

II.

ACCOUNT OF FURTHER EXCAVATION IN 1932 OF THE PREHISTORIC TOWNSHIP AT JARLSHOF, SHETLAND, ON BEHALF OF H.M. OFFICE OF WORKS. BY ALEX. O. CURLE, C.V.O., F.S.A.Scot., F.S.A.

In the account which was read to the Society last year of the primary excavation on this site (to be found at p. 113 of vol. lxvi. of the *Proceedings*) particulars were given of the exploration, as far as it had gone, of a stone-built dwelling. This will be henceforth referred to in relation to other houses on the site as Dwelling No. i, and is shown on the plan (fig. 1). It will be remembered that it lay with its main axis north-east and south-west, and consisted of a large chamber, A, measuring some 10 feet by 9 feet 6 inches, flanked on the one side by two cells with rounded ends, E and F, and on the other side by a small cell, B, and an irregularly shaped larger cell or chamber, C, with a long oval chamber, D, measuring some 13 feet 6 inches in length, set across the north-east end. It will be recalled also that the excavation was interrupted at a wall at the south-west end, in which was a doorway blocked with three large stones laid one above the other. The view illustrated by fig. 2 shows the extent of the excavation completed in 1931. At the point where it had been left off the exploration was resumed in the summer of last year (1932).

Behind the wall above mentioned, which was 3 feet thick, an entrance passage, G, was found leading inwards from the north-west, and at right angles to the main axis of the building (fig. 3). The area of excavation towards the north-west was limited by the foundations of a wall lying immediately below the turf on the present surface-level, and evidently that of an enclosure at the end of the "Jarlshof" building. It was found that the passage extended beneath this wall, the floor being at a depth of 7 feet, and as it was undesirable to destroy the latter, a pit was sunk behind it within the enclosure. This pit, while revealing the existence of various occupation levels, also disclosed the fact that the end of the passage had been partially broken down and closed by a wall built across it, behind which structural remains, presumably of other dwellings, were revealed. The passage led inwards for a distance of 7 feet, being 1 foot 9 inches wide at its outer end, thereafter expanding to a width of 3 feet 4 inches, and contracting at its inner extremity to 2 feet 9 inches. On the left it was flanked by a wall 3 feet thick, separating it from A, and on the right by a wall dividing it from chamber L (to be afterwards described), built on both faces for a distance of 4 feet 6 inches and thereafter continued on

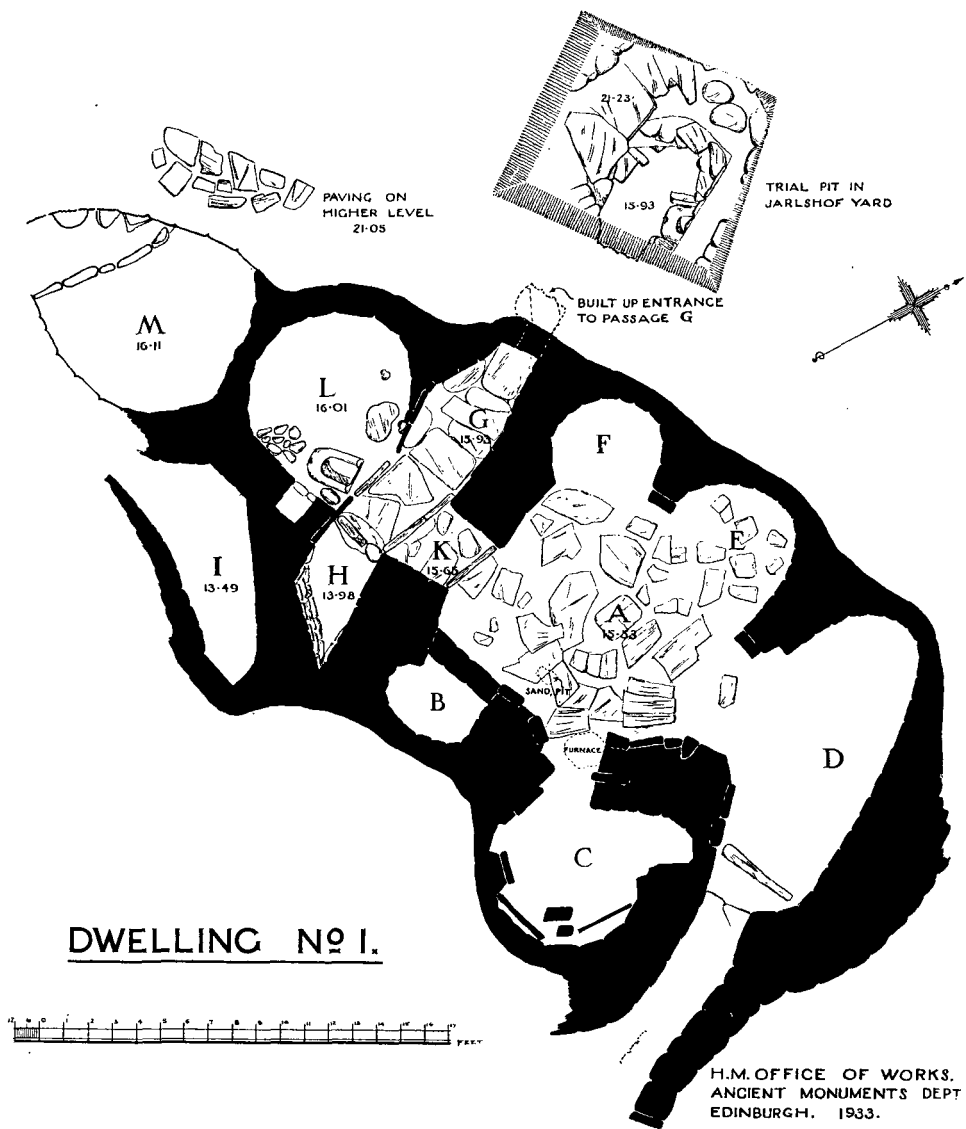


Fig. 1. Plan of Dwelling No. 1 at Jarlshof, Shetland.

the side facing the passage by three upright slabs, and on the side of chamber L by building and the last of the three uprights, the wall thus being tapered to a point. Throughout its length the passage was paved with large flagstones carefully laid, and at the outer end a single



Fig. 2. View looking north-east showing the extent of the Excavation completed in 1931.

step dropping to the pavement indicated a descent from a higher level outside. The paving was in two layers separated by a few inches of soil, showing two periods of occupation, or of reconditioning of the dwelling. On raising the upper layer it was found that the three upright slabs which formed the end portion of the facing of the wall on the right were sunk only to the level of the top of the primary pavement, thus clearly showing some alteration in the passage wall at the second period,

which possibly merely consisted in a reduction of its thickness at the inner end for some purpose not apparent.

Throughout the length of the passage there were no indications of door checks or of bar-holes in the walls on either side. In clearing



Fig. 3. Original Entrance Passage leading inwards from the north-west, showing the closed cell H at the end of it.

out the passage the soil was found to be very pure. Four fragments of perforated heart-shaped stones were found in the upper level, the butt of a club, a fragment of a saw of slate 4 inches long (fig. 16, No. 5), and a few sherds of blackened pot. There was also found the oblong rubber that from its size obviously belonged to the quern found subsequently inverted in the doorway.

At the inner end a doorway on the right, 2 feet 8 inches wide

and provided with a sill, gave access to a chamber (L on plan) approximately circular, and measuring 6 feet 10 inches in diameter (fig. 4). The soil that filled it above the floor-level was markedly pure without any mingling in it of debris or relics. On the left of the door-



Fig. 4. Chamber L, showing *in situ* Saddle Quern with Rubber placed upon it, also Lump of Clay and shaped Slab opposite.

way the wall stood to a height of 3 feet 9 inches, and constructed within it at this point, at a height of 9 inches above floor-level, was an ambry measuring at the opening 1 foot 1 inch by 1 foot 4 inches, and extending inwards for 1 foot 3 inches. It was built on the sides, covered with a single stone, and furnished with a kerb on the front. Nothing was found within it. The floor at this level of occupation was not paved, and was covered for a depth of a few inches, irregularly, with a layer of peat-ash,

which had evidently spread from a hearth formed by a bed of cobble-stones laid in a scattered fashion adjacent to the ambry. Above this hearth the peat-ash had accumulated against the wall to a height of a little over a foot. It was of a yellowish colour, distinguishing it as meadow peat from the grey-coloured ash produced by moorland peat. To the left of the doorway, and partially in front of the ambry, lay *in situ* a saddle quern of sandstone measuring 2 feet 1 inch by 1 foot 7 inches, and propped up against it, between it and the wall, was the rubbing-stone, measuring 11 inches by 7 $\frac{3}{4}$ inches, which had been used upon it when last in service. Opposite, on the right of the doorway, lay a heap of fine

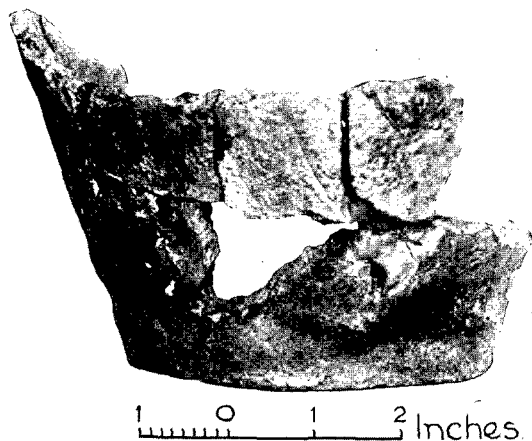


Fig. 5. Base of Pot found in Chamber L.

grey-coloured clay in a perfectly plastic condition, estimated to weigh some 8 lb., and on the floor in front a large flat-shaped slate. A short distance away on the floor lay a lump of yellow clay. The presence of these lumps of clay and the complete absence of any cereal grains from the vicinity of the quern makes it probable that the quern was used for the purpose of working up the natural clay to be used in potting and not for bruising grain.

In the wall to the right of the doorway, some 2 feet distant and about 1 foot above the level of the shaped slate which lay in front, a rectangular stone, placed vertically, had been used to close a small cavity behind. From this there were extracted the jawbone of a lamb and a piece of coarse pot. The only other relics found on this floor-level were a number of sherds comprising the larger portion of the base of a coarse pot (fig. 5).

At a depth varying from 7 inches to 1 foot below the upper level an earlier floor was found. It was paved, and the soil which overlay it, especially towards the north-west, was black and greasy.

A number of relics were found in this stratum. They consisted of three

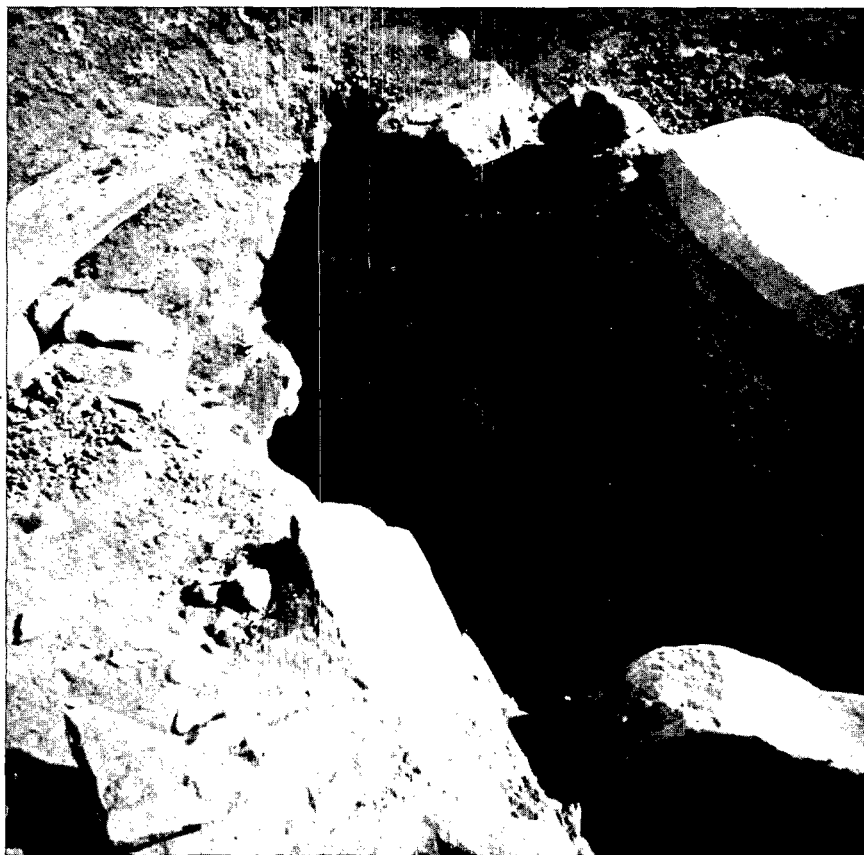


Fig. 6. Cell H, showing Back Wall and loosely built Wall on its west side.

fragments of perforated heart-shaped slates, one of which came from the very bottom; two ox scapulas, one of which had been used as a shovel and showed signs of wear; a fragment of a worked slate (fig. 17, No. 1, p. 103); a portion of a saw (fig. 16, No. 6, p. 102); a spatulate object of slate 11½ inches long (fig. 13, No. 1, p. 97); and a bone chisel, in bad condition, made from the cannon bone of a small ox with a socket fashioned in the process-end after the manner of the Maglemosian chisels of the Eneolithic period in Denmark. There were numerous animal bones in the lower

soil, mostly those of immature animals, and in a very bad state of preservation. A few pieces of pot also came from the same source.

Opposite the inner end of the entrance passage was a small cell (H on plan), some 5 feet long and 2 feet 3 inches wide at the entrance, formed against the outer face of a wall the lower part of which, at least, belonged to a previously existing structure (fig. 6). There was no definite floor within it, and it appeared to have been used as a refuse-pit. The entrance had been blocked, evidently at the date when the upper pavement in the passage was laid, with a large upright stone placed on the top of an irregular filling of flat stones in such a manner that it could have been only kept in position by the material filling the chamber behind it.

There were a number of relics in the upper soil from the level of the wall-head to a level 2 feet above the floor-level of A (hereafter termed A datum-level). Among them were a fragment of a slate saw (fig. 16, No. 2, p. 102), numerous pounders, complete and broken, three pieces of perforated heart-shaped stones and slates, one of them almost a complete specimen (fig. 13, No. 2, p. 97), while lower down were found pieces of other fourteen perforated heart-shaped stones. At about 9 inches above A datum was a thin layer of clean sand containing a few limpet-shells and occasional bones of oxen, and below this again an irregular layer of large flat stones from which came several pieces of coarse blackened pot. Lower still at the depth of a few inches below the A datum-level was a bed of limpet-shells some 6 inches deep, and in a hole in the west wall at this level was a further collection. The actual bottom was ill defined and lay some 1 foot 4 inches below the level of A. Just above it a few more sherds of coarse pot were found.

The homogeneous character of the filling and of the relics within it bore out the impression that this chamber had been deliberately filled in at an early date in the history of the dwelling. The walls that surrounded it presented some curious features. That forming the back or south side was well built in its lower courses, slightly convex towards the interior, and extending deeper than either of the other walls. It was obviously a wall of earlier construction, and, as was learned later, was the outer wall of another building (Dwelling iii). Its base lay at a depth of 1.60 foot below A datum. The wall on the east, which divided this cell from B, merely abutted on the last-mentioned, was not so well built, and was founded about 4 inches less deep. The wall on the west was still shallower, and was in parts so loosely constructed that it could only have remained stable with soil behind it. In this a small cavity was found filled with cockle-shells. At the end of the passage G, and opposite to the entrance to the chamber L above described, was

the blocked doorway, K, which had given access to A and the main part of the dwelling. The large stones blocking the entrance were so arranged as to indicate that they had been placed in position from A, and that the portion of the building beyond had been abandoned. The lowest stone on being turned over was found to be a large saddle quern, beneath which there lay a small deposit of fish-bones.



Fig. 7. View of the secondary Entrance Passage leading into Chamber D, from the outside.

At either end of this doorway a sill projected across the floor, but there were no door checks or bar-holes in the adjacent walls. The paving over the floor was also in two layers, with a few inches of soil between as in the passage G.

The abandonment of this part of the dwelling put out of use the original entrance, and a further exploration of the building at the south end of D showed that a secondary entrance had been opened there, and that the stone which lay across the end of that chamber, shown in fig. 11 of the Interim Report, had probably been the front of a step down to the floor-level from the passage leading from the

outside (fig. 7). This passage, the walls of which were poorly constructed and dilapidated, extended outwards for a distance of 9 feet with a breadth of 2 feet 3 inches.

