Glenbatrick Waterhole, a microlithic site on the Isle of Jura

by John Mercer

SUMMARY

Two camps (G1, G2) had been made at 59 ft (18 m) OD on the shore silt of a slightly sunken lagoon, now almost extinct, which had formed behind a cobble ridge; the silt seems to be either just above the highest Post-Glacial transgression's washing limit or, perhaps, partially within its spray zone. Although pollen diagrams were produced for both the uppermost silt and an overlying 3 ft 6 in (1 m) of peat, the only clear evidence obtained was a dominance of heather throughout the peat period, with the corresponding limitation of trees (a little alder, birch and hazel), and also a lack of cultivation-weed pollen even in the top of the peat, in line with the total absence of farming relics in the valley. Floor G1 yielded a Phase 1B industry (189 microliths) comparable to the Lussa Bay material in all but the latter's tanged point (as a result of this and other evidence, henceforth Phase IA). Floor G2 (239 microliths) immediately followed G1, on typological grounds – for example, its only Phase 1B trapeze is rather nearer the Phase 2 form than are any on the G1 floor. The waterhole and the unusual absence of any terrace between 27 and 56 ft (8 and 17 m) OD is thought to account for the presence at this height of such early camps (Phase IB has been shown by C14 at Lussa Wood I to include the calendar period 7000–6500 BC). Similar reasons probably led to the neolithic occupation (on the G2 floor) evidenced by two leaf-shaped arrowheads. Radiocarbon assay on charcoal from a small pit in the G2 floor gave a calendar age of *c* 2950 BC; charcoal from under the side of a low ridge (so far only partially excavated, one burnt flint) in the otherwise artefact-free zone between G1 and G2 gave *c* 3860 BC. This paper forms part of a series of site reports and syntheses (Mercer 1968, 1970a, 1970b, 1971, 1972, 1974a, 1974b).

REPORT

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

Glenbatrick is the most westerly or seawards bay of the S coast of Loch Tarbert. The broad mouth of this magnificent 6-mile (10-kilometre) fjord is open to the Atlantic breakers, but its inner half is a labyrinth of sheltered creeks and islands; these must once have harboured an abundance of wild life. The head of the E end of the loch is formed by the isthmus which unites the two halves of Jura, at present a peat-covered strip at the most 1 mile (1km 600m) wide; at its highest point the surface of the sub-peat layer is probably about 50 ft (15 m) OD.

Glenbatrick itself is a valley on the vast scale of L. Tarbert. Its upper reaches are formed by the N flanks of the two northerly Paps, each some 2,500 ft, (750 m) and by the slopes of other lesser peaks; the valley floor, 2 miles long, (3 km 200 m) descends straightly to the sea, becoming a mile wide at the mouth. Bedrock is the island's usual Lower Dalradian quartzite, occasionally broken by Tertiary NW-SE dolerite dykes. Striae showing ice-movement both W and N have been recorded for Glenbatrick, that is to say both across the valley, the main glaciation's direction for Jura, and down into L. Tarbert, presumably the final, local phase; typical island boulder clay

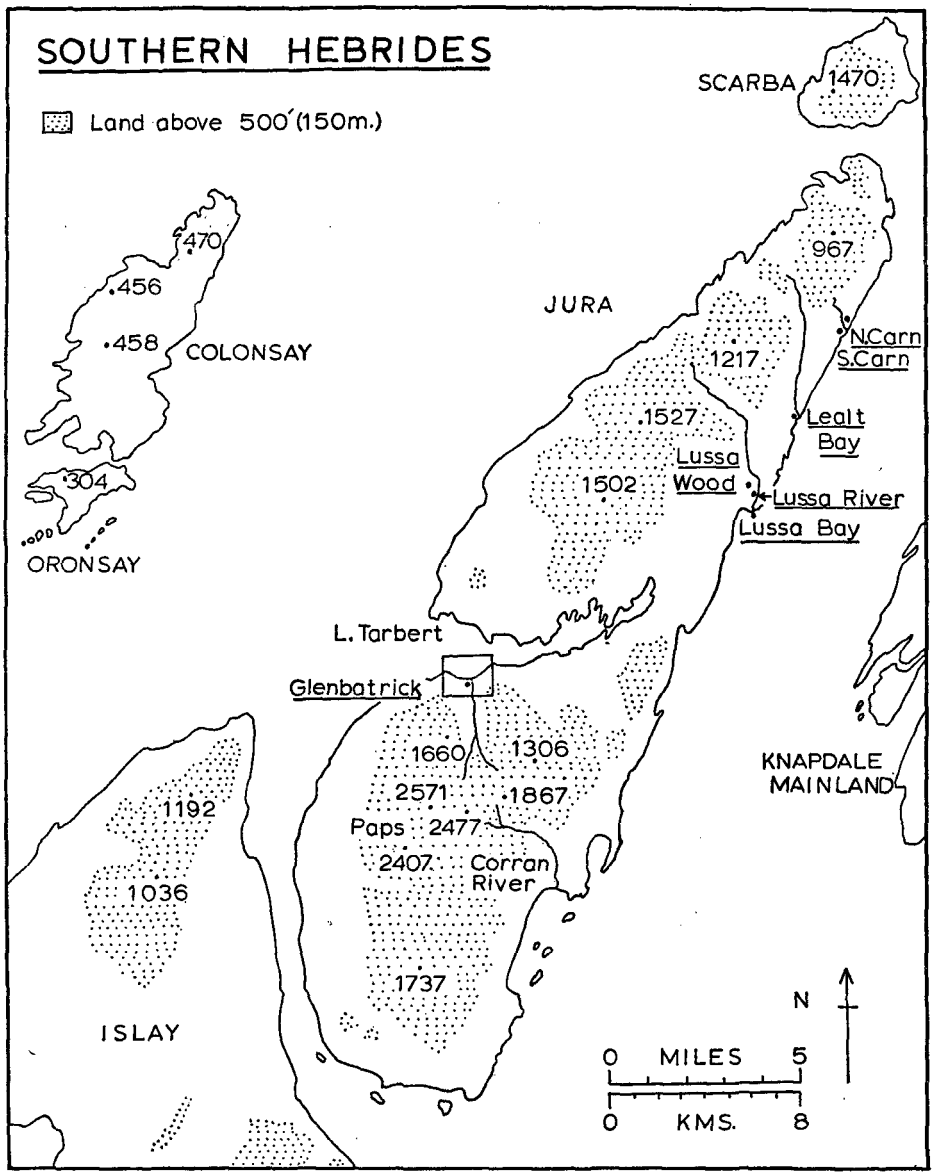
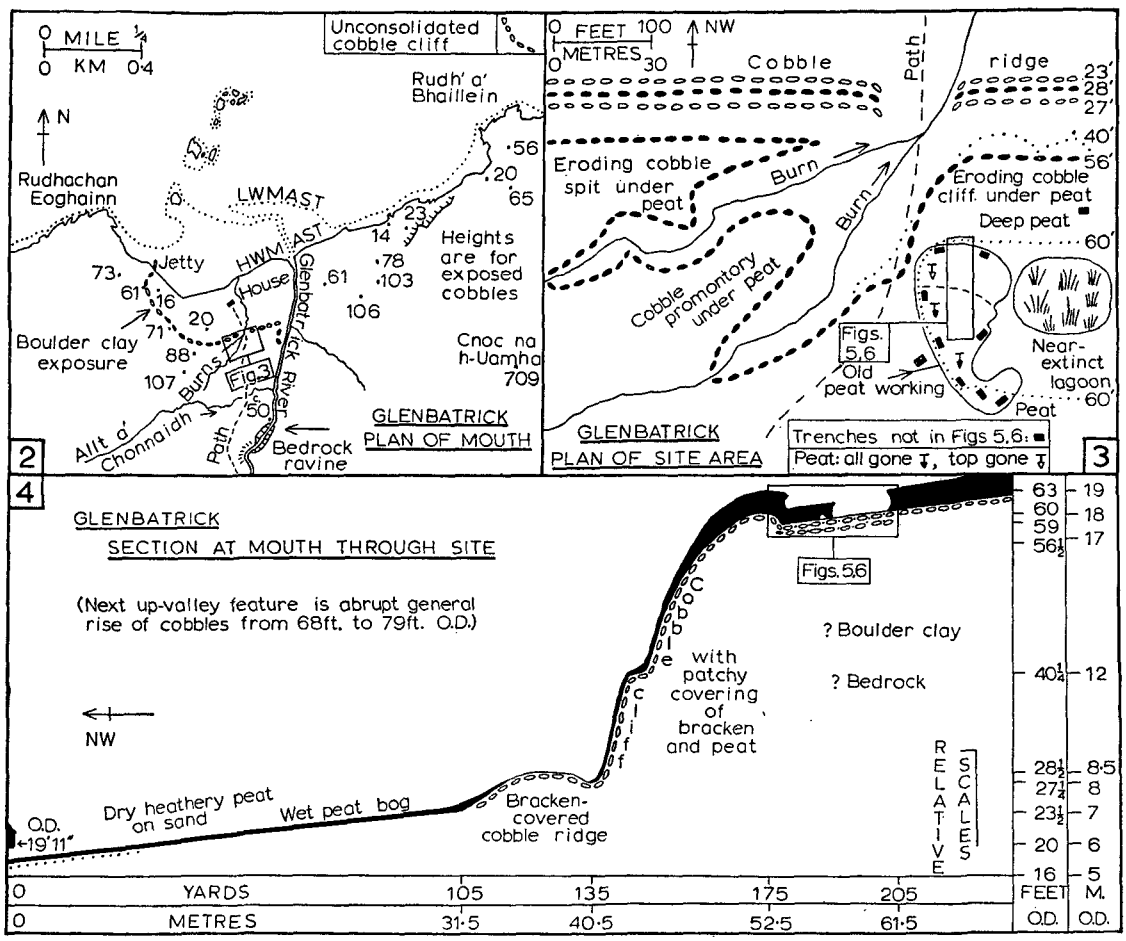


FIG 1 Southern Hebrides

is visible in the face of the main extinct cliff cut in unconsolidated material, the clay's visible vertical range 75–82 ft (23–25 m) OD. The clay is capped by *c* 20 ft (6 m) of rolled cobbles, presumably a relic of the Late-Glacial high sea; the top of the cobbles is also the highest point of this unconsolidated cliff in Glenbatrick.

