Excavations at Bay Farm 1, Carnlough, Co. Antrim, and the Study of the 'Larnian' Technology

P. C. Woodman, G. Johnson


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EXCAVATIONS AT BAY FARM 1, CARNLOUGH, CO. ANTRIM, AND THE
STUDY OF THE 'LARNIAN' TECHNOLOGY


Department of Archaeology, University College, Cork

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ABSTRACT

The paper describes excavations carried out at Bay Farm, Carnlough, Co. Antrim, between 1977 and 1980, which revealed that a series of hill-washes had covered a number of Later Mesolithic chipping floors located some distance behind the shoreline which existed at that time. A limited number of retouched tools were recovered, many in an upper stratum above the chipping floors and dumps of debris. The material recovered suggested that knapping activities had concentrated on the production of blades. A refitting programme carried out by G. Johnson showed that the so-called 'Larnian' uniplane core was often a final product in the reduction sequence of a nodule of flint. The reason for their abundance was that they represented a point at which it was difficult to remove the preferred blade form and so the core was abandoned in favour of a new nodule.

Introduction

The excavations at Bay Farm 1, Carnlough, Co. Antrim, were to elucidate a number of problems of the Later Mesolithic period. Excavations at Newferry, Co. Antrim (Woodman 1977), combined with an examination of large quantities of collected material from areas such as the Bann Valley (Woodman 1978a), had shown that there was, in the later part of the Irish Mesolithic, an extensive non-microlithic industrial tradition characterised by the presence of artefacts such as the butt-trimmed forms, some of which are often known as 'Bann Flakes'. While it was apparent that this industrial tradition had an antiquity of up to 2000 years, several important questions remained unanswered. Of these, the most important were the following.

(1) How much of the heavily rolled material from the Antrim coastal sites, such as Curran Point (Movius 1953), belonged within this Later Mesolithic technology?

(2) How much did these assemblages resemble those found further south at sites such as Sutton, Co. Dublin (Mitchell 1956)?

(3) Could a full range of settlement activity be expected on the Antrim coast which had for so long been characterised as a virtual heartland of the Irish Mesolithic?

(4) Although of lesser direct relevance to the Irish Mesolithic in itself, why was there such a dichotomy between the Mesolithic of the Antrim coast and that of the adjacent Scottish coastline?

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(5) The relationship between the Mesolithic of the Antrim coast and the Neolithic had been a subject of controversy (Case 1973; Woodman 1976).

The Mesolithic of the Antrim coast had been bedevilled by the occurrence of mid-Holocene raised shorelines (Carter 1982) which contained exceptionally large quantities of rolled flint artefacts. For a long time, from the disputes on the antiquity of man in Ireland, during which the gravel of the railway cutting at Larne was combed for evidence (Knowles 1883; Gray 1884), through Coffey and Praeger’s seminal paper in 1904, to the work of the Harvard Archaeological Mission (Movius at Glenarm, 1937; at Cushendun, 1940; and Curran Point, 1953), the study of the Irish Mesolithic on the Antrim coast has been based on material found in geologically re-sorted contexts. Therefore it was necessary to discover a site where the material had not been totally disturbed.

The location chosen for excavation was in Bay Townland, at Bay Farm in Carnlough Bay, which lies at the foot of Glencloy (Nat. Grid ref. D291165). Glencloy is one of the smallest of the Antrim Glens, being divided from Glenarm to the south by a steep ridge of high ground (Belair) which lies around 200m above sea-level. To the north the bay is limited by the Garron Plateau, which rises steeply to nearly 300m above sea-level and effectively cuts off the glen from the north. The coastal plain on this northern edge consisted of a narrow terrace, usually only about 1km across. To the south-west, access to the interior and the Braid Valley is through a gap reached by a long incline to a col which lies at the 200m mark. The actual excavation site lies in Bay Farm on the southern edge of the bay.

At one stage it was also hoped that excavations at Bay Farm would form part of a larger project which would investigate the prehistoric land use and settlement patterns of Glencloy as a case study for Irish prehistory. Because of financial limitations, and also because the first author moved in 1983, the larger project only achieved part of its goal. However, the idea of the project did lead to three major excavations being undertaken, as well as several minor investigations, together with a study of the vegetational history of the area and a detailed field survey of part of the Garron Plateau. While the publication of the results of these investigations will not appear as a single project report, several other reports are in preparation, e.g. Windy Ridge (Woodman et al. 1994).

The original choice of site was a direct response to the discovery of several unrolled ‘Bann Flakes’ by the late Mr William Stewart of Carnlough. These were found in field 1 in the mid-1970s when the landowner was putting in a new drainage system (Fig. 1). They were brought to the excavator’s attention in early 1977, by which time the new drains had been installed and the land returned to its original condition. Mr Stewart informed us that most of the material which he had collected in Bay Farm came from the tip formed while the contractor was digging the trenches for the new drainage system and that it was particularly abundant in the area close to the fence between fields 1 and 2. This is an area at the base of the apparently gentle slope which runs down the foot of Belair. The site also lies close to the sea edge of the flat promontory which protrudes westwards into the bottom of Glencloy. As this was an area of virtually permanent grassland, it was impossible to ascertain the location of any sites without excavation—if indeed any sites had survived. Even chemical prospection was of limited value owing to the depth of soil and other deposits covering the site.
Fig. 1—Location map of site and trenches opened at Bay Farm 1.
The first two-week trial excavation was carried out in field 2 in September 1977. Two trenches, 3m x 2m, were opened within a notional grid of 10m squares which took the dividing fence as their baseline. While one feature was found in the sq. F trench (usually referred to as trench F), in trench G, which lay nearly 20m to the east, only disturbed soliflucted deposits were uncovered. In 1977 test pits (Bay Farm site 2) were also dug in a field which lay further inland. Again this site had first been identified in a drainage trench by Mr William Stewart, and has proved to be Neolithic.

In 1978 it was decided to concentrate on excavations in field 1, though continuing to investigate trench F in field 2. It was assumed that, as the surface of parts of the terrace to be investigated lay below 8m (Northern Ireland OD), raised beach deposits could be expected and that our best hope of recovering a Mesolithic site lay in the chance that a site might be buried beneath the raised beach deposits. Mr Stewart had recalled seeing some beach deposits along the line of the main drainage trench. Excavation in 1978 consequently took the form of a series of 2m x 2m test pits placed at 10m intervals within a grid system based on the 25" scale map (Fig. 1c). The first line of trenches (1–6) was laid out on an east–west axis from the terrace up the slope of a slight spur. Dr J. Mallory took charge of the excavation of a separate site at the top of the spur. Here at Bay Farm 3 (this area was originally designated Bay Farm 1 (Upper) but the name was changed to Bay Farm 3 for simplicity) an extensive Bronze Age burial and settlement site was uncovered. This site is the subject of a separate report (Mallory, in preparation). However, the trench notation was shared between Bay Farm 1 and 3, as can be seen from Fig. 1. The purpose of this line of trenches was to establish the location of the raised beach, find any traces of in situ material below it, and of course find traces of later settlement on top of the spur (Bay Farm 3). If necessary, this line of trenches would be supplemented by a series running at right angles on a north–south axis. Four trenches were opened along this axis. Trench 9 contained disturbed beach deposits; trenches 10 and 12 were opened adjacent to trench 2 but were abandoned because of a considerable depth of soliflucted deposits.

A further line of test pits, 26–30, on the north–south axis was opened in 1979. These lay on a line 20m west of trench 1 (Fig. 1) and their purpose was to discover the presence of the raised beach. In trench 29 a small scatter of in situ Later Mesolithic flint was found below beach deposits. As a result, a machine-cut trench (31) was opened. A limited quantity of material was again found below the beach deposits.

As will be seen from the description below, the raised beach was not found in the main area of excavation but only on the northern periphery of the terrace, e.g. trenches 9 and 29. Instead, the terrace was covered by soliflucted deposits. These were found to have had a beneficial, and at the same time damaging, influence on the site.

Having established during the 1978 season that some Mesolithic material was in situ, the main excavation, in 1979, was based on two areas around trenches 2 and 11. These revealed extensive chipping floors and areas of industrial waste. In 1980 a limited four-week excavation was carried out to help define the limits of the site and to ascertain whether any traces of occupation could be found upslope of the areas of industrial activity. As will be seen from the discussion below, no significant concentration of occupation other than industrial activity was uncovered during the excavation.
Methodology

The excavation was based on a recovery grid which was referred to earlier. The basis of the grid was 50cm x 50cm for *in situ* material, while disturbed material was collected in units of 1m². The smaller unit was a development of the experience of the excavator at Mount Sandel (Woodman 1985), where it was felt that the 1m grid in the hut area did not create a sufficiently large number of units to allow detailed examination of spatial variation. Each grid square was characterised by a six-figure number, east-west figures being given first and north-south second: thus the grid square in the north-east corner of trench 11 is 054/135 (Fig. 2).

Given that there could be over 1000 pieces from a single grid square, point-plotting and recovery of each separate artefact was eventually deemed to be impossible. However, over-reliance on a grid unit even as small as that used in Bay Farm 1 could result in a mechanical distribution of material in which subtle changes may be missed. Therefore all flint artefacts were, where possible, recorded *in situ*, and cores, hammerstones, natural boulders and cortical flakes were, where

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Fig. 2—Trench layout of Bay Farm 1. Location of later features noted on plan.
possible, noted on the plan. When lifted, all artefacts were kept by grid square, with the result that if ten cores were found and recorded from one unit then it was possible to locate them to the unit but not to identify one individual core recorded on the plan. It has been usual to point-plot retouched tools, but in this instance, as ‘Bann Flakes’—which form the majority of retouched tools—are usually recognised out of the field, there are no point-plotted distributions for the retouched tools. While the grid units were used from the beginning, in situ recording was only employed to its fullest extent from 1979 onwards. In particular, it was used to a very limited extent in the initial test pits where, in the early stages, it was not always apparent when the material was in situ.

While these grid units are convenient for recovery and for reference to features occurring at a particular location, in this report we have continued to designate trenches by a number.

It became apparent during the 1978 season that a significant proportion of the upper deposits on the site were disturbed, usually by solifluction. The fact that the upper levels were disturbed allowed for a more rapid excavation of these levels. As rapid excavation will bias the recovery of artefacts, only a representative sample of material was kept from these upper levels.

The site

In spite of the occasional concentrations of material found in trenches 29/31, the main emphasis of the excavation was in the southern part of the site near the field boundary. Although it can be seen from the trench layout (Fig. 2) that this area was divided in two (based on trenches 2 and 11), the site was stratigraphically still very much of a unit. In detailed discussion these two areas will be considered separately. Test pits 1–3 were initially supplemented by extending trench 2 (Pl. I) and by a test pit within what became trench 11. This revealed that the site was buried in an extensive soliflucted deposit which could be found in trenches 1 and 2 and the original test pit 11. It became apparent that the soliflucted clays had buried a slightly

Pl. I—Excavation of trenches 2 and 2a.
sloping terrace and that trench 3 lay above this terrace. Therefore, while trenches 11 and 11b examined the archaeology of the terrace, trenches 2a, 2c and 11b examined the higher ground to the east and south for further traces of occupation. Trench 11d straddled these two areas.

In spite of the slight gap between the northern and southern portions of the site, a substantial area has been investigated, in total roughly 20m x 20m. It became apparent during the excavation that there were no in situ extensive areas of occupation adjacent to the area under investigation. Occupation debris along the northern and western edge in particular was eroded away by the later soliflucted clays. The slight drop of about 30m onto the lower terrace had provided some protection from erosion, in particular in trenches 11, 11a and 11d.

**Stratigraphy**

In many areas it was impossible during the excavation to distinguish the layering discussed below. Therefore the excavations had to be carried out on a series of absolute levels of either 5cm or 10cm depth. These are referred to in the text as *levels*, while the term *layer* is used to describe the stratigraphic succession of the various deposits found during excavation.

Three composite sections have been provided. One was east–west (trenches 1, 2, 2a, 3—there was unfortunately a gap at trench 2c; Fig. 3) and one ran north–south (Fig.4), and then a second north–south section was provided for trench 11d (Fig. 5).

The one factor which appeared to condition the thickness of certain deposits and the uneven survival of what may have been a very extensive site was the little notch cut into the boulder clay. This was seen to be at its sharpest in trench 11d (Fig. 5) but obviously was quite sharp even in trench 11. This can be seen in the western section of the trench 11 test pit (Fig. 5). Although there is no relevant
Fig. 4—Composite north/south section based on trenches 2, 11 and 11b. Location shown on Fig. 2.

Fig. 5—Section north/south of trench 11d. Trench 11 test pit (west face). Section of trench 9 (east face).
section from trench 2c for the east-west section, it is apparent that the change in shape must have been more gradual.

The stratigraphy of the site is as follows, based on what would appear to be a series of natural layers. It is important to distinguish between absolute levels and layers. Thus the occupation layer (6) could be found at different levels in different trenches.

(1) Humus which, as the field had not been ploughed, was relatively thick.

(2) Brown soil. This usually contained pieces of chalk and occasional sherds of modern pottery. On the northern edge of the site this layer was often as little as 10cm thick, but towards the east, in particular across trench 2a and through trench 3, it gradually became thicker. Layers 1 and 2 in trench 1 were only 20cm thick, while at the western end of trench 3 they were 40cm thick.

(2a) In trenches 2a and 3 a possible transitional layer was noted. In trench 2a this layer contained some disturbed material.

(3) Intermittent lenses of yellow clay.

(4) This hollow was filled with soliflucted deposits, dark brown to grey in colour, which increased in thickness to the north and west. In trench 1 (Fig. 3) layer 4 was 50cm thick, while in the southern end of trench 11 it was only 20cm thick. In places where it was thickest, such as in trench 1, the upper portion was leached. This layer often contained iron concretions. J. Cruickshank (pers. comm.) has suggested that, as this layer resembles the Lias clays found on the edge of Belair to the west and, more importantly, upslope from the site, this layer could be the product of a mudflow. This may explain the inclusion of so many stones and small boulders in the layer and the fact that numerous flint flakes were found within it, positioned both at an angle and vertically.

It is, however, possible that the accumulation of stones noted as a stone raft in trench 2 (Fig. 2), which was found in the middle of this layer, was a collapsed stone wall. There is one indicator of a possible recent origin for the layer. A tobacco-pipe stem was found 15cm into this layer in trench 1. In retrospect, this small trench was badly disturbed by a modern drain. It is therefore likely that this pipe stem, found before the drainage trenches were recognised, is a modern contaminant.

In trenches 1 and 2 there was a noticeable division within layer 4. The basal portion was significantly darker, perhaps because of leaching. In trench 11d, at the southern end, layer 4 may have a different origin from the Lias clays. It may be in part upcast from F16. One problem is that in certain trenches it was difficult to distinguish between the brown clay and the underlying orange clay owing to iron staining.

(5) Orange/red clay. Clays of this colour were found across the whole site but it is quite possible that they have different origins. In trenches 3 and 11b, in particular, these were boulder clays, with some flint being found in the surface of the clay. In trenches 1 and 2, artefacts were found throughout the lens of clay, while in trenches 11, 11a and 11d this red/orange clay overlay a black lens of occupation soil, charcoal and industrial debris (layer 6). One must conclude that, where the clay overlies layer 6, it is a clay derived from the local boulder clay.
(6) Areas of occupation. Owing presumably to erosion, these are relatively intermittent and in many trenches non-existent.

(7) Areas of *in situ* boulder clay have been designated layer 7. In places there is no clear distinction between layers 7 and 5, and therefore, in certain trenches, the difference was determined by the presence or absence of flint artefacts. Usually, however, the underlying boulder clay contained more grit, and in some places a distinct layer of gravel was found below the surface.

Two other related stratigraphic problems still remain. These are (i) the degree of disturbance (i.e. at what depth could it be assumed that archaeological material was *in situ*) and (ii) at what depth there ceased to be evidence of post-Mesolithic elements. These two problems are only partially related. The latter will be discussed in more detail below.

Disturbance was usually indicated by the presence of flint flakes lying at angles, by an absence of groupings of material, and by the presence of flint artefacts with a series of patinas varying from brown to green. These highly coloured flint flakes were rarely found in layer 6 and usually only on the surface of layer 5. There was therefore, in many trenches, up to 20cm of relatively undisturbed material. In trench 2a this distinction was much less clear, and the transitional layer, 2a, was more often noted in section than during excavation (Fig. 3). Therefore the condition of the material and evidence of groups of material were used to establish when *in situ* material was being examined.

**Later elements**

As can be seen from Fig. 2, this area was subject to a degree of modern disturbance. The most obvious form of disturbance is the modern drainage system which cut across the site, running downslope south-east–north-west. These drains, often over 1m deep, were filled at the base with chalk pebbles, and are almost certainly connected with recent drainage schemes (Pl. I). At the top these gullies were rarely more than 50cm across, while at the base it was not unusual for them to only just exceed 30cm in width. Occasionally they were first noted as a line of redeposited red clay.

One example of this system, F22, cut across an earlier, broader gully, F90, at the northern end of trench 11d (Figs 2 and 5, N–P). There appeared to be two earlier gullies (F90 and F16) running roughly parallel 3–4m apart. They ran across the site from 11c to 11d, but no equivalents were uncovered in the northern trenches. These gullies were about 1m across and relatively shallow in comparison to the stone-filled drains. They were usually broad and flat-bottomed and less than 1m deep. On occasions, where upper disturbed deposits were being removed rapidly, the gullies were only noted in section. In fact, the example on the northern edge (F90) was only fully excavated in trench 11d. F16, the southern example, contained numerous boulders which had accumulated along its bottom in trench 11. Only a relatively low percentage were flint nodules. Unfortunately, in 11d the gully cut through the top of a chipping floor, F77, and so it was difficult to determine whether boulders in its base were part of a similar accumulation or were derived from the chipping floor.

These two gullies were so shallow and broad that, in spite of the stones in the base of F16, they were unlikely to be drains. They were also so close together that they were almost reminiscent of shaughs associated with hedgerows on either side.
of a laneway. This may explain why others were not found. They are of relatively recent origin as they were cut through layer 4.

A major later feature in this part of Bay Farm was the raft of stones found in trench 2 (Fig. 2). This feature is interpreted as a collapsed stone wall. The stones were up to 30cm across and at maximum formed a layer 20cm thick. They were usually basalt boulders rather than flint. It seemed that this stone layer, which covered the south-western section of sq. 2, ran roughly parallel with features 16 and 90. It was certainly found to continue in a test pit (47–121). One major difference between the stone layer and the gullies was that the collapsed stone wall was embedded within the upper part of layer 4 (Figs 3 and 4). Unfortunately, no concentration of artefacts was found in association with this raft, except the ubiquitous flint in disturbed contexts.

We know that the modern field system was in existence by the time of the second Ordnance Survey of 1852, and from various landscape paintings we know that it was being imposed in nearby Glenarm just after 1800. These gullies and the collapsed wall could belong to older systems. The problem, however, is their relative antiquity.

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Fig. 6—Sections through a selection of features.
Perhaps the most enigmatic later feature on the site was the stake-hole (F18) found in trench 2a, at grid reference 122/066. This was 12cm deep and 4cm in diameter (Fig. 6). It was noted first at a depth of 35cm from the surface, on the top of layer 2a. It contained some charcoal, which has produced a \(^{14}\)C date of 2360 ± 170 BP (UB-2605). Mallory has obtained similar dates from Bay Farm 3, also from stake-holes. Three tiny stake-holes in trench 3 were first identified at about the same depth. These were again found at a high level within the brown soil, layer 2, and did not penetrate as far as the underlying boulder clay, layer 7. They may be of recent origin.

**Northern area—prehistoric levels**

This area comprised trenches 1, 3 and those grouped around 2. It can best be regarded as a series of trenches across an area measuring 8m x 20m. It consisted of a depression, the lowest points excavated on the site being in trenches 1 and 2 (see Fig. 3).

The *in situ* Mesolithic material in this depression was associated with layer 5 or the orange/red clay. In trench 1 this clay tended to be cut through by gullies.

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**Fig. 7**—Plan of features in northern part of site.
containing a slightly grey clay. A similar phenomenon was noted at the southern end of trench 2. Usually the flint was scattered throughout this charcoal-flecked layer. In trench 2, two specific features were noted, F9 and F17. F9 was one of a series of concentrations of flint flakes and cores in a pit-fill matrix of dark brown soil. It first appeared at the surface of layer 5 and was up to 20cm deep in places (Fig. 7). A small depression, F28, which contained some charcoal was recorded at the base of layer 5. The most obvious feature in trench 2 was the gully F17, which ran for over 1m in length and was up to 20cm deep (Fig. 6).

Another possible feature (F14) was noted in the eastern section of trench 2 and was continued as a gully, F88, in trench 2c. This gully and the other small pits, F85 and the flint concentrations, were again initially evident cut in from the surface of layer 5. F85 was only 15cm deep while F88 was over 30cm deep. This feature first appeared as a thin line in 122/056. Besides these pits filled with flints, two more diffuse areas where charcoal concentrations occurred were F84 and F87, while a small post-hole, F78, was noted cut into the sterile underlying clay. F78 was 6cm in diameter and 20cm deep. It must be considered questionable as to whether this relatively even scatter of flakes, cores, waste and burnt material was anything other than a slightly redeposited layer.

To the east, out of the hollow, in trenches 2a and its extension, there were no overlying clays, but at about 40cm below the surface the amount of disturbance dropped off significantly. The dominant feature in this area was the chipping floor, F25 (Fig. 8), which we must presume was originally more extensive. It first appeared at the top of trench 3a, as did F33. Usually, however, these features only became apparent within layer 2a. The series of small irregular pits such as F30–33, as well as F52, F54, F83 and F86, were cut into the boulder clay. A possible small pit was also uncovered in trench 3.

Many of these pits were only apparent when concentrations of flint flakes were found in what was assumed to be sterile boulder clay, notably F32, F33 and F86, which were reminiscent of F9. The post-holes were usually initially noted in a similar fashion. Often, even in section, they could be difficult to define as they were frequently refilled with clay which may have been only marginally darker than the surrounding boulder clay (Fig. 6). In trench 2 it was apparent that F9 and F17 were cut into the surface of layer 5 and might post-date it. However, in trench 2a, although there was less stratigraphy, it was apparent that some of the features, notably F52 and F54, underlay the chipping floor, which also rested on the boulder clay (see north face of trench 2a).

It is difficult to establish a rationale for the features in this area. Their survival may be due to less erosion at that particular point, while many other little pits and post-holes which had refilled with clay rather than flint may not have been noted. Some, such as F52 and F53, are quite long gullies, containing little flint and filled with dark clay. All pits contained some flint, too much to be explained as choking stones, but some, such as F31 and F86, like F9, contained little debitage and were packed with flint flakes. On excavation, these pits and post-holes were rarely more than 10cm deep, but as they were first noted within layer 2a they could have been at least 10cm deeper. This is of particular importance with small post-holes such as F78, whose width appears greater than their depth.

In summary, the hollow excavated with trenches 1 and 2 had at its base layer 5, which contained quantities of Mesolithic material—probably not entirely undisturbed. Features 9 and 17 were cut into the surface of layer 5. This trend could be
seen in trench 2c, where a series of pits were identified from the surface of layer 4. At the top of the slope in trench 2a, pits were first found in layer 2a. Some of the pits, post-holes and gullies underlie a Mesolithic chipping floor. The little stake-hole (F18) occurred at a stratigraphically higher level.

Southern area

The dominant feature in this area was the chipping floor, which stretched from trench 11 to 11d (Fig. 9), but the significance of several other trenches should first be mentioned. Trenches 11b, 11c and 11h were placed upslope from the hollow to examine the possibility that there was extensive occupation rather than industrial activity upslope from the chipping floor. No significant concentrations of retouched tools or other evidence of occupation were found in either 11b or 11h. Trench 11c

![Ground-plan of chipping floor in trenches 2 and 2a.](image)
was never fully investigated as it was so badly disturbed, being cut by three late features, i.e. a drain and gullies F90 and F16. Only along the northern edge was it felt that there was any in situ material. The predominant characteristic of the material from trench 11c was of a mixture of industrial traditions and material in a poor condition. If a part of a major settlement had been cut into by trench 11c then a higher proportion of retouched tools might have been expected. It was only along the southern edge of 11d, which had also been extended out of the hollow, that one

Fig. 9—Ground-plan of chipping floor in trenches 11, 11a and 11d.
possible feature was found. Here, at the base of layer 3, was a ring of charcoal-stained soil with a scatter of reasonably good-quality blades.

The southern edge of the hollow itself was filled by the chipping floor (F23) (Fig. 9). In the trenches where it was found it was stratified under the layer of red clay, layer 5. As noted earlier, a scatter of later prehistoric material was found as low as on the surface of layer 5. This included several small potsherds just above its surface and two end scrapers. However, it was observed during excavation that while at the northern edge of the chipping floor layer 4 virtually rested directly on the chipping floor, on the southern edge layer 5 was almost sterile for several centimetres. While in the northern end of the site in trench 2a much of the thickness of F25 was created by underlying features, F23 had a definite thickness as a layer in its own right (Fig. 5). The large concentrations of this material can be seen in Fig. 9 and Pl. II, and in the various distribution diagrams below. One noticeable difference between F23 and F25 is that there were more basalt boulders in the former.

The chipping floor tended to thin out rather dramatically to the north and east in trench 11, and a definite edge was also found in 11d. The southern edge butted up against the slope of the hollow in test pit 11 (Fig. 5), but in 11a this portion was not excavated and one of the gullies cut across it in 11d (Fig. 5).

While the chipping floor could be described as being in place, it was by no means intact; even within trenches 11 and 11a there were hollows which looked as if they were products of later erosion (Fig. 9). Similarly, the northern edge of the chipping floor may have been created by erosion. Thus the scatter of pieces found in the north-east corner of trench 11 represents only features cut into the surface.
of layer 7. A somewhat similar trend was noted at the southern end of trench 2, where little in situ material was recovered.

In places, some occupation would seem to have taken place on the surface of the chipping floor, as evidenced by the scatter of charcoal on its surface in trenches 11 and 11d. There was also a greater concentration of retouched tools on the surface of the chipping floor in trench 11 and, in places, concentrations of burnt flint. The total chipping floor was lifted from both trench 11 and trench 11a, but only sample squares were removed from trench 11d. In general, this layer of flint would seem never to have exceeded 15cm in thickness, although occasional refitted pieces were found pressed into layer 7 or first appeared in layer 5. While the chipping floor contained some burnt flint, it mostly consisted of large cores, flakes and cortical flakes, but in trench 11, when a layer of these was removed, an underlying layer produced much higher concentrations ofdebitage

![Fig. 10—Plan of features in southern part of site.](image)
and burnt flint. This was less evident in trenches 11a and 11d.

A scatter of pits containing some flint and charcoal were found, particularly in trench 11. These were the same type of shallow irregular pits found in trench 2a, notably F47 and F51 (Fig. 10). One possible example was uncovered in trench 11a. In many instances these pits were equally difficult to define and, unlike the flint cache pits, they usually only contained quantities of flint near their surface—probably the remains of the chipping floor which originally overlay them.

A possible arc of stake-holes was also uncovered in trench 11. Four in particular (F68, F72A, F74 and F75) appeared in section as convincing post-holes, while the others were rather shallow and broad. Of course, as in the northern area, these were only noted at a level where they cut into the boulder clay. They are therefore probably only the base of the stake-holes. An extension to this line of stake-holes would seem to run through F93 at the southern end of trench 11d.

Besides this scatter of stake-holes, some concentrations of charcoal were noted, and at one point a particular concentration of hazelnut shells was uncovered.

Nothing of significance was found below the chipping floor in trench 11a, while much of the chipping floor (F77) in trench 11d was only planned and not
excavated. However, at the western end of trench 11d a drain and gully had virtually destroyed a narrow trench, F89, reminiscent of F52, and had cut through a post-hole, F93. It is of interest that, as in trench 2a, stake-hole 78 lay beyond the gully, F76, and F93—another possible stake-hole—lay at the end of F89. Unfortunately, F89 was found at the base of one of the broader gullies, F90. At the last stage of excavation, the base seemed to resolve itself into two shallow depressions. It is also noticeable that a final possible stake-hole, F93A, seen in section also, lines up with F89 and F93.

**Feature 1, trench F**

This was the area of initial investigation in field 2. It has already been noted that trench G was abandoned when it was realised that this area had been totally disturbed by mudflows. Instead, attention was concentrated on trench F, where an initial investigation had revealed what was assumed to be a small pit. This was again filled with flint but had been disturbed by a small drainage trench (Fig. 11). Given the possibility that there might be traces of settlement in the vicinity of this feature, which lay at the edge of the original small 2m x 3m test trench, the area under investigation was extended (Fig. 11). The extension across the field drain to the north was abandoned when it was discovered that it only contained waterlain clays.

The main 3m x 6m trench was found to be covered by up to 50cm of soil. Pieces of coal were found as far down as the base of the soil. Test pits to the south

![Fig. 11](b) Plan of surface of flint packing in F1.)
showed that elsewhere the soil was rather thinner; cleaning of the surface of the boulder clay revealed that feature 1 was much more extensive than had been realised. In essence, this was defined by a dense concentration of flint. No other features were found in trench F.

On excavation, F1 appeared to be a series of pits. The most westerly example, F1(A) (Fig. 11, section A–B), was initially investigated as far back as 1977. It may have been two shallow pits filled with flint and dark soil, cut not more than 20 cm into the boulder clay. The eastern section, which was even more packed with flint (see Fig. 11, C–D), was significantly deeper adjacent to F1(A), where it was nearly 90 cm deep. It was filled with a mixture of grey and red clays and packed with flint (Fig. 11b). A lens of particularly black soil was found in one small area. A large flake of decarbonated chert was found in this lens (Woodman and Johnston 1994). Aside from the material in the black lens, the material in F1 could be best described as industrial waste. Towards the base a number of hammerstones were found—levels 7 and 9 each produced seven hammerstones. This is a surprising concentration as less than 1 m² was opened at this depth. Even by the standards of the chipping floor, this material was particularly poor.

There is no doubt that F1(A) was a small pit dug into the boulder clay, probably during the Mesolithic. A second example may have existed beside it. The main arc of F1 is a different problem. There was difficulty in defining the northern edge and, as can be seen from the section, excavation was stopped at an arbitrary point. The southern edge was much easier to define. To the excavator, this characteristic was suspiciously reminiscent of the tree falls at Mount Sandel (Woodman 1985). The layer of dark soil could have washed in from a destroyed pit. Like many of the pits, it was not particularly rich in charcoal. It is, of course, rather narrower than most of the tree falls, and in places so packed with flint (Fig. 11b) that it is difficult to believe that the flint just washed in. The origin of F1 must therefore remain an enigma.

**Summary of site description**

Examination of the stratigraphy of this site shows that it is unlikely that even all the Mesolithic features belong to one particular phase of occupation. The chipping floor, F23/77, was buried under a lens of red clay which, near its southern edge, was relatively sterile. This clay was derived from the local boulder clay. In places, the same processes which formed the red clay had cut into the chipping floor. The material found in layer 5 (which filled up a small hollow) in trenches 1 and 2, with its thin scatter of charcoal, could well have been derived from the outer, perhaps thinner, edge of the chipping floor (F25). This would imply that the various features in trenches 2 and 2c cut into the surface of layer 5 and were stratigraphically later. The chipping floor, F25, and the other pits and post-holes in trench 2a, such as F78 or F82, were probably also later, implying two separate phases of occupation. If occupation was taking place on open ground near the sea, the erosion of clay could happen fairly rapidly. Therefore no significant difference in date is necessarily implied. Similarly, although there is evidence for a stratigraphic succession in that pits, such as F52, and post-holes were found underlying the chipping floors, this may represent nothing more than a casual shift in activity areas in one short period of occupation, even one season. There is certainly no stratigraphic evidence for a break in occupation between the chipping floors and the lower levels of occupation.
Besides the chipping floors, the following main types of features were recognised: (1) stake-holes usually less than 10cm in diameter and rarely more than 10cm deep, although, as noted earlier, this could be a product of these features not being recognised at a higher level; (2) small, often irregularly shaped pits, usually less than 1m across and 20cm deep; (3) flint caches—groups of pits filled with flint material (see below under artefact distribution).

No apparent level of organisation can be determined in either area. What is perhaps of significance is the lack of any definite built hearth.

A descriptive terminology for Irish lithic assemblages

While the purpose of this report is to describe the archaeological material and context of the excavations at Bay Farm 1, the occurrence of numerous different industrial traditions within Glencloy highlighted many of the weaknesses of the descriptive methods used until now. Therefore the opportunity has been taken to provide a short general-purpose lexicon for Irish lithic assemblages. Some aspects will not refer to this assemblage, but too often the terminology used in the available literature refers only to a particular set of problems associated with one site or a group of specific sites.

As descriptions of stone tools frequently employ a series of terms which can have slightly different meanings to each archaeologist, the authors have decided to use a series of descriptive terms whose meanings have been spelt out clearly in the following section. There are numerous textbooks which illustrate many of the differences in retouched tool type, etc. (e.g. Brezillon 1977), but these are often dominated by an array of retouched tools which have been made throughout the Stone Age. The purpose of this section is simply to provide classifications of the main categories of unretouched pieces which usually constitute more than 95% of all material recovered. These are generally simply dismissed as waste. Many of these terms derive from a simple classification initially used by Woodman (1974). The purpose of that classification was to provide a way to distinguish clearly between the Mesolithic and Neolithic industries of the Antrim coast. This section amplifies many of the groups used in that original paper and, in an attempt to make it of more general use throughout Ireland, several categories have been added here, notably scalar cores. Obviously one purpose of typologies is to provide a set of clearly recognisable criteria which helps description, but a second purpose can be to identify criteria which reveal distinctions between different groups of material.

Given that any classification which attempts to provide criteria for every possible variation becomes cumbersome and unworkable, this system merely sets out the major descriptive categories, and any further refinements are best developed on an *ad hoc* basis.

Condition of material

At the moment, there is no objective and adequate method of describing condition. The simple distinction between condition of artefacts is usually based on sharpness and patina: (a) fresh—very sharp and unpatinated; (b) weathered—this varies from slightly to heavily weathered, depending on the degree of loss of sharpness and heaviness of patina; (c) rolled—having been in water. By their very nature, these are qualitative categories which are almost best employed in a relative sense.
Colour changes can be caused either through an addition to the surface (patination) or through chemical changes of the surface of the flint (cortication). Flint, of course, varies in colour in its natural unweathered state—from black through blue to grey. However, owing to contact with various natural elements, such as marine conditions, iron-rich soil, etc., surface colour can be altered. These surface changes can, in certain circumstances, indicate a degree of disturbance or exposure to the elements and/or the presence of mixed assemblages, etc., but it is important that they be viewed in the context of the site. Over-reliance on minor variations in patina without some independent means of establishing the existence of mixed assemblages can be misleading.

One of the most difficult categories of description is cortex. The divisions generally used are: (a) fresh—mined flint whose cortex is still soft and chalky; (b) scree-fresh—where nodules have lost their chalky fresh cortex after lying exposed for some time; (c) water-rolled—where at least some areas of cortex have been worn smooth. Some flint may fall into a special subcategory where numerous heavy chattering marks, often C-shaped, indicate that the nodule has been in the sea and may have ended up in a shingle beach. Unfortunately, particularly where only a small area of cortex has survived, it does not follow that cortex without indentations is simply river-rolled. As yet there is no objective way to establish whether flint has been obtained from glacial deposits.

**Cores**

The typology used in describing cores has been adapted from that used by Woodman (1974; 1978) in the description of Mesolithic material. The classification used here includes a more detailed description of later elements and elements occurring in areas of poor flint. The description of cores does not make any allowance for the use of different techniques of percussion, e.g. direct, punch or pressure. There is no evidence for pressure flaking in Ireland other than in the use of secondary retouch for the manufacture of implements such as arrowheads.

*Single-platformed* (Fig. 12)

As the term suggests, these are cores with flakes removed from one platform. Owing to the fact that the Later Mesolithic in Ireland is characterised by the so-called uniplane core (Woodman 1974), the divisions within this category are to a certain extent peculiar to Irish archaeology. One potential source of error is that in some cases it may be difficult to distinguish between a striking platform and a core where flakes have been removed at right angles to the main direction of flaking. A simple distinction is that if there are a number of flake scars on the second face, if it exceeds 5cm in length and is more than 50% of the length of the first face, then it should be regarded as a dual-platformed core. There are two variables which can be noted in this category.

*Uniplane.* This can be a tendency rather than an absolute criterion. Uniplane cores are those which are worked for less than 50% of their circumference. The worked area is calculated as a proportion on the total circumference at a point midway on the long axis of the core. In the Larnian method, many of the uniplane cores have a flat flaked surface.

*Faceting.* Most single-platformed cores in Ireland tend to have large, smooth striking platforms, but in some instances faceting can be found, particularly in
later assemblages. To be described as faceted, five or more facets should be found on the platform face.

_Dual-platformed cores_ (Fig. 12)

Three separate forms can be noted.

1. Dual-opposed platforms: where the two platforms can be found on the same plane, usually at opposite ends of the core. This form is particularly common in the Early Mesolithic.

2. Alternate platforms: where the two platforms are arranged so that two separate planes are used and flake scars from the two planes do not impinge on each other.

3. Chopper-like cores: where a set of flake scars form the platform for the removal of a second set of flakes. These were particularly evident at the Cloney, Glenarm (Movius 1937).
Multi-platformed cores (Fig. 13)

Until now this has been a simple category in which the occurrence of cores with more than two platforms has been used to distinguish industries which post-date the Mesolithic. However, there is no doubt that this is an over-simplification and there are some distinctive forms within this group.

1) Disc cores: these are simply cores where flakes have been removed in a circular manoeuvre around the core. This usually results in disc-shaped cores where the flake scars of one face become the striking platform of the other.

2) Globular cores: this type was noted at Bay Farm 3, where a series of spherical cores were found. These were formed by removing flakes from numerous platforms, with the result that the core is virtually spherical and lacks any of the irregular protrusions which characterise type 3 cores (below).
(3) Polyhedral cores: these are the normal multi-platformed cores, which are often made by removing flakes from three or more striking platforms and creating several flaked surfaces which join to create a rather more angular form.

Miscellaneous and fragmentary

The one obvious type within this group is the casually worked pieces where one or two flakes have been removed without proper preparation.

Scalar forms (Fig. 13)

Although not present in the Bay Farm assemblage, scalar forms have been identified in numerous assemblages in Ireland (Woodman 1981; 1983) and should be included in any descriptive typology. The authors accept the suggestion that at least a significant number of these forms are by-products from the production of small blades, although a case can still be made for some of the more regular forms being artefacts in their own right (K. Knutsson, pers. comm.). These forms are often characterised by extensive damage at one or both ends. The flake scars indicate that small, parallel-sided bladelets have been removed. The more regular forms have retouch down one or both long edges of the piece. Scalar forms would seem to be most common in areas where the natural flint occurs in small pebbles. They rarely exceed 4 cm in length.

These forms can be divided into two main groups.

(1) Split pebbles:

(a) worked on one face and worked from one end, the other surface formed by cortex;

(b) as above, worked on one face but with working from both ends.

(2) Bifacial forms:

(a) worked on both faces from one end;

(b) worked on both faces from both ends.

Blades and flakes

It has been pointed out by Pitts (1978) that there are numerous different ways of measuring length and breadth. In this study, the length is determined by taking the maximum measurement at right angles to the striking platform, while the breadth is determined by the maximum measurement at any individual point at right angles across the length measurement (Fig. 13).

Blade Flake distinction

Used in its most general sense, the term ‘flake’ is non-specific and refers to any removal from a core. However, a simple distinction is that any flake whose length is more than twice its breadth is regarded as a blade. Within this category no distinction has been drawn between blades and microblades. Microblades can be distinguished on the basis of width but, as there are many small blades in assemblages where larger forms predominate, a distinction such as this is rather artificial. Perhaps the term microblade should be reserved for narrow, parallel-sided blade assemblages where the blades have been removed with pressure, as in the case of the southern Scandinavian handle cores (Callahan 1985).
Cortex

Flakes which have more than 50% of their surface covered in cortex are described as cortical flakes. While obviously the presence of these in large numbers could indicate industrial activity, this does not preclude their use as blanks for artefacts such as scrapers.

