

A survey of crannogs in the Lake of Menteith, Stirlingshire

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ABSTRACT

Underwater survey at the Lake of Menteith, a shallow Lowland loch, located four sites which can be identified as crannogs. Survey data was captured using aerial photographs, sidescan sonar, and intensive echo-sounding from a small boat, backed up by diver search. This paper places the Menteith sites within their immediate context by examining associations with natural ridges underwater and with nearby land of arable potential. The discussion also considers the significance of the survey for crannog studies in a national context, and draws particular contrasts with previous surveys on much deeper, Highland lochs.

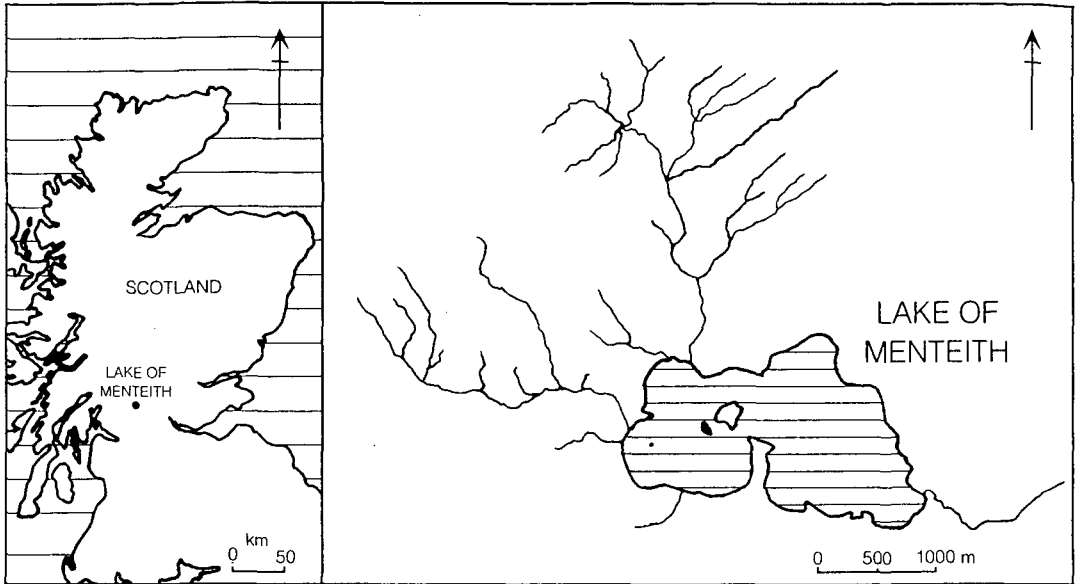
INTRODUCTION

From May 1993 to February 1994 an underwater survey was undertaken of the Lake of Menteith in Stirlingshire. The systematic study of water bodies has been a much-neglected part of Scottish archaeology, as only two extensive underwater surveys have previously been carried out, at Loch Awe in Argyllshire (McArdle *et al* 1973) and Loch Tay in Perthshire (Dixon 1982). The surveys of the deep, Highland trough lochs of Awe and Tay have done much to shape current thinking on crannogs, particularly in terms of site setting and location (eg Morrison 1985). The Lake of Menteith, a shallow Lowland loch, was deliberately chosen in order to provide a contrast with these surveys. This paper aims to discuss the results of the Lake of Menteith survey and place the Menteith sites within the wider context of crannog studies in Scotland. Discussion will then turn to the location of the Menteith sites in their immediate setting, noting direct associations with natural ridges underwater and examining the case for the siting of the crannogs near land of arable potential. Finally, some preliminary remarks will be made on the implications of the concentration of sites in the Lake of Menteith for the archaeology of the surrounding area.