The general landscape sculpturing of the mouth of Glenbatrick – but with heights specific to the site area – is shown in fig 4. Measurements are, as always, to the top of the sub-peat layer, using a water-level, staffs and probes. The beach cobbles, to start at sea-level, disappear under

the low wind-torn face of the sand-spread which covers the extensive 17–27 ft (5–8 m) OD platform. Parallel to and just clear of the base of the platform's towering, unconsolidated backing cliff, the cobbles surface as a ridge, crest 28–29 ft (8·50–9 m) OD. The cliff itself, 27–56ft (8–17 m) OD, holds patchy terracing, at the most 5 yds (4·50 m) wide, at 40 ft (13 m) OD; some way up the more sheltered main watercourse, 150 yds (140 m) E, a much more extensive example of this terrace – a zone often used by Jura's Phase 2 occupations – was located by levelling.

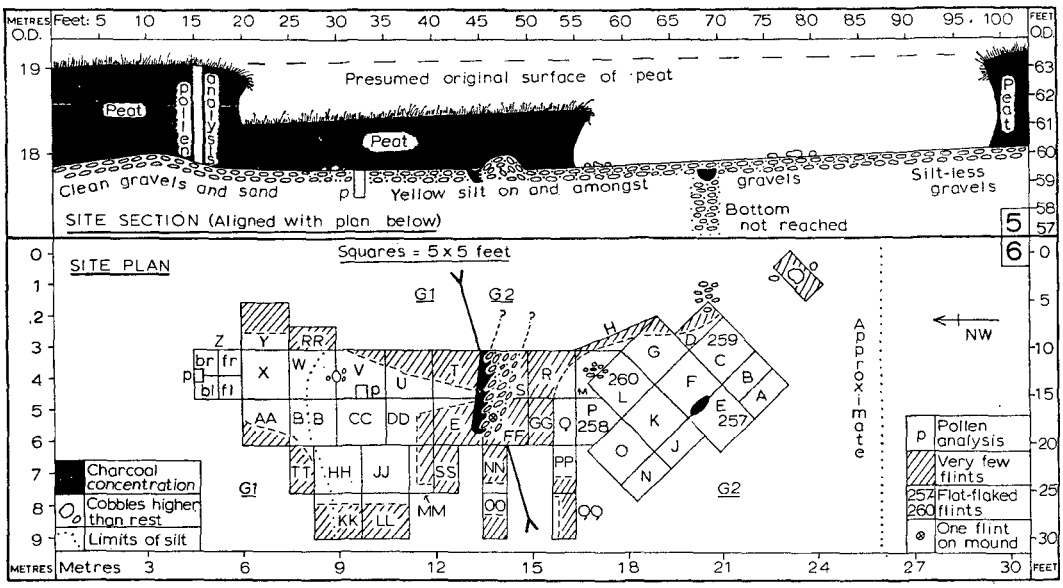


FIGS 2–4 Glenbatrick, plans and section

From the top of the unconsolidated cliff (a spectacular feature marked on the 6 in or 15 cm OS map) there stretches back another well-defined terrace. The site, NGR NR 518798, stands upon it, some way back from the front edge and at 59–60 ft (18–18·50 m) OD. Two minute burns meet just W of the site and the main river lies to the E and 70 yds (65 m) away. Uphill, the terrace rises evenly to 68 ft (21 m) OD.

The site itself is on a silt of very local extent; apart from the distant boulder clay, the valley's sub-peat layer is made up of rolled cobbles, with an instance of gravels and sand to be described later. Evidence will be given in the excavation report suggesting the silt was deposited in a lagoon

of which a near-extinct remnant is to be seen to the E of the site (pl 1c); the rest of the 56–68 ft (17–21 m) OD terrace holds dry hollows probably of similar origin. In fact, on the similarly pitted 17–27 ft (5–8 m) OD platform and just E of the main river, there is a close modern parallel (pl 1d). Oddly, the first edition of the 6 in (15 cm) OS map, its survey about a hundred years ago, chose to show that the site lagoon had then reached the state of a circular marsh (an unusual detail), but nothing appears there on the second edition, produced at the end of the century; this alone suggests that shrinking to topographical insignificance occurred between the two surveys. The area just W of the site silt is now drained by the two trickling burns, their 56–27 ft (17–8 m) OD courses through the terrace-edge gravels being down two disproportionately large ravines: these deep broad channels are probably the result of Atlantic-period drainage in combination with the highest Post-Glacial transgression. This extensive M-shaped double notch (base towards the present shoreline) in the unconsolidated cliff is thought to have begun the drainage of the W end of the site's lagoon. The nineteenth-century acceleration in the lagoon's extinction can be put down to the removal of much of the peat cover between the E burn and the eastwards-shrinking lagoon for fuel for the Victorian shooting lodge on the beach below. The only ponding, at this height, to have survived until now, in spite of the two inroads upon it, the lagoon is likely to have been a regular, sizeable body of water in early Post-Glacial times.



FIGS 5 and 6 Glenbatrick, site section and plan

Glenbatrick's few trees grow far from the site, at the base of the valley walls or sunk in the main watercourse; heather and bracken are the dominant vegetation. Wildlife is rare, though the soft silt at each end of the modern, sunken lagoon, the haunt of basking adders in hot weather, is kept churned up by the hooves of the herds of deer which still pass daily across the valley mouth. The only regularly used access route by land, for humans, is from the mouth of the E coast Corran River, the island's largest burn after the Lussa River. The route strikes NW over the bog for an 800 ft (250 m) pass between Corra Bheinn, 1,867 ft, (575 m) and Beinn Tarsuinn 1,306 ft (400 m). Once there, a faint track undulates across the tarn-holding moraines which ridge the saddle, leading eventually into the upper reaches of Glenbatrick. The final ½ mile

(800 m) of the current route lies not along the main watercourse but, aiming for the Victorian shooting lodge which until now has been literally the only sign of human activity in the valley, passes right across the site, not necessarily by coincidence.

(b) *The excavation* (pl 1a, figs 5–7)

A total area of 950 sq ft (90 sq m) was excavated. The peat-digging for fuel for the house below had entirely stripped the cover off the S end of the site and had left 1–2 ft (30–60 cm) of peat in the centre; the northern or seawards end was covered by 3½ ft (1 m) of apparently untouched peat which continued northwards to the front edge of the terrace. There were no artefacts in any part of the peat. The normal sub-peat layer varied from pure silt (found to cap silt and gravels mixed) to an immediate surface of silt and gravels; the N and S margins of the excavated area consisted of sand and gravels. Figs 5 and 6 show the various deviations from these surfaces; the most interesting of these was a silt-and-gravel ridge, with radiocarbon-dated charcoal, discussed in the next section.

Flints and charcoal were scattered throughout the upper 3 in (750 mm) of the silt (not particularly on the surface), with occasional specimens down to 4 in (10 cm). Fig 7 gives flint-quartz weight as a rough guide to concentrations; the unexcavated silt certainly contains a few more. Artefact distribution (fig 7) suggests two concentrations, with the edge of a third on the N margin (not excavated, under 3½ ft (1m) of peat). The dividing line between the excavated concentrations was taken as trenches S and FF, free of flint and quartz, with the few NN–OO artefacts assigned to the northern concentration, on the basis of an NN triangle matched there by several specimens but not present on the G2 floor; the overall result is barely affected. The more northerly and typologically earlier of these floors (Phase 1B) will be referred to as G1, the other as G2. The former was perhaps a little more deeply in the silt, taken overall, than the latter. If interpretated as a lagoon shore, the silt is likely to have undergone pre-peat cracking, with downwards movement of artefacts; probably both the lighter flints and the charcoal were also moved about by wind and water (especially following seasonal changes in surface level).

A further charcoal concentration was located on the N margin of trench E. This was within the silt, not quite reaching to the surface, and was part of the filling of a scooped pit which had its base 10 in (25 cm) into the silt. It can be most easily explained as a cooking pit. This charcoal gave a C14 date of 4225 ± 230 BP (GX–2563), corrected age about 2950 BC.

In order to confirm that sub-peat morphology was in keeping with the idea of the one-time extension of the now near-extinct lagoon as far as the site, levelling was carried out across the silt and then across the gravels (under peat) immediately to the N of the silt. Levelling W-E from the small burn across the silt's final surface showed undulations against zero (the W end) of a maximum of 3 in (750 mm) over the first 80 ft (24 m) (the site), this maximum being at the E end, the beginning of a continuing rise; the middle of the present lagoon, 30 ft (9·50 m) further, was actually 8 in (20 cm) higher than the site; for the final 100 ft (30 m) to the main watercourse there was a steady rise totalling another 20 in (50 cm). The second set of levels compared the heights of the points used for the first with those points on a parallel, W-E line along the gravels (under peat) to the north. This showed the site and present lagoon zone to be fronted by a ridge in the N gravels, the height differences falling in a regular curve from 14 in (35 cm) at the W end to zero at the centre (W end of the present lagoon) and then rising steadily to 4 ft (1·20 m) at the E or main watercourse end. Finally, levelling the site zone N-S showed a regular, minute rise totalling 1 ft (30 cm) between the ridge and the up-terrace margin of the silt some 10 ft (3 m) SE of trench A. Overall, then, the site silt is level across-valley and has a slight slope up-valley, acceptable as the sediment surface of a quiet lagoon; originally the difference in height between ridge

