley – that one would expect to find Obanian origins, if the culture developed locally.

Here one is handicapped (as at all Jura sites) by the lack of bone and antler at the open-air Lussa River; however, there were no elongated pebble tools, a notable difference. Nevertheless, there is an Obanian facet which characterises the new Jura site: the only distinctive features of the knapping industry of the Oronsay sites are Lussa River's standardised hammer-anvil stones and bipolar chisels.

The limits of the implications of this can be sketched. When, at the beginning of the century, archaeology first became interested in the chisels, a whole paper[11] was devoted to them, *outils écaillés par percussion*. This paper so exactly describes the several hundred Lussa River specimens, with its copious illustrations so exactly depicting their types, that it is pointless to do more here than note the most significant conclusions: the chisels were considered to be a deliberate tool, either prepared or used with a bipolar technique, or both; they could be of modern chisel or gouge form; they could have up to four working edges and often approached a geometric shape, e.g. a parallelogram like Lussa River no. 209. Bishop seems the first, in Scotland at least, to have suggested[12] they would be suitable for shaping harpoon-heads. Breuil noted[13] that they are known from all Upper Palaeolithic horizons of France, Spain and N Africa and in the Franco-Cantabric Azilian. The chisels received passing mention at Dalaruan-Millknowe[14] and at Albyn[15] ('scalpriform flakes') and probably occurred at Risga[16] (at least in the unemphatic unifacial form found well-patinated at Lealt Bay, described below); they do not seem to have been reported from the Oban sites or from Ballantrae.[17]

In December 1969 the present writer examined the entire flint collection of the National Museum of Antiquities. In total about half as many chisels as at Lussa River were noted. Most had light patina or none. Except for six on the Tweed, all were coastal, ranging from a Culbin-Tiree line down to the Border; this is partially at least a reflection of the range of the Museum's collections. Most were found in 'waste' boxes, though not all of these contained examples.

Double figures were reached at Culbin (12), Dirleton (12), Hedderwick (50), Glenluce (13), N Mull (11). The Oronsay collections[18] were dominated by the form.

Clearly, this tool, with a vast range in time and place, has not everywhere received the consideration it requires. Since, unlike, for example, the scraper, the chisel does not seem to occur in all stone-using occupations, it is most likely to belong either to groups practising a slightly peculiar economy or at least to a group's craftsman with a peculiar skill, and to appear and reach a use-peak as often as, since the opening of the Upper Palaeolithic, the peculiar economy or craft has been practised.

On Jura, Lussa Bay yielded a maximum of 8 chisels (and even these could be derived from late sites such as Lussa River); one was made on an older artefact. Lealt Bay, after a fresh examination of the 50,000 or so flints, produced 106 chisels:

Quartz: 3 very poor examples
Patinated flint: 12, unemphatic unifacial flaking (some are dubious)
Patina light or none, flint: 81
Made on older material, flint: 10

The latter 91, which can be included in the 'late' phase of Lealt Bay, are markedly similar to the bulk of the 334 Lussa River chisels. It seems likely therefore that the chisel reached a use-peak during Jura's third microlithic phase, with its beginning in the second phase.

The graver figures can be compared: Lussa Bay 6 poor examples (rolling may have disguised a few more), Lealt Bay 44, Lussa River 30. Again Lussa Bay is distinct from the others (Moita do Sebastião, without harpoon-heads or other graver-made work, had only 4 gravers and 2 chisels, *pièces esquillées*[19a]), whilst again many of Lealt Bay's forms are repeated at Lussa River. If little used at Lussa Bay, then, gravers had a regular, fairly-equal function at Lealt Bay and Lussa River, eclipsed, however, by the increasingly popular chisel.

It is possible that this use-peak of the chisel, with the standardised hammer-anvil stones, was linked to that on Oronsay. It should be emphasized here that the Oronsay flint-work yielded no other tools which could have been used to make the bone implements. On the other hand, if the absence of microliths on Oronsay is accepted, then the lack of them, plus the apparent absence of elongated-pebble tools at Lussa River, may be held, on the face of it, more or less to counter-balance the chisel and hammer-anvil stone similarity.