It will be remembered that in 1931 there were recovered from the floor of A and the closed cell B, and to a less extent from the floor of cell F, numerous fragments of clay moulds for casting bronze swords and axes, which definitely fixed the period of the occupation of the dwelling as in the later Bronze Age. Hitherto in this report no mention has been made of any such finds. None were found on the lowest levels of the entrance passage G, nor of the chamber L, nor at any depth within the cell H. Nor did the peat-ash which covered the secondary floor of L yield any specimens, while the surface of the later paving in G and K produced only a few, and none came from below the blocking stones. In the soil which lay above the peat-ash in L, however, and in that overlying the later paving in G and K for a depth of several inches, they were very numerous. It was thus obvious that the use of these clay moulds was confined to an occupation, or occupations, subsequent to the restriction in the extent of the dwelling, and also to the filling in of cell H. As the distribution of the fragments was all around an arc of a circle centred towards the south-east end of A, it was evident that in that vicinity the moulds had been broken up to release the castings within them, and that the fragments had been thrown into the "refuse-pit" B, and across the blocked doorway K into the disused passage and chamber beyond.

An examination of the floor of A showed that while the greater part of the paving was primary, some of the paving-stones adjacent to the entrance to the chamber C overlay an earlier floor. It was observed that one of these stones on the north-east side of the entrance to C was much calcined, and on lifting it the soil beneath was found to have been burned to a bright red colour over an area measuring 1 foot 8 inches in diameter, and to a depth of 1 foot 3 inches below the surface. Here evidently had been a fire of considerable intensity, and possibly that used in connection with the casting. Some 3 feet 6 inches distant, in front of the wall separating B from C, and at 1 foot 4 inches out from the wall, the raising of another paving-stone revealed the surface of a cavity filled with sand formed of comminuted shells, and measuring on the surface 16 inches in length by 9 inches in breadth. This cavity turned out to be a small pit (shown in section in fig. 8) 11 inches in depth, with sides converging till they were 6 inches apart, and thereafter diverging so as to form a pocket, rounded at either end, and measuring $9\frac{3}{4}$ inches in length. On the surface beneath the uplifted flag, three particles of bronze were observed, a fact of some significance.

As the centre of distribution of the fragments of moulds was near this spot, it seems highly probable that this pit full of sand had been employed to hold the moulds thrust into it during the process of casting, and that the adjacent hearth had been used for fusing the metal. It should be stated, however, that no pieces of crucible were found in this dwelling.

As the burnt flagstone which overlay the hearth was lying partially beneath an upright stone at the end of the block of building that formed the front of C, it was obvious that the latter and the wall of which it

JARLSHOF : SUMBURGH : SHETLAND
BRONZE AGE DWELLING NO. 1.
SECTION THROUGH PIT IN FLOOR.

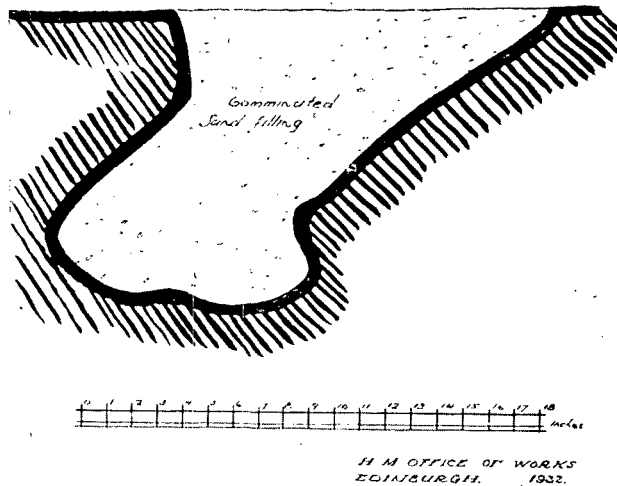


Fig. 8. Section of Casting Pit.

formed a part were secondary. An examination of some of the details of construction around chamber C indicated that certain of these were also probably secondary, viz. a built pier on the right of the entrance, and some of the upright stones in their present position.

There seems evidence here therefore of a fourth occupation restricted to this one chamber, a fact also suggested by the formation of a doorway with checks at the entrance to it, such as were not found elsewhere in the dwelling.

In the report of the exploration carried out in 1931, attention was directed to the occurrence of fresh blown sand on the floor of the main chamber A in the vicinity of the blocked entrance, and it was surmised that this sand had found its way in through the doorway,

and that it would be encountered in the passage when that was opened out. But neither in the passage nor in the chamber off it was there any such sand, and it was obvious therefore that it must have come from some other direction. That it entered through a hole in



Fig. 9. The Outer Wall of Dwelling No. 1 exposed behind Chamber D.

the roof is the most likely explanation, and that it was accordingly in consequence of this dilapidation that the final phase of the occupation was confined to this one room. The presence of food refuse in the shape of animal bones, noted in 1931, partially beneath the wall in front of C at its inner end, and also in the fresh blown sand, bore further evidence to the secondary nature of the wall, and to the fact of the final occupation.

As the result of the excavation of an area to the east of Dwelling

No. i, the outer face of the wall in the neighbourhood of chamber D was laid bare (fig. 9), and a study of this showed that the floor-level of the dwelling lay at a depth of 2 feet 6 inches below the actual surface at the period of occupation. The occurrence of a stratum of drift sand,



Fig. 10. View into Chamber M, showing the later construction at the south-west end.

visible in the illustration, deposited against the outer face of the wall, and lying evenly over the area excavated to the east, permitted an exact ascertainment to be made of the original surface-level as the obvious foundation course of stones, rather rougher than those employed above, lay below it. Moreover, the stratum of sand lay across the front of the secondary entrance into D, suggesting that the total period of occupation of this dwelling had not been a long one.

In the course of the exploration a contiguous chamber M (fig. 10),

beyond L, was excavated under the belief, eventually disproved, that the two were connected. The chamber, which obviously belonged to another dwelling, measured some 10 feet in length by 8 feet at its greatest breadth, and at some later period had been diminished at the south-west by a row of flagstones set on end 2 feet 4 inches above the datum-level of A, and at a considerably higher level than the floor of M, cutting off a portion of it. The walls of the chamber appear to have been subjected to considerable alteration. Within the arc of stones at the south-west end it seemed to have been entirely broken down. The wall on the south-east had been destroyed and reconstructed, and that on the opposite side was of a different character and did not extend so deep, while the division wall between M and L had, in its later state, been erected subsequent to the filling in of M, as it was too slight to have stood without support.

As in the adjacent chamber the soil filling M was very pure to a low level, and contained few relics, bones, or debris. Close to the north-west part of the wall, at a level of 1 foot 9 inches above the A datum in Dwelling i, there was found a bronze knife (fig. 11), $5\frac{1}{4}$ inches long, with a raised central moulding, the sides of which are parallel to the outer lines of the blade, and furnished with a short hilt with a fish-tail termination, after the manner of the swords of the period. The encrustation on the tang, which extends on to the blade with a convex outline from shoulder to shoulder, seems to have been due to the material employed in the fixing of the handle. Except for the loss of the actual point the object is complete, and in its form apparently unique. Against the opposite wall, at about the same level, lay a large lump of clay with flat stones laid against it, obviously to prevent it drying. Here also a portion of a slate saw was found (fig. 16, No. 4, p. 102), and a worked slate, probably a knife (fig. 21, No. 2, p. 106). One piece of a mould of a different



Fig. 11. Bronze Knife found in Chamber M. (3.)

colour and texture than those found elsewhere came to light, but unfortunately with no part of the matrix remaining on it. A remarkable object found near the bottom (fig. 12, No. 1) was a piece of thick heavy flagstone of the Old Red Sandstone measures, 1 foot 3 inches in length and $1\frac{1}{2}$ inch in thickness, with very large rude serrations along one edge. A somewhat similar object was found at Skara Brae.¹ This

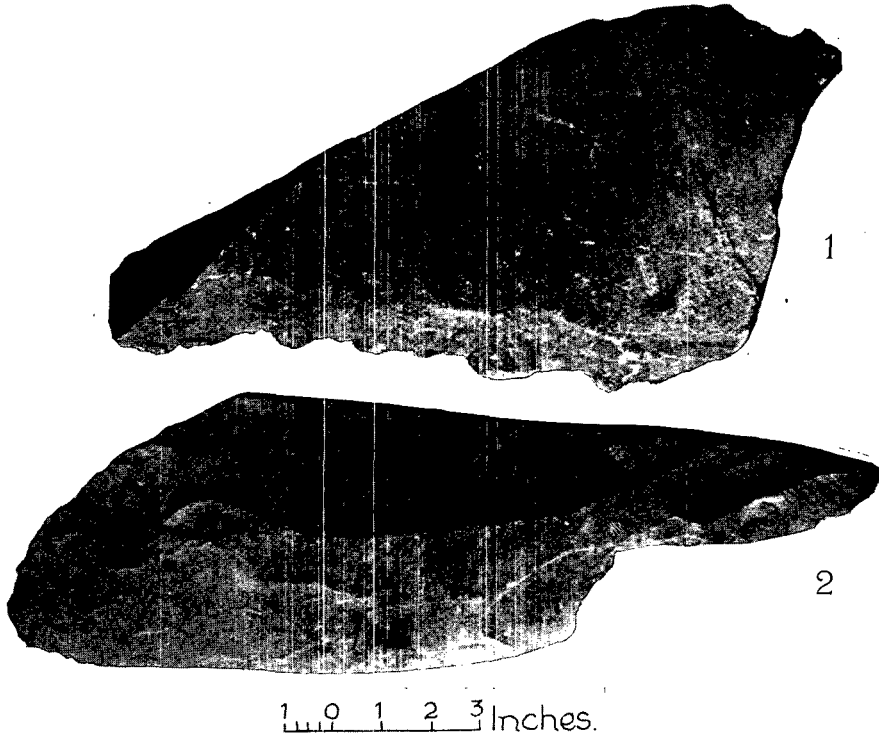


Fig. 12. Stone Object with serrated edge found in M, and Hatchet of Slate from I.

stratum yielded also twelve pounders or hammer-stones, chipped or abraded at one or both extremities. From 6 inches to the datum-level of A the soil was much discoloured, greasy, and mixed with specks of carbon. Over the greater part of the floor lay a thin brown stratum apparently of discoloured sand. Relics from this level were few and comprised three pieces of perforated heart-shaped slates or stones, and a very rude saw $4\frac{3}{8}$ inches long, seemingly unfinished (fig. 16, No. 1, p. 102). Though the edge is serrated the tool has not been reduced by rubbing, a process which appears to have been carried out with pumice, judging

¹ Gordon Childe, *Skara Brae*, pl. xl., fig. 2.

from the number of pieces of that material found with evidence of use as an abrasive, and the smoothed surfaces of the other saws and knives. Several pieces of heavy black pot were also found.

Beneath the floor-level, and passing under the deepest founded wall



Fig. 13. Rude Stone Implement from I, Portion of perforated Heart-shaped Stone from H, and Saw from K.

of the chamber, there extended an earlier level of occupation, probably represented by a kitchen-midden which was met with elsewhere.

Immediately to the west of the cell H there was excavated an area which was at first presumed to be a chamber connected with Dwelling No. i, but which subsequently proved to have been a vacant space between the south wall of L and the wall of another dwelling, later on identified as No. iii. This area is shown on the plan as I. As was to be

expected from a cul-de-sac between two dwellings, as this area seems to have been or become, it appeared to have been used as a rubbish dump and contained numerous relics. From the upper-level came an unusual number of pieces of slate of varying sizes: three pounders or hammer-stones, a small jasper pebble showing marks of abrasion at one end, seven pieces of perforated heart-shaped slates or stones (some of them seemingly parts of specimens of smaller size than those hitherto found, the indicated breadth being only about 6 inches) and some fragments of coarse pot. Down to the level, 2 feet above A datum, the sand or soil was much discoloured and full of building debris, slates and stones, some of the latter being a couple of feet in length. In the upper stratum were found the pointed end of a stone club, five fragments of perforated heart-shaped slates, and three hammer-stones. Between 3 feet and 2 feet, relics were equally numerous. In the south-east angle formed by the west wall of H and the wall of Dwelling iii there lay together three large stone clubs (imperfect) measuring 1 foot $2\frac{1}{2}$ inches, 1 foot $\frac{1}{2}$ inch, and 11 inches respectively, two of which are illustrated in fig. 14, and further west part of an exceptionally heavy specimen 9 inches long. From the same stratum came six pieces of perforated heart-shaped stones, a small oblong pebble $2\frac{3}{4}$ inches long, which might have been used as a burnisher, abraded at one end, two dozen fragments of coarse red pottery with much grit in the body and blackened with smoke, and six pounders or hammer-stones. Two pieces of pumice were also found, one of which, $3\frac{5}{8}$ inches long, showed a groove along one face, evidently produced by friction in the shaping of some artefact. In a bottle-neck at the west end, caused by the convergence of the opposite walls, there were found at the 2-foot level parts of four more clubs, and of nine further perforated heart-shaped objects. Below the 2-foot level the soil was very dark and greasy, and contained many disintegrated bones. It also revealed, from the presence of burnt soil, evidence of occupation. Many relics were likewise found at this level, viz. a circular object of slate 5 inches in diameter, and another of oval shape 4 inches by 3 inches (slightly imperfect), six fragments of perforated heart-shaped slate and stone, a hammer-stone of quartz, and an artefact of slate 5 inches long, possibly a knife. From a level corresponding to that of the floor of A in the south-east corner was found a remarkable implement fashioned from slate (fig. 12, No. 2, p. 96), a cleaver with a handle, measuring 18 inches in length by $5\frac{3}{4}$ inches in breadth, and two other objects of slate which might be the ends of similar objects. From the same level came the fractured leg-bone of an ox showing signs of wear at the break, six hammer-stones, two of which were broken, and three pieces of pumice.

It is important to note that when the occupation occurred, represented

by the level at from 1 foot 6 inches to 2 feet above A datum—the wall on the south, which extends much deeper, had been already erected, but the wall on the east, which divides the area from H, was not in existence, as that wall appears, as previously stated, to have been constructed after the area was filled up. And as it was inferred from the closing of the



Fig. 14. Stone Clubs found in I.

entrance to H, and the absence of pieces of mould, that that cell was filled in previous to the third occupation when the casting took place, it was obvious that all the finds from I belong to an early period in the history of the settlement.

In endeavouring to fix a chronological sequence for relics and pottery we may therefore place specimens from I in an earlier category than those from H, and consider those from H as earlier than the third occupation of the dwelling, *i.e.* the period of the clay moulds.

The Structure.—The complete length internally of the dwelling after excavation was 29 feet 6 inches. The ground had been dug out to a depth of 2 feet 6 inches, and the walls, to the extent to which they were against the sand, and beneath the external surface, were built with yellow clay. The stones used were flat stones selected from the beach, and never shaped nor dressed to fit them for their purpose, in this respect differing from the material employed in the construction of the adjacent broch, and of the secondary buildings around it where rudely dressed or hammered stones are not uncommon. Nor were pin-nings, small stones used to fill the interstices, employed, as is customary in broch-building. There is one feature observable, however, which is common to all three structures, viz. the use of large flat stones set on edge at the base of the walls, a fashion also to be observed in the walls of chambered cairns on the mainland, and, as a remarkable survival, in stone dykes in Shetland at the present day. Such a stone appears in the wall of chamber C, and a similar stone is built into the back of the exposed chamber of the neighbouring broch. The walls which separate F from E, and E from D, are faced at their terminations with rectangular monoliths set upright in the ground. This practice may be observed throughout the buildings surrounding the adjacent broch, where such stones have been employed to form the piers from which sprang the corbelled arches fashioning the roofs. Though no fragment of roof remains on this dwelling we may infer that it was similarly roofed over by a system of beehive vaults formed by projecting each stone a little further inwards than the last in the fashion known as corbelling.

The floor of the dwelling, as has been stated, was partially paved, and partially covered with sandy clay burned to a brick red. The latter process was confined to chambers C and D, and it was not observable in the part of the dwelling to the west of the doorway which was abandoned previous to the third occupation.

In the case of cell E the paving was laid on yellow clay.