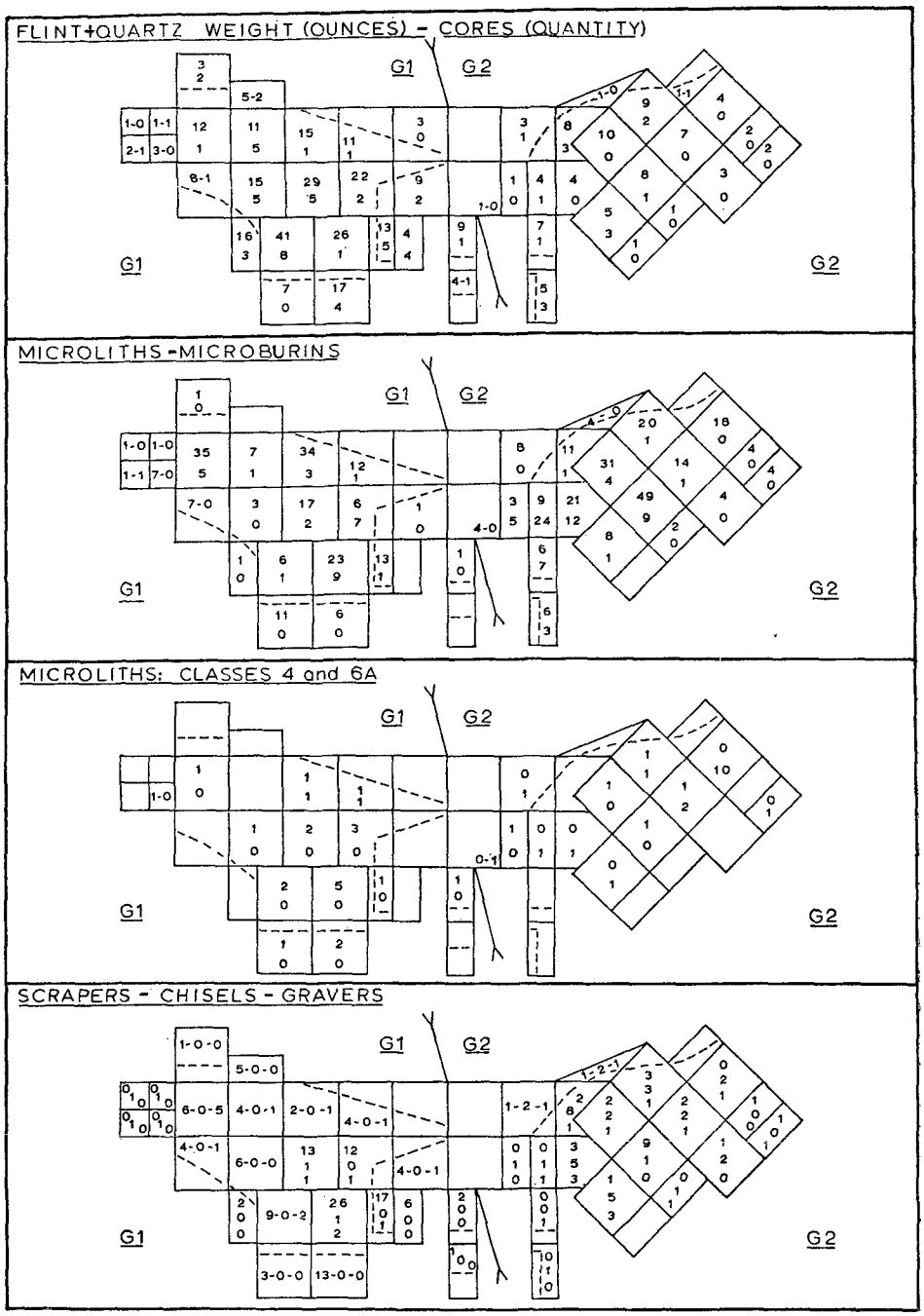


FIG 7 Glenbatrick, artefact distribution

and lagoon bed would have been greater; that the bed of the remaining lagoon should be higher than the dried-out site silts points to early drainage (less sedimentation) at the W end, where the M-shaped notch cuts the terrace, and the site silts would also compress down on drying.

The only important natural change from the described stratification came in trenches KK, HH, BB, W: the tenacious yellow silt ended, giving way horizontally to clean loose sand and gravels with a continuing yield of flint artefacts. Most important were three small rolled flints in the sand and two more just in the silt area: natural agencies must have brought these, and they are too rare on Jura not to be derived from an earlier occupation, presumably seawards. It is thought that the trenches in which they were found lay within the washing limit of the transgression being perhaps at the very maximum of the spray zone, always likely to be marked by sand such as included the minute flints; however, any gravel and sand flung up by the transgression would soon be indistinguishable from the much earlier gravel and sand upon which the ponding began (at least those forming the S margin of the site are supposed to be Late Glacial in origin). A pit 3 ft (1 m) deep was dug in trench F but the bottom of the silt and gravels, hard-packed and without recognised vertical change, was not reached.

The exact origin of the silt was obviously of prime importance in assessing the age of the site. The first specialist's examination of a sample produced an analysis and indeterminate conclusions (Appendix 1); a second opinion (Appendix 2), based upon the analysis, was that the indications were undoubtedly of the silt's deposition in an acid, freshwater lagoonal environment.

Next, to try to date the silt and thus provide a maximum antiquity for the flints, the silt was subjected to pollen analysis. A vertical series of five samples was taken from 10 to 2 in (25 to 5 cm) in trench V; however, although probably in an anaerobic condition since the growth of the overlying peat, removed by the excavation, there is no certainty that drying out did not occur at any time before the beginning of the peat, causing pollen loss, nor that this drying out did not lead to cracking which resulted in turn in contamination by down-filtering of later though still pre-peat pollen. The samples yielded very little pollen indeed but 6 alder grains (3 in the lowest; 2 in 4; 1 in 5) out of a total of 11 tree pollen grains in all five samples indicate that the silt incorporates non-arctic and probably post-Boreal evidence. It is only really safe to date the base of the peat with these conclusions, in view of possible contamination.

The overlying peat itself, 3 ft 6 in (1·10 m) deep, was submitted to analysis, a vertical series of 21 samples, at 2 in (5 cm) intervals, from the W corner of trench Z. Unfortunately the diagram showed 'no recognisable trends', with a great similarity of content at all depths, though there were fewer grains of any kind in the upper levels. Samples 2–8 (1 being the base) yielded very high *Ericaceae*, low tree pollen with alder and birch predominating, and relatively low *Coryloid* – this was interpreted as certainly after the Boreal-Atlantic transition (in keeping with the pollen from the top of the silt) and possibly Sub-Boreal (because the *Alnus* values compared to those of Bird Loch and Lealt Bay (Mercer 1968, figs 4 and 8). Samples 1 and 9–21 were practically without tree pollen (*c* 2%), with *Ericaceae* dominance, leading Dr Durno to place the upper 26 in (65 cm) in the Sub-Atlantic, in spite of the low *Gramineae* when compared with the other Jura diagrams. He added that any evidence of early agriculture woul dhave been swamped by the massive quantity of heather pollen.

It should be noted that, in spite of the lack of identification of oak pollen in the silt and the overlying peat, charcoal samples from both the trench E pit and the trench S trough (next section) were all found to be oak wood. Both pit and trough were made in the top of the silt.

The occupations at the site will have been subject to various influences. Probably lacking cover then as now, winds from S and W will have been very strong. Water-level in the lagoon will have varied, affecting the extent of the silty shore available for a camp. Occupation of one

patch for many years would have led to packing down of the silt, followed by its waterlogging – causing a shift of camp to another patch, perhaps only until sedimentation had raised the level of the original patch above summer water-level. Access to the shoreline below was another factor: this would have been down the adjacent W burn, the latter also providing fresher but less constant water than the lagoon.

(c) *The Cobble Ridge* (pl 1a, figs 5–6)

Its W limit revealed in trenches F and SS, and partially excavated there, probing through the peat showed the ridge continues eastwards. Full excavation is to be undertaken.

In trench S the ridge rose 4 in (10 cm) above the silt. There was a burnt flint in its surface. A trench dug N-S across it produced nothing, but it was found that along its N side there had been scooped a corresponding trough, about as deep as the ridge was high. The silt and gravel filling held an unusually large amount of charcoal. The trough continued some way under the ridge.

The ridge is, then, considered to have been built with the trough material. Following this, charcoal was deposited in the trough, the latter being partially refilled by the ridge material, this probably naturally slumping back, and partially by fine silt, in part from the surface immediately N of the trough and in part by wind and perhaps water transportation.

A cooking trough or a burial, perhaps by cremation, are possibilities. For the charcoal there is a date of 5045 ± 215 BP C14 years (GX–2564), corrected age about 3860 BC. The position of the ridge, in an artefact-free zone, can be interpretated in many ways. Perhaps the most satisfactory at present is to assume there was originally a natural break of surface there, keeping the microlithic camps to one and the other side; for example, a tongue of water or a cobble ridge. A later group, either one of the unexcavated microlithic camps or a very early Neolithic occupation, then chose the feature for adaptation to their unknown purpose.

It can be repeated here that the charcoal of the Phase 1B microlithic camp and its immediate successor (G1–2) is thought to be that scattered haphazardly through the silt, as were their other artefacts. The dated charcoals, *c* 3860 BC and *c* 2950 BC, may be associated with the Neolithic points; future work should clarify this.

(d) *Summary of the finds*

(1) Charcoal (wood and hazel-nut shell) scattered throughout the silt; concentrations in trenches E and T (described already). Wood determinations were carried out on the trenches E and T charcoal concentrations: all samples identifiable were oak (*Quercus robur* L. type).
(2) Coarse-grained quartzite cobble, chopper-like, 1 lb 12 oz (G1 : KK), similar to N Carn no. 2. Coarse-grained quartzite flake, natural platform with signs of initial ineffective blows, bulb; 3 in (750 mm) wide, 2 in (500 mm) long but end lacking, ½ in (13 mm) thick at butt (G2 : K). No. 1 (fig 8): fine-grained quartzite elongated flat-sectioned beach pebble with bevelled end (G2 : M).
(3) Two flakes of green pitchstone (G1 : HH), Arran-type exterior.
(4) Flint artefacts, 23 lb 14 oz, milky quartz 1 lb 11 oz (four pieces weighed 1 lb 4 oz), quartz crystal 8 oz. Figs 8–15. Ratio 11 : 1.

