

## II.

ON A CAVE CONTAINING BONES AND OBJECTS OF HUMAN WORKMANSHIP, AT BORNESS, KIRKCUDBRIGHTSHIRE. BY ADAM J. CORRIE, M.A., F.S.A. SCOT., WILLIAM BRUCE CLARKE, B.A., F.S.A. SCOT., AND ARTHUR R. HUNT, M.A., F.G.S. (PLATES XVII-XXII.)

*Brief Review of Scottish Caves as yet explored.*—Up to the present time, though much attention has been paid to the subject of bone-caves, both in England and in various parts of the Continent, but little is known concerning the ancient troglodytes of Scotland. This is probably owing in some measure to the remarkable scarcity of caverns in the limestone rocks of Scotland as compared with those of England. For it is evident that osseous remains and objects of human workmanship are far more likely to be preserved, if deposited in a limestone cave, than in one hollowed in any other kind of rock, owing to the probability that, in the former case, the cave earth containing them would become sealed down, and protected by a floor of stalagmite.

Of the Scottish caves which had been hitherto examined and described, the following are the principal, so far as the authors of the present paper have been able to ascertain.

In the year 1847 a cave near Montrose, at Lower Warburton, in the parish of St Cyrus, Kincardineshire, was examined by Mr Alexander Bryson. Its entrance is described by him<sup>1</sup> as facing due south, situate about half-a-mile from the estuary of the Esk, and about 15 feet above high-water mark. Its mouth was filled up with soil, containing bones of ox, deer, badger, hare, rabbit, and other small rodents, beside a few bird-bones. At the mouth, or lowest part of the cave, the bones belonged chiefly to the larger ruminants; at a height of 3 feet were found remains of small rodents. Above this came a mass of earth, about 10 feet thick, showing signs of stratification: through this mass skulls of rats and other small rodents were mixed promiscuously, but the scapulæ and lighter bones were aggregated into heaps, so that a spadeful of them might have been taken up without any earth at all. Beyond these remains, an inner chamber was reached, the floor of which was covered by an unctuous slime, full of buccinum, mytilus, and patella; but a vertebra

<sup>1</sup> Edinburgh New Phil. Journal, 1850.

of an ox, and an amulet made from the leg of an ox, were the only osseous remains. This cave was next described by Mr W. Beattie.<sup>1</sup> His account differs but little from the preceding one, excepting that he mentions the presence of wild cat, and also of a species which he states is either fox, wolf, or dog. His most important discovery, however, was a portion of a human parietal bone, and two other small pieces of human bones. The bones which he obtained were stated by Professor Owen to belong only to existing species. In the year 1865 a paper on this cave was written by Dr Howden, and read by Dr M'Bain, in the same year before the Royal Physical Society in Edinburgh.<sup>2</sup> Dr Howden seems never to have penetrated into the cave, for he says—"This cave, ever since I knew it, has been completely closed up by a large mass of rock several tons in weight, but around the entrance the soil still abounds in fragments of bones, shells, wood-ashes," &c. He, however, gives a list of the remains preserved in the Montrose Museum by Mr W. Beattie, which are as follows:—Shells, *Mytilus edulis*, *Cardium edule*, *Littorina littorea*, *Buccinam undatum*, *Fusus antiquus*, *Patella vulgata*, *Helix nemoralis*; fragments of the claws of *Cancer pagurus*; leg-bones and bill of *Sula bassana*,—their frequency, considering that the gannet is said by Dr Howden to visit the district only in the summer, is a fact rightly insisted on by him as being noteworthy. Bones of the following animals, *Cervus elaphus*, *C. capreolus*, *Sus*, *Bos*, *Felis catus*, *Canis familiaris*, *Mus*, *Hypudeus*, a portion of a human radius and parietal bone. Some coarse pottery, ornamented with cord-like pattern, was found, together with flat, round, and oval stones. Dr Howden, however, unlike Mr Bryson, who ascribed the presence of the remains in the cave to fluvatile action, and Mr Beattie, who thought it due to the agency of hyænas, was the first to recognise the fact that the cave had been a place of human habitation.

Bones, many of which were split, were also found in a cave at Wemyss, Fifeshire, as described by the late Sir James Y. Simpson. They belonged to the following animals:—Ox, sheep, deer of two sizes (probably red and roe deer), and hog; and were accompanied by remains of birds. Besides

<sup>1</sup> Brit. Assoc. Report, Aberdeen, 1859, p. 99; Proc. Soc. Antiq. Scot., ix. p. 630.

<sup>2</sup> Proc. Royal Phys. Soc. Edinburgh, 1865-66, p. 368.

these occurred microscopic remains of cereals, shells of oyster, limpet, and whelk, sharpening stones rendered smooth by friction; round perforated stones, about two inches in diameter; and two implements formed from the tine of a red-deer horn.

In a cave at Sea-Cliff, near North Berwick,<sup>1</sup> somewhat similar objects were found, but in this case accompanied by human remains, together with portions of urns and jars. Near this cave, on a rock close by, and also at another spot further inland, remains of a similar character occurred in a kitchen-midden, comprising those of pig, goat, deer, and associated with them bone-needles, combs, querns, hones, and pottery.

Close to Dillymäenan, in Banffshire, a cave has been described by Mr James Hunter,<sup>2</sup> containing alternate layers of comparatively soft clay, shells, and charcoal. At the depth of 2 feet a distinct floor of hard baked clay was reached.

Again,<sup>3</sup> in the same paper a second cave dwelling is described, containing, in section, from 4 to 6 inches of natural soil, below which were found layers of sea-shells, charcoal, and soft clay. At the depth of 2 feet was a hard baked floor, about three quarters of an inch thick; below which again were similar layers of charcoal, &c., and a few bones, small and unsplit.

In the year 1871 a cave was exposed in the course of quarrying for building-stone at Oban, and the contents, which owing to the kindness of Professor Turner<sup>4</sup> the authors have been enabled to look over, have been described by him. They consist of the skull of a human adult male and that of a child about nine years of age. Other human bones were found, among which was a platycnemic tibia, and a femur, also showing signs of flattening. These were similar, in many respects, to those from the Denbighshire caves described by Professor Busk. In addition to these were bones of ox, red-deer, and goat, most of which were split, together with remains of dog, fox, otter, pine-marten, water-vole, and portions of some kind of duck. Flint-flakes, limpets, and calcined bones also occurred.

<sup>1</sup> Sculptured Stones of Scotland, by Dr J. Stuart, vol. ii., appendix to preface xiii. p. 87, *et seq.*; Archæol. Scot., iv. p. 353; Proc. Soc. Antiq. Scot., viii. p. 372.

<sup>2</sup> Pro. Soc. Ant. Scot., May 1868, p. 46.

<sup>3</sup> *Ibid.*, p. 470.

<sup>4</sup> Brit. Assoc. Report, Edinburgh, 1871, p. 160.

A paper, as yet unpublished,<sup>1</sup> was read by the Rev. R. Mapleton on a bone-cave at Duntroon, in Argyllshire, which was discovered in the year 1862. It contained human bones, a human skeleton in a sitting-posture, and two flint-flakes.

Such is a brief sketch of the chief results of cave research in Scotland up to the present time.

*Description of the Borness Cave, and its situation.*—The cave which is the subject of this paper is situated on the farm of Borness, on the sea-coast of the parish of Borgue, Kirkcudbrightshire, about  $2\frac{1}{2}$  miles west of the mouth of the river Dee. Its existence had long been known, but until the autumn of the year 1872 the nature of its contents was wholly unsuspected. A chance visit by one of the present explorers and a friend, led to the discovery, by the latter, of an ox-tooth lying on the surface of the floor. This suggested the making of a trial excavation, which at once made it evident that the earth of the cavern was rich in various osseous remains. Arrangements were at once made for the carrying out of a systematic examination, the results of which, so far as the work has as yet proceeded, are given in the present paper.

The cave is situated in a bay or indentation in the coast-line, at the foot of the sea-cliffs, which, though not very lofty, are remarkably bold and picturesque. Upon the summit of the headland, which forms the western horn of the bay, and distant about 100 yards from the cave, occurs a small, but exceedingly well-defined, specimen of the "British-camps" or hill-forts, which are so numerous in this part of Kirkcudbrightshire. It consists of two trenches and three lines of embankment. These run across the headland from one cliff-edge to the other, and form the defence on the land side; the remaining sides of the camp being rendered inaccessible by the perpendicular sea-cliff. The area enclosed is, roughly speaking, triangular in shape, and communicates with the exterior by means of a causeway which runs through the lines of entrenchment. It is not impossible that the entrenchment may at one time have formed a complete circle, the encroachment of the sea upon the cliff having since destroyed all but that portion of the "camp" which now remains. It is, however, perhaps more probable that the

<sup>1</sup> Proc. Soc. Ant. Scot. 1873.