However, the two lines of evidence can be reconciled. The pasts of Jura and Colonsay-Oronsay were closely linked during historical times at least. In the eighth century the Oronsay monks adminstered Jura's main chapel; the traditional route for mainland bodies going to Oronsay's sacred burial grounds passed across Jura, setting out on the second, longer crossing from the northern shore of the mouth of Loch Tarbert; on this same stretch were always landed the Colonsay-Oronsay cattle destined, via the Kenuachdrach ferry (preferred to that from Lagg, though the latter was nearer), for the Craignish peninsula and the mainland. It could be that the earliest Colonsay-Oronsay settlers spread there from Jura. And perhaps the Oronsay 'Obanians' were mainland-Jura hunters extending their territory or early Jura settlers on expeditions such as usually precede colonisation. If the Neolithic practices were actually carried to the west by immigrants, then possibly these drove the natives to settle on increasingly-remote islands (*vide* the well-known legend of the Fir Bolga and the 'green mounds' or *sithean* e.g. the Oronsay middens).

One is next led to wonder whether the sites on Oronsay, one of the main gathering grounds for seals in the British Isles, might not in fact be the camps of seal-hunters who were actually a part of the microlithic complex which, including Lussa River, probably covered W Scotland.

They could have been Jura's later microlith-using hunter-settlers on expeditions such as were a part of Hebridean life into recent times, camps like Lussa River including preparation of gear and weapons (and leaving behind used chisels). Only harpoon-heads and chisels might be needed, worn out and discarded in any quantity on the Oronsay expeditions, not microliths. Remote Oronsay lacks flint, which perhaps also became in short supply regionally (seemingly evidenced at Lussa River), and so expendable bevel-ended scraper-rubbers, made at the Oronsay camps themselves from elongated beach pebbles and from long bones – perhaps anyway more suited to seal-skin than flint – were commonly used for preparing the seal skins. If this hypothesis were to be proved, as by a site (holding Risga in suspense) unequivocably associating microliths, chisels, harpoon-heads and elongated skin-working tools, then clearly a part of the Oronsay occupations is likely to be of the same age as Lussa River.

Other evidence allows a broadening of the Oronsay-Jura comparison. Examination suggests to the writer that the Oronsay sites were probably occupied as dune flats, or even hollows, behind the shore, with subsequent erosion – resisted by the spread of trampled refuse – turning them into conical mounds. Their present height, probably 35–45 ft OD, is in line with maximum-stand and regression time occupations. In accordance with this are C14 dates obtained by the Hunterian Museum on a shell and bones from Bishop's 1914 excavations: 3065 ± 210 BC (GX–1903) and 3805 ± 180 BC (GX–1904), corrected dates 3750 BC, 4580 BC. The Lealt Bay (later part) and Lussa River industries have the same geological position and cover the Late Atlantic period too.

Typology, geology and chronology all suggest, then, that known 'Obanian' material from Oronsay and, by extension, other similar Argyll 'Obanian' material, was the product of the region's microlithic period, evidenced by the Jura excavations. In this case the claim of the 'Obanian' material to culture status in its own right would no longer be supportable, since its artefacts would be seen to be but an aspect of the last 2,000–1,500 years of W Scotland's microlithic period, now known to have lasted over 4,000 years. The microlithic period, in turn, would be shown to possess a range of basic equipment normal to its cultural stage, and would take its place as a fully-evidenced NW extension (with some locally-evolved tools) of the W European microlithic scene. A few transversely-struck flake-choppers at Lussa River and a *petit tranchet* at Lealt Bay suggest no more than some weak, indirect eastern element in the Jura industries; to the writer the Obanian harpoons appear generally southern in aspect, and a point worth noting is that Cuzoul de Gramat's[20] Tardenoisian I level (above a form of Sauveterrian, as at Birsmatten) yielded a fine antler mattock identical to the few specimens ('Baltic') from Risga, Cnoc Sligeach[21], Druimvargie and the Forth. It is hoped that further work under way in N Jura will, in clarifying the sequence during the microlithic period, yield further information on the relationship, on the one hand, between the earliest phase and the southern industries and, on the other, between the later phases and the 'Obanian' material.