The centre of the paved floor in A was situated 15·53 feet above Ordnance datum at high-water mark, and the level of the floor of the adjacent broch is 2·3 feet higher still.

OBSERVATIONS ON THE FINDS.¹

Heart-shaped Slates, etc.—The relics of most general distribution within and around this dwelling have been the fragments of perforated heart-shaped slate or schistose stone, the number recorded from this site alone amounting to over a 100, and they are of frequent occurrence

¹ A complete list of the finds is printed at the end of this communication.

elsewhere. They appear to have varied slightly in size, but the complete specimen found in 1931 and illustrated in last year's Report and here reproduced anew (fig. 15) may be considered typical. It measured $8\frac{3}{4}$ inches by $9\frac{1}{4}$ inches, and the perforation at the broad end measured $2\frac{5}{16}$ inches by $1\frac{5}{8}$ inch. No further light has been obtained of the purpose served by those objects. The form suggests a tool for working in sand or soil, it being practically that of the labourer's shovel at the present day, though in no instance where the point of one has been recovered has it shown a surface that might have resulted from such employment. The only part on which signs of wear have been observed has been the edge of the perforation, obviously intended for the hand, or for a handle

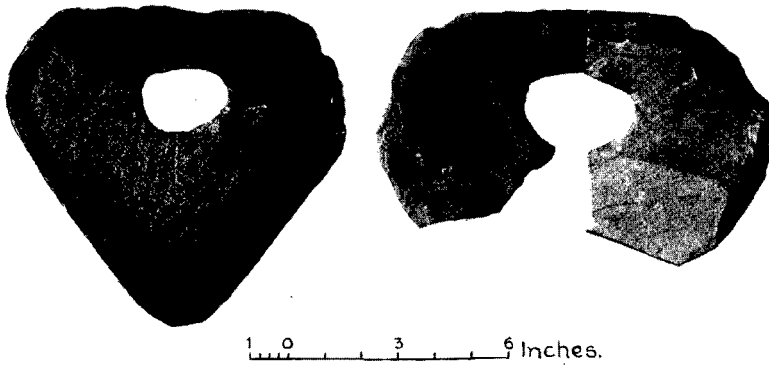


Fig. 15. Heart-shaped Object of Sandstone and fragments of a second.

of some sort, and across which the objects have been invariably broken. The excavation of the sites of the dwellings, and the frequent subsequent clearance of blown sand, might account for the presence of so large a number on the spot. It is on record that the specimen in the Goudie Collection at Lerwick, and referred to last year, was found in Papa Stour, used as a cover upon an urn of coarse clay containing incinerated bones, and associated with a polished celt.¹

Objects with a Serrated Edge.—Sixteen objects with serrated edges, a selection of which are shown in figs. 16, 17, and 18, were found generally distributed over the occupied area, and were apparently in use among the inhabitants subsequent to the advent of bronze as well as previously. Most of them are fragments, but two appear to be complete (fig. 16, No. 1, and fig. 17, No. 5). The first-mentioned has already been referred to (p. 96) as being unfinished. It is furnished with a tang for

¹ Spence's *Shetland Folk Lore*, pp. 81-3 (1899). I am indebted to Mr J. M. Corrie, F.S.A.Scot., for this reference.

fastening to a handle at right angles to the cutting edge, which would render its use as a saw somewhat difficult, and the second has a notch cut on either side obviously to retain a cord for fastening it to a handle. The lower notch is undoubtedly original, and while the upper

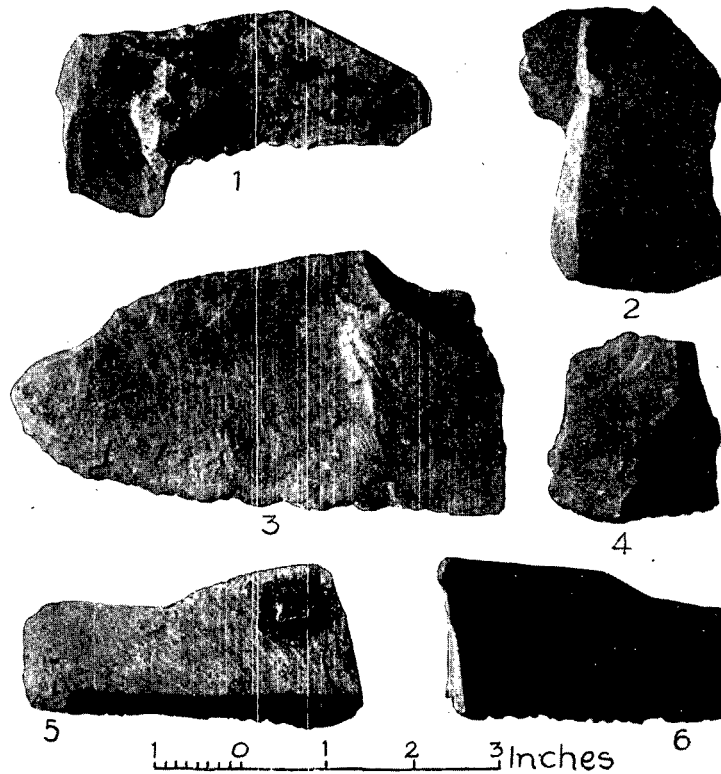


Fig. 16. Objects of Slate with serrated edges.

one is probably also genuine, owing to a recent chip it shows a fresh surface.

It is doubtful if these objects were employed as saws in the ordinary sense on wood or bone, for the complete absence of wood-charcoal from the hearths indicates that timber was by no means plentiful in Shetland in the last millennium B.C., and there is such a scarcity of articles fashioned of bone that the need of so many saws to operate on that material is not apparent. The position of the tang on the one perfect example, and the form of the second, slightly curving in its length, suggest a

use as sickles for cutting off the heads of grain, in fact the tanged specimen presents a close analogy in form to certain socketed sickles of bronze, of which one found near Errol, Perthshire,¹ in the National Museum of Antiquities may be cited as an example. Also the curved

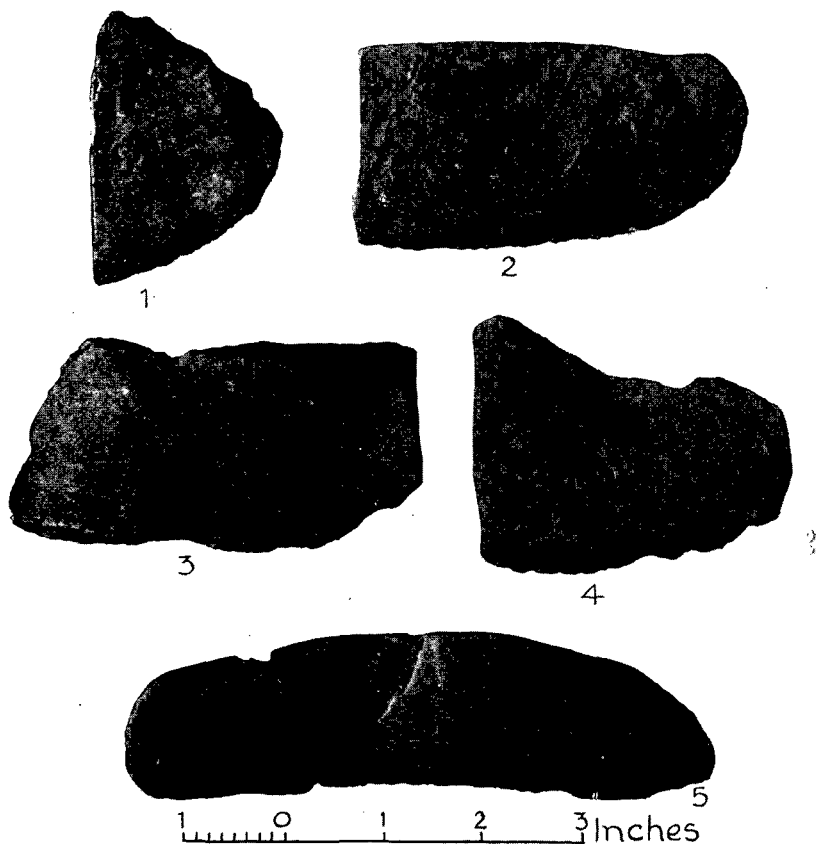


Fig. 17. Objects of Slate with serrated edges.

specimen bears in its shape a strong resemblance to the curved blades fashioned from flint found in England and elsewhere, and for which also employment as sickles has been suggested.² The purpose to which the large triangular slab of sandy flagstone (fig. 12, No. 1, p. 96) already

¹ Evans, *Ancient Bronze Implements*, p. 200, fig. 236.

² See Evans, *Ancient Stone Implements*, 2nd ed., p. 358; Oldeberg in *Acta Archaeologica*, vol. iii. fasc. 3, p. 209; *Proc. Prehist. Soc. of E. Anglia*, vol. vii. p. 67.

referred to (p. 96) as having been found in M, could have been applied is not apparent. The object (fig. 19, No. 3) has been regarded as the handle of a saw.

Knives.—There are six examples, partial or complete, of slate

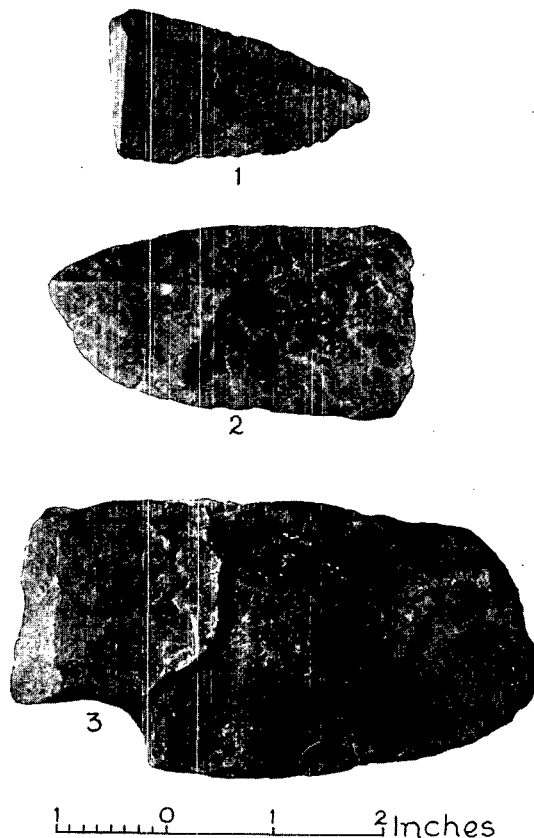


Fig. 18. Objects with serrated edge (Nos. 1 and 2), and Knife (No. 3), all of slate.

knives. They appear to be of two kinds. Those with a finely fashioned edge as shown in fig. 19, Nos. 1 and 2, and in fig. 20, No. 1, and those presenting a closer analogy to the so-called knives of flint, with a rudely chipped edge, such as shown in fig. 20, No. 2, and fig. 21, No. 2. To the latter class belongs an example illustrated in fig. 18, No. 3, which is peculiar in having a curved notch at one end to form a grip.

Knives of similar material belonging to what is known as the Arctic

Culture are found in Norway, and knives and saws in Sweden, but a study of the examples in the museums of Oslo, Bergen, and Stockholm leaves the impression that there was no cultural connection between those slate artefacts and these found in Shetland. They all probably

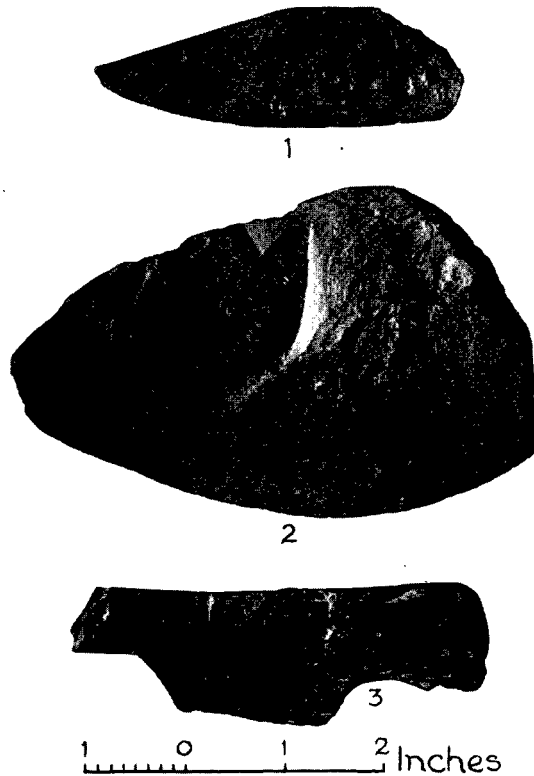


Fig. 19. Knives of Slate.

owe their origin to the absence in both regions of flint, the usual material from which such tools would have been made, and the adaptation of a native stone easily obtainable, and suitable, as a substitute.

Club-like Weapons or Implements.—Such objects, rudely fashioned for the most part, and peculiar to Shetland, were represented by eighteen broken specimens, found sparsely in Dwelling No. i, but to a much larger extent in the area I, which, as above narrated, lay outside the walls, eleven of the eighteen coming from the latter site. It is noteworthy also that those examples from I, which for reasons given are believed

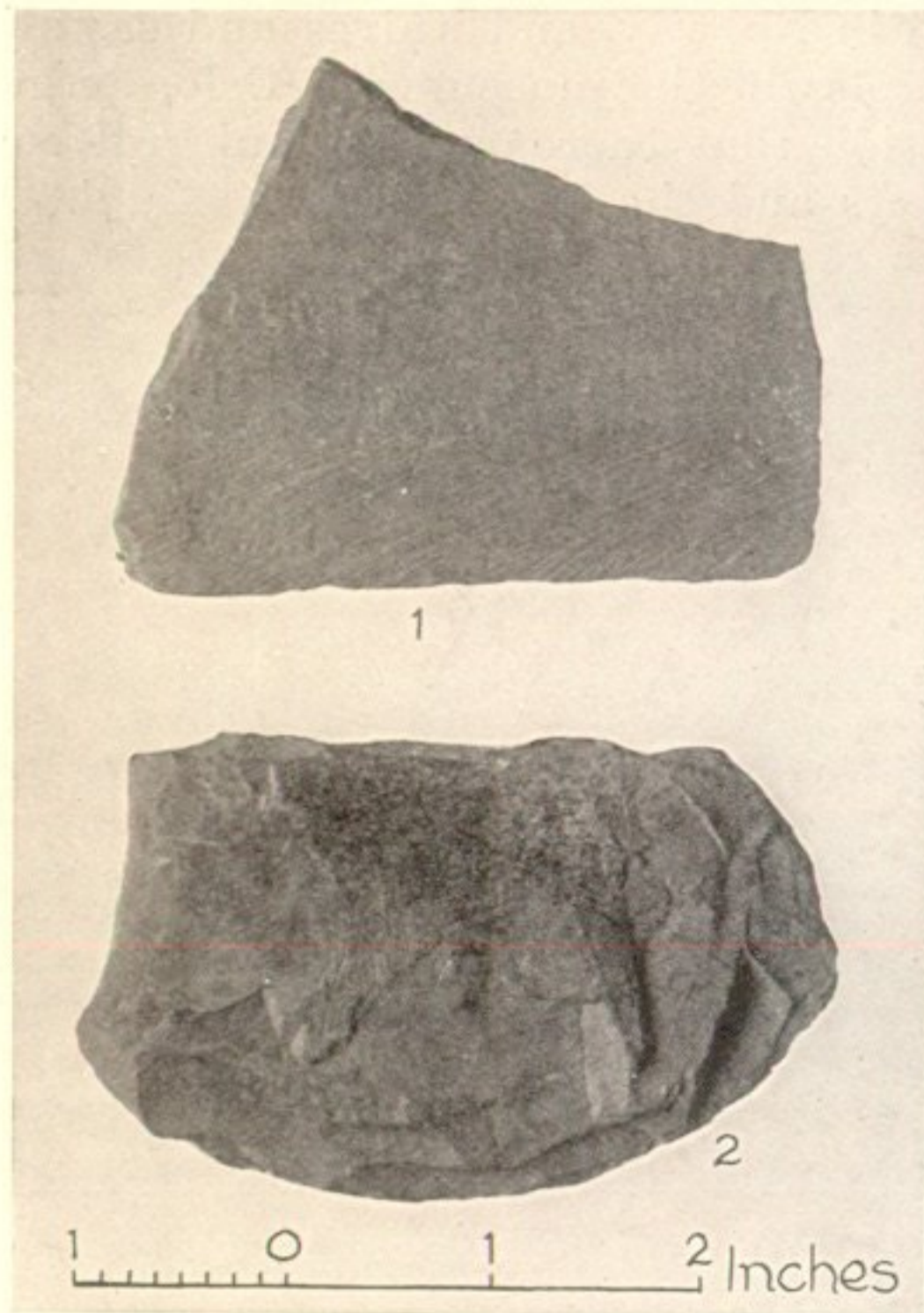


Fig. 20. Knives of Slate.