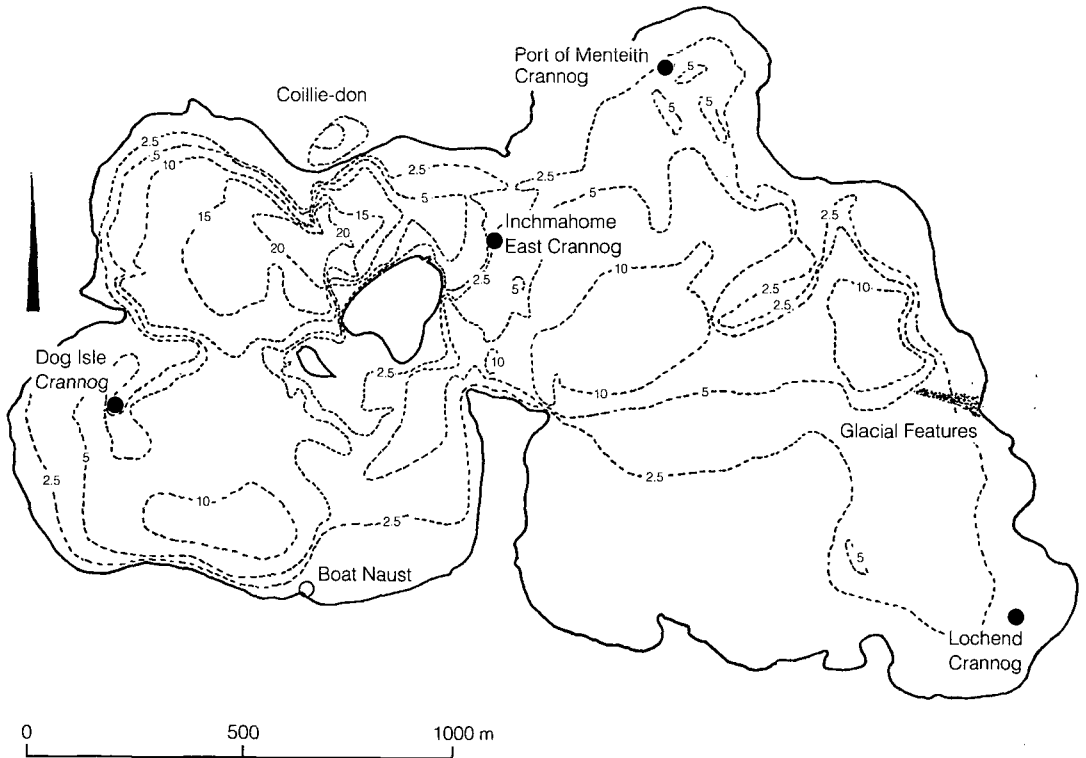
LAKE OF MENTEITH

The Lake of Menteith (NGR: NN 577 005) is a Lowland mesotrophic loch which forms part of the drainage network of the River Forth (illus 1). It is situated 5 km east of Aberfoyle, between the Trossachs and Stirling. It is rarely more than 10 m deep, with a maximum depth of only 22.3 m (illus 2). With a maximum length of c 2.5 km and a mean width of over 1 km, the surface area is 2.64 sq km; the area it drains is about 6.25 times greater (Murray & Pullar 1910). Like

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ILLUS 1 Location map. (Based on the Ordnance Survey map © Crown copyright)



ILLUS 2 Location of submerged sites in the Lake of Menteith (bathymetry after Wewetzer 1991)

most other Scottish freshwater lochs, it has its origins in the Pleistocene glaciation, specifically the Loch Lomond re-advance (Smith 1993). The land around the loch rises more or less gradually on all sides from the shore so that the loch occupies a cup-like depression. This is interpreted as a very large kettle hole in the mounds and ridges of the Menteith glacial moraine which has been filled by the loch. Recent work by Wewetzer (1991 & 1996) demonstrates that the loch is not just one big kettle hole, but is a compound of four smaller ones, visible as basins over 10 m in depth (illus 2).

HISTORICAL FEATURES

Despite its small size, the lake contains three islands, all with strong historical connections. The largest of these islands, Inchmahome, features the remains of an Augustinian priory, founded in 1238 by Walter Comyn, Earl of Menteith. The Priory ruins comprise remains of a cloister, nave, refectory and chapter house. It was here that Mary Queen of Scots was sent for three weeks in 1547 after the Battle of Pinkie. The priory was a great favourite with Robert Bruce, who is known to have visited there on several occasions (Stewart 1923; Fawcett 1986).