(m) *The Camp at Lussa River*

The Lussa River people abandoned their predecessors' much-used fourth level and camped instead on the flat sandy terrace which, at the head of the ½ mile-long estuary, now stands at 33 ft OD. They were there in the drier months, since the terrace is likely to have been waterlogged for much of the year; the great quantity of hazel-nut shells shows the occupation included the autumn at least. Possibly also eaten were berries of the bramble group, the barren strawberry (not recorded on Jura),[22, 23] the seeds of the common chickweed and, very doubtfully, a species of wild pear. The campers lit fires of oak and hazel, with some willow, elm, ash and blackthorn, and perhaps birch.

Red ochre, which in this case may have come from Mull or Skye, usually indicates ornamentation, either prosaic or ritualistic, rather than paintings. The pitchstone, unless gleaned from an earlier site, may have been brought from Arran. The change from imported flint to island quartz may reflect an immigrant's ignorance of some of the flint sources, or their gradual exhaustion; or a changing way of life (e.g. herding) or a momentarily peculiar situation (e.g. stormy seas or the lack of a boat) which, whilst clearly not reducing the need for stone for tools, hindered travel to the flint deposits. But quite possibly the latter were by this stage in Neolithic territory. Microliths usually, though not always, indicating the hunting of land animals, were probably still as important as in Jura's earlier phases. Nevertheless, the chisels and their implications may show incipient adaptation: if the usual forms of game were becoming scarce, then perhaps a widening in the range of quarries brought to the fore a traditional if little-used weapon, for example the harpoon-head, which in turn raised to prominence a peculiar tool used in its manufacture, the bipolar chisel.

In summary, the Lussa River camp, dated to 3450–2940 BC, is considered illustrative of a third and last N Jura microlithic phase; it is likely to be closely related to the last 'Obanian' camps of Oronsay.

## Appendix 1

### Soil Samples

(a) Hardpan washings and the small amount broken up: caddis larvae tubes (App. 2), fragments of two rove-beetles (App. 2), small seeds (App. 3), carbonised hazel-nut shells, charcoal (App. 4). Also some stone artefacts.

(b) A sample of about 50 cu in was taken of the blackish sandy loam around the large piece of charcoal used for C14, i.e. from a position just W of the hardpan, at the join of upper and lower levels. The organic artefacts were limited to charcoal (App. 4).

(c) *The Cracks.* Volume: North Crack 200 cu in, South Crack 90 cu in. The stone artefacts were typical of the site (the many minute pieces of flint and quartz were not counted).

N.C.: 49 quartz (1 used, scraper-like), 18 flint (2 whole pebbles, 1 used blade, 1 poss. chisel frag., 1 non-microlithic point's butt or scraper on a broken-off butt, 1 two-patina chip), insect remains (App. 2), small seeds (App. 3), carbonised hazel-nut shells, charcoal (App. 4).

S.C.: 15 quartz (1 used), 16 flint (1 used, 1 chisel, 1 poss. chisel frag., 1 scraper, 1 two-patina flake), organic as N.C. (App. 2–4).

## Appendix 2

### Insects

*Caddis Larvae Tubes*

Report by Dr and Mrs J D George, Porifera and Polychaeta Section, Department of Zoology, British Museum (Natural History). 'Cases of freshwater Caddis larvae (Order Trichoptera). Since no larvae were present in the tubes it is not possible to positively identify the caddis. However, it could be *Limnephilus vittatus* (Family Limnephilidae) or *Mystacides longicornis* (Family Leptoceridae).'

In order to account for the survival of the cases (often found by geologists in far older deposits), Dr George was asked for the exact composition of the material used to cement together the sand-grains. He replied that silk was used, but that as far as he knew this had not been analysed.

The Caddis larvae tubes occur in quantity (six in a very small sample) in the hardpan at the centre of the site (App. 1). The following limited information[24, 25, 26] has been located on the life-cycle of the majority of Caddis flies: the eggs, one generation a year, are laid in or perhaps near fresh water (seemingly in autumn); they hatch after about 10 days and the larvae make cases and inhabit them, in fresh water

throughout, until (in Britain, 7–10 months later, in spring or summer) the pupating stage is due; then the larvae burrow down into the mud near the margin of their habitat and there emerge from the case, leaving it behind to go ashore, the end of their aquatic stage. The two species mentioned above do not seem unusual in any way; both are said to prefer standing water rather than streams.