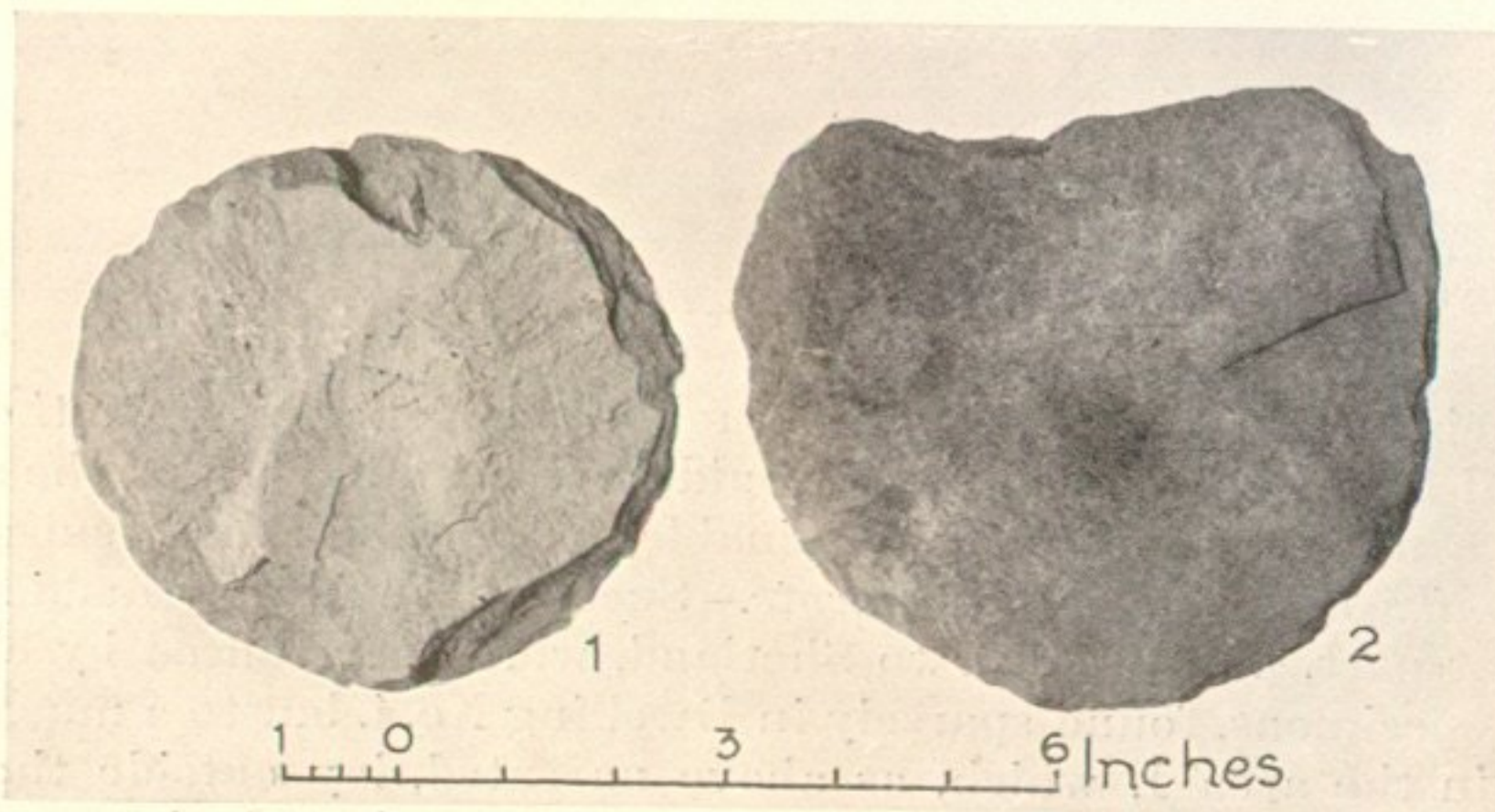


Fig. 21. Stone Disc (1) and Slate Knife (2).

to have been referable to an earlier date than those found within the house, are very much more massive and heavy. Fig. 14 (p. 99), and fig. 22, Nos. 1 and 3, illustrate typical examples.

Axes.—Seven axes formed from flat pebbles by roughly chipping the surface, sometimes on one face only, were found, six in 1931 in cells B, D, and F in association with fragments of moulds, and in one case with quartz scrapers, and one in 1932 in L. Examples are shown by

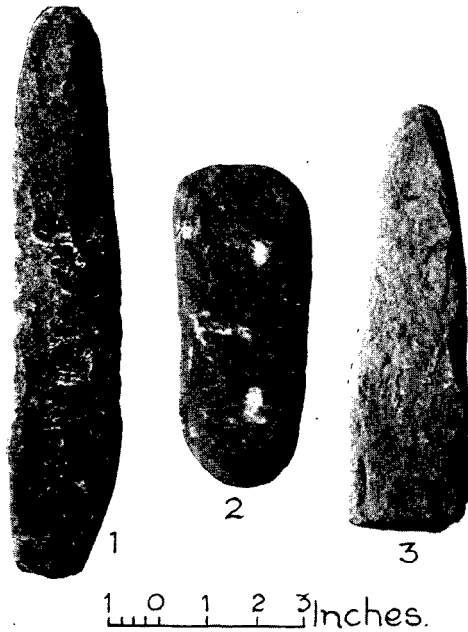


Fig. 22. Stone Clubs, Nos. 1 and 3; Stone Axe, No. 2.

fig. 22, No. 2, which is roughly flaked on one surface, and fig. 13, No. 1, p. 97. Such axes are also characteristic Shetland tools, and have been found in considerable numbers in the island.

Adze.—The axe or adze of grit, measuring $6\frac{1}{2}$ inches by $1\frac{1}{4}$ inch, fashioned from the segment of a large circular vessel, referred to in the previous Report, is here illustrated (fig. 23). It is of a different character to the foregoing, being of smooth texture, probably owing to the material from which it was made and the previous use to which that material had been put.

Oval Slate.—An oval object of slate, measuring $8\frac{3}{8}$ inches in length by $4\frac{3}{8}$ inches in breadth, found just above the floor-level of A in 1931



Fig. 23. Adze formed from segment of a stone vessel.

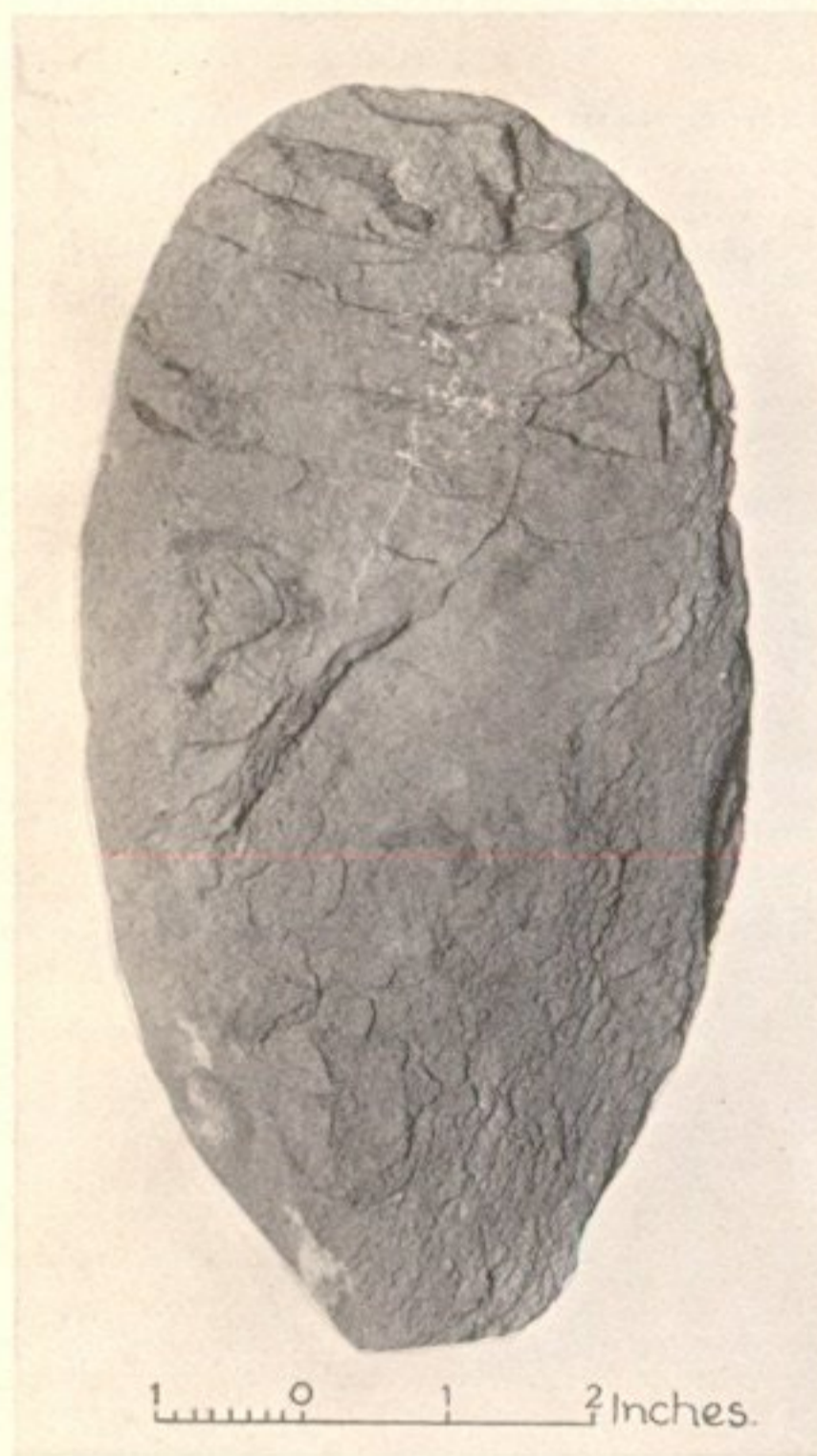


Fig. 24. Oval Object of Slate.

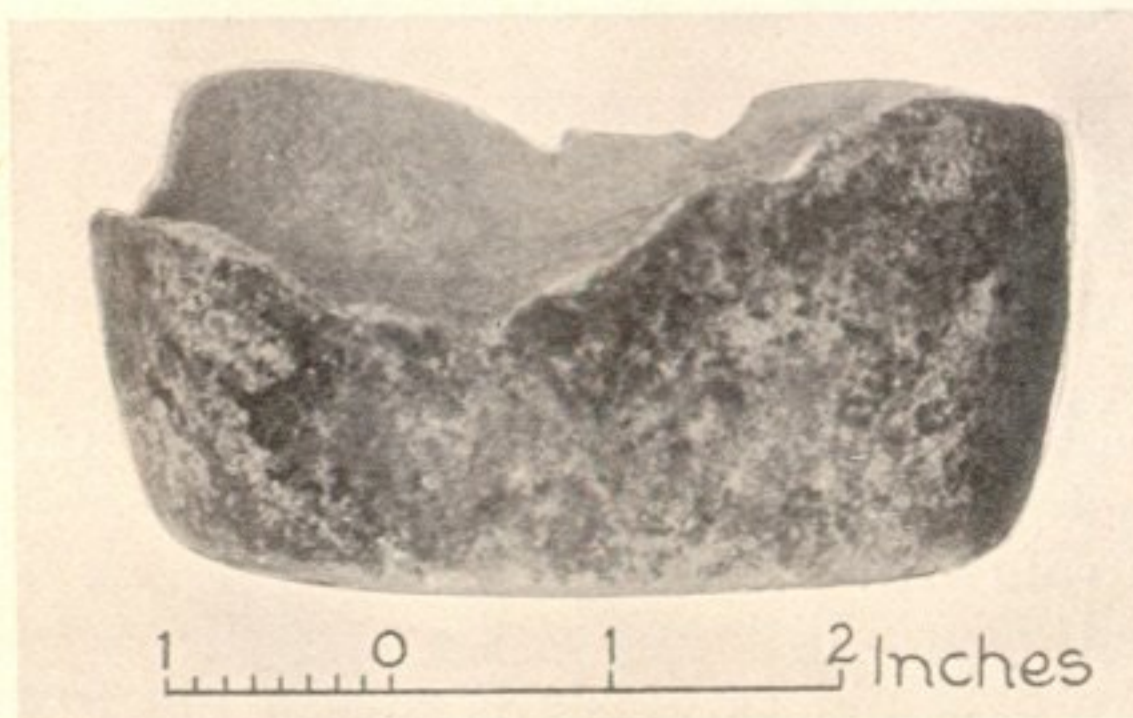


Fig. 25. Vessel of fine-grained Sandstone.

is illustrated in fig. 24. Its use is uncertain. It might have been used for working clay with, or as a palette.

Vessel of Sandstone.—Fig. 25 illustrates the small four-sided vessel of fine-grained sandstone measuring over all some $4\frac{1}{8}$ inches by $3\frac{1}{2}$ inches by 2 inches in height found in the small cell B in 1931. The outer surface is blackened with soot, while the interior has been rubbed

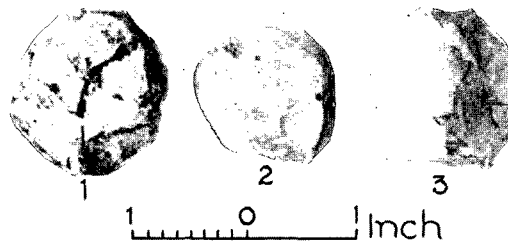


Fig. 26. Scrapers of Quartz.

smooth, and the bottom has been entirely worn away owing to a secondary use as a rubber or polisher. In the National Museum there are three other small vessels of similar form made of steatite from Shetland, and others from the island of Unst are in the British Museum.

Scrapers of Quartz.—There are also illustrated here (fig. 26) three of the nine scrapers or parts thereof found in 1931 in the excavation of A to F. As quartz does not give such a clean fracture as flint, the flaking is much coarser. The scrapers were not all found on the floor-level. It is worthy of note, though the inference to be drawn is not apparent, that none were found in the other portions of the dwelling excavated in 1932, or in area I.

Bone Chisels.—The bone chisel and the half of another found in 1931 in C and D are illustrated in fig. 27. As previously stated (p. 88) in their form, with a socket for a handle fashioned in the process-end of the bone, they resemble certain tools found in Denmark at Maglemos and preserved in the Danish National Museum of Antiquities at Copenhagen. But the Maglemosian chisels are much larger and are referable to an Eneolithic or late Megalithic Culture, while there can be no doubt that the

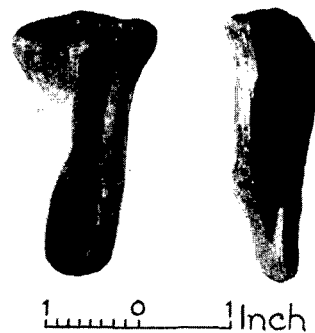


Fig. 27. Bone Chisels.

Shetland tools, from the levels at which they were found, were in use in the late Bronze Age. As previously stated, a third specimen, in a much decayed condition, was found in chamber L.

Knob of Bone.—The knob of bone referred to in the Interim Report and found in D is illustrated in fig. 28. It measures 1 inch by $\frac{3}{8}$ inch by $\frac{3}{4}$ inch, and is encircled at its base by a ferrule or collar of bronze. Probably it has been the end of a knife handle.

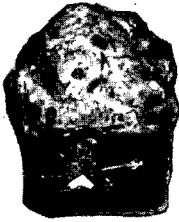


Fig. 28. Knob of Bone with Bronze Collar.

Vertebra, perforated.—The lumbar vertebra of a sheep, illustrated in the previous Interim Report, is again reproduced here (fig. 29). It has been perforated vertically, and a small pin of bone fashioned to fit it was found inserted in one of the vascular foramina. This object was found in the cell B. The purpose for which it was used is unknown.