The name, Lake of Menteith, was derived from the Earls of Menteith who had their castle, now in ruins, on the second-largest island, Inch Talla or 'Castle Island'.¹ The castle occupies the whole of the island and its form suggests a 17th-century date (MacGibbon & Ross 1891, 285). The ruins consist of a hall and keep surviving to roof height, along with ancillary buildings including a brewhouse. The smallest island, Dog Isle, only 41 m by 34 m, is so called as this was supposedly where the earls kept their hounds. No structural remains can be seen on the island today.

PREVIOUS SURVEYS

The Lake of Menteith was considered an attractive subject for archaeological survey because of previous work in the area. Sir John Murray & Fred Pullar (1910, 16) carried out a bathymetrical survey of Menteith in 1910 and mentioned 'a submerged crannog covered by 4 feet of water in the north-eastern angle of the loch at the Port of Menteith'. The site was not described in any more detail and has never been examined since or even had its position accurately recorded. A second bathymetrical survey of the loch was carried out in 1991 (Wewetzer 1991 & 1996). These two bathymetrical surveys were obviously of great value when planning and conducting underwater archaeological survey operations. Wewetzer also used sidescan sonar to distinguish the geophysical features of the loch. (The results of this were made available to the present author.) Sidescan has been widely used in maritime archaeology and the technique has great potential as a reconnaissance tool in limnoarchaeological surveys (Duck & McManus 1987, 223). This study is the first archaeological survey of a freshwater lake in Britain to make use of such data.

Despite the historical associations and previous work discussed above, it is worth stressing that the Lake of Menteith should not be seen as unique. This study could have been carried out in almost any Scottish loch as a great number have strong historical connections and some form of archaeological potential. The pioneering survey work of Murray & Pullar provides bathymetrical charts for over 600 lochs, offering a head start in conducting underwater archaeological operations in Scotland. Murray & Pullar's work has also meant that Scottish lochs have been extremely well studied in a geomorphological context, again a benefit to future limnoarchaeological study.

ARCHAEOLOGICAL SURVEY

The main aims of the underwater survey were to locate submerged features and assess their form and archaeological potential, to survey their positions accurately within the loch and produce a close contour plan for each site. This report will concentrate on the artificial islets identified within the loch.

The definition and recognition of this type of site is somewhat problematic. The term 'crannog' is used here merely to refer to a wholly or partly artificial island within a body of water. Morrison (1985, 16–20) has provided the most widely accepted definition of what constitutes a crannog and identifies two crucial characteristics: first, the site should have been deliberately intended for use as an island in the water; second, that island should be, at least in some part, artificial.