The evidence of the Caddis tubes points to unbroken waterlogging of most or all of the site for, say, at least half the year. The tubes are associated with the charcoal, nut-shells and other artefacts as components of the *in situ* pan, which was covered by up to a foot of soil. Therefore it can be implied that they are effectively contemporary – and that the site was only occupiable during the drier half of the year.

The pan itself indicates waterlogging, of course, and its deep rusty red colour shows that sufficient dry intervals or seasons to form ferric compounds have occurred. At present the site is permanently waterlogged, to an inch or two above the surface, from October to March (pl 1a); but in summer the terrace often dries right out (even to the trenches with bedrock bases), temporarily waterlogging up to the surface after rain.

*Miscellaneous*

Report by Mr P M Hammond of the Department of Entomology, British Museum (Natural History) on fragments of two rove-beetles from the *in situ* pan (App. 1): 'A head capsule of *Othius myrmecophilus* and the first abdominal tergite of *Philonthus decorus*, both typical leaf-litter species.'

Report by Mr A R Waterston, Department of Natural History, Royal Scottish Museum, on insects from the Cracks (App. 1). Both Cracks: *Otiorrhynchus singularis* (weevil), many earthworm cocoons. North Crack: *Euzetes globulus* (oribatid mite, twice), ? cocoon of parasitic wasp (ichneumon). South Crack: *Drymus bruneus* (lygaeid bug). These indicate woodland litter.

## Appendix 3

### Seeds

Report by the Royal Botanic Garden, Edinburgh.

Both Cracks: *Cenococcum graniforme* (lead-shot fungus) sclerotia, *Betula* (birch) seeds and female cone scales. North Crack: *Potentilla sterilis* (barren strawberry) seed, unidentifiable seed (very doubtfully *Pyrus* sp.), ?*Picea abies* (Spruce Fir) needle. South Crack: *Rubus* sp. (bramble) seed, *Stellaria media* (chickweed) seed, *Myrica gale* (bog myrtle) male bud. These suggest open birch scrub, with the chickweed as a cultivation indicator.

## Appendix 4

### Charcoal

Summary of reports by Dr M Y Stant, Jodrell Laboratory, Royal Botanic Gardens, Kew, on 150 specimens from the two dry pounds of large pieces found loose in the upper layer (a) and on a few dozen minute twigs etc. from the hardpan and washings (b), and by the Royal Botanic Garden, Edinburgh, on the specimens from the cracks (NC, SC) and from the sample taken to the W of the pan (c):

| *Wood* | % | a | b | NC | SC | c |
|---|---|---|---|---|---|---|
| Oak (Quercus robur type) | 47 | 51 | | | | |
| Hazel | 32 | 35 | × | | | |
| Salicaceae (Prob. Salix Sp.) | 9 | 10 | | | | |
| Elm | 8 | 8 | | | | |
| Ash | 2 | 2 | | | | |
| Prunus (Prob. P. spinosa) | 2 | 2 | | | | |
| Birch (?) | | | | | × | |
| Not identified | | 42 | × | × | | × |

Dr Stant also confirmed specimens of carbonised acorn husk and hazel-nut shell.

## Appendix 5

### Stones yielding red colour

Report by Mr G H Collins, Institute of Geological Sciences, Edinburgh, on two examples of the eight soft specimens. 'Red ochre – nearest source most probably from the bole, or weathered surface, of a basaltic flow, most common on Mull and Skye.'

Report by Mr R W Sanderson, Petrographical Dept., Institute of Geological Sciences, London, on the four hard specimens.

'The large fragment is of a dolerite containing a relatively high content of iron oxide. This is, or was originally, in the form of magnetite. The red colouring is produced by limonite which is an alteration of the magnetite.

The three small pieces all appear to be the same material. One fragment on which I have ground a flat surface shows that it is composed of yellow metallic grains of iron pyrites surrounded by limonite. Again, iron pyrites (an iron sulphide) decomposes to limonite on weathering.

