Flint Tools from the Present Tidal Zone, Lussa Bay, Isle of Jura, Argyll

by John Mercer

SUMMARY

The Lussa Bay flint industry is a NW Britain parallel to the continental blade and medium-sized elongated trapeze-triangle microlith sites, those without a specifically Baltic element; notable examples of these lie in the Morbihan islands, on the Tagus and on the E coast of Spain. Lussa Bay is comparable to Daylight Rock (Caldey Island, S Wales), and it is suggested that the latter was a W Britain parallel to the continental sites. Evolution from roughly-similar Late-Glacial technologies, perhaps with cross-Channel cultural osmosis, could be the cause of the similarity between the British and the continental industries; alternatively, some noteworthy north-going human migration may have occurred. The W Britain coast is the most immediately obvious development-cum-migration zone for the two British industries.

The Lussa Bay material was found derived in a geological position allowing two alternative datings. The present paper, in view of the Lussa Bay typology and the evidence of the recently-published Lealt Bay site, proposes that the Lussa Bay industry is older than the very varied yet distinct Lealt Bay material (which included a unique range of minute trapezes), that it was overwhelmed towards the end of the transgressing phase of the eustatic rise (no other sites at this position are known in Scotland) and that, on present knowledge, this implies for the new industry a minimum antiquity of about the Boreal-Atlantic transition, *c* 5500 BC (see note p 28).

ACKNOWLEDGMENTS

Professor G F Mitchell of Dublin University is thanked for having given his opinion on several dozen of the artefacts, Mr J G Scott of the Art Gallery and Museum, Glasgow, for his opinion on the scale-flaked material.

It is gratefully acknowledged that Mr Malcolm McKechnie and his family, of Inverlussa, collected a good number of the specimens, giving them to the writer.

As before, Susan Mercer has carried out half the work, including that of drawing the illustrations.

INTRODUCTION

This is the second in a series of reports which the writer is preparing on prehistoric human activity in N Jura. The first report[1a] provides essential background to the present paper: including fresh information on the area's Post-Glacial vegetation and land-sea movements, it described the excavation of some 50,000 stone artefacts from the washing limit deposit of the highest Post-Glacial transgression of Lealt Bay, an inlet 2½ miles N of Lussa Bay.

A. LOCATION AND DESCRIPTION OF SITE (figs 1–3)

Rather over 4 miles from the mid-Argyll mainland, Lussa Bay (NGR NR643868) is an E coast inlet 10 miles from Jura's N tip.

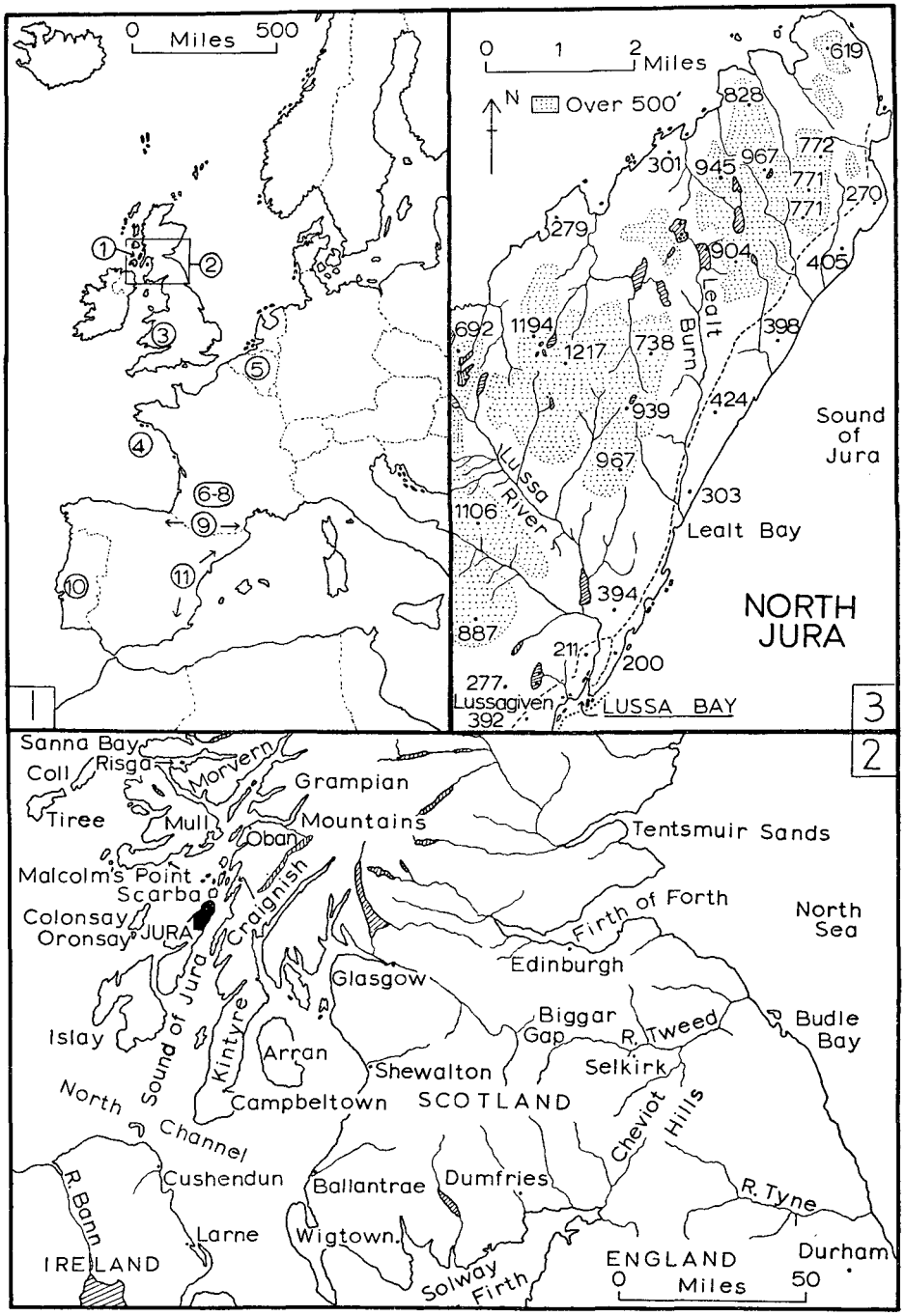

FIG 1 Europe, with some W coast trapeze areas
FIG 2 S Scotland with NE Ireland
FIG 3 N Jura

Approaching Lussa Bay from the sea (pl 2, a, b), one finds a well-indented anchorage which is, however, shallow and open to the prevailing SW sea. A broad expanse of tidal zone shingle flat covers almost all the back of the bay; the final stretch of the channel of the Lussa River, the island's largest water-course, takes up the W margin. The houses of Inverlussa, the lowest one within the reach of an exceptionally high sea, overlook the burn. The eastern promontory holds the pits and mounds of an abandoned slate quarry. There are no recognised signs of ancient habitation, nor, at present at least, are there any caves around the bay.

The lowest ¼ mile of the Lussa River's course passes through a complex of gravel banks, near-extinct channels, patches of swamp and low tangled vegetation. In the conifer wood above this lie what are thought to be various traces of past land-sea relationships differing from the present one: these were outlined in the already-published report, and the conclusions made therein will be used later in this paper.

A mile above Lussa Bay, the remarkably-narrow river-valley turns sharply NW (it looks as though at one time the burn reached the sea at Lussagiven, to the south, a much wider and straighter course now however choked, probably by glacial material), and then, broadening, sets off across the island. With the treeless slopes of the vast Lussa Glen rising on each side to about 1,000 ft, there is then another 3 miles to the furthest sources of the river, two small lochs lying on saddles at about 550 ft OD. From this point the Atlantic coast is but a mile away below. Other than the Lealt Bay-Glengarrisdale route, the Lussa Glen with these passes provides the only easy E–W crossing north of Loch Tarbert.

B. OCCURRENCE OF THE ARTEFACTS

Flint artefacts were found over the whole of the Lussa Bay shingle flat and river channel (99%), and in the storm-tide zone of the river (1%), which is to say as far as the upper limit of the gravel banks (i.e. up to the upper houses, 150 yds above the bridge). A total of 4,424 specimens was recovered, as a result of gleaning at an average interval of a fortnight during 1966–9; most of the flints were found by wading in the tidal zone of the watercourse, the only part of the site frequently turned over. From a dinghy and with the aid of a glass-bottomed viewing box and a long-handled scoop, an examination was made of the offshore bed (to 1½ fathoms) of Lussa Bay and of the channel between Lussagiven and its islands: apart from an occasional sterile patch of cobbles, the bed was found to be covered by an extension of the equally-sterile sand which begins at the lower limit of the Lussa River's tidal channel. The dotted line on fig 3 indicates a depth of 10 fathoms.

All grades of rolling occurred amongst the artefacts, together with a few fresh-looking specimens. On many of those that were broken the fracture seemed recent, and the writer has been told by several local people that the children of the village have long amused themselves by striking sparks from the well-known flints of Lussa Bay.

All shades of brown and yellow staining were noted; occasionally black. However, unstained opaque white patina also occurred, and even barely-patinated somewhat-translucent specimens were found occasionally. Undoubtedly the darkest brown-staining went with the most rolled specimens, one or two cores approaching the gloss, colouring and shape of horse chestnuts.

Horizontally, the only distinction made was that those flints found in the 150 yd storm-tide zone (above the bridge) were kept separate from those found in the tidal zone. There were only 21 of the former; where classified their incidence will be indicated.

Vertically, the only distinction comes as a result of a random trench dug at low tide in the centre of the least active part of the shingle flat. The uppermost level consisted of 6 in of

gravel, sand and silt, containing flints such as were found on the surface. These included the barely-rolled, unstained white-patinated no. 167. At the very base was found no. 193, barely-rolled, creamy-yellow, quite translucent. Then 3 in of rapid grading leading to 30 in (bottom not reached) of very pure, pale grey sand (medium grade and finer). This was extremely hard-packed, and seemed to hold only fragments of tree branches and the shells of hazel nuts. However, 6 in into it, no. 28 was found: barely-rolled, it was the colour of its matrix upon extraction, but as it dried it became white with only an underlying greyness. Although it had been intended to go much deeper, work was stopped by incessant trench collapses, due to water seepage.

C. TWO POSSIBLE INTERPRETATIONS OF THE GEOLOGICAL POSITION OF THE ARTEFACTS

Faced with a collection of flints found on an active beach, the most obvious interpretation is that they are unlikely to be anterior to the date at which sea-level, relatively falling away from the land after its maximum stand during the highest Post-Glacial transgression, reached approximately its present level. It has been written[1b] that 'the movement of land recovery . . . continued until about the Iron Age'; no doubt the date at which this movement halted was as locally variable as were the absolute dates of the maximum stand period to which it succeeded. On Lealt Bay evidence, the N Jura maximum stand period probably ended about Mid-Atlantic, so an absolutely-maximum antiquity for the return to about the present land-sea relationship would be Late Atlantic.

However, Movius' work in NE Ireland[2] has shown that his investigation region was inhabited *prior* to its transgression's period of maximum stand, the people's artefacts now being found in deposits laid down by the transgressing sea on its way *up*. NE Ireland is visible from Lussa Bay, 60 miles away.

The present writer's random trench at Lussa Bay was in fact an attempt to reach such a transgressing-time deposit, if in fact anything of that period remains under the present shingle flat. The trench failed, of course, in its object, reaching either a more or less modern sand layer or, just possibly, the penultimate deposit of the receding sea, medium-grade offshore sand (similar in kind, for example, to deposit 3A at Lealt Bay); the present shingle flat is the latest deposit.

But, in pushing its mouth back down to the present height, the Lussa River itself has re-excavated its channel to well below the level of the surface of the adjacent silt flat. There are, of course, many unknowns: minor comparatively-recent transgressions, causing alternate refilling and re-excavation of the lower course, may well have occurred, for example. Nevertheless, to the writer it does seem clear that, if Lussa Bay was inhabited at the time when the highest Post-Glacial transgression was on its way up, then the inhabitants' tools will now be represented – no matter what the intervening movements – on the present shingle flat and in the river channel. The flints would have been disinterred by the river the first time its channel re-took possession of the zone which held them; even if the artefact-containing deposit were not disinterred across the whole shingle-flat area (i.e. by the sea), at least the flints from the river channel would have been spread over the area and one could expect to find them now in all except the finest sand. And, since the well-rolled artefacts at Lealt Bay testify to the presence of people *before* the end of the maximum stand, it does not seem difficult to accept that there could have been human beings at Lussa Bay during late trangressing times. On Lealt Bay evidence, the transgressing sea would have reached the present shoreline height about the Boreal-Atlantic transition.

In addition to artefacts from 'transgressing' and 'regressed' times, the collection may

include a greater or lesser number which have been washed right down the river, and which will thus date from the period between the other two, the maximum stand (though during the transgression's maximum stand the nearest valley-bed camping-ground would have been about 500 yd away upstream).

Summary. It can in fact be said that artefacts from all periods of Jura's occupation *could* be present amongst the specimens about to be described. But, since it seems theoretically tenable that the proportion of 'maximum stand' artefacts in the regressing-time beaches would diminish with the distance below the washing limit – and this is in fact far away from the present beach – it is most to be expected that the bulk will belong to one or both of the two extreme periods, very early or very late.