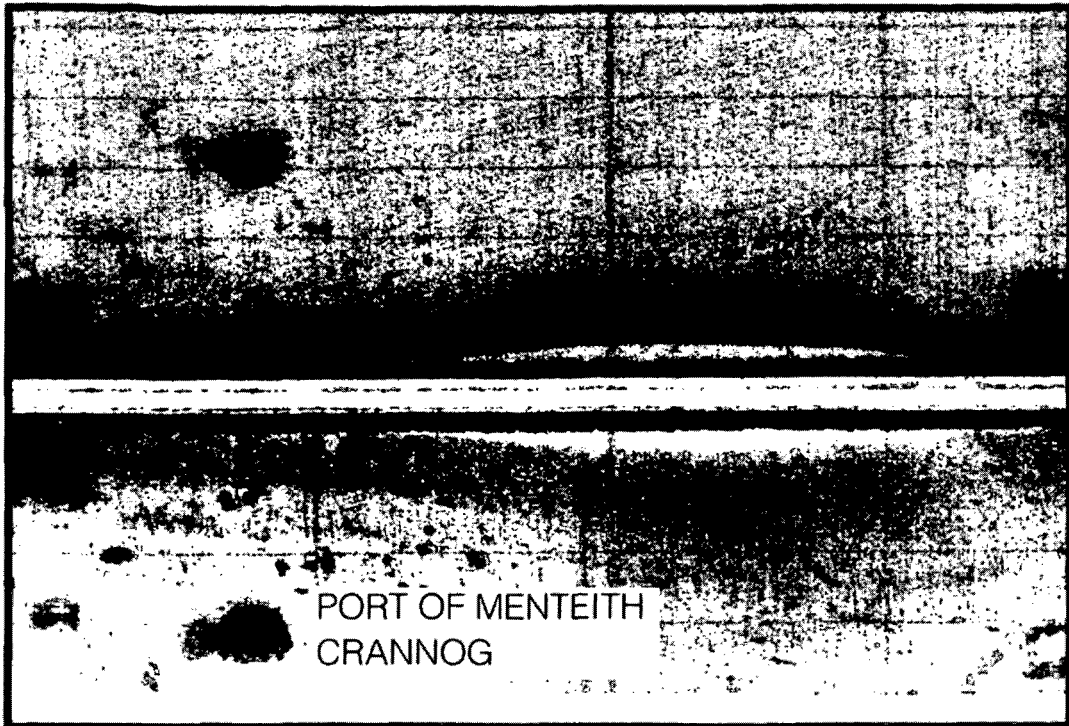
SURVEY METHODS

Due to the relatively small size (2.64 sq km) and shallow nature of the loch a complete survey could be attempted. Earlier surveys of Loch Awe and Loch Tay, greater in size and much deeper, concentrated on areas where either references to known sites existed or where they were most likely to be found (ie within a depth of 10 m or less). This meant that survey operations were conducted along the shallow sides of these deep, Highland trough lochs. As the Lake of Menteith rarely exceeds 10 m in depth (illus 2), the potential for submerged settlement exists almost throughout the entirety of the loch.

The poor underwater visibility of the loch (usually less than 0.6 m) meant that a range of search techniques had to be applied. The simple search procedure of snorkelling and observing the loch bottom, the underwater equivalent of fieldwalking, used effectively during the Awe and Tay surveys, was extremely ineffective in the green murky water of Menteith. Instead, underwater search was carried out using the identification of possible sites from aerial photography; the examination of suspected anthropogenic features identified from sidescan sonar survey data; and by intensive echo-sounding of the loch from a small boat backed up by diver search to examine any mounds or anomalies revealed.

All available aerial photographs relating to the loch were examined at the Royal Commission on the Ancient and Historical Monuments of Scotland in Edinburgh. The murkiness of the water at Menteith meant that features were unlikely to show up at all unless they were close to the surface. The problem was exacerbated by the appearance of many faint circular features which were not consistent from photograph to photograph. It was suspected that these 'features' were caused by the active algal regime of the loch. Ultimately, only two sites were identified from aerial photographs, the site previously mentioned near Port of Menteith and a similar feature in the south-east bay at Lochend. These appeared as very faint circular features which could only be distinguished from the conglomerated mass of algal 'features' due to their consistent appearance on photographs.

The sidescan sonar method produces a plan view of the shape and texture of the surface of the loch bed (Belderson *et al* 1972). Its operation is similar in principle to that of an echosounder. Created pressure waves are projected into the water and the reflection from the loch bed is picked up by a receiving transducer, converted into electrical energy and usually recorded on a continuously running paper recorder. From these sidescan sonar records (sonographs) it is possible to distinguish between features of positive and negative relief, such as sand waves, channels or anthropogenic features (eg shipwrecks or crannogs) and between major sediment



ILLUS 3 Crannog off Port of Menteith recorded on sidescan sonograph; the image is presented in its opposite (top) and true reflection (below) as a dark blob to the left of the sonar images

types (Duck & McManus 1987, 223). Patches of different loch bed material can be easily distinguished as they give a different reflection and therefore appear in either darker or lighter tones on the sonograph. Two areas of interest were located from the sidescan sonar data. The crannog near the Port of Menteith was recorded (see illus 3) and more importantly, a similar feature of the same dimensions, later confirmed as a crannog, was visible from the sonographs off the north-east shore of the island of Inchmahome.

The most effective method of search used during the survey was echo-sounding. Aerial photograph identification was found to be unreliable due to the problems outlined above, while the sidescan data did not allow complete coverage of the loch as the equipment cannot be used in very shallow water where it may be damaged or lost (thus Lochend Crannog was not recorded during the sidescan survey).