I am afraid that these rock types are not distinctive enough to enable me to pinpoint a source. However there are a number of dolerite dykes in Jura which could be the source of such material.'

## Appendix 6

### Flint with glossy red matter

Report by Dr A E A Werner, Research Laboratory, British Museum.

'Under the microscope the stain appears to contain strands (rootlets?) that are stained red and seem to have coloured the surrounding area also. Under ultra-violet there is no fluorescence, which would appear to indicate that the material is not of a resinous nature.

Unfortunately the sample is too small for a specimen to be taken for analysis. I would judge that the colour may be due to an iron oxide pigment.'

## Appendix 7

### Pumice

Report by Mr R E Binns, Tromsø Museum, Norway.[27]

*Method of Study.* Small parts of the specimen were crushed and studied with a petrographic microscope. The refractive index of the glass and of the feldspars were measured using suitable liquids.

*Results of Examination.* Surface colour dark brown. Two types of glass are present. By far the commonest is a pale greenish-brown type with refractive index $1{\cdot}519 \pm 0{\cdot}001$. A few fragments are colourless to very pale pink and have an index of about 1·505. Crystallites and microlites are common. Only plagioclase feldspar is observed. It occurs both as microlites and as larger crystals. It has an unusually wide range of refractive index, 1·528 to 1·550, thus covering albite, oligoclase and andesine. Most of the fragments measured seem to be oligoclase. Rare fragments of clinopyroxene are seen.

The method of study does not allow a reliable determination of all the minerals present in the specimen, nor does it allow any sure distinction between phenocrysts and microlites, except when the latter are in glass fragments. However it provides sufficient information to enable a comparison to be made between this and some eighty other specimens studied by this method and in part by thin-section examination and chemical analysis. It is clear that this specimen is identical with the majority of the other pumice found in postglacial strandlines in northern Europe, including Scotland and Ireland, and with all that recorded from archaeological sites in the British Isles. The chemical analyses of most specimens from strandlines and archaeological sites have shown that these are dacitic, and this applies also to this specimen.

Comparison between the chemical and petrographic data of these pumices and of rocks from volcanic areas such as Iceland, the West Indies, the Aleutian Islands, Japan and small islands and submarine locations in the Atlantic Ocean, together with oceanographic data, have proved that this dacitic pumice has derived from Iceland. As the North Atlantic Drift sets in the wrong direction, the pumice could scarcely reach the British Isles direct from Iceland (conditions are unlikely to have been

more favourable for this at the time of the drifts). It could, however, reach British coasts by circumnavigating the northernmost Atlantic in an anticlockwise fashion.

The dacitic pumice is thought to have mainly been erupted about 6,700 radiocarbon years ago, but some of it may have been produced about 4,000 radiocarbon years ago. This piece seems to belong to the first variety. Hekla may be the source volcano, but insufficient is known of the products and eruptive history of other volcanoes on Iceland or off its coast, and one of these may also be the source.

## Appendix 8

### Black Glass Bead

Report by Dr H McKerrell, Research Laboratory, National Museum of Antiquities of Scotland.

Not a leaded glass of any kind nor Pyrex or material of that sort. Just a simple sodium/calcium silicate which could be of almost any period.

## Appendix 9

### A Human Hair

Report by Mr D R Brothwell, Sub-Department of Anthropology, British Museum (Natural History).

The hair was submitted as found, i.e. still concreted to the flint artefact.

'Study was made under the scanning electron microscope. Detail of the external morphology which is typical of the whole extent of the hair examined is illustrated in the photographs (pl 1b, × 1250, pl 1c, × 2000). Although there appears to be some post-mortem erosion influencing the shape of the cuticular scales, and one or two longitudinal damage "fissures", detail is still generally good. It would be unwise to be dogmatic on the evidence of so little hair, but it can be said that the size of the hair and the shape of the cuticular scales certainly suggest that the specimen is from a human. Nothing in the appearance or the condition of the hair indicates why it has been preserved as well as it has. Indeed, it appears to be remarkably free of decay – especially of fungal attack. The hair appears to be well pigmented, with no noticeable reddening which can take place in ancient hair (owing to changes in the melanin pigment).'