Other Objects of Bone.—A piercer or awl formed from the bone of a sheep, fractured and rubbed down to a point, found in 1931 in F, is shown in fig. 30, No. 2. And on the same fig. is an oblong piece of cetacean bone found in B, which has been fashioned by rounding the edges, and used for some unknown purpose.



Fig. 29. Perforated Sheep's Vertebra with pin inserted in foramen.

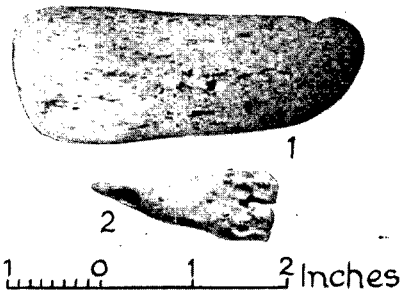


Fig. 30. Piercer and Object of unknown use, both of bone.

Pottery.—There was not much pottery found in Dwelling No. i and it was for the most part in small fragments. None of it bore any ornamentation. It seemed to be divisible into three classes: (1) Sherds with comparatively little steatite in the body; (2) those with a great deal; and (3) those with none at all. Sections 1 and 2 in fig. 31 represent the first class. Both pieces came from low levels in H and M respectively and are obviously early. The pots of which they formed part have been

vessels, cup-shaped, and slightly incurving to the rim. The body is backed with hard grit and has been burnt to a dark red or purple tone. There is black encrustation on the outside of both pieces. The composition of section 10 is very similar and seems to have been the edge of a shallow saucer-like dish. As it came from a comparatively low level

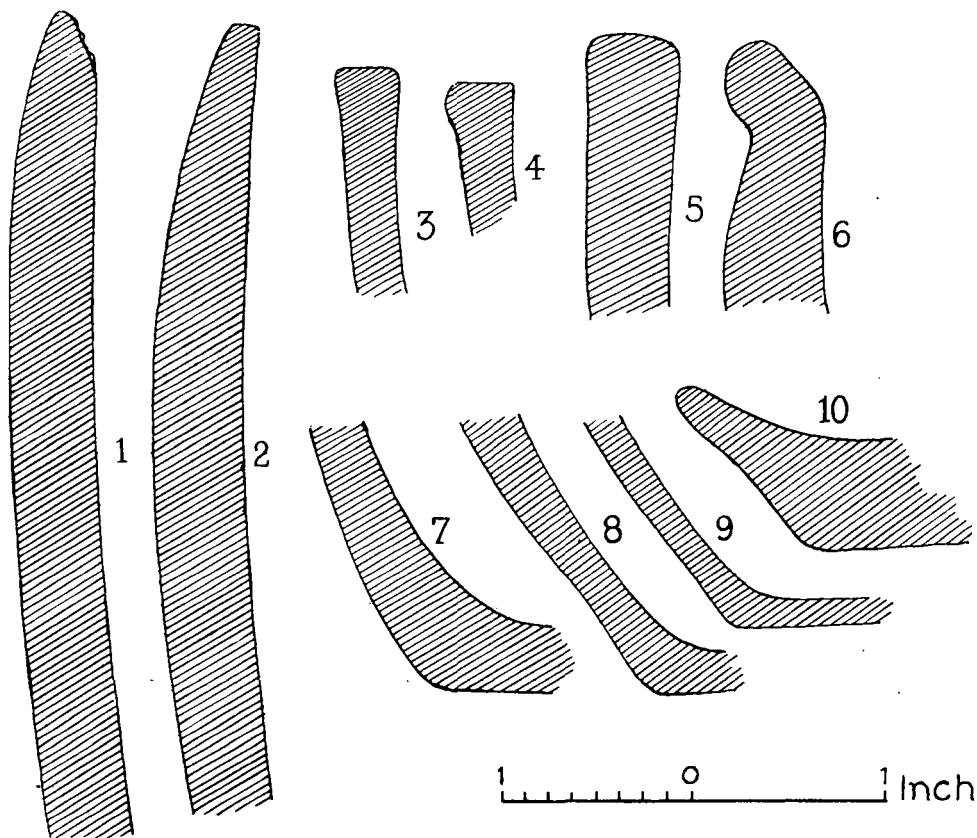


Fig. 31. Sections of Pottery.

in I, it too must be early. The sherds represented by sections 3, 4, and 5 in fig. 31 are all heavily backed with steatite, pieces as large as a grain of barley being used in No. 5 and less obvious material in 3 and 4. The former came from a high level in B, but a sherd of similar ware was found near the floor-level in C, so it was evidently in use throughout the occupation. The rims indicated by 3 and 4 came from I at a level 1 foot above A datum, and must be early for reasons previously stated. No. 3 is slightly rounded on the rim, while 4 is definitely flat. Section 6

represents a class of pot with no steatite in its composition. The ware is very rough and coarse, the potting much inferior to that of the other sherds, and although this particular fragment was found about 1 foot 7 inches above floor-level in G it is probably late, other sherds of the same class were found at higher levels.

Of the bases indicated by 7, 8, and 9, the first two are of similar character to 5, much backed with steatite. No. 9, on the other hand, represents a portion of a vessel of a hard fine ware, light red in colour, and polished on both surfaces, of superior quality to any other piece of pottery among the finds.

A few sherds of steatitic ware have a smooth polished black external surface. These were found at low levels in K and L, and also in I.

Cereals.—As stated last year, grains of some species of barley, probably bere, were found on the hearth in chamber C. None have been met with elsewhere, and as the find spot was in the latest level of occupation this evidence of agriculture only relates to the latest period of the Bronze Age.

Clay Moulds.—In the Interim Report read last session a reference was made to fragments of clay moulds for casting bronze axes and swords, which were found at the west end of the dwelling in areas A, B, and F of plan. As already mentioned, many more fragments were found this season, beyond the blocked doorway in the passage G, and in the chamber L. In all there have been recovered some 200 pieces belonging to matrices of faced or bivalve moulds, forty-four fragments of the gates or orifices of the moulds, twenty-two pieces of the outer envelope at the junction of the two valves, and a very large number of fragments of other parts of the outer envelope or casing of clay. A careful scrutiny of all these fragments has made it possible to distinguish and separate the parts of individual moulds, recognisable by various features, such as the form of the matrix, the colour of the mould, the size or shape of the keys or the sockets, by which the valves were fitted to one another, and to ascertain consequently the purposes which they were intended to serve. The result shows that there were pieces of such moulds for eight socketed axes, seven swords, a discoid object with a cone in centre, a gouge, and also several pieces of two "lost wax" or *cire perdue* moulds for casting a rod, one circular, and the other angular. Many of the pieces of individual moulds have been brought together, allowing of partial reconstruction.

Axe Moulds.—A. A much-damaged mould of which there are twenty-seven fragments, a certain number of which have been fitted together. All the fragments are of a brick-red colour, due to the mould having been burned

by the use of metal at too high a temperature which has caused it to adhere after casting, with the consequent breaking away of the clay forming the actual matrix. Parts of both sides of the mould remain. Pieces of this mould were found in 1931 in Cell B, and in 1932 in the passage G. It has been used for casting an axe with a single half-round moulding at the mouth of the socket, measuring $4\frac{1}{4}$ inches in length.

B. The greater part of one valve, and several pieces of the other, including in the latter the matrix for the cutting-edge awaiting in the former. There are ten pieces in all, found in 1931 in B, and in 1932 in G (fig. 32).

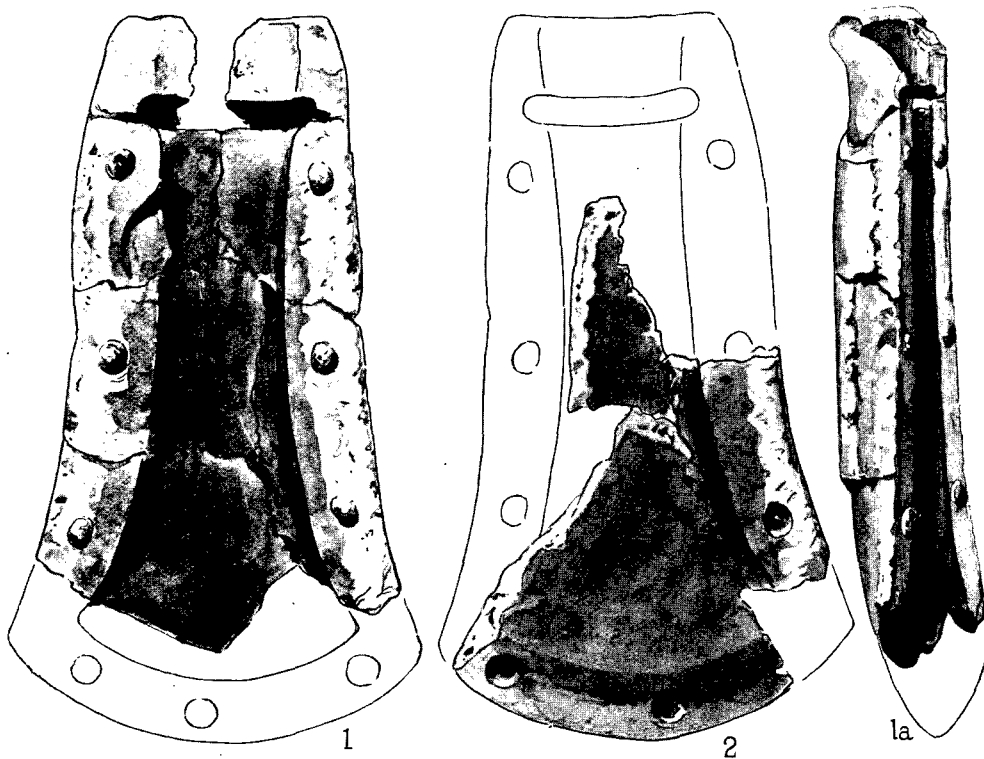


Fig. 32. Pieces of a Mould for casting a Socketed Axe. (5.)

The mould has been used to cast an axe with a roll-moulding at the mouth of the socket, measuring $4\frac{1}{4}$ inches in length and $2\frac{1}{16}$ inches across the cutting-edge.

C. Twelve pieces, consisting of parts of the matrix applicable to the cutting-edge, the side, and the gate or orifice. The fragments were found in 1932 in K, G, and L.

D. Eleven small pieces found in G and K.

E. A single fragment showing part of the matrix for the loop. The colour of the fragment does not correspond with that of any other mould.

F. One fragment of the side of a matrix, found in 1931. The socket for the key is of a different shape from that on any of the other axe moulds.

G. Two small unidentified fragments.

H. Seventeen fragments which, from the colour of the clay and of the matrix, appear to be parts of one mould. Found in K, G, and L.

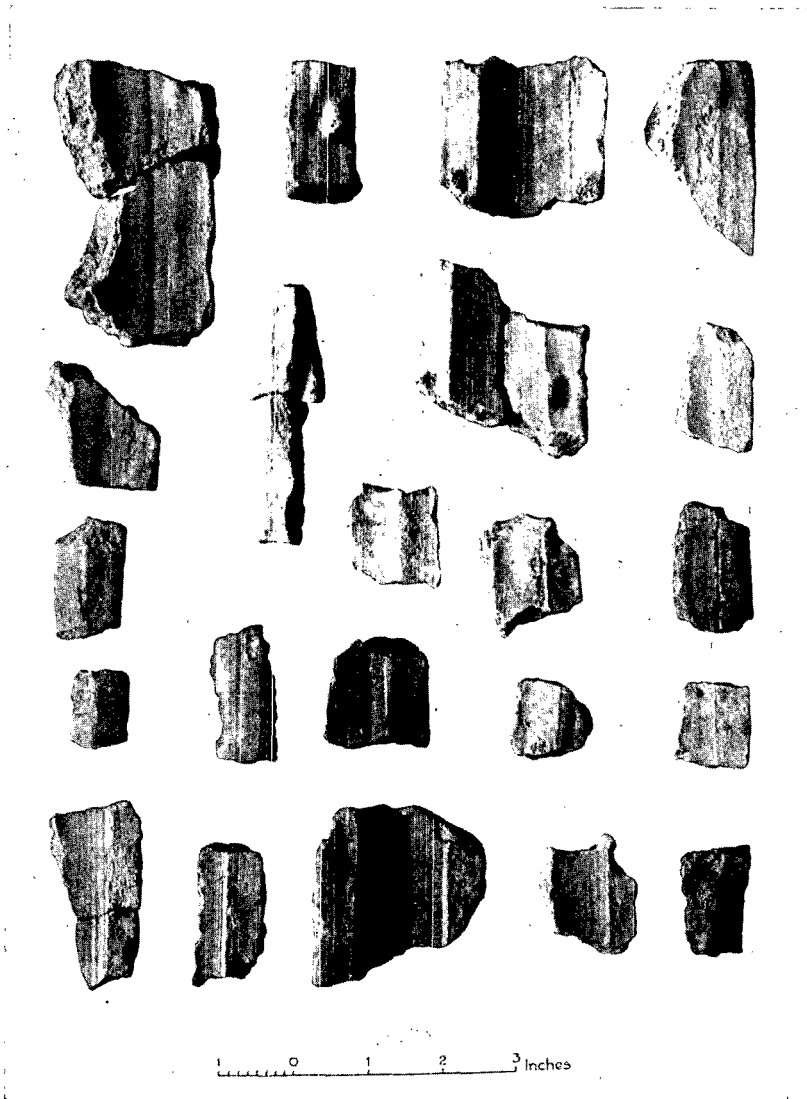


Fig. 33. Fragments of various Sword Moulds.

Sword Moulds.—There appear to be fragments of seven different moulds for swords, a selection of which is shown in fig. 33. This number has been arrived at by careful consideration of every piece, and by assembling the various pieces

according to the similarity of various features, such as the colour of the flange at the edge of the matrix, the tone of the black coating on the matrix itself, the size and shape of the keys, the character of the surface (striated as indicating the use of a wooden pattern, or otherwise), and the nature of the surface of the outer casing of clay. The differences are, however, sometimes very slight, and it may be that the actual number stated exceeds the reality.

The swords to be cast, as far as ascertainable, have been of the usual pattern of Bronze Age swords as found in Scotland, having a flat handle with a fish-tail

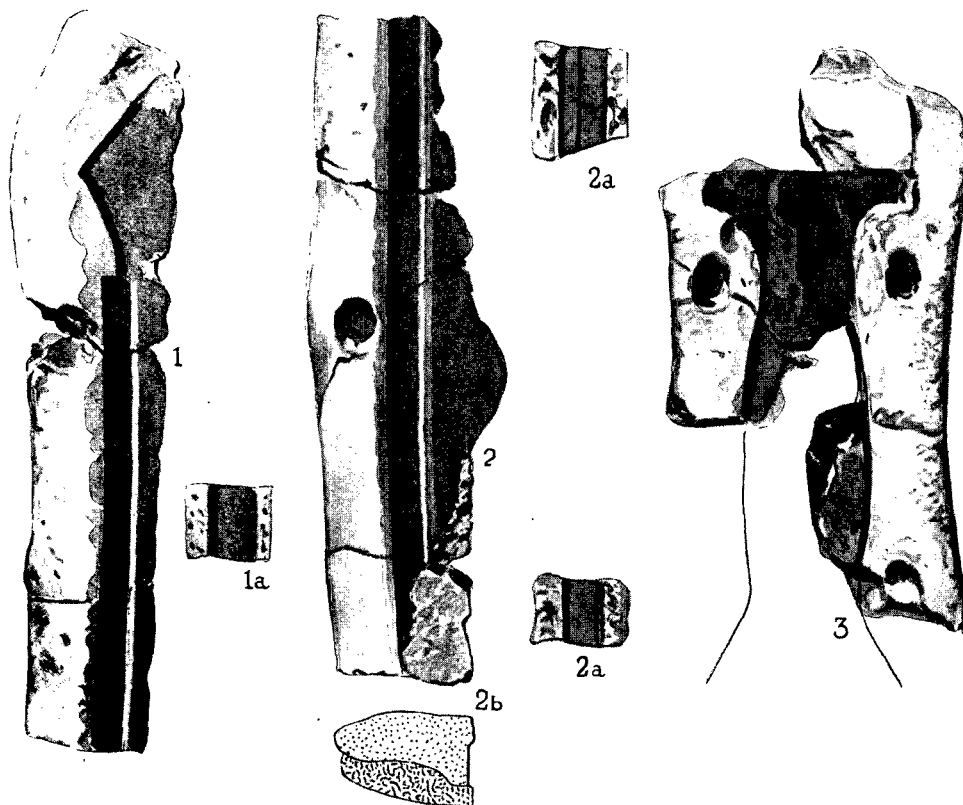


Fig. 34. Portions of Sword Mould "g". (f.)

terminal to hold the pommel. In the case of one sword there has been a well-formed notch, presumably for the finger, on the edge at the base of the blade (fig. 34, No. 1).