The entire loch was systematically covered with an echo-sounder over a period of several weeks. Using a compass and two fixed points on either side of the shore, straight traverses were rowed and any possible features were immediately investigated by divers. Traverses were taken about one metre apart to ensure adequate coverage and were concentrated on different parts of the loch at any one time, until the entire loch was covered, allowing some areas of overlap. The echo-sounding printouts provided profiles of the loch bed which were extremely useful in assessing the location and immediate settings of the crannogs discovered.

Fully submerged sites were surveyed in detail using a new method created during this survey incorporating a Total Station equipped with data logging software (for a full description of this technique see Henderson & Burgess 1996). This technique allowed the survey of submerged sites

within the same costs, time limits and, more importantly, to the same accuracy as that currently achievable on land.

SITE RECOGNITION

There are no strict criteria for the identification of crannogs or artificial islets in the field. In surveys of Loch Awe (carried out in 1973) and Loch Tay (carried out in 1979), recognition was based on the appearance of two or more features consistent with an artificial island: the existence of a large stony mound, for example, which could not easily be explained in terms of natural processes (although examples in south-west Scotland consist of mounds of timber, peat and brushwood); alignments of stone or timber indicating causeways, jetties or canoe docks (as seen at several sites in Loch Awe); organic deposits and other midden material; durable artefacts such as quern stones; timber piles within the boulder matrix with some, perhaps, showing organized relationships and signs of carpentry (Morrison 1985, 86). The same basic criteria were applied at Menteith and any mounds identified from aerial photographs, sidescan sonographs and echo-sounding were closely examined by divers for evidence of features and finds.

RESULTS

Four sites were identified as crannogs during the survey: Lochend Crannog (NS 5897 0025), Inchmahome East Crannog (NN 5771 0064), Port of Menteith Crannog (NN 5810 0011) and Dog Isle Crannog (NN 5676 0025).