D. THE ARTEFACTS

The raw material

The description of the Lealt Bay flint, with the question of its origin, probably applies at Lussa Bay: much (though again not all) of the raw material looks to have been small, very rolled pebbles (even when allowance is made for the post-working rolling). As against 17 such pebbles found unstruck at Lealt Bay, there were 52 at Lussa Bay (weighing 1 lb 11 oz, the largest being 4½ oz and the 10 smallest together totalling 1 oz). The 4,424 artefacts collected weighed 23 lb 9 oz.

Physical state and age

All attempts to correlate physical state with age come up against difficulties. Degree of rolling is clearly unreliable, since conditions around the site are extremely variable. Degree of staining is no doubt equally unreliable. For example, the staining medium is probably stronger on and in the upper part of the surface of the shingle flat (during neaps not washed over by the sea for several days at a time) than in the river; linked to this is the probability that flint alternating between wet and dry (not only with springs and neaps, but with high and low tide too) would stain faster than flint permanently underwater in the sea or in the river. A few flints found partially-embedded in the quiet NE corner of the shingle flat were darkly stained over their exposed parts but lightly so over the rest. Another factor, as Schmalz[3] has pointed out, is that patinated flint stains more easily than unpatinated flint. One wonders also what happens to any patina and staining on flints which spend a long period in deep clean sand saturated with pure seawater, and so on.

Finally, there are the unstained but densely white-patinated specimens and the few which are hardly patinated or stained. Their state suggests that an original or at least ancient artefact-holding deposit may still be under active erosion; the river mouth may at present be creeping forward (local opinion is that the land has gained appreciably on the sea during the last half-century), so the deposit in question may lie somewhere just below the bridge, at the downstream end of the stretch which is scoured by spates.

Generally, it does not seem advisable to attempt to interpret the varying physical states of the artefacts in terms of their relative age.

The typology

Apart from a few individual comparisons in this section, comparison with the Lealt Bay industry, and with others, will be reserved until later.

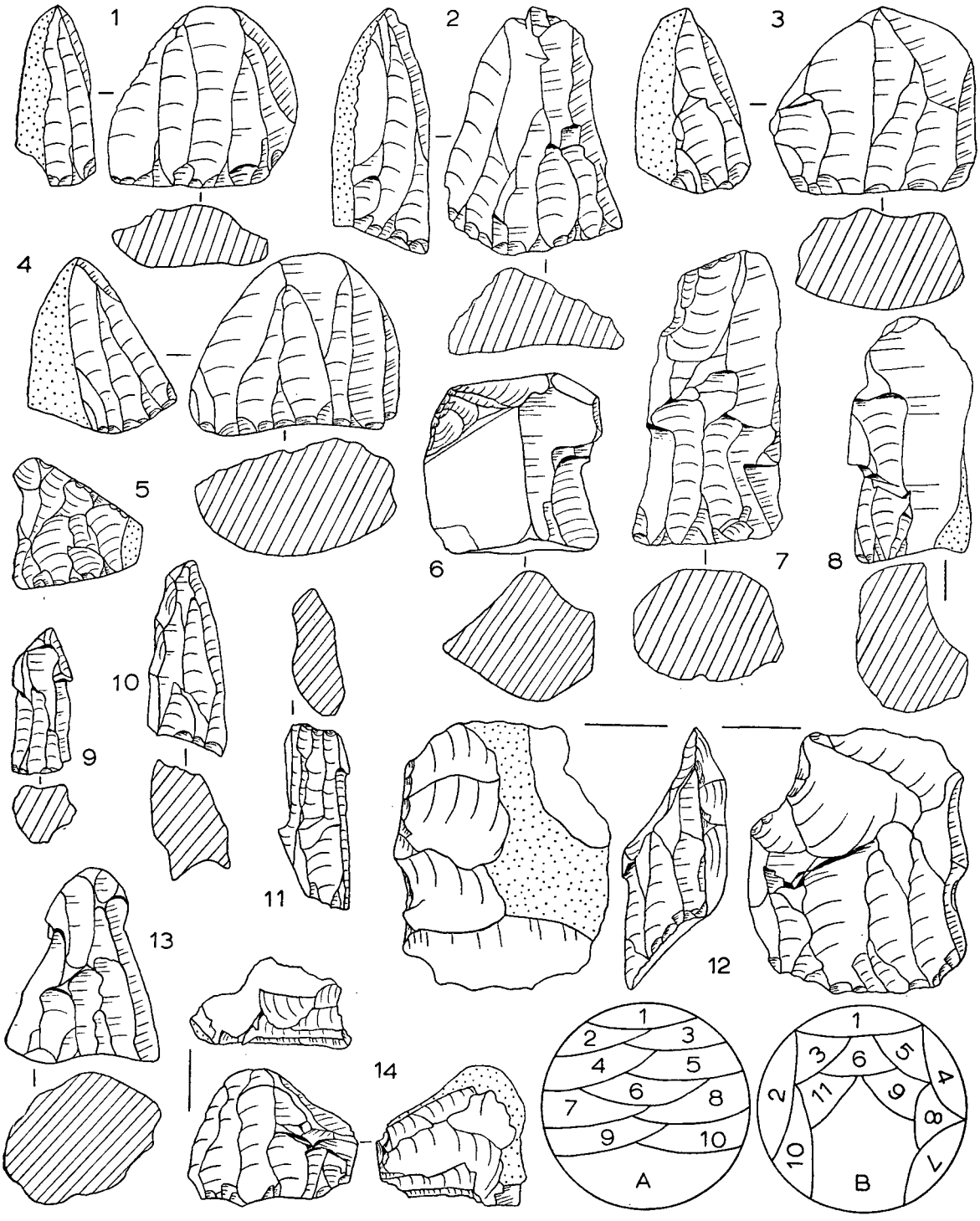

FIG 4 Cores (1/1)

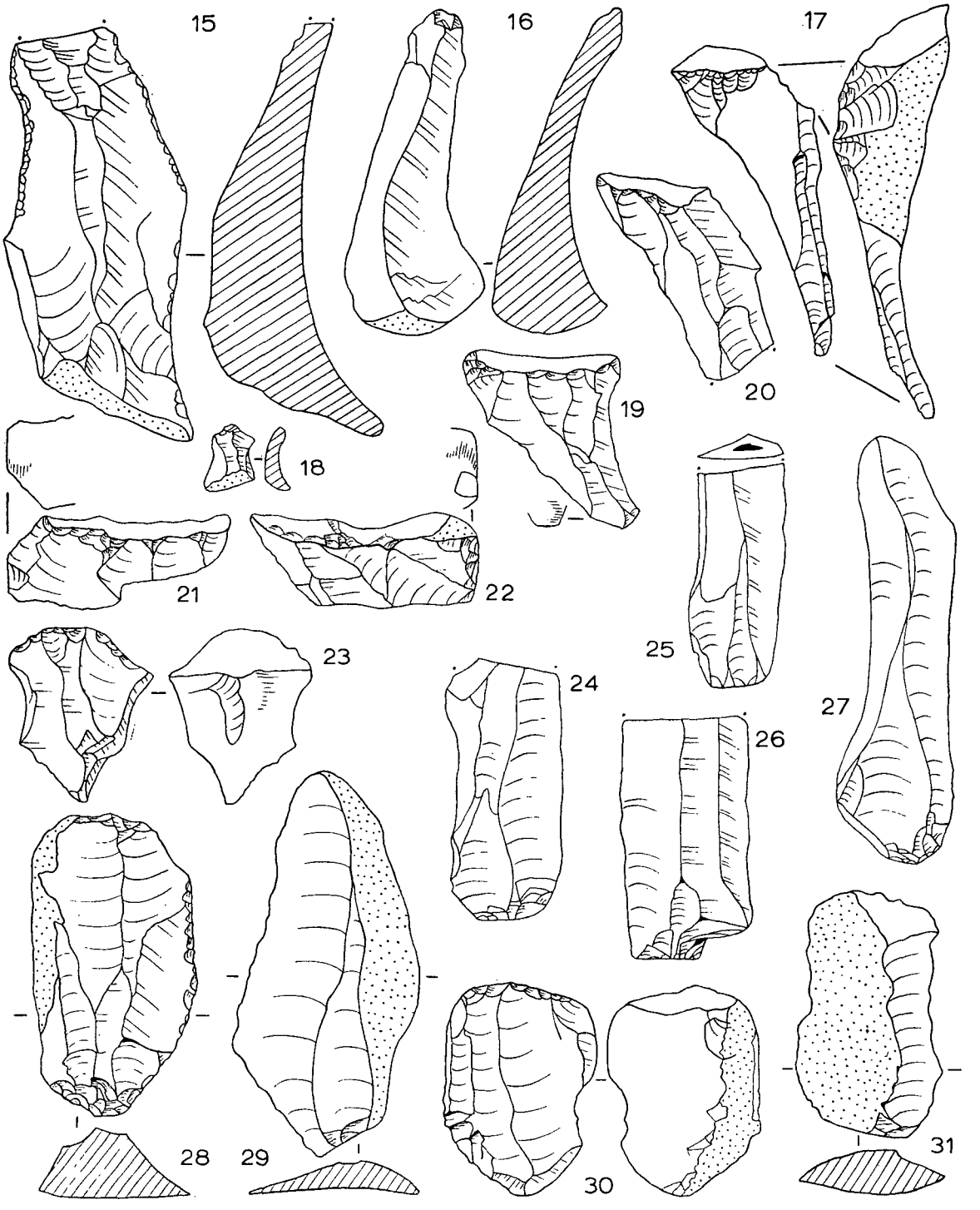

FIG 5 Knapping-technique evidence ($\frac{1}{1}$)

Summary

a	Cores (including 2 scrapers, 1 graver)	134
b	Platform rejuvenation/repositioning evidence	66
c	Microliths and other steeply-trimmed work	84
d	Micro-burins	20
e	Scrapers (inc. 2 core-scrapers)	127
f	Gravers and graver-like tools (inc. core-graver)	7
g	Small choppers (?)	3
h	Scale-flaked work	5
i	Blades (exc. scrapers, gravers) 12 with trimming	309
j	Leaf-shaped flakes (29 with trimming inc. 19 butt frags.)	115
k	Arched, tip-heavy flakes	37
l	Flakes part-backed (lengthways) with cortex	137
m	Miscellaneous forms	1
	Trimmed but not classified	19
	Total	1,064

Note. Rolling acts against the identification of some tools more than others. The following trimmed implements in particular (all present at Lealt Bay) could therefore be under-represented above: core-scrapers, edge-trimmed blades and flakes, gravers, perforators, toothed flakes. Blade production, as defined in 'i', is certainly under-represented, due to breakages. Signs of use were only rarely recognisable with any confidence and no statistics will be given. Measurements are of the specimens as found.

(a) *Cores (inc. 2 scrapers, 1 graver)*

Description	*Total*	*No. of Platforms* 1	3	2	*Angle* 80°–100°
1. No trace of cortex – nos 6, 7, 9, 13	27	8	1	18	9*
2. Cortex tip	2	2	–	–	–
3. Flaked only part of the way round – nos 1–5, 8, 10–12, 14, 146, 151	105	69	7*	29	8
Totals	134	79	8	47	17

Total weight was 4 lb 14 oz, average just over $\frac{1}{2}$ oz. Individuals graded from $2\frac{1}{2}$ oz downwards, several small specimens only weighing an ounce in total.

Attention must be drawn to a group of skilfully-flaked cores represented by nos 1–4. They have the form of laterally-compressed leaning cones; such regularity from such poor material is remarkable. See category l.

Asterisked entries each include a core-scraper; neither was heavily rolled or stained, no. 146 even retains a little translucence. Group 3 includes what was perhaps a single platform specimen which has been converted into a graver (no. 151).

Groups 1, 3 each include a two-platform specimen with parallel platforms (no. 11, cortex-side not shown). But the preference was to position the second platform more or less at right angles to the first, rather than roughly parallel to it; this is also suggested by the flakes analysed in the next category.

Nos 7–11 represent the elongated specimens. No. 13 is symmetrical, pyramidal (compare Lealt Bay nos 12–14).

Illustrated. Group 1: one plat. nos 9, 13; two plats. no. 7 not 80°–100°, no. 6 at 80°–100°. Group 3: one plat. nos 1–4, 8, 151; two plats. no. 5 not 80°–100°, nos 10 (cortex-side not shown), 14 at 80°–100°, no. 11 parallel; three plats. nos 12, 146 (cortex-side not shown).

(b) *Platform rejuvenation/repositioning evidence.* Groups 1–3 could stem either from the rejuvenation of the core's first platform (i.e. with intention to continue with that platform), or from repositioning in the form of a change to a second platform (two-fifths of the cores had more

than one platform) with these first flakes inevitably incorporating the edge of the old platform. Group 4 flakes may not have been intentional rejuvenators. The following descriptions refer to the first platform.

	Lussa Bay	*Lealt Bay*
1. Struck along the platform plane, near-tangentially, tending to be elongated in shape, nos 21, 131	42	43
2. Struck from core tip towards platform, arched, nos 17, 19, 20	18	13
3. Removing core tip (struck parallel to platform) elongated or squatly pyramidal, no. 22	4	1
4. Struck from normal flaking direction, short and wide, and thick in section, having removed large piece of platform, no. 23	2	3
Totals	66	60

(c) *Microliths and other steeply-trimmed work*. Of the 84 specimens, 25 are too fragmentary to be reliably interpreted (nos 89, 90, 93–4). In Table 1, 57 of the other 59 are described in an order which approximates to that used at Lealt Bay when describing 655 of that site's 1,283 microliths; however, very few indeed of the Lussa Bay specimens have acceptable parallels at Lealt Bay, making tabular comparison unworkable. With the possible exception of nos 55, 82, 85 (indeterminate) and of nos 37, 62, all are illustrated bulbar end downwards. nos 32–6, 45, 50–2, 57–61, 64, 66, 68, 74, 76, 78, 89, 93–4 definitely retain the bulb; many not included in the 'bulb' column have their lower end missing, so the bulbar proportion may perhaps be higher still. No. 79 was the only microlith found above the bridge. Lengths as found.