(e) *Flint and Quartz*

Raw materials and condition. Two types of basic nodule stand out. The first, deduced from the many massive, cortex-bearing flakes found on the North floor, is of a kind to be seen in S Mull

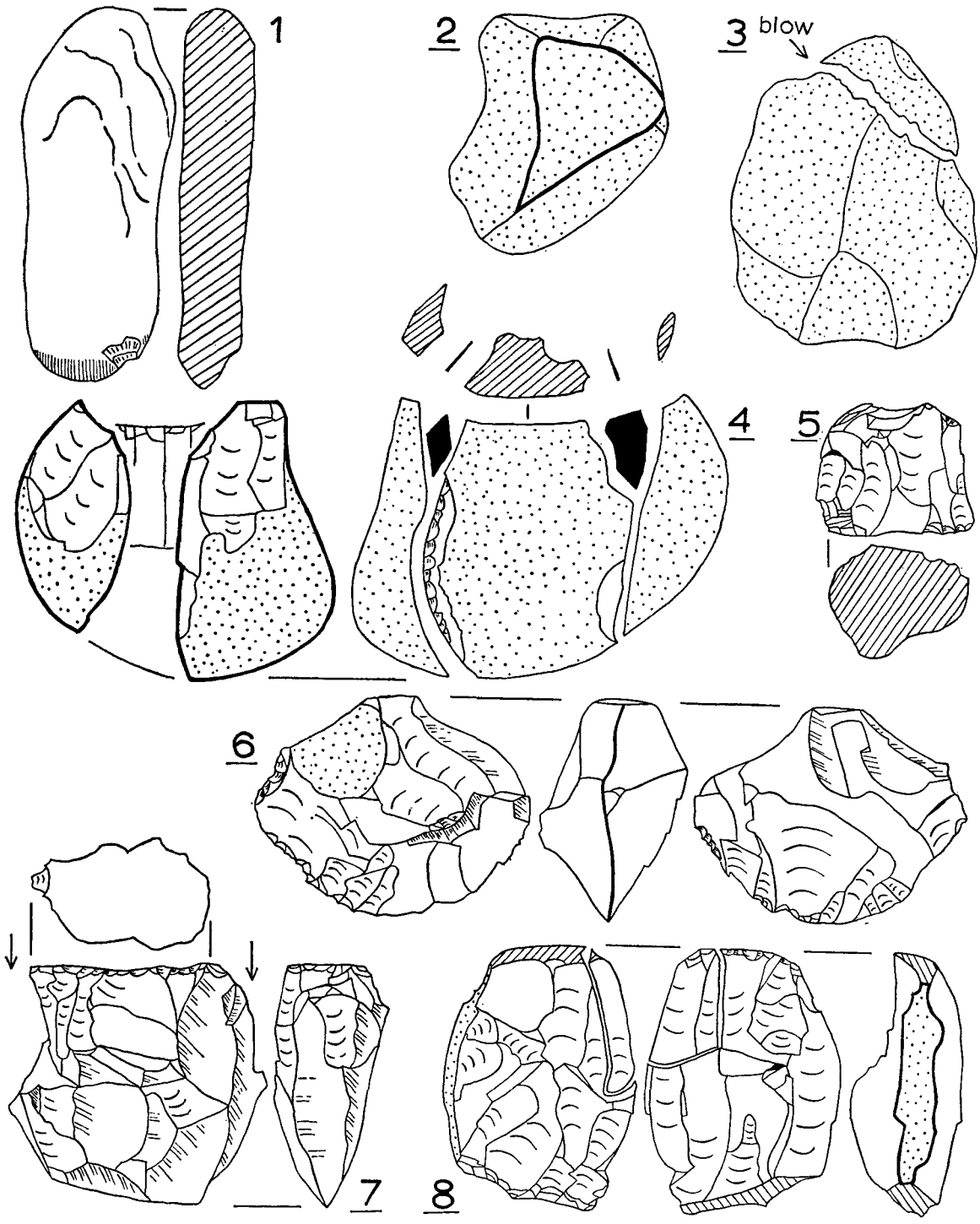


FIG 8 Quartzite tool no. 1 (1: 2), flint pebble and cores (1 : 1)

(Mercer 1968, 46): large shapeless nodules with rough exterior and mediocre grey cherty interior. The other is the small water-rounded pebble with smooth cortex and variable interior, in particular three whole ones (2 oz in total, HH, and no. 2, LL), two cores abandoned at once (4 oz MM, and no. 3, LL, unworkable flint) and the partially reconstructed no. 4 (2 oz, JJ–MM–SS–?), good grey-brown flint.

Five rolled flint chips up to 3/20th in (40 mm) maximum dimension (X, Z, JJ, TT, the seaward end of the site), three possibly lightly rolled artefacts, may show, as discussed, that the transgression just touched the lagoon. The lagoon itself has caused glossy patches on a great many artefacts (some on broken *faces*). There was re-use evidence in the shape of a large rolled flake with a freshly used edge (MM) and a large fresh flake struck off a rolled (i.e. older) core (NN); in neither case need the rolling have occurred at Glenbatrick, of course. No two-patina specimens were found.

Single patination varied. Flints from the sand-gravel zone (N end of North floor) were well-patinated; those deep in the silt (i.e. the rest of the G1 floor) were unpatinated or lightly so; those from the G2 zone were generally of medium patina, with those found on its surface (exposed by the peat-cutters) chalky white.

The quartz was of above average quality. Of the 2 lb 3 oz, four milky lumps totalled 1 lb 4 oz and crystals (one of 1 in or 26 mm) 8 oz, the rest weighing only 7 oz. Classified: three cores and a platform flake (crystals), a scraper and a chisel (milky).

Typology (figs 8–15, G1 artefacts with underlined numbers)

	Summary	*G1*	*G2*
a	Cores	54	15
b	Platform flakes	101	41
c	Microliths	189	239
d	Micro-burins	31	68
e	Scrapers	139	28
f	Gravers	17	14
g	Chisels	6	37
h	Blades	159	50
i	Flakes with basal tapering	19	8
j	Humped forms	6	2
k	Perforators	9	5
l	Part-cortex flakes	62	18
m	Scale-flaked specimens	0	4
n	Miscellaneous forms	0	3
o	Trimmed but not classified	27	48

(a) *Cores (including scrapers, graver)*

		G1						*G2*					
	Description	*Ill. Nos*	*Total*	*3 Plat*	*2 Plat*	*80°–100°*	*Scr.*	*Ill. Nos.*	*Total*	*3 Plat*	*2 Plat*	*80°–100°*	*Scr.*
1	No cortex	5	5	1	2	0	3	13, 15	3	0	2	1	0
2	Cortex tip only	6, 7	4	2	1	0	1	14	1	0	0	0	0
3	Flaked only part round	4, 8–12	42	1	9	2	3	16	10	0	4	3	1
4	Abandoned at once (one crystal)	3	3	0	0	0	0		1	0	0	0	0
	Totals		54	4	12	2	7		15	0	6	4	1

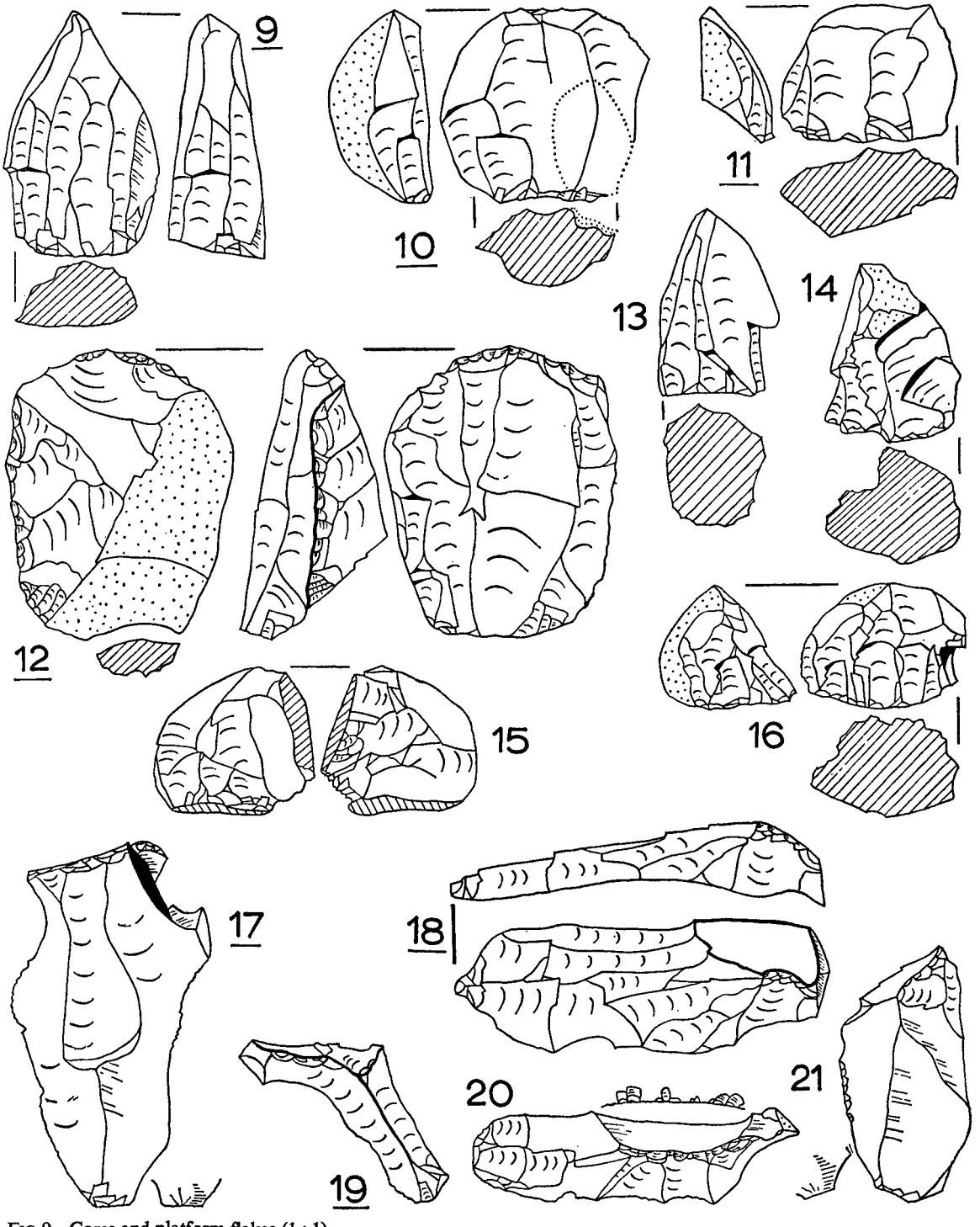


FIG 9 Cores and platform flakes (1 : 1)