Lochend Crannog

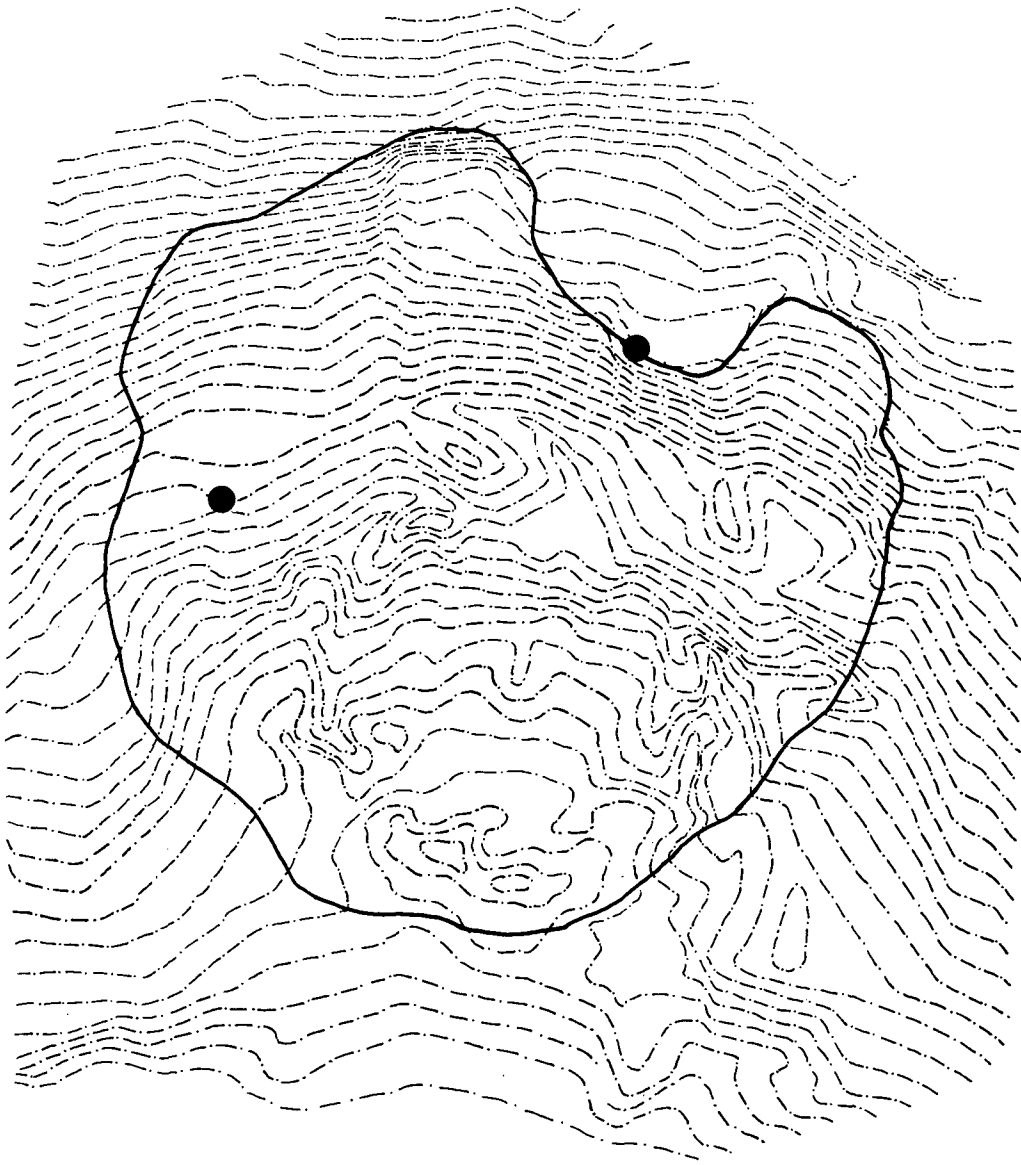
Lochend Crannog appears as a heavily slumped boulder mound 55 m from the south-west shore on an area of sloping loch bed (illus 4 & 6). The average diameter of the site is 36 m although this appears from the survey to be partly due to slumping activity. The site surface is, on average, just 0.5 m above the loch bed with its highest part 0.6 m below water level (surveyed November 1993). The bottom of the crannog was at a depth of just over 1.2 m nearer the shore, sloping to 4.5 m deep on the north-west side, furthest from the shore. Two timbers were located in the boulder matrix of the site: one heavily eroded alder timber (*Alnus* sp) (diam 0.21 m) and one more substantial oak timber (*Quercus* sp) (diam 0.33 m).

Inchmahome East Crannog

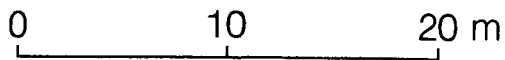
Inchmahome East Crannog lies 194 m from the main northern shore and 136 m north-east of the Island of Inchmahome, in a water depth of 3.2 m (illus 5 & 6). The site appeared as a stone mound (diam 18–20 m) and lay 1.6 m below the surface at the time of survey (January 1994). To the north, connected to the main body of the crannog, is a roughly circular feature about 5 m in diameter, its surface about 1.2 m from the loch bed. Nothing is visible in the boulder covering of this site to suggest this feature is not contemporary with the main mound. No timbers or further features were identified.

Port of Menteith Crannog

As previously mentioned, this was first identified by Murray & Pullar (1910). The site was located in the north-east bay of the loch, 112 m from the shore in a water depth of 3.7 m (illus 6 & 7).