An imbrication count had also been requested, since this has long been used to distinguish sheep wools at least, but the writer was told that such counts have never been done for the varieties of human hair.

The hair is unlikely to post-date the planting of the wood some 60 years ago, the last human disturbance of any importance in the area. Hair tends to survive better than bones, of course. The hair could belong to a planter or a lazy-bedder, or even to one of the regression-time people to whose artefact it is now cemented.

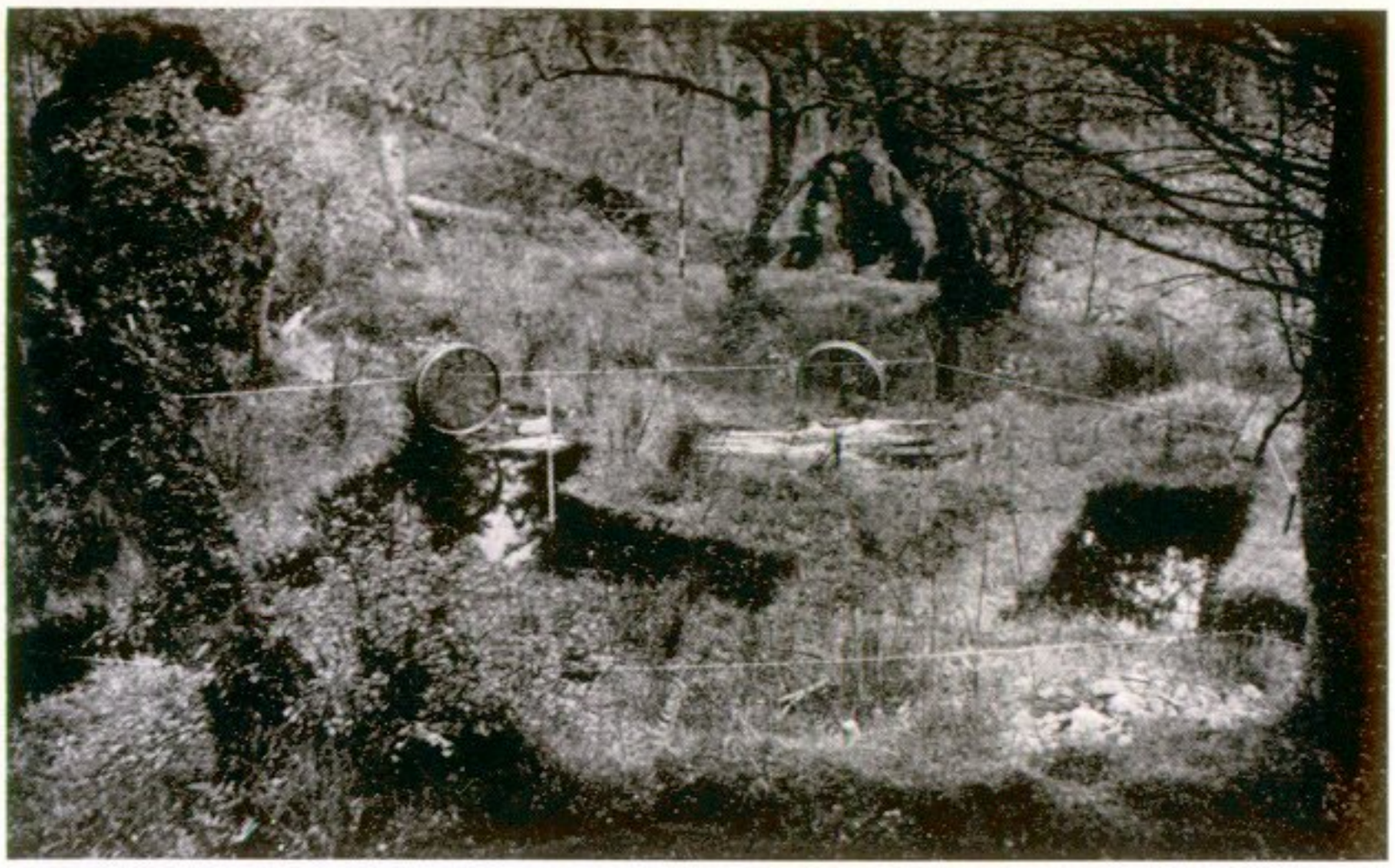
## ACKNOWLEDGMENTS

Dr S E Durno of the Macaulay Institute for Soil Research, Aberdeen, is thanked for personally sampling and then analysing the pollen sequence of the Lussa Wood bog. Mr R E Binns of Tromsø Museum, Norway, is thanked for a full and interesting report on the pumice specimen. Dr M Y Stant, Jodrell Laboratory, Royal Botanic Gardens, Kew, kindly reported upon the large quantity of charcoals, the Royal Botanic Garden, Edinburgh, on the seeds. Grateful acknowledgment is made of soil reports by the Macaulay Institute and by the West of Scotland Agricultural College, Glasgow, of the bead examination by the National Museum of Antiquities Laboratory, Edinburgh, and of identifications by the Royal Scottish Museum, Edinburgh, the Institute of Geological Sciences, Edinburgh and London, and the Research Laboratory and the Departments of Entomology and Palaeontology of the British Museum. The radiocarbon datings were kindly carried out by the Research Laboratory, The British Museum.

The writer is grateful to Mr and Mrs A R Nelson, the owners of the land, for once again giving permission for the investigations. The excavation proper took the writer and Susan Mercer about thirty working days each, in spring 1969, kindly helped on three days by Mr John Hewish. The illustrations are again drawn by Susan Mercer.