Summary

% of 59		*Totals*
3·5	Obliquely-blunted points	2
42	Partially and fully blunted backs	17 (8 frags.)
7	Trimmed on each side	4
7	Base tapered or tanged	4
15	Triangles	8 (1 frag.)
2	Crescent	1
3·5	Sub-trapezoid (base not trimmed)	2
20	'Trapeze' forms	9 (3 frags.)
100%	Total	47 (12 frags.)

Nos 33, 52, 74, 93 and, in part, nos 53, 65, are trimmed from the non-bulbar face.

No. 88 is a broken tanged point which one can term the proto-trapeze type (contrast no. 60).

The illustration of no. 82 shows the oval facet on the vertical but untrimmed face of its lower edge (the latter a hinge fracture); the corresponding upper-end facet is also negative.

No. 75 could be called a triangle with concave end, a hollow-based point or, the least suitable, a sub-trapezoid like nos 57–8.

(d) *Micro-burins*. With the bulbar end of the original flake or blade downwards: 12 butt and right notch (no. 96), 4 butt and left notch (no. 95), one tip and right notch (no. 92, but could be another obliquely-blunted point), one tip and left notch (no. 91), one tip indeterminate, one fully indeterminate.

Table 1 suggests the micro-burins are to be mainly attributed to the production of the usually bulb-less trapezes, triangles and convex-backed bladelets. The rarity of tip-end micro-burins shows the non-bulbar ends of the trapeze-triangle group were usually shaped by direct blunting.

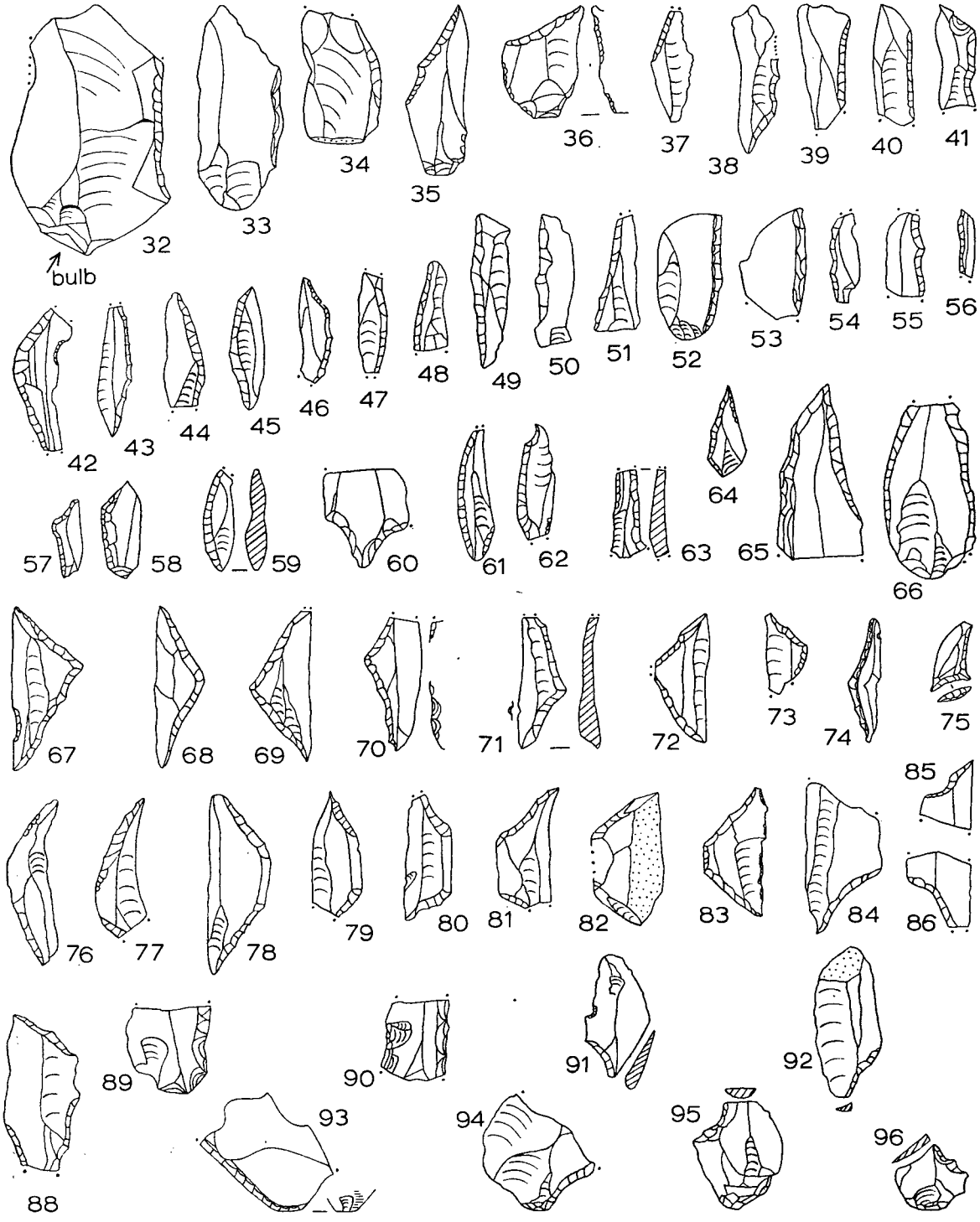

FIG 6 Microliths, micro-burins ($\frac{1}{1}$)

TABLE 1
DESCRIPTION OF MICROLITHS AND OTHER STEEPLY-TRIMMED WORK

Description	*Quantity*	*Bulb*	*Prob. frag.*	*Illustration nos and notes*
Basal end not separately shaped				
Partially trimmed one side				
Obliquely 1 $\frac{1}{20}$″–$\frac{13}{20}$″	2	1		Nos 35, 37 (comp. no. 36)
Lengthways 1$\frac{1}{2}$″–$\frac{4}{5}$″	3	3	1	No. 32 (trimming not quite vertical). No. 33 (effectively trapeze?). No. 34. Not at Le. B.
Almost fully trimmed one side, $\frac{9}{10}$″–$\frac{13}{20}$″	3	0	1	Nos 38–41
Fully trimmed one side				
Trimmed side convex, $\frac{9}{10}$″–$\frac{13}{20}$″	6	1	2	No. 42, face left concave (comp. nos 76–7), nos 43–8 (comp. no. 59). Note triangular tendency.
Trimmed side straight, $\frac{19}{20}$″–$\frac{11}{20}$″	5	3	4	Nos 49–56 (latter $\frac{2}{5}$″)
Fully trimmed one side, partially the other				
1 $\frac{1}{20}$″	2	1		Nos 65–6, not at Le. B.
$\frac{11}{20}$″	2	1		No. 64, comp. no. 48 at Le. B. No. 63 rod-shaped
Basal end separately shaped				
Base tapered by trimming from below	2	1		Nos 61–2, comp. No. 50 at Le. B.
Base tapered by trimming from above	1	1		No. 36
Tanged from below	1	1		No. 60, comp. section 'j' base-trimming. No close parallel at Le. B.
Triangles				
Isosceles	1	1		No. 74, comp. Le. B. no. 65 (heavy pat.)
Scalene	7	1	1	Nos 67–73, 75. Nos 69–9 near isosceles. Nos 70–1, 75 lightly spurred (cf La Cocina, Tagus, Port St Mary)
Crescent, median spine towards arc *and* bulbar	1	1		No. 59, not at Le. B.
Quadrilaterals				
Sub-trapezoid (base not trimmed)	2	2		No. 58, *trimming not microlithic but flattish*; no. 57
'Trapeze' forms				
Back rounded, face concave	2	1		Nos 76–7, upper-end trimming on former so slight as to be dubious. Comp. Daylight Rock no. 14, also nos 12, 13[4]
Back angular				
No concavity	4	1		Nos 78–9, 83, 82, latter doubtful ('back' damaged recently). Comp. no. 52 at Le. B.
Some concavity (misc.)	3	1	3	Nos 80–1, 84–6, 88. Rolling reduces concavity
Total 84	47	21	12	Frags. not inc. 25

(e) *Scrapers (inc. 2 core-scrapers)*. These were an important diagnostic tool. Nos 97–137, 139, 140, 143 illustrate a series, which includes three-quarters of the total specimens (groups 1–5), grading from the true end-of-blade scraper (convergent to non-convergent trimming) to the thumbnail: the overall size gradually decreases, the length-breadth ratio gradually diminishes, the basic material gradually 'degenerates' from that of the 'pure' blade and flake to the cortex-flake and eventually to the fragment of any of these. Nowhere in these 94 specimens does a break in the series suggest that they are not – end-of-blade scrapers to thumbnails – the work of a single people. Many of group 6, though not 'end', are effectively the same as tool-heads as those

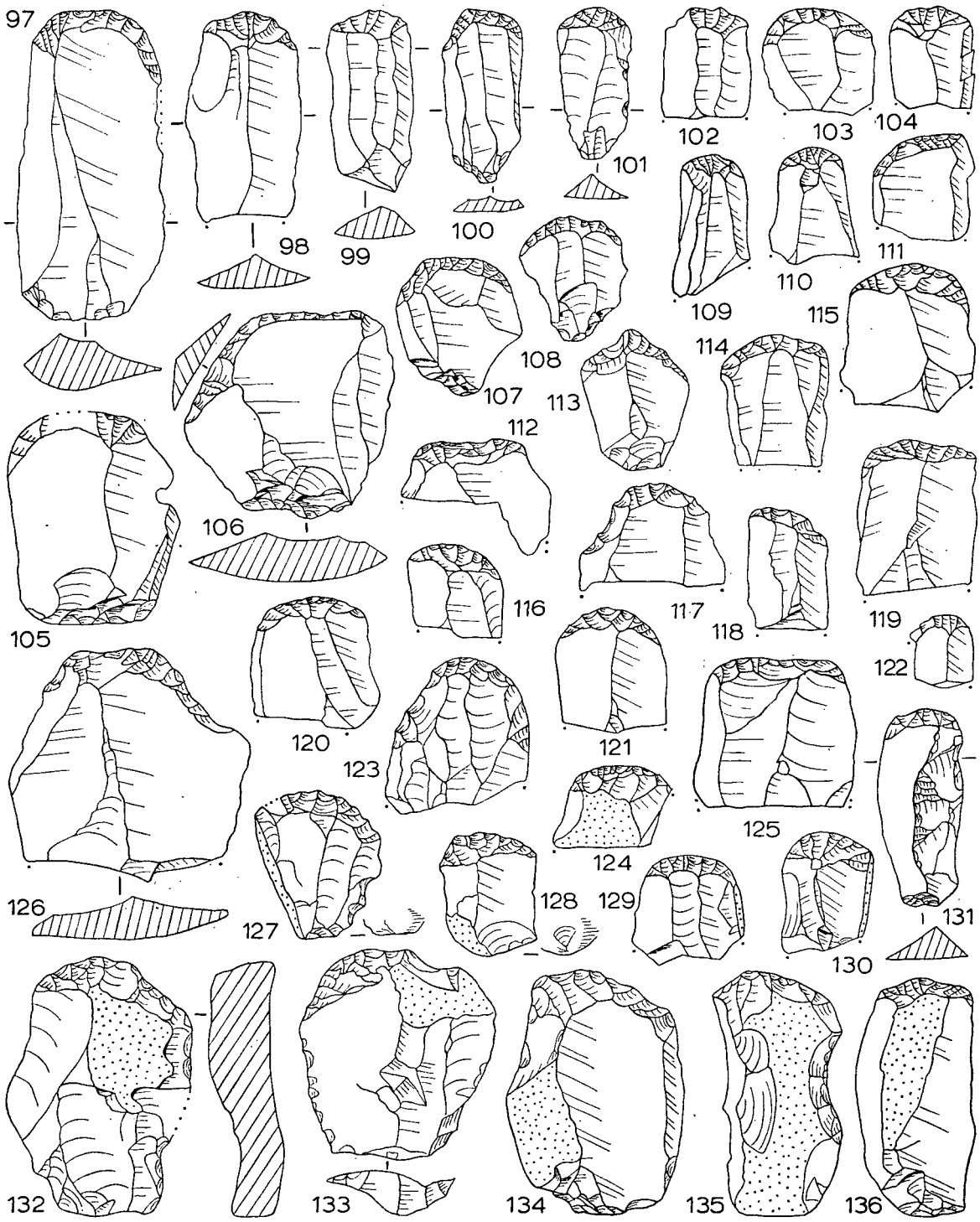

FIG 7 End-scrapers ($\frac{1}{1}$)

of group 5. Fragments (as opposed to specimens *made in origin* on fragments) could not be more closely attributed with certainty.

The hafted thumb-nail scraper is an obvious development from the end-of-blade form. Probably, during Late-Glacial/Early Post-Glacial times there was a period when the whole series – from one to another through transitional forms – was current wherever there was any shortage of flint. Perhaps the more economical and less-demanding hafted tool came eventually to be preferred, no longer merely as a way to get use out of broken or sharpened-down fragments of the longer form, but as a primary approach. Whatever the sequence and dating, the Lussa Bay knappers were clearly at the stage of producing the full series.

