John MERCER, Edinburgh

THE PALAEOLITHIC AND MESOLITHIC OCCUPATION OF THE ISLE OF JURA, ARGYLL, SCOTLAND

The occupation sequence about to be described has been built up from a dozen sites concentrated in N-Jura (Mercer, 1968–79). It is based on local land-sea relationships, site stratification, pollen analysis, drifted-pumice dating and radiocarbon assay. The paper[1] will begin with a discussion of the inter-linked shorelines and climate, then give an impression of the main sites and, finally, describe and compare the stone implement typology.

Late Glacial habitat

Jura is a vast island (fig. 1) some 80 km (50 m) long. It rises to about 780 m (2500 ft) in the south and 470 m (1500 ft) in the north.

Several recent papers have shown that W-Scotland was suitable for human habitation from 11,000 or 10,500 BC. Kirk and Godwin (1963) described an organic level at Loch Droma (Ross and Cromarty) which, with a C14 date of 12,810 ± 155 bc (Q–457), had not since been overlaid by ice, although in a through valley. Kirk commented: "In view of its location on the exposed, north-west Atlantic rim of Scotland one would except . . . an onset of milder oceanic conditions at an earlier date than localities in the English Lowlands or the North European Plain." He concluded his contribution: ". . . it would appear that in Northern Scotland the process of deglaciation was not unlike that established for Scandinavia, namely an early and rapid melt of the ice in western fjords and a longer survival in uplands east of the Atlantic watershed. The significance of such a possibility for plant, animal and human colonisation needs no stressing."

Coope (summarised in Pennington, 1974), working on beetle remains, noted that early in Zone I (12,380–10,000 BC) there was a rapid rise in temperature, from less than 10°C as a July average to almost 17°C, though winters may have remained cold.

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

Pennington (1974) brought together the evidence for juniper surges from 11,000/10,500 BC at Loch Droma, on Skye, in the Lake District and in N Wales: these imply the onset of warm conditions well before the opening of Zone II (10,000–8,800 BC). This warmth appears to continue into Zone II without a break.

Direct local evidence comes from a bore-hole sunk by the Institute of Geological Sciences (Binns *et al,* 1974) between Jura and Colonsay; four other cores were taken near Skerryvore, Iona and Eigg. At the point sampled (present fig. 1, lat. 56° 4.93' N, long. 6° 3.75' W) the water was 30 m (c 16 fathoms) depp upon sediment groupings totalling 43 m (c.140 ft) in thickness. At the base was 9 m (30 ft) of till. The other cores next held sandy muds "deposited in close association with ice" but these were lacking in the Colonsay sequence. Here, upon the till, lay 29 m (95 ft) of rather different sandy muds, broken down, on their micro-faunal (foraminifera) content, into three climatic zones: warm (considered Zone II), cold (III), and warm (post–III). A C14 age of 9961 ± 25 bp (SRR–117) was obtained for the top of this last sub-division, adjusted to eliminate derived material (Mesozoic) to 8680 bp. The paper considered the whole of the second grouping to have been deposited "at some distance from the ice front"; even during this Zone III deposition there may well have been "a continuously high level of suspended matter", suggesting melting and thus compartively-warmer conditions in the S Hebrides. On top of the second grouping came a thin deposit of modern sediments. These broad indicators are in line with the recent conclusions summarised above.

Clearly, then, Jura could have been occupied by man between 11,000/10,500 and 8,800 BC, at least in the summers and, perhaps with Eskimo-like adaption, possibly in the winters too. The Zone III comparative cold then intervened (8,800–8,300 BC) before the Post-Glacial amelioration.

All known Jura Mesolithic sites were made on their current shorelines. The world-wide low sea-level of the full Devensian (Weichselian) glaciation would have continued into Zone I – but the position of this sea-level on the N-Jura landmass, itself still greatly depressed by ice, has not been established. However, the abrupt onset of the warm conditions (just summarised) early in the eleventh millennium BC, followed by other local oscillations such as the Bølling, would have caused a small but rapid rise in world sea-level, bringing about a transgression of N-Jura. Though the melting of the island's own ice-load would have led to isostatic recovery, the latter is thought to lag behind a related rise in sea-level. Thus, the human occupation proposed for the warm period of 2,000 years would have been for most of the time on the beaches of a rising sea-level. Shoreline camps of the period will thus have been washed away and so only rolled stone tools will now be found, in the current versions of the Zone II beach deposits. N-Jura has yielded several artefacts distinctive enough to be attributable to Zone II and they will be described later.

Early Post-Glacial shorelines

It is generally accepted that in Zone IV (8300–7600 BC) world sea-level stood at least 37 m (120 ft) below that of the present. However, the S-Hebrides would then still have been isostatically depressed and so, here again, the exact land-sea relationship is not known. Land-recovery of only 20 m (65 ft) would allow passage between Jura and Islay and, probably, between Islay and Oronsay-Colonsay (fig. 1). The

recovery of 37 m (120 ft) would merge the S Hebrides into a single landmass (fig. 1). Evidence should be recoverable from the hypothetical loch on fig. 1 (hatched), by coring of the sea-bed sediments. Significantly, at the point where the Admiralty Chart's 37 m (20 fathom) depth-line reaches N-Jura (Corpach, fig. 1), there are massive relict dunes (unique on Jura) which could well be the stub of an E–W shoreline once joining N-Jura to N-Colonsay; further evidence on the origin of the dunes is being sought. In any event the main archaeological sites all lie upon the east shore of N-Jura, the nearest landing-place to the mainland. This suggests they were the camping grounds of migrating hunters. N-Jura would also have been the best access route to the rest of the S-Hebrides, with movement particularly easy during the Zone IV period of low sea-level (as it may similarly have been in Zone II).

Sea-level rose rapidly during Zones V (7600–7000 BC) and VI (7000–5500 BC). As will be described, N-Jura was certainly occupied again from at least about 7000 BC. During Zones VII (5500–3000 BC) and VIII (3000 BC to date) there has been an overall land recovery of about 12 m (40 ft). The sites of the secenth millennium are now at 16–18 m (53–59 ft) above present sea-level (Ordnance Datum, OD).

The final camps of the N-Jura Mesolithic were clearly made on the rising beaches. The lowest site located is now about 6 m (20 ft) above present sea-level and probably dates from around 3000 BC.

To the archaeologist, Jura's extensive bays present two striking features: the cobble-covered terraces at 35–30 m (120–100 ft) and 10–6 m (35–20 ft). The dates at which the vast terraces were cut in the underlying bedrock are unknown but the sea last covered the upper during the Late-Glacial period and the lower during the described Early Post-Glacial transgression, on this latter occasion on its way to its washing limit now around 15 m (50 ft). The lower and so-called "25-foot" terrace has mesmerised archaeologists working in Scotland, so that it has been established as "the Mesolithic Beach" in many past papers on the region. But it is in fact of little direct relevance, except in the zone of coincidence, that where a low isostatic depression allowed the platform (pre-Holocene in origin) to remain high enough to play the part of Early Post-Glacial washing limit. This is only to be expected in areas on the margins of the ice-cap; as has been shown, N-Jura does not fall into this category, only the final, regression-time sites occurring on the lower pre-Holocene terrace.

The N-Jura sites

This and the next section should be read with the aid of the summary of the industrial sequence in fig. 4.

The island's most favoured habitat is the Lussa Valley (pl. 1); it provides an easy landing place and camping ground, a salmon river and the main N-Jura pass through the interior to the west coast at Corpach. The present tidal gravels of Lussa Bay (Mercer 1970a) have yielded some 6000 derived and rolled flint artefacts, classed as Phases 1A and 1B in Jura's typology (fig. 4). Low down in the wood behind Lussa Bay are the two Phase 3 Lussa River sites (Mercer 1971). Higher up in the same

trees, the two Lussa Wood sites (Mercer 1974ab, 1979) on a broad flat terrace have yielded artefacts from every phase of Jura's sequence. These sites are on well-developed terraces (Mercer 1971, fig. 4) of great archaeological interest: comparatively extended horizontally, the valley's topography caused the occupations of the final land-recovery phase to move off the camping grounds of the middle phase, in order to keep close to the effectively-receding shore, and this has allowed the disentangling of the two phases.

Lussa Wood I (Mercer 1979) is in fact Jura's most valuable single site. It is now 600 m (650 yd) from the sea at a height of 16.5 m (53 ft) OD; the washing limit of the Early Post-Glacial transgression, marked by a narrow cross-going bog, runs across the terrace just behind the site. The oldest undisturbed occupation left three continuous-construction stone rings (pl. 2, fig. 5a), amongst the earliest stone structures in the British Isles; with C14 ages of 8194 ± 350 bp (SRR–160) and 7963 ± 200 bp (SRR–159), the rings and their large trapezes fall into Jura's Phase 1B. These are the earliest Scottish C 14 dates. The photograph shows the rings as they have been left, the remaining stones unmoved except for the back slab of the centre ring, temporarily replaced. The back of the centre ring was removed in a search for charcoal, the front of the right hand ring to allow excavation of a further 2 m (6 ft) depth of the gravels, these proving to be archaeologically barren. The rings were buried in a scoop in the marine gravels but an adjacent cobbled patch (pl. 2, fig. 5b) was on the top of the gravels; no artefacts or charcoal lay upon it and so its origin and purpose are still unknown. A wide range of small finds, including 3000 microliths, was recouped by water-sieving (standard practice at Jura sites since 1965).

The main Lussa River camp (Mercer 1971) – the Phase 3 type-site – lies half a minute's walk below Lussa Wood I. The camp had been made on a narrow sand-filled terrace at 10 m (33 ft) OD. The peculiar stone industry (fig. 4) was mixed with a kilo of wood charcoal, about a thousand burnt hazel-nut shells, some carbonised acorn husks and a range of other organic and inorganic remains. Radiocarbon assay gave 2670 ± 140 bc (BM–556) and 2250 ± 100 bc (BM–555), corrected ages 3450 BC, 2940 BC. These are the youngest dates in the sequence, though a small patch of artefacts, probably washed over by the sea or the river, was found even lower, at 6 m (20 ft) OD.

The Carn region, a couple of hours' walk up the coast, holds a valuable range of sites. The two S-Carn sites are now upon an extinct headland at 20 m (65 ft) OD; S-Carn I has yielded 3000 microliths of Phase 2 type. Carn Cave, its present floor at 10 m (33 ft) OD, is cut into the base of an ancient cliff immediately south of the headland. Excavation of the cave is hampered by the fall of the roof, over the entrance zone, at some time in the past. But the cave is the best of the few natural shelters on this much-frequented stretch of shore. Excavation has so far reached only the Middle Ages but the well-defined occupation horizons have produced much material, including two iron hunting arrowheads (Mercer 1968, p. 4). The Jura caves, all cut at the same height, were underwater until Phase 3 in the sequence (Carn Cave is the same height as the upper Lussa River site, just described). Organic material survives only very rarely at the open-air sites, due to the acidity of

the overlying peat. But the lowest level in Carn Cave should hold the bone and antler tools known to have been used in Phase 3 at least (since they occur in W Scotland's "Obanian" culture, hitherto considered the region's earliest occupation, with a dating of fourth millenium BC, but now to be absorbed into Phase 3 of the present sequence – this will be discussed later).

The area's main site, N-Carn (Mercer 1972), stands now at 14 m (46 ft) OD, in the northern shadow of the extinct headland. It can be used to illustrate the way the changing land-sea relationship has been employed in the construction of the industrial sequence. Fig. 2 shows the trench cut from the Main Area of occupation down the approach gully to the terrace below (the "25-ft beach"). Trench B lay squarely within the Main Area. It revealed an ideal local soil profile. Working upwards, bedrock was succeeded by panned cobbles with some alignment, perhaps glacial, then came the Old Land Surface – a blackish humus with few stones – followed by a good band of small rounded pebbles thrown up by the storm seas of the transgression, this covered by the present peat. The washing limit came somewhere on the clean rock-slope rising out of the top left corner of the diagram.

Halfway down the gully it was found that the hardplan had been undercut and tunnelled by the supposed calm or day-to-day sea-level, this point now at about 13 m (41 ft) OD. Just below, upon a small ledge, 60 cm (2 ft) of what might be called "rapid fill" had built up amongst a few pebbles, immediately following the dropping away of sea-level. The pollen of the twelve vertical samples, added together, showed the 60 cm (2 ft) of sediment had accumulated at the same time as the second sample upwards from the peat overlying the Main Area, this peat having also been sampled. This result supported the interpretation of the marine nature of the band of small rounded pebbles directly below the peat on the Main Area.

This in turn helped interpret the various artefacts in the Main Area. The enlargement in the bottom right corner of fig. 2 depicts a small stone setting, found sunken in the Main Area; it had been put in position at a time when the Old Surface was still the current surface, free of the marine pebbles. With its back to the prevailing wind and holding charcoal, it was clearly a small hearth. Its charcoal gave a C 14 date of 7414 ± 80 bp (SRR–161), implying a calendar age around 6000 BC. This gave a date for the associated Phase 2 flints in the top of the Old Land Surface. There was a larger quantity of flints mixed with the marine pebbles, showing continuing occupation through the maximum stand of the marine trangression. The C 14 date also gave a maximum antiquity for the reach of the transgression to the height of the Main Area, of geochronological interest.

Between the Lussa Valley and the Carn coastal zone there is one site, Lealt Bay (Mercer, 1968). Also Phase 2, it is very similar to N-Carn in eight, stratification and tools. However, at Lealt Bay there was pollen not only in the overlying peat but also in the Old Land Surface underlying the marine level. This lower pollen's all-time peaks for birch and hazel, but already with some alder, suggested the occupation began very early in Zone VIIa, soon after 5500 BC, that is (Mercer, 1968, fig. 8).

The last site to be described is Glenbatrick (Mercer, 1974c), the first to be excavated on the west coast of the island. The site (pl. 3) stands on an extinct cliff at 18 m

(59 ft) OD, cut in the deep unconsolidated filling of a vast valley. There were two separable floors, one rather earlier than the other typologically, but both within Phase 1B. The hunters had camped on the shore of a sunken lagoon or waterhole, now almost extinct; the tools were in a tenacious clayey-silt rich in kaolinite. On the broad terrace below there is a modern version of the lagoon (pl. 4); the silt beaches can be seen in the plate – they would have made good camping grounds, especially if the valley was otherwise floored with bare cobbles. The deer visited this modern waterhole on many evenings during the excavation of the site above.

The stone industry sequence

The tool typology is illustrated by fig. 3 and summarised in fig. 4. In addition, most sites in the 20–14 m (65–46 ft) height zone have a scattering of Neolithic artefacts mixed with the upper Mesolithic industry; below this height, Early Metal Age tools and two camps have been found (Mercer, 1972, 1974b).

Taking the main tool types one by one, the clearest evolution is shown by the trapezoids. Fig. 3 illustrates four of these from Lussa Wood I. The large tanged point, No. 1, is perhaps Jura's most interesting single tool; classed as Phase 1A, it is rolled all over, including on the break facet, and was in the marine gravels which filled one of the stone rings. Next to it, No. 2, comes one of several unrolled trapezes from within the rings; these are the type-tools of Phase 1B, their trimming only on the two oblique edges. No. 3, very rare, comes from the 30 cm (1 ft) of gravels covering the rings: it can be seen as a transitional type since, though still as large as the previous specimen, its shorter vertical side, or back, is also trimmed. Finally, also from the upper gravels, there is a small trapeze, No. 4, trimmed right around, including down its back: it typifies Phase 2. Poorly-made examples of this last form occur on Phase 3 sites.

Another Phase 1A tanged point, No. 5, is smaller and stouter than No. 1; it comes from the derived Lussa Bay collection, in the present marine gravels. These gravels have yielded one further possible tanged point. These three tools at present make up Phase 1A – the derived collection will doubtless contain other 1A artefacts but these cannot be distinguished from those of Phase 1B. Thus the rest of the Lussa Bay collection is at present placed in 1B; it is characterised by large trapeze-triangle microliths (Mercer 1970a, fig. 6), such as the present No. 2 from higher up the valley.

Phase 1B occurs not only at the two Lussa Valley sites but also at Glenbatrick, a site with the same trapezoids (Mercer 1974c, fig. 10). The earlier floor also held the present No. 6, the largest example found in N-Jura of a type ("6A") numerically dominant amongst the microliths of Phases 2 and 3.

Moving now to Phase 2, its range of small varied trapezoids (Nos. 7–14) has been found in large quantities at N-Carn (Nos. 7, 10, 13, 14), S-Carn I (No. 9), Lealt Bay (Nos. 8, 11, 12) and Lussa Wood I (No. 4), to illustrate only the main sites.

In Phase 3, however, the diagnostic microlith is an extreme form of rod. It should be underlined that there *are* many long narrow microliths in earlier phases but not

ones which are trimmed right down each edge, are square in section and (an arbitrary definition, of course) over four times as long as they are broad. No.15, of quartz crystal, is a fine specimen from the lower Lussa River site. The best selection of rods comes from the upper Lussa River site (Mercer, 1971, fig.8), for example the present No.16. The rods also occurred in the top of the Lussa Wood I gravels (No.17), together with the Neolithic tools.

Turning from the microliths to the heavier flint artefacts, here too there are diagnostic types, though less clearly defined in evolution. Each Phase 1B occupation has produced a set of asymmetrical cores, eg No.18 (Lussa Bay); these seem less distinctively represented in Phase 2 and have probably disappeared by Phase 3. The same trend is shown by the end-scrapers (No.19 is from Lussa Bay), their quality deteriorating through the phases.

Conversely, there is a tool, the *éclat écaillé,* which is rare in Phase 1B, common in Phase 2 and the dominant form in Phase 3 (where it even outnumbers the microlith). The present No.20 is from the upper Lussa River site. This splitting tool, showing bipolar shaping/use, is probably under-reported from Mesolithic sites; the attention it deserves came first from Bardon and Bouyssonie (1906).

Last on the typological list are the quartzite tools. Phase 3 has a peculiar hammer-anvil stone: both No.21 and the specimen at the bottom of fig. 4 are from the main Lussa River site. The distinctive feature is the battering of two notches, one just above and one just below the centre of each long edge. The type also occurs in the top of the Lussa Wood I gravels (with the rods, a number of *éclats écaillés* and the Neolithic artefacts).

Thus, the Phase 3 diagnostic tools are the microlithic rods, the double-notched quartzite hammer-anvil stone and the peak of the *éclat écaillé* (the last two tools are likely to be closely connected in manufacture and/or use). Phase 3 is also notable for its use of far more milky quartz (common on Jura) than flint (entirely imported). In Phase 1B very little milky quartz was used, in Phase 2 it was sometimes made into tools, but less so than was flint – but in Phase 3 there can be twenty times as much (weight) milky quartz against flint. This opaque white quartz, often poor in quality, was used for scrapers and *éclats écaillés.* An excavation in progress at the time of writing (August 1979) has confirmed the above definition of Phase 3 typology; the site, Glengarrisdale, lies on Jura's west coast, to the north-west of the Carn sites (fig. 1).

There were also non-diagnostic quartz and quartzite chopping tools in use in Phases 2 and 3. There is an absence of Mesolithic axes on Jura, with only a few Lussa River quartz tools (Mercer 1971, fig.12) sharpened by a cross-going or *tranchet* blow. Two good examples of the *petit tranchet* have been found, at Lealt Bay (Mercer, 1968, fig.13, No.255) and at S Carn I.

Affinities in W-Scotland

Until the construction of the Jura sequence, it was thought that the first occupation

of the region was evidenced by a few scattered and varied collections made over half a century ago. These were grouped as the "Obanian" and placed in the fourth millennium BC. The main sites were shell middens on Oronsay (fig.1) and caves at Oban some 35 km (22 m) to the north of Jura. The best-known tools have been the attractive though, in a W-European context, undistinctive types of bone and antler barbed points. There is yet no comparable Jura material since, as noted, uncarbonised organic matter does not survive under the acid peat which covers the outdoor sites. So far only the excavation of the King's Cave (Mercer 1978, fig.5, No.18), opposite the Glenbatrick Mesolithic site, has produced an early bone tool: this was a large point, just possibly once barbed, found some way from a few undiagnostic flints on cave's basal shell sand. There is hope, then, that Carn Cave holds late Mesolithic organic tools.

The Oronsay middens have yielded quantities of *éclats ecaillés,* the only distinctive feature of the flint assemblages (Bishop, 1914, fig.33; also from earlier excavations, Lacaille, 1954, fig.89). Equally important, there was at least one double-notched hammer-anvil stone (Bishop, 1914, fig.32, No.1) of Jura's Phase 3 type.

Against these similarities must be placed an absence of microliths in the Oronsay middens, due perhaps to a concentration on say seal-hunting (with bone and antler points) rather than on deer-stalking (with microliths). At present Oronsay is one of Britain's few seal-breeding grounds whilst Jura is a fashionable deer-stalking moor.

The islet of Risga, on Loch Sunart, some 50 km (35 m) north of Jura, was also included in the "Obanian", by its barbed points. The Barr River excavation (Mercer 1973) a landing place from Risga, yielded a small microlithic industry nearest to Jura's Phase 3 in type.

A number of radiocarbon assays have been carried out on Oronsay's "Obanian" material. The datings, after correction, all fall within the second half of the fifth millennium or in the fourth millennium BC.

In summary, the similar dating of Jura's Phase 3 and of the Oronsay middens, together with the geographical dependence of the smaller island and the typological overlap – and it is worth pointing out that there are no *dissimilar* forms of the *same* tool in the two islands – combine to suggest that the "Obanian" should now be blended into the end of the long period of the W Scottish Mesolithic evidenced by the Jura sequence.

European affinities

Jura's tanged points (Phase 1A) have been placed in the warm period between 11,000/10,500 and 8,800 BC. This is the time of the later tanged point industries of NW-Europe, probably including the occupation of Hengistbury Head on the south coast of Britain (Mace 1959). It is recalled that the Hebridean shorelines would then have been in different positions to those of the present and that the camps upon them would have been washed away: the three tanged points were all found in a rolled state in marine gravels.

Phase 1B appears to fall within the axe-less trapeze-triangle complex of the W-European coastline (fig.6). The origins of these key microliths should lie morphologically in the immediately-preceding European shouldered point industries, as represented for example at Le Martinet, France (fig.7, top). As at present proposed, Jura's Phases 1A and 1B are separated by a long interval; the doubt over their relationship is parallelled by that over the connection, in NW-Europe, between the tanged and shouldered point industries.

Jura's Phase 1B had probably begun by 7000 BC – but south of the ice cap (including of course the whole coast of W Europe) all pre-Zone-VII beach sites are believed to have been drowned. The great isostatic recovery of N-Jura, near the Grampian ice-centre, has preserved a wider range of sites than can be expected in the southerly unglaciated regions. The high caves of Caldey Island, off S-Wales, are an exception and, in fact, do hold an industry (Lacaille and Grimes, 1955) comparable to that of Jura's Phase 1B. Otherwise, the east side of S-Britain holds similar microlithic industries – but these Scandinavian-affinity sites had axes as a major element in their culture, a feature absent in W Scotland.

The well-known Mesolithic sites of the W-European coastline have the strongest similarities with Jura's Phase 1B. The contiguous stone rings of Lussa Wood I are otherwise unknown in Britain. On the Island of Téviec, off the Morbihan coast of NW-France, an excavation (Péquart, 1937) produced many sunken stone rings (present fig.5c). They were described as especially well made and positioned on their own away from the numerous graves: "First a hole of perfectly regular diameter was dug in the soil. Then, using material undoubtedly specially chosen . . . good stones, usually rectangular, 60–80 cm long and 20–30 cm wide . . . were placed on end, perfectly fitting, to form a regular circular facing." That illustrated now was 50 cm (20 in) deep. It held kitchen refuse (marked "3" in the figure) including burnt bone, charcoal (oak and wild pear) and also a wild pear fruit itself (Lussa River yielded a possible pear pip: Mercer, 1971, p.29). Halfway up there were flat burnt stones ("4") lying on the burnt debris (occasional flat stones, lying horizontally, were noted within the Lussa Wood I rings). The lowest deposits were "cinders" ("1") and "charcoal earth" ("2"). "These hearths served without doubt for the cooking of venison" (Péquart, 1954). Two of the Téviec rings were contiguous (shown on the site plan). There were also even cobbed patches (the present fig.5d) fairly similar to that at Lussa Wood I (fig.5b); the French patches were near graves and their excavator thus considered them to be ritual hearths. No construction resembling the graves (the bodies laid out with antlers, red ochre etc.) has so far been found at Lussa Wood I. Téviec's stone tools were similar to those of Jura's Phase 1B except that the trapezes included some squat types (present fig.7 and Mercer, 1970a, Table 3). Taken overall, greater similatity between such distant sites could hardly be imagined.

The Muge sites, on the Tagus River in Portugal (fig.6) held many grave and hearth pits; sunk in the gravel and sand, these were not lined, but then there was an absence of large stones in the area of the sites. At Moita do Sebastião (Roche, 1960), for example, the cooking hearths were recorded as averaging 75 cm (2 ft 6 in) diameter

and 40–65 cm (1 ft 4in – 2 ft 2in) depth; most were regular ellipses in shape, as one would expect of unlined scoops. A trapezoidal sunken area, 11 m 60 cm by 3 m 20 cm (38 ft by 10 ft), with post holes, sounds comparable to that at Low Clone, Wigtownshire, SW Scotland (Cormack and Coles, 1968). The Muge burials bore traces of red ochre. The Portuguese tools were also in turn comparable to those of Jura's Phase 1B, other than for some squat specimens (present fig. 7).

Both the Morbihan and Tagus sites belong to the sixth millennium BC and are thus later than Jura's Phase 1B. The comparable site on Caldey Island appears, however, to be about the same age as Jura's Phase 1B. Continental sites may well have existed in the seventh millennium BC but have been washed away by the rising sea-level. Navigation between Brittany and SW-Britain would have been at its easiest during the time of low sea-level, since there was then the land-bride closing the Channel to the east. Doubtless the association with W-Europe was established before 6500 BC.

It is still not known when exactly Jura's Phase 1B industry was replaced by the Phase 2 tools but the island's varied evidence has suggested that this had occurred by 6000 BC (Mercer, 1972, p.18). Jacobi (1976) has summarised the data for the arrival time of Britain's "micro-triangle" industry (eg Jura's Phase 2, typified by small trapezoids): it had crossed just before the land-bridges were broken (about 6400 bc), being dated by recent C14 assays to the first quarter of the seventh millennium in N-Ireland (but with axes) and in NE-England and to the second half in the Pennines. In the latter highlands, as the "Narrow-blade" industry, it replaced the "Broad-blade" industry, the latter now known to have been current in the eighth millennium. The two industries and their interaction are paralleled by those of Phases 1B and 2 on Jura, though on the comparatively-remote island the exchange of industries appears to have taken place rather later, as one can expect.

However, in N-Ireland the "micro-triangle" industry is the earliest unambiguous evidence for human occupation so far found (advance note on Mount Sandel, Woodman, 1974); its C 14 dates are 8725 ± 115 bp (UB–912) and 8555 ± 70 bp (UB–913). These dates, for an industry which is presumably comparable to Phase 2 on Jura, are earlier than those of Phase 1 B at Lussa Wood I (8194 ± 350 bp, 7963 ± 200 bp). Once Mount Sandel's tools have been published it can be considered whether Jura's Phase 2 could have come from N-Ireland – though the Irish site is said to have axes and, as noted, none have been found on Jura (hunters only?). It is only 55 km (35 m) from Mount Sandel to Islay – many cultural influence have certainly passed across this stretch of sea since this period. At any rate the Mount Sandel microliths utterly disappear from Ireland (Woodman 1977) around the time they appear on Jura, to be replaced by an industry ("Larnian" of Movius, "Late Mesolithic" of Woodman) without parallel on Jura at any time.

Since in NE-England and the Pennines the "micro-triangle" ("Narrow-blade") industry is not accompanied by axes, these areas appear more likely than does N-Ireland to be the source of Jura's Phase 2 (on strictly typological grounds). In these regions the intrusive industry (intruding on the "Broad-blade", the equivalent of Jura's Phase 1B), continues for several millennia, as does the equivalent Phase 2 on Jura.

In summary, Jura's Phase 1B appears likely to have had contemporary W-European coast associations whilst Phase 2 may have arrived by way of south-east and central Britain. The origins and affinities of Phase 3, typified by the peculiar microlithic rod, the double-notched hammer-anvil stone and the *éclat écaillé,* await further evidence: at the end of the S-Britain Mesolithic the microliths do become proportionately narrower (without notable assemblages of the Jura type) but it may well be that Jura's Phase 3 was a W-Scottish development.

The arrival date on Jura of the Neolithic is unknown, since unequivocably Neolithic charcoal is not found on the Mesolithic sites; the excavation of a Neolithic dwelling in S Jura is now almost completed and should provide C 14 dates (advance information from the excavators, on the staff of the Royal Commission on Ancient Monuments, Scotland). A period of Neolithic activity and perhaps of interaction with the Mesolithic people is shown by various sites' leaf-shaped and transverse arrowheads and by the chips off a polished axe of Antrim porcellanite (Mercer, 1974b). The island Mesolithic is likely to have ended about 3000 BC, about a millennium after the arrival of the Neolithic in Scotland and N-Ireland.

Mesolithic life on Jura

Only a few notes can be offered on early life on Jura, since so much has been lost with the disintegration of the organic relics. The many pollen analyses have shown that, late in Zone VI (7000–5500 BC) Jura was well wooded with birch and hazel, with some pine and a little oak and elm; the charcoal used at Lussa Wood I to give the C 14 dates in the seventh millennium BC was associated with other charcoal which was identified as hawthorn an maple (the latter is otherwise not known from Britain before the Neolithic). The charcoal at Glenbatrick (Phase 1B) was all oak (*Quercus robur*). From the opening of Zone VIIA (5500–3000 BC) the hazel was replaced by the alder, with birch and alder dominant to the end of this phase; there was more oak and elm than pine. At the upper Lussa River site, the charcoal associated with that which gave the C14 dates of around 3000 BC was identified as oak, elm, ash, hazel, a sallow, blackthorn and probably birch.

The seeds recovered give evidence both on the vegetation and on food habits. Most sites have yielded hazel-nut shells. The upper Lussa River site produced acorn husks, the seeds of a bramble, the common chickweed and the barren strawberry (now absent from Jura) and just possibly a wild pear pip. There is no wild pear in Scotland now but a species does just survive near Plymouth – and at least the warmer Zone VII A could have seen it in the Hebrides, as is certainly did at Téviec (Morbihan).

All known camps are on the coast. There is no evidence for fishing. The meat supply probably depended not only upon deer but also on boar, recorded for Jura in the Middle Ages. The other large mammals of Scotland and Ireland, now extinct, may also have reached the S Hebrides. The excavations yielded a few fragments of limpet and oyster shell.

The Mesolithic occupation left many pieces of red ochre, probably imported from one of the adjacent volcanic regions. The flint too was from outside: the main sources would have been Antrim, E Scotland and S Mull (Mercer, 1968, p.45). The quartz crystal and milky quartz were both local and the accelerating use of the latter may be an index of increasing settlement on Jura. Various pitchstones were also knapped, primarily a dark green type resembling that of Arran. The local quartzite was shaped into heavy tools. One other possession the first islanders must have had, though there are no traces left, was the boat.

A systematic approach to the W-Scottish Mesolithic

Although remote and usually including rain and ferocious insects amongst the working hazards, the region is in fact archaeologically favoured. As do other glaciated and indented coasts – usually already well-exploited by archaeologists – the area offers the changing land-sea relationships as a working aid. The overlying peat holds pollen. These factors help to overcome a customary disadvantage of British Mesolithic sites, that they usually contain only a single occupation level. However, it is a disadvantage that organic finds are usually made only in the middens and the caves, though the latter are numerous in W Scotland and were probably all occupiable during the late Mesolithic. The region's very remoteness means freedom from disturbance both in the past and during the excavation.

Perhaps the best approach would be to form a publicly-supported group with a base in the Hebrides. It could work first on the three largest of the Inner Hebrides: Islay, Mull and Skye. A three-fold preparatory campaign would be needed in each:

1) The land-sea relationships would be established and dated
2) The vegetation sequence, land clearance and associated habitat evolution would be worked out and dated
3) A series of sites potentially capable of being placed in a sequence would be located on each island.

Each aspect means a good deal of work, not least the shoreline evolution. The inconspicuous washing limit of the last high sea can usually only be found by cutting a trench right up the hillside. Coastal features in this region have been mapped by geographers or used by archaeologists without the backing of a thorough investigation of the sequence of deposits. Also, very accurate height measurement is essential, geared to Ordnance Datum (not always easy to contrive in remote islands).

The second phase of the work – begun once the background had been understood – would be to excavate the sites and, one hopes, fit all the different elements together to produce a broad picture of Mesolithic life in the Inner Hebrides. Remote islands may well have the advantage of giving clear-cut results, the outcome of their geographical restrictiveness on movement.

From the inner islands one would transfer both to the seemingly less-occupied outer islands and to the adjacent mainland coast. It would be important to understand each small area thoroughly first and then to move only a small distance away,

so as to avoid losing contact with identified industries, shorelines and soil profiles, easy to do in an area of steeply-tilted isostasy. Approached systematically, the Inner Hebrides have unique possibilities for the study of the Mesolithic in Britain.

NOTE

1 This paper is an updated version of that given at the Mesolithic Conference of the Prehistoric Society (London) in April 1976. The conference papers were later published but the editor (P Mellars) omitted the present work, without notification, because the author refused to accept his autocratic demands for extensive additions to the text. The author regrets the resulting long delay in publication of this summary (drawing on six detailed site-reports) of a decade of work on N-Jura.

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1974b The Neolithic level at Lussa Wood I, N Jura, Argyll. Glasgow Archaeological Journal, 3: 77.
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Plate 1: Mouth of Lussa Valley, low tide.

Plate 2: Three stone rings and cobbled patch, Lussa Wood I.

Plate 3: Site lagoon (18 m OD), Glenbatrick.

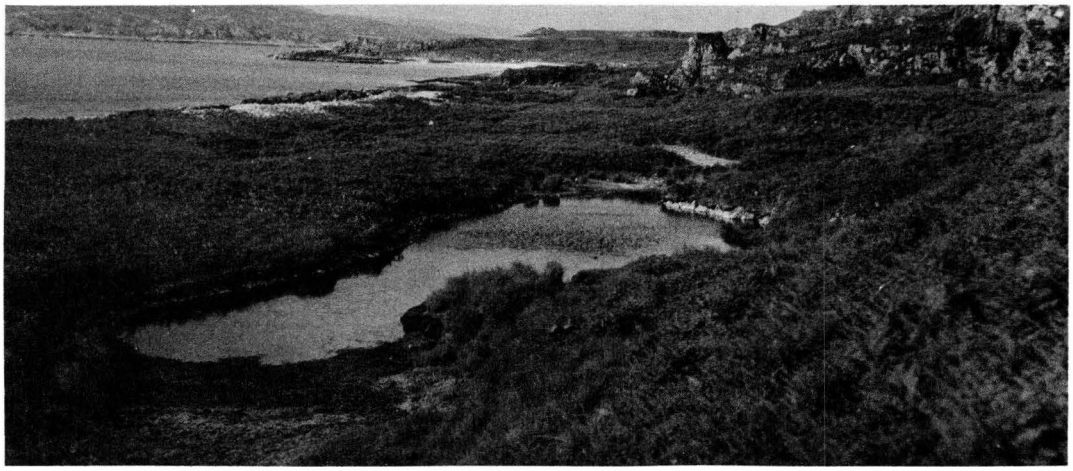


Plate 4: Modern lagoon (10 m OD) below site, Glenbatrick.

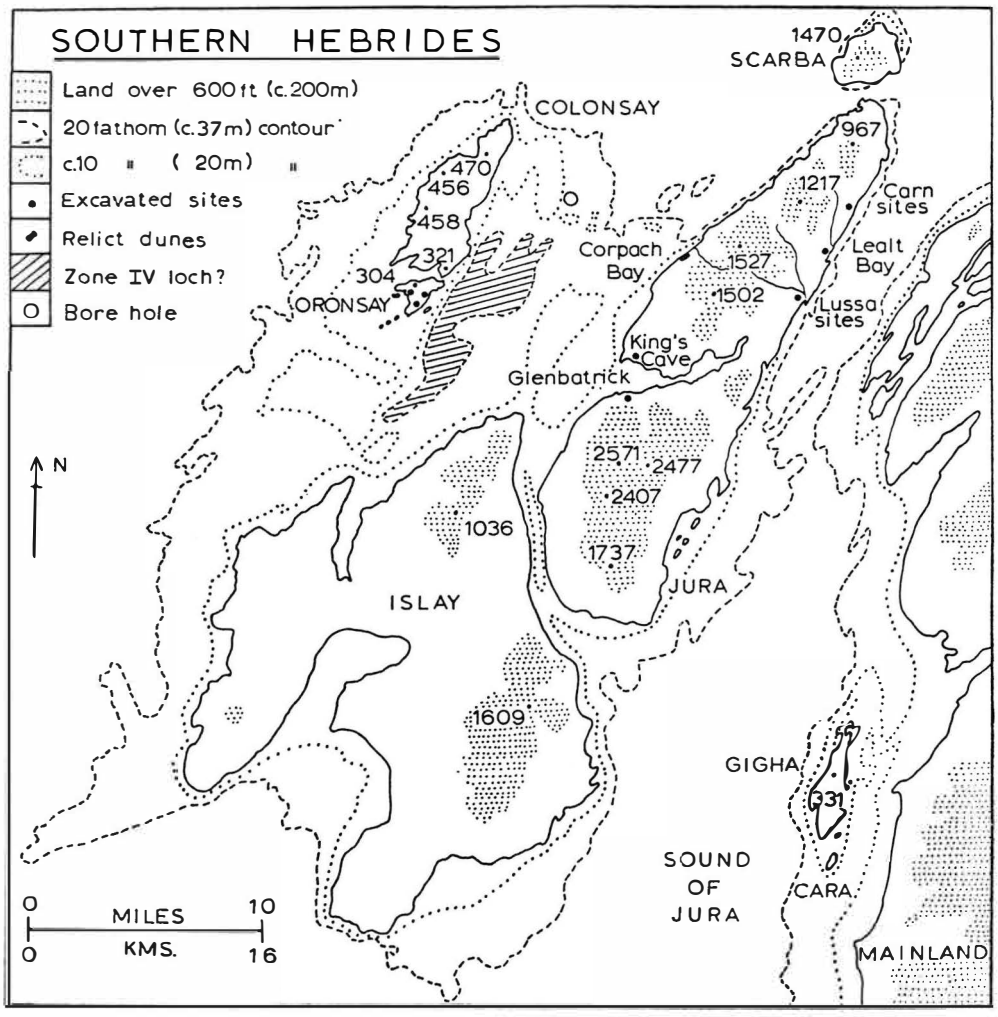


Fig.1: Map of Southern Hebrides.

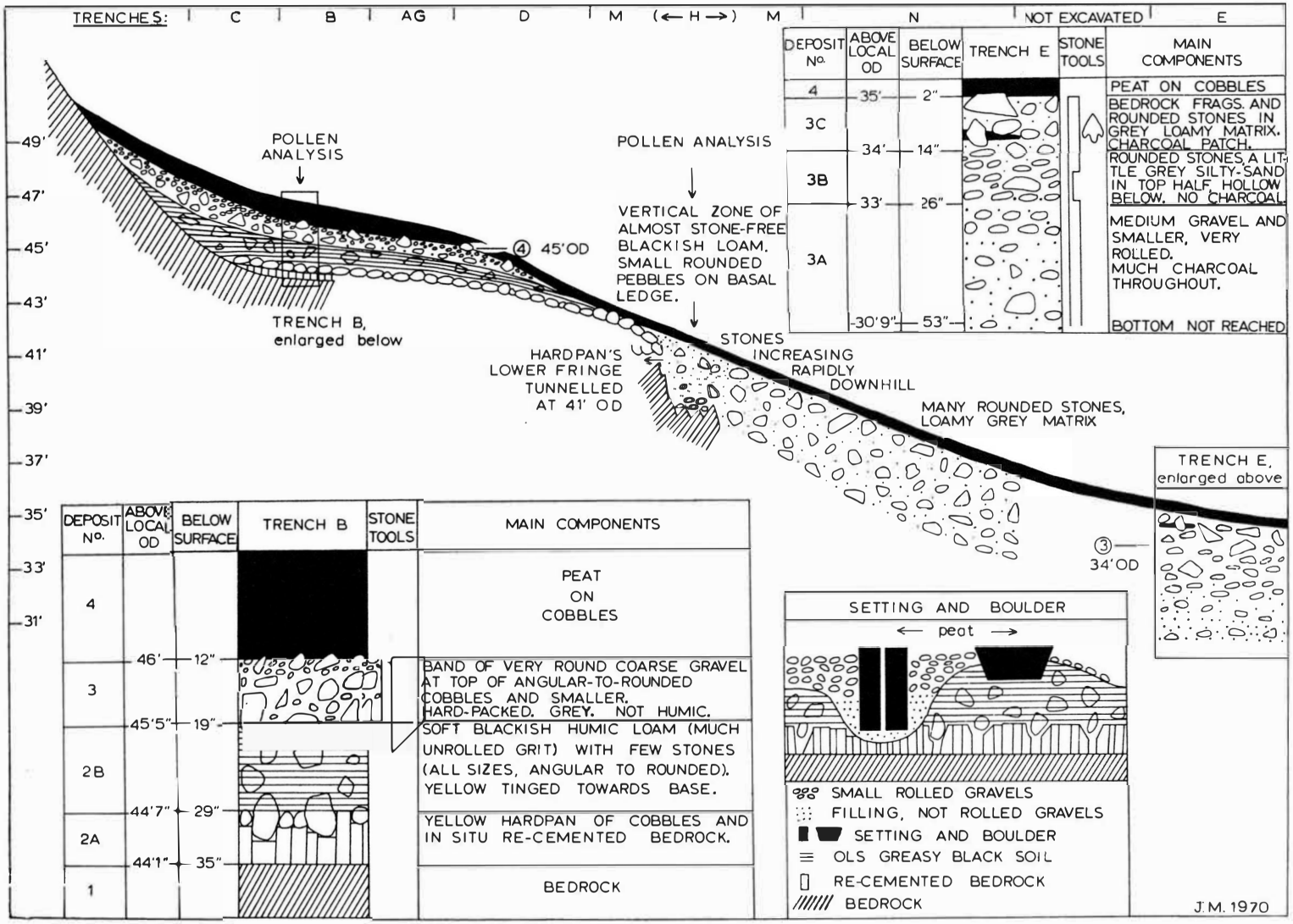


Fig. 2: Section, North Carn.

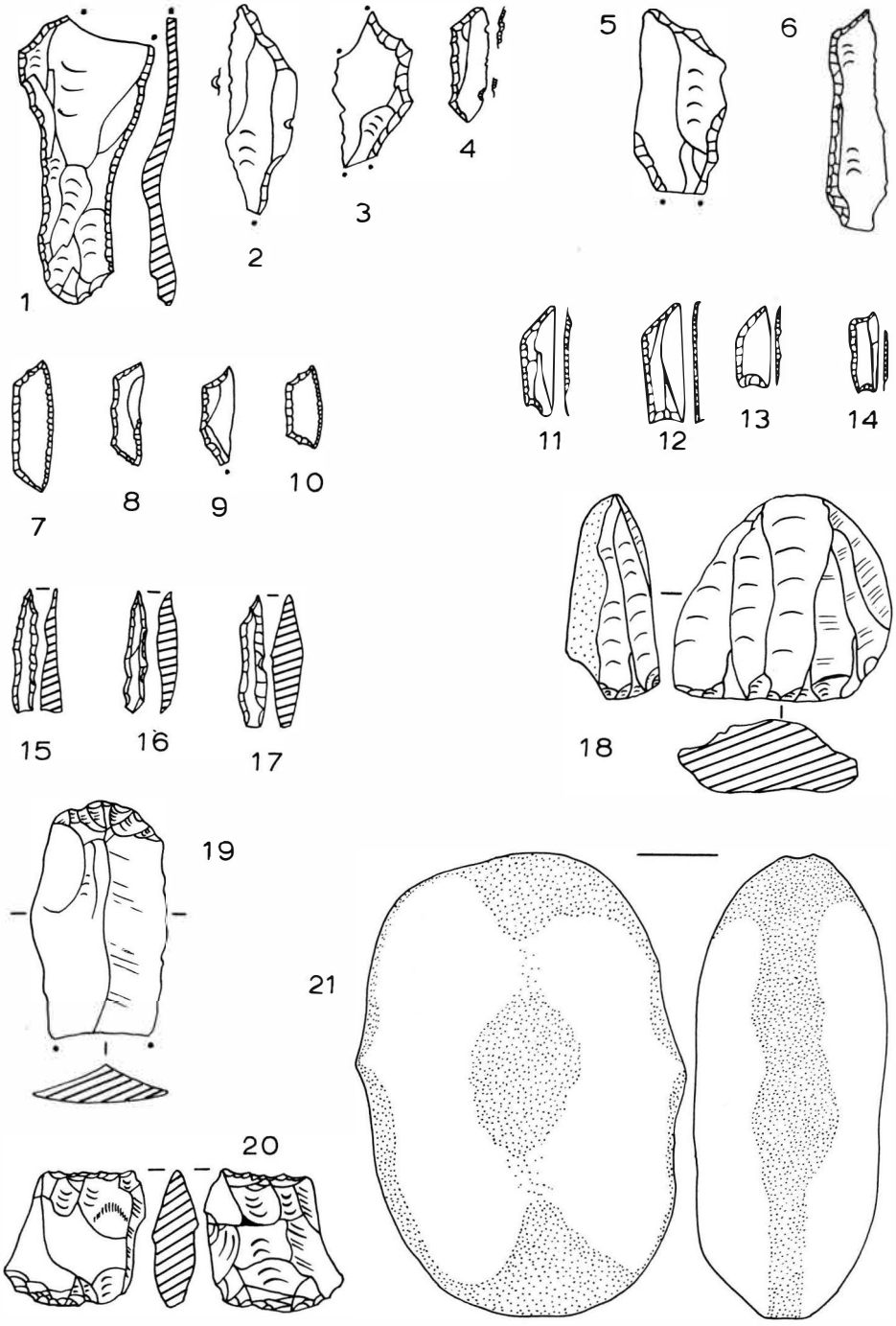


Fig. 3: Diagnostic artefacts, North Jura (life size).

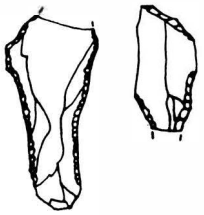
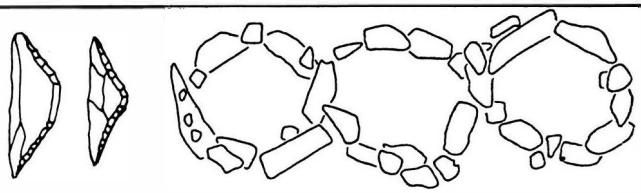
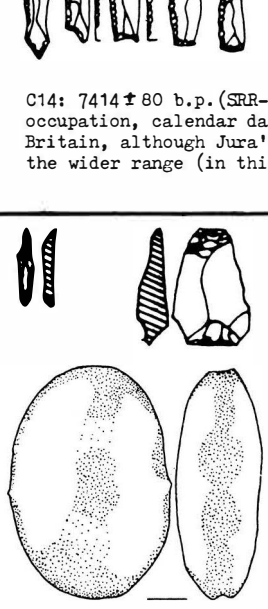
TOOL PHASE	DATE BC	SITES	SITE HEIGHT OD	DIAGNOSTIC TOOLS ($\frac{1}{1}$) WITH NOTES
1A	11000/ 10500- 8800	LUSSA WOOD I LUSSA BAY	53 ft (16.5m) PRESENT TIDE LINE	LWI LB  **Tanged points, derived and rolled;** LWI tool rolled by 6750 BC. Affinities: Hengistbury Head, Le Martinet, Bromme, Ahrensburg. Hebrides inhabitable 11000/10500- 8800BC according Kirk & Godwin (1963), Coope (various), Birks (1973), Pennington (1974).
-	8800- 8300	-	-	Pollen Zone III - cold and probably uninhabited
1B	BY 6750	LUSSA WOOD I LUSSA BAY (DERIVED) GLEN- BATRICK	53 ft (16.5m) PRESENT TIDE LINE 59 ft (18m)	 C14: 8194 ± 350 b.p.(SRR-160), 7963 ± 200 b.p.(SRR-159) for the stone rings with these trapezes and triangles, calendar date perhaps 6750-6500 BC. Affinities: Caldey Island (Wales) and W European coastal sites, with the rings at Téviec (Morbihan coast), separate sheet. N.B. No axes in any Jura phase.
2	BY 6000	SOUTH CARN LUSSA WOOD I LEALT BAY NORTH CARN	65 ft (20m) 53 ft (16.5m) 47 ft (14.5m) 46 ft (14m)	 C14: 7414 ± 80 b.p.(SRR-161) for opening of the North Carn occupation, calendar date perhaps 6000 BC. Affinities: South Britain, although Jura's 7000 Phase 2 microliths have perhaps the wider range (in this minute type).
3	UNTIL 3000	LUSSA WOOD I LEALT BAY LUSSA RIVER LUSSA RIVER BANK	53 ft (16.5m) 47 ft (14.5m) 33 ft (10m) 20 ft (6m)	 C14: 4620 ± 140 b.p.(BM-556) 4200 ± 100 b.p.(BM-555) corrected ages: 3450 BC, 2940 BC. Affinities: microlithic rods (length-breadth ratio over 4:1, square section) with late South Britain sites éclats écaillés and double-notched hammer-stones with Isle of Oronsay ('Obanian').

Fig. 4: Summary of occupation sequence, North Jura.

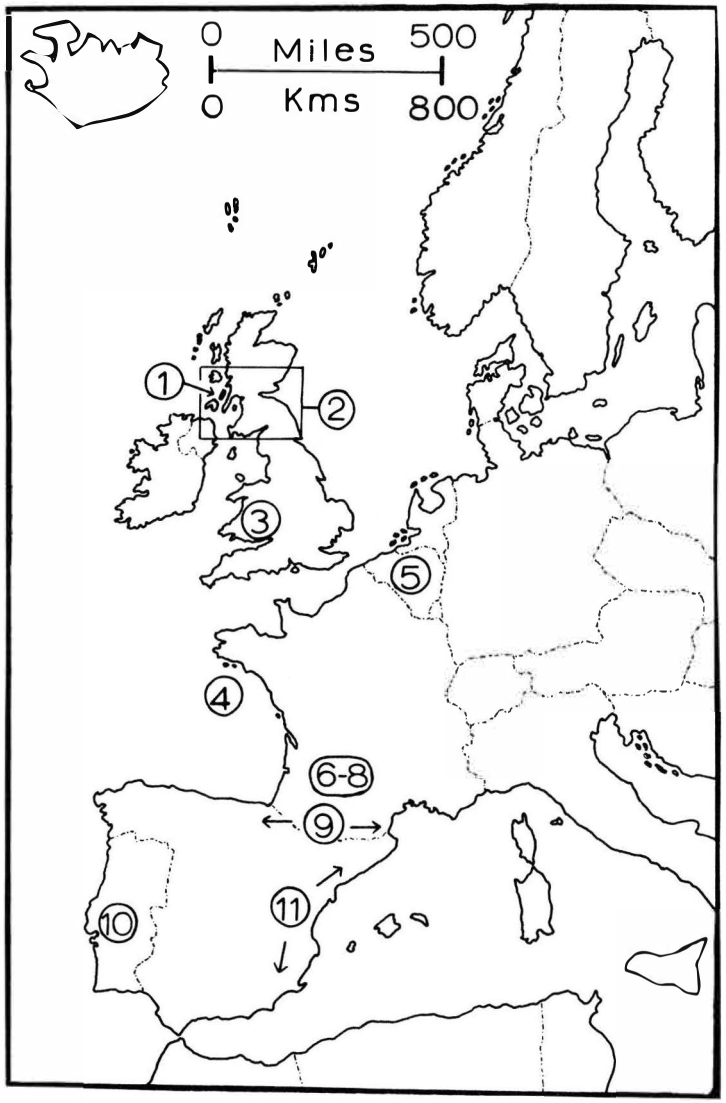


Fig. 6: West European coastal sites referred to in Fig. 7.

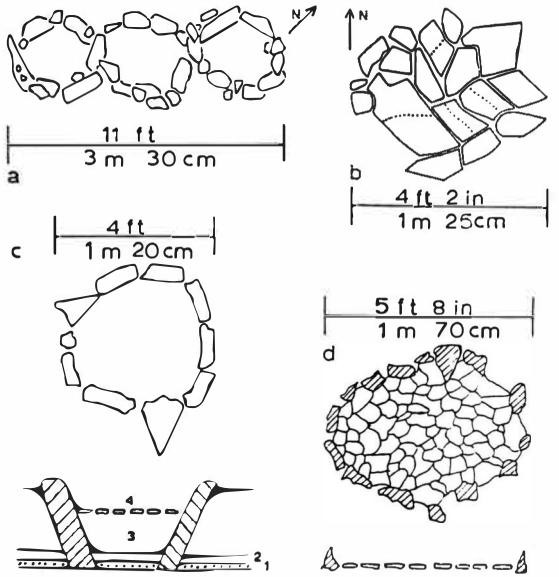


Fig. 5: Structures at Lussa Wood I (ab) and Téviec, Morbihan, France (cd).

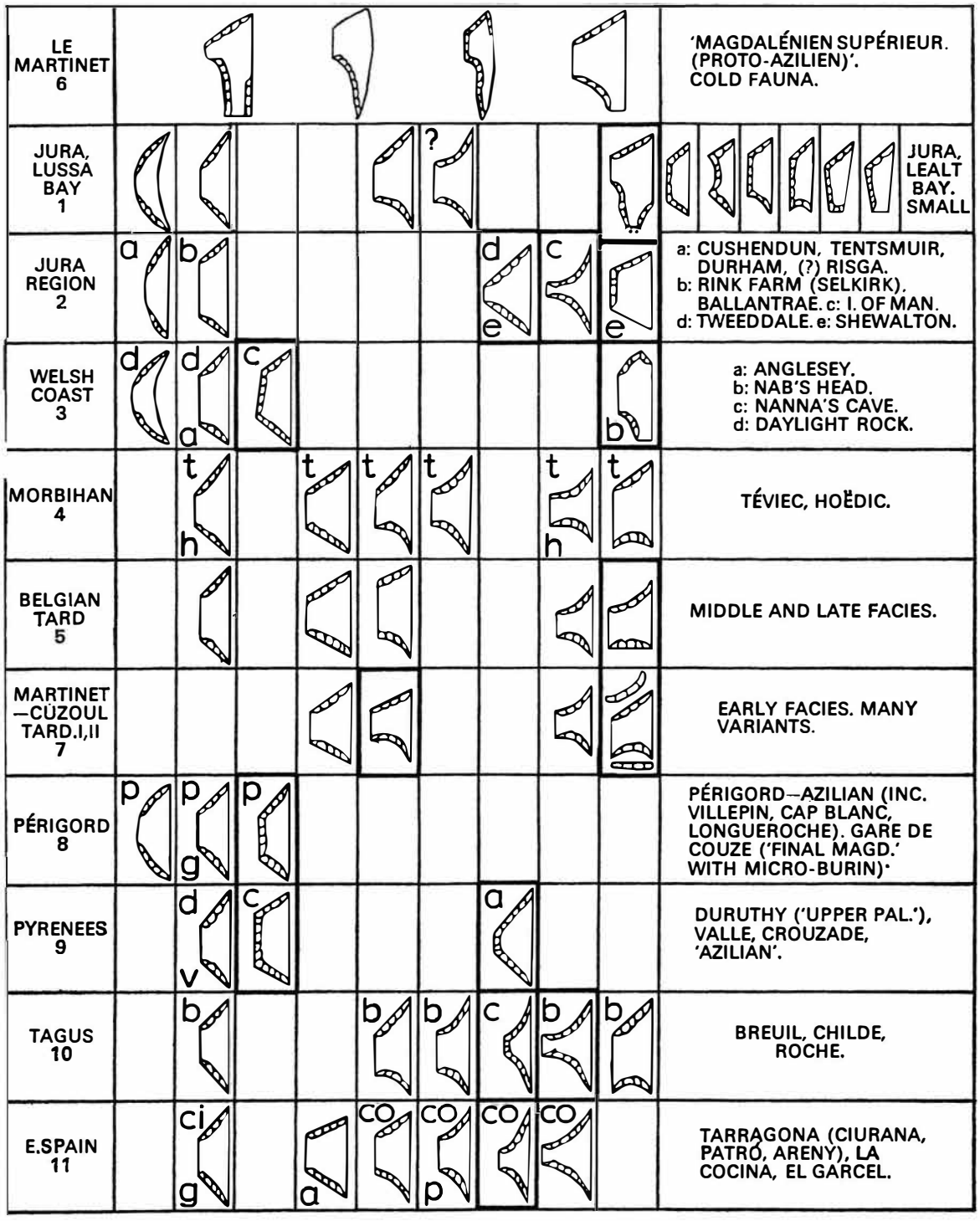


Fig. 7: Some proto-trapezes and trapezes of the West European coast.