TABLE I

MICROLITHS

Description	G1 Quantity	G1 Bulb	G1 Prob. frag.	G1 Illustration nos and notes	G2 Quantity	G2 Bulb	G2 Prob. frag.	G2 Illustration nos and notes
BASAL END NOT SEPARATELY SHAPED								
1A Partially trimmed one side								
i Obliquely, 1–$\frac{3}{5}$ in	9	3	2	Varied, as usual. Nos 22–3 bulbar, nos 24–7, latter compares triangle no. 66	5	2	0	No. 93 bulbar, $1\frac{1}{10}$ in (outlying trench S of trench C). Nos 94–5
Lengthways	3	3	0	$1\frac{1}{10}$–$\frac{9}{10}$ in. Nos 28–30	1	1	0	No. 96, $1\frac{1}{20}$ in, bulbar, trimmed tip
ii Obliquely, under $\frac{3}{5}$ in	0	0	0		1	0	0	No. 97, poor
1A–B Intermediate	4	0	1	Nos 31–3	0	0	0	
1B Fully trimmed one side								
ia Convex	10	2	1	Varied, $1\frac{7}{10}$–$\frac{3}{5}$ in. Nos 34–9. Nos 36–7 inverse, No. 38 humped	12	1	0	$1\frac{1}{10}$–$\frac{3}{5}$ in, Nos 98–102. No. 98 break prob. micro-burin facet; part inverse. Nos 99, 101 inverse
1b Convex, under $\frac{3}{5}$ in	1	0	1		0	0	2	No. 103 inverse
iia Straight or concave, 1–$\frac{3}{5}$ in	3	1	1	One concave, no. 40, bulbar, and no. 41, both mainly inverse	6	0	0	No. 104, $1\frac{3}{20}$ in. No. 105. No. 106 complete hinge flake, as no. 102
b Straight, under $\frac{3}{5}$ in	0	0	0		1	0	1	No. 107
1Di Fully trimmed one side. partially the other	1	1	0	No. 42	0	0	0	
1E Fully trimmed each side, maximum width over a quarter of length	0	0	1	No. 43	2	0	0	Nos 108 (?trimmed base), no. 109 bulbar
2 Fully trimmed each side, maximum width under a quarter of length	0	0	0		2	2	1	Nos 110 (see Note 1), 111 (bulbar), 112
BASAL END SEPARATELY SHAPED								
3Ai 'Base' tapered by trimming from below	14	3	10	Nos 44–9. No 44 bulbar, No. 46 inverse. Nos 47, 49 angular. Frags are the easily recognisable basal ends (?6c)	15	1	17	Nos 113–119. No. 113 peculiarly large. No. 114 typical. Nos 115–116 (?6Biii – See Note 2). No. 117 inverse. No. 118 near-pentagon
3Bi Base trimmed convexly	0	0	0		1	0	0	No. 120 (?Bii)
ii Base trimmed straight	1	1	0	No. 50, inverse	0	0	0	
3Ci Base trimmed concavely/ symmetrically	2	2	0	Nos 51–2 (both trench X)	0	0	0	
ii Base trimmed concavely/ asymmetrically	0	0	0		0	0	1	No. 121, bulbar frag.

TABLE I—(*continued*)

MICROLITHS

		G1				G2			
	Description	*Quantity*	*Bulb*	*Prob. frag.*	*Illustration nos and notes*	*Quantity*	*Bulb*	*Prob. frag.*	*Illustration nos and notes*
3D	Miscellaneous tanged forms	4	2	0	Nos 53–4 (bulbar). Nos 55–6	0	0	3	Nos 122–4, bulbar frags
TRIANGLES									
4A	Isosceles	10	2	0	Nos 57–66. No. 58, NN. Nos 61, 64 bulbar. No. 66 most transverse Jura triangle, compare no. 85	2	0	0	Nos 125 (GG), 126
4Bi	Scalene, lower left angle	6	1	0	Nos 67–72. No. 69 towards trapeze. No. 72 prob. bulbar	1	1	1	No. 127, bulbar. No. 128, poor
ii	Scalene, upper left angle	6	1	0	Nos 73–7, No. 74 prob. bulbar	1	0	0	No. 129, complete
CRESCENTS									
5A	Median spine towards arc	3	0	0	No. 78 has median spine towards more chord-like edge (trimmed). Nos 79–80, compare Class I	3	0	0	Nos 130–1
QUADRILATERALS									
6A–C	Frags.	0	0	1	No. 81, back feebly trimmed	0	0	8	No. 132, compare nos 135–8 (nos 132, 136, 138 in two pieces each). No. 133 (hollow back clearly intentional). No. 134
6A	Sub-trapezoid, sub-trapezium, base not trimmed	1	1	0	No. 82, largest found on Jura (but see Note 2)	19	4	0	No. 135 (longest). Nos 136–7 (both bulbar), 138: peculiarly narrow, all trench C. No. 139 inverse. No. 140 typical. No. 141 squat, bulbar. No. 142, smallest, bulbar
6Bi	Base trimmed convexly	0	0	0		0	0	1	No. 143, inverse (? 3Bi) (trench P, North floor flint, like no. 144)
iiia	Base trimmed straight, obliquely	5	0	0	Nos 83–7. No. 85 very broad. No. 86, some concavity, *back trimmed*. No. 87 rounded back, compare LUB no. 77	2	1	2	No. 144 bulbar, upper end micro-burin notch, nos 145–7. See also nos 115–6
6C	Rhomboid	1	0	1	No. 88, same flint as nos 67, 73, 84. No. 89, remains of lower trimming	2	0	0	Nos 148–9
	TOTALS	84	23	19		76	13	37	