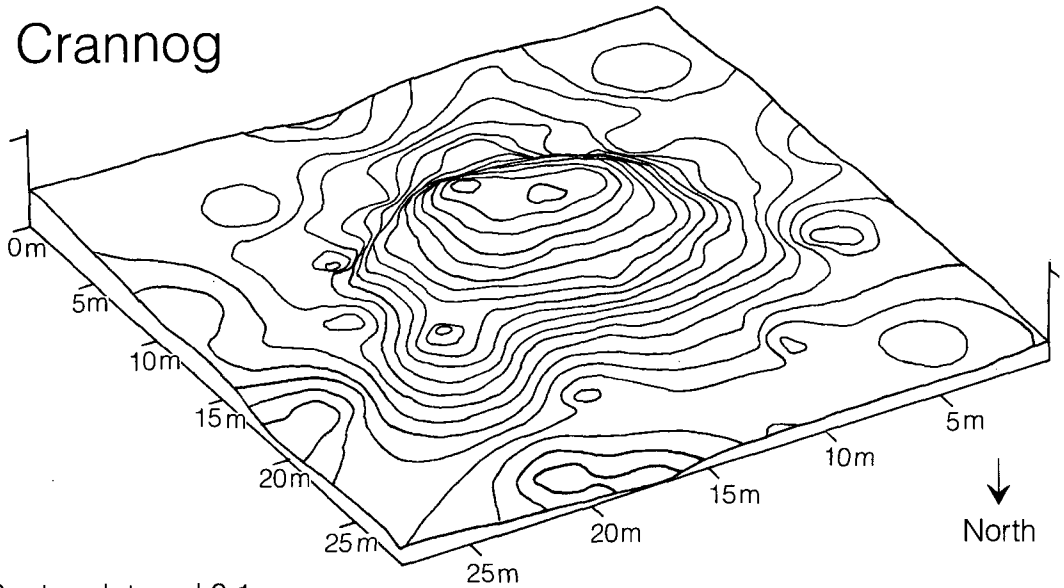
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● Timber — Extent of boulders

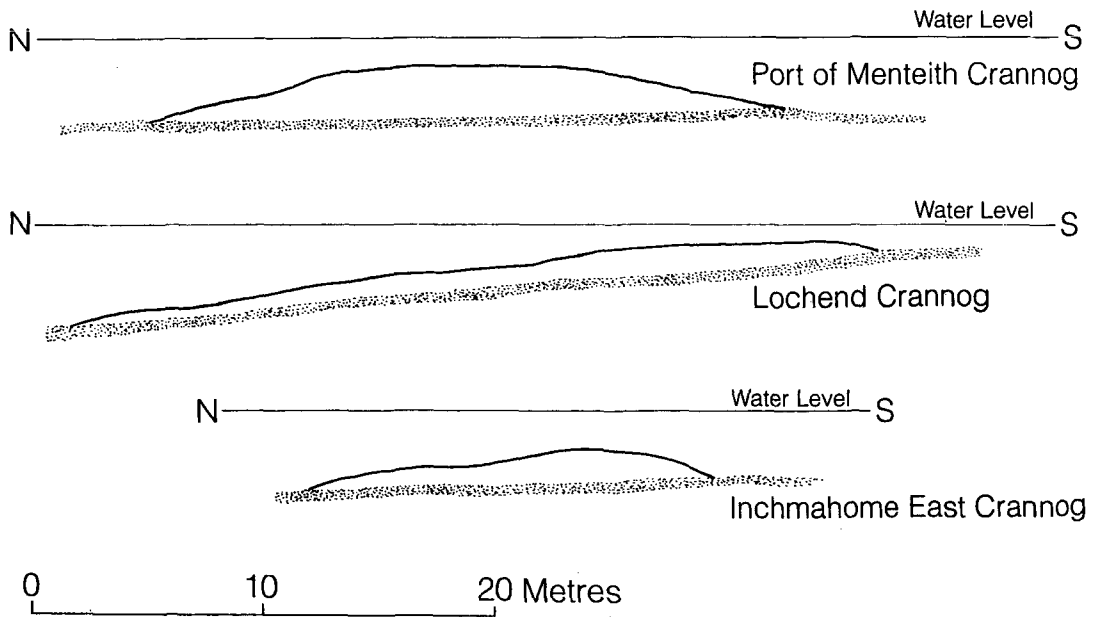
ILLUS 4 Lochend Crannog

Inchmahome East Crannog



Contour Interval 0.1m

ILLUS 5 Inchmahome East Crannog



ILLUS 6 Sections of three Menteith crannogs

This flat-topped crannog has steep sides and is an almost completely circular mound sitting on a natural ridge. It is 24 m in diameter and its surface is about 2.5 m off the loch bed. The highest point of the site lay 1.2 m below the surface of the water at the time of survey (February 1994). One heavily eroded oak timber (diam 0.26 m) was located, lying horizontally within the boulder matrix of the crannog.