Platform types (Fig. 13)

This is a simple method for the description of platform type. It does not relate entirely to the various methods of percussion.

(1) Smooth: there is an arbitrary distinction between these forms and type 2 (below). These platforms are often large and have no facets on them. The indication of their size is a simple vertical measurement through the point of percussion, irrespective of whether this is the maximum thickness of the platform. Platforms which are more than 2mm thick are considered as part of this class.

(2) Point: these are platforms which have a thickness of less than 2mm.

(3) Faceted: Bordes’s (1950) distinctions have been used to characterise the presence of faceting of platforms. Those with more than two flake scars are described as faceted, while those with more than five flake scars can be described as strictly faceted. It is this second category which is important, as facets can occasionally occur inadvertently in industries where the main method of production is through the use of large, smooth, striking platforms. In some instances the degree of faceting suggests deliberate platform preparation. This could be described as a pseudo-Levallois—the other aspects of Levallois core preparation are missing.

(4) Cortex: these are platforms which are simply covered in cortex.

TECHNIQUES OF PERCUSSION

Within Ireland there is a slight restriction on techniques of percussion. There is no evidence for the use of pressure. Cores with a 90°+ angle between platform and core face are quite rare. Instead there is a recognition of the following methods of percussion.

(1) Direct percussion (usually hard-hammer): associated either with a range of platform and core types in later prehistory or a range of smooth platform sizes and uniplane cores in the Later Mesolithic.

(2) Controlled percussion (usually a punch): associated with small or point percussion platforms and a range of single- and dual-platformed cores.

Both of these could be described as being associated with platform cores.

(3) Scalar core technology: associated with the use of the bipolar technique. This technique is usually found in later prehistory and is commonest in certain areas where small pebble flint occurs with some frequency.

Industry from Bay Farm 1

Because of the exceptionally large quantities of material from Bay Farm 1 there had to be a certain degree of selection. Only small samples of material from
what were regarded as disturbed levels have been kept for comparative purposes. While attempts have been made to give totals for the more in situ deposits, this has usually been carried out at a very simple level, e.g. retouched tools, cores, flakes, cortical flakes, etc. More detailed analysis has had to rely on small samples.

CONDITION

The material from the upper disturbed layers is rarely in a good condition. Edges have been shattered back and few pieces are fresh. The colour usually varies from red-brown particularly in the topsoil to a greenish patina in some of the soliflucted clay layers. Most of the in situ material in layer 5 is unpatinated and is in exceptionally fresh condition. There are a few slight variations in condition. In particular, material found in trenches 2c, 2 and 1 in the level 5 or 7 deposits is slightly patinated and less fresh; it may therefore be slightly out of context. The material from F9 does not exhibit this tendency to the same degree. Similarly, some material from the chipping floors, in particular F23 and F77, may have lain exposed as it has a dull matt white patina.

SOURCES

With the exception of one decarbonated chert flake found in F1, all the raw material used at this site was flint, nearly all beach flint. Using cores as an indicator, which minimises the risk of counting the same nodule on numerous occasions, approximately 1% of the material used on the site has fresh chalky cortex. The rest is water-rolled. Given the impossibility of distinguishing between beach and river-rolled flint even when nodules are complete, it has been presumed that virtually all the flint nodules were derived from the nearby beach. This is suggested by the heavy bashing on the cortex. The nearby raised beach would have provided a more than adequate source of flint (see below, discussion.

<p>| Table 1—Typological subdivisions of a sample of cores from Bay Farm 1 (trenches 11 and F). |</p>
<table>
<thead>
<tr>
<th>Trench 11</th>
<th>Trench F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-platformed</td>
<td></td>
</tr>
<tr>
<td>−50 worked smooth</td>
<td>65</td>
</tr>
<tr>
<td>−50 worked faceted</td>
<td>10</td>
</tr>
<tr>
<td>+50 worked smooth</td>
<td>10</td>
</tr>
<tr>
<td>+50 worked faceted</td>
<td>4</td>
</tr>
<tr>
<td>Dual-platformed</td>
<td></td>
</tr>
<tr>
<td>Opposed platforms</td>
<td>1</td>
</tr>
<tr>
<td>Alternate platforms</td>
<td>3</td>
</tr>
<tr>
<td>Multi-platformed</td>
<td></td>
</tr>
<tr>
<td>Disc</td>
<td>1</td>
</tr>
<tr>
<td>Globular</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2</td>
</tr>
<tr>
<td>Scalar forms</td>
<td></td>
</tr>
</tbody>
</table>
on topography). Similarly, the nearby chalk cliff would have provided both the very fresh and scree-fresh flint.

**Cores**

If thedebitage is excluded, it can be seen that cores form a relatively large percentage of the total material and that the dominant form is the classic Larnian uniplane core. Nearly 90% of the cores are single-platformed, while over 75% are uniplane (unlike Fig. 14:7) with smooth striking platforms (see Table 1 and Fig. 14—Selection of cores (1–7) and platform rejuvenation flake (8).
typological discussion above). The few cores of other types are relatively poor and are mostly dual-platformed.

To some extent the industry does appear heavy, but when one considers that the raw material was available in the form of large nodules on the nearby beach, it is apparent that there was no tendency to use the largest nodule available. Although one core over 25cm long was noted from trench 11d, the mean core length is 8.00 ± 1.2cm. Nodules to make cores of twice this length are freely available on the beach. The main purpose would therefore seem to have been the production of parallel-sided blades which, as will be seen from the discussion below, rarely needed to exceed 10cm in length.

The cores exhibit a certain variation in form. Less than 50% appear to have been worked from a complete nodule, with just the cortex removed from the upper surface and a platform created by removal of a large flake from one end, e.g. Fig. 14:3. Some of these are worked in a rather more semicircular fashion (Fig. 14:7) than in the classic uniplane core, which is usually D-shaped in section with the straight edge being the worked surface. The commonest form is, of course, the classic uniplane core, which can vary from rectangular to triangular in outline, e.g. Fig. 14:1, 2 and 6. While they can be worked to a thin plate or abandoned owing to a stepped protuberance at the distal end (Fig. 14:1), they often have a keeled longitudinal section (Fig. 14:2, 3).

Obviously the cores found at Bay Farm represent the discards, for whatever reason, and it is always difficult to assess how blades were removed from a core when it has been abandoned. Initially it was felt that the distinct flatness of many of the cores from the Mesolithic levels at Bay Farm suggested that, in many instances, instead of working immediately from intact nodules, the cores may have been based on large fragments of nodules whose ventral surface became the working surface of the uniplane cores. The simple creation of a striking platform would therefore allow the easy production of blades (but see p. 200 below).

One remarkable aspect of the range of cores found at this site is that there are limited numbers of crude cores which might have suggested a totally ad hoc production of blades. At the other extreme, there are very few cores which were worked until exhausted (compare Fig. 15a). The mean thickness of the cores is 4.79 ± 1.9cm. The substantial nature of the cores can be seen in the distribution of weight of cores from a sample taken from trenches 11 and 2a (Fig. 15b). Their size is not obviously due to exhaustion of the cores. Other factors must have caused their abandonment. Yet shorter blades could be used, as can be seen from the production of short stubby blades at sites such as Rough Island (Movius 1940b) or Rockmarshall (Mitchell 1949).

By-products

If analysis either of the total material, including fragments, or the sample of complete flakes is taken into consideration, a high percentage must be considered as by-products and debitage, with a relatively small proportion being good-quality usable blades or flakes.

Cortical flakes are by far the most common artefacts in this class. There are a large number of flakes which are totally covered in cortex. A number of these are distinctly dome-shaped (unlike later industries, in which these forms are relatively rare) and can be up to 4cm thick. At one point, consideration was given to the possibility that they were blanks for cores, but measurement of their thicknesses
Fig. 15—(a) Distribution of the maximum length and thickness of a selection of cores.  
(b) Distribution of weight of a sample of cores.
showed that they were significantly thinner than the cores. Not every cortical flake was measured for thickness as some were patently too small for use as cores, but Fig. 16 illustrates the size of those examples more than 2.5cm thick. A comparison with cores in the same figure clearly illustrates that they are not core blanks. Therefore they are either large flakes removed from the end of the nodule to create a striking platform or large flakes removed from the upper surface of the nodule. This would create a flat surface from which blades could be removed with a uniplane method. However, as will be shown below, the uniplane form of so many Later Mesolithic cores is an end-product of a certain flaking method rather than a method in its own right.

**Platform rejuvenation flakes**

Examples such as Fig. 14:8 are relatively rare, less than 0.05% of the assemblage. The creation of a large platform at an angle of less than 90° to the core face meant that platform rejuvenation was rarely required.

**Core rejuvenation flakes**

These are more common and in excess of 1% of the assemblage in many parts of the site. They are simply a device for removing the distal end of the core. Because the flakes have stopped before the end of the core, a step has developed; core rejuvenation or plunging flakes remove this protuberance. This was, of course, the origin of the term ‘Larne Pick’ (Movius 1942).

**Flakes**

This category includes primary (cortical), secondary (partial cortical) and inner flakes. Again, as this is an industrial site we must presume that much of the material found on the site does not reflect accurately what was produced. Much of the material is fractured, though the fracture rate is by no means as bad as that recorded by Saville (1981), who noted that he had to examine nearly 50kg of material to obtain 200 complete flakes. In our case, we can note that approximately 25% of the flakes, larger than 3cm long, were complete.

It is, of course, only possible to describe the range of material from *in situ* deposits in a rather general sense at this stage. More detailed discussion of the forms of waste and flakes and their differential scattering across the site as a result of human behaviour and other factors will be dealt with below.

In general, however, the range of blades and flakes could not be described as being particularly large. The total sample analysed shows that flint-working was characterised by the presence of small debitage as well as the by-products discussed earlier. On average, debitage or pieces smaller than 3cm in length form between 30% and 50% of the material. The only two exceptions are trenches 2e and 11d (southern concentration). Although rarer, there is also a noticeable group of irregularly shaped flakes, characterised as flakes with a protuberance of more than 1.5cm on an edge or with a thickness greater than 3cm. Here the availability of other blades and flakes, as well as the virtual absence of these characteristics at sites such as Newferry, suggests that these irregular forms, presumably accidental by-products, would not have been produced for use. Scatter diagrams were created for all the complete flakes from three grid squares, 119/063 (trench 2a, F25), 138/050 (trench 11, F23) and 144/041–145/042 (trench 11d).

These samples were taken by measuring all complete artefacts from these
Fig. 16—Length/breadth scatter diagram of a selection of flakes from grid squares 138/050 and 145/042-144/041.
particular 50cm² grid squares. As can be seen from the scatter diagrams, the industry consists of pieces mostly less than 10cm long and generally less than 8cm. Obviously there is a certain variation in the distribution of material, and it is noticeable that the trench 2a sample square 119/063 contains much moredebitage, with the result that the mean size is much smaller. However, if debitage less than 3cm in length is excluded, the mean length of all three samples is much closer (obviously the numbers of cortical flakes and irregular flakes also vary).

Table 2—Mean flake size of selected samples of material from trenches 11 and 2a.

<table>
<thead>
<tr>
<th>Grid square</th>
<th>Mean length (cm)</th>
<th>Mean length of flakes &gt; 3cm</th>
<th>Percentage of laminar forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>138/050</td>
<td>5.36 ± 2.5</td>
<td>5.92 ± 2.1</td>
<td>26%</td>
</tr>
<tr>
<td>145/042-</td>
<td>6.59 ± 2.4</td>
<td>6.9 ± 2.3</td>
<td>39%</td>
</tr>
<tr>
<td>144/041</td>
<td>4.75 ± 2.7</td>
<td>6.37 ± 2.2</td>
<td>43%</td>
</tr>
<tr>
<td>119/063</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The laminar quality of the industry can best be seen by examining the laminar facets on the cores (Fig. 14). In the case of the flakes, the laminar element is obscured by the presence of so much waste material. However, the numbers of laminar forms as a percentage of the total number of good flakes (excluding cortical flakes) was established for each of the three samples. In all cases, the percentage of blades is less than 50%.

Fig. 16 (contd)—Length/breadth scatter diagram of a selection of flakes from grid square 119/063.
The low percentage of blades and the apparent smallness of many of the usable pieces could in part have been caused by the removal of some of the larger useful blades from the site.

PERCUSSION TECHNIQUE

The striking platforms were usually smooth, varying in size from 1mm to more than 15mm in depth. The mean platform depth ranged from $0.7 \pm 0.3\text{cm}$ (trenches 11 and 2a) to $0.8 \pm 0.4\text{cm}$ (trench 11d). Examples with faceted platform were virtually unknown.

Samples were taken from F1 and trench 11.

<table>
<thead>
<tr>
<th>Platforms</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth &gt;0.2cm in depth</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Point &lt;0.2cm in depth</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Faceted</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Strictly faceted, five or more facets</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Cortex cover</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

There is every reason to believe that the assemblage was produced with hardhammer percussion. Of the sample examined, 20% had incipient percussion marks while 70% had clear prominent bulbs of percussion. The purpose of this activity would appear to have been to produce blades and flakes. There is no evidence of axe-manufacturing flakes or rough-outs from this site.

Fig. 17—Hammerstones.
(a) Distribution of weight of a selection of hammerstones.
(b) Length/breadth scatter diagram of hammerstones.
HAMMERSTONES

As this is an industrial site, it is hardly surprising that hammerstones were a relatively frequent occurrence. The hammerstones are usually made of a fine-grained quartzite which does not shatter easily. These are pebbles deriving from the old red sandstone conglomerate, which outcrops several miles away on the northern edge of Glenarriff. Eventually, through tidal movement and longshore drift, they find their way onto beaches at Carnlough and Glenarm. Often they have been discarded after large spalls have come off, e.g. Fig. 17:2. This is due to the large amounts of energy used in producing blades with the hard-hammer percussion technique.

The numerous fragments and flakes show how much force was used. These quartzite flakes, which have spilled off the hammerstones, can be up to 10cm long when complete. In spite of the amount of force used, the hammerstones are relatively small, averaging little more than 10cm in length. The longest complete example measures only 12cm. Their weight is frequently less than 1kg. Usually they are rather ovoid in outline (Fig. 17:1), though some irregular forms are also known. Damage is commonly confined to either end of the hammerstone (Fig. 17:1, 3), though some irregular examples have damage at numerous points (Fig. 17:2, 4). Fracturing from internal weaknesses within the pebble was also frequent.

Examination of Fig. 18 shows that there is a definite upper limit to the size of hammerstones. Few are over 1kg. This may be due in part to selection through longshore drift and availability. But it would also coincide with the upper limit in size and weight for a hand-held hammerstone to be used with accuracy, i.e. not to be cumbersome. However, quite a number of small hammerstones, less than 400g, have been found. These are not small hammerstones for secondary retouch: the technology of this industry does not require them. Some exhibited heavy damage, suggesting that they had been used for blade/flake production. Heavy damage has been characterised by: (1) removal of flake; (2) reduction of the original surface through pounding so that the shape of the hammerstones is altered; (3) a surface with more than 3cm² of damage. One must conclude that, as today, the beach at Carnlough was not a prolific producer of quartzite pebbles and so the flint-knappers were forced to use hammerstones of a range of sizes. Based on experiments, it would seem likely that those nearer the bottom end of the range were used for blade/flake production while the large examples may have been used for quartering the larger nodules of flint.

Table 3—Retouched tools from in situ contexts at Bay Farm 1.

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>Certain</th>
<th>Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butt-trimmed</td>
<td>32</td>
<td>10</td>
</tr>
<tr>
<td>Backed knives</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Distal</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pointed forms</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Scrapers:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neolithic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Notched:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Shallow</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Invasive</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
RETOUCHED TOOLS

Butt-trimmed forms (32 + 10)

Considering the quantities of material recovered and their ubiquitous nature in the Irish Later Mesolithic, remarkably few examples of butt-trimmed forms were found. If the in situ deposits only are considered, 32 were recovered. It has been usual to apply a strict definition to butt-trimmed forms rather than to use the term 'Bann Flake', which has too general a meaning: there has been a tendency to regard any leaf-shaped flake as a 'Bann Flake'. As these large, leaf-shaped flakes can be easily produced in any technology using a hard-hammer percussion technique, a stricter definition is necessary if these forms are being used to indicate that the site is Later Mesolithic. Butt-trimmed forms should be flakes more than 4cm in length and retouched carefully along at least one proximal lateral edge for c. 1.5cm. Where their presence is being used to designate an assemblage as Later Mesolithic, ideally retouch should occur on both proximal lateral edges. Within this general category there are a range of forms, such as those with a tang. The term 'Bann Flake' should be reserved for large, leaf-shaped forms, 4cm or more in breadth, where retouch at the proximal end is very light.

Here, on the basis of the 14C dating, industrial techniques and typology, a Later Mesolithic date is not in doubt. It was apparent that a number of artefacts did not quite fulfil the standard criteria as already outlined. Some examples found at Bay Farm had less than the 1.5cm of retouch required. However, as they obviously could have functioned in the same manner the strict criteria have, in this instance, been relaxed, although pieces with sporadic and accidental retouch are still excluded. With so much flint available, there has obviously been an ad hoc use of blades without the same degree of careful retouch (e.g. Fig. 19:4).

As can be gathered from the previous discussion, there are relatively few classic, large, leaf-shaped 'Bann Flakes'. Figure 19:3 would seem to be the closest to the classic 'Bann Flake'. In most instances, the degree of retouch is rather limited and is simply designed to round off an irregularity on the flake edge. As in the upper zones at Newferry, Co. Antrim (Woodman 1977), the retouch is usually exceptionally light and almost entirely confined to the dorsal surface. Four examples have slightly invasive retouch (Fig. 19:1) reminiscent of very late examples from post-transgression contexts in the sand-hills at Portstewart (Woodman 1978a). The most noticeable individual example is Fig. 19:6, a rather crude tanged example which is unusual at such a late date, and whose tang, at 1.8cm wide, is rather narrow by Irish standards. Similar examples have been found in the Isle of Man (Woodman 1978b).

Two other characteristics are noticeable. Quite a number have extensive damage to their edges, often taking the form of nibbling back. This is more extensive than at Sutton (Mitchell 1956) or Newferry (Woodman 1977). It is still uncertain how much of this damage is post-depositional (see Appendix I). There are also significantly more elongated laminar specimens present than is usual (e.g. Fig. 19:5 and Fig. 20). Woodman has shown that in many Later Mesolithic contexts the butt-trimmed forms are broader than the other blades and flakes (see Woodman 1978a, fig. 33).

Backed knives (2 + 2(?))

Only two good examples were found. The first (Fig. 19:8) was broad, particularly heavily retouched along the left-hand edge and had a damaged functional
edge; it was reminiscent of those found at Newferry. The second was retouched along the mid-portion of the back. One problematic example is almost a normal ‘Bann Flake’ in that it is retouched at the butt on both edges. However, unlike the normal ‘Bann Flake’, it has a steep edge covered in cortex forming a natural back, and could therefore be considered as a backed knife. The second questionable example is even more problematic. It is a slightly leaf-shaped flake, lightly retouched at the butt on the left dorsal lateral edge. Unfortunately, part of the distal left edge is missing, but the mid-portion of the same edge has been blunted. This example does not have the usual squat shape of the backed knives but typologically must be considered as one.

*Distally trimmed (2 + 1(?))*

One is a rather large, slightly patinated example. There is peripheral blunting at the butt on the right edge, so slight that it could hardly be regarded as deliberate retouch (Fig. 19:7). There is one possible flake removed off the distal right edge, while a more definite area of retouch exists on the distal left edge. The distal right-hand retouch may have been to produce a straighter functional edge. A second very broad flake is also blunted at the butt along one edge and obliquely at the distal end. A possible example has a small area of blunting about 1cm long.

![Fig. 19—Selection of butt-trimmed (1–6) and distally trimmed (7) forms, and a backed knife (8).](image-url)
This could also be regarded as an obliquely trimmed specimen. It is of interest that it was found in the same square as the first-mentioned example (Fig. 19:7).

Pointed forms (1(?) )
Normal bar forms and/or blade points would be expected on a site of this date. No definite examples were found. However, one possible unfinished form was recovered. It was being retouched from the distal end along both edges (Fig. 21:1).