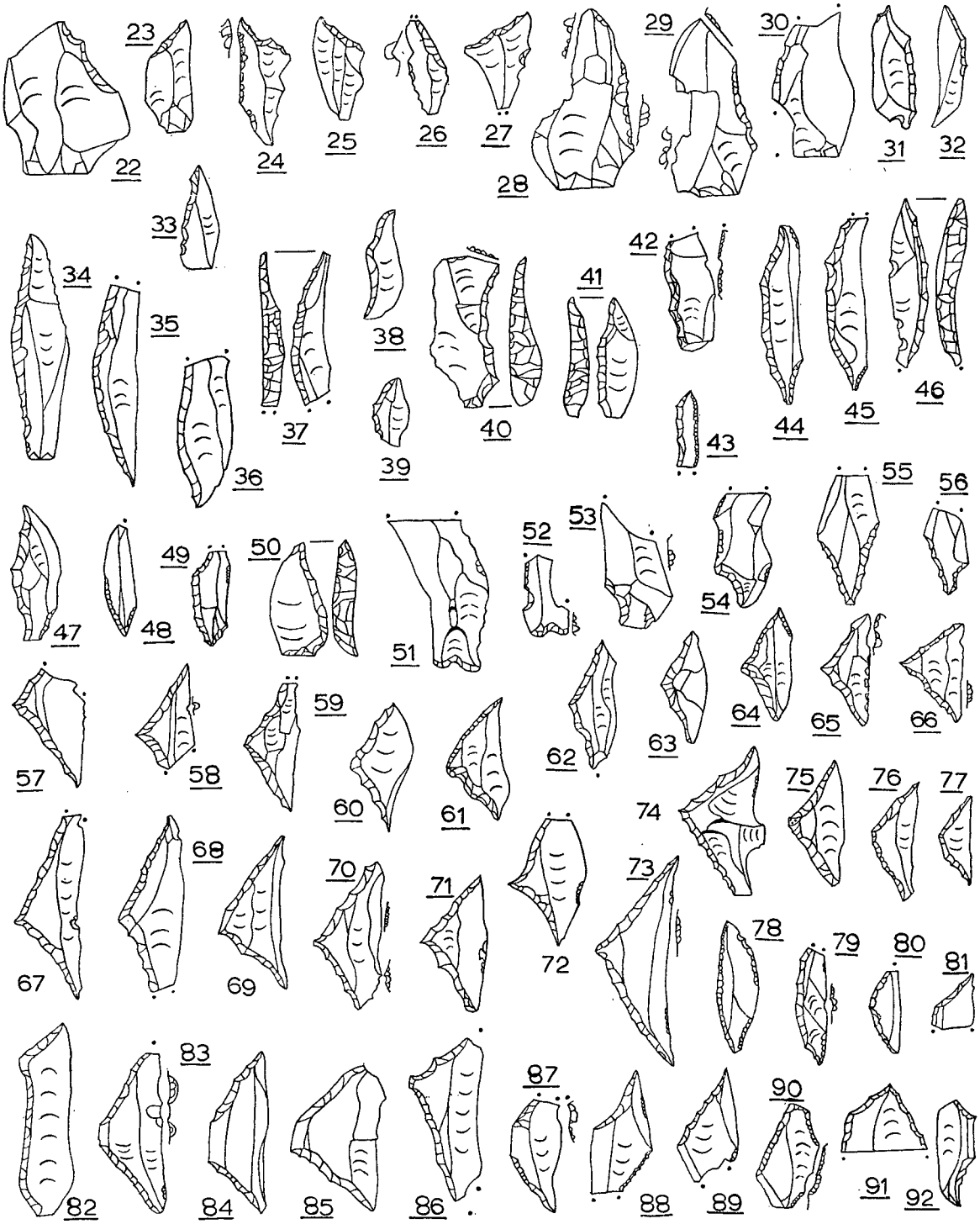


FIG 10 Microliths (1 : 1), floor G1

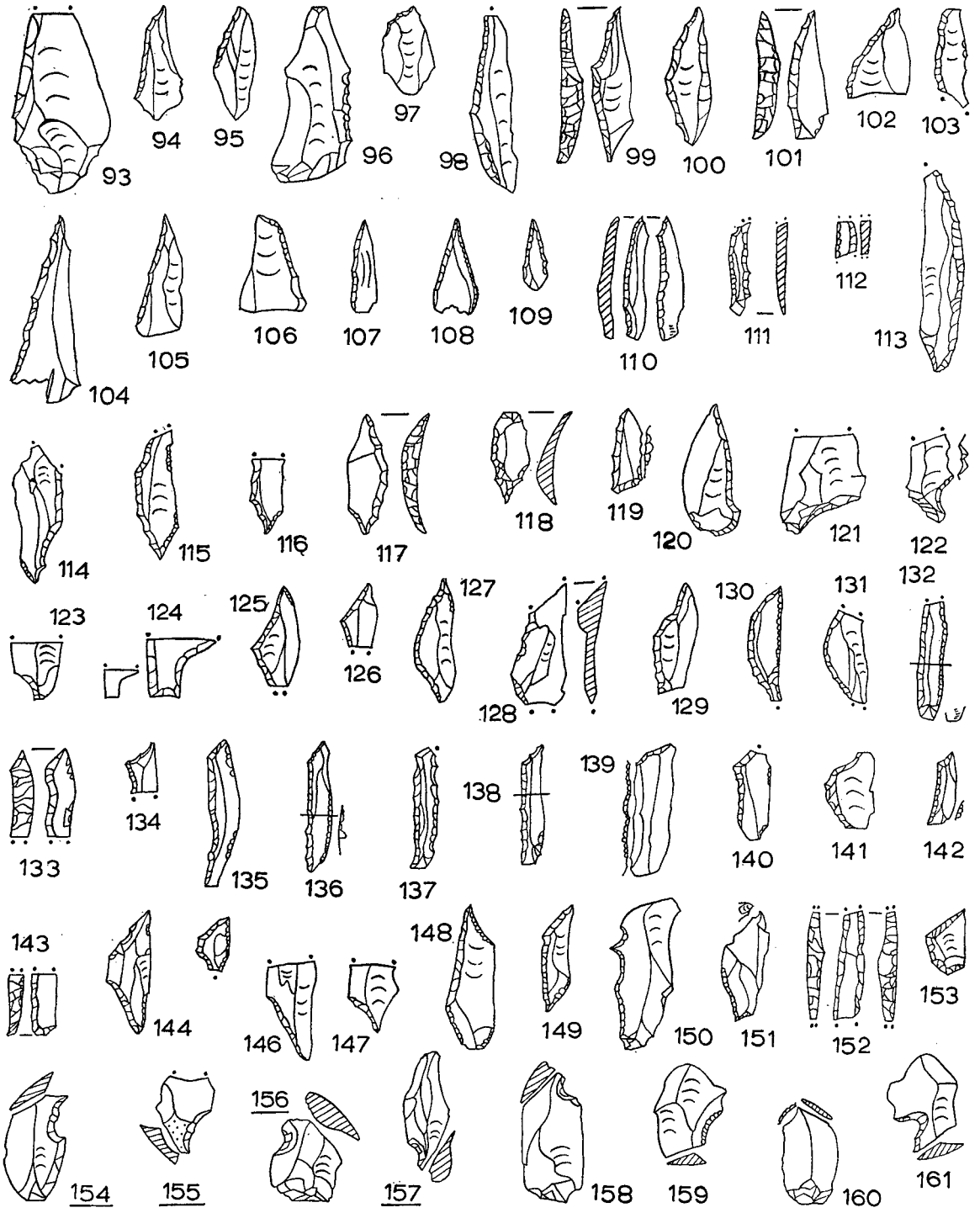


FIG 11 Microliths (1 : 1 except no. 124 at 2 : 1), micro-burins

(*a*) All are one platform except as indicated.

(*b*) G1, Class 2. No. 6 has two-way flaking from single edge but, as usual, chopper use is not indicated as edge quite unbattered; compare LUB no. 58, LUR no. 8. No. 7 is a core-graver (see section 'f').

(*c*) G1, Class 3. Nos 4, 9, 10 (flake replaced), 11 (one of two of crystal) compare LUB nos 1–4, scraper No. 12 to LUB no. 12 (three platforms each). No. 8, high-grade flint, is one of two with near-parallel platforms (flake replaced).

(*d*) No. 14 worked until toothed (? blocking out a flake), No. 16 compares LUB nos 1–4.

(b) *Platform Flakes*

	Lussa Bay	*G1*	*G2*	*Lealt Bay*	*N Carn*	*Lussa River*
Class I – nos 18 (G1), 20 (G2), 188 (G1), 214 (G2)	42	76	34	43	18	42
II – nos 17, 19 (G1), 21 (G2), 223 (G1)	18	21	7	13	5	18
III	4	2	0	1	0	4
IV	2	2	0	3	0	2
Totals	66	101	41	60	23	66
I : II	2⅔ : 1	3½ : 1	5 : 1	3⅓ : 1	3½ : 1	3⅓ : 1
% to cores	50	200	266	46	46	220

The largest are illustrated. Graver no. 223 – a massive flake – may also be a platform flake (II). No. 19 has removed a two-way edge. Many have signs of use. Scrapers: G1 6 (Class I), 1 (III); G2 1 (I).

(c) *Microliths* (Table I)

	G1	*G2*
Described, complete	84	76
Described fragments	19	37
Miscellaneous forms	3	14
Undescribed	83	112
	189	239

Miscellaneous forms. G1: no. 90, bulbar, rhomboid-like, no. 91, no. 92 (bulbar). G2: no. 150 (bulbar), 151 (?graver), 152, inverse parts (class 2 or 'ultra-narrow *petit tranchet*'), 153 (Note 2).

Note 1. No. 110, trench Q, bulbar, has flatter, more incursive trimming than rest: its flint resembles neolithic-type no. 271, P.

Note 2. Nos 115–16 (both L) approach Lealt facies trapeze, and consider only slightly-less angular no. 49 and also no. 82 (the only G1 floor 6A). These (including opposed basal trimming of tanged point type) are likely to have had a role in the change from the Phase 1B trapeze (e.g. present no. 84) to the Phase 2 variety (e.g. Lealt Bay no. 111, opposed basal trimming, and N Carn no. 136). Note also that no. 144 is narrower than any North-floor trapeze, and see also nos. 145, 153.

Note 3. Nos 67, 69, 72: underlining of numbers omitted in error from fig 10.

(d) *Micro-burins*

Largest illustrated.

Class		Lussa Bay	Glenbatrick G1	Glenbatrick G2	Lealt Bay	N Carn	Lussa River
1 Right notch, butt (nos 154, 158)	Quantity	12	13	50	199	136	40
	%	66	54	75	71	64	69
2 Right notch, tip (nos 155, 159)	Quantity	1	2	3	15	9	2
	%	6	8	5	5	4	4
3 Left notch, butt (nos 156, 160)	Quantity	4	5	2	33	27	6
	%	22	21	3	12	13	11
4 Left notch, tip (nos 157, 161)	Quantity	1	4	11	34	40	9
	%	6	17	17	12	19	16
5 Indeterminate	Quantity	2	7	2	65	35	13
	Not inc.	—	—	—	—	—	—
Total Quantity		20	31	68	346	247	70
			24				
As a percentage of microliths		24	16	30	27	35	28

(e) *Scrapers*

	Description	G1 Ill. nos	G1 Total	G1 Over 1 in	G1 Straight	G2 Ill. nos	G2 Total	G2 Over 1 in	G2 Straight
1 A	End, on blade	Nos 162–5	5	3	2	No. 202	1	0	1
B	End, on cortex-free flake	Nos 166–72	26	8	2	Nos 203–7	8	1	1
2	Broken cortex-free working end of 1, 3 or 5	Nos 173–9	19	0	0	Nos 208–11	4	0	0
3	End, on cortex flakes, inc. frags.	Nos 180–6	30	13	3	Nos 212–13	2	1	0
4	Broken-off cortex-bearing working end of 3 or 6	No. 187	2	0	0		0	0	0
5	End, misc. poor material	No. 188	8	7	5	No. 214	1	1	0
	End scraper series		90	31	12		16	3	2
6	Neither end nor steep, on cortex flakes, frags., etc.	Nos 189–95	33	12	1	Nos 215–16	7	4	1
7	Steep, inc. cores (G1 : 7, G2 : 1)	Nos 5, 12, 196–201	16	15	5	Nos 14, 217–19	5	5	2
	Totals		139	58	18		28	12	5

All are convex unless indicated. Many on butts.

G1. Straight: nos 162, 182, 188, 191, 195. Concave: nos 163, 201. Toothed: nos 184, 189–99. Nosed: nos 181, 190, 193. Double-ended: no. 166. End-and-side: nos 189, 191. Three-side: no. 192. Right-around: nos 194–5. No. 164 *écaillé* blow. No. 168 beaked (see Gravers). Group 2 mostly good work on good flint. Group 5 includes 4 platform-edge flakes (no. 188), group 6 one. No. 189 compares rolled N Carn no. 193 (only scraper from that site's lower zone, 34 ft OD terrace T3).

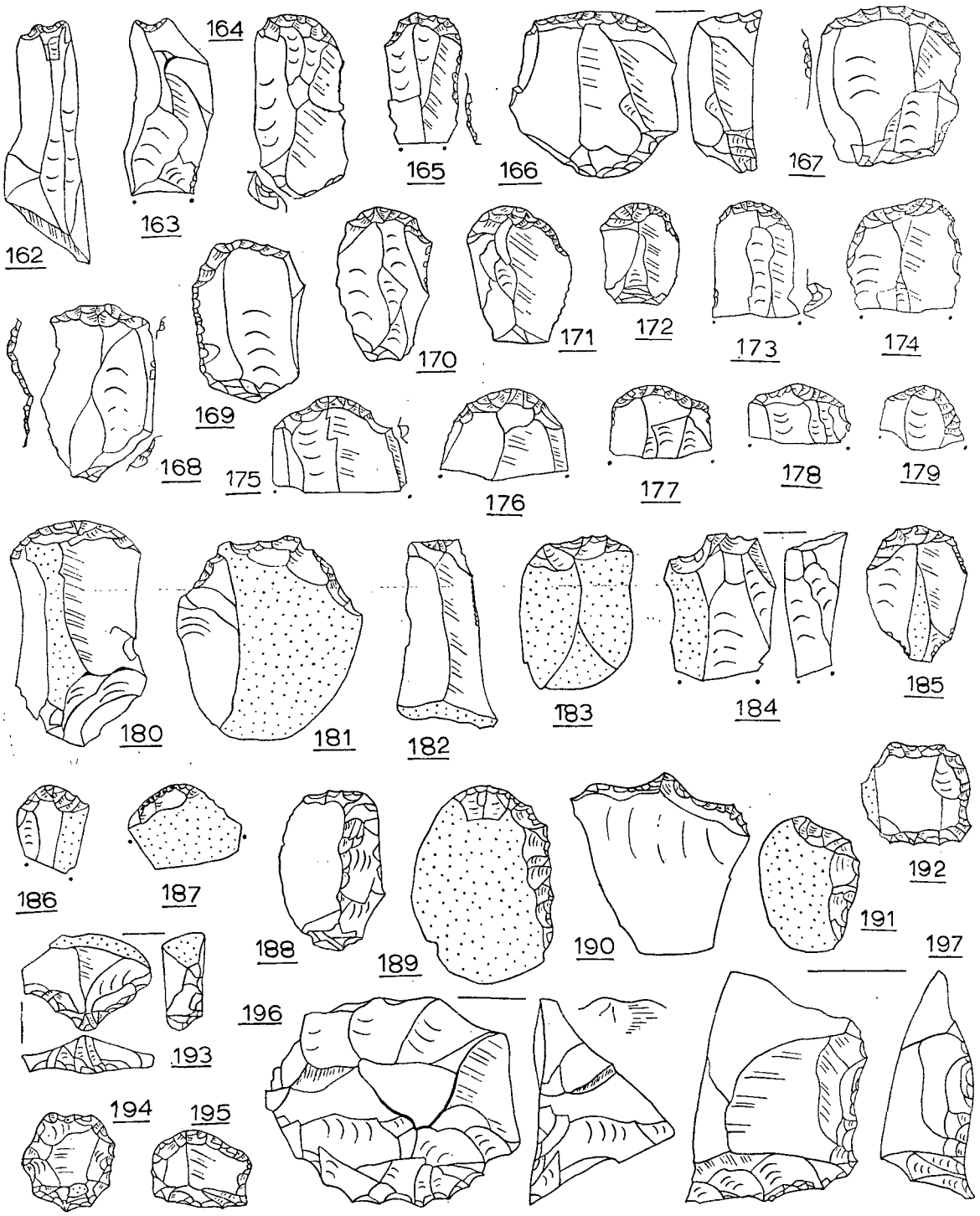


FIG 12 Scrapers (1 : 1)