The fragments have been assembled as follows:—

a. Thirteen fragments of a mould, one piece showing the matrix for the lower part of the handle with a notch at the base of the blade on the edge at either side. The largest fragment measures 3 inches in length. All were found in the entrance passage.

b. There are twenty pieces grouped under this head, of which two portions relate to one side of the handle. Found in A, G, and L.

c. One complete portion of a valve referable to one side of the handle of a sword which cannot be identified as related to any other fragments (shown in profile, fig. 38, No. 2, p. 119). It was found in cell B in 1931.

d. Eleven fragments of the portion connected with the blade, distinguished by a striated surface, arising probably from the use of a wooden pattern, the grain of which has been reproduced on the mould.

e. Two large heavy contiguous fragments from the blade portion of the mould measuring $3\frac{1}{2}$ inches in length. Found in chambers G and L.

f. Nine fragments of a grey-coloured mould, found in the entrance passage G, K.

g. Fifteen fragments of the upper part of a mould, with a portion for half of the handle. On the inner side of the mould beneath the centre of the matrix is the impression of a rectangular reinforcing rod (fig. 34). The longest reconstructed portion measures $5\frac{1}{2}$ inches. Found in the entrance passage G.

Gouge Mould.—The upper part of one-half of a bivalve mould for a socketed tool, 2 inches in length (fig. 35, Nos. 1 and 1a). In all probability the mould, of which this is a part, has been used to cast a gouge. Such tools are very rare, there being only seven recorded finds of gouges in Scotland.

Mould for a Curved Blade.—An indefinite fragment of a grey-coloured mould, showing part of the matrix of a blade with a curved edge (fig. 36, No. 5). The piece is too small to determine with any certainty what the complete mould was intended for.

Miscellaneous Fragments.—Twenty fragments of the matrices of moulds.

Cire Perdue Moulds.—Nine fragments of two solid moulds for *cire perdue* casting (fig. 36, Nos. 1 and 2)—the largest reconstructed fragment, measuring $3\frac{1}{4}$ inches long, showing about two-thirds of the complete section of a mould for an object with circular section. Pieces were found in 1931 in B, and in 1932 in the entrance passage G. These moulds were

probably intended for casting a piece of strip metal such as is produced at the present day by a bronze worker requiring a reserve of metal from which he can detach portions for patching, making rivets, etc. The moulds are slightly blackened inside, probably by the smoke of the burning wax as hereafter described.

Mould for a Pinhead.—One piece of a mould for casting a disk with a conical prominence in the centre. Diameter of disk $1\frac{1}{2}$ inch, height of cone $\frac{1}{4}$ inch (fig. 35, Nos. 2, 2a, and 2b). This appears to have been employed for the production of the head of a large pin of a type found frequently in Ireland, but of which only one specimen, found with bronze swords, is recorded from Scotland, found at Tarves in Aberdeenshire and now in the British Museum.¹ No portion of a mould suited to cast the actual pin of which this might have been for the head has been found. A very similar object frequently forms the pommel of

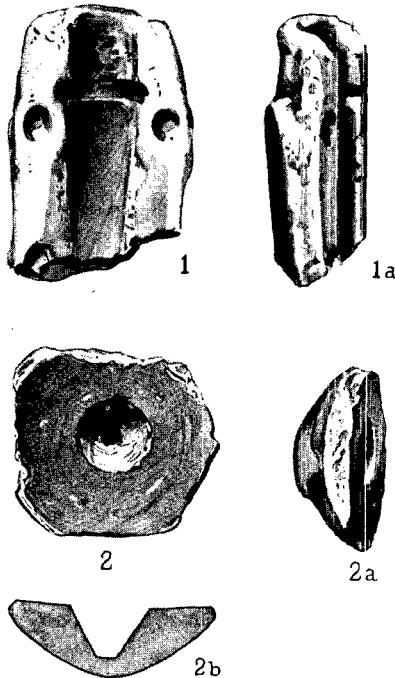


Fig. 35. Moulds for a Gouge and for a Disk. (f.)

¹ Evans, *op. cit.*, p. 372.

swords of this period in Denmark, but the handles of the Shetland swords as indicated by the moulds were unsuited to carry such a terminal. Moreover, no example of a sword with such a pommel has been found in Britain.

Gates of Moulds.—Forty-four fragments connected with the gates or orifices of moulds. Among these occur three pieces which, when joined together,

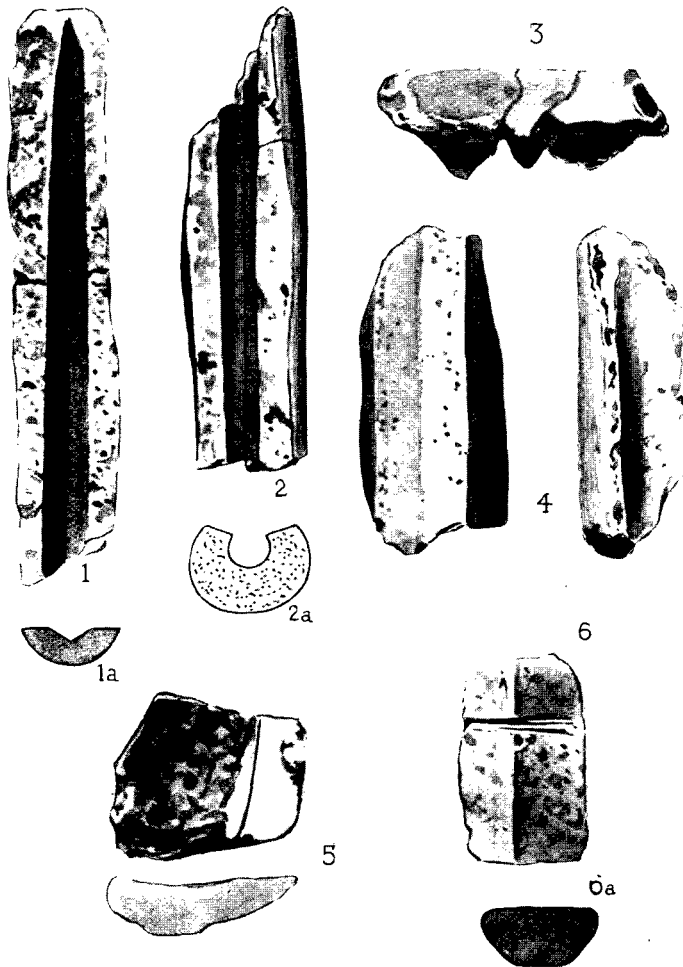


Fig. 36. Nos. 1, 1a, 2, 2a, Pieces of Moulds for *cire perdue* casting; No. 5, Part of a Mould with curved edge; No. 3, Portion of a Gate; and Nos. 4 and 6, Examples of Outer Casings. (#.)

represent the greater part of the gate and valves (fig. 37, Nos. 1 and 1a) attached to the upper end of the actual core as hereafter explained.

Pieces of the Envelope.—(a) Twenty-two pieces of the outer envelope of clay which surrounded the moulds, showing by a slight ridge on the inner surface the line of junction of the two sides.

(b) Five pieces of the outer envelope of a mould, faceted on the outer surface and appearing to fit the *cire perdue* moulds above mentioned (fig. 36, No. 4).

(c) A large collection of fragments of the envelope or outer casing of moulds.

So many important pieces of clay moulds have been found in this excavation that it is possible to deduce the method by which such moulds were constructed and subsequently employed in the process of casting.

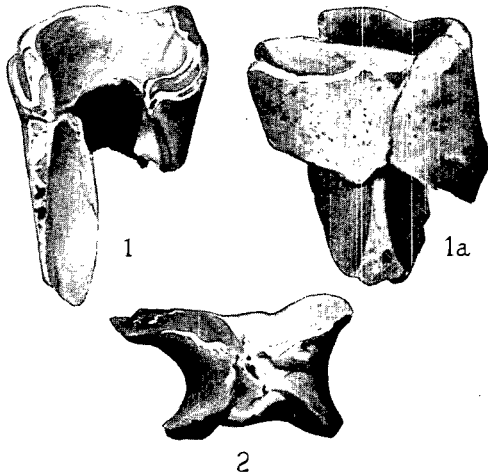


Fig. 37. Portions of Gâtés and Valves. (4.)

Bivalve or Faced Moulds.—The method followed in making a bivalve or two-sided mould, known also as a faced mould, whether for the purpose of casting a solid object such as a sword, or a hollow object such as a socketed axe, was practically the same.

In preparing the material the clay appears to have been levigated—that is, worked to a plastic condition—on a saddle-quern with the aid of a stone rubber. A number of querns and rubbers were found, and as already stated, without any grain in their vicinity as might have been expected had the purpose for which they were chiefly used been grinding corn. It is presumed that they were largely employed in the working of clay, and as evidence of this there was discovered on the hollow surface of an inverted quern, found in another dwelling not reported on at present, a thin coating of inorganic matter which appeared to be clay.

Presuming that it was the intention of the craftsman in the first instance to make a sword mould, an actual sword, or a replica of one fashioned probably in wood (for the grain of wood is clearly visible on certain of the moulds), to be used as a pattern, was laid on a flat surface such as a slate or stone, and a low wall of clay raised around it to the height of exactly one-half the thickness of the pattern where it presented a recognisably thick surface, as in the hilt, or to the edge of the blade elsewhere. The top of this wall was thereupon carefully smoothed and powdered with fine sand or dust, such as is known at the present time as “parting sand.” Fine clay was then laid on the top of it and worked across the pattern till the whole was covered to a uniform thickness of about $\frac{3}{16}$ inch. It was then allowed to dry

somewhat, and thereafter the pattern, with the clay adhering, was turned over so as to present a fresh surface on which to repeat the process for the other half of the mould.

The pattern was temporarily removed, and the matrix painted or smeared over with a fluid mixture, which served the double purpose of forming a fine surface and prevented the metal adhering to the mould. This was probably composed of a fine clay slip mixed with soot, as the surface of the matrices in all cases is grey or black. At the edge of certain pieces of a matrix of a sword mould (fig. 38, No. 1) may be seen the spread of the painting beyond the edge of the matrix by the feather or brush used to apply the mixture. This took the place of the

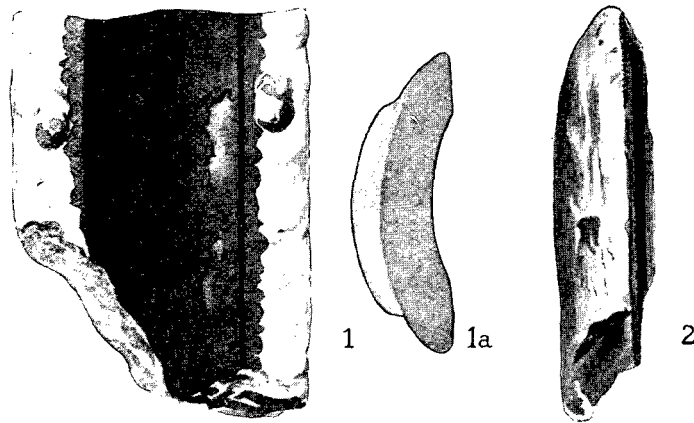


Fig. 38. Pieces of Sword Moulds. (♯.)

“anointing” practised by modern founders, who apply black lead, or, alternatively, smoke the interior of the mould. That accomplished, the craftsman then proceeded to form the socket for the keys by impressing a small pebble or some round-ended object, at intervals, into the edge or flange that surrounded the actual matrix. The fact that in one of the Jarlshof fragments there may be seen clay coated with the black slip pressed down and forming the side of such a socket, shows the order in which the steps proceeded. The surface of the flange or edge of the mould was then dusted with parting sand to prevent adherence, the pattern was replaced, and the upper valve or side of the mould was formed, the clay used being in a sufficiently ductile condition to flow easily into the sockets and form the keys wherewith the two sides were to be locked together. By means of a knife a shallow depression was made in the centre of each side at the base of the hilt to form a channel for the flow of the metal. When sufficiently dried the two

sides were prised apart and the pattern removed. An envelope or outer casing of clay, formed of rather coarser material with a certain amount of coarse sand in it to cause it to adhere, was then wrapped round the whole mould except the opening at the end, and carried beyond in sufficient mass to allow of the formation of the gate into which the metal would be poured. Such a pouring gate, found in another part of the site not treated of this year, is illustrated by fig. 39, and shows on its under side (No. 1) the impression of the top of the mould against which it was fitted. The complete mould would then

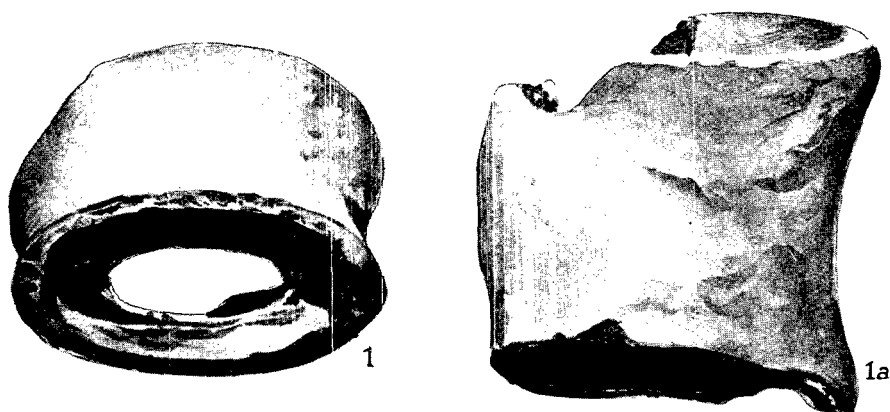


Fig. 39. Gate of Sword Mould. 1, View from below. 1a, Elevation. (♯.)

be subjected to a high temperature, and after being baked to a brick-like condition was ready for use. Fig. 38, No. 2, shows the actual hilt portion of one side of a mould for a sword viewed in profile, which, though not found with the "gate" above-mentioned, fits into the base of it.

No air vents have been observed in any portions of these moulds, and it is conjectured that through the joints of the mould, which would not fit very tightly, the air would escape during the process of casting,¹ and a similar action would result from the amount of sand used with the clay in the mould producing a certain degree of porosity. Sometimes it might happen that the two sides did not fit very closely together, or that keys were broken in the act of parting the valves to extract the pattern, so in that case the two sides were bound together with some ligature, possibly gut or sinew, and the impression of such a binding may be seen on the piece of the outer casing (fig. 36, No. 6, p. 117).

¹ See Evans, *op. cit.*, p. 446.

In a number of pieces of such moulds for casting swords, but by no means in all, a hole, occasionally round, sometimes of rectangular shape, runs longways through the mould below the matrix. As a rule this hole is found entirely in the outer casing, but in the example from Jarlshof in which it occurs it is at the back of the inner core of clay in which is formed the matrix (fig. 34, Nos. 1, 2, and sections, p. 115). Generally there is only a single hole, but in two of the pieces of mould from the find at Haag, in the parish of Thorsager in Eastern Jutland, preserved in the National Museum at Copenhagen, there are two parallel holes placed at a little distance from each other.¹ In the case of a portion of a mould representing the hilt of a sword from Traprain Law in the National Museum, there is a circular hole which does not extend to the outer end, and in a similar part of a mould from Whitepark Bay, County Antrim, in the Municipal Museum at Belfast, there is also a circular hole in the outer envelope which only extends half-way along the length of the hilt.

It is believed that such holes were used to contain pins or rods of wood, for the purpose of strengthening the moulds, and preventing them sagging during the process of drying,² and the charred remains of such a pin were actually discovered in certain pieces of a clay mould for casting a sword found in the Island of Sild, situated a short distance to the south of the Danish frontier.³ In the Jarlshof example, the grain of the wood of which the pin has been formed has left its impression on the side—and as may be seen in the section (fig. 34, No. 2*b*), the clay has been pressed up from either direction against the sides of the pin.