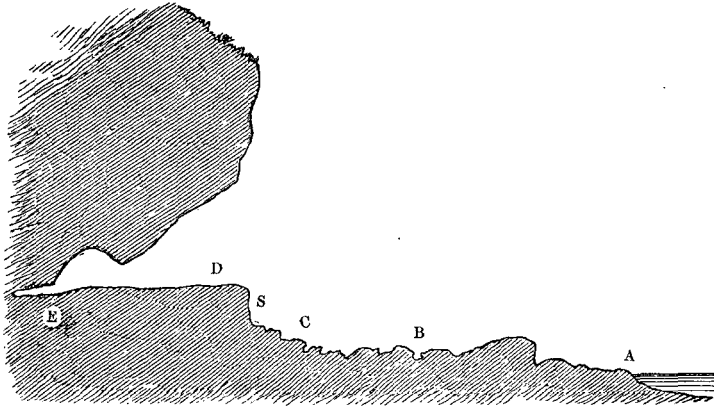
"camp" was originally formed, pretty much as it now exists, on a promontory which from its natural advantages was so easily defended. An old inhabitant of the village of Borgue informs one of the authors that human bones,<sup>1</sup> of large dimensions, were dug up, about the year 1780, on the cliff in or near this "camp." It will be for future consideration and investigation, whether the "camp" and the cave were or were not simultaneously occupied by the same people. The cave may have served as a sheltered and secure adjunct to the "camp."

The above mentioned indentation in the coast line is divided into two unequal portions by a narrow ridge of rock, between 50 and 60 feet in height, which runs out at right angles from the cliff down to the sea, and it is at the head of the south-eastern and narrower portion of the bay so divided that the cave is situated. This portion of the bay is in fact a deep, narrow, vertical-sided gorge or ravine, over 100 feet in length, and 24 feet in average width, which, commencing somewhat below high-water mark, terminates landwards in the mouth of the cave. Huge masses, and smaller fragments of rock, fallen from its precipitous sides, strew the bottom of this ravine, which slopes gradually down from the mouth of the cavern to the sea.

From the land there is but one way of access to the cave, viz., by climbing out upon the lofty ridge of rock above mentioned and descending its side, by rough steps, which were cut when the work of exploration was commenced. The descent is, indeed, so precipitous, that a false step might entail most serious consequences, on which account a rope, though not absolutely necessary, is commonly used, by way of precaution. On reaching the bottom of the ravine the explorer finds himself considerably below the level of the mouth of the cavern, although, on the other hand, some feet above the range of the highest spring tides. From this point of view it is evident that the cave itself is a direct continuation of the ravine, just as a railway tunnel is usually the continuation of a cutting. The mouth of the cave, which faces S.W., is triangular in shape, the walls inclining towards each other, and meeting in the roof. Before commencing the excavation, there extended across the lower part of the

<sup>1</sup> The authors are indebted to Mr Gilbert M. Sproat for drawing their attention to this fact.

entrance, from side to side, a mass of breccia and stalagmite, consisting at the bottom of large fragments of rock cemented together by carbonate of lime, and at its upper part of almost pure stalagmite, the exact thickness of which cannot as yet be determined. On the outside, this mass



Longitudinal Vertical Section of Borness Cave previous to Exploration.  
Scale  $\frac{1}{4}$  inch to a foot.

- A Sea-level.
- ABC Ravine bottom sloping from cave to sea.
- S Stalagmite rampart across lower part of cave mouth
- D Central point at mouth of cave.
- E Point at the entrance of the small passage at the back of the cave.
- DE (Datum line) =  $39\frac{1}{4}$  feet.
- DA = 89 feet.
- Breadth of ravine at A = 19 feet ; at B = 14 feet ; at C = 39 feet.

of breccia presented a wall-like face, some 8 or 9 feet in height, from the bottom of the ravine; while on the inside, its summit was level with the cave-floor, to which it acted the part of a retaining wall. From the summit of this breccia wall the floor sloped gently inwards. Besides the massive stalagmitic rampart across the mouth, a sloping bank of the same deposit lined the right or S.E. side of the cave; while, at the entrance, on the left side, and also at the inner end of the chamber on

the opposite side, the wall is coated thickly with stalagmite. The stalagmite of the rampart across the mouth, and of the bank along the floor on the right side, is cream-coloured, not crystalline, porous, and exceedingly tough. That covering the walls in part, as described, is whiter, more crystalline, and laminated; while a third kind, of a soft, pasty, and impure character, occurred in the midst of the cave-earth, in one part, in a layer of several inches in thickness. This intercalated layer of pasty stalagmite probably points to a period during which the cave was unoccupied by man, and the formation of stalagmite upon the floor was therefore allowed to proceed during the interval without interruption.

The cavern, so far as at present explored, consists of a single chamber, into the inner extremity of which a narrow, low, passage opens. The dimensions of the former, before any of the cave earth was removed, were as follows:—The length was 39 feet 3 inches; the width, which at the entrance was 21 feet, at 15 feet inwards narrowed suddenly to 14 feet, owing to the projection of the south-eastern wall of the cave. The height of the roof at the entrance, at a point immediately over the outer edge of the breccia rampart, was about 23 feet, from which point it descended inwards to a height of between 7 and 8 feet, at about 14 feet from the entrance. From this point the roof again rose to the height of 12 feet, near the back of the chamber. At the inner end of the latter, near the floor, the low, narrow passage, already mentioned, opens. Its length is apparently about 12 feet, as ascertained by the introduction of a long rod, for until the cave-earth, which fills it to within 2 feet of its roof, is removed, its extent cannot be accurately determined. Its width at the mouth is about  $2\frac{1}{2}$  feet, and the height of the crown of its roof, above the level of the floor of the cave itself, is  $2\frac{1}{2}$  feet also. The general direction of the passage is identical with that of the cavern, of which it is, in fact, a continuation.

The rock of the district is of Silurian age, and consists of an alteration of hard, and somewhat altered, bluish sandstone beds, with thin-bedded, but coarse, slates or shales. The strata on all sides of the cave dip at high angles, and in many places assume a vertical position. They have, moreover, suffered remarkable folding, contortion, and fracture. The strike of the strata is, roughly speaking, east and west, and is sin-

gularly uniform over the whole district. Some well-defined highly inclined beds at the mouth of the ravine strike  $15^{\circ}$  south of west, as taken by prismatic compass. The direction of the ravine and cave, taken from the inner extremity of the latter, is  $48^{\circ}$  south of west. Thus the ravine and cavern have been cut out of the cliff at an angle of about  $33^{\circ}$  to the strike of the strata.

The rock in places shows indications of lime in its composition, and is traversed in some parts by veins of calc-spar. Hence, probably, is derived the carbonate of lime which, dissolved out of the rock by the water (containing carbonic acid) which drips from the roof of the cave, is thereby redeposited upon its floor and walls in the forms of stalagmite and breccia. Professor Geikie, who has visited the cave, states that it is a most unusual circumstance to find, in Scotland, rocks of the geological age and character of those here described, containing lime sufficient to form so considerable a thickness of stalagmite.

From the general form of the cave, its position, and the nature of the rock in which it occurs, there can be no doubt that it owes its origin, not to the chemical, but to the mechanical action of water;—it is, in short, a cave of erosion, not corrosion. It is evident that it was hollowed out by the sea-waves, at a time when the land stood considerably below its present level. The highest part of the floor, viz., at the entrance, before the excavation was begun, was 27 feet 6 inches above the level of high-water at spring tides. Until the contents are entirely removed, and the rocky bottom itself is reached, the amount of upheaval of the land which has taken place since the waves had access to the cavern cannot be ascertained. But, in the meantime, assuming the depth of the cave earth to be not greater than the apparent height of its breccia retaining wall outside the cave, viz., 8 feet 6 inches, the amount of upheaval then indicated would be 19 feet; that is to say, the cavern would belong to an old coast-line, standing 19 feet above the level of the existing one.

Along the whole length of the roof, and at the inner extremity of the cave, a fault is traceable. By this, no doubt, the direction of the cave was determined—the line of the dislocation proving that of least resistance to the action of the sea-waves. At the inner end of the chamber, the fault presents somewhat of the appearance of a mineral vein. For 10 feet or so inwards from the cave mouth, along the roof, the fault is



represented by an open, slanting fissure from 2 to 3 feet in width. Above this, at the summit of the cliff, which just there is lower than on each side, occurs a patch of boulder-clay full of subangular, rounded, and scratched stones, the unmistakably glacial character of which deposit was ascertained by Professor Geikie, and Mr Horne of the Scottish Geological Survey. From the proximity of the boulder-clay to the cavern roof, and from the fact that the above described fissure slants upwards from the latter towards the former, it is not improbable that some portion of the earth and stones which the cave contains may have been derived from the boulder-clay above it. But, if this was the case, it must have been at a time when the deposit of glacial debris extended several feet farther seaward than it does at present, for no communication apparently exists now between them. There can be no doubt that a part of the earth and stones which the cave contains has been derived from its roof and walls, as the rock composing them gradually crumbles away under the influence of the weather. But the question of the origin of the cave-earth will probably have more light thrown upon it by the time that the work of excavation is completed.

The cave with its contents and overlying glacial deposit, taken in connection with a submerged forest, which extends at least to low-water mark in the neighbouring inlet, known as Brighthouse Bay, point to the following events, which have all, geologically speaking, happened recently:—The deposition of the boulder-clay; the hollowing out of the cave by the sea-waves, at which time the land must have stood considerably, perhaps not much less than 19 feet, below its present level; the growth of the forest, now submerged, at which time the land must have stood certainly more than 22 feet above its present level; the subsidence of the land to its existing position, and the consequent submergence of the forest; the filling of the cave with its contents, a process which, commenced perhaps by the sea-waves themselves, has thenceforward been carried on by various agencies up to the present day, at varying rates, and with occasional intermission.

In connection with the submerged forest in Brighthouse Bay, above referred to, it may be mentioned that a magnificent pair of antlers of the red-deer, with part of the skull, were dug out of the sand, between tide-marks, in 1872. They are in the possession of Mr A. J. Corrie, and

have been pronounced by competent judges to be finer than any that can be obtained at the present day.

In a paper on the raised beaches of the N.E. of Ireland, read before the British Association in 1872, Professor Hull has pointed out the close relation which exists between the raised beaches and caves of the N.E. coast of Ireland and those of the western shores of Great Britain opposite; the former gradually increasing in maximum height above high-water mark, from 6 feet at Dublin Bay, to 20 feet at the extreme north-eastern point of the Irish coast; and the latter decreasing, from a similar height (*i.e.*, 20 feet) on the shores of Argyllshire and Ayrshire, towards the estuary of the Mersey, where, to quote the professor's words, "the evidences of a raised beach almost disappear." The estimated height of the Borness cave above the sea, *viz.*, something less probably than 19 feet, seems to accord with Professor Hull's observations.

It is not improbable that the age of the cave itself, as distinguished from its contents, may be the same as that of the raised beaches, with worked flints, at Kilroot, Larne Harbour, and Island Magee, mentioned by Professor Hull in the paper already referred to, and it is possible that hereafter some relation may be established between its contents and those of the caves in the N.E. of Ireland, worked and described by Dr Bryce, and Mr Thomas Andrews.<sup>1</sup>

*Method of Working.*—When the ossiferous character of the Borness cave was ascertained, and an investigation determined on, it was decided that the excavation should be carried out on a plan sufficiently systematic to enable the position of each object in the cave deposit to be recorded with due exactness.

The excavation was commenced in August 1872,<sup>2</sup> under the direction of Mr A. J. Corrie and Mr W. Bruce Clarke, who after a short time were joined in the work by Mr A. R. Hunt, and during the following year by Mr Randall Johnson. Mr Bruce Clarke is responsible for the portion of this paper in which the organic remains are described, and for that in which an outline is given of previous cave explorations in Scotland. Mr Corrie and Mr Hunt are responsible for the description and

<sup>1</sup> Brit. Assoc. Report, 1834, pp. 658, 660.

<sup>2</sup> Permission having been most kindly and readily given by James Stewart, Esq. of Cairnmore, the proprietor of the farm of Borness.

measurements of the cave, and for that which may be called the geological portion of the paper. The description of the implements has been undertaken by Mr Hunt, whilst in the remainder of the paper the work has been performed jointly by the authors.

The general idea of working has been taken from the method adopted by the committee appointed by the British Association in 1864, for the exploration of Kent's Cavern in Devonshire.

The plan of working was as follows:—A central point was taken at the mouth, and another at the back of the cave, just in front of the passage before mentioned, the exploration of which has not yet been commenced. These two points were joined by a line called the datum-line. Lines were then drawn at right angles to the datum-line, at distances of a yard apart, thus dividing the cave into 13 "parallels," each a yard wide, each parallel being itself subdivided into two "semiparallels" by the datum-line.

A layer of earth, &c., was first removed from the surface of the cave floor, 1 foot in thickness. This was termed the A layer, the succeeding layers being designated by the other letters of the alphabet in order. During the removal of the A layer, the remains which were obtained from the various semiparallels were placed in boxes, a separate box being allotted to each of them, except where very few specimens (*e.g.*, but one or two) were found, in which case the objects from two or more semi-parallels were placed together in the same box. Each box was then carefully labelled as follows:—The parallels were distinguished by the Roman numerals, counting from the mouth of the cave inwards, and the semi-parallels by the letters R or L, as they were situated right or left of the datum-line. Thus, for example, the label *A. R. V.* indicates that the contents of the box upon which it is affixed came from the Right hand semiparallel of the fifth parallel of the A layer.

After the completion of the A layer, it was decided that it would be advisable still further to subdivide the parallels in order that the position of the objects found might be more exactly recorded. In order to effect this, and at the same time to make the new arrangement accord with that first adopted, each semiparallel was divided into lengths of one yard each by lines drawn parallel with the datum-line. Thus, instead of a whole semiparallel of earth 1 foot deep being excavated at once as at

first, a square yard only of earth of the same depth is now taken out at the same time. The only difference, resulting from this new arrangement, is that the objects found in each square yard of earth, &c., are placed in a separate box. The labels for these boxes differ slightly from those affixed to boxes belonging to the A layer, for they have in addition to the Roman figure and letters, a small Arabic numeral. For example, the label *B. R. V. 3*, indicates that the contents of the box came from the third yard (counting outwards from the datum-line) of the right semi-parallel of the fifth parallel of the B layer.

During the removal of the A layer it was perceived that it would conduce to greater accuracy, as well as convenience, if, instead of taking off the cave earth by one layer at a time, four layers could be attacked at once, as is done in the working of Kent's Cavern. Among other advantages which this plan presents, it obviates the necessity of trampling on each layer while the one above it is being removed. With a view to the removal of four layers simultaneously, the blasting of the stalagmite at the entrance was attempted, but it proved so intractable, gunpowder being found to be of no avail (owing to the presence of frequent cavities in which its force expended itself), that after 2 or 3 cubic feet were removed by immense labour, with sledge-hammer, crow-bar, and pick-axe, it was decided that the attempt should be for the time given up, and the excavation of the cave earth and softer breccia resumed.

Since, from these circumstances, a four-foot vertical face of earth could not be got at, it was resolved that the next layers of earth should be taken off to half that depth; or, in other words, that the B and C layers should be removed simultaneously.

Each square yard was first broken up to the depth of 2 or 3 inches with a small hand-pick, to loosen it, and all bones, implements, and other objects observed in it were placed in a box. The loosened earth was next shovelled into a wheelbarrow, each shovelful being carefully looked over a second time, and where dry enough, passed through a sieve, and the objects thus obtained placed with those previously found in a separate bag or box. At the close of the day's work, each parcel was taken home, carefully washed, and then dried on a separate tray, the water, after the washing of each parcel of bones, &c., being passed through a fine perforated zinc strainer to guard against the loss of any small objects of

interest. The fragments of bone, which were too small for identification unless bearing marks of cutting or gnawing, were next picked out, all those belonging to the same layer of cave earth being placed in one large box. All implements of bone, or stone, objects of iron or bronze, &c., were then taken out, labelled with a number indicating the yard of cave earth in which they were found, and placed in the drawer of a cabinet. The remaining bones, teeth, shells &c., belonging to each parcel were then placed together in a separate box, which was carefully labelled, as has been before explained.

While the above described method of subdivision of the cave earth has always been carefully adhered to, it has occasionally happened that obstacles in the working have made it difficult to remove certain divisions of earth without interfering with those next them. In these cases such adjoining and hardly separable subdivisions of earth were taken out together, the objects found in them being placed together in one box, and labelled accordingly. All bones and other objects found loose on the surface of the floor, or on the heap of earth outside the cave, have been carefully kept apart from those whose original position is known.

Nearly the whole of the excavation has been carried on under the personal supervision of Mr Bruce Clarke, Mr Corrie, or Mr Hunt; the washing of the bones, and other objects, has been performed by themselves, or by persons under their immediate direction: while the labelling and final arrangement, &c., has been done entirely by their own hands.

*Objects found in the Cave.*—It may be well to state here that, owing to other occupations, the authors have found it impossible to get ready for this paper anything like an exhaustive account of the objects which have been found: they will be, however, in all probability examined during the ensuing spring, and a full account be presented to the Society at a future date.

The various objects that have occurred in the cave comprise bones, burnt wood (along with which are found also burnt bones), shells, grain, implements of bone, fragments of iron, a few ornaments and fragments of bronze, and a few implements of stone.

First as to the bones, the following have been identified:—Ox and

red-deer are most plentifully represented;<sup>1</sup> the bones of the former betoken a small species, whilst those of the latter, and especially the antlers, indicate fine and largely developed individuals, equal almost in size to the oxen. Next to these in abundance come bones belonging to a very small variety of sheep or goat. The bones of pig occur in considerable abundance; it is, however, curious that in the A layer hardly any occur at all, while in the B and C layers they are almost as plentiful as those of ox, red-deer, and sheep. The presence of horse rests on the evidence of a single molar, which occurred in the A layer. That this should be the sole remains of horse appears remarkable, and seems to show that it was brought from some other place, perhaps for a special purpose, as for instance, an ornament. Two species of rodent have occurred, the water-vole and mouse. These, the latter especially, may, and from the occurrence of bird-bones in close proximity to them probably do, owe their introduction rather to the agency of birds of prey than to that of man. Among the carnivora no remains of dog, wolf, or fox have hitherto been identified, but the presence of pine-marten is clearly shown, by the occurrence of several of the long bones. Besides these a radius, ulna, and humerus, all apparently fitting, and which were found close together, are certainly carnivorous in type. They appear to belong either to a large form of cat, perhaps a wild cat, or else to lynx. The latter animal has been found in a cave in Derbyshire by Dr Ranson.<sup>2</sup>

In the A layer the remains of birds are very numerous indeed, but in the B and C layers they are, with the exception of a very few specimens, not represented at all. What the significance of this fact may be at present is not by any means clear. Among other remains of birds have been at present identified those of starling, and some other Corvidæ, besides a few remains of raptorial birds; while those belonging to the duck tribe, and others of aquatic habits, are probably the most numerous.

A few frog or toad bones have been found, whilst of fish almost the only identifiable remains are a few small vertebræ, and one or two hypopharyngeal bones of a small wrasse. In some parts of the cave a yard

<sup>1</sup> This appears to have been an error as regards Red-deer. See succeeding table of Messrs Bruce, Clark, and Johnson, p. 502, from which it appears that, next to the ox, the sheep and the pig are most numerous represented.

<sup>2</sup> Prehistoric Times, by Sir J. Lubbock, 1872, p. 294.

or two of earth appeared to be crammed full of minute fish-bones, about the size of the ribs of the herring; their abundance was such that it was next to impossible to pick over the earth in which they were from their running into the fingers like so many needles. These small fish-bones may be masses of the excreta of birds which inhabited the cave, and if so, of course point to periods during which the cave was unoccupied by man.

Besides the bones which have been got out of the cave during the investigation, burnt-wood and burnt-bones, but more especially the former, have occurred in very great abundance. In some parts, more particularly at the entrance, as indeed might be expected from the facility there given to the escape of smoke, the remains of fires, as shown by the charcoal fragments, split stones, and discoloured earth, occur almost throughout the whole depth of 3 feet which has been hitherto excavated; so that the cave earth in these parts may literally be said to be as black as soot. The remains of fires grow scarcer as the back of the cave is approached, until at the farthest point as yet reached they disappear altogether. Some of the charcoal is in such good preservation that it is hoped that the species of tree to which it belongs may be identified by aid of the microscope.

Perhaps the most interesting discovery, among the fire-remains, is that of grain in a carbonized condition. It was first discovered by its floating upon the surface of the water in which the bones were washed, and on further examination it has been detected in other parts of the cave besides that in which it was first found. The grain has been examined by Mr William Carruthers, of the British Museum, and found to be wheat. A similar discovery by Sir J. Y. Simpson in the Wemyss cave was referred to in the early part of this paper.

Among the embers of these old fires, and in other parts of the cave as well, shells of mollusca have occurred in great abundance; some are much broken and disintegrated, but a very large proportion of them are almost as perfect as on the day they were brought into the cave.

Mr. R. D. Darbshire has very kindly undertaken the identification of the species of mollusca which have up to the present time been found. The following is the list of species:—

Tapes decussatus, <i>Linn.</i>	Patella vulgata, <i>Linn.</i>
T. pullastra, <i>Montagu</i>	Littorina littorea, <i>Linn.</i>
Cardium echinatum, <i>Linn.</i>	L. littoralis, <i>Linn.</i>
C. edule, <i>Linn.</i>	Purpura lapillus.
Mytilus edulis, <i>Linn.</i>	Buccinum undatum.
Pectunculus glycimeris, <i>Linn.</i>	Fusus antiquus.
Pecten maximus, <i>Linn.</i>	Trochus lineatus, <i>Da Costa.</i>
Ostrea edulis, <i>Linn.</i>	Zonites nitens.
Anomia ephippium, <i>Linn.</i>	

Besides these, a specimen of *Artemis exoleta* was picked up at the mouth of the cave, lying on the surface, and identified by Professor Geikie.

Of the above species the limpet and periwinkle alone occur in great abundance. The other species are represented by a few, and in some cases by only single specimens.

*The Implements and other Objects of Human Workmanship.*—The Plates which illustrate this section of the paper are engraved from photographs taken by Mr A. R. Hunt. The numbers by which the implements are indicated in the Plates are those which they bear in the author's catalogue.

In the 3 feet of cave earth, &c., removed up to the present time, 123 objects of human art have been discovered. Of these 24 occurred in the A layer, 62 in the B, 28 in the C; 3, owing to the removal in some few cases of more than 1 foot of earth at a time, must be marked B or C; and 6, through their not having been found *in situ*, cannot be accurately labelled.

These 123 objects include every fragment found in the cave, of whatever material, that shows any undoubted trace of human workmanship. Of the entire number 90 are of bone, 10 of stone, exclusive of 21 other stones which perhaps show doubtful indications of workmanship,<sup>1</sup> 7 of bronze, 12 of iron, and 4 of glass. The latter appear to be portions of rings. Two of them are of bluish translucent glass, and bear three lines of narrow spiral ornamentation of a blue colour; of the other two, which

<sup>1</sup> Besides these there occurred a large number of rounded stones or pebbles, some of which appeared to have been broken by heat and may have been used as "boiling stones."



are both opaque, one is white, and the other of a greenish colour. (Plate XXII. figs. 62, 82, 93, and 153.)

Owing to rust, the iron fragments, with possibly one exception, are quite shapeless. Some of them may be merely nodules of iron ore, a supposition which is supported by the fact that small pieces of charcoal adhere to some, and that a lump of vitreous slag occurred among them.

The bronze objects, as might be expected, are in a much better state of preservation. They consist of a massive ornament (Plate XVII. fig. 79); a thin circular brooch, which has apparently been enamelled (Plate XVII. fig. 134). The pivot extremity of the pin and the catch by which this brooch was fastened are present. A small link of an ornamental chain; a handful of fragments, found in one place, some of which show that the thin bronze had been folded and fastened by rivets of the same material; two small fragments of what may have been a bronze fibula, and other small pieces of the same metal.

Of the worked stones the most noticeable are—A hard siliceous pebble, with an oblique groove on each side, which has plainly been used for sharpening pointed instruments (Plate XVIII. fig. 115). A long, flattened ellipsoidal stone, bored at one extremity, of apparently an altered sandstone (Plate XVIII. fig. 110). A subrectangular stone of yellowish brown shale, with edges and corners rounded, and perforated like the preceding (Plate XVIII. fig. 67). A sandstone pebble perforated by a large aperture so as to resemble a massive stone ring (Plate XVIII. fig. 116). A perforated striated disc of grey shale (Plate XVIII. fig. 111). A flat semi-heart shaped piece of greywacke; and some smooth stones that have probably been used as whetstones. Some of the perforated stones may have been employed as loom weights.<sup>1</sup>

The articles in bone comprise needles, pins, pegs, combs, awls, spear or arrow-heads(?), spoons, and spoon-shaped implements, handles, and sundry nondescript forms.

*Needles.*—Of these there are four specimens in the collection. They vary greatly in size and finish, from No. 25, which is extremely well made, to No. 37, which is little more than a fragment of split bone with a hole bored in it (Plate XVII. figs. 5, 25, 37, and 85). It seems

<sup>1</sup> See paper by Mr Joseph Anderson, in Proceedings, vol. ix. p. 557.

not altogether improbable that the coarser needles may have served the purpose of shuttles in the process of weaving.

*Pins.*—Of the fourteen pins and fragments of pins that have been found, the three best are given in Plate XVII. The two, Nos. 7 and 140, are long, abruptly terminated, and in shape like double boat-hooks. They show no tendency to taper to a point, which, if ever present, has been broken off. Under their heads are marks of wear. No. 30, and another not figured (No. 148), are sharp at one end, with broad flat heads, formed by the natural shape of the bone.

*Pegs* (Plate XVII. figs. 23, 33, 80, 96, 97, and 130).—A number of short pieces of worked bone have been discovered, and as they have evidently served various purposes, a few of them may be considered deserving of a brief notice. No. 23 should perhaps be included among the pins; it is, however, much shorter than those already described. It shows marks of considerable wear under the head. No. 80 is in shape like a violin peg. There is a groove over the top of its head, which is flattened from one end to the other. The pair of pegs, No. 33, were found in peculiar circumstances, to be described hereafter. No. 130 is evidently very similar to them, and will also be further noticed. Nos. 96 and 97 are merely sharpened fragments of bone, as are several others not figured.

*Combs.*—Two well-preserved specimens have been found, both of which are represented in Plate XIX. No. 2, which is very nearly flat, and about  $\frac{1}{4}$  of an inch thick, is just 4 inches in length,  $\frac{5}{8}$  of an inch broad at the handle end, which was broken, and  $1\frac{3}{4}$  of an inch at the base of the teeth. These have been eight in number, of which six remain. Whether from fracture or otherwise, they are of uneven length, the longest being half an inch. This comb, though roughly made, is noticeable for the fine grooves, or marks of wear, on the inner edges of its teeth. No. 127 was unfortunately broken by the pick, and a portion of it lost. Its length is  $4\frac{1}{4}$  inches, its breadth  $\frac{7}{8}$  inch at the fractured end, and  $1\frac{3}{4}$  inch at the base of the teeth. These are twelve in number, and about  $1\frac{1}{4}$  inch long; the longest being toward the centre. This comb is highly convex on the smooth side, concave on the under or cancellated surface, and about half an inch thick in the centre. It is ornamented with six parallel lines across the convex side, each alternate pair being connected by right lines drawn obliquely to the longer axis of the instru-

ment, the whole thus forming three bands of ornamentation. In form it corresponds to the type of the "Broch-comb," of which so good a collection exists in the Museum of the Society; but in ornamentation it differs, the authors believe, from all of them. This comb also shows the marks of wear across its teeth; but unlike No. 2, they appear on the under or concave side of the instrument. Both combs exhibit the marks between the teeth, which have been so well described and interpreted by Mr Millen Coughtrey, in his paper on the kitchen-midden at Hillswick,<sup>1</sup> in which so much light is thrown on the subject of the "Long-combs." From the evidence brought forward by Mr Joseph Anderson, in his interesting and valuable paper<sup>2</sup> on the use of these combs, there can be little doubt they were employed in the process of weaving.

*Awls* (Plate XX. figs. 27, 100, 135, and 142).—Besides a number of sharpened fragments of bone, there are four well-made awls. No. 142 has evidently served two purposes, being pointed at one end, and chisel-shaped at the other. Mr Walters, shoemaker, of Torquay, has kindly presented Mr Hunt with a bone tool, having a similar chisel-shaped extremity, which was made by himself, and which has been in constant use for upwards of 30 years. It is made of a horse's shin-bone, as being "thicker and harder than anything else obtainable." Both the chisel end and the back were used for smoothing stitches, the former being specially used for smoothing those in the welts of the boot.

*Spear or Arrow-Heads(?)*—The only weapons found hitherto that could have been used in hunting are the five given in Plate XIX. They taper gradually to their points, which, owing to the cavity of the bone of which they are made, are scalloped on one side like the shoulder of a pen. Two of them have a small hole in the broader or basal end for the insertion of a pin to secure the shaft or handle. In the case of No. 16, the pin, also of bone, is still *in situ*.

*Spoons*.—Among the implements found in the A layer, is the highly finished spoon given in Plate XX. fig. 1. Its present length (for it has apparently been fractured) is about  $6\frac{3}{4}$  inches. It consists of a long, thin stem or handle, at one end of which is formed a circular ring, and at the other what appears to be part of the bowl of the spoon. It is cut out of a

<sup>1</sup> Proc. Soc. Ant. Scot. vol. ix. part 1, p. 118.

<sup>2</sup> Proceedings, vol. ix. part 2, p. 548.

single piece of bone. Taken in connection with the bones of animals which occur in such abundance in the cave, this long spoon may perhaps have been used for extracting marrow, for which purpose it is admirably adapted.

*Spoon-shaped Implements.*—Of these there are five, all of them being given in Plate XX. None of them are completely perforated, but No. 11 is partially so, and appears to be a form intermediate between these and similar objects from the Dowker-bottom and Settle Caves, now in the British Museum, in which the perforation is complete. One bored specimen, found at Settle during the earlier explorations, also in the British Museum, and figured by Mr Roach Smith in his "Collectanea Antiqua,"<sup>1</sup> is very similar in shape to those from Bornesse. An elaborate spoon-shaped fibula from the Victoria Cave Settle, has been recently figured and described by Mr Boyd Dawkins.<sup>2</sup> It is doubly barbed at its smaller end, as if to retain it in its place when in use. Another, from the Dowker-bottom Cave, in the British Museum, has a single hook on one side, which might serve the same purpose. Mr A. W. Franks has favoured the authors with his opinion, that the bored Settle specimen mentioned above cannot be a spoon, suggesting at the same time the possibility of such implements being hair-pins, but not without hesitation on account of the perforations. It seems just possible that the latter might have been of service in keeping the hair-pin in its place by tying or otherwise. The holes would thus serve the same purpose as the barbs in the more elaborate, and undoubted spoon-shaped fibulæ.

*Handles or "Links"* (Plate XXI).—No. 71 appears to have been the handle of some cutting instrument. An illustration of it is given for the sake of comparison with the more obscure forms associated with it in the same plate. These, which may be roughly described as hollow cylinders, each with a central oval or oblong aperture cut through the shorter axis, have been found in other localities, and have taxed the ingenuity of antiquaries to discover their probable use. One, found during the rebuilding of the Royal Exchange in London, is figured by Mr C. Roach Smith, in his "Roman London,"<sup>3</sup> and described by him as the "handle of some

<sup>1</sup> Collectanea Antiqua, vol. i. plate xxx. fig. 1.

<sup>2</sup> Journal Anthropolog. Inst., vol. i. pl. ii. fig. 1.

<sup>3</sup> "Roman London," plate xxxiv. fig. 5.

implement." This specimen is solid at one end, and its partial hollow-ness seems owing to the natural form of the bone. It is not unlike No. 124, the only solid one hitherto found at Borness. Another, from one of the Settle caves, is figured by the same author in his "Collectanea Antiqua."<sup>1</sup> Both of these are now in the British Museum. More recently several have been found at the Victoria Cave, Settle. In a paper published in the Journal of the Anthropological Institute, to which reference has before been made, Mr Boyd Dawkins, referring to specimens found in the latter cave, has suggested that they "possibly may have been used as studs for fastening together thick clothing." Although one of these figured in that paper was originally described in the explanation of the plates as "probably a handle," the author has quite recently favoured the present writers with his opinion that it, together with one of another form not hitherto found at Borness, are "bone links for fastening dress."<sup>2</sup> Without venturing to offer an opinion on this question, the authors would draw attention to the following fact:—The finest specimen<sup>3</sup> found at Borness, indeed the only perfect one that has occurred, contained, when it was first discovered, the two pegs (No. 33, Plate XVII.) already alluded to. When the implement itself was washed to free it from the cave earth which filled it, these pegs were found in the interior, one at either end, both lying with their points inwards. It seems probable that they were an essential part of the instrument, and for convenience kept inside when not in use. In a similar way bullets, caps, and perhaps a spare nipple, found a place in the butts of old fashioned pistols. It is of course possible that these pegs may have been used in the position in which they were found, but it is difficult to conceive for what purpose. As all the other "links" found in the cave were more or less imperfect, not to say fragmentary, their pegs, if they had any, may have been dissociated from them before they were cast aside or lost, so that it is only in the case of perfect specimens that there is any possibility of their pegs being found in their places. Whether a mere coincidence or not, it so happened that the second best "link," No. 124, occurred in the same "yard" of earth as the peg No. 130, so similar both in size and shape to the pair found in

<sup>1</sup> *Collectanea Antiqua*, vol. i. plate xxx. fig. 2.

<sup>2</sup> See *Journal Anthropolog. Inst.* vol. i. p. 64, and pl. ii. fig. 2.

<sup>3</sup> Plate xxi. fig. 32.

No. 32.<sup>1</sup> All the "links," whether entire or fragmentary, that have been found at Bornes are given in Plate XXI.

Eight miscellaneous objects will be found in Plate XXII. No. 44 is similar in general shape to a crab's claw. On its concave edge are three notches, differing in size from each other, and worn as they would be by the friction of threads or twine passing through them. It seems possible that this instrument may have found its use in smoothing, and reducing to a uniform gauge for weaving or other purposes the thread as received from the spindle. That threads of various thickness were in use seems clear from the variety in the sizes of the needles already described.

No. 139 is a curved and pointed instrument, made from the tine of a deer-antler, hollow at the base, as if for the insertion of a handle, where also it is furnished with a perforated ear. It is very like an instrument supposed to be a needle figured by Mr J. E. Lee, in his "*Isca Silurum*."<sup>2</sup>

No. 19, an ornamented fragment of bone, was found under several inches of stalagmite on the S.E. side of the cave, and is probably the extremity of a "long-comb."

No. 114 is a hemisphere of bone, ornamented with two incised concentric circles and a dot in their midst.

The flat, pointed, perforated implement, No. 26, may possibly have been used as a needle or shuttle. It has been broken at the obtuse end. No. 141 is a very singular object, whose use it is difficult even to guess. It consists of two rings of bone united at one point by a narrow neck.

No. 91 is a smooth broad piece of bone worked to a blunt edge. It corresponds closely in shape to the "rubbing-bone" which is figured and described by Mr Joseph Anderson in his paper<sup>3</sup> before alluded to; and which appears to have been used for smoothing down the woven fabric.

No. 143 is a long bone, bored longitudinally through its upper articulating surface, and transversely at the middle through both walls of the bone. It may possibly have been a whistle.

<sup>1</sup> Since the above was written the authors have been favoured by the Rev. Canon Raine of York with a note of the discovery in that city of a similar bone "link" also containing small pegs, and associated with Roman remains.

<sup>2</sup> *Isca Silurum*, by J. E. Lee, F.S.A., plate xxx. fig. 2, and p. 60.

<sup>3</sup> Proceedings, vol. ix. p. 561.

The drawings of all the objects figured in the plates are of the actual dimensions of the implements themselves.

A dozen or so of tines and other parts of deer-antlers, showing marks of cutting, have occurred, two of which appear to have served as handles to cutting or boring instruments, perhaps of metal.

The foregoing are the most important of the implements hitherto brought to light at Borness. No coins nor remains of pottery have as yet been found; and in their absence, and the present incomplete stage of the exploration, it may be considered premature to attempt to fix the date of the occupation of the cave. Suffice it to say, that there is a strong family likeness between many of the objects from Borness and certain of the implements from the Settle Caves, which are considered by such high authorities as Mr A. W. Franks, Mr W. Boyd Dawkins, and Mr C. Roach Smith, to belong to the Romano-British period.

The following table shows the distribution of the various objects of human art in the 3 feet of cave earth hitherto removed.

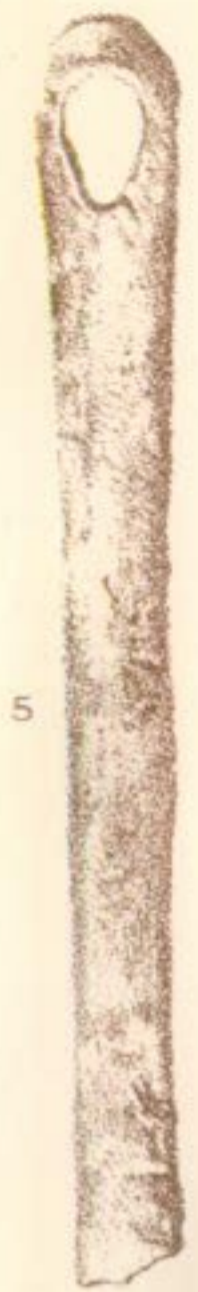
Layers.	Bone.	Iron.	Stone.	Bronze.	Glass.	Totals.
A.	19	—	1	1	2	23
B.	45	8	5	2	2	62
C.	19	4	4	1	—	28
B. or C.	3	—	—	—	—	3
Uncertain	3	—	—	3	—	6
	89	12	10	7	4	122
A.	1 (since lost)					1
						123

The results so far obtained in the course of the present investigation clearly show that the Borness cave was inhabited by man—whether driven by his enemies to a place of secure retreat and reduced by want to a state of semi-barbarism, or in what other circumstances, it is at present premature to suggest. But whatever the causes which led to the occupation of the cave, the masses of fire-remains, the enormous accumulation of bones, the quantity of shells, the periods of intermediate quiescence shown by the local bands of soft stalagmite and by the small fish bones introduced probably by birds,—not to speak of the great stalagmitic rampart

across the entrance, quite underneath the back of which, and covered by some eighteen inches of the deposit, burnt bones and charcoal were largely represented,—all point conclusively to the lengthy period during which this cave was inhabited.

The authors cannot conclude this paper without expressing their sincere thanks to Messrs A. W. Franks, Wm. Pengelly, W. Boyd Dawkins, J. E. Lee, R. D. Darbishire, and others, from whom they have received valuable information and assistance.





5



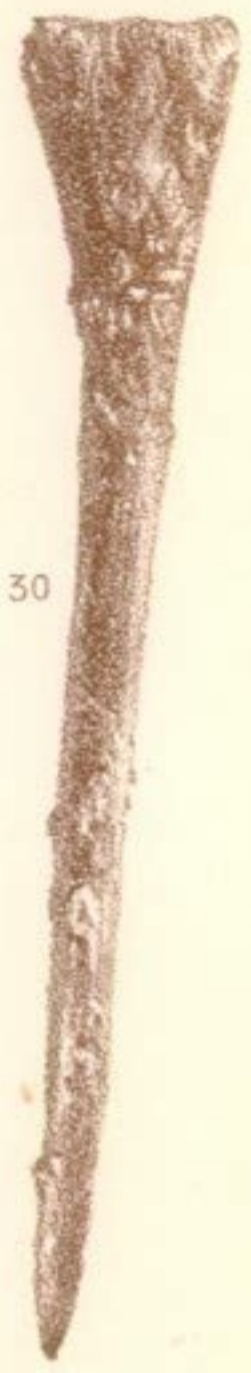
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25



7



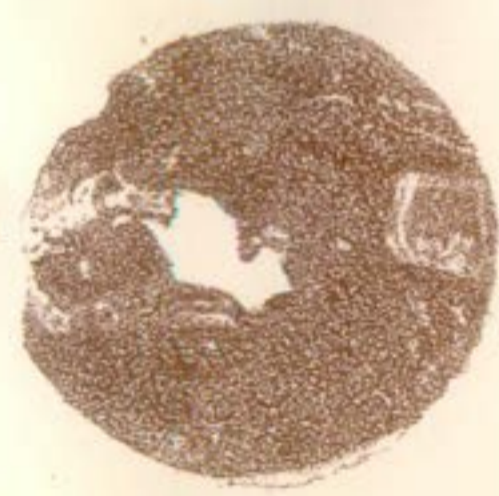
30



140



79



134



134



134



96



37



80



33



97



33



130



23

IMPLEMENTS OF BONE AND BRONZE FROM A CAVE AT BORNESS.  
(ACTUAL SIZE)

110



67



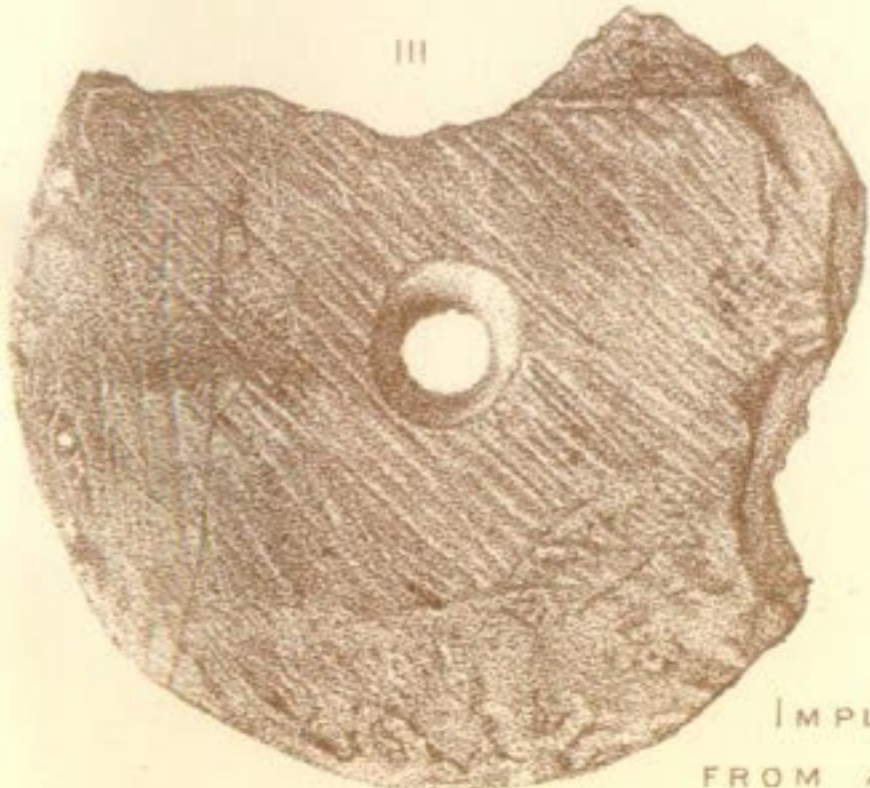
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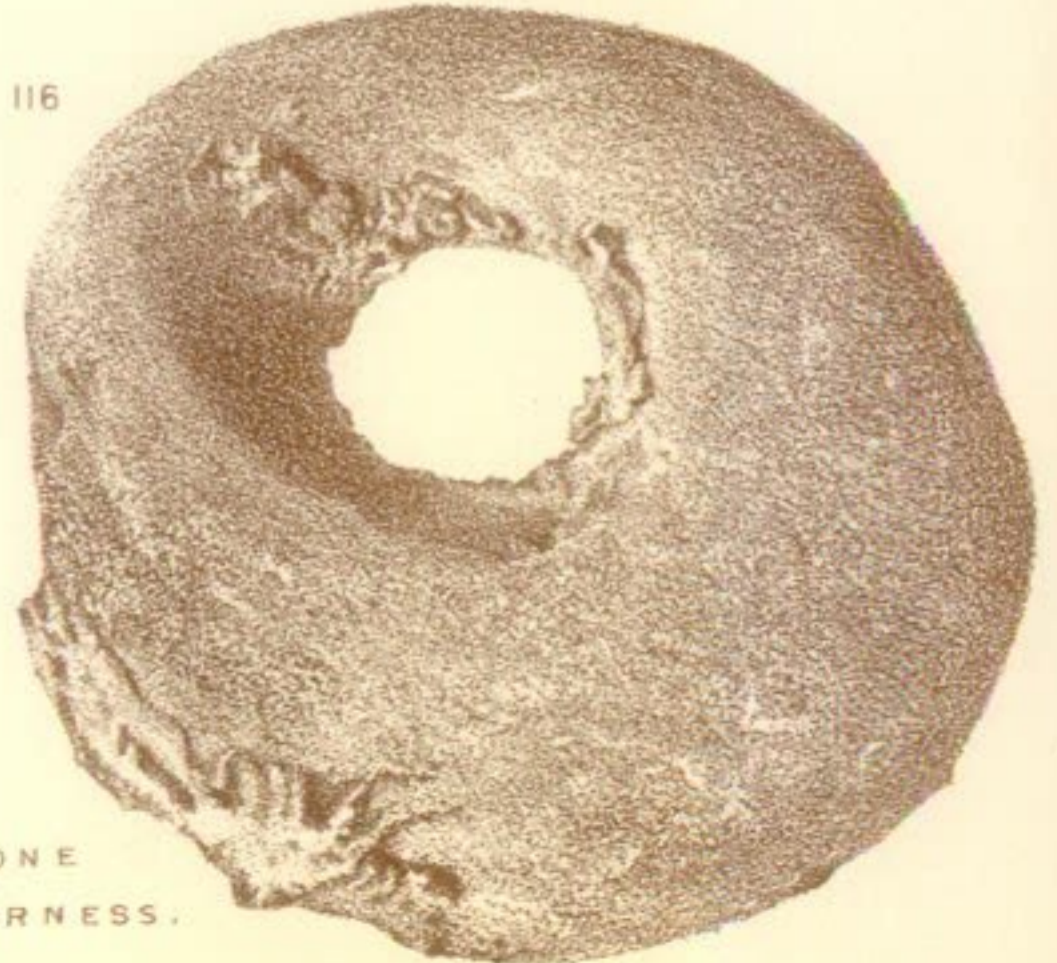
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111

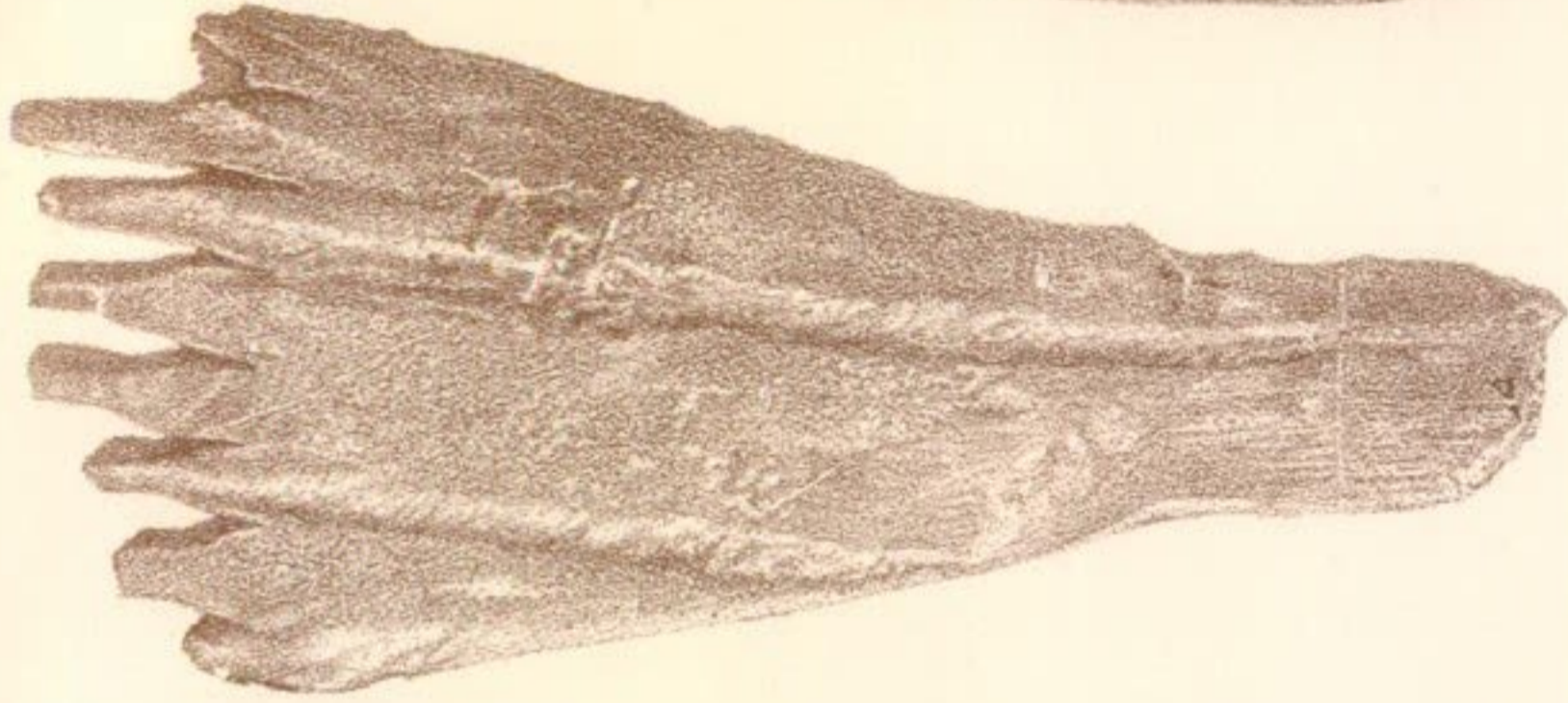
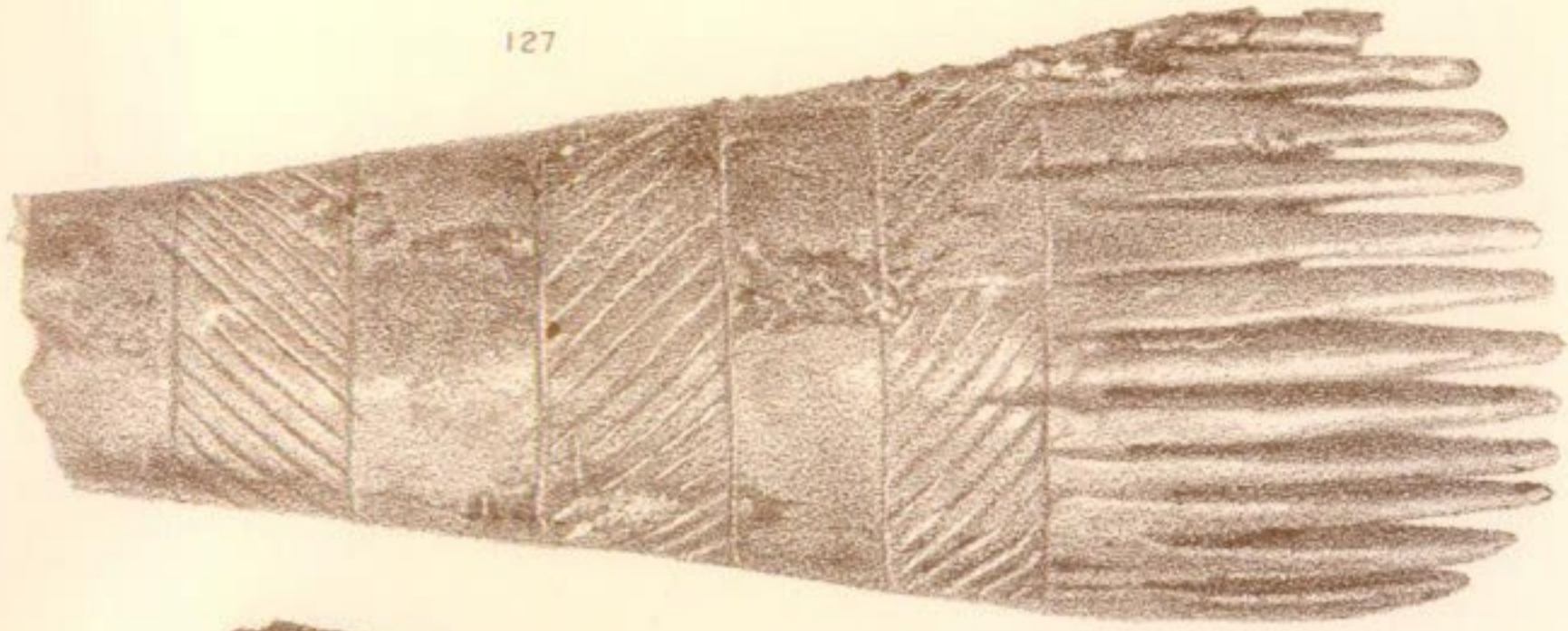


116



IMPLEMENTS OF STONE  
FROM A CAVE AT BORNESS.  
(ACTUAL SIZE)

127



2



16



29



14



28



132



131



112



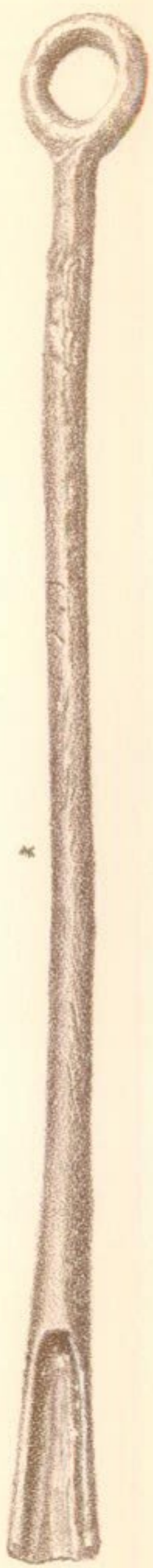
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11



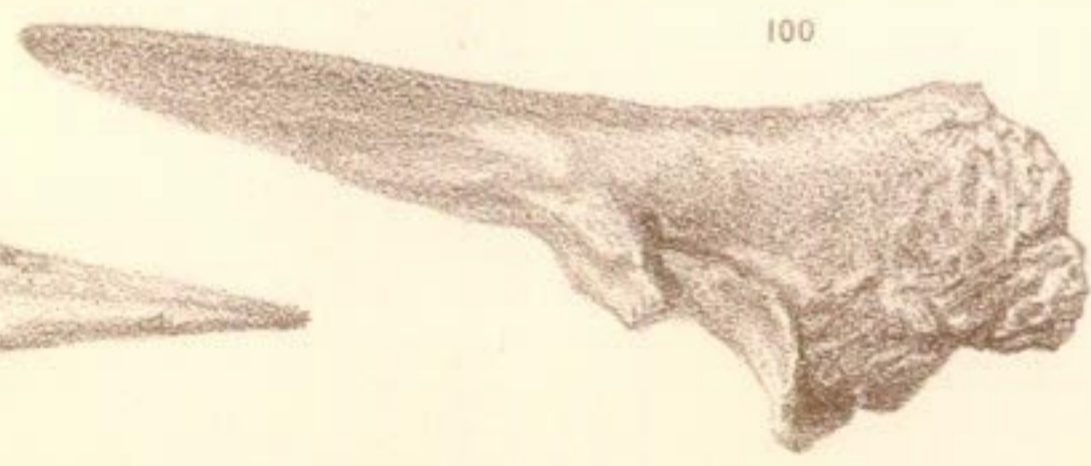
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K



27



100

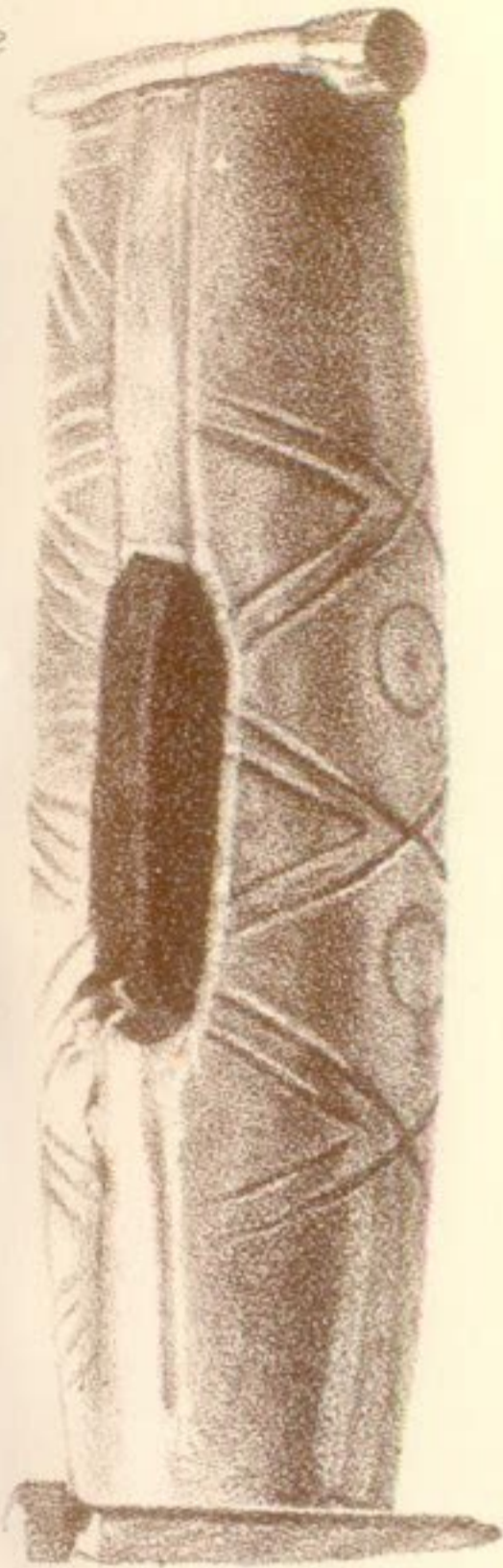


142

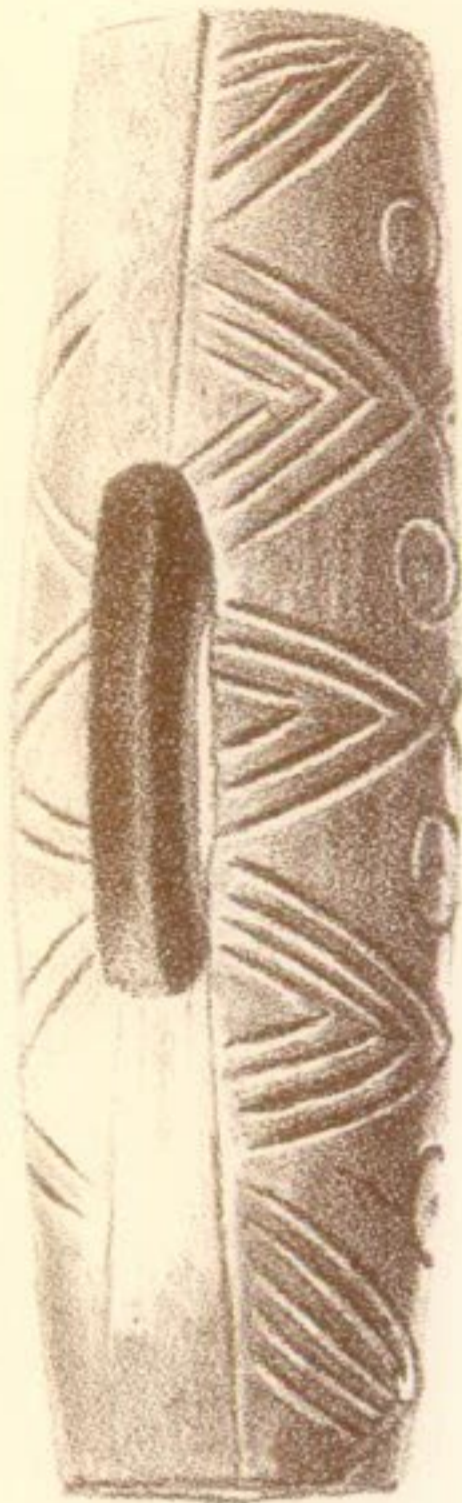


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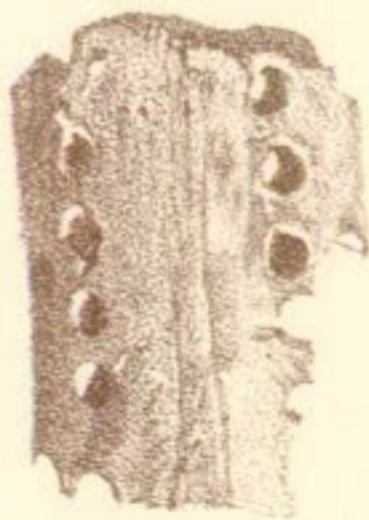
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124

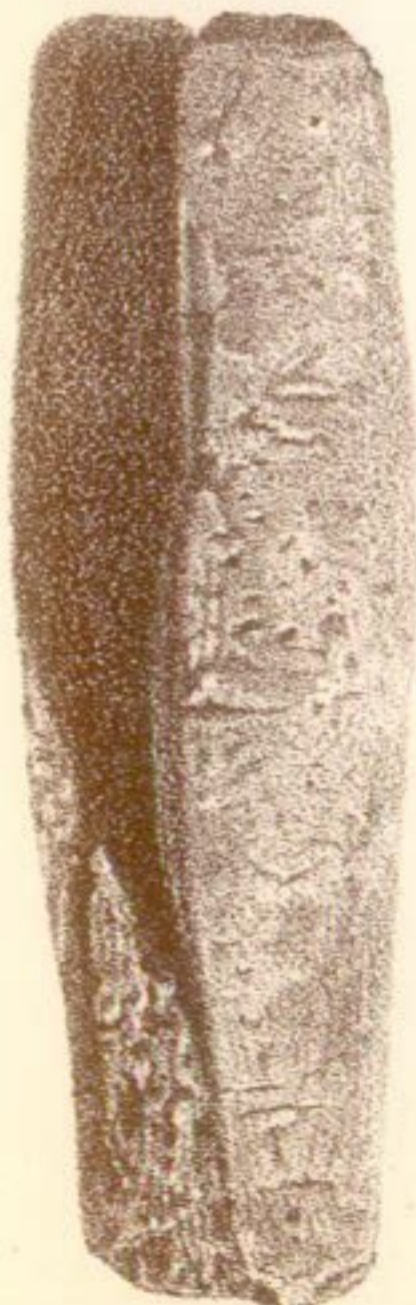


6



102

71



137



IMPLEMENTS OF BONE FROM A CAVE AT BORNESS



139



62



19



44



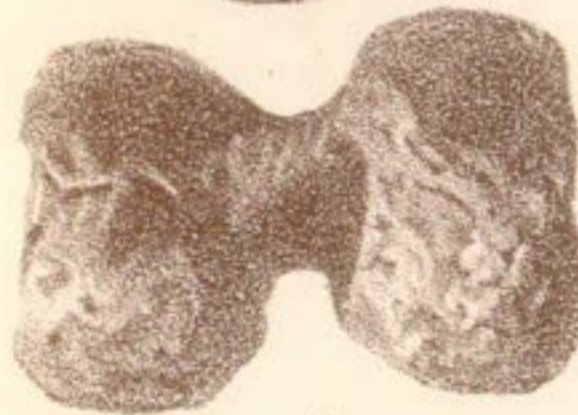
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114



93

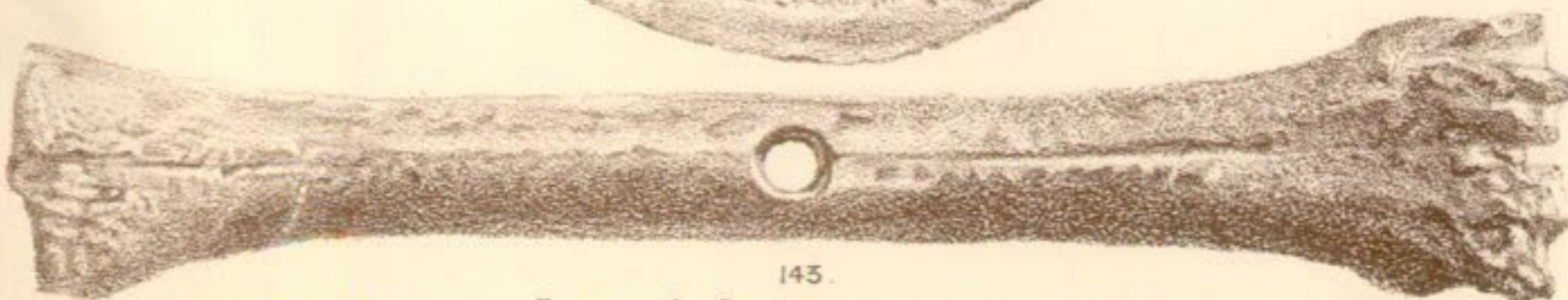


141

26



82



143

IMPLEMENTS OF BONE & DEER-HORN FROM A CAVE AT BORNESSE.  
(ACTUAL SIZE)