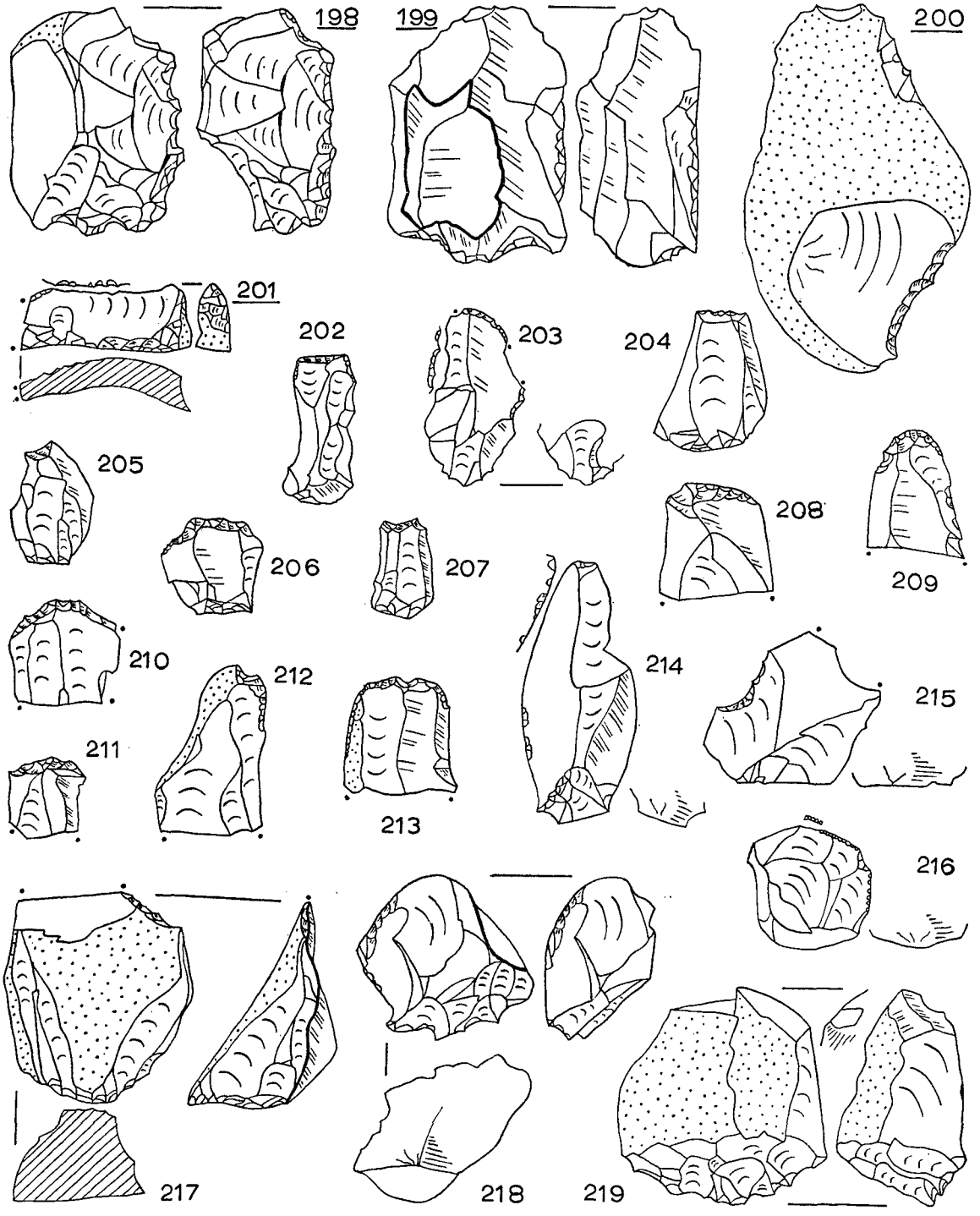


FIG 13 Scrapers (1 : 1)

All five of group 7 straight specimens have been trimmed to a right angle (nos 197–9, latter only quartz scraper). Three of group 7 are edges off steep or core scrappers, two having use after separation (no. 201). The two working edges of no. 198 are not in the same plane.

G2. Straight: nos 202, 204, 216. Concave: nos 205, 207, 215. Notched: nos 212–13. Toothed: nos 14, 218. Nosed: no. 217, clear intent to make nose (upper-end scraper edge likely too). One platform flake (no. 214), one *écaillé* blow (no. 203), one edge off steep or core scraper.

(f) *Gravers*

G1. A maximum of 10 blow-gravers, mostly with broken working tips, and a spall. No. 7, core, with blunted rest at finger-pressure point, and use-spall's facet on platform. No. 220, *bec-de-flûte* on a blade, is by far the best (compare Lussa Bay no. 152, but blows on back rather than edge). No. 221, microlithic trimming below blows, use opposite on each face. No. 222, spall off trimmed specimen. Six *bec-à-encoche* gravers. No. 223, probably off a core with two parallel platforms, with flaking beak accentuated and right beak formed by inverse chipping; both beaks rounded and glossy. No. 226, also double, left beak natural but accentuated. No. 224, double on thick-ended hinge flake, beaks formed on ends of protruding pressure ring, right natural with use, left formed by trimming. If this is limit of Phase 1B gravers, then it is understandable that so few should have been recognised in the well-rolled Lussa Bay collection.

G2. Twelve blow-gravers, 3 spalls. No. 228, note bulb. No. 231, on hinged end, with blow facet trimmed microlithically. Nos 225, 227. Two beaked forms, no. 229 carefully made notch undercutting corner of hinged end, other corner, with blow, missing.

(g) *Chisels*

G1. A scarcity of chisels, like that of gravers. Compares well with Lussa Bay. Apart from nos 233 (CC), 235 (JJ), there were only four small heavily patinated specimens (no. 234) in trench Z where, as noted earlier, a third floor is thought to begin. However, a scraper (no. 164) and five flakes (no. 250) had their bulbs removed by the *écaillé* technique (but were far from being 'chisels') and, had the *éclat écaillé* not been already evolved in the Upper Palaeolithic elsewhere, one would feel these were the first steps towards it.

G2. Thirty-six flint (nos 232, 236, largest and smallest), one milky quartz. Five leaf-shaped flakes with bulbs removed (PP, QQ, Q), also scraper no. 203.

(h) *Blades*

	G1			*G2*		
Description	*Illustration Nos*	*Quantity*	*Over 1⅛ in*	*Illustration Nos*	*Quantity*	*Over 1⅛ in*
Without trimming	No. 240	113	37	Nos 243–4	40	20
With trimming	Nos 237–9, 241, 245	30	22	No. 242	5	2
Scrapers	Nos 162–5	5	3	No. 202	1	0
Gravers	No. 220	3	3	—	2	2
Humped forms	—	1	1	No. 255	1	1
Perforators	Nos 256–7	7	7	—	1	0
Total		159	73		50	25

G1. Amongst 'untrimmed' are many with much edge use (no. 240). Twenty-three 'trimmed' included varied end-narrowing, as for hafting when at blunt ends (nos 237–8, 241, 245), or as for piercing, like the modern pointed knife (nos 238–9, 245).

G2. Nos 243-4, largest; no. 242, trapezoidal.

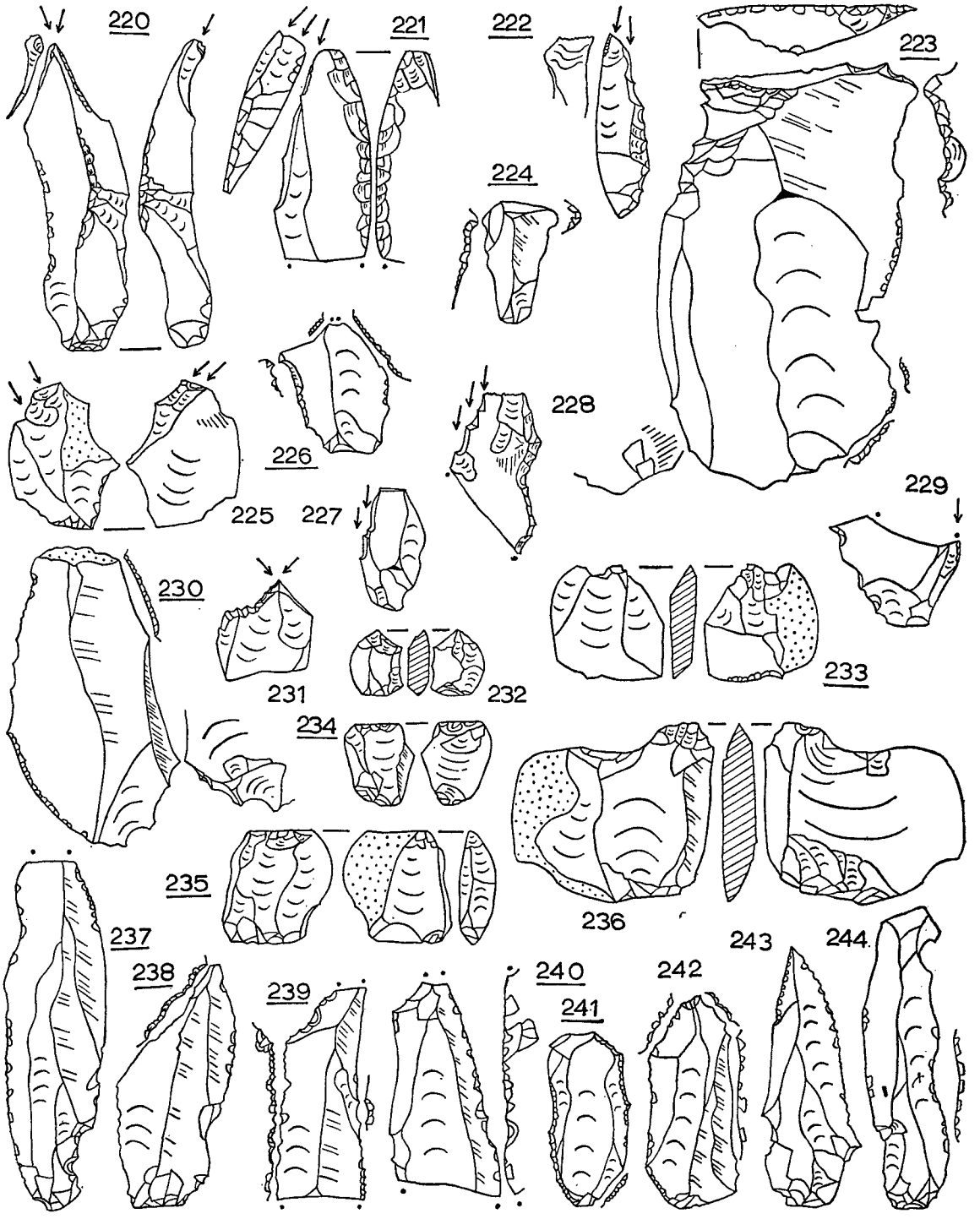


FIG 14 Gravers, chisels, blades (all 1 : 1 except no. 221 at 2 : 1)