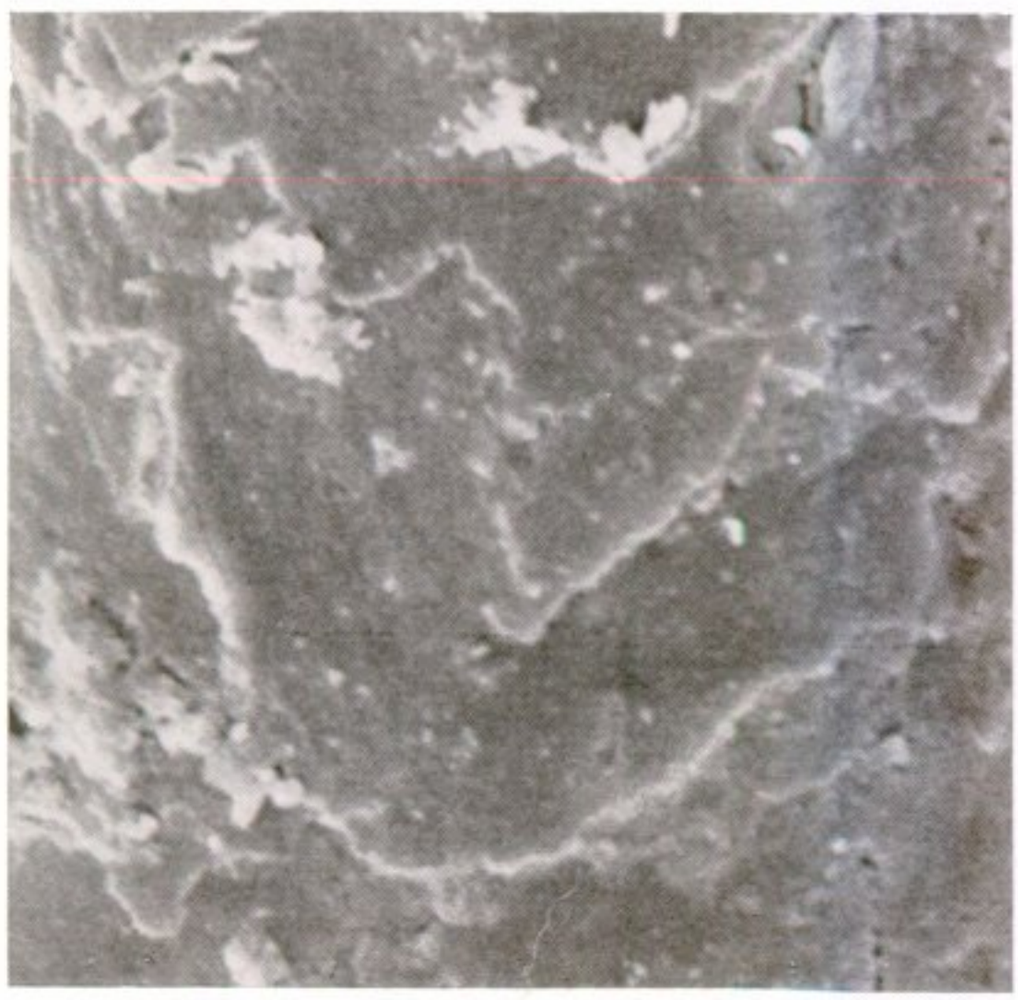
## NOTES

1a. Mercer, J, *Quaternaria*, XIII (1970), 177–85, a synthesis of first four *PSAS* papers. Written before C14 correction.
1b. Mercer, J, *PSAS*, 100 (1967–8), 1–46.
2. Mercer, J, *PSAS*, 102 (1969–70), 1–30.
3a. McKerrell, H, *Scottish Archaeological Forum*, 3 (1971), 73–84.
3b. Mr J C C Romans, Macaulay Institute for Soil Research.
4. Mr A H Johnson, West of Scotland Agricultural College.
5a. Mercer, J, *PSAS*, 104 (1971–2), forthcoming.
5b. Lacaille, A D, *The Stone Age in Scotland*, O.U.P. (1954), ch. vii, reports summarised.
6. Coles, J M, *Dumfriesshire and Galloway Nat Hist Ant Soc*, XLI (1962–3), 67–98.
7. Thompson, M W, *PPS*, 20 (1954), 193–211.
8. Examined in S France and N Spain museums in 1970.
9. Peters, E, 'Das Mesolithikum der Oberen Donau', *Germania*, 18 (1934), 81 ff.
10. Bandi, H G, *Birsmatten-Basisgrotte*, Bern (1964).
11. Bardon, L, Bouyssonie, J and A, *Rev de l'École d'Anthrop de Paris*, XVI (1906), 170–5.
12. Bishop, A H, *PSAS*, XLVIII (1913–14), 91.
13. Breuil, H, *PSAS*, LVI (1921–2), 261–81.
14. Gray, A, *PSAS*, XXVIII (1893–4), 263–74.
15. McCallien, W J, and Lacaille, A D, *PSAS*, LXXV (1940–1), 81.
16. Coles, op cit.
17. Lacaille, A D, *PSAS*, LXXIX (1944–5), 81–106.