Dog Isle Crannog

The historical associations of the Dog Isle in the later medieval period have already been described, but these do not preclude the possibility of earlier occupation at the site. Underwater examination of the island suggested that it is at least partly artificial, consisting of boulders in some places and peat in others. Most revealing was the discovery of two vertical oak piles at a depth of 1.7 m, embedded in the island (illus 8). One of these timbers was recovered as it demonstrated evidence of working in the form of tool facets. These facets were probably made by a flat-edge iron axe, most probably shaft-hole hafted. Unfortunately, the facets were too eroded to allow any estimates of blade width and character (R Sands, pers comm).

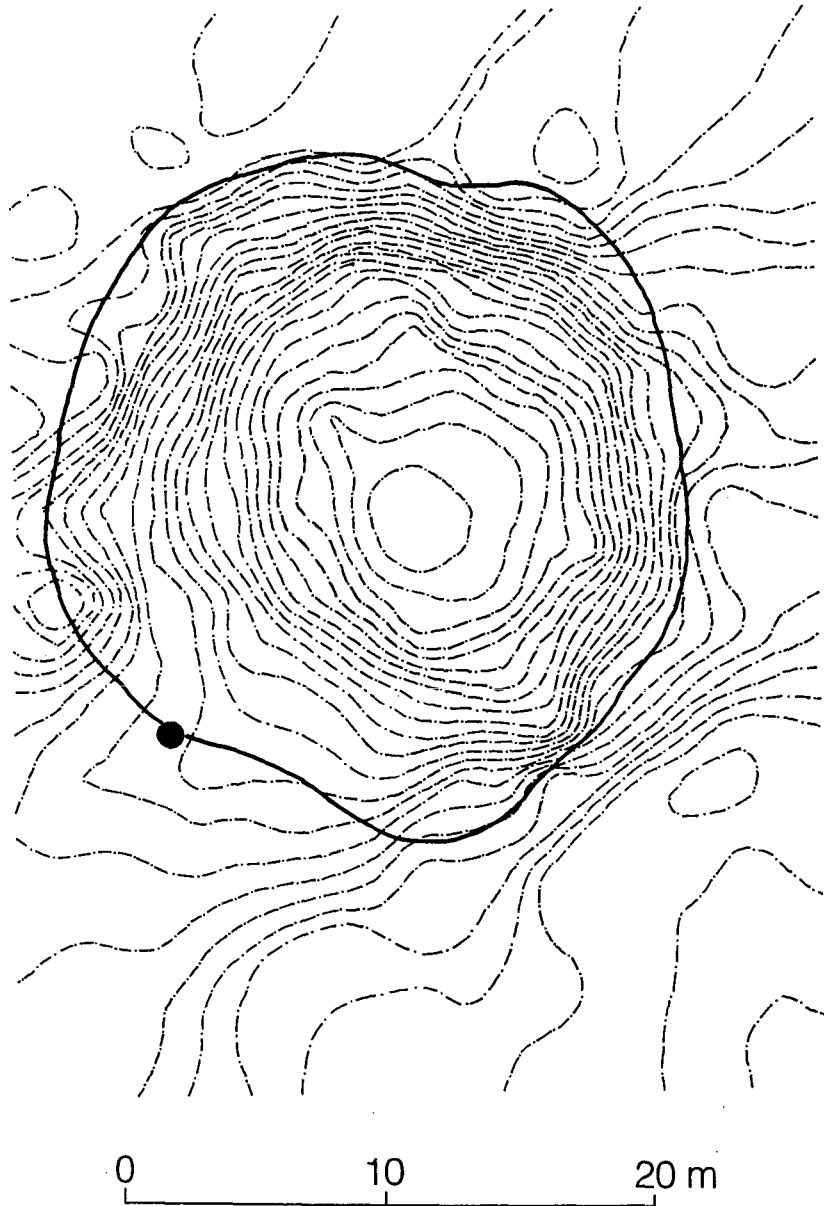
STRUCTURAL TYPE AND DATE

The submerged, circular, stone mounds of Port of Menteith, Lochend and Inchmahome East are directly comparable with the crannogs found during the Loch Awe and Loch Tay surveys. Port of Menteith, with its steep sