

II.

LAND MOVEMENTS IN SCOTLAND IN PREHISTORIC AND RECENT TIMES. BY J. GRAHAM CALLANDER, F.S.A.Scot., DIRECTOR OF THE NATIONAL MUSEUM OF ANTIQUITIES.

On the 16th of November last (1928) Mr H. M. Cadell of Grange informed me by telephone that part of the trunk of a tree which had something of the appearance of a dug-out canoe had been exposed

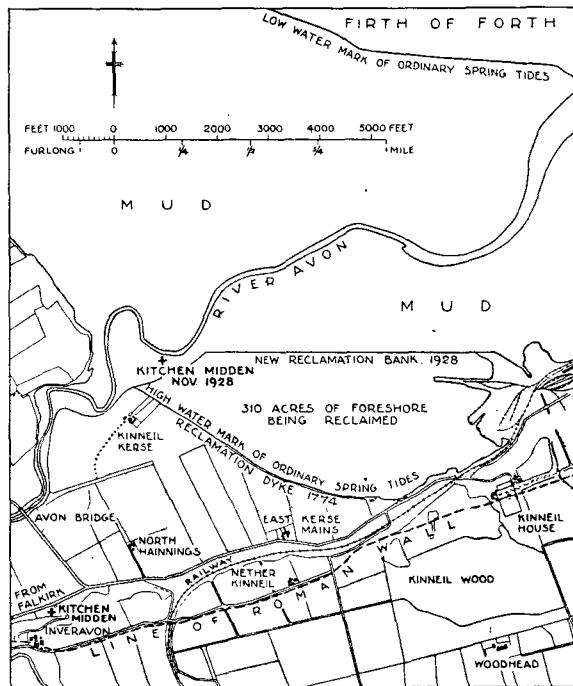


Fig. 1. Map of the Kinneil district showing positions of Kitchen-middens.

on the right bank of the River Avon just before it falls into the Firth of Forth, and it was arranged that I should visit the site. This I did a few days later with Mr Cadell and Captain E. Roynon Jones, R.N., Marine Superintendent of the Forth Conservancy Board.

At the time of my visit the Forth Conservancy Board were engaged in operations to reclaim a stretch of mud on the foreshore extending to about 310 acres to the west of Bo'ness. In doing so a reclamation

bank was being built due west from an old reclaimed area at Kinneil to within 100 yards of the bed of the Avon, as it meanders through the muddy flats on the south side of the Firth (fig. 1). From this point the bank strikes west-south-west till it meets the north-west corner of the old reclamation dyke built in 1774, when the Carse of Kinneil was enclosed. Half-way between the new western bank and the channel of the Avon, and about 300 yards from the north-western corner of the new reclamation area, is the spot where the tree-trunk

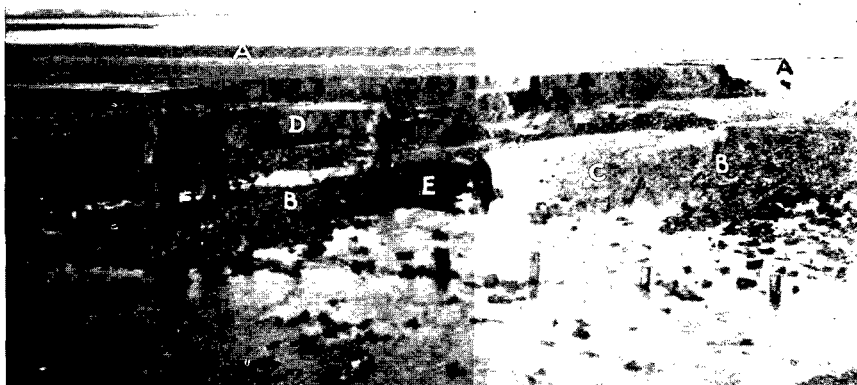


Fig. 2. Site of Kitchen-midden near Kinneil, Bo'ness.

A, Channel of River Avon. B, Kitchen-midden. C, Antlers found here.
D, Mud overlying Kitchen-midden. E, Tree-trunk.

came to light. It lay under 3 feet of mud, on a bed of shells measuring 1 foot thick, its position, as I was informed by Mr Cadell, being about the Ordnance datum line (fig. 2). Thus it as well as the shell-bed was covered by the tide for several hours twice each day.

No signs of human workmanship could be detected on the trunk of the tree after it had been freed from its bed of silt, and we had to give up the idea of its being a canoe. However, there remained the question whether the shell-bearing layer consisted of kitchen-midden refuse or simply of dead shells drifted in by the tide. Oyster shells, generally of large size, predominated, but there was a sprinkling of mussels and cockles and an occasional dog-whelk. Some 20 feet from the tree-trunk I noticed what looked like the end of a small branch of a tree projecting about 3 inches out of the shell-bearing layer. On

wading through the mud and pulling the object out it proved to be the antler of a red deer, sawn off a short distance above the burr, apparently by a metal tool; the points of two tines had been removed in similar fashion, and that of the third by cutting and breaking. About 6 feet distant from this antler I picked up part of another, but it was much decayed and showed no signs of human work on it. From the appearance of the shells and the presence of the two antlers embedded amongst them I think that there can be no doubt that we had located a genuine kitchen-midden. Had there been only one antler it might have been argued that it had been brought down the Avon, or from the higher reaches of the Forth, by the stream, but it is extremely unlikely that two antlers could have been deposited so close together by natural agencies. Be that as it may, the occurrence of shells and antlers at this place, under 3 feet of mud, more than half a mile from what would be high-water mark but for the old reclamation dyke, indicates a considerable change of conditions on the south shore of the Firth of Forth since the shells were deposited. It is plainly evident that a distinct sinking of the land has taken place between the time of the kitchen-midden people and the present day.

Deposits of oyster shells are to be found in many places on arable ground on the south side of the Forth to the west of the site under discussion, and the kitchen-midden discovered in cutting a road near Inveravon and described by Dr B. N. Peach, F.R.S., lies about a mile and a furlong to the south-west (fig. 1). A section of this midden measuring 50 yards long by 20 yards wide was exposed to a depth of 3 feet without the bottom being visible.¹ Remains of fireplaces were plentiful among the shells. The middens lay on, or at the foot of, the bluff that rises above the shore at this part, at an elevation of about 20 feet above Ordnance datum. There is no record of implements or weapons having been discovered in these deposits, but presumably no special search was made for them.

Such a discovery as this new kitchen-midden naturally raises the question of relative levels of land and sea in prehistoric times, and as I have had the opportunity of surveying a good many monuments of antiquity which exhibit clear evidence of considerable land movements since they were built, I should like to draw attention to them, dealing with the question from an archæological and not from a geological point of view.

It seems to be taken for granted by many archæologists and geologists that the sinking of the land, which it is recognised has taken place in the southern part of Great Britain, has been balanced

¹ *Memoirs of the Geological Survey* (Sheet 31, Scotland), p. 54.

by a rise in the north, the fulcrum being about Yorkshire. Some of us in Scotland, however, since the discoveries of Azilian relics in the 25-to-30-foot raised beach at Campbeltown, Oban, and Oronsay, and of the pile structures at Dumbuck and Langbank on the Clyde, have had a strong feeling that the most recent land movements in the west of Scotland, if not in other parts, have been a considerable rising of the land followed by a decided sinking, which is still in progress.

There can be little doubt that the worked flints found in the 25-to-30-foot raised beach at Campbeltown,¹ and the stone, bone, and deer-horn implements and food refuse discovered at Cnoc Sligach, in the island of Oronsay,² and in the caves at Oban,³ all of which are on the same beach, were deposited when that beach was being formed, because these relics were covered with sand and gravel washed up by the sea. The claim that these artifacts were pre-Neolithic was disputed by one of our greatest Scottish geologists, who argued that as Neolithic dug-out canoes had been found in the 50-foot raised beach, both in the Tay and the Clyde areas, any human relics found in the more recent 25-to-30-foot beach could not be pre-Neolithic.⁴ But the evidence of the canoes is not satisfactory. Certainly two stone axes are said to have been found in one of the Clyde canoes, but, on the other hand, we have the record of another which had a plate of lead perforated with nail-holes lying underneath it.

Since the above-mentioned discoveries were made another Azilian site has been located near the eastern end of the small rocky islet of Risga on Loch Sunart, this being the most northerly of these sites which has come under my notice. It lay about the same level as the other Azilian sites, though not in a raised beach.

When we turn south we find that an undoubted typical Tardenoisian implement in the form of a small beaked graver, and many heavily patinated flints, have been found on the 25-to-30-foot beach at Bridge of Aird, near Stranraer, and an Azilian harpoon was picked up in the River Cree. Crossing to the east coast of Scotland examples of the blunt chisel-like objects, so typical of the Oban, Oronsay, and Risga sites, have been recovered from a kitchen-midden on Inchkeith in the Firth of Forth,⁵ but unfortunately the height above Ordnance datum was not recorded, and I am told that the island has been so much disturbed since then by military operations that the site cannot now be identified.

In addition to the kitchen-midden at Inveravon described in the Geological Survey Memoir, which lies at an elevation of about 20 feet

¹ *Proc. Soc. Ant. Scot.*, vol. xxviii, p. 263.

² *Ibid.*, vol. xlviii, p. 52.

³ *Ibid.*, vol. xxix, p. 211.

⁴ James Geikie, *Antiquity of Man in Europe*, pp. 274 and 315.

⁵ *Proc. Soc. Ant. Scot.*, vol. xxxii, p. 304.

above Ordnance datum,¹ I have seen other two deposits of shells on the south shore of the Firth of Forth. One was at Granton Castle, and lay about 30 feet above sea-level. It consisted of large oyster shells, which, in the little time that was available for examination, seemed to me to be food refuse. No artifacts, however, were found among the shells, but most of the deposit had been removed before it could be investigated. The second deposit occurred at about the same level at Bridgeness, near Bo'ness, but it contained only dead shells washed up by the tide.

Evidence that there had been a considerable rise in the land in the neighbourhood of Stirling since prehistoric times is seen in the deer-horn implements found with the skeletons of two whales in that district. Unfortunately the implements were not typical of any period, and so could not be dated.

From these occurrences there is a good case for claiming that from Ardnamurchan Point to the Mull of Galloway on the west of Scotland, a distance of 160 miles, there has been a general rise in the land since the 25-to-30-foot raised beach was being formed in Azilio-Tardenoisian times. We cannot claim definitely that this movement extended to the east coast of Scotland, but the probability that it did should be considered, and Azilian deposits should be searched for in the 25-to-30-foot beach there.

Evidence that a subsequent sinking of the land from the Sound of Harris to the Mull of Galloway on the west coast, a distance of 240 miles, can be seen in a fair number of monuments dating from the Neolithic period to the Early Iron Age. That the movement is still going on can be observed in places in the Outer Hebrides where the peat slopes down to the shore and is being eaten away by the sea. This was commented upon by Captain Thomas more than fifty years ago.

When surveying the prehistoric monuments in the Outer Hebrides for the Ancient Monuments Commission (Scotland) in 1914 I was surprised to see that some of these structures in North Uist and South Uist showed conclusively that there had been a decided sinking of the land during and since late prehistoric times. Two denuded late Neolithic chambered cairns—one at Geirislett, Vallay Strand, North Uist,²

¹ *Supra*, p. 316. Although this kitchen-midden has been mentioned amongst the evidence indicative of a rise in the land it proves nothing, as we do not know the period of the deposit, and consequently cannot say whether it is earlier than the one recently discovered more than a mile nearer the low-water mark of the Forth, which has been cited as showing evidence of the sinking of the land. It would be interesting if the two middens could be shown to belong to different periods.

² Erskine Beveridge, *North Uist*, p. 255; *Anc. Mon. Com. (Scot.), Inventory of Ancient Monuments in the Outer Hebrides, Skye, and the Small Isles*, No. 237.

and the other at Sig More, on the northern shore of South Uist¹—which are built on rock—are now so much encroached upon by the sea that part of the kerb of the former is often covered at high-water, and sea-weed washed up by high tides is to be found against the wall of the chamber of the other. But the testimony of some of the duns and other structures, which are assigned to the early part of the Christian era, is equally strong. On the south shore of Vallay, a tidal islet lying on the north coast of North Uist, are the ruins of a dun on Rudh an Duin. During spring tides this fort shows as much as 18 inches of water above the sill of the outer entrance, and about 1 foot in the inner area.² About 1½ mile to the west-south-west, on a rocky islet in Vallay Sound, is Dun Thomaidh,³ which must be very wet when a heavy sea is running in from the west. Barely 1 mile farther west, at Foshigarry, on the north shore of North Uist, is a multiple-chambered earth-house,⁴ which yielded an extraordinary collection of objects made of cetacean bone and other materials. It is buried in blown sand, but the sea is now washing away so much of the sand that part of the walls are tumbling on to the beach. I might cite the case of an earth-house at Galson, on the north-west coast of Lewis,⁵ which is being destroyed in a similar fashion. This would extend the sinking movement of the land nearly to the Butt of Lewis. Situated on an islet near the south and inner end of Loch Obisary, in the south-east corner of North Uist, is a dun. Part of the enclosing stone wall is always submerged, as is also a considerable portion of the interior.⁶ There can be very little rise and fall of the tide here, as the loch is long and the mouth is only about 25 yards wide. Moreover, it opens on to Loch Eport, a long arm of the sea, which also narrows to about 60 yards near the mouth. Had the tide free access into Loch Obisary much more of the dun would be submerged every full tide. It is interesting to note that in 1542 the valued rental of North Uist was reduced by two or three merk-lands owing to the encroachment by the sea. Again in 1721 complaints about the sea overflowing several parts of the island were sent in to the Forfeited Estates Commissioners.⁷ Submerged tree stumps and peat are to be seen under low-water mark on the north side of Vallay.⁸

This does not complete the evidence for the sinking movement on the west coast of Scotland. Nearly a mile and a half east of Dumbarton Castle, on the north shore of the Clyde, at Dumbuck, are the remains

¹ *Inventory of Ancient Monuments in the Outer Hebrides, Skye, and the Small Isles*, No. 385.

² *Ibid.*; *North Uist*, p. 215.

³ *Ibid.*, No. 212.

⁴ *Ibid.*, p. 42.

⁵ *Proc. Soc. Ant. Scot.* vol. lviii, p. 185.

⁶ *North Uist*, p. 167.

⁷ *Ibid.*, pp. 6 and 7.

⁸ *Trans. Glasgow Arch. Soc.*, vol. v. new series (1902-6), p. 43.

of a pile structure.¹ The genuineness of some of the relics found there was questioned by some archæologists, and Dumbuck was left under a cloud. But no one could challenge the authenticity of the pile structure, the platform of logs, the bones of red-deer and *Bos longifrons* found, the massive ladder cut out of a log of oak, the dug-out canoe over 33 feet in length, or the built dock in which the boat lay. As all the structures are covered to a depth of 4 feet at high-water during ordinary spring tides² it is evident that different conditions must have obtained when the main building was occupied and the canoe and dock were in use. We can imagine the possibility of a house raised on piles above high-water from the presence of the ladder, but a dock would never be built in a position where it was liable to be frequently submerged. The natural assumption is that, when the dock and canoe were being used, the land stood higher than it does now; the canoe could be docked at high-water and launched at that or any lower state of the tide, or it could be dragged up even when the water was low. On the opposite bank of the Clyde, near Langbank, another pile structure was found.³ It also is under water when the tide is high. A bone comb, bearing typical Early Iron Age decoration, and a small penannular brooch of bronze, of a class often found on Scottish sites occupied in the second century A.D., were discovered in this building.

Proceeding farther south as far as the Glenluce Sands in Wigtownshire, we find suggestions that there may have been a sinking of the land in that part in recent times. It is to be admitted, however, that the evidence is not so satisfactory as in many of the cases already referred to. On these sands a considerable area of shingly beaches completely denuded of their sandy covering by the wind is to be seen. Within living memory this shingle was utterly devoid of vegetation, now it is covered with a good growth of plant life. A possible explanation of this is that, owing to the lowering of the level of the land, the water from the higher ground behind is being dammed back by sea-water to an extent sufficient to encourage and maintain the growth of plants.

Coming to the east coast, we have seen that the recently exposed kitchen-midden on the Avon shows distinct evidence of a sinking movement since metal was introduced into this country.

At two other places on the east coast of Scotland I have seen what *may* be indications of a similar movement. One is on the south shore

¹ *North Uist*, p. 6.

² *Proc. Soc. Ant. Scot.*, vol. xxxiv. p. 437.

³ According to information kindly supplied by the Engineers' Office, Clyde Navigation, "this figure is exceeded at extreme tides, the excess having been as much as 6 feet on two occasions during the last fifty years, the second being on 5th November 1926."

of the estuary of the River Tyne in East Lothian, where the sea is wearing away the bank immediately above the high-water mark; and the other on the south shore of the Dornoch Firth, to the east of Tain, where a similar eating into the land is taking place. Of course, land erosion has to be taken into consideration, but as both these places

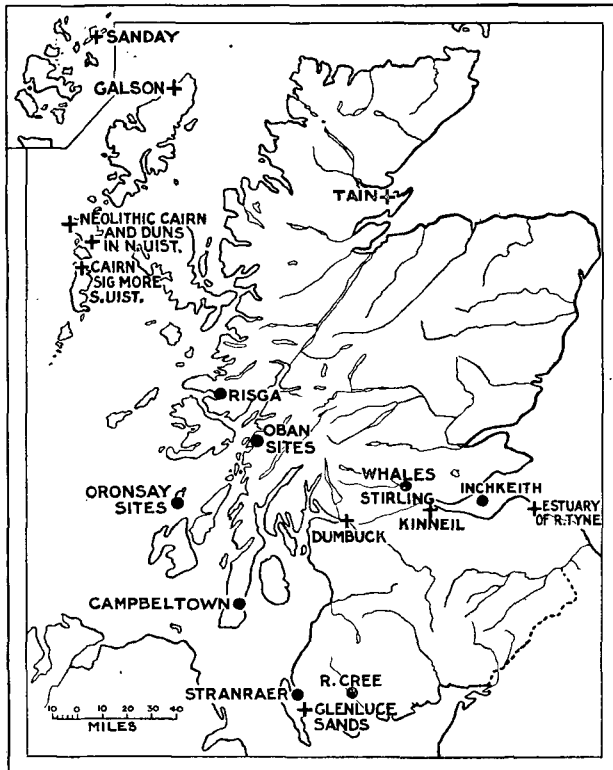


Fig. 3. Map of Scotland showing sites indicating Land Movements.

are in comparatively sheltered estuaries, it may well be that a subsidence is assisting the action of the waves in their encroachment.

It is stated that the land is sinking on the coast of Yorkshire, as at Holderness, and, if this be so, the movement may easily continue along the east coast of Scotland.

That the same movement extends farther north seems borne out by observations made in Sanday, Orkney, by W. Trail Dennison, who considered that "at the present rate of subsidence every part of Sanday will be submerged in less than 400 years."¹

¹ *Saga Book of the Viking Club*, vol. i. 1892-96, p. 74.

From these observations it would seem that on the west of Scotland, from at least Ardnamurchan Point on the north to the Mull of Galloway on the south, apart from local movements, there has been a regular rise in the level of the land since Azilian times, when the 25-to-30-foot raised beach was being formed, this being followed by a general sinking, which is still going on, from the Sound of Harris, if not from the Island of Lewis, to the Mull of Galloway. The evidence for similar movements on the east coast is not so clear, although there are suggestions that corresponding changes in the relative levels of land and sea may have taken place there, while in Orkney there seems no doubt of a definite lowering of the land-level at the present time.

In the map of Scotland shown in fig. 3 places referred to where evidence of a rise in the land is to be seen are marked with a dot, while those where indications of a sinking of the land are to be noted are marked with a cross.