Description	*Total*	*Over 1 in*	*Under 1 in*
1A. End, on blade (nos 97–101, 143)	9	7	2
1B. End, on cortex-free flake (nos 105–108, 113)	16	7	9
2. Broken cortex-free working part of 1, 3 or 5 (nos 102–4, 109–12, 114–23, 125–6)	24	1	23
3. End, on cortex-flakes used complete (nos 127–8, 132–6, 131 core-rej.)	29	16	13
4. Broken-off cortex-bearing working end of 3, 5B or 6 (nos 124, 129, 130)	9	0	9
5. End, basic material a fragment			
A. Without cortex (nos 137, 139, 140)	5	1	4
B. Cortex-flake	2	1	1
End scraper series	94	33	61
6. Neither end nor steep, on cortex-flakes fragments etc. (nos 138, 141–2)	19	9	10
7. Steep, including two cores (nos 144–147)	10	8	2
8. Side (irregular) on cortex-flakes (nos 148, 157)	2	2	0
9. Side (concave) on cortex-flakes (no. 149)	2	2	0
Totals	127	54	73

Groups 1–5 were all convex except: a few straight specimens, particularly nos 106, 112, 125 and 143; two concave, no. 140 and another in 1A; one nosed, no. 113. Nos 99, 102–4, 109–10, 123 (?), 125, 129, 135 are made on butt ends. No. 133 (group 3) came from a core with finely-faceted platform. Group 5A includes 3 double-ended specimens (no. 137); groups 6 and 7 hold many in which the preparation extends over most or all of periphery. No. 157 weighed 3 oz; a group 7 specimen weighed 6 oz. No. 157, apparently nosed, appears somewhat similar to an Irish specimen.[5]

The side-scraper no. 148 (section as no. 149) was one of the few flints found up the river (compare Lealt Bay no. 199, one of the rolled specimens at that site).

At Lealt Bay, group 1 included a proportion of thin-section blades flatly-trimmed at the end to a straight edge (nos 150, 153–8). These tools, which might be termed 'truncated' blades, may or may not be scrapers; this uncertainty of course applies to 'scrapers' in general (thought to have a multiplicity of uses) and, since a line appears hard to draw, the writer includes them all under 'scrapers'. At Lussa Bay only two such specimens were recognised, in 1A (no. 143) and 1B (no. 181 if obliquely blunted and pointing right would be very similar).

(f) *Gravers and graver-like tools (inc. core-graver).* No. 151 is a small, well-flaked core. Nos 155–6 are elongated lumps, the latter battered at each end and similar to those which at Lealt Bay were noted as probable chisels or wedges. No. 150 compares with Lealt Bay no. 215. No. 152, on a blade, has a thinned base and median spine; the working end compares to Lealt Bay no. 207. No. 154, on a now-broken blade, has a chipped notch. No. 153 is a very small flake.

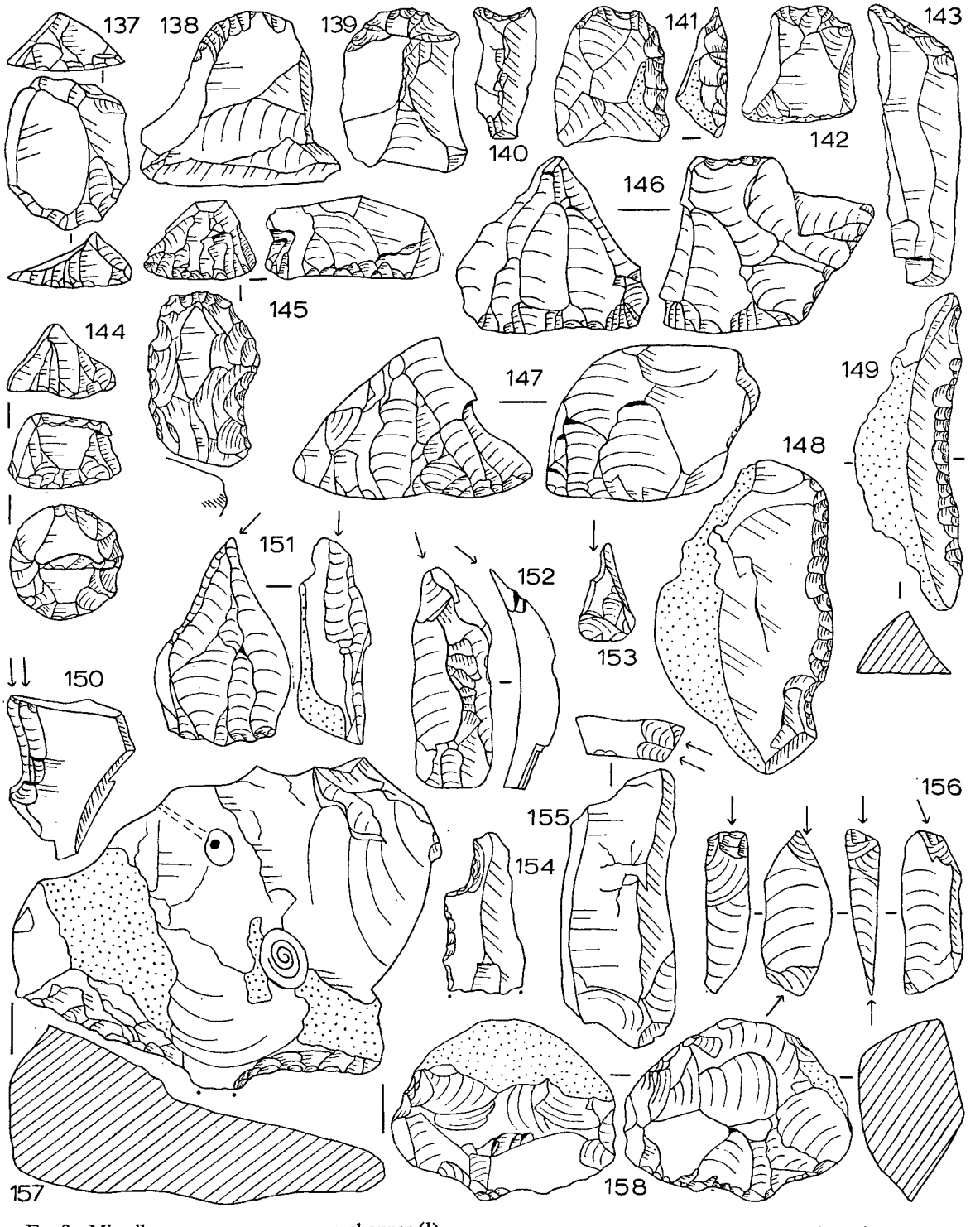

FIG 8 Miscellaneous scrapers, gravers, chopper (½)

Eight other specimens, each with 'graver' blow, are dubious. No faceted blow-platforms were recognised, unlike at Lealt Bay.

(g) *Small choppers* (?). No. 158 is triangular in section: a crudely and bifacially flaked sharp edge is opposed to a rounded cortex-bearing short side. The other two specimens are essentially similar. Presumably they would be used in a wood or bone sleeve. One or two cores also bore signs of two-way flaking from one edge.

(h) *Scale-flaked work.* Maximum diversity. Nos 191–4, barely rolled, have fully-scaled reverse faces. Nos 191–2, 194, opaque, are stained a golden-brown; no. 193, translucent, is creamy-yellow. No. 191 probably lacks a tang, no. 192 a tang and a barb. The central unscaled facet (not cortex-like) of no. 192 has a much more aged-looking surface than those of the surrounding facets, suggesting the point was made from an appreciably-older artefact. No. 188, opaque and yellow, appears to be a large isosceles triangle, most of its two shorter edges somewhat bevelled by crude bifacial scale-flaking.

(i) *Blades* were defined as at Lealt Bay (length twice or over twice the width, cortex-free, flattish, sides between parallel and tapering to one end or the other). To the writer it seems probable that at Lussa Bay this strict exclusion of all fragments under 2:1 (many no doubt broken by the sea or the river, and others by generations of islanders) has taken a greater proportional toll than at Lealt Bay. At Lealt Bay the blades were divided into those under and those over $1\frac{1}{8}$ in, this being considered the length of an average micro-burin plus that of an average divided microlith: the criterion is used again below, but this time only to yield a comparison between blade lengths at the two sites.

Over $1\frac{1}{8}$ in long	*Description*	*Quantity*
120	1. Without trimming (nos 24–7, 159–162, 164–5, 167, 171–3, 175–6)	297
8	2. With trimming (nos 163, 166, 174)	12
5	3. Scrapers – 'e' (nos 97–101, 143)	9
1	4. Gravers – 'f' (nos 152, 154)	2
134	Total as defined	320

No. 167 of group 1 (see main section B for its occurrence) superficially resembles a Gravettian blunted-back. Its 'edge-blunting' in fact consists of the negative facets left, *before separation from the core*, by the use of its future back as a secondary platform – then, having flaked from along its length, there was a reversal to the original platform and the present blade was struck off; it could even be merely platform-edge rejuvenation waste. Alternatively, one might feel[6] that the specimen is an example of the deliberate blunting of a future edge prior to removal of the blade from the core, a technique known in the Upper Palaeolithic. The blade has signs of use along its sharp edge and, intentional or not, probably served as a blunted-back tool.

Group 2 includes: six 'shouldered' blades (no. 174), more emphatically prepared than their Lealt Bay counterparts; four with side notches (no. 163 with oblique/tapering trimming at the broader end, no. 166 with chisel-shaped upper end); two with a little edge trimming.

(j) *Leaf-shaped flakes.* 'Leaf-shaped' flakes are now given attention because of their importance at the Lealt Bay site and in adjacent NE Ireland. The specimens' length-breadth ratios are all under 2:1, as are those of the 'Trimmed butt-ends' (placed under 'Asymmetrical'). Untrimmed butt-ends are ignored, as are all other primary flakes, of miscellaneous shapes and sizes, and even if with massive butts. No. 182 came from the storm-tide, upper zone. Abbreviated: plain, tapered, thinned, faceted (butts).

Description	Totals	*Symmetrical*					*Asymmetrical*							*Misc.*
		Massive butt nos 169–70, 177, 179, 184			*Normal butt no. 178*		*Massive butt nos 168, 180–1, 183, 185, 190*				*Normal butt nos 182, 186–7*			*no. 189*
		Pl.	Tap.	Fac.	Pl.	Fac.	Pl.	Tap.	Th.	Fac.	Pl.	Tap.	Th.	
1. 2½″–1¼″	22	5			2		7				8			
2. 1¼″–1″	26	1		1	12	1	1	1			8		1	
3. Under 1″	48	5	1	1	21		3		1	1	13	1	1	
Total	96	11	1	2	35	1	11	1	1	1	29	1	2	
4. Trimmed butt-ends	19							1				8	6	4

Total trimmed: 29 ('faceted' butt 4, thinned butt 10, tapered butt 11, other edge-trimming 4). Compare trimmed blades: 11 (shouldered butt 6, side notches 4, edge-trimming 2).

Faceted butts: the largest, no. 169, seemingly trimmed after removal from the core, may be compared to point no. 224 at Lealt Bay; whilst either could be used as a butt-end scraper, the present no. 185 is very small to have served as such and, as did the fairly symmetrical small specimen no. 170, may have come from a core with delicately-faceted platform.

No. 183 is one of the three complete tapered flakes.

Butt-end no. 168 is probably thinned as well as base-tapered. 'Miscellaneous' butt-ends have other forms of edge-trimming (no. 189, very fresh in appearance, compare Lealt Bay no. 238).

First, this rough analysis suggests some slight tendency, presumably intentional, for the largest leaf-shaped flakes to be asymmetrical and have massive butts rather more often than do the two smaller groups. Secondly, it is clear that a fair number of flakes (and at least a few blades) were secondarily trimmed for mounting (contrast no. 40); there is some small overlap, at the least, with Lealt Bay, but rolling of the Lussa Bay material has made the above figures unusable for close comparison.

(k) *Arched, tip-heavy flakes.* These are all cortex-bearing ('Larne Picks'). The 37 specimens grade in size from nos 15, 16 to no. 18, without a break. The fact that the cortex-thickened tip is more resistant to attrition than is the bulbar end has made it impossible to distinguish with certainty those with the bulbar end humanly narrowed (by use or trimming) from the rest.

As at Lealt Bay, nothing suggests these objects make up a deliberately-produced tool-form. Were it not for the quantity in which the shape occurs in Movius' Late Larnian, one would feel that these Lussa Bay specimens were nothing more than a waste-form bound to appear from time to time, especially when flaking small round nodules; that the largest specimens should have been used nevertheless would not prove they were a deliberate end-product. Possibly the region's 'Larne Picks' were in fact a combination of unintentional and intentional, the former – once a special function was found for them – early giving rise, in NE Ireland at least, to the latter. A wide statistical survey of their incidence is needed before a site can be said to have an 'over-normal' quantity. Their trimming and signs of use vary, as one might expect of improvisations rather than intentional productions. A fine specimen found at Flint Jack's Cave (Cheddar), for example, has bulbar-tip use and cortex-tip trimming (BM 1930, 11–4, 12).

(l) *Flakes part-backed (lengthways) with cortex.* These primary flakes are thought to relate particularly to the knapping of the small but distinctive group of cores – having the shape of asymmetrical laterally-compressed leaning cones with quarter-moon platform areas – already discussed in category (a) and illustrated by nos 1–4. The method by which, ideally, these cores were flaked is suggested by 'A' on fig 4 (the symmetrical pyramidal core being flaked as in 'B'). Flake 1 (of 'A') is of course fully cortex-backed; 2 is backed on the left, 3 on the right and so on.

Only 1 is necessarily useless, each of the rest has a sharp edge; where the custom was to blunt an edge anyway – a custom somewhere in the ancestry of the Lussa Bay people – this would have been a more economical method than the right-around approach, since the latter produces many fully cortex-backed specimens (i.e. each without a sharp edge).

Flakes part-backed (lengthways) with cortex were divided (excluding those classified elsewhere) between specimens which bore the strip on the left and those which bore it on the right, with a result of 71 to 54, plus 12 indeterminate fragments. Illustrated are examples most probably removed early in a core's life, the arris angle flattish, cortex about half (nos 29, 31), some way into the core (two parallel platforms), with correspondingly acute arris-angle and little cortex (no. 28), and very late on, the cortex an extension of the bulbar side of the flake (no. 30).

(m) *Miscellaneous form.* No. 195, hinged, perhaps *petit-tranchet* or side-scraper.

E. COMPARISON WITH THE LEALT BAY MATERIAL

Just over half the Lussa Bay *cores* were single-platformed and flaked only part of the way round; often there was a second platform, preferably at about a right-angle to the first; sometimes flaking extended right around. This far they were much like the Lealt Bay cores. A minor difference was that a few elongated cores (nos 7, 8) suggest 'large' blade production more clearly than did any at Lealt Bay. Another minor difference was that the Lussa Bay cores included the standardised asymmetrical group (the standardisation is underlined by the fact that Lussa Bay is a derived industry); the shape occurred at Lealt Bay, but at that site various pyramidal forms were more common. Correspondingly, there were 137 flakes part-backed (lengthways) with cortex at Lussa Bay but only 58 at Lealt Bay.

At Lussa Bay, the production of *blades* was clearly more important – in terms of the whole collections – than at Lealt Bay. Although rather under two-thirds as much flint was found at the first site as at the second, total blades were 320:271 and, within these figures, large blades (over $1\frac{1}{8}$ in long) were in fact 134:78. And this is in spite of the suspected abnormal breakage and thus reduction in classifiable specimens at Lussa Bay.

At Lussa Bay, 75% of the *scrapers* formed an unbroken series ranging from end-of-blade to end-of-small-flake. At Lealt Bay the end-of-blade specimens, thinner in section, were comparatively feebly trimmed and variably shaped, only a few heavily-patinated fragments like no. 184 comparing to the Lussa Bay group. The thumbnail scrapers were much the same at each site. Another notable difference was that Lealt Bay yielded a high proportion of scrapers on heavy primary flakes; had these been important at Lussa Bay they would certainly have survived in proportion, yet very few were found there (one of them, no. 148, coming from up the river and similar to one of those rolled, no. 199, and thus amongst the oldest, at Lealt Bay).

Very few of Lussa Bay's *steeply-trimmed tools* were really similar to those found at Lealt Bay – only the smaller blunted backs (nos 34–56), the small points (nos 61–4), the isosceles triangle (no. 74) and one of the sub-trapezoids (no. 57). In one way or another the rest were different. Two part-backed blades (nos 32–3) and two symmetrical points (nos 65–6) were much larger than any of their shape at Lealt Bay, nor is the tanged specimen (no. 60) comparable. The triangles (nos 67–73, 75) were larger and proportionally broader (some blunted backs were tending towards triangularity too). The small stout 'crescent' (no. 59), superficially a heavy version of several dozen at Lealt Bay, turned out on closer inspection to be without equivalent there: not one of the Lealt Bay 'median spine towards the arc' group was in fact bulbar. One of the two sub-trapezoids (no. 58) is quite flatly trimmed. The 'trapeze' group (nos 76–86, 88) was quite distinct, generally in being larger and usually in lacking trimmed backs and also in

being rather less 'geometric'. Conversely, many of Lealt Bay's microlithic forms (including those with the lighter group-patination) have not been found at Lussa Bay.

At Lussa Bay, 20 *micro-burins* could be recognised with certainty, whilst there were 84 whole or broken microliths and other steeply-trimmed specimens. At Lealt Bay,[7a] 346–1, 283 were the corresponding figures. Micro-burin-microlith proportions were thus Lussa Bay 24%, Lealt Bay 27%. Of those microliths etc actually classified, 47 and 341 respectively, the figures for specimens clearly retaining the bulb were 21 (45%)–54 (16%). So it is probably safe to say that removal of the bulb by direct chipping was comparatively unpractised at Lussa Bay, although some allowance must be made for the greater ease with which the bulb can be recognised on the Lussa Bay specimens (because they are much larger). The smaller blunted backs were the bulbar element (and almost the only steeply-trimmed form) common to the two sites.

Leaf-shaped flakes, symmetrical and asymmetrical, with miscellaneous butt-end trimming, occurred at each site. The butt ends of some from each collection consisted of powerful bulbs on broad thick chunks of the original core-platform. Presumably such flakes were the result of robust flint-careless knapping; such an approach would be unsuited to the small scarce nuclei commonly used on Jura, and so perhaps one should allow for the possibility that, even if a current technique, examples are not likely to be numerically important on the island.

The *leaf-shaped scale-flaked point* no. 193 has no exact Lealt Bay parallel as to manufacture, but no. 194 is similar to Lealt Bay no. 280 (the latter retains the protrusion to which Stevenson has drawn attention,[7b] and would be narrower when finished). The two differing *barbed-and-tanged points* have no parallels at Lealt Bay; geographically, perhaps the nearest which have been published are those found on the sand dunes of the Isle of Colonsay[7c] and of Sanna Bay, Ardnamurchan,[8] both being, like no. 192, of the smallest size, with that from Sanna Bay said to be

TABLE 2

DIFFERENCES BETWEEN LUSSA BAY AND LEALT BAY INDUSTRIES

Description	*Lussa Bay*	*Lealt Bay*
Total weight (flint)	24 lbs	39 lbs
Cores, most common form	Asymmetrical	Pyramidal
Flakes part-backed (lengthways) with cortex	137	58
Blades (all)	320	271
Blades (over 1⅛ in)	134 (42%)	78 (29%)
Scrapers	End to thumbnail	Misc. (end-scrapers comparatively degenerate)
Microliths:		
'Non-geometric'	Large, medium, small	Medium, small
Crescents	Small, 2% (1)	Small, 15% (51)
	Not at Le. B.	Misc.
Triangles	Medium, 15% (9)	Small, 10% (34)
Sub-trapezoid	Small, 3·5% (2), one flatly trimmed	Small, 15% (54)
'Trapeze' forms:	Medium	Small
	One back trimmed	All backs trimmed
	20% (13)	11% (37)
Bulbar (classified)	45% (21)	16% (54)
Micro-burins (% of all microliths)	24% (20)	27% (346)
Lealt Bay Cat. 'i'	(?) 1 triangle scaled & bevelled	60 triangles, quads. and pents.
Scale-flaked work	Triangle (see above)	
	Leaf-shaped (2)	Leaf-shaped (many)
	Barbed-and-tanged (2)	

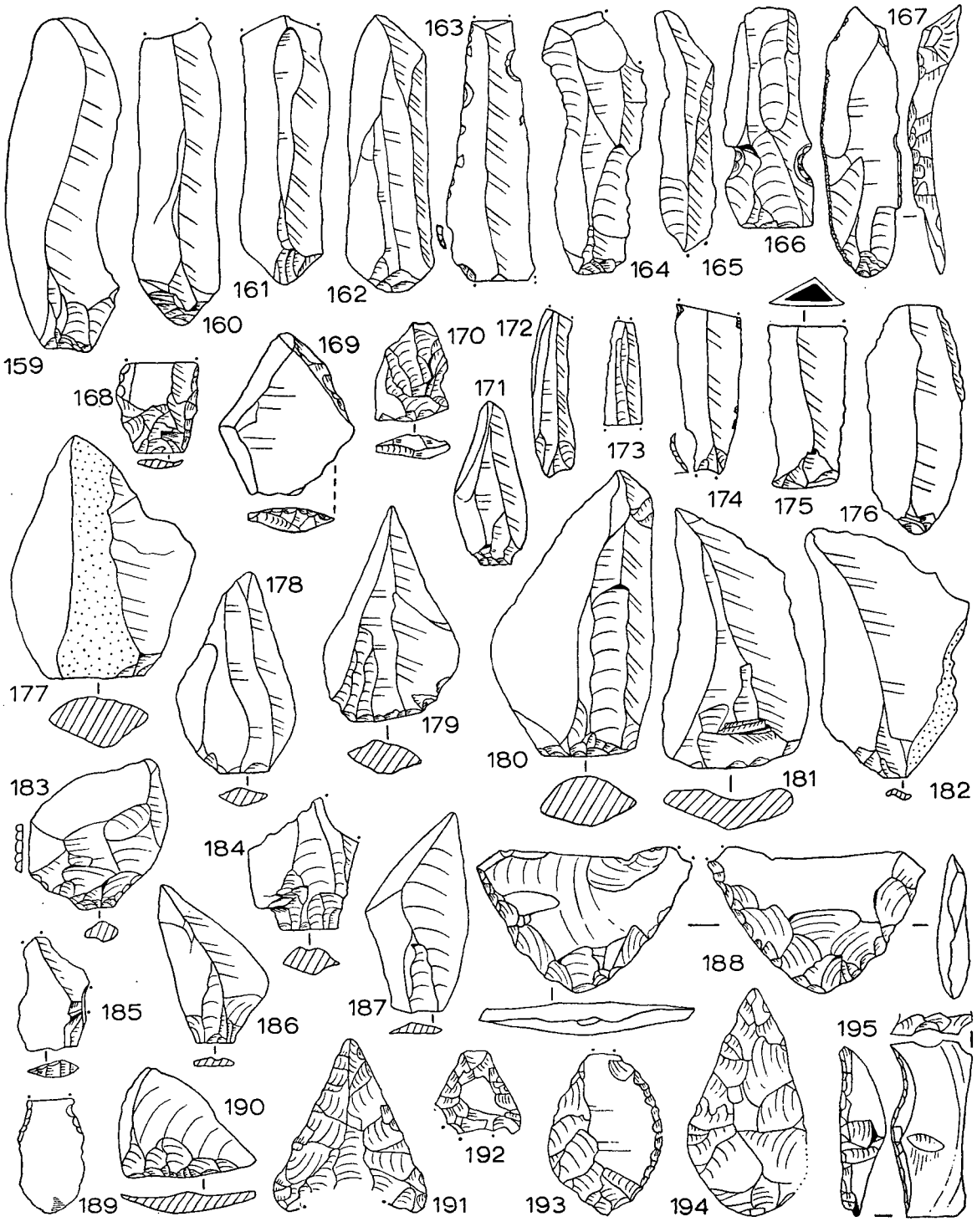
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FIG 9

associated with Beaker ware, a linking remarked elsewhere in Scotland. The massive *isosceles triangle with oblique bifacial edge-trimming* would be an acceptable successor to Lealt Bay's large coarse unstandardised triangles (category 'i'); fairly similar to no. 188 is a specimen from Hedderwick (E Lothian) displayed at the NMA as a typical Neolithic B arrowhead (BM 113). In summary, it is possible that Lussa Bay's scale-flaked specimens (a maximum of 5) could well *post*-date most or all of the Lealt Bay microlithic material, and be a continuation of that site's scale-flaked element.

Table 2 summarises the main differences between the two sites. On general typological grounds (fully discussed in the next section), it is now suggested that the majority of the Lussa Bay forms, those above the heavy line, are earlier than the corresponding Lealt Bay types, and that, below the line, the reverse holds good (the leaf-shaped specimens may overlap). There is some site evidence at Lealt Bay (see typology sections in this and earlier report) to support this proposal: a few forms tentatively thought to be early at Lealt Bay have parallels at the present site, whilst others then put forward as late have none. The two periods from which the Lussa Bay collection are thought thus to stem are of course those suggested earlier when discussing land-sea movements in the bay (main section C, summary), very early (minimum antiquity the Boreal-Atlantic transition) and very late (maximum antiquity Late Atlantic). Before going on to make wider comparisons, it should be mentioned that, on this point, there is further N Jura evidence to be reported.

F. AFFINITIES IN GREAT BRITAIN

The following may have to be modified once the results of the recent work in Wales and the Midlands (mentioned below) are fully published. In the meantime, British theory would lead one to expect that immigrants arriving on Jura during say the Boreal should have had one of three labels: Sauveterrain-affinity, Megalmosian, British Upper Palaeolithic ancestry. These groupings are used for comparison in the absence of a comprehensive and convincing typology for Great Britain.

The *Sauveterrian-affinity* group can be ruled out at once, there is no resemblance at all.[12]

Of the *Maglemosian*, it has been said[13] that its 'geometric' microliths are limited to triangles, irregular elongated trapezes and transitional forms, and scarce irregular crescents, differing in character in being neither so narrow nor so minute as those from purely microlithic industries. This is a reasonable description of the Lussa Bay microliths and also of their relationship to those at Lealt Bay. There is marked similarity between the trapeze-triangle microliths at Lussa Bay and at the Proto-Maglemosian Star Carr (*c* 7500 BC)[14]; at the former all but one of the trapezes had untrimmed backs, at the latter forty-one out of forty-five. Other resemblances to the Maglemosian are the importance of blade production and of blade-end scrapers; again one could compare the latter at Lussa Bay to those from Star Carr. The limited production of leaf-shaped flakes with feeble basal trimming could derive from such specimens as Star Carr's no. 71; the Lussa Bay points nos 65–6 from the Star Carr 'awls', e.g. no. 102. However, axes, *which could hardly escape recovery*, are missing (but was Lussa Bay a settlement or just a hunters' landing place and camp?) and the obliquely-blunted point is rare and mainly bulbar (as at Lealt Bay and in Scotland generally). Though of course later, the most typical 'Obanian' harpoon-head has affinities to the south rather than in the Baltic (and Cuzoul de Gramat's Tardenoisian I level yielded an Obanian-type antler mattock). Overall, then, Lussa Bay does not seem *directly* linked to the blade, trapeze-triangle and axe grouping termed Maglemosian.

The best case can be put forward for a *British Upper Palaeolithic ancestry*. Lussa Bay's

knapping standard and blade production were both fairly high, especially if one allows for the poor raw material; there was a strong end-scraper tradition; the points nos 65–6 are markedly of Late-Glacial aspect. Rare ancient parallels can be found for the stout, locally-atypical 'crescent', no. 59: two early specimens are known from the Gower Peninsula, one of these from the latest excavation at Cat's Hole (with Creswellian tools and the micro-burin, and faunal and geological evidence for a Late-Glacial date)[9] and the other from Paviland Cave (in a Creswellian layer)[10], whilst a third came from the recent excavation at Creswell Crags (in association with backed blades and the bones of rhinoceros and reindeer).[11] Lussa Bay's characteristic trapeze-triangles are of course smaller and more 'geometric' than the nearest comparable Creswellian forms, but these forms' clear geometric trend would make them acceptable ancestors to the Jura tools; the possibility of influence by the Continental trapeze-triangle industries will be discussed shortly.

The tanged point no. 88, a proto-trapeze, is not of typically Creswellian aspect. A few, varied tanged points have been picked up in Scotland, but the tool is best known, in Britain, from the Hengistbury Head Upper Palaeolithic site[17] on the Hampshire coast. No. 88 could be Jura's earliest single tool. Its relationship to Lussa Bay's trapeze-triangles is uncertain: it could be directly ancestral or it could have been part of an industrial complex which – presumably in the south – influenced the native Late-Glacial industries towards their Post-Glacial geometricity, including that at Lussa Bay. No. 88 has to be placed in suspense.

Amongst British Post-Glacial sites, two on the W coast can be compared to the bulk of the Lussa Bay collection. Daylight Rock (Caldey Island, Carmarthen Bay, S Wales)[18] is similar in blade and end-scraper production. The asymmetrical cores to which attention was drawn earlier are closely paralleled (by nos 20, 21), and flakes with partial cortex backing lengthways were at least common enough to form the raw material for some of the illustrated tools. The microlithic element corresponds fairly closely: partially-trimmed points were not standardised, only one or perhaps two out of the four found appear to approach the well-known micro-burin-fashioned obliquely-blunted type; three large sub-triangular crescents (nos 12–14) had their untrimmed edges left concave, one (no. 14) having also an untrimmed gap in the middle of the working (compare Lussa Bay nos 76–7); there was a single rod (no. 18); the several triangles are a little larger but are otherwise similar, as is the single trapeze (the presence of only one trapeze is not considered a significant difference between the two sites – see next section); a minor comparison is no. 19 to Lussa Bay no. 64; and the Daylight Rock report noted that, generally, though the micro-burin technique was well-evidenced, often the bulb was not removed, or was simply chipped away. Gravers were poorly evidenced. Finally, two uninformative choppers, without *tranchet* technique, were found at Daylight Rock.

The Caldey report placed Daylight Rock in the Atlantic period, but the present writer has since been informed[19] that this date is now felt to be too late. The Boreal-Atlantic transition, suggested as a minimum antiquity for the Lussa Bay collection, would, then, be in conformity with the Daylight Rock affinity proposed above.

The nearest regional site with which Lussa Bay must be compared is Shewalton Moor,[20] on the SW mainland. The artefacts are not identical. The three Shewalton trapezes (see Table 3) were proportionally rather the broader; no. 7 had a trimmed back; the two untrimmed backs were of minimum length (no. 6 initially suggested a broken triangle but the flint's uniform patina was apparently considered sufficient to show that it was a trapeze); neither backs nor sides were concave. Triangles were usually broad equilaterals (much like 'trapeze' no. 6), occasionally as at Lussa Bay. There was only partial similarity between the rest of the tool-forms (e.g. only one poor rod at Lussa Bay, no micro-burins at Shewalton). These differences suggest that, whilst the rarity of regional trapezes must place them in the same complex, the two sites were not closely

linked (less so than Daylight Rock and Lussa Bay), due either to the obvious geographical gap or to lack of contemporaneity.

Shewalton has always been dated to the Bronze Age,[20, 21] for the following inter-conflicting reasons. The lack, unlike at Lussa Bay, of the micro-burin, on the grounds of its absence in the far-distant Belgian Late Tardenoisian: however, to explain the non-conformity of Shewalton to the U.K. scene, it has also been claimed that the industry was a highly local development, independant of the continent. Further, in the same chapter,[20] four other Scottish collections *including* micro-burins *were* claimed as Bronze Age! Another aspect said to back the dating was the presence of the trapezes, though, as will be suggested below in section (H), there seems at present no evidence for limiting the site's types to the Bronze Age. The most convincing evidence for a Neolithic or later date at Shewalton was the reported association with undoubted scale-flaked material (of which one might just compare the small equilateral triangles nos 21, 22 to Lussa Bay no. 188). Generally, at Shewalton[22a] the microliths were 'in very small proportion to the immense numbers of relics of later facies', being found 'on old land-surfaces below wind-blown and shifting sand' one of which yielded, 'isolated', the material under discussion. At Shewalton, on the 50 ft isobase, the highest Post-Glacial transgression was probably falling away at least by Mid-Atlantic times (see section I, below) but the old camp-sites just about the maximum shoreline would for long be inhabited in preference to the newly-exposed sea-bed, and consequently two or more industries, quite distinct in age, could become mixed (as probably occurred at Lealt Bay); or, at any time, sand can be blown away, lowering a recent industry onto an older one, and so on (see also the appendix). However, section H will suggest that, within even a very limited region, the trapeze-triangle industries often had a long life (e.g. the Muge middens).[46, 47b] Until concrete evidence appears, Shewalton Moor and Lussa Bay can be left with different dating hypotheses.

G. COMPARISON WITH IRELAND

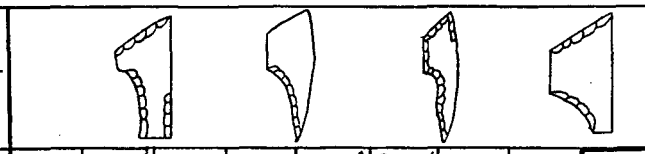
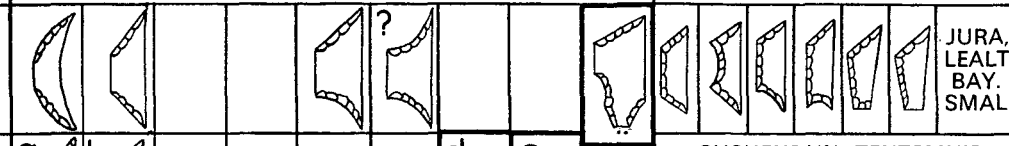
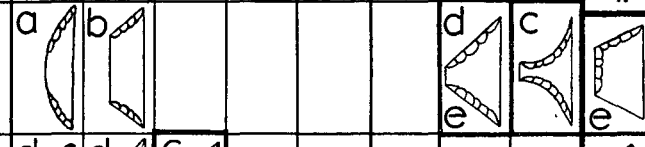
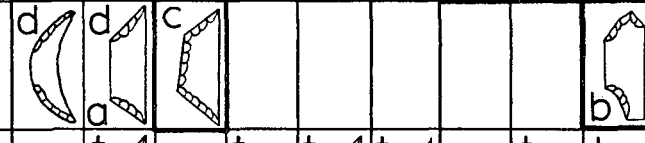
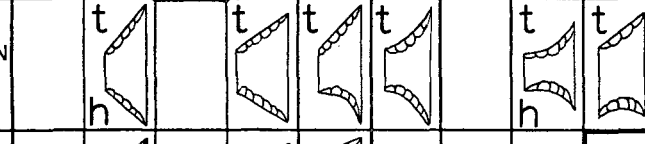
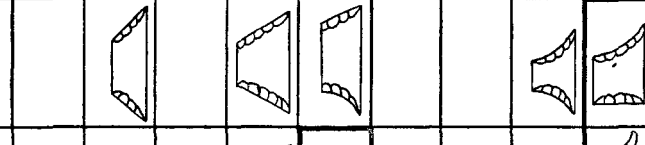
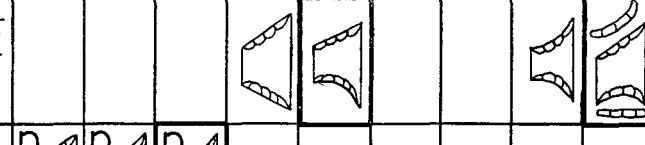
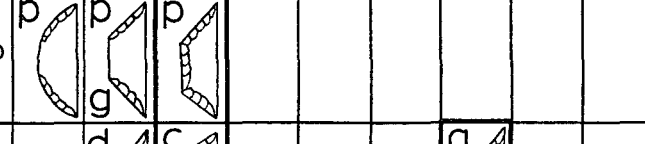
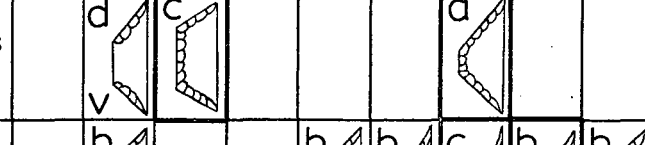
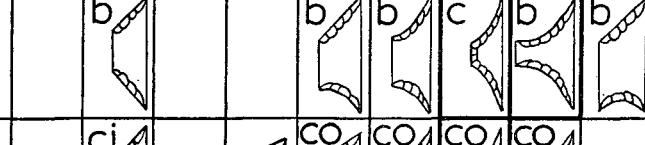
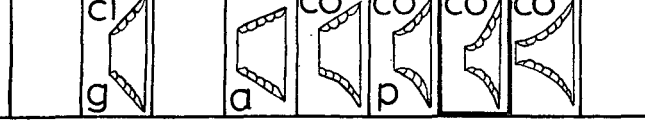
The importance and types of its steeply-trimmed specimens are enough to distinguish Lussa Bay from all Irish industries. Other major differences are the series of end-scrapers, the small number of steep scrapers and the total lack of axe and pick forms at Lussa Bay (though the latter absence could be due to a scarcity of large flint or by Jura being only frequented by seasonal hunters).

H. EUROPEAN AFFINITIES

Table 3 (see notes 23, 25–51) suggests the Lussa Bay site is the present NW extreme of the complex of axe-less blade and trapeze-triangle industries (characteristic: the medium-sized, elongated, symmetrical trapeze trimmed on its two non-parallel sides) which, in early Post-Glacial times, extended over much of Europe and the directly-connected continents.[22b] Shewalton Moor and Daylight Rock, Caldey Island, are included as other sites belonging in some way to the complex.

Table 3 outlines the trapezes (medium to medium-large in size) from many Post-Glacial W European coast sites. Also included is a selection from a 'Magdalenian', cold fauna site[23] making medium to large, tanged point proto-trapezes (as Hengistbury Head, the Hamburgian, etc); to these one might compare the broken Lussa Bay no. 88 which, like other site or regional variations from the most widespread forms, has in Table 3 been encased in a heavy line. Represented also is a rare Post-Glacial example of another trapeze-form, found in the Creswellian[15] (peculiar to it and developed from the angular Gravette rather than the tanged point, and usually

TABLE 3
SOME PROTO-TRAPEZES AND TRAPEZES OF THE W EUROPEAN COAST

LE MARTINET 6		'MAGDALÉNIEN SUPÉRIEUR. (PROTO-AZILIEN)'. COLD FAUNA.
JURA, LUSSA BAY 1		JURA, LEALT BAY. SMALL
JURA REGION 2		a: CUSHENDUN, TENTSMUIR, DURHAM, (?) RISGA. b: RINK FARM (SELKIRK), BALLANTRAE. c: I. OF MAN. d: TWEEDDALE. e: SHEWALTON.
WELSH COAST 3		a: ANGLESEY. b: NAB'S HEAD. c: NANNA'S CAVE. d: DAYLIGHT ROCK.
MORBIHAN 4		TÉVIEC, HOËDIC.
BELGIAN TARD 5		MIDDLE AND LATE FACIES.
MARTINET —CUZOUL TARD.I,II 7		EARLY FACIES. MANY VARIANTS.
PÉRIGORD 8		PÉRIGORD—AZILIAN (INC. VILLEPIN, CAP BLANC, LONGUEROCHE). GARE DE COUZE ('FINAL MAGD.' WITH MICRO-BURIN).
PYRENEES 9		DURUTHY ('UPPER PAL.'), VALLE, CROUZADE, 'AZILIAN'.
TAGUS 10		BREUIL, CHILDE, ROCHE.
E.SPAIN 11		TARRAGONA (CIURANA, PATRÓ, ARENY), LA COCINA, EL GARCEL.

large), that from Nanna's Cave[16] (lower layer); also on Caldey Island, the industry is considered earlier than that at Daylight Rock. For comparison, Lealt Bay's unique range of *small* trapeze forms is included. U.K. axe, blade and trapeze-triangle industries (Proto-Maglemosian and descendants) have already been discussed; a few other, scattered, S Britain, medium and medium-large trapezes are also not shown (southwards from the probably very early Post-Glacial Sheffield's Hill site, where at least nos 19, 29, 49 on fig 14 were trapezes).[24]

It was said earlier that the 1:5 trapeze-triangle ratio (ignoring no. 14) at Daylight Rock, Caldey Island, does not weaken the comparison with the Lussa Bay industry (2:1) nor bar Caldey from forming a link in the chain of W European coastal trapeze-triangle sites. Examination of the composition of some of the Table 3 industries shows that the ratio in fact varies considerably from site to site. Taking the Tagus middens as an example,[52,53] the Cabeço de Arruda ratio was 3:1 but that from Cova da Onça was 1:5; at the prolific Moita do Sebastião the microliths were almost all trapezes (no crescents), at the equally prolific Cabeço de Amoreira they were almost all triangles. Overall, then, the middens are likely to have yielded the two forms in effectively equal proportions. Clearly, where both trapezes and triangles are found at a site, the hazards of manufacture probably decided whether or not the tool had a back; triangles alone might sometimes be but a comparatively recent preference, perhaps one sometimes hardening around an increasing scarcity of long blades. Further, if the trapeze proportion can be very high at one site and very low at another, yet both represent the same people, it follows that there are likely to be sites which, though an integral part of the same culture, will only yield triangles. In Great Britain, for example, this in turn implies that, in addition to Lussa Bay, Shewalton Moor and Daylight Rock, the European trapeze-triangle complex may also be paralleled by many of the medium-sized-triangles-only sites (e.g. there is a remarkable similarity between the variously-spurred triangles, with trapezes, of La Cocina and the Tagus middens and those, without trapezes, of Port St Mary on the Isle of Man[30a] – but there is not now space to consider this more fully . . .).

Two details in the excavators' reports on Moita do Sebasião and La Cocina are especially relevant to Lussa Bay. At the Portuguese site too there were few gravers (4, amongst some 6,000 artefacts); bone tools were limited to 3 punches, a perforated phalange and a polished rib, and there were a number of worn antlers – nothing needing a graver. At the Spanish site the excavator noted that 'the triangles usually have a small notch about a third of the way along the sharp edge, as though an attachment there had caused a minute flake to come away': at Lussa Bay such a notch can be seen on 3 or perhaps 4 of the 7 large whole triangles and also on trapeze no. 80 and 'proto-triangle' no. 42.

It will be noted that, like Caldey but unlike groups 4, 5 and 7 (Table 3), Lussa Bay shows no tendency to evolve towards or be influenced by the squat, often more or less horizontal-base trapezes ('right angle' or 'inland Tardenoisian' forms) which eventually merge with the transverse arrowhead. The three Shewalton specimens were, however, rather square.

There is evidence[54] that some at least of the blade and trapeze industries of the Mediterranean were linked to the spread of Neolithic cultural traits, and in S Iberia a series of chambered tombs contained industries with a blade and trapeze element, the earliest tombs holding some of the forms of the peninsula's Mesolithic industries (the latter comparable, as Table 3 shows, to those of Lussa Bay). The seven El Pozuelo tombs,[55] for example, yielded 463 microliths: 246 were right-angled trapeze-triangles (groups 6–10), 184 were fairly broad more or less isosceles trapeze-triangles, including a few trimmed-back trapezes and some rare crescents (groups 1–5), only 9 were obliquely-blunted points (group 11), 24 were oddities. The U.K.'s chambered tombs, cists and other sites of comparable age have yielded no such evidence,[56] and therefore connection with Lussa Bay is unlikely.

Development *in situ* from the various Upper Palaeolithic cultures is an obvious possible source of the European trapeze-triangle complex, with Star Carr (*c* 7500 BC) and the SW Asian sites (present at least by 10,000 BC) as two extreme examples, the Asian element then – apparently during the first stages of its evolution of Neolithic culture – beginning its recently-proposed westerly movement[54] along the N Mediterranean shore, extending at least as far as the mentioned Iberian region. This involves Europe in two trapeze-triangle phases, the first developing more or less simultaneously in various parts of the continent, the second returning and so far limited to the Mediterranean. Examples of the first could be the Cocina, Muge, Morbihan and Caldey sites – all *in situ* above the range of the eustatic rise – and also the often-postulated W European drowned coastal sites, such as Lussa Bay.

Absolute dates for the tabled trapezes, elongated and right-angled, are few and of varied accuracy: Cushendun Late Boreal (Early Larnian); Daylight Rock pre-Atlantic; Belgian Tardenoisian Atlantic (Middle facies) with contemporaneity with the Neolithic (Late facies); SW France Tardenoisian I and II probably Atlantic; Azilian and Périgord-Azilian Pre-Boreal-Boreal; Moita do Sebastião 5400 ± 350 BC. The age of the mentioned very similar trapezes and triangles at Star Carr can be borne in mind: the middle of the eighth millennium, Pre-Boreal. This paper has already suggested a *terminus ante quem* of the Boreal-Atlantic transition (minimum dating *c* 5500 BC) for the main Lussa Bay industry, and there seems nothing in the European scene to make this unreasonable.

I. COMPARISON WITH REGIONAL NEOLITHIC AND LATER SITES

The Neolithic or later aspect of the Lussa Bay collection must now be discussed. Disconcertingly for the purposes of typological comparison, study of the final chapters of the standard work[57] suggests that the Neolithic-time and later people produced just about every form of stone implement known in Scotland since the first appearance of man in the country.

The non-scale-flaked material fell into various groups. Some occurred on or under sand dunes more or less in association with relics of Neolithic or later date. Some of it occurred in isolation without any dating means whatsoever, and was dated by a believed resemblance to that dated by its believed association with the Neolithic and later relics. The first two groups were interwoven with surface collections which had sometimes been categorically divided into 'early' and 'late' purely on patination grounds, or with museum collections put together from several barely-recorded origins. The highest Post-Glacial transgression was sometimes used to provide a *terminus post quem* for the formation of a dune on which artefacts had been found, but it can nowadays be seen that even here there was scope for error: the transgression's maximum stand is at present thought to have varied considerably – with the locality – as to closing date (for example, it seems that around Dumfries, which is on the 20–30 ft isobase, the sea had begun to fall away again *before* even 6645 ± 120 BP,[58] and thus quite low-lying artefacts could in that region date from early Atlantic, pre-Neolithic times). Sanna Bay, Ardnamurchan, is the only late dating of microliths on stratification grounds; upon turning up the original paper[59] one finds no mention of the microlithic element associated by Lacaille with the Bronze Age material, whilst his description of the stratification is in fact distinct from that by Lethbridge. In sum, though it is probable that stone working in peripheral Scotland long survived the coming of metal, a late typology based on sound field-evidence has still to be worked out. Because of this absence of reliable information, the writer does not intend comparing the Lussa Bay material, other than the five already-discussed scale-flaked specimens, with the extraordinarily varied regional material at present grouped as Neolithic or later. But further work in N Jura ought to show whether the

scale-flaked artefacts at Lussa Bay should be joined, as 'late', by others amongst the site's tool-forms.

J. FACTORS IN THE SURVIVAL OF THE LUSSA BAY INDUSTRY

Compared to other Scottish early Post-Glacial sites, Lussa Bay has two peculiarities: it is the only collection from the present tidal zone and it is typologically unusual. These characteristics would be most unlikely in a *post*-trangression industry: one can hardly imagine that such industries in such positions could escape observation until now, nor does such typology look likely to have been a late, limited-area development or a late, lone intrusion. A third characteristic of Lussa Bay has been proposed to explain the other two: N Jura is part of the zone of very maximum isostatic recovery, suggesting that the material has been lifted out of the sea, when most of its coastal contemporaries elsewhere are still underwater. The Caldey caves, holding industries compared to Lussa Bay's, are even now some 90 ft above sea-level: this peculiarity saved them from the eustatic drowning (from which S of about Lancashire there was of course little effective recovery, if any at all). A final factor at Lussa Bay is the river, which is thought to have revealed the artefacts in cutting through the upraised gravels.

Apart, then, from the rare high cave, recouping of the material from coastal sites of much of the Boreal period seems likely to be limited to the zone of maximum isostatic recovery. One would of course expect such material to include relics of the U.K. Late-Glacial people's immediate descendants, little understood or accounted for at present, and this Lussa Bay seems to do (it is not impossible that it is Scotland's earliest site, with full range of artefacts, yet published).

It is also relevant to add that nowhere else on *Jura* has the writer found flint artefacts in the present tidal zone; not even on the extensive shingle spreads around the mouth of the Corran River, the next in size after the Lussa, nor at the mouth of Lealt Burn, nor on the beach below the much-frequented and already-published high site at Lealt Bay. From this alone it would be possible to deduce (with apologies for the repetitiveness) that the Lussa Bay collection represents either:

(a) the theory preferred, a pre-Lealt Bay people (*terminus ante quem* Boreal-Atlantic transition) whose tools were buried by the transgressing sea and then subsequently disinterred by the regression-time, re-advancing river-mouth; the scale-flaked work would then represent (Late Atlantic onwards) the rare passages of Neolithic and Bronze Age hunters (stone-working then down to a minimum and, especially if many of Jura's cists are Bronze Age, as likely by the latter period to be due to island farmers and/or pastoralists as to mainland hunters), or

(b) much less acceptably, a post-Lealt Bay people, either the only ones on Jura's shoreline still dependent on stone tools (at the island's best settlement site?), or alternatively the only ones gone to live on the new shoreline, the other inhabitants (perhaps enough to leave many cists) remaining on the transgression-maximum terrace . . . yet not at Lealt Bay (typologically, too, it is difficult to see the main part of the Lussa Bay collection succeeding to Lealt Bay). Still, an 'invasion' in, say, the Sub-Boreal period cannot yet be entirely ruled out.

K. STRANDLOOPERS, SEASONAL MAINLAND HUNTERS OR EARLY SETTLERS?

A south-facing inlet well-placed for the mainland crossing and ideal for small shallow-draught boats, the mouth of the larger of the island's two salmon rivers, the valley behind it one of the two easy passes into and through N Jura's mountains, Lussa Bay seems the most

likely place for the island's earliest settlement. Equally, and as proposed for Lealt Bay, probably-seasonal mainland hunters perhaps used the inlet as a landing place and camping ground. Strandloopers, defined as coastal nomads, are difficult to imagine: such strandloopers would have to be considered either wandering mainlanders who took the trouble to make boats in order to include Jura in their itinerary, or nomadic islanders who nevertheless made boats especially to cross to the mainland and back for flint nodules, and neither picture seems likely to the writer. Organisation and equipment sufficient to cross to Jura seems most likely to mean a comparatively permanent dwelling on the mainland opposite; similarly, to be able to cross from Jura to collect and bring back flint pebbles would suggest some fairly permanent base on the island. Therefore it is proposed that the people who made the Lussa Bay implements should be considered either organised mainland hunters or early settlers.

PROPOSED LUSSA BAY–LEALT BAY INTEGRATION

It was in Late Boreal times that Jura's woods were at their maximum extent and conditions for hunters and gatherers therefore at their best. The island saw human activity at least by the Boreal-Atlantic transition (*c* 5500 BC), Lussa Bay having already been reached by a people of blade and medium-sized elongated trapeze-triangle technology, then widespread throughout Europe and in their case perhaps having evolved from the Creswellian, possibly with cross-Channel cultural osmotic influences; however, present knowledge is insufficient to rule out a noteworthy north-going cross-Channel migration, presumably from NW France. However this may be, the approach zone to Jura for the Lussa Bay people and their industry looks likely to have included the W coast of Great Britain.

The Lussa Bay people lived during the last phase of the eustatic rise in sea-level, say from about the present shoreline up to the maximum stand; some may have seen the sea lower still. By about Early Atlantic times their discarded tools had been overwhelmed (to be partially disinterred, during the last regression phase, by the returning river-mouth).

By the time the transgression of N Jura had reached the maximum stand – on Lealt Bay evidence a washing limit *c* 51 ft was attained early in the Atlantic period – the Lussa Bay industry had been replaced by one which was quite distinct: the Lealt Bay material, some of it rolled, has a poorer blade element, includes a great miscellany of *minute* microliths and, though containing all manner of scraping tools, numbers only a few very poor end-scrapers. However, some descent from Lussa Bay is suggested by Lealt Bay's unique range of minute trapezes. N Jura evidence to fill the gap in typological evolution is at present being sought.

The Lealt Bay site, thought to have been in use over a comparatively long period but not yet firmly divided into phases, included amongst its 'late' evidence the relics of a well-marked occupation by people of Neolithic culture; the sea was probably regressing by then, but not for a long time would the small and slowly-emerging marine zone offer advantages over the old camp-sites on the terrace above. However, in the extensive mouth of the Lussa Glen the sea's maximum reach was to fall back as much as 400–500 yd and this probably caused occupations there to move down earlier than at Lealt Bay; two Neolithic-type arrowheads, one at least paralleled at a Lealt Bay high camp, were lost around the present shoreline height at Lussa Bay. In S Jura a possible Neolithic chambered tomb has been reported;[60] it presumably stems from Early Sub-Boreal settlement.

It is likely that, by the time Bronze Age culture reached Jura, the shoreline was right back to its present position, and camps were again being made on the pre-Recent platform. At Lussa Bay, two barbed-and-tanged points witness the presence of Bronze Age hunters. Though the age

of most of the island's many now-obliterated stone-lined graves is unknown, the Food Vessel cist[61] recently ploughed up at the S end suggests that Jura had some settled population early in the second millennium.