That these holes were for such a purpose as indicated, and not for an air vent to allow the gases to escape when the metal was poured into the mould, seems evident from the position they occupy well below the matrix, in some instances even close to the outer surface of the mould; from the absence of any air ducts leading into them from the interior of the mould, and from the fact, as stated, that they do not seem to have been prolonged to the actual extremity of the mould at the end from which the introduction of the metal took place.

In no fragment of a clay mould for an axe has any hole been seen such as occurs in some of the sword moulds, nor has any air vent been observed. It is believed that the air found its way out between the two sides at the junction as in the sword moulds.

The preliminary steps in preparing a mould for a socketed axe followed much the same lines as those for a sword mould, except that a plug,

¹ See Carl Neergaard, *La Trouvaille du Haag, Mémoires de la Société Royal des Antiquaires du Nord* (1908-13), p. 172.

² See Carl Neergaard, *op. cit.* p. 169.

³ See *Zeitschrift für Ethnologie* (1881), p. 187.

possibly of clay, was placed in the socket of the pattern and extended beyond it, having the diameter of the socket, plus the thickness of the metal, so as to allow for an extension of the mould to act as a bearing for the core, noticeable in the remains of the actual mould found at Jarlishof (fig. 32, p. 113).

When the mould had been constructed, and the pattern removed as in the case of the sword mould, it would be baked in a fire till the clay was transformed to a brick-like consistency. It was then necessary to fashion a core in order to produce, in casting, the socket of the axe. The two sides of the mould were opened and the interior filled with clay, which was allowed to project an inch or so in a cylindrical form, which projection at the present day is called the "print." The clay within the mould formed an exact pattern of the external aspect of the axe which it was desired to cast; but as the core was intended to represent the interior, the clay was pared away to the extent of the actual thickness of the metal desired for the axe, but left untouched within the collar projecting above the socket, thus providing a bearing to keep the core absolutely firm in its position.

As a step in the formation of the duct which was to convey the jet of molten metal into the mould, a portion of the print on either side, at right angles to the junction of the two valves of the mould, was sliced off with a tapering cut which ended immediately above, and led into the matrix of the socket. The core with the top sliced off is shown in the diagram (fig. 41, No. 1), and the flat inner surface of the large tooth-like header or jet (fig. 40), from Traprain Law, indicates the position assumed by the metal against it.

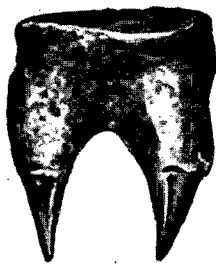


Fig. 40. Header or Jet of
Bronze from Traprain
Law. (♣.)

Thereafter followed the formation of the gate into which the metal was to be poured, and of the side of the ducts to correspond to the cuts made on the top of the core, for conducting the metal into the matrix. With the hand a small bottomless cup was fashioned having a flange or rim projecting on the under side. Around the outside of this cup a strip of clay was wrapped so as to project below it, while with the fingers inserted from the under side the clay was pressed against the flange causing it to adhere, and producing with the pressure of the finger an oblong concavity on either side to form the outer side of the ducts. When completed this part of the mould was attached to the top of the print, the hollows being made to correspond to the cuts and so form the ducts. The illustration (fig. 37, Nos. 1 and 1a, p. 118) shows an actual gate with part of the ducts remaining attached to

it, and the header from Traprain Law (fig. 40) shows exactly the form of a similar gate and ducts taken by the metal remaining after the casting had taken place.

When the core with the gate attached had been baked, it was

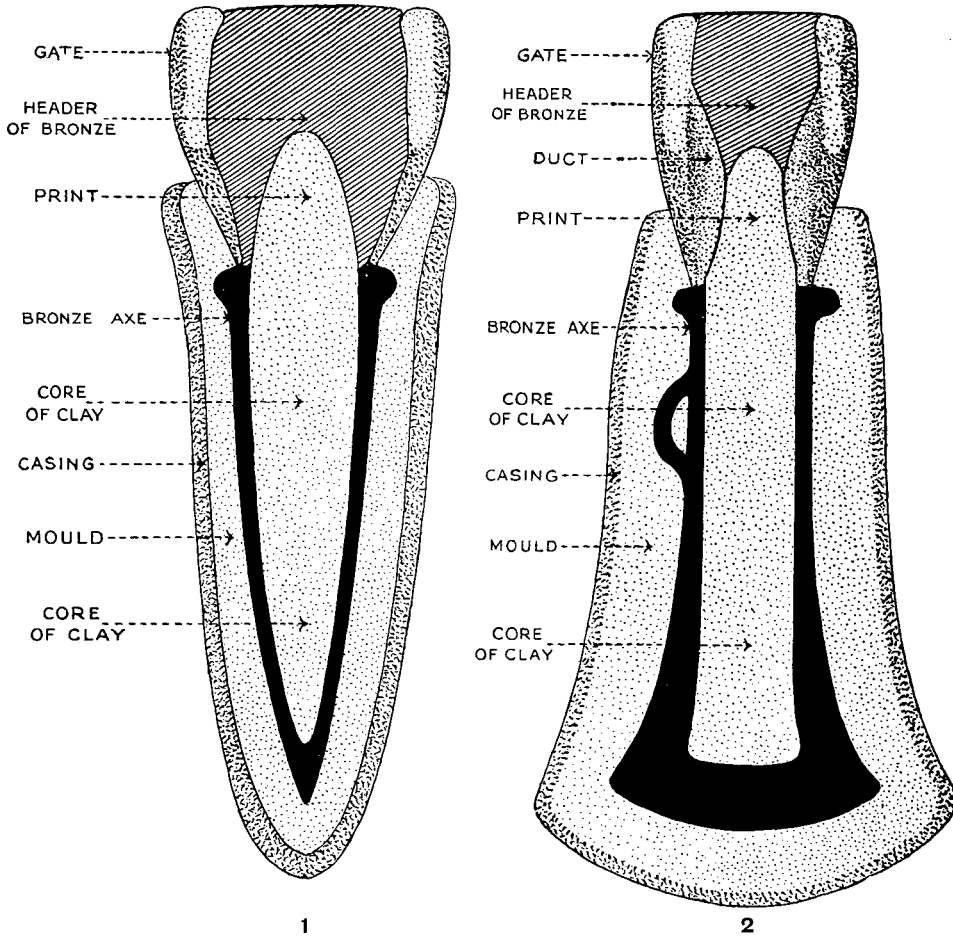


Fig. 41. Diagrammatic Sections of a Clay Mould for casting a Bronze Socketed Axe, showing the casting within.

replaced in position in the mould ready for the casting. The diagrams (fig. 41, Nos. 1 and 2), showing sections across the ducts and at right angles to them, illustrate the completed process after the metal has been poured into the mould.

In Dwelling No. i no part of a crucible has been found, but a number

of such objects, boat-shaped, with a pouring lip at one end, and flat on the bottom, are represented among the relics from Haag mentioned above.

When the mould was to be used it was placed upright in the pit, in which the sand had probably been previously damped to make it bind, and so maintain the moulds in position.

The metal brought in the crucible from the neighbouring hearth was then poured into the mould, and after it had cooled the latter was taken out and broken up to release the casting, and the fragments thrown away. The axe then appeared with the superfluous metal, now known as the header or jet, which had filled the gate and the ducts, still attached at two points on the edge of the socket. These were detached, and as this bronze could be remelted, after removal, it was no doubt carefully preserved for further use. The final act in the production of a casting was the removal of all rough edges left by the metal which had overflowed into the interstices at the junction of the two sides of the mould, and in the case of a socketed object, left also at the ends of the jet. Both swords and axes are occasionally found with such casting marks remaining upon them.

Solid Moulds for cire perdue Casting.—In addition to the bivalve or faced moulds, pieces of two other moulds were found illustrating a different method of casting known as the "lost wax" or *cire perdue* process. In this case a pattern was made of wax and encased entirely in clay. When the clay was baked the heat caused the wax to be burned out or to escape through the porous body of the mould, and to leave a cavity in the interior, which was an exact replica of its form. This process was usually employed for the production of objects in which there was undercutting, or detail too delicate to be given effect to by a faced mould.

A study of all these moulds makes it evident that they were the work of a practised hand who was thoroughly acquainted with his craft, and in no ways the tentative efforts of a beginner. The finished moulds have not differed in technique as far as observable from those, pieces of which are to be seen in our own National Museum from Traprain Law, in the Municipal Museum of Belfast, or in the National Museums of Dublin, Copenhagen, or Stockholm. A close examination of the relics recovered, assignable respectively to the four periods in the occupation of the dwelling, does not disclose any differentiation of such a nature as would indicate a marked change in the character of the occupants. The pottery is plain and unornamented throughout, nor does any of it show features which would distinguish it as a product of the Bronze Age as recognised generally on the mainland of Scotland. The heart-shaped slates or stones are represented at all

levels of the occupation, so are the saws, even the scrapers of quartz are not confined to the lowest. The evidence therefore points to a travelling smith, coming from the South, with his raw material and his craftsmanship acquired in the more advanced regions of the mainland, as the maker of the moulds and the producer of the swords, axes, etc., for the inhabitants of the dwelling.

From the areas in use solely during the two earlier periods of occupation there came no traces of bronze, nor, as has been stated above, fragments of moulds. But it does not follow from this absence of metal that the people were Neolithic, though still existing in a Stone Culture. The discovery by Professor Bryce¹ of a portion of a beaker urn in a stone cist at Scatness, a short distance from Sumburgh, clearly proves the advent of the Bronze Age race or culture at a very much earlier date, and probably for a long subsequent period Shetland would be affected by infiltration from the mainland of the round-headed people who had spread over Britain.

VEGETABLE REMAINS.

Some fragments of charcoal were found near the floor-level of the passage G, and also at a low level in the cell H. They were submitted to the Regius Professor of Botany, Sir W. Wright-Smith, who arranged for their examination by Mr M. Y. Orr of the Royal Botanic Garden. Mr Orr reported that of the two packets of specimens from G, one "contains Oak (probably root)," and that the other "contains much material which was too much carbonised to be recognisable, but that among it fragments of the wood of the following were identified: Oak, Willow or Poplar (?), Pine (probably), certainly coniferous wood.

None of the material was in a state suitable for microscopic examination, and the identifications were based entirely on the appearance of the surface of the specimens when broken across. The packet from H contained Oak, Willow or Poplar (which of the two last named it was impossible to say in the material), and Alder (probably).

While the result of this report suggests a possible difference in the climatic conditions of Shetland in Bronze Age times, it must be borne in mind that peat appears to have been consumed entirely on the hearths, indicating that timber was not plentiful.

ANIMAL REMAINS.

A report on the animal remains by Miss Margery I. Platt, M.Sc., of the Royal Scottish Museum, is printed as an Appendix to this paper.

¹ See *Proc. Soc. Ant. Scot.*, vol. lxxvii.

I desire to acknowledge my indebtedness to Mr J. Graham Callander, LL.D., Director of the National Museum of Antiquities, for advice on numerous occasions in the consideration of the relics; to Mr A. J. H. Edwards, Assistant Keeper of the National Museum, to Mr Charles Henshaw, and to Mr George Mancini for assistance in evolving the details of construction of the moulds and the methods of casting; to Mr James H. Richardson, Inspector of Ancient Monuments for Scotland, for making drawings for my use of pieces of clay moulds in museums in Ireland and elsewhere. I am grateful to Sir William Wright-Smith, Regius Professor of Botany, and to his Assistant, Mr M. Y. Orr, for their report on the vegetable remains; and to Miss Margery I. Platt, of the Royal Scottish Museum, for a thorough examination of the animal bones and a full report thereon; and to Mr D. Balsillie, also of the Royal Scottish Museum, for examining specimens of bronze. I acknowledge with thanks the assistance of Mr Peter Murray Thriepland, who spent a month with me in Shetland, and of Professor Bryce, who also paid a visit. To Mr J. B. Mackay, of the Office of Works, I was much indebted. Not only did he relieve me of any anxiety in regard to levels and plans, but he was always ready with help in whatever way it might be required. I am grateful also to Mr Strachan, the foreman, who not only attended to the work of supervision, but kept a record of the finds with meticulous care. Lastly, I desire to pay a tribute to the team of local workmen, whose zeal and intelligence contributed much to such success as was obtained in the excavation, and to the pleasure it gave me to conduct it.

APPENDIX I.

STATEMENT OF FINDS AND THEIR RELATIVE DISTRIBUTION.¹*Bone.*

Chisels of Maglemosian form: 1 from C, 1 from D, 1 from L.

Comb, fragments of, from D.

Knob or finial, with ferrule of bronze, from D.

Object of cetacean bone, of unknown use, from D.

Piercer, from F.

Scapulas of oxen, used as shovels: 1 from B, 1 from L.

Vertebra of sheep, perforated and fitted with pin, from B.

¹ For purpose of this record, objects represented by broken pieces are treated as if whole.

Bronze.

Dagger or knife, from M.
Finger-ring, spiral, from wall-head above D.

Stone and Slate.

Adze, from D.
Axes: 4 from B, 1 from D, 1 from F, 1 from L.
Cleaver, 1 from I.
Clubs, parts of: 1 from C, 1 from F, 1 from H, 11 from I, 2 from K,
1 from L, 1 from M.
Dises: 1 (oval) from A, 2 from I, 2 from M, 2 from an exploratory pit.
Hammer-stones and Pounders, noted: 5 from G and K, 7 from H,
5 from I, 2 from L. (Many others with only slight evidence of use
were not recorded.)
Heart-shaped perforated objects (mostly fragments): ca. 36 from A-F,
11 from G and K, 22 from H, 25 from I, 4 from L, 11 from M, 2
from an exploratory pit.
Hones, imperfect: 1 from L, 1 from D.
Knives: 1 from A, 1 from B, 1 from D, 1 from K, 1 from L, 1 from M.
Perforated stone, 1 from M.
Pumice, numerous pieces, many of them abraded, found throughout.
Rubbers, for saddle querns: 1 from C, 1 from G, 1 from L, 1 from M.
Saddle querns: 2 pieces from C, 1 from K, 1 from L.
Scrapers of quartz, 9 from A-F.
Serrated tools (saws or sickles), mostly fragmentary: 2 from A, 2 from
C, 1 from F, 1 from G, 2 from H, 1 from K, 4 from L, 3 from M.
Vessel of fine grained sandstone, from B.
Vessel of steatite, part of, from D.
Worked slates, of indefinite use: 3 from H, 4 from I, 2 from K, 10 from
L, 6 from M.

APPENDIX II.

REPORT ON THE ANIMAL BONES FROM JARLSHOF, SUMBURGH,
SHETLAND. By MARGERY I. PLATT, M.Sc., Royal Scottish Museum,
Edinburgh.

The animal remains found in the course of the excavation at Sum-
burgh form a valuable record not only of the fauna of the Bronze
Age in the remote island of Shetland, but also, as there are bones
occurring in upper levels of the fauna of subsequent periods. Animals
of food value were present at the lowest levels in the greatest

abundance, and though others were also represented, these were only in a very small minority. As may be expected, remains of the sheep and ox were most numerous, those next in order of numerical importance being pony, pig, bird, fish, shellfish, seal, walrus, and dog. Recent sub-soils revealed fragments of whale, cat, and wolf. With few exceptions the bones were all broken and incomplete.

Sheep.

The sheep bones from Sumburgh are the most numerous and the best represented of all the animal remains. Unfortunately most are of fragmentary nature. Those approaching complete preservation and therefore of use in identification are eight lower jaws, not including the jaws of immature specimens; several cervical, thoracic, and lumbar vertebræ; a few scapulæ, pelvic girdles, and ribs; many radii and tibiæ; several fore and hind cannons, carpals, tarsals, and phalanx bones. The few skulls are very incomplete. There are two humeri and one broken femur only. These bones, and other representative fragments of many, occur at all levels throughout the excavation: in the upper layers investigated in the early part of 1931, down to the floor-levels of all the various chambers excavated in the latter part of 1931 and in 1932. The greater proportion of sheep bones belonged to small and, as may be definitely proved in the case of the lower jaws, to immature animals.

The bones of the typical slender Shetland sheep are liberally represented at all levels. As previously stated, most of the jaws are immature. The youngest possess the three milk molars with only one permanent molar behind them. A transitional type between the latter and the adult jaw shows the third milk molar being replaced by the third premolar, the first molar well worn, the second molar fully grown but unworn, the last molar having not as yet made its appearance. The single adult jaw of this type has both molars and premolars well worn. The latter measures as follows:—

Total length of jaw	14.75 cms.
Total length of complete tooth row	6.9 ..

The corresponding jaw of the Shetland sheep skeleton in the Royal Scottish Museum measures:—

Total length of jaw	15.0 cms.
Total length of complete tooth row	6.0 ..

The bones of a sheep of larger build are found in deposits 3 feet to 5 feet down, though apparently not common in the lowest layers of the excavation. Parts of this represented are a lower jaw, tibia, radii, and a humerus. Measurements of these are given below, and to the right

those of the corresponding bones of the Shetland sheep in the Royal Scottish Museum:

	Large Sheep.	R.S.M., Shetland.
<i>Lower Jaw:</i>		
Length	18.5 cms.	15.0 cms.
Complete tooth row	7.1 ,,	6.0 ,,
<i>Radius:</i>		
Length	16.4 ,,	13.3 ,,
* Max. width of proximal end	3.2 ,,	2.8 ,,
* Max. width of distal end	3.0 ,,	2.7 ,,
* Min. width of shaft	1.8 ,,	1.4 ,,
<i>Humerus:</i>		
Length	14.5 ,,	12.95 ,,
Max. width of proximal end	3.75 ,,	3.45 ,,
Max. width of distal end	3.2 ,,	2.8 ,,
Min. width of shaft	1.65 ,,	1.35 ,,
<i>Tibia:</i>		
Length	19.9 ,,	18.2 ,,
Max. width of proximal end	3.7 ,,	3.55 ,,
Max. width of distal end	2.45 ,,	2.4 ,,
Min. width of shaft	1.25 ,,	1.25 ,,

* These data are taken from the anterior aspect of the bone in every case.

Skulls.—The skulls show features of interest, in spite of their being only of a fragmentary nature. Both horned and hornless varieties are represented.

Horned Skulls: A. Large Type.—This skull has fairly large horn-cores spreading away from each other at a right angle. Their measurements as compared with those of a typical Shetland sheep are as follows:—

	Sumburgh.	Typical Shetland.
Length of horn-core (outer curvature)	10.7 cms.	7.5 cms.
Circumference at base of core	11.0 ,,	7.0 ,,

It is seen that the horn-cores of some specimens (including odd horn-cores) are of a larger and heavier type than those of a typical Shetland sheep, though not nearly so large as those recorded by Professor Watson from Scara Brae.¹ The large Sumburgh sheep skull is found in the same deposit as the large-sized radius, and it is therefore possible that both belonged to this larger horned sheep.

B. Small Type.—The small horned skull is immature and is apparently the only preserved Shetland sheep skull, though other bone fragments of this type are numerous throughout all levels. This skull occurs at the same level as the larger skull, so it is apparent that this layer presents a mixed assemblage of types.

¹ V. Gordon Childe, *Scara Brae: A Pictish Village in Orkney* (1931).

Hornless Skull.—This third variety—a hummel type—is from a very recent layer at the surface. The cranium is a large size and corresponds to that of the larger horned type. The depth of these skulls from the posterior end of the suture between the frontals to the occipital crest is the same in both; as also is the width of the skull along the suture separating the frontals and parietals.

Concluding from the evidence of all the bones, the slender Shetland sheep is represented throughout all the layers of the excavation; a larger sheep occurs, in addition, on the floors of various chambers, and also in more recent layers, while a hornless variety is found in the most recent deposit at the surface. Animals of all ages, between early youth and adult, are present throughout.

Ox.

The ox bones from Sumburgh are very numerous and of extensive range; in fact, like the bones of the sheep, they are present in every part of the excavation. Almost every bone of the skeleton has been recognised in whole or in part, though, as also in the case of the sheep, the remains are much broken up. Apart from carpals and tarsals very few bones remain whole. It is probable that larger bones such as humeri, femora, radii, metatarsals, and metacarpals, of which there are many fragments, were broken intentionally in order to extract the marrow. The complete larger bones of use in identification are so few, comprising only a radius, two metacarpals, and a humerus, that measurements were taken of some of the larger fragments in addition. The four complete bones just mentioned are all of a short type, corresponding in length to similar bones of the Shetland ox preserved in the Royal Scottish Museum. The metacarpals, however, are even sturdier in girth, as may be seen from the following data:—

	Sumburgh.	R.S.M., Shetland.
<i>Radius:</i>		
Max. length	24·8 cms.	26·0 cms.
Max. width of proximal end	6·85 "	7·4 "
Max. width of distal end	6·25 "	6·4 "
Min. width of shaft	3·5 "	3·75 "
<i>Metacarpals:</i>		
	A.	B.
Max. length	18·0 cms.	15·75 "
Max. width of proximal end	5·95 "	5·55 "
Max. width of distal end	6·7 "	5·95 "
Min. width of shaft	3·7 "	3·25 "
<i>Humerus:</i>		
Max. length	23·7 "	26·5 "
Max. width of proximal end	8·3 "	8·75 "
Max. width of distal end	7·3 "	6·7 "
Min. width of shaft	3·5 "	3·65 "

These short ox bones are all recorded from the deepest layers of the excavation, *i.e.* from the floors of the various chambers of prehistoric date. From their evidence, and judging also from the small size of the mature lower jaws described below, it may be assumed that this early ox belonging to these primitive people was similar to the typical small Shetland ox of to-day. Since the evidence from complete bones is so scanty, as before stated, measurements were taken of the larger fragments of the long bones and of a few atlas vertebræ which appeared somewhat large. Wherever possible, measurements of the articulating processes and the shaft were taken and many were found to exceed the corresponding measurements of the Shetland ox. Allowing for the fact that numerous young animal bones are abundant, it seems evident that a larger ox was also present. Measurements of the fragments are as follows, with the corresponding Shetland ox datum on the right:—

	Sumburgh.	R.S.M., Shetland.
<i>Humerus:</i>		
Max. width of distal end . . .	8.35 cms.	6.7 cms.
<i>Radius:</i>		
Max. width of proximal end . . .	8.9 ,,	7.4 ,,
<i>Metacarpal:</i>		
Max. width of distal end . . .	7.6 ,,	5.55 ,,
<i>Tibia:</i>		
Max. width of distal end . . .	5.95 ,,	5.55 ,,
<i>Atlas vertebra:</i>		
	A.	B.
Length of centrum . . .	4.7 cms.	4.3 ,,
		3.8 ,,

The larger of the atlas vertebræ is the same size as an atlas from our domestic cattle of to-day. As it was found at a high level in recent deposits, its appearance is not unexpected. The other large bones, however, were found at floor-level in the various chambers and are therefore of prehistoric date. Hence both the small and the large ox bones are of contemporary age; in the very earliest parts of the dwelling, *i.e.* chambers L and I, they occur together. Supporting evidence, in the distinction of these two varieties, from the skull and lower jaws, is not particularly helpful. A single skull only was found and that from the upper deposits of historic date and therefore not so important. It is of the Celtic shorthorn type so far as can be made out (for horn-cores and the anterior part of the skull are wanting), having the usual dished frontals, rising to a median prominence at the vertex. Horn-cores found separately belong also to this variety and there are no

differences distinguishing the sexes. There are four lower jaws approaching completeness; they occurred in the lowest and middle layers, and all of them indicate the small Shetland ox and none belong to the large ox. Two out of the four jaws possessed a complete adult dentition; the more complete specimen is short, being only 31·5 cms. long, while the complete tooth row measures 13·9 cms., comparing favourably with that of the Shetland ox. The second adult jaw is of similar dimensions, but is peculiar in that the last molar has only two cusps. Of the immature lower jaws, the youngest complete one has a third milk molar, followed by a single unworn permanent molar. This jaw measures 18·5 cms. in length. Another jaw is transitional in age, possessing two permanent molars, while many incomplete fragments are younger, having only milk teeth.

Odd teeth, presumably of the small Shetland ox, were found at all levels. Numerous small cannon bones, scapulæ, and vertebræ indicate the quantity of young animals.

From all these observations it is evident, therefore, that bones of both young and old animals are distributed indiscriminately throughout all levels of the excavation—though the majority are fragmentary only, and that some represent an ox about the size of the Shetland ox, and others a contemporary ox of larger build. In view of the scanty number of complete lower jaws, it is impossible to draw conclusions as to the actual proportions of young to adult animals, though it would appear that young animals are more numerous.

Pony.

The remains of the pony were sparsely scattered throughout all parts of the excavation. In spite of such a small proportion being present the complete bones are almost as numerous as those of the ox, though in this case no skull or jaw was found. A tibia, two metatarsals, a few atlas vertebræ, and a small radius were measured, though not all were complete bones. The last, the small radius, was found in chamber L at the lowest level, other bones and attendant fragments were found in parts of Dwelling No. i of prehistoric date, whilst the remainder were found in the more recent layers. Owing to the absence of jaws, which always give definite evidence, it is difficult to say whether the few perfect long bones found are actually adult. They do, however, compare favourably with those of the Shetland pony, and it is therefore possible that they belong to this type. Measurements are given below; those of the Shetland pony which correspond were taken from the specimen in the Royal Scottish Museum:—

FURTHER EXCAVATION AT JARLSHOF, SHETLAND. 133

	Sumburgh.	R.S.M., Shetland Pony.
<i>Tibia :</i>		
Max. length	28·8 cms.	30·5 cms.
Max. width of proximal end	7·6 ,,	8·9 ,,
Max. width of distal end	6·1 ,,	6·55 ,,
Min. width of shaft	3·15 ,,	3·5 ,,
<i>Metatarsal :</i>		
Max. length	23·8 ,,	24·8 ,,
Max. width of proximal end	4·25 ,,	4·6 ,,
Max. width of distal end	4·1 ,,	4·45 ,,
Max. width of shaft	2·5 ,,	2·75 ,,
<i>Atlas vertebra :</i>		
Max. width	11·05 ,,	13·4 ,,
Length of centrum	2·9 ,,	3·45 ,,
<i>Radius :</i>		
Max. width of distal end	6·35 ,,	7·1 ,,

Numerous pony's teeth were found at various levels, and, on comparison with the Shetland pony jaw, are found to quite agree in size and structure with these teeth. Therefore in the absence of larger bones, jaws or skulls giving evidence to the contrary, it may be assumed that the pony represented by these remains belongs to the typical small Shetland breed, and that it was utilised by the inhabitants of every occupation since it occurs at all levels. The bones were not broken longitudinally for marrow, as apparently in the case of the ox; and few bones of young animals were found.

Pig.

Numerically, the remains of the pig are of little importance, being even more scanty than pony remains. The few records made are characteristically from all levels of the excavation. They comprise teeth, small pieces of jaw with teeth *in situ*; a few lower jaws; scapulæ and fragments of these; and phalanx bones. With the exception of two tusks (one only a part), both, however, indicating a boar of adult age, the remainder of the bones are all from immature animals as they are very small. The jaws are small, and where the last molar is present this is unworn. This character may merely indicate degeneracy due to domesticity, but as the jaws are small, the absence of signs of wear may be due to youth. In fact, in one case in which the jaw was taken from an early level, a phalanx bone of a young pig was along with it. Since both these might have belonged to the same animal, the jaw is in this case definitely young. The complete large tusk, evidently a lower left canine, was found in an early part of Dwelling No. i, though not

at the very lowest level, and is most certainly of prehistoric date. Along its outer curvature it measures 17·5 cms., and at the distal extremity, near the chisel point of wearing, it is 5·7 cms. in girth. Its proximal half indicates peculiar growth, probably due to disease, since the usual smooth surface is annulated and covered at intervals with concretions. The fragment, which is only the partial section of a tooth, 8 cms. long, must be part of a huge tusk, as it is even in this fragmentary state 2·7 cms. in diameter. The latter is from surface layers. Such a large tusk would be very exceptional in a domestic boar, but it would require stronger evidence than the occurrence of one tusk to testify to the existence of wild pig in Shetland.

Cat.

Only four bones of the cat were found, all from middle layers of the excavation, and therefore probably of late prehistoric date. They comprised a scapula, a lower jaw in part, a femur, and also part of a tibia. The last three named are certainly of the wild variety.

Dog.

The remains of this animal are equally scanty as those of the cat. There is, however, an additional point of interest in that the small atlas vertebra of a dog was taken from one of the earliest levels explored—chamber M. Strangely enough, the remaining bones (with the exception of a jaw which was fully adult), a tibia and a femur, were all from the young animal, and are recorded from a prehistoric as well as from a surface layer.

Wolf.

The occurrence of the lower jaw of a wolf is apparently unique for Shetland. The jaw is not perfect, for the anterior part is missing. Because of the well-worn appearance of the large carnassial tooth, the wolf was certainly of adult age. The first three premolars and the first two molars are present, and all worn—the missing teeth have at some time dropped out. Measurements are given below:

Total length of fragment	15·2 cms.
Width of jaw, below carnassial tooth	2·6 "
Width of premolar 1	0·45 "
Width of premolar 2	0·9 "
Width of premolar 3	1·1 "
Premolar 4 absent.	
Width of molar 1	2·4 "
Width of molar 2	1·0 "
Molar 3 absent.	

The occurrence of the jaw of a wolf in close proximity to the ruins of a dwelling of comparatively recent date may have some other explanation than that the wolf was indigenous to the Island.

Seal.

A few bones of both the Common Seal (*Phoca vitulina*) and the Grey Seal (*Halichoerus grypus*) were found at all levels. The Common Seal bones included a humerus found on the floor of chamber I, one of the earliest levels of occupation. Although the bones of the Grey Seal were found at various levels extending down to prehistoric times they did not occur so deeply as those of the Common Seal. Among others, a good scapula is recorded from deposits dating back probably to the early part of the Christian era.

Walrus.

The axis and lumbar vertebræ of the walrus occurred in deposits at floor-level of chamber I. No other remains of this animal are recorded.

Whale.

A few bones of the whale, in every case the fragmentary remains of large vertebræ, were taken at surface-level, and in consequence are not of very great import.

Birds.

Fragments of bird bones are quite numerous, occurring at all levels. Apart from the age of the deposits in which they were found they are not of further interest, since all are recorded from Shetland to-day. The mandible of a Great Northern Diver and the fragment of a humerus and complete coracoid of a Gannet were found in the lowest levels. In deposits not quite so early as the last, but of early date, were remains of the Cormorant, Razor-bill, Herring Gull, Gannet, Stork, Swan, Goose, Shag, and Heron. Higher up, in more recent surface layers, many of these occurred again, such as the Cormorant, Diver, Shag, and Goose, while in addition were Blue-eyed Shag, Great Black-backed Gull, Petrel, Storm Petrel, Turnstone, Bittern, Curlew, and Raven. The bones of the birds from the lowest levels differed in no respect, and were exactly the same size as those of the present day.

Fish Remains.

Many fish bones were found in the chambers of the dwelling first excavated and also on the floors of first occupation of an even earlier date. In fact, apart from the majority which were associated with

the relics of these early people, only a few occurred in the surface soils. The bones identified are chiefly those of the Cod; of these vertebræ, clavicles, supraclaviculars, articulars, quadrates, dentaries, premaxillæ and maxillæ are present. Among the remainder some bones of the Ling are included, also a large maxillary bone of the Fishing Frog (*Lophius piscatorius*).

Shells.

The shells seem to have a very definite distribution, in that they occur only in the very earliest parts, *i.e.* in chambers H, K, L, and I, all adjoining one another, and none is recorded from the later occupation. In addition, however, quantities of shells were found in exploration trenches and the surface layers. These last include land shells as well as edible varieties, whereas it is significant that the whole of the shells found in the early dwelling itself comprise only the shells of Cockles and Limpets, commonly used as food. From the upper layers, in addition to Cockles and Limpets, the shells of *Littorina littorea*, *Buccinum undatum*, and *Helix nemoralis* also occur.

From the previous notes it is evident that in the case of some animals, notably sheep and ox, more than one breed is indicated. This distinction occurs in prehistoric times and persists, so far as can be made out, into the upper layers, where another variety in addition may be present. The same types occurred during all the centuries represented, and possibly this might be anticipated, since climatic conditions on these islands will no doubt have been comparatively stable for all this time; and probably due to the remoteness of Shetland geographically, there has been no progressive development in one direction or another. Absence of forest no doubt accounts for the exclusion of deer. Conclusions drawn as to actual breeds are given tentatively in every case, since material from the excavation of determinable character is very scanty and insufficient. Should further excavation provide bones of a more complete nature, more valuable and interesting knowledge of the animal life associated with these primitive Bronze Age people may be determined.