18. Cnoc Sligeach: Bishop, op cit, fig 33, nos 1, 7, 12, 20 at least; and a hammerstone of Lussa River type, fig 32, no. 1. Casteal-nan-Gillean: Lacaille, op cit, (1954), fig. 89, nos 2, 3, 6, 7 at least. Cnoc Riach: N M A collection includes little but chisels.
19a. Roche, J, *Le Gisement Mésolithique de Moita do Sebastião, Muge, Portugal*, Lisbon (1960).
19b. *Discovery and Excavation*, 1970.
20. Lacam, R, Niederlander, A, and Vallois, H -V, *Arch Inst Pal Hum*, Mém. 21, Paris (1944).
21. Clark, J G D, *PSAS*, LXXXIX (1955–6).
22. Morton, J K, *Proc Bot Soc of Brit Isles*, vol. 3, pt 3, Suppl. (1959), 1–59.
23. Knox, R B, *Trans Bot Soc Edin*, 37 (1959), 251–6.
24. Imms, A D, *A General Textbook of Entomology* (1957).
25. *Cambridge Natural History* (1895), vol. v, ch. xxi.
26. Linssen, E F , and Newman, L H, *Common Insects and Spiders*, Warne (1962), 59–61.
27. Binns, R E, *Scott J Geol*, 8 (2) (1972), 105–114, for general discussion of this and other British pumices.



a Lussa River site, hardpan zone, from NE slope up to T4 terrace; white measure on charcoal concentration, sieves on bedrock cracks, ranging pole on lip of drop to T2 terrace

b Lussa River hair, typical detail, ×1,250



c Hair detail ×2,000