Note. The implications for the Obanian can only be discussed when some further, most relevant N Jura evidence has been published, in *PSAS*, vol 103, forthcoming. Evidence and implications, in summary, have already appeared elsewhere, with a synthesis of the writer's first four completed N Jura sites.[62] Also, since the present paper was submitted, in April 1969, two *in situ* industries of Lussa Bay type have been excavated on Jura (incidentally confirming that the Lussa Bay collection belongs almost entirely to one phase, apart from a few specimens such as no. 88 and the Neolithic artefacts). One of the new sites, Lussa Wood I, holds three continuous-construction stone rings, 13ft 6in overall; charcoal from one gave a C14 age of 8194 ± 350 BP (SRR–160), from the other two together 7963 ±200 BP (SRR–159), in fact the earliest Scottish C14 dates and implying a calendar age of 7000–6500 BC. This dates the Lussa Bay industry, with no. 88 thought to be earlier still.

APPENDIX

Patination. It was noted that, in the Shewalton collection at the National Museum of Antiquities of Scotland, most of both the microlithic and the scale-flaked groups were quite unpatinated. One may feel that, if conditions were such that the scaled material could be quite unchanged after about 4,000 years, one cannot expect any older element present to be in a diagnostically different state. The Shewalton flints appear to have been hardly exposed to patinating agents: this is probably the result of having been rapidly covered by sand, thus being protected from weathering.

In W Scotland, where most if not all industries became covered sooner or later, the main patinating factor can be supposed to have been *the period during which the flints were exposed to the weather*, rather than their overall age. At Lealt Bay (Main Area) where there was no sand or other covering material until the few inches of probably very recent peat began to grow, the flints were heavily patinated almost in their entirety. A second factor must be the medium by which the flints were covered: acid peats and sands are some of the least patinating, chalk, shell-heaps and base-rich sand amongst the most, with noteworthy general variations, e.g. peat from the W coast is more acid than from the east, whilst England's fen peat is calcareous.[63] A third consideration is doubtless the humidity state of the covering medium, dry being the least patinating, then wet or perhaps wet-dry alternately. It is supposed that, within the comparatively-short Post-Glacial flint-working period, where material in or on the chalk in S Britain, for example, can be expected to be heavily patinated, that from W Scotland, with many possible combinations of the above factors, could have any degree of patination.

NOTES

1a. J Mercer, *PSAS*, 100 (1967–8), 1–46.
1b. A D Lacaille, *The Stone Age in Scotland*, O.U.P. (1954), 56.
2. H L Movius, *The Irish Stone Age*, C.U.P. (1942).
3. R F Schmalz, *PPS*, XXVI (1960).
4. A D Lacaille, and Grimes, W F, *Archaeologia Cambrensis*, CIV (1955), fig 23.
5. H L Movius, op cit, fig 48, no. 6.
6. The writer is indebted to Mr Harvey Bricker of the Abri Pataud (Dordogne) excavation for this suggestion.
7a. It is regretted that an early set of micro-burin figures was published for Lealt Bay. The total should have been 346 specimens, not 250, but with differences of under 2% only from the published proportions.
7b. R B K Stevenson, *PPS*, XXII (1956).
7c. W B Wright, and A M Peach, *Geol Mag*, XLVIII (1911), 164–75.
8. T C Lethbridge, *Man*, (1927), 115.
9. I L1 Foster, and G Daniel, *Prehistoric and Early Wales*, Routledge (1965), fig. 2, no. 3.
10. W J Sollas, *JAI*, XLIII (1913), fig 15, no. 1.
11. C B M McBurney, *PPS*, XXV (1959).

12. Also discussed at Sauveterre-la-Lémance with M L Coulonges, being compared directly with Le Martinet and Le Roc Allan material.
13. J G D Clark, and W F Rankine, *PPS*, v (1939).
14. J G D Clark, *Excavations at Star Carr*, C.U.P. (1954).
15. R F Parry, *P Somerset Arch & NHS*, 1928, pL XVI, nos 14–16, 30 are particularly close, for example.
16. A D Lacaille, and W F Grimes, op cit, fig 15, no. 6.
17. A Mace, *PPS*, XXV (1959).
18. A D Lacaille, and W F Grimes, op cit.
19. Letter (31st July, 1968) from Mr A D Lacaille: '. . . a soil analysis from which I concluded that most of the artefacts were assignable to a later period than that to which I think now they ought to be referred'. Apart from the material already discussed in the present paper, the Caldey excavations yielded a few Neolithic/Bronze Age artefacts.
20. A D Lacaille, *The Stone Age in Scotland*, O.U.P. (1954), Ch. IX, fig 127.
21. J G D Clark, *The Mesolithic Age in Britain*, C.U.P. (1932).

22a. A D Lacaille, *TGAS*, n.s. IX (1937), 56–74.

22b. J G D Clark, *PPS*, XXIV (1958).

23. L Coulonges, *Arch Inst Pal Hum*, Mém. 14 (1935), fig 4, respectively nos 2, 9, 10, 18 (Le Martinet).
24. A L Armstrong, *Mem & Proc Manchester Lit & Phil Soc*, 82–3 (1937–9), 115.
25. H L Movius, op cit, fig 23, no. 3 (Cushendun).
26. A D Lacaille, *PSAS*, LXXVIII (1944), 5–16 (Tentsmuir).
27. G Coupland, *PPSEA*, v (1925), 62–4 (Durham).
28. *The Cambridge Ancient History*, Vol I, Ch. 3 (1965), by D A E Garrod, and J G D Clark, fig 9, no. 6. (Risga).
29. NMA collection: 'Rink Fm. (Selkirk), P.S.A.S. LXV'.
30. A D Lacaille, *PSAS*, LXXIX (1945), fig 5, no. 7, noted as 'without any known Scottish counterpart'; bulb of percussion chipped away. No. 11 a trapeze-form too (Ballantrae).

30a. J G D Clark, *The Mesolithic Age in Britain*, C.U.P. (1932). (Isle of Man).

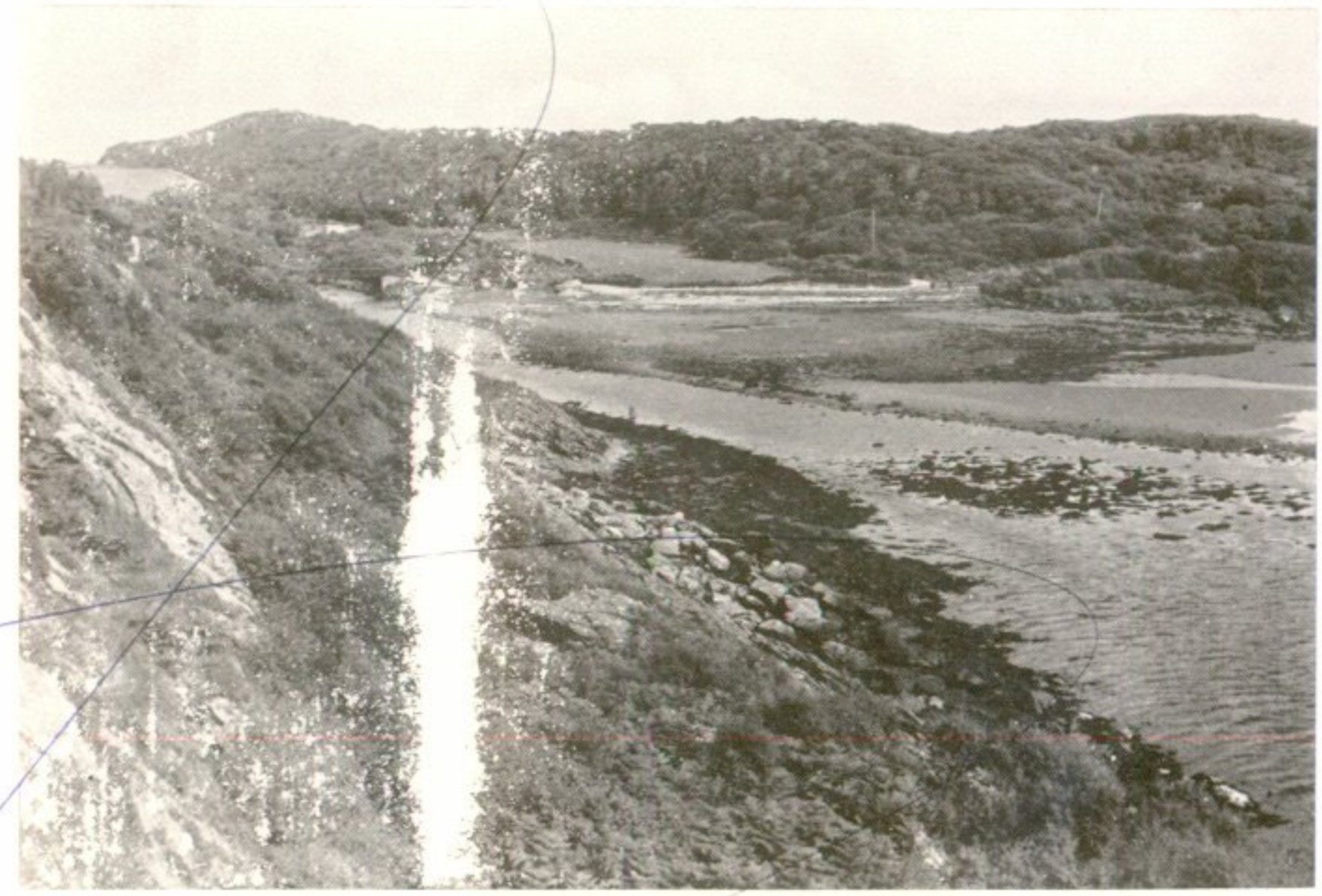
31. NMA collection: 'BMA 2497, Dr. W. A. Munro, P.S.A.S. 1939–40, 9 and 1941–2, 111' (Tweeddale).
32. A D Lacaille, *The Stone Age in Scotland*, O.U.P. (1954), fig 127 (Shewalton).
33. G J Wainwright, *PPS*, 29 (1963) (Anglesey, Nab's Head).
34. M and S-J Péquart, M Boule, and H Vallois, *Arch Inst Pal Hum*, Mém. 18 (1937) (Téviec).
35. M and S-J Péquart, *L'Anthropologie*, 44 (1934) (Hoëdic).
36. A D Lacaille, *The Stone Age in Scotland*, O.U.P. (1954), fig 38 (Belgian Tardenoisian).
37. D Peyrony, *Eléments de préhistoire* (1948), fig 80 (Belgian Tardenoisian).
38. L Coulonges, op cit (Le Martinet).
39. R Lacam, A Niederlander, and H Vallois, *Arch Inst Pal Hum*, Mém. 21 (1944) (Cuzoul).
40. D Peyrony, *Eléments de Préhistoire* (1948), fig 76 (Perigord-Azilian).
41. D Peyrony, *Bul Soc Préh France* (1936) (Villepin).
42. D de Sonneville-Bordes, *Le Paléolithique Supérieur en Périgord*, (1960), fig 283, No. 2 (Cap Blanc), fig 284, no. 4 (Longueroche), nos 6, 7 (Gare de Couze).
43. Toulouse N.H. Museum collection (Duruthy).
44. *The Cambridge Ancient History*, op cit, fig 10, no. 37 (Azilian).
45. L Coulonges, *Une Civilisation préhistorique fantôme: l'Azilien*, Soc Étud Rech Préh, Les Eyzies (1961). Refers to 1936 re-appraisal excavation at Mas d'Azil by M and S-J Péquart (reported *Rev Lorraine Anthrop*, 1936–7, not located): in the 'Azilian' layer '*nous n'avons pas trouvé ni les triangles scalènes, ni les trapèzes . . .*' but '*Bien que Piette n'en ait pas fait mention et qu'il n'en ait figuré aucune . . . nous les avons recueillis nous-mêmes dans les déblais . . . nous sommes à nous demander à quel niveau exact gisaient ces piéces . . .*'
46. H Breuil, and G Zbyszewski, *Comm Serv Geol Port*, 28 (1947) (Tagus).

47a. V G Childe, *The Dawn of European Civilization*, London (1957), fig 4 (Tagus).

47b. J Roche, *Le Gisement mesolithique de Moita do Sebastião*, Lisbon (1960) (Tagus).

48. S Vilaseca, *Las Industrias del Silex Tarraconenses*, Madrid (1953), fig 24, no. 5 (Ciurana), fig 83, no. 4 (Patró).
49. S Vilaseca, *La Estación Taller de Silex de l'Areny*, C.S.I.C. (1961), fig 3, no. 3.
50. L Pericot, *Archivo de Preh. Levantina*, 2 (1945) (La Cocina).
51. Toulouse N H Museum collection. (El Garcel).

52. H Breuil, and G Zbyszewski, op cit.
53. J Roche, op cit.
54. J G D Clark, *PPS*, XXIV (1958).
55. C Cerdan Marquez, G and V Leisner, *Los sepulcros megalíticos de Huelva*, Madrid (1952).
56. Miss A S Henshall, in conversation.
57. A D Lacaille, *The Stone Age in Scotland*, O.U.P. (1954).
58. H Godwin, and E H Willis, *Amer J Science*, Radiocarbon Suppl. 4 (1962), 57–70.
59. T C Lethbridge, op cit.
60. M Campbell, *Discovery and Excavation, Scotland*, 1966.
61. A S Henshall, *PSAS*, 98 (1964–6), 317–18.
62. J Mercer, *Quaternaria*, XIII (1970). Slightly modified in the present and forthcoming *PSAS* reports.
63. G K Fraser, *Peat deposits of Scotland*, Pt. I, Geol Surv G B Scot, London (1943).



a Lussa Bay from W point, low tide

b Lussa Bay, Inverlussa village, from mouth of R. Lussa, low tide