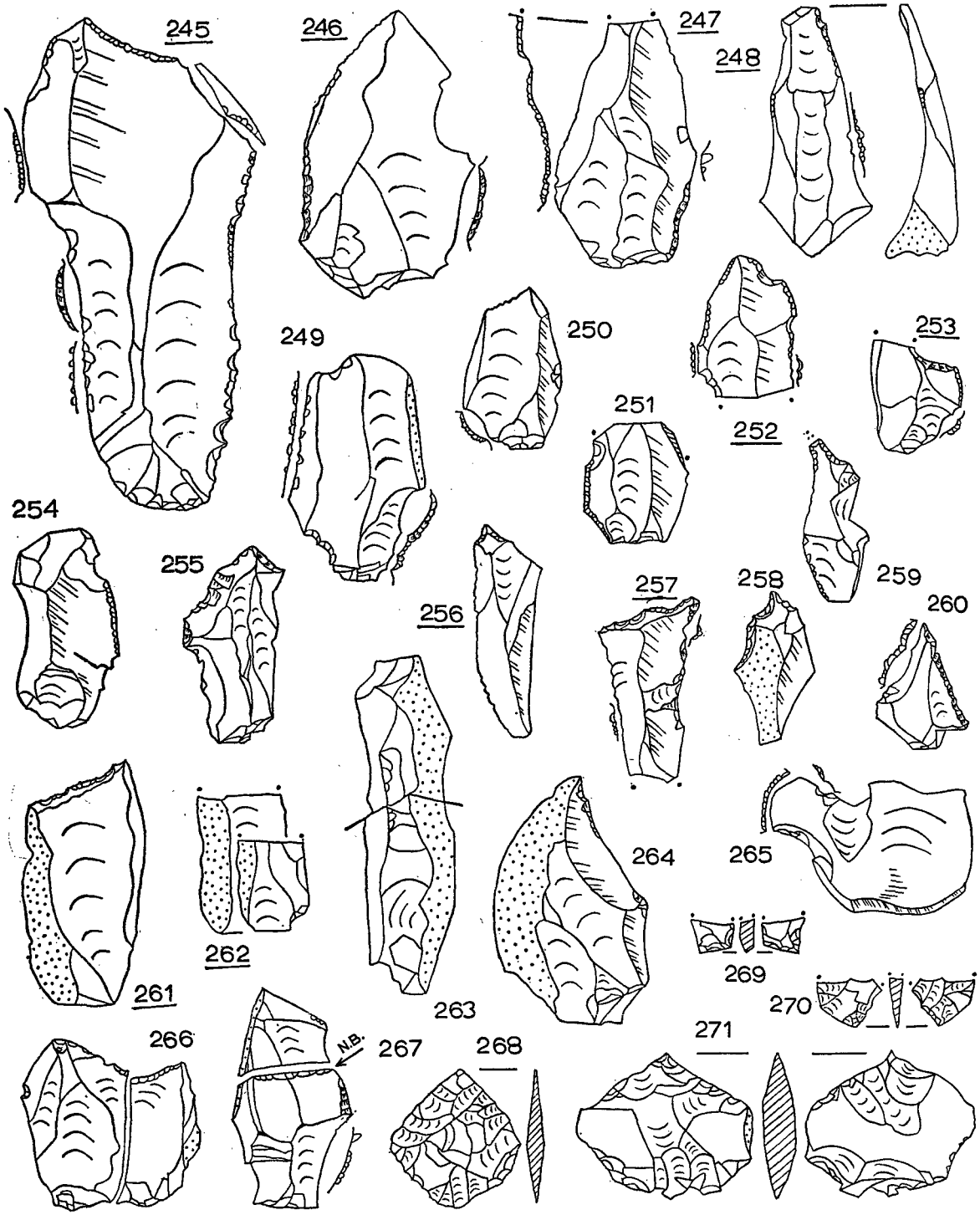


FIG 15 Miscellaneous artefacts (1 : 1)

(i) *Flakes with end-narrowing*

These are simply those too squat or ill-formed to be classed as blades. G1: nos 246 (base probably thinned by *écaillé* work, hollow natural), no. 247 (lower left edge probably trimmed but too thin to show), no. 248 (arched, tip-heavy flake, in Ireland a 'Larne Pick' – G1 6, G2 O, of varied size and trimming.) G2: nos 249–51. See also other categories, e.g. nos 223, 230.

(j) *Humped forms*

This tentative grouping differs from the last two in that the aim appears to have been to define a small feeble hump towards the middle of a side, as opposed to the trapezoid which results from a little oblique trimming at each end of one side. These humps seem likely to be the vestige of the ancestral tanged-point strain. Specimens occur at most Jura sites, e.g. Lussa River no. 158, the microlith N Carn no. 91, with such large steeply trimmed specimens as Lussa Bay no. 88 and others still to be published. G1: nos 252–3. G2: no. 254 (natural hump), no. 255 (scraper end).

(k) *Perforators*

Haphazard. G1: 7 on blades (no. 256, No. 257 with gripping notch). G2: nos 258–60, one blade.

(l) *Part-cortex flakes*

Excluding those classified elsewhere (e.g. nos 181, 184, 186, 213, 225, 235, 236, 249). Unclassifiable trimming. G1: 40 left (no. 261 natural obliquely blunted flake with some trimming, no. 264), 7 right (no. 263, burnt upper half in trench C, unburnt lower half in L).

(m) *Scale-flaked specimens*

G2 only. No. 268, trench E, good pale grey unpatinated flint, fully trimmed each side. No. 271, P, dark grey lightly patinated cherty material, presumably a discarded rough-out for a leaf-shaped point rather than a neat *éclat écaillé*; see also no. 110 and its note. Two fragments, no. 270 (C), no. 269 (L) perhaps tang off barbed-and-tanged point. (On fig 6, by error, these appear as nos 257–60 respectively.)

(n) *Miscellaneous forms*

G2: no. 265 (spatulate), no. 266 (broken during trimming), no. 267 (trimmed after being broken).

(o) *Trimmed but not classified*

Many are simple shapeless flakes and fragments with a naturally pointed part which bears slight trimming.

APPENDIX 1

Analysis of the silt

by D C Bain, Macaulay Institute, Aberdeen

1. *Above 75 microns* (sand size). An optical examination revealed the presence of three minerals – quartz and two types of felspar, composed of potash felspar (orthoclase) and a plagioclase felspar. These minerals are typical constituents of granite or acid gneiss.
2. *1·4–75 microns* (silt size). This fraction was similar to the coarser one in containing quartz and felspar, but in addition contained mica muscovite.

3. *Below 1·4 microns* (clay size). X-ray diffraction traces showed that this fraction was composed of kaolinite and an interstratified clay mineral built up of alternating layers of vermiculite and mica.

True clay-sized particles comprise only a small part of the total material. The bulk is silt so that 'silty-clay' (sic) is more appropriate than 'clay', or, better still, 'silty-clay with a little sand.'

The mineral content in itself gives no indication of mode of deposition. One would not expect to find much mica or felspar in a relatively pure quartzite and the minerals are certainly not derived from dolerite. However, Dalradian quartzites often contain quartzose mica-schist layers intercalated with the true quartzite and if this is the case in the area around the extinct lagoon, then the minerals in the silty-clay could be derived from the rocks immediately surrounding it. If this does apply, then it *may* be indicative of deposition in standing freshwater, but this would not be conclusive.

APPENDIX 2

Interpretation of the silt analysis

by Mrs Susan Forster of the Department of Geology, Birkbeck College, University of London

The presence of kaolinite, as opposed to other clay minerals, means the silt must have been deposited in a freshwater environment – kaolinite is not formed in the sea, and although it *might* occur in marine sediments that had been brought in from a kaolinite-rich source area, the other details of the sample make it quite clear that this could not be the case. Lime, which would have blocked the local formation of kaolinite, is not present (negative evidence). The minerals which are present are exactly what one would expect in an acid, freshwater lagoonal environment.

ACKNOWLEDGMENTS

The pollen analyses were once again carried out by Dr S E Durno, whilst Mr D C Bain, also of the Macaulay Institute, analysed the silt. For a decision on the origin of the silt the writer is grateful to Mrs Susan Forster of the Department of Geology, Birkbeck College, University of London. Dr M Y Stant, Jodrell Laboratory, Royal Botanic Gardens, Kew, kindly identified the oak charcoals.

The excavation, shared by Susan Mercer, lasted a total of 35 working days each in June 1970 and June 1971. It owed much to the enthusiasm of Mr and Mrs D Astor, who contributed essential transport and accommodation; further, they provided the funds for the C14 dating, a gesture the value of which other workers in particular will appreciate.

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a Site looking S at Beinn Siantaidh. Mound (S-FF) with horizontal rods separates G1 working floor (foreground) from G2

b Site from W ravine across promontory

c Site from NE across near-extinct lagoon

d Comparatively modern sunken lagoon on Pre-Recent platform. Silt beaches with wet and dry zone (mid-summer)