Scrapers (3 + 1(?))
One of these (Fig. 21:2) is a classic Neolithic scraper—a simple convex form made on a relatively thick flake, retouched only at the distal end. A second flake, retouched at the butt end, could also be a fragment of a scraper. The retouch is rather heavy and atypical for that on a ‘Bann Flake’. Both these pieces were found in 143/050 in level 4, where the chipping floor F23 was stratified below a relatively sterile layer of clay (level 4 at that point). They are probably both Neolithic.

The other two specimens are much more irregular and are typical of the few Later Mesolithic items which could be classified on morphological grounds as scrapers. Figure 21:4 is a large flake, carefully and abruptly retouched for 3cm on the distal and right distal lateral edges. As the portion of the flake opposite is covered in cortex right down to the edge, it is unlikely to be a distally retouched knife. Figure 21:3 has rather more sporadic retouch, also at the distal end of the flake.

Notched
Heavy (4). Two of these are fragments of blades with short denticulate notches, similar to those found at Newferry zone 6 (Fig. 21:5). The other two are large

---

**Fig. 20**—Length/breadth scatter diagram of butt-trimmed forms.
Fig. 21—Blade point (?) (1), Neolithic scraper (2), scrapers (3–4), notched pieces (5–8), invasive notch (9), and miscellaneous piece (10).
heavy flakes which initially resemble crude scrapers. Owing to their irregular denticulated surface, they have been classified as heavy notched pieces (Fig. 21:6).

*Shallow* (6). Five of these are made on blades, the other on a flake. Five are formed on the bulbar surface and all are made with relatively abrupt retouch on comparatively thin edges. The notches can be quite narrow, e.g. Fig. 21:8 has a maximum width of only 2cm, while one example has a notch just over 3cm (Fig. 21:7). Superficially, there is little evidence of extensive damage within the notches. In some instances more than one notch exists. These are usually contiguous (Fig. 21:8); this example is also backed on the right-hand edge.

*Invasive* (1). This example (Fig. 21:9) has been classified separately as its retouch is rather more invasive than is usual. It has a very shallow notch on the right-hand edge near the distal end. The proximal end of this blade is broken.

*Miscellaneous* (7)

These are pieces with areas of retouch which can be regarded as deliberate rather than sporadic. Three from trench 11 have heavy retouch, while two others have more sporadic retouch.

Three examples may be a distinct form. They are quite elongated blades with an area of blunting or retouch near the butt. This blunting is usually quite light, runs for up to 3cm in length, and does not run from the striking platform. The area of retouch can be either dorsal or bulbar (Fig. 21:10).

---

**Fig. 22**—Scraper (1) and miscellaneous heavily trimmed piece (2).
One piece which deserves special consideration is a large rectangular flake with steep heavy retouch on both lateral edges (Fig. 22:2). While one flake scar has been removed from the bulbar face, the edges created lack notches. This may be the first stage of a rough-out for a core borer or pick.

**Later elements**

These consist of material found at higher levels and usually patinated brown-orange. As this material is out of context, there is little point in noting Mesolithic elements. Of particular interest are the end of blade scraper found in level 2, trench 11, and the large flake scraper also from level 2, trench 11 (Fig. 22:1). An abruptly retouched cortical flake was found in 2a, level 4. The significance of the distribution of disturbed material is discussed elsewhere.

**Dating**

Three $^{14}$C dates have been obtained for this site:

- UB-2603 Trench 11d F77 $\pm 100$ BP
- UB-2604 Trench 11 F23 $\pm 95$ BP
- UB-2606 Trench 11 F23 $\pm 100$ BP

These dates confirm that the major typological characteristics of the site are Later Mesolithic. The date range also just overlaps with the potential beginnings of the Neolithic, e.g. at Ballynagilly, Co. Tyrone (ApSimon 1976). This leaves the position of the Neolithic scrapers and potsherds rather uncertain. If the site had been $^{14}$C-dated to before 6000 BP, it could have been assumed that they were intrusive.

**Industrial succession**

This, unfortunately, was not as clear as had been hoped. As material had been washed downslope onto earlier deposits, there was no clear interface.

In trench 2 there was an apparent shift from disturbed levels containing material which was highly patinated, even in level 5, through to level 7, where very

![Schematic representation of interface between Mesolithic and later elements in levels 5 and 6 on a north/south axis (trench 2).](image-url)
few pieces were patinated. Here levels 6 and 7 are usually regarded as being in the orange clay (layer 5), while level 5 was the interface between the orange and brown clays. With levels being excavated across a slight slope and with gullies cut into the lower levels, it is hardly surprising that there was only a gradual reduction in highly patinated disturbed material.

<table>
<thead>
<tr>
<th>Level</th>
<th>Patinated</th>
<th>Fresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 5</td>
<td>29.2%</td>
<td>70.8%</td>
</tr>
<tr>
<td>Level 6</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Level 7</td>
<td>1%</td>
<td>99%</td>
</tr>
</tbody>
</table>

This gradual change and the appearance of Neolithic elements can be seen in the distribution of potsherds and core types in trench 2 (Fig. 23). It is apparent that most of the multi-platformed cores occurred in level 5 (and from surviving samples at higher levels). In this level very fragmented potsherds were also recovered. Only at the more northerly edge did these potentially later forms penetrate into level 6 (117/119).

A somewhat similar trend can be documented in adjacent trenches, such as trenches 1 and 2c. Upslope in trench 2a there appeared to be a simple distinction between the Mesolithic material left in situ and the more disturbed topsoil finds.

The most complex area was found in trench 11. During the excavation of this trench it was realised that the upper brown clay was disturbed, and therefore attention was centred on the sequence of material within the orange clay. Four levels have been created.

Level 4: Orange clay.
Feature 23: This chipping floor lay within and at the base of level 4.
Level 5: This consists of the base of feature 23.
Level 6: This consists of material underlying the base of feature 23 or else the tops of small pits and post-holes cut into the surface of the underlying clay.

There appears to be no real evidence of the numerous core types that characterise later prehistoric sites in this area, in particular multi-platformed cores. However, as can be seen from Table 4, there were three potsherds in level 4—though near the top—as well as two scrapers which could be described as Neolithic. Therefore it did seem possible that there could be some other evidence of later elements in level 4—particularly on the basis of material recovered in trench 2, level 5 (Table 4).

The potsherds were found on the surface of layer 4 and were therefore stratified well above a significant scatter of retouched tools. However, the scrapers were found within level 4 itself. This material could suggest that the contents of level 4 in trench 11, which overlay the chipping floor F23, were the product of inwash at a later date rather than in situ accumulation as a result of prehistoric activity. In particular, near the southern end of the trench in grid square 143/050 there is a definite inwash of material from further upslope.
TABLE 4—Stratigraphic location of selected elements from within trench 11.

<table>
<thead>
<tr>
<th></th>
<th>Pottery</th>
<th>Cores</th>
<th>Other elements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;50</td>
<td>&lt;50(F)</td>
<td>&gt;50</td>
</tr>
<tr>
<td>Level 3</td>
<td>(?)</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Level 4</td>
<td>3</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>F23</td>
<td>—</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Level 5</td>
<td>—</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

INTERPRETATION OF THE HORIZONTAL VARIATION

As can be seen from earlier discussions, certain areas of the site contained material which was not entirely in situ, notably trenches 1, 2 and 11c, and to a lesser extent 2c. Material from certain levels in 11, 11a, 11d and 2a could be regarded as in situ, while that from trench 3 is so limited that it is of little use.

A comparison of the locations of retouched tools shows that there are several significant concentrations (Fig. 24). In particular, very few retouched tools were
found on the north-western edge of the site. Instead, they tended to concentrate near the southern edge of the site and in the vicinity of trench 2a (the F1 material has been excluded from this discussion). There is a noticeable trend for the retouched tools in trench 11d to be found on the higher ridge at its southern end in the vicinity of the charcoal-stained area, F80. Only small, select areas were sampled in the chipping floor, F77, but more material was recovered than at the southern end of 11d; however, only one retouched tool was recovered within the areas sampled in F77.

One of the most noticeable aspects of the distribution of retouched tools is the difference between the material centred on the two chipping floors, F23 in the south and F25 in the north. In the former case there was a substantial

---

**Fig. 25**—Distribution of flakes, cortical flakes, cores, debitage and burnt material from trenches 11 and 11a.
concentration of 'Bann Flakes', while in the latter there was a remarkable concentration of the notched forms. This implies, perhaps, short periods of specific activity in each instance, in a fashion reminiscent of the Meer II site in Belgium (Cahan et al. 1979).

Figure 25 for the southern area and Figs 26 and 27 for the northern area, as well as Table 5, albeit in a different format, illustrate the distribution of different groups of material across parts of the site. It was only possible to show this distribution for certain selected areas. Trench 11d was only sampled and therefore no accurate representation could be given. Similarly it was only in trenches 2a, 2c and the northern part of 2 that sufficient material was felt to be in situ. Layer 5 at the southern end of trench 2 had been badly eroded. The large concentration of different forms in trench 11 must, at least, be a reflection of the thickness of the surviving layers in that trench (the possibility of multiple layering of debris from different types of occupation in trench 11 will be discussed below). There must also be some correlation between most forms and the extent of survival. Thus the large concentration of cores in the north-western corner in 2a is solely due to the fact that more material was found there. (The one exception is the concentration of burnt material towards the centre of this trench.) This is also reflected in the fills of features 30–2 (Table 7), which underlie the chipping floors in this area. The other obvious concentration can be seen in the sampled areas in F77, where a relatively restricted area produced large quantities of material. At the other extreme, the material from the northern end of trench 2 has relatively low densities.

Table 5—Metrical attributes of blades from in situ areas at Bay Farm 1 (after Johnson 1988).

<table>
<thead>
<tr>
<th>Trench</th>
<th>11</th>
<th>11a</th>
<th>11d</th>
<th>2a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>152</td>
<td>27</td>
<td>82</td>
<td>106</td>
</tr>
<tr>
<td>Length (cm)</td>
<td>7.73 ± 1.8</td>
<td>7.99 ± 1.8</td>
<td>7.79 ± 1.7</td>
<td>8.15 ± 1.9</td>
</tr>
<tr>
<td>Breadth (cm)</td>
<td>3.21 ± 0.8</td>
<td>3.42 ± 0.9</td>
<td>3.19 ± 0.8</td>
<td>3.44 ± 0.9</td>
</tr>
<tr>
<td>Platform depth (cm)</td>
<td>0.72 ± 0.4</td>
<td>0.74 ± 0.5</td>
<td>0.80 ± 0.4</td>
<td>0.73 ± 0.3</td>
</tr>
<tr>
<td>Bulbar thickness (cm)</td>
<td>0.89 ± 0.3</td>
<td>0.88 ± 0.4</td>
<td>0.91 ± 0.3</td>
<td>0.92 ± 0.3</td>
</tr>
</tbody>
</table>

In spite of those factors which might bias the distribution of the retouched tools, there was a genuine variation in tool types between the northern and southern areas. Therefore it seemed possible that other elements, such as blade forms, might also vary. Samples of blades from different areas were examined for morphological differences, i.e. significant variation in length, breadth, etc. In particular, the possibility of different shapes being produced in different areas had to be considered. Johnson (1988) examined samples of blades from different areas of the site.

Johnson felt that the variations noted were so slight that they could be considered within the normal range to be expected on an Irish Later Mesolithic site (see below). Therefore there is little reason to suspect the deliberate production of morphologically distinct blade types in different parts of the site.
Fig. 26—Distribution of cores, flakes and cortical flakes from trenches 2, 2a and 2c.
Fig. 27—Distribution of debitage and burnt material from trenches 2, 2a and 2c.
Table 6—Range of artefact forms recovered from each trench.

<table>
<thead>
<tr>
<th>Sq. 11:</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>188</td>
<td>1051</td>
<td>2341</td>
<td>4430</td>
<td>938</td>
</tr>
<tr>
<td>%</td>
<td>2</td>
<td>12</td>
<td>26</td>
<td>49</td>
<td>11</td>
</tr>
<tr>
<td>Level 4</td>
<td>62</td>
<td>474</td>
<td>1053</td>
<td>1511</td>
<td>337</td>
</tr>
<tr>
<td>Level 5</td>
<td>92</td>
<td>403</td>
<td>861</td>
<td>2318</td>
<td>177</td>
</tr>
<tr>
<td>Level 6</td>
<td>16</td>
<td>121</td>
<td>224</td>
<td>601</td>
<td>111</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sq. 11a:</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>40</td>
<td>337</td>
<td>900</td>
<td>662</td>
<td>258</td>
</tr>
<tr>
<td>%</td>
<td>4</td>
<td>15</td>
<td>41</td>
<td>30</td>
<td>12</td>
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</table>

<table>
<thead>
<tr>
<th>Sq. 2a:</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>204</td>
<td>1245</td>
<td>2238</td>
<td>4117</td>
<td>399</td>
</tr>
<tr>
<td>%</td>
<td>3</td>
<td>15</td>
<td>27</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Level 4</td>
<td>27</td>
<td>127</td>
<td>399</td>
<td>489</td>
<td>39</td>
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<tr>
<td>Level 5</td>
<td>111</td>
<td>644</td>
<td>1069</td>
<td>2118</td>
<td>115</td>
</tr>
<tr>
<td>Level 6</td>
<td>31</td>
<td>368</td>
<td>425</td>
<td>601</td>
<td>39</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Sq. 2:</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>18</td>
<td>79</td>
<td>175</td>
<td>257</td>
<td>32</td>
</tr>
<tr>
<td>%</td>
<td>3</td>
<td>14</td>
<td>31</td>
<td>46</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sq. 2c:</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>81</td>
<td>281</td>
<td>2234</td>
<td>674</td>
<td>556</td>
</tr>
<tr>
<td>%</td>
<td>2</td>
<td>7</td>
<td>58</td>
<td>18</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sq. 11d south:</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>22</td>
<td>101</td>
<td>690</td>
<td>184</td>
<td>30</td>
</tr>
<tr>
<td>%</td>
<td>2</td>
<td>10</td>
<td>69</td>
<td>18</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sq. 11d north (F77):</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>64</td>
<td>89</td>
<td>794</td>
<td>938</td>
<td>290</td>
</tr>
<tr>
<td>%</td>
<td>3</td>
<td>4</td>
<td>37</td>
<td>43</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F1 (trench F):</th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>111</td>
<td>347</td>
<td>459</td>
<td>834</td>
<td>20</td>
</tr>
<tr>
<td>%</td>
<td>6</td>
<td>20</td>
<td>26</td>
<td>47</td>
<td>1</td>
</tr>
</tbody>
</table>

In trench 11, even during excavation, it was apparent that there was more than a single level of occupation. Concentrations of charcoal were found scattered across the top of F23 and again at its base. This multiplicity of occupation can be seen by dividing the material from around F23 into three levels. A relatively high concentration of burnt flint was found in levels 4 and 6, while there was a much higher concentration of waste in level 5. As a contrast, F25 contained a relatively similar proportion of all forms throughout three levels.

Trench 11 is also one of the few trenches where it is possible to show genuine concentrations of cores within the trench (139/050-051) and charcoal spreads. At one point, a concentration of burnt hazelnut shells was found in 139–140/050.
Some of the absences and relative scarcity of material in the area 140–142/049–050 in the north-eastern part of the trench must be due to erosion. The other area where there was a distinct concentration of cores was in F77, the chipping floor, in trench 11d. In Table 6 this shows up as a slight rise in the overall number of cores taken from the sampled areas, but a visual inspection of the field plans for the southern area shows that a large concentration of cores was found along the northern edge of F77.

Table 7—Range of artefact forms recovered from selected features.

<table>
<thead>
<tr>
<th></th>
<th>Core</th>
<th>Cortical</th>
<th>Flake</th>
<th>Debitage</th>
<th>Burnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>F48</td>
<td>2</td>
<td>7</td>
<td>31</td>
<td>32</td>
<td>41</td>
</tr>
<tr>
<td>F66</td>
<td>1</td>
<td>10</td>
<td>59</td>
<td>116</td>
<td>3</td>
</tr>
<tr>
<td>F52</td>
<td>11</td>
<td>33</td>
<td>64</td>
<td>176</td>
<td>3</td>
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<tr>
<td>F30</td>
<td>4</td>
<td>4</td>
<td>17</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>F31</td>
<td></td>
<td>12</td>
<td>34</td>
<td>46</td>
<td>6</td>
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<td>F32</td>
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<td>4</td>
<td>47</td>
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<td>112</td>
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<tr>
<td>F9</td>
<td>111</td>
<td>347</td>
<td>459</td>
<td>834</td>
<td>20</td>
</tr>
</tbody>
</table>

As was noted earlier, some of the post-holes found in trench 11 formed an arc. We must assume that these could have been considerably deeper and cut through the chipping floors and then refilled by flint debris. Several post-holes began to show up as particular flint concentrations from up to 10cm higher in the stratigraphy. This suggests that they could have been at least 20cm deep and perhaps even more substantial. It is, of course, tempting on the basis of this arc of post-holes to reconstruct a hut, but the curvature of the arc is so slight that the hut would be immense. It is also placed inconveniently near the bottom of the slope in trench 11 so that any logical extension of it would run up this very short but sharp slope. Any examination of modern hunter-gatherer settlements shows the existence of numerous facilities or structures not necessarily associated with huts; for example, these post-holes could be part of the base of a drying rack. There would appear to be little relationship between the post-holes and the distribution of flint.

One noticeable aspect of the southern edge of the site is the absence of any hearths. Fires would seem to have been lit in a casual fashion wherever it suited. No groups of hearth stones or basin hearths of the type found at Mount Sandel were uncovered. One question which, of course, must be asked is whether the charcoal spreads represent in situ burning or rubbish discarded from elsewhere. The concentration of burnt flint in trench 11 in areas where there was charcoal would seem to suggest that the charcoal came from the casual lighting of small fires on top of, or under, the F23 chipping floor. Because the material from the chipping floor F77 was only sampled in a very limited manner, it is less certain whether the charcoal spread in that trench was dumped there or was an in situ fire, but even within the sampled areas there was a noticeable concentration of burnt flint.

The fact that material could have been dumped there from elsewhere raises the possibility that the debris came from an area of extensive settlement further upslope. It was for this reason that 11b and 11h were excavated and so much attention was paid to F1 in trench F9. Similarly, trench 11d was extended south-
wards up the slope. Excavation in this area did reveal a slightly lower (relative) level of industrial waste, though only in trench 11d was there a small scatter of retouched tools. In some of these upslope areas there was also a lower incidence ofdebitage, perhaps an indication of a lesser level of flint-working. Examination of the material from the disturbed levels of trench F9 and the in situ material from F1 within that trench, on the other hand, revealed another area of industrial activity further upslope. This may further indicate that the southern unexcavated areas did not contain extensive areas of settlement. The physical evidence from the excavations of these areas suggests a rather low level of occupation. This would seem to be supported by F. Hamond and R. Doggart (pers. comms), whose work on phosphates and magnetic susceptibility also suggested that intense occupation did not take place.

Northern area

The additional information derived from the distribution of artefacts adds little to our understanding of this area. The scatter of post-holes, again presumed to be only the bases of larger post-holes, does not form any coherent pattern, though the gullies F14, F85 and F52 could perhaps be described as forming an arc. The fact that some are filled with flint again suggests that they are associated with the chipping floor.

The low concentrations of charcoal and burnt flint would, however, suggest that this rather smaller chipping floor was not associated with any extensive occupation.

Flint concentrations

One particular phenomenon has to be considered separately. During the excavation, several concentrations of flint flakes were noted in shallow, irregular features: F66 (trench 11), F9 (trench 2), F85 and concentration A (trench 2c), and possibly F86 (trench 2a extension). Many other features, such as those found in trench 2a, F30–3, contained some flint but not quite in the same concentrations. It was thought that these features might have some special significance, particularly as a very specific group of better-quality blades was found on the northern end of Bay Farm.

Examination of Tables 6 and 7 and Fig. 28 shows that there was often no significant difference between these distinct concentrations as large cores and cortical flakes were found in them. The only slight trend in a few instances was a greater quantity ofdebitage, which suggests that these small pits had been deliberately filled with a selection of large pieces but do not represent, given the number of cortical flakes and cores within them, deliberate caching of blades intended for further use.

Faunal remains

In spite of the relatively neutral state of the soil, only one bone fragment was recovered and has been identified as cetacean. As two bones were found at the base of the disturbed levels it is presumed that the absence is not due to deterioration. The absence of burnt bone fragments also indicates an absence of faunal remains from the site. It is surprising that no burnt bone fragments were found associated with the charcoal.
Fig. 28—Length/breadth scatter diagrams of blades and flakes from selected features.
The use of refitting in the analysis of the Later Mesolithic assemblage from Bay Farm

As can be seen from the previous section, simple description or counting of artefacts does not provide an answer to many of the problems of the Bay Farm excavation. These problems tend to resolve themselves into two areas: (1) those associated with the particular Larnian technology, or how the blades were actually produced and why the flat uniplane core is such a distinctive element; and (2) was there any evidence for a high degree of organisation of knapping at Bay Farm, with tasks being carried out in particular areas, or did the excavation expose a more casual and multiple use of the area? Is there any evidence that a substantial portion of the by-products of the industrial activity was removed from the site? It was felt that these problems in particular could be best assessed through the technique of refitting.

The analysis of the assemblage centred on refitting of the sample recovered from the southern portion of the site, trenches 11, 11a and 11d. In addition, the blades were analysed for morphological and spatial variations in their production, while a sample was analysed for traces of use.

Aims of the analysis

Technology
The refitting concentrated on analysing the lithic technology, i.e. the preparation and production of flakes, with particular emphasis on the blades and 'Bann Flakes'. By refitting the flakes and cores into their original nodule forms it was hoped to identify the production technique in detail.

Spatial organisation
There were tentative indications that activity on the site may not have been confined to flake production. Scatters of charcoal and burnt hazelnut shells on the surface of the chipping floor suggested that activities other than knapping may have taken place. While these may simply be the result of casual activities directly associated with the flake production, they may indicate more substantial activity. In addition, the presence of over 30 retouched flakes and the possibility of some structural remains tentatively suggest other forms of activity. Within the assemblage distribution there may be evidence for organisation of knapping procedures or areas of specific flake production. On the other hand, it is quite possible that much of the material represents dumps of waste flakes and cores.

Functional traces
The possibility that some of the blades from the assemblage may have been used was investigated through microwear analysis (see Appendix I) in conjunction with the morphological analysis of a sample of the material.

Technique, Problems and Potential of Refitting

Refitting or conjoinning is a technique of reconstructing the original shape of objects which, either deliberately or accidentally, have been broken or shattered. The refitting of pottery sherds, for example, is an integral part of many ceramic studies, employed as a method of reconstructing the original shape of ceramic ware (e.g. Cahen and Van Berg 1979). The technique can be applied to virtually
any broken artefact type, from bone points (e.g. David 1972) to fire-shattered hearth stones (Julien 1972; Olive and Piggot 1982). Refitting is one of the most potentially useful techniques that can be applied in the analysis of lithic industries.

Although some of the earliest lithic refitting was carried out over 100 years ago (Spurrell 1880; Smith 1884), it is only recently that the technique has been acknowledged as an important part of lithic analysis. It has provided detailed information about the artefacts themselves and about their cultural and behavioural associations. The impressive results from a number of major refitting projects—such as Pincevent, France (Leroi-Gourhan and Brezillon 1966; Newcomer 1970), Rørmyr, Norway (Skar and Coulson 1986), and Boxgrove, England (Roberts 1986)—demonstrate some of the applications of the technique. In Ireland, however, the only documented example of lithic refitting is that of the Lough Beg Hoard (Woodman 1978a).

**Technique**

The general method of refitting lithic artefacts involves piecing together flakes, blades, retouched artefacts, debitage and cores which were originally knapped from the same nodule. Because of the uniform concoidal fracture of flint (and other siliceous mineral rocks) there are certain features which predetermine the manner in which the flakes must refit to their parent core. It is, effectively, the exact inverse of the knapping process.

The knapping process involves a gradual reduction of the core, with a series of flakes being detached in a direction determined by the knapper. Where the flakes are removed from a number of different directions, e.g. from a multi-platformed core, the refitted flakes will necessarily conjoin on different planes. On a uniplane/single-platformed core, however, the flakes will refit along the same axis, each ventral face conjoining with the dorsal face of its successor. Although the manner in which the flakes and cores refit is predetermined by the way in which they were produced, the success of refitting depends on other, independent factors:

(a) a general understanding of the lithic industry, with analysis of the types of cores in the assemblage which will provide some information on their production;

(b) the individual character of the flint, including the grain size, the colour and the presence of inclusions and/or impurities which can identify flakes and cores from the parent nodule;

(c) the general morphology of the flakes and cores, including platforms and bulbar thickness, flake profile and, most frequently, the outline of the flake in plan.

There are exceptions to the above, where, for example, the shape of an artefact has been modified by secondary retouch, thus obscuring the original outline, or where a flake has been shattered through burning or through frost action.

**The purpose of refitting**

Although the general approach to refitting appears to be relatively uniform for most assemblages, the methodological details may vary, depending on the reasons for applying the exercise in the first place. The purpose and value of refitting an assemblage will vary according to the individual assemblage, the condition of that material, the excavation, and the questions asked of that
particular assemblage. There are, however, three main aspects of a lithic assemblage and its site which may be examined through refitting. All three are relevant to the study of the Bay Farm assemblage.

(1) Technology

One of the central aims of lithic analysis is to determine the manner in which the artefacts were produced. This has most commonly been approached through experimental replication of the artefacts (see Johnson 1978) and through anthropological observation and analogy. Experimental replication of artefacts (e.g. Crabtree and Bordes 1969) explores the possible ways in which artefacts may have been produced. Observation of ethnographic production techniques provides other possible interpretations for prehistoric knapping modes. While both provide possible or probable modes of production, the results are not always detailed or objective enough. More often than not, it is possible to produce the same flake or implement in a number of different ways. In this respect, refitting provides an objective method of determining exactly how a core reduction was carried out. With each group of refitted flakes it will be possible to decipher a core reduction sequence, i.e. the sequence in which the flakes and blades were knapped from their original cores.

It must be stressed, however, that it is not normally possible to determine the percussor used through refitting alone. This factor can only be approached through the analysis of a number of features, as suggested by Ohnuma and Bergman (1982), which may then be used in conjunction with the evidence from refitting.

For example, Newcomer’s refitting of flakes from Swancombe, England (1970), demonstrates the use of refitting in identifying the technology and the manner in which the flakes had been produced. The Clactonian industry had previously been interpreted as a direct anvil (or block-on-block) method, i.e. swinging a flint nodule against a large rock or anvil, with little control over the direction in which the detached flakes fell. Newcomer suggested, however, that if the direct anvil approach had been employed, the resulting scatter of flakes would be wide and would have no perceptible patterning to their distribution. The pattern of refitted flakes at Swancombe was confined, the flakes having fallen from the core in a relatively tight arc or spread around the knapping area (see Newcomer and Sieveking 1980 on distribution of knapped flakes).

(2) Behavioural aspects

Once the core reduction sequence has been determined, a number of other features may be analysed, features which are related to the behavioural aspect of the assemblage and of the site.

(a) The history of individual flakes and their movement across the site may indicate spatially segregated or specialised activity areas. The spatial relationship between the refitted flakes may, for example, identify a flake which was produced in one area, taken to another, used and then abandoned.

(b) The elements which may be missing from a refitted nodule, for example a central blade which has been removed from the site for use elsewhere. The only evidence for the blade having been produced and removed from the site will be in the form of a shell of refitted flakes, indicating the blade’s original position.
(c) The original shape of the nodule, which may indicate, for example, a deliberate selection of a particular type, size or shape.

(d) Various other factors may also be assessed, such as the intention of the knapper in reducing the core, the individual style of the knapper, identifying particular individuals through characteristic features of a reduction sequence, etc.

A spread of lithic material over a large area may have no perceptible organisation to its distribution. Traditional statistical and morphological analyses may identify general aspects of the nature of the spread, e.g. concentrations of cores, flakes or debitage. These, in turn, may suggest general aspects of the activity, such as a knapping area or a rubbish dump. Anthropological and ethnographical analogies have traditionally provided the main source of information for interpreting behavioural aspects of sites where the nature of individual areas is not evident from the archaeological remains. Studies of the Nunamuit Eskimo (Binford 1978) have been used to interpret features on archaeological sites. Since these interpretations are based on analogy, however, they remain theoretical possibilities, without practical resolutions within themselves.

The impact of refitting on the interpretation of behavioural traits and site organisation is evident from work done on the assemblages from sites such as Pincevent (Leroi-Gourhan and Brezillon 1966), Meer II (Cahen et al. 1979) and Rørmyr II (Skar and Coulson 1986). The manner in which refitting can explore such difficulties as site formation and intra-site activity is well exemplified by the Magdalenian site of Pincevent. In one of the most precise and impressive analyses of an assemblage to date, the refitting contributed to the interpretation of on-site activities (tool production, use and resharpening, etc.) and to isolating areas where specific tasks had been carried out. The internal organisation of the site into food-processing, flint-working and habitation areas was identified through the refitted material.

(3) Stratigraphical aspects

The limited refitting carried out on the lithics from Terra Amata (Villa 1982) demonstrated how the stratigraphical sequence of a site can be misinterpreted throughout an excavation and how the actual stratigraphy can be determined through refitting of the material. Terra Amata (de Lumley and Boone 1976) was originally interpreted as a multi-phase site with apparent stratigraphical layering, both of soil and of artefacts, indicating several phases of occupation. The patterns of the refitted artefacts (Villa 1982), however, demonstrated an interrelationship between the layers. Flakes from the upper levels refitted with flakes from lower levels, indicating that the site was not a complex of independent levels but the result of a single phase of activity. Subsequent disturbance had redistributed the artefacts throughout the strata.

Likewise, refitting of artefacts from Hengistbury Head, England, dismissed the previous interpretation of two separate occupations of the site, demonstrating a single period of activity through the distribution of the refitted flakes (Barton and Bergman 1982).

LIMITING FACTORS

Refitting of prehistoric assemblages will vary, depending not only on the assemblage but also on the archaeological context of the material and the manner
in which the assemblage was excavated. There will frequently be limiting factors, such as the manner in which the artefacts were recorded during the excavation and the extent to which the site is excavated.

The potential information which can be retrieved from refitting is drastically reduced if, for example, the material is not systematically recorded with point-plotting and labelling of artefacts. Where systematic records are not made, the only information attainable would be the manner in which the artefacts were produced, i.e. the core reduction sequence. Similarly, much potential information may be lost when a site is only partially excavated or when there is a change in the approach during excavation, e.g. if sieving of the material is only introduced during the course of the excavation. It is therefore essential that the method of excavation should be planned in advance.

**INTERPRETATION OF REFITTED FLAKES**

The manner in which artefacts conjoin, and therefore the manner in which the artefacts were produced, can be divided into different types of refits. As a result of their refitting of the Meer II assemblage Cahen and Keeley (1980) outlined three types of refits, each representing particular activities and indicating particular activity areas.

Type 1: Refitted flakes demonstrating ‘curated’ artefacts brought to the area either as unretouched blanks (which were later modified into tools) or as fully formed tools which were used and resharpened in that area.

Type 2: Refitted flakes demonstrating tools which were prepared and used *in situ*.

Type 3: Refitted flakes demonstrating the remains left by the *in situ* preparation or the retouching and resharpening of a large series of tools, i.e. expeditiously made and used tool-kits.

Each of the above was defined by the following:

(1a) refitting of retouch or resharpening flakes to the tools, i.e. to complete the original tool form or blank;

(2a) refitting of a tool with the flakes which were struck from it, either before or after the removal of the tool blank, i.e. to complete the original, unmodified blank;

(3a) refitting of a group of tools together with blanks and debris from the manufacturing process.

**Type 1**

A site, for example, whose primary purpose was as a temporary camp for a hunting expedition would be expected to display type 1 refits, where some resharpening and reshaping of tools might have taken place incidentally to the primary purpose of the site. Such a site might resemble a Nunamuit Mask Eskimo site (Binford 1978). The assemblage would produce only a few retouched artefacts with much debitage and flakes indicating the nature of the activity, the majority of the tools having been removed from the site on abandonment.
Type 2

This type of refit appears to be the opposite of type 1. Whereas type 1 refers to the resharpening flakes, type 2 refers to the tools onto which the retouch flakes are refitted. Such an assemblage may represent a site or an area with a specific on-site function such as butchery, perhaps in association with other activity areas.

Type 3

This final category of refits illustrates the remains of a site whose primary purpose seems to have been the production of tools, many of which may have been removed from the site for use elsewhere.

These specific types of refits need not occur as isolated incidents, and types 1 and 2 will, necessarily, occur together. It is also possible to have elements of all three occurring on the one site, where flake production, flake use and flake resharpening took place. It would also be possible to have all three occurring in the same area of the one site. The occurrence of each type of refit has different implications for the site or area in which it occurs, and these may vary according to the archaeological and spatial context of the assemblage. The classifications are useful, however, in structuring the information from the refitting of many assemblages, but they are too restricted for others. Where knapping, artefact use and ‘curation’ occur on the one site, the categories are useful in describing the evidence.

Where an unretouched group of flakes is concerned, the classification is largely redundant, with the possible exception of type 3.

It is also based on the common and often erroneous assumption that a tool is retouched. Therefore if the Cahen and Keeley classification were applied to a Later Mesolithic site in Ireland, for example, the absence of types 1 and 2 might imply that there was no use or ‘curation’ of the artefacts simply because there are so few retouched artefacts.

Analysis of the Bay Farm 1 assemblage

As described above, Bay Farm was excavated as a series of trenches in two areas, one in the northern portion of the site and the other in the southern. The site produced two main knapping areas (features 23 and 25). Feature 23 (trenches 11, 11a and 11d; see Fig. 9) was considered to be the more complete of the two, with edges of the knapping area apparent, particularly in trench 11. The refitting, therefore, concentrated on this material. The assemblage from the southern portion of the site was spread over an area of 10m x 8m, but only 40m² of this were excavated. While the material was completely recovered from trenches 11 and 11a, that from trench 11d was only recovered in whole from the southernmost 3m x 2m area. Elsewhere in trench 11d the assemblage was sampled at random. In total, the assemblage from trenches 11, 11a and 11d numbered 226 cores, c. 1400 complete flakes and approximately 4200 broken flakes. Twelve per cent of the cores and 16% of the complete flakes were refitted.

As the Bay Farm 1 assemblages fall below some of the required standards outlined above, it is necessary to define quite clearly the purpose of a refitting programme at this site before reporting the general results obtained.
ANALYSIS OF KNAPPING METHODS

Technology
Identification of the manner in which the cores were reduced and the method of flake production. This involves simply reconstructing the core reduction sequence of a representative sample of cores across the site.

Blades
Identification of the way in which the blades, in particular, were produced. Were they deliberately produced as blades, or were they inadvertently produced in the normal course of core reduction?

'Bann Flakes'
Identification of the production method of 'Bann Flakes'. As with the blades, were they deliberately produced?

ANALYSIS OF BEHAVIOUR

Spatial distribution
Was the industry uniform in its distribution across the site or were there differences in core reduction and blade/flake production in different areas? Were there particular production areas for blades or 'Bann Flakes'? Can a spatial organisation be identified? Is there any further suggestion of occupation?

Interpretation of features
Can the patterning of refits contribute to the interpretation of features such as stake-holes, pits, the spreads of charcoal and the burnt hazelnut shells?

ANALYSIS OF SITE STRATIGRAPHY

Stratigraphical distribution
Does the assemblage represent a single phase of activity or is there evidence for different activity phases?

Disturbance
Is the assemblage largely in situ or is the disturbance greater than was suggested during excavation?

ANALYSIS OF KNAPPING TECHNIQUES

While only 12% of the cores from the southern portion of the site were successfully refitted, they formed an adequate range of material to be considered as representative of the majority of the assemblage. However, no example of a dual- or multi-platformed core was refitted, and therefore the information from the refitting is relevant only to the uniplane/single-platformed cores (Fig. 29:1, 2, 4), which represent 75% of the total core assemblage. Sixteen per cent of the complete flakes from the assemblage were refitted, either to their original core or with other flakes.

Core preparation
The occurrence of numerous large cortical flakes has already been noted. It was initially thought that the dome-shaped cortical flakes from the site could be
the initial flakes removed from nodules to create core faces, or even that they were possible blanks for cores. Further analysis, however, suggested that they were probably too thin to have served as such. The refitting demonstrated that the majority of the cores were initiated through the removal of a single cortical flake, but this removal created a core platform and not a core face.

Of 31 refitted cores, fifteen were refitted with this initial cortical cap, while virtually every group of refitted flakes suggests a similar preparation. The mean length for the refitted cortical caps is $8.8 \pm 2\text{cm}$, with a mean width of $6 \pm 1.7\text{cm}$ and a mean thickness of $2.5 \pm 1\text{cm}$.

This apparently simple technique of removing a thick cortical cap from one

Fig. 29—Cores with refitted flakes made from ovoid nodules
end of a nodule, creating a platform from which flakes were struck, is self-evident from the cores (e.g. Fig. 29:1, 2). The approach is by no means unique to the Later Mesolithic in Ireland and seems to occur throughout many European industries, particularly those involved in blade production, such as the French Upper Palaeolithic (Bordaz 1970, 37). Although such industries involve the same approach to starting a core, they utilise vastly different methods thereafter. The Upper Palaeolithic industries, for example, produced crested blades which have few similarities with Irish material. In the Larnian industry the majority of flakes were produced from one face only and from one platform. Platform rejuvenation, which was quite common in certain industries, e.g. Rørmyr II (Skar and Coulson

Fig. 30—Selection of cores with refitted flakes (1–3) made from ovoid nodules, and an elongated nodule (4).
1986), is relatively rare. The consequence of the Larnian approach was determined by the shape of the nodule, which also determined the size and shape of the initial cortical cap removed. There are three general classes of nodule shape in the Bay Farm 1 assemblage as determined by the refitting: (1) ovoid, (2) elongated and (3) miscellaneous.

(1) Ovoid. Within the refitted material this was the most common nodule shape, representing 76% of the total refitted cores. The ovoid shape effectively meant that, regardless of where the opening cortical cap was removed from, the maximum flake length possible was relatively uniform. Similarly, the depth of the core platform was not determined by where the flake was struck from, but by the size or thickness of the nodule. The cortical caps from this class tended to be relatively thick; in some examples the thickness of the cortical flake was up to 50% of the nodule length. The result of this was that the larger the proportion removed by the initial cortical cap, the shorter the potential flake length.

Core no. 2 (Fig. 29:3) demonstrates the removal of a thick cortical cap to provide the core platform and is a typical example. Core 1 (Fig. 30:1) is another example, while core 43 (Fig. 30:3) has a relatively small and thin cortical cap (c. 20% of the nodule length). The removal of the latter, apparently, was not sufficient to serve as a platform and a second flake was subsequently detached from the same plane. This second flake appears to have satisfied the requirements for the creation of the core platform and allowed further flake removal.

(2) Elongated. The main approach to this nodule shape was to remove a relatively thin cortical cap from one end of a nodule. Struck from the nodule at an angle perpendicular to the long axis, it allowed for the maximum possible flake length to be produced. The nodule shape permitted easy removal of this initial cortical cap because of its narrow end, which, once removed, provided a platform of maximum depth for that nodule. Twenty-four per cent of the refitted cores were from this class, with a mean length of 8 ± 1.3cm, a mean width of 7.9 ± 1.8cm, and a mean platform depth of 3.9 ± 1.7cm.

Core 44 (Fig. 30:4) illustrates this procedure, whereby an elongated nodule was struck at one end, removing a relatively thin cortical cap which exposed the flint platform. While this class allows a maximum flake length to be achieved, it restricts the number of flakes which could be removed from the nodule as the platform depth is generally not as deep as that of the ovoid nodules.

(3) Miscellaneous. There are a few examples where the initiation of a core is not as systematic as above. Core 40 (Fig. 31:1, 2), for example, appears to have been started in an ad hoc fashion, although the final stages of the reduction are generally in keeping with the standard for the site. It appears that the reason for this digression was simply the large size of the nodule (18cm x 12cm), making it difficult to work until it was split into two portions. The nodule is irregular, although roughly ovoid, and appears to have split when struck to remove the opening flakes.

The general approach to starting a core remains uniform regardless of the size of the nodules (apart from the exception above). Core 49 (Fig. 31:4), for example, is one of the smallest cores from the assemblage, being only 0.5cm in length. The original nodule was roughly ovoid and the cortical cap removed to create a
striking platform is only 6.3cm x 4.8cm x 1.7cm. Core 23 (Fig. 31:3) is also relatively small, with the maximum dimensions of the nodule being approximately 6.5cm x 6cm x 4cm. Although the core is not present, three flakes are refitted with the cortical cap. The arrangement is unusual in that the cortical cap refits at an angle of c. 45° to what would have been the core face. Nonetheless, the flakes were detached at the standard c. 110° angle to the ventral plane of the cortical cap.

The angle at which these cortical caps were removed or refitted remains standard throughout most of the refitted examples, regardless of the shape of the nodule. It refits at an obtuse angle of between 95° and 125° to the core face. As a result, the core platform angle was between 55° and 85°. The effect of this was to produce a core from which a standard length of flake could be removed throughout the reduction sequence. Flakes from core 37 (Fig. 31:5–8) demonstrate how

![Refitted portions of cores](https://example.com/image.png)

**Fig. 31**—Refitted portions of cores of miscellaneous character (1–2); examples of cores with associated large cortical flakes creating striking platform (3–4); and refitted blades from core 37 (5–8)
the flake length remained relatively standard throughout the core reduction, despite the virtually exhausted state of the final core. Core 15 indicated the intention of the knapper to retain a standard flaking angle on a core platform. The cortical cap was removed, leaving an obtuse platform angle of c. 140° to the intended core face. Since this was presumably too wide an angle from which to remove flakes, a second flake (not refitted) was struck from the same platform plane, leaving a less obtuse angle of c. 115° to the core face. This second flake was removed despite reducing the potential flake length by c. 2cm.

Core face preparation

It is at this point that the initially suggested sequence (see above, p. 165) differs from the refitted evidence. Rather than removing one large cortical flake from the nodule to create a core face (i.e. domed cortical flakes), a series of cortical flakes were removed to expose a flint face with a central ridge (see Fig. 32).

This sequence of removing a series of three cortical flakes, perpendicular to the core platform, to create a central ridge on the core face appears to have been common, particularly with the wider ovoid nodules. There are, however, no fully refitted elongated nodules, and therefore it is not possible to verify the manner in which they were reduced. While it is possible that the dome-shaped cortical flakes were removed from the front of these elongated nodules, it seems unlikely since the majority of the flakes are too thick and wide for the nodules. The cortical

Pt. III—Ovoid nodule (core 37) showing refitted flakes with cortical flakes removed from one side of core face.
Fig. 32—Schematic sequence for uniplane core development.
flakes which are removed to create a core face differ from the initial cortical caps in being considerably thinner. While the mean thickness of the cortical caps is 2.5 ± 1cm, that of the facial cortical flakes is 1.7 ± 0.3cm.

Core 37 (Pls III and IV) is one of the most completely refitted nodules from the site, and it demonstrates both the removal of an initial cortical cap, to provide a platform, and a series of cortical flakes perpendicular to that, to create the core face. The difference between the two types of initial opening flakes in this core is generally representative of those throughout the refitted ovoid nodules.

**Blade and flake production**

One hundred and seventy-six complete flakes and blades (16% of the total) and 55 broken were refitted to other flakes, cores or both. This sample appears to be representative of the assemblage as a whole. Sixty-seven (29%) of the flakes had a length/breadth ratio equal to or greater than 2:1; however, only seven of those were good-quality parallel-sided blades. The mean refitted flake length of 8.2 ± 1.5cm is only marginally longer than that for the refitted cores (7.7 ± 1.3cm), and the sequence of the most completely refitted nodules demonstrates a relatively uniform flake length throughout the reduction.

Flake production does not appear to have differed across or throughout the site. Once the cortical flakes had been detached, a series of secondary flakes were removed in a similar fashion. The removal of the initial cortical flakes left a central ridge on the core face. A flake or blade was then detached by striking the core

![Pl. IV—Core 37 with cortical flakes removed.](image-url)
platform directly above this ridge (Pls V and VI). Subsequent removal of two flakes or blades from either side of that flake resulted in a second central, or almost central, ridge on the core face (as in Fig. 32). This central ridge was created and utilised throughout the reduction to produce blades, flakes or blade-like flakes.

While removal of the ridge frequently resulted in the production of a blade, it was not exclusively utilised for that purpose. The production quality, likewise, was not consistent and a wide range of forms were produced. Core 51 (Fig. 33:3), for example, followed the general sequence of creating a ridge through the removal of three cortical flakes. The flake produced from the ridge in this case, however, is irregular, with neither edge being conceivably useful. Core 28 (Pl. V), in contrast, produced a good-quality blade using the same approach.

The varying flake quality suggests that while the central ridge was deliberately created and utilised, it may have been for reasons directly associated with the general technique—in other words, maximising the number of possible flakes from the nodule rather than being specifically designed for producing particular flakes or blades. The convex core face with a ridge (either single or double) made the core reduction considerably easier and more productive than it would have been with a flat core face.

The process of removing three flakes to produce a ridge was repeated on each newly exposed core face. As the reduction progressed, the core face tended to become less convex. On average, it produced nine flakes, including cortical flakes, unless the reduction was terminated owing to some defect in the core. There appears to have been one series of flake removals from a relatively flat face on a number of refitted cores (e.g. Fig. 33:2), which may generally represent a final stage in the reduction sequence. The flat face of a typical Larnian core seems to have been the result of a final removal of a central ridge (e.g. Fig. 33:1), without
any change in the method. While some of the discarded cores retain a ridged face, the majority seem to have been removed as a final step in the reduction. Core 16 (Fig. 34:1) illustrates this final flake removal.

It was not possible to identify a specific blade-producing technique apart from the normal sequence. While some of the better-quality, double-ridged blades (e.g. Fig. 34:3, 7) may reflect a variation of that sequence, it was not demonstrated by the refitted cores. Figure 34:2 shows one of the finest-quality blades from the site, refitted with two large, irregular flakes which did not illustrate the blade production. Similarly Fig. 34:6, a slightly pointed form, comes from the same core as more irregular forms. There is, undoubtedly, a varying degree of blade production evident, ranging from the less regular ‘blade-like flakes’ (Fig. 34:4) to the laminar, parallel-sided blades such as Fig. 34:2. Unfortunately, the refitted cores did not allow for a more complete assessment of the blade production, but it is evident that there was no consistent control over the types of blades produced from an individual core.

‘Bann Flake’ production

A primary question concerning the butt-trimmed forms/‘Bann Flakes’, and similar although unretouched flakes, is whether or not they were deliberately produced (Anderson and Johnson 1993). There is no doubt that they were at least deliberately selected and retouched. It is, however, possible that they were incidentally produced during the general knapping sequence (see Mitchell 1971). While some examples are only distinguished from the normal range of flakes by the presence of retouch, the classic ‘Bann Flake’ does seem to be distinct by being rather broad.

Of the 32 butt-trimmed forms and related forms, which included retouched blades and a tanged flake, 25 came from the southern portion of the site relevant

Pt. VI—Refitted core, flakes and blades (platform view).
Fig. 33—Uniplane Larnian core (1); uniplane core with final flake refitted (2); refitted core with failed attempt to remove central ridge (3); and refitted core minus two cortical flakes (4).
to this study. Two of these were refitted, one with a second flake and the other with a group of eight flakes. While the latter was not retouched, it was included in the ‘Bann Flake’ analysis on the basis of similar morphology. This flake refitted in the normal sequence for flakes throughout the assemblage and there was no indication of a deliberate production (Pl. VII). The retouched ‘Bann Flake’, however, is a particularly fine example, with retouch along both proximal edges (Fig. 34:5). While the same principle of creating a central ridge was employed, the angle of that ridge is considerably broader than the norm for the refitted flakes. This gave a broad, thin-sectioned flake which was formed through the previous removal of a curved blade-like flake (Pl. VIII). Given that there are only two flakes in the refit, it is not possible to be more specific about the production involved. The lack of cortex on either flake, however, and the relatively flat core face which the refit represents suggest that they were produced in the later stages of the core reduction. Neither the fine quality of the flint nor the neat trimming of platform edges are usual for the assemblage, and the latter, in particular, may indicate a deliberate production of these particular pieces.

Fig. 34—Core with refitted leaf-shaped flake (1); selection of blades (2-4, 6, 7); and ‘Bann Flake’ (5).
Pt. VII—Refitted flakes with leaf-shaped flake at centre.

Pt. VIII—Refitted 'Bann Flake' with refitted flake.
Fig. 35—Relative length of flakes throughout reduction sequence in selected cores.
While the lack of refitted butt-trimmed forms prevents detailed conclusions being reached, the general refitting suggests that cores were not prepared and reduced for the specific production of these flakes. While the broad leaf shape is not part of the normal range, there were some indications that they may have been produced in the final stage of the reduction, when the core face was flatter and slightly broader flakes were produced. Core 18 (Fig. 34:1) illustrates an irregular but leaf-shaped flake which refitted directly onto the core face. While this particular example broke during production, it suggests a tendency towards leaf-shaped flakes in the final reduction. There are also several cores which retain leaf-shaped flake scars (e.g. Fig. 33:1), again suggesting the above. In addition, the lack of cortex on the ‘Bann Flakes’ from the assemblage would seem to support this. While c. 70% of the unretouched flakes have some degree of cortex, few of the retouched artefacts have. Similarly, 82% of the refitted flakes have cortex, and those without tended to occur towards the final stages of the reduction (e.g. Fig. 29:1).

Flake breakage

As mentioned in the site description, there was a high incidence of broken flakes in the assemblage; 75% of the flakes were incomplete. Although only 24% of the refitted flakes and blades were broken, the difference is qualified, to a certain extent, by the difficulty involved in identifying conjoining flakes which are broken. The overall percentage (75%) is undoubtedly a truer reflection of their occurrence on the site. Given the nature of the assemblage, i.e. predominantly waste material, this is not exceptionally high and compares generally with that for other production sites (see Roberts 1986). There appears to have been, however, a standard point at which the flakes broke. Core no. 23, for example, has six conjoining flakes, of which all but one are broken. While the flake length varies slightly through the core, the relative point at which the flakes broke is similar, i.e. just under or over half of the original length. Similarly, flakes broken at the same point were refitted in cores 36 and 37. While a certain amount of damage would be expected from contemporary activities and post-depositional disturbance, this does not explain the standard breakage point. Fischer et al. (1984, 33) published illustrations of flakes accidentally broken during experimental production. Two in particular, which were broken when a hammerstone was dropped on a heap of flint, show a similar breakage pattern to many of the Bay Farm examples. The damage from trampling tended to produce tripartite fractures, which, although present in the Bay Farm assemblage, were not refitted. While these may explain the fracturing of many of the flakes, it seems unlikely that they would consistently produce the breakages noted on the refitted cores.

It is possible that many of these flakes were broken during the actual production as they were removed from the core. The size and shape of core no. 23 suggested that it may have been held in the hand during knapping. An apparent effect, noted during general experimental knapping, of holding a core too tightly in the hand can be that the detaching flake bounces against the palm as the percussive force runs through the flint, causing the flakes to snap in two.

Core abandonment

It has already been noted that many cores were abandoned before they were exhausted. It was initially thought that the cores were abandoned when the length
of the core face was reduced to such an extent that the desired length of flake could not be achieved. While the mean core length is $7.7 \pm 1.3\text{cm}$, the mean refitted flake length is $8.2 \pm 1.5\text{cm}$, indicating that some reduction in flake length occurred. This, however, was not exclusively responsible for the discarding of a core. Many of the refitted flakes retain a relatively standard length to the point at which they were abandoned (see Fig. 35), and several cores were abandoned which could have been worked further without any significant reduction in flake length (e.g. Fig. 35). The selection of the ovoid nodule shape appears to have resulted in a relatively uniform length of flake throughout the reduction.

Several factors appear to have influenced the point at which a core was abandoned. The most obvious is where a natural inclusion or impurity in the flint, e.g. chalk or a chalk cavity, prevented further flake production. Aligned to this, but due to human error, was when an irregularity in the core face could not be, or was not, corrected, i.e. a stepped core face or a protruding irregularity. In some cases the core platform became too narrow for further reduction, while in others the remaining platform was cortex-covered and therefore unsuitable for further reduction.

Undoubtedly the reduction of the core face to a flat plane was limiting the production of the sought-after laminar flakes which dominate most Irish Later Mesolithic assemblages. In many instances this could have been rectified and a more curved surface recreated, but the fact that so much flint was readily available on the nearby beach must also have influenced many decisions to abandon cores before they were exhausted. It would frequently have been easier to abandon a core and start afresh than to try to rectify an irregularity in the core being worked. This tendency is probably demonstrated by the absence of refitted core-rejuvenation or platform-rejuvenation flakes. None of the refitted cores indicates an attempt to rectify an irregularity.

Flint quality

While there appears to have been a deliberate selection of particular nodule shapes, the range of flint quality in the assemblage is broad, varying from poor-quality, coarse-grained and brittle flint to the less common fine-grained and dark flint. The present-day beach produces a similar selection of flint types, which is also dominated by the poorer-quality nodules. It is relatively easy, however, to select a flint type on the basis of the outer cortex, and in this way the finer-quality flint can be exploited. It is generally accepted that a purer, fine-grained flint is more desirable than the coarser-grained, since the homogeneous structure allows for greater control.

The refitted cores from Bay Farm, however, demonstrate a remarkably extensive working of poor-grade flint. Many cores were worked to the point of exhaustion without a single flake having been removed from the site. Core no. 35 (Fig. 33:4) is a typical example, where a coarse-grained and brittle flint nodule was reduced without a single regular flake produced. The refit is complete except for two cortical flakes which are unlikely to have been useful.

At the other end of the scale, there are very few fine-grained cores which refitted to the same extent. The particularly fine-quality flint with scree-fresh cortex represents only 5% of the refitted cores, and these are only partially complete (cores 3, 12 and 21). This small percentage is in keeping with the 1% of
the complete assemblage represented by scree flint. Given the distinctiveness of the cortex and the flint, it is almost certain that if the remainder of these cores were present in the assemblage they would have been noticed. The low success rate in the refitting of this material initially suggested that many of the flakes may have been burnt or patinated and thus rendered unrecognisable. Repeated investigation of this possibility, however, failed to produce further flakes or cores. The possibility that this finer-quality flint had a higher incidence of use and therefore was removed from the site was also considered. It is not possible, however, to verify this since the same flakes may lie in the adjacent unexcavated ground. In addition to this, the fresh-cortex flint may have been brought onto the site as prepared nodules, i.e. having been partially reduced at the source of the raw material. One nodule in particular suggests this: core no. 21 is a large and irregular group of four flakes which appear to be only a small part of a considerably larger nodule. Again, however, the remainder of this core may simply be unexcavated.

Fig. 36—Distribution of refitted cores and flakes in trenches 11, 11a and 11d.
FLAKE REMOVAL

During excavation it was thought likely that numerous good-quality blades were removed from the site and that there would usually only be the core, cortical and poor-quality flakes left. While certain cores are clearly lacking blades, it is apparent that cores with a number of central flakes missing, such as Fig. 37:2, are relatively rare. The Larnian method, particularly as used at Bay Farm, does not seem to lend itself to the production of numerous good-quality flakes from each core. As noted earlier, it was usual to remove less than ten flakes from each core—hardly an efficient form of specialised production.

SPATIAL DISTRIBUTION

The lack of complete excavation and retrieval of the assemblage imposed limitations on the extent to which flakes refitted and the interpretations of the

Fig. 37—Core 42, the largest refitted core from Bay Farm (1), and a refitted core showing gap created by missing flakes (2).
results. It was not possible, for example, to confirm whether the missing flakes from certain cores lay unexcavated in the adjacent area or were removed from the site. Likewise, the density of the assemblage and the lack of detailed archaeological and stratigraphical context prevent conclusions from being reached in some cases. Nonetheless, the refitted flakes and cores provided some general information on the spatial distribution of the material.

**Horizontal distribution**

Experimental knapping has suggested that the spread of material from flake and blade production with a hard-hammer will normally result in a relatively tight arc around the knapper (Newcomer and Sieveking 1980). There are, however, numerous variables to be considered, including the knapper’s position (sitting on the ground, seated on a stone, standing, etc.), the percussion technique used (hard- or soft-hammer), the method of percussion (direct or indirect), and the way in which the core is held during knapping (in the hand, against the thigh, etc.). The resulting scatters can differ considerably depending on such variables. Knapping from a standing position, for example, can result in a wider flake scatter, with some flakes travelling up to 4m from the knapper. Although using a punch percussion resulted in a similarly wide scatter of flakes, direct percussion with a hard-hammer resulted in a tight arc around the knapper. Experiments carried out during the course of this research, although less controlled, produced similar results. A sheet, marked out with square metres, was laid out, with the knapper’s position clearly marked. The core reduction was carried out using direct hard-hammer percussion. The resultant scatter of flakes from the reduction of three cores was tightly confined to within 50cm of the knapper. Similarly, in the course of casual knapping, flakes over 3–4cm long were rarely noted to have travelled more than 2–3m. This, in general, suggests that where cores and flakes refit from within 1m² they can be interpreted as representing *in situ* knapping incidents, with the obvious factor of possible disturbance taken into account. An exception to this is the possibility of material being dumped or shifted, resulting in discrete groups of refits (see below).

The horizontal patterning of the refits from Bay Farm in general seems to confirm the original interpretation of *in situ* knapping, with some disturbance evident. Refitted cores, flakes and blades generally occurred within 1m² of each other, but with several exceptions (Fig. 36). Three of the most completely refitted cores followed this trend. The largest and heaviest of these (core 42) consisted of eleven flakes and two cores, all lying within 1m² (Fig. 37:1). Core no. 37 is c. 90% complete, and the core, flakes and debitage were confined to a single 50cm square. Similarly, core no. 36 refitted from 1m². The absence of detailed indications for *in situ* knapping (arcs of material or fan-shaped spreads) is probably due simply to the density of artefacts recovered from the site.

While this general pattern occurred in most areas of the trenches analysed, there were several exceptions. In trench 11 there were two particularly interesting examples. Core no. 29 is a group of five refits, including four flakes and one blade. The four flakes occurred together within the same 50cm square, while the blade was found 1.5–2.5m away. Although this is well within the normal range, it may indicate the blade having been placed to one side of a knapper. Such a tendency has been noted, for example, at Pincevent (Leroi-Gourhan and Brezillon 1966),
where blades consistently occurred in concentrations to one side of a knapping spread (Newcomer and Sieveking 1980, 347). While one single incident at Bay Farm hardly constitutes a trend, it is a possible explanation for the distribution in this case. The second notable example, from the northern part of the trenches examined, was that of a ‘Bann Flake’ which refitted with an equally impressive unretouched flake (Pl. VIII). They were separated by 4.5–5.5m, occurring in different excavation trenches—the retouched flake in trench 11, the unretouched in trench 11a. Despite the distinctive fine-grained and fresh flint type, the rest of this core was not found, and it is most likely, given the distribution of the assemblage in both trenches, that it lies in the unexcavated area between. Nevertheless, 4–5m is a considerable distance between two relatively large flakes which show no sign of damage, suggesting that their distribution is not due to natural causes. Is it possible that they were both knapped in one area (trench 11a), and the leaf-shaped flake then taken a short distance away and retouched where it was found in trench 11? While there was no indication of a retouching area, the majority of the retouched flakes occurred in trench 11. If secondary work was executed to a greater degree on artefacts which were to be removed from the site, it may have been assigned to a particular area. Designating retouching areas on the basis of one flake, however, is not reasonable, and it is possible that these two flakes were separated naturally during knapping. Both were examined for microscopic traces of use but neither showed use-related traces (E. Anderson, pers. comm.).

Another notable feature in trench 11 was the occurrence of a core refitted with a single flake, while a second, unrefitted flake was also identified, probably from the same core, from the southernmost end of the trench. These occur outside the concentration of the assemblage and the refits and are from the same 50cm square, implying that they were knapped in situ. They seem to represent an isolated knapping incident away from the central area.

The distribution of the refits from the southern end of trench 11d is more densely concentrated than that in trench 11 (see Fig. 36). The pattern of refits suggests that the material might have been dumped in this area, so intense was the concentration. In one 50cm square 22 flakes, from nine different cores, were refitted. If Bay Farm represented a substantial industrial site, with consistent maintenance of the chipping floors, waste material may well have been shifted and cleared from one area to another. It is unlikely, however, that complete nodules would be reconstructed from dumped material, with all the flakes conveniently lifted and dumped in a 50cm² area. While some dumping may have occurred on the site, it seems more likely that the refits from trench 11d represent in situ knapping. In addition, there was no apparent evidence for maintenance in any area analysed.

In trench 11d the distance between two flakes was sometimes as great as 5m (see Fig. 36). One particular flake was found 6–7m away from its core. Similarly, core no. 39 consisted of only two flakes found at either end of the trench, with 5–6m between them. The flakes are not particularly regular and there is no obvious reason why they should have been separated by such a distance. It is possible, of course, that disturbance, contemporary with the site activity or caused by post-depositional factors, was responsible for their distribution. In this instance, where refits are being attempted along a north–south axis in trench 11d, another factor has to be considered. The extension to the chipping floor, F77, was not fully excavated and only a sample of material was removed; therefore it is highly likely that other refits could remain
undetected amongst the unsampled material. It may be that part of F77 could be a
dump area for artefacts which were produced further south.

Overall, the distribution of refitted flakes and blades seems to suggest
relatively undisturbed knapping incidents. The effect which the modern drainage
trenches had on the assemblage, however, was not clearly demonstrated. While in
trench 11 the refits are generally confined to the area between two main gullies,
there is some movement of flakes which does not seem to have been caused by
natural disturbance. The distribution in trenches 11 and 11a suggests that the
unexcavated area between them must contain a considerable amount of the
assemblage. In other areas, particularly in trench 11, the digging of the drainage
gullies must also have been responsible for the partially refitted nodules. In spite
of the limited area excavated, the absence of refits between 11d and 11/11a would
suggest two entirely different episodes.

Vertical distribution

The stratigraphic layering of the assemblage could not be defined during
excavation, and therefore it was not possible to determine whether the site
represented single- or multi-phased activity. In general, there were direct refits
throughout all levels, from the highest (level 3) to the lowest (level 7), although the
vast majority came from the lower levels 5, 6 and 7. Several cores matched flakes
from these lower levels across the site. Without detailed stratigraphical evidence,
however, it is not possible to determine whether these cores represent single-phased
knapping or simply individual cores being reduced over a period of time. Given the
overall context, however, it seems likely that the results represent roughly
contemporary knapping incidents. There is much doubt about the interpretation of
level 4, which was the highest level of apparently in situ Mesolithic activity in trench
11. There was a relatively thin scatter of material from this level but, despite the lack
of quantity, some of the finest-quality flakes were recovered from it. The refitted
'Bann Flake' and the blade described earlier both came from level 4. While it could
not be conclusively demonstrated, the overall impression was that this level may
represent later activity, post-dating the creation of the chipping floor F23.

Interpretation of features

A number of stake-holes occurred across the site with no identifiable pattern
to their distribution. There were, however, four stake-holes which appeared to
form a row with a slight curve (Fig. 38, features 68, 72A, 74 and 75). It was
suggested that these may represent the remains of a simple structure such as a
drying rack, or perhaps a wind-break or some such form of shelter for the
knappers. If such a structure had existed contemporaneously with the main
knapping in the trench 11 area, the patterns of the refits ought to have
demonstrated this, e.g. it could be expected that the refitted flakes and cores
would be confined to one side of the row of stake-holes. Their distribution,
however, covers the area irrespective of these features, and it is not possible,
therefore, to interpret the features.

Only one of the pits was positively associated with refitted artefacts. Feature 66
(Fig. 38) lay on the northern edge of a modern drainage gully but produced a
core and nine flakes comprising c. 95% of the original nodule. This nodule
included the smallest pieces ofdebitage refitted from the site, three pieces less
Fig. 38—Distribution of refitted material and features.
than 2cm in length. It is highly unlikely that thedebitage, in particular, would be deliberately placed in a pit, and the flakes from the core are not particularly regular. While the digging of the drainage trenches may have affected some of the material in the area, it seems to have left other parts intact. The presence ofdebitage suggests that this core was knapped in situ. The pit may have been some form of natural hollow or disused pit, which caught the debris from the knapping of this core.

At the southern end of trench 11d a charcoal-stained circular feature occurred (Fig. 38). While the chemical analysis of the soil sample did not indicate significant burning, the feature occurred in an area of concentrated refits whose distribution appears to respect the immediate area around the feature (Fig. 38). It is possible that this represents a discrete knapping area centred around a small fire, although the chemical analysis does not support this. There was no other evidence in the area to confirm the nature of this feature. It was, however, the only area on the site where refits apparently occurred around and not over a feature.

The refit patterns did not contribute further to the interpretation of the hazelnut and charcoal spreads. The distribution of both the organic material and the refitted flakes and cores generally reflected the concentration of the assemblage as identified during excavation. While it had been hoped that refitting of burnt flakes would indicate areas of in situ burning, only occasional burnt fragments refitted and did not provide additional information.

**SUMMARY**

The aspect of the assemblage most successfully explored through the refitting was the technology. A number of standard features were identified.

(a) Two nodule shapes were evident, one elongated, the other ovoid. The latter was by far the most common, 74% of all identifiable shapes. Although it was not possible to demonstrate it conclusively, it seems likely that the nodules were selected for different purposes: the ovoid examples seem to have provided a relatively large number of moderately long flakes, while the elongated examples possibly produced longer and narrower flakes and blades.

(b) Without exception, the method of opening a nodule was through the removal of one cortical cap perpendicular to the intended core face. This removal created a core platform from which the flakes were removed.

(c) Flake production was carried out in a relatively standard series of stages, each stage removing three or four flakes. The reduction depended on the creation of a central or near-central ridge on the core face. This ridge was consistently created and removed throughout the reduction, producing a range of flake types including good-quality blades. The removal is represented on the detached flakes by a central ridge on the dorsal face. The difference between these and the dual-ridged, parallel-sided blades appears to have been partially the angle at which the ridge is created, and partially the point above the ridge at which the platform is struck (see Fig. 34). While the statistical evaluation did not identify any significant difference between flakes produced in the early and later stages of the reduction, there seemed to be a tendency for the final flakes to be broader. This would coincide with the stage at which the core face
became relatively flat, having been convex throughout most of the reduction. Although lacking definite evidence, it is not unreasonable to suggest that the broad, leaf-shaped flakes were produced in the final stages.

(d) The maximum number of flakes from any one refitted core was twelve, of which three were cortical. On average, based on the relatively few completely refitted nodules, between six and ten flakes were produced per core.

(e) There was no evidence to contradict the original interpretation of the use of direct, hard-hammer percussion (Woodman 1978a). The refitted flakes illustrated a range of platform depths, from less than 0.2cm to over 1cm. The large, pronounced bulbs and the ring cracks evident on many support that interpretation. Only 14% of refitted flakes/blades showed signs of platform preparation. Usually this was on the platform edge rather than on the surface of the platform, but this figure is only just below the overall percentage for the assemblage. While some flakes were neatly trimmed on their platform edges (e.g. Fig. 34:6, 7), the majority of prepared flakes showed only slight scrubbing which did not alter the shape of the platform edge.

The spatial distribution of refits generally followed the concentrations of cores, flakes anddebitage from the excavation. Refitted flakes and cores tended, with some exceptions, to occur within 1m² of each other. Of these, the most notable came from the northern portion of trench 11 and the adjacent trench 11a (see Fig. 36). Here several good-quality flakes/blades refitted across an area of 5–6m. A combination of the distribution of these flakes, their occurrence in the upper level 4, and their relatively good-quality fresh flint sets them apart from the normal refitted flakes. While there are no stratigraphical or morphological details to confirm the suggestion, it is possible that these flakes belong to a late phase of activity which happened after the formation of F23.

Stratigraphical phasing of the assemblage was not apparent in the refitted flakes and cores. In several cases, flakes from the three main levels (4, 5 and 6) were refitted in the same core. These do not necessarily indicate a single phase of activity, however, and are only indicative of individual knapping incidents. The overall evidence suggests that the assemblage represents such activity, i.e. individual knapping episodes, without any complex organisation evident. The possibility that specialised production areas existed outside of the excavation trenches is indicated by negative refitting evidence, i.e. the lack of refitted classic blades and ‘Bann Flakes’. Their presence in the assemblage suggests that a certain amount of exceptionally good-quality production took place. There was, however, only limited evidence for that in the refitted assemblage.

The results of the Bay Farm 1 excavation

While the excavations were undertaken with the hope of providing a series of answers to questions posed in the Introduction, the nature and condition of the surviving material have rather limited the conclusions which can be drawn.

Assessment of behaviour

In particular, the partial destruction of the site and the limited extent of excavation have placed a series of constraints on our interpretation of its function.
These problems have been compounded by the fact that much of the material was not in a good condition for microwear analysis (Appendix I), and therefore much of the interpretation of function must be based on observation, chemical analysis and refitting.

Substantial settlement might, of course, have been masked by knapping debris, which would create a spurious impression that only industrial activity took place. However, both F. Hamond in a phosphate survey of the site and R. Doggart in a magnetic susceptibility survey recorded relatively low readings, which suggests that, in comparison to sites such as Mount Sandel, there was never anything more than a limited occupation in this part of Bay Farm. This would seem to be supported by the absence of any concentration of substantial features on the site, e.g. deep pits, dug or built hearths, etc. In fact, the origin of many of the irregular features such as F9, F85 or F31 must remain uncertain, and while it is tempting to see F17, F14/88, F52 and F76 as gullies created through human activity, it is quite possible that they are of natural origin. The few stake-holes, such as the row running for 5m from F63 to F78 on the northern portion of the site or the shorter run from F68 to F71 in trench 11, could be considered as being of more certain human origin, but whether they were associated with a hut, a wind-break or some other facility for nets or fishing, etc., is unknown.

As has been noted in the site description, settlement associated with the areas of industrial activity need not necessarily have been confined to the area of the chipping floors; therefore trench 11e and trench F9 were opened to look for evidence of settlement to the south and upslope from the chipping floors. While one lens of phosphate-rich soil was found within F1 in trench F9, these areas tended to produce the same range of industrial waste as the chipping floors. There is, therefore, no clear evidence of a substantial settlement in the immediate vicinity of the chipping floors excavated at Bay Farm 1. This is confirmed by the virtual absence of Mesolithic settlement in Mallory's excavation at Bay Farm 3. The only possible indicator of some activities associated with the use of blades rather than their production was the scatter of material in the upper part of level 4 in trench 11. While this material probably washed into the upper portion of this level, it had to be derived from somewhere, and there was undoubtedly a greater tendency for usable blades and flakes to occur in this level. This is not enough to explain all the industrial activity but is a slight indication of some other activities going on in the vicinity of the chipping floors.

If the site was not associated with a major settlement then it is highly probable that it should be considered as little more than an area of industrial activity. In the refitting analysis of the material with particular reference to the southern group of trenches, the possibility was examined that the chipping floors could be divided up into specialist work areas, and that a substantial proportion of the end-products produced at the chipping floors was removed.

However, the very nature of the site rather limited the potential for refitting. It could hardly be considered in the same category as Rørmyr II (Skar and Coulson 1986) or, in particular, Bare-Mosse (Skar 1987), where the total assemblage could be presumed to have been recovered. In spite of these limitations, it was shown that much of the chipping floor in trench 11 accumulated as a result of a series of knapping activities in which much of the debris was simply left where it fell. While there was some evidence of pieces joining through the chipping floor, much of the material which refitted came from within a single
square metre. It was felt that this was commensurate with knapping taking place while someone was squatting on the chipping floor. A few refits were obtained over longer distances, up to 6m, but these were confined to the layer overlying the chipping floor. As a slight contrast, the material from trench 11d did show that, while much of the material from the southern end of the trench was simply abandoned on the spot, some material was dumped in an area of cores to the north (F77). This tendency might have been more apparent if F77 had been fully excavated rather than just sampled.

The evidence for the removal of blades from this area is not entirely clear. Many cores have been refitted to the extent that it is obvious that very few of their blades have left the site. None of the butt-trimmed forms found could be refitted to cores. However, less than 40 butt-trimmed forms were found, while over 1000 cores were recovered; the problems of establishing refits would be immense. Thirteen butt-trimmed forms were found in trench 11 and six of these were in level 4, where a tendency was noted for material to be scattered more widely.

There is undoubtedly a tendency for the poorer cores to refit more completely as less would be removed, but while it is apparent that a number of blades are missing, the fact that this pattern cannot be reconstructed in a large number of cases would once again suggest that the debris remaining on this site cannot be regarded as the discard from a series of activities whose sole purpose was to produce blades for use elsewhere. Instead there would simply seem to be an accumulation of activities.

(1) In trench 11/11a, in relation to the accumulation of chipping floor F23, the observation from the use-wear analysis is of crucial importance. As much of the material is slightly weathered, this chipping floor may have lain open and the material may have accumulated over a number of years.

(2) After its accumulation, in fact post-dating the \(^{14}\)C dates for F23, there was a final event in which material was scattered over a larger area. A significant number of the butt-trimmed forms are associated with this event.

(3) As there is no evidence for refitting between trenches 11a/11 and 11d, it is possible that the accumulation of material beside F80 represents a separate series of events. In this case the limited refitting suggested that by-products from activities at the southern end of trench 11d were dumped in F77, perhaps along with charcoal from fires.

(4) In area 2a was the last remnant of another chipping floor, whose contents may have been mostly eroded downslope into the upper levels of trenches 2c and 2. The separate nature of this chipping floor is emphasised by the fact that few butt-trimmed forms occurred in it but instead a number of other retouched tools were recovered.

(5) A further chipping floor may have existed in the vicinity of F1 in trench F9. The only material which could be regarded as possibly \textit{in situ} was that recovered from F1, as ploughing had disturbed the rest of the area. Even in this case either nature or man had pushed the debris into this large irregular hollow (Fig. 39 is a schematic representation of some of these events).

Other chipping floors obviously littered this area. Material was washed downslope into trench 11c, but further upslope, in Bay Farm 3, virtually no Mesolithic
material was uncovered. One little pit in Bay Farm 3 (trench 6) produced a ‘Bann Flake’ and some blades. On the other hand, test pit 9 revealed that the beach deposits of the littorina transgression had been pushed out and flattened and also contained the same range of material. This was confirmed in trench 31, which cut through beach deposits and exposed the same range of material pre-dating the beach deposits.

Technology of the Later Mesolithic at Bay Farm

The method of manufacture, traditionally described as the Larnian method, has been clearly demonstrated. In particular, it has been shown that the classic uniplane core is not so much an integral feature during reduction of a core but rather a frequent by-product which is a limitation to the further effective utilisation of the core. It has also been shown that frequently very few useful flakes and blades are produced from each core, with the result that large quantities of by-products are left after the production of a relatively small number of usable flakes.

It is apparent that the main purpose of the Larnian knapping method is to produce what should perhaps be described as laminar flakes. However, within that category there are many different forms, in particular broad leaf-shaped forms as well as the more laminar pieces. With such a high proportion of the artefacts from the Later Mesolithic being used without secondary retouch, there remained the possibility that there was a conscious policy to produce blades or flakes of a particular form; therefore a detailed analysis of flake form was carried out by Johnson (1988). No significant variation could be detected between areas, and Johnson felt that the full range of blade forms could be seen within a single core.

A direct comparison with other Mesolithic assemblages is obviously quite difficult. This is perhaps best seen by comparison with Newferry zone 4, where virtually no industrial by-products occur. At Newferry the flint assemblage is, with the exception of zone 7, mainly dominated by retouched pieces and laminar flakes. Newferry zones 8 and 4 are included for comparison.

<table>
<thead>
<tr>
<th></th>
<th>Newferry Zone 8</th>
<th>Newferry Zone 4</th>
<th>Bay Farm 1 11d</th>
<th>Bay Farm 1 11</th>
<th>Bay Farm 1 2a</th>
<th>Sutton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2:1</td>
<td>12</td>
<td>19</td>
<td>34</td>
<td>73</td>
<td>55</td>
<td>22</td>
</tr>
<tr>
<td>2:1–3:1</td>
<td>32</td>
<td>52</td>
<td>19</td>
<td>24</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>3:1–4:1</td>
<td>24</td>
<td>24</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>More than 4:1</td>
<td>32</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Mean flake length of flakes &gt;3cm</td>
<td>7.45</td>
<td>6.94</td>
<td>5.51</td>
<td>5.92</td>
<td>6.37</td>
<td>5.41</td>
</tr>
</tbody>
</table>

While there are quite a number of high-quality blades at Bay Farm, there is a clear and significant reduction in the percentage of more laminar forms and in flake length. This must indicate that a certain number of blades have been removed from the site. The Curran Point assemblage of fresh material from Larne, Co. Antrim (Woodman 1978a, fig. 21), shows the same tendency as Bay Farm, while the Sutton assemblage has perhaps a better balance of discarded industrial by-products and finished tools.
The other obvious comparison is with the retouched tools from other Mesolithic sites. In one sense, on the basis of previous discussion, this must be a slightly spurious comparison as this site may represent such a limited portion of the activities of a Later Mesolithic community. Like most Later Mesolithic assemblages, Bay Farm is dominated by butt-trimmed forms, but there the resemblance to other Later Mesolithic assemblages ends. Like Newferry zone 6, there are a number of notched pieces, but there are no points, bar forms or core implements—axes, borers or picks. As noted earlier, there is no evidence that core implements were even made at Bay Farm. Similarly there is no evidence that ground stone axes were ever used in the Mesolithic at Bay Farm. Perhaps the most noticeable absence is the bevelled piece...
which occurs with some frequency in the Leinster shell-middens. Many of these differences can be attributed to functional differences between sites—thus the bevelled pebbles are usually associated with shell-middens.

Table 9—Range of retouched tools from selected sites.

<table>
<thead>
<tr>
<th>Newferry zone 4</th>
<th>Leinster middens</th>
<th>Lough Kinale</th>
<th>Bay Farm 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butt-trimmed</td>
<td>62</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Distal</td>
<td>16</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Backed</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Spokeshaves</td>
<td>—</td>
<td>—</td>
<td>3</td>
</tr>
<tr>
<td>Scrapers</td>
<td>2</td>
<td>4 (?)</td>
<td>—</td>
</tr>
<tr>
<td>Points and bar forms</td>
<td>16</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Picks and borers</td>
<td>—</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>Flint axes</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Ground stone axes</td>
<td>9</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Bevelled pebbles</td>
<td>—</td>
<td>31</td>
<td>—</td>
</tr>
</tbody>
</table>

Although the large size of the so-called Larnian blades has frequently been emphasised as a characteristic of the Irish Later Mesolithic, this attribute may be more apparent than real. Usable blades tend to be 6–8cm in length, and very few are over 10cm long. Caches of Neolithic forms from Ballyalton and Ballymacpeake (Woodman 1992) tend to be of a similar length. In fact, amongst discarded material on the Antrim coast, while the mean length of Neolithic material from Mad Man’s Window is of similar mean length to the Later Mesolithic material from Bay Farm, there are occasional flakes in Neolithic contexts that are more massive than the Mesolithic forms (Woodman 1992).

The excavation of Bay Farm 1 in its broader context

The site of Bay Farm must also be placed in the context of its own environment. On the Antrim coast by about 6000 BP the sea-level had risen to its maximum relative level and had created a bay which was significantly different from that of today. It is known from fieldwalking in the area that the second or inner ridge of beach shingle on which Bay Farm Cottage had been built contained unrolled Later Mesolithic material near its top (Bay Farm 4), while the outer, more extensive and impressive ridge only contained rolled material and may therefore be a slightly later phenomenon of the regression stage. This is slightly different from Prior’s (1966) suggestion, which dated the inner ridge to Pollen Zone IV and the outer ridge to the maximum Littorina Transgression.

The Bay Farm chipping floors must therefore be seen as lying close to the outer shore of the bay on a relatively flat terrace but with minimal traces of occupation away from the shoreline (see J. Mallory, Bay Farm 3, in preparation). The debris from close to Bay Farm Cottage is likely to be an extension of the series of Late Mesolithic chipping floors. The main question which this particular positioning of sites poses is whether the industrial activity found at Bay Farm is associated with extensive Mesolithic settlement in the immediate vicinity. This possibility was investigated through a programme of fieldwalking and through
Fig. 40—Location of Mesolithic sites in the Bay Farm area.
access to the collection of the late Mr William Stewart of Carnlough. Unfortunately the Glens of Antrim are, at the moment, an area of pasture rather than arable farming, and therefore the opportunity to carry out fieldwalking was very limited. However, as can be seen from Fig. 40, no significant concentration of Mesolithic material could be found outside the coastal zone. The limited fieldwalking programme did identify extensive later prehistoric occupation in the area. Besides the discovery of several upland Neolithic settlements, including Windy Ridge (Woodman et al. 1994), Mr Stewart found traces of at least three lowland Neolithic settlement sites at Belair, Galdanagh and the so-called College site. These emphasise even further the narrowness of the distribution of Later Mesolithic material in this area.

However, one of the major problems of the Irish Later Mesolithic is the significance of the occasional ‘Bann Flake’ or related artefact which is found away from riverine and coastal contexts. These stray finds occur in very small numbers in several areas, e.g. in the Lowry Coll in Donegal, where they come from the same townlands in the Raphoe area as large quantities of later prehistoric material (Woodman 1978a; Flanagan 1968). Much of the obvious activity in the Later Mesolithic is concentrated in certain locations such as river narrows, coastal sites and islands, but with a certain degree of ‘curation’ of the artefacts these other occasional finds might represent an important, though less obvious, exploitation of other environments. Their complete absence from William Stewart’s collection suggests that this use of the glen was very limited. The occurrence of one tanged ‘Bann Flake’ at Windy Ridge at 300m above sea-level (Woodman et al. 1994) could indicate some use of the whole glen and its environs. The recent discovery of Later Mesolithic material near Linford on the edge of the Antrim Plateau is therefore an indicator that there was some upland exploitation during the Later Mesolithic. This site (B. Williams and D. Moore, pers. comm.) lies at over 200m above sea-level and is several kilometres from the coast. Some rather dispersed traces of Mesolithic activity were found below medieval and Neolithic settlements. Several large blades and tanged butt-trimmed forms were found. These are reminiscent of artefacts found in Newferry site 3, zone 7, and two 14C dates would appear to confirm the age of this material.

<table>
<thead>
<tr>
<th>Hearth</th>
<th>Context 1071</th>
<th>UB-3552</th>
<th>6937 ± 63 BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit</td>
<td>Context 1060</td>
<td>UB-3553</td>
<td>7017 ± 43 BP</td>
</tr>
</tbody>
</table>

It was also hoped to identify Mesolithic sites in the lagoon behind Bay Farm 1, but again, although several test trenches were dug and soil breaks examined, no Mesolithic material was recovered from its shores. Excavations at Bay Farm 2 have revealed Neolithic occupation on a gravel ridge in the centre of the valley. Work carried out by Francis (1987) has shown that there was a river channel on the southern edge of the lagoon during the Neolithic. This channel would appear to have begun to silt up early in the Neolithic, and no trace of deposits from an earlier lagoon was recovered. It is, of course, possible that Later Mesolithic settlement could be concentrated on the northern side of the bay, in particular in the vicinity of the Cranney River, but in spite of the vigilance of William Stewart no concentration of Mesolithic artefacts has been uncovered.

It is very difficult to assess the economic strategies of the Mesolithic communities who made use of the glen. In spite of the fact that the soil was not acidic
no concentration of animal bones was found, and it is noticeable that no shell-middens have been found on the Antrim coast. Therefore one can only speculate on the economic potential of the environment.

The rivers of east Antrim are quite small, and only the Glenarm River was noted as being of importance for salmon (Lewis 1837). Schalk (1977) has noted that the richness of rivers for fish such as salmon would be in part related to their size and, as both the Glencloy and Cranny are quite small, it is unlikely that they would have supported a substantial fish population. Additionally, it is highly probable that as the Glens would have been densely forested (Francis 1987) the normal run-off into the rivers would have been reduced through the recycling capacity of the forests to retain moisture. There is also no evidence that the land-

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Fig. 41—Site catchment analysis of Bay Farm 1 and location of Mesolithic sites in the Glencloy area.
based resources would have provided a major contribution to their food. A site catchment analysis carried out in conjunction with Drumalla Outdoor Pursuit Centre has shown that the not particularly high but quite steep edges of the glen caused a significant reduction in the size of territory which could easily be exploited. It is obviously difficult to assess how much territory could be covered in the Late Atlantic period when only a modern Irish patchwork field system exists today. However, aside from the north-easterly route, which ran into quarries half-filled with hazel scrub, most groups faced thick hawthorn hedges which would have equated with any Atlantic period forest. No group managed to cover more than 5km, and the Belair ridge to the east of the site was obviously a substantial obstacle. The northern edge of the project area, with its very narrow coastal strip (only 0.5km across), would also have limited the potential of the area. Pig, which would have preferred the lowlands, rather than deer seem to have been exploited in the Irish Later Mesolithic; on this basis there would seem to have been no obvious advantage in the terrestrial aspect of this particular glen.

On the other hand, the sea could have provided a more substantial contribution. It has already been noted that there are no surviving shell-middens in the area and the intertidal shoreline is quite narrow. Therefore the concentrations of shellfish which occurred on long rocky shores, such as those on Oronsay (Mellars 1987), would not have been available in Carnlough Bay.

Nevertheless it is possible to document a rich series of marine resources. Even today there is a salmon net strung during the spring at Hunter’s Point, north of Carnlough village, while in the seventeenth century Dobbs (1683) noted the exceptional richness of the sea at Red Bay—a bay which did not differ radically from Carnlough Bay.

This bay yields great plenty of fish, as salmon, turbot, plaice, sole, codd, whiting, mackerel, ling, hallybutt, a fish somewhat like a turbot, and herrings; I have seen the people stand upon the shore, some wading a little way out, and draw in small nets upon the shore in a dark night, and the lookers on with small bags in their hands, some would throw sand in the faces and eyes of the fishers, others with their bare feet or toes make holes in the nets for the herrings to slip out and so whip them into their bags and away with them.

In carrying out the site catchment analysis, a two-man Canadian canoe was used to assess the potential mobility of Mesolithic communities on the sea. Using the tidal changes, it was found that large areas of sea could be covered quite rapidly; in fact the distances for canoe travel marked on Fig. 41 were covered in 30 minutes! Therefore with sea transport the waters of the bay could have provided fish, while rocky turbulent waters off Garron Point could have been a major source of fish within easy reach.

There are, of course, two limiting factors. We do not know the level of sophistication of boats or of fishing tackle in the Irish Later Mesolithic. On the basis of Fenno-Scandinavian evidence, it could be quite sophisticated. Here there is evidence of fishing spears, traps, etc. Nets, such as the Antrea find in Finland (Clarke 1975), have been found, and even relatively long boats, such as those at Tybrind Vig (Andersen 1985). Little of this sort of evidence survives on Irish Mesolithic sites. At Ferriter’s Cove in County Kerry, McCarthy (1993) has documented a range of fish species, from rockfish such as ballan wrasse, through large fish such as tope, to fish
such as whiting, which appear to have been caught in substantial numbers. The evidence from Kerry and the documentary sources could indicate a possible extensive use of the sea. However, fish may have been a limited seasonal phenomenon. While salmon could best be caught in the spring, runs of cod, herring and mackerel would be available in the summer. The local pollock have been a traditional standby until recently, but these cannot be caught in rougher winter conditions.

Therefore, while the sea could have provided a significant range of resources, many of these resources were scattered over a wide area, and it seems unlikely that Bay Farm would have been the key strategic locality for this region which Binford (1980) would have regarded as a base camp typical of a more logistically organised community.

As Binford noted (1979), it is unlikely that hunter-gatherer communities would have come specifically to the coast just to exploit flint as a raw material. Instead, this would be best seen as an embedded procurement strategy, i.e. the procurement of raw material would take place while other activities were going on. This would explain the apparently casual nature of many of the knapping events.

One major problem must remain. Where were the products of the Bay Farm knapping events going to? In spite of the occasional Mesolithic form, such as that found at Windy Ridge, there is no concentration of Later Mesolithic artefacts in the glen away from the coast. Movement of the products to the south would seem pointless as good flint was equally available further south. Therefore the material would be moved either inland or to the north. So far, there is little evidence that Later Mesolithic flint blades and flakes were moved north into the flint-poor areas, but, as has been noted by Woodman (1981) and Griffith and Woodman (1987), a case can be made for the transportation of material into the Bann Valley. The absence of Larnian cores along the northern shores of Lough Neagh, where some flint was available and used in other periods, as well as the chemical similarities between the Newferry material and the flint of the Antrim coast (Griffith and Woodman 1987) suggest that some flint was finding its way into the interior from coastal sources. This would again suggest that the chipping floors at Bay Farm can only be seen as a small part of a much larger, more complex system.

Summary

At the beginning of this report several questions were posed; while the excavation has not contributed answers to all of them, it has helped our understanding of the Later Mesolithic of east Antrim. It is apparent that the unrolled material from Bay Farm resembles very closely the classic rolled assemblages from sites such as the Curran Point, and that, with the exception of the axes, the range of retouched tools is rather similar to that found in particular on other coastal sites. Perhaps the narrower range of formal tools at Bay Farm compared to Newferry is an indication of the repeated but rather limited use of this coastal location. The rather wasteful use of flint nodules to produce a limited number of blades has, of course, created a spurious impression of an intensive use of this area. Instead it seems probable that the limited use of the area on the margin of an annual territory may explain the apparent lack of contact with adjacent regions of Scotland.

However, perhaps the most substantial piece of information which can be derived from the Bay Farm 1 excavations is a better understanding of the lithic technology of the Irish Later Mesolithic. The so-called Larnian method can be
seen as a way of producing a consistent and relatively large standard form of blade-like flake rather than simply being geared towards producing crude large blades and flakes which were only limited by the massiveness of the flint nodules.

ACKNOWLEDGEMENTS

We would like to acknowledge the support we have received from numerous sources. We thank the Director, Trustees and Keeper of Antiquities of the Ulster Museum for allowing P. C. Woodman to carry out the excavation as well as for providing financial support. Other financial and related support was provided by Historic Monuments Branch, DoE(NI), particularly in the area of post-excavation analysis and report preparation. The Department of Archaeology, Queen’s University, Belfast, provided support through the recognition of this and other excavations in the Glencloy Project as required training excavations for its students. We would also like to thank the Co-Director of the project, Dr J. P. Mallory, for his tireless support and organisational abilities. It is impossible to list all those who contributed to the excavation but, in particular, Dr S. O’Brien, Mr R. Doggart and Mr D. Cartmill played key roles as assistants. The drawing of the site plans and artefact illustrations were carried out primarily by D. McLeod, while A. Desmond coped with the changing technology which accompanies any report preparation that takes longer than a decade.

We would also like to acknowledge the generosity of the landowner and tenant farmers of the Bay Farm area. Without their agreement this excavation would not have been possible.

Finally, we would like to dedicate this paper to the memory of the late Mr William Stewart of Carnlough, a self-educated scholar in the finest tradition of amateur archaeology. Willie Stewart found the sites in Bay Farm and without his knowledge this project would never have begun.

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Appendix I

Use-wear analysis

ELIZABETH ANDERSON
Department of Archaeology, University College, Cork

Introduction

The following report summarises the results of a use-wear analysis on a small sample of retouched tools from Bay Farm, Co. Antrim. The work forms only a minor part of a broader study which deals primarily with Later Mesolithic flint technology (Anderson 1994), while also incorporating the use-wear analysis on flint material from the Later Mesolithic riverside site at Newferry, Co. Antrim (Woodman 1977). The results of the Bay Farm material have therefore to be considered within a more general framework of Later Mesolithic tool form and use. In addition, while the small sample of material cannot be considered as representative, the analysis was undertaken in conjunction with Johnson’s refitting and use-wear analysis (1988). It was hoped that the studies would complement each other.

Methodology

The methods and techniques adopted here follow those used by Keeley (1980; Keeley and Newcomer 1977). All documentation of the wear features was facilitated using a Leitz Metallux 2 incident light microscope with bright field illumination. Magnifications ranged from 50X to 500X. The specimens were all cleaned in a weak solution (10%) of HCl to remove any mineral deposits and rinsed in distilled water in an ultrasonic tank. Further cleaning was done using a warm detergent solution to remove finger grease or ‘Blu Tack’ residue.

Any determinations of tool use or wear patterns were based on an experimental programme. During examination all observed wear traces were mapped onto a 1:1 scale drawing of the piece. Black and white photographs were also taken using a Wild MPS 45/51S camera system with automatic exposure capability.

Table 1—Retouched tools used for use-wear analysis.

<table>
<thead>
<tr>
<th>Trench</th>
<th>Level</th>
<th>Context</th>
<th>Type</th>
<th>Used?</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>5</td>
<td></td>
<td>Butt-trimmed blade</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td></td>
<td>Tanged flake</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td></td>
<td>Butt-trimmed blade</td>
<td>Unused?</td>
</tr>
<tr>
<td>11</td>
<td>Base</td>
<td></td>
<td>‘Bann Flake’</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>23</td>
<td>Butt-trimmed blade</td>
<td>Unused?</td>
</tr>
<tr>
<td>11d</td>
<td>7</td>
<td>23</td>
<td>Butt-trimmed blade</td>
<td>‘Bann Flake’</td>
</tr>
<tr>
<td>11d</td>
<td>7</td>
<td>23</td>
<td>Butt-trimmed blade</td>
<td>‘Bann Flake’</td>
</tr>
<tr>
<td>11d</td>
<td>6</td>
<td>23</td>
<td>Butt-trimmed blade</td>
<td>Unused?</td>
</tr>
<tr>
<td>11c</td>
<td>4</td>
<td>25</td>
<td>Butt-trimmed flake</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>5</td>
<td></td>
<td>Butt-trimmed flake</td>
<td>Unused?</td>
</tr>
<tr>
<td>2a</td>
<td>5</td>
<td></td>
<td>‘Bann Flake’</td>
<td></td>
</tr>
</tbody>
</table>
Sampling and selecting

The majority of the retouched tools from Bay Farm were butt-trimmed forms and ‘Bann Flakes’, with some backed pieces also present. Of these, only fifteen were considered suitable for analysis (Table 1). The remainder were either patinated white or partially patinated.

Aims of the analysis

Two basic questions were asked of the Bay Farm retouched material.

1. Were the retouched tools used?
2. If so, what kinds of materials were being worked?

Edge angle

The main value of this attribute is that it can be functionally diagnostic when correlated with other variables such as edge wear. A relationship can exist between edge angle and the amount and type of edge wear and the relative hardness of the worked materials (Grace 1989, 93). The range of edge angle values can then be functionally correlated with the relative hardness of materials, e.g. hard, medium and soft. In addition, the condition of the tool is not a restricting factor when assessing the overall suitability of the tool to perform certain work. Edge angle values for all the retouched material were measured with a goniometer using a plastic protractor to read off the values. Measurements were taken at 5° intervals. Where the angle varied along the edge two values were taken and the mean measurement recorded. At Bay Farm the dominant value for the retouched blades and flakes was 20° (25.6%), with 24° measuring 25° (Table 2).

Johnson (1988, table 8) also recorded edge angle values for the unretouched blades from Bay Farm. Her table 8 clearly shows that the preferred range of edge angles for the blades from all trenches is between 20° and 50°. Edge angles above and below this are rarely preferred. These results indicate that the retouched and unretouched material from Bay Farm would have been capable of dealing with soft to medium-resistant materials such as meat, fish, vegetables, wood and fresh hides.

| Table 2—Edge angle values of retouched material from Bay Farm. |
|-----------------|---|---|---|---|---|---|---|
| 10°             | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° |
| 5.4%            | 17.5% | 25.65% | 24.3% | 16.2% | 4.0% | 5.4% | 1.3% |

Microscopic analysis

Except for four pieces that in all likelihood may not have been used, the remainder of the sample had been severely affected by post-depositional surface modification, most notably soil sheen. Macroscopically, this appeared as ‘bright spots’ resembling varnish; in some cases these were scattered randomly across the tool surface, while in other instances large stretches of the edge were masked.

Microscopically, surface alteration was also apparent. It appeared as a ‘greasy lustre’ which could not be removed, even after repeated cleaning. Its erratic distribution both on the edges and in the interior of the examined pieces indicated that it was not use-related. This difficulty with post-depositional surface modification was also encountered by Johnson (1988), who was unable to determine the use of a sample of the unretouched material from the site.

The reason for the poor state of preservation of the tools is in all probability the
nature of the sediments and the archaeological context. Firstly, Bay Farm has been interpreted as an industrial site where large quantities of flint, including the retouched material, were recovered from the chipping floors. Therefore factors such as original trampling, possible dumping of flint and the movement of material within the chipping floor have to be considered. Van Gijn (1990, 53) argues that original trampling, solifluction and compaction modify the surface of an artefact to a considerable extent. She also suggests that a ‘polish’ can result from trampling and that it can mask some use-wear traces like meat, fresh hide and initial wood polish (ibid., 54).

Secondly, the majority of the examined pieces originated from an area of the site which had been buried in soliflucted deposits. This could account for the presence of soil sheen, thought to be produced by natural, mechanical or chemical attack, i.e. water percolation or solifluction. In pronounced cases the entire surface of the tool appears varnished, while in less extreme cases ‘bright spots’ are visible either in localised areas or scattered at random across the tool surface. Levi-Sala (1986, 105) found that these ‘bright spots’ could be replicated experimentally after 5-120 minutes’ shaking in gravelly or fine-sand sediments. Furthermore, she noted (ibid., 106) that, in the soil, flat bright spots can occur after a very brief but intense movement when one implement is rubbed against another. Van Gijn (1986, 22) found, also through experimentation, that even slight movement in fine-grained soil could inflict substantial damage on the surface of a tool.

In addition, some of the retouched material was patinated white. Plisson and Mauger (1988) note that the existence of patinated pieces within an assemblage shows that agents of chemical degradation are present in the sediments and are acting on the flints. The probability of vertical artefact displacement, sometimes recognised through refitting, can also mean that use-wear traces should be viewed with caution.

Finally, the excavator reported that some of the retouched tools were only recognised out of the field. As a result, some of the examined pieces may have been stored loosely in boxes amongst the remainder of the debitage. All of these factors are likely to account for the presence of post-depositional surface modification on the Bay Farm material.

Four pieces were relatively unaffected by this surface modification, yet even these were not in pristine condition. Their scattered distribution around the site (one recovered from trench 11d, two from trench 11, and one from trench 2a) suggests that their relatively good state of preservation was fortuitous. Microscopic examination indicated either that they had not been used or that the contact material left no visible trace of use. Edge damage was minimal, although the absence or presence of edge damage was never used as a sole indicator of use or non-use, certainly considering the archaeological context. However, given the large quantities of flint material recovered from Bay Farm it is not surprising that some of the retouched material was never used.

Conclusion

The microscopic use-wear analysis of the Bay Farm material was not successful. Neither of the two questions posed at the outset of the study was answered, nor has it been possible to provide an insight into the activities, if any, that may have taken place on the site.

Some general statements can, however, be made. Firstly, the recording of edge angle values has shown that the preferred values range between 20° and 50° for the
unretouched material, while for the retouched sample the preferred value is between 20° and 25°. Unfortunately, the lack of corroborative microwear traces does not allow for correlations to be made concerning tool form and use. Nevertheless, the results would suggest that the blade/flake assemblage at Bay Farm was capable of dealing with soft to medium-resistant materials. In addition, the apparent preference for edge angles within this narrow range has also been recorded at Newferry (20–40°) and for certain Later Mesolithic flint hoards (Anderson 1994).

Also, while similar difficulties with post-depositional processes were encountered with the Newferry material, use-wear traces compatible with experimentally produced wood-working polishes were identified on some of the retouched blades and flakes. This result can really only serve to substantiate the suggestion that some Later Mesolithic blades and flakes could have been used as wood-working tools but fails to account for the other uses that the blades and flakes could have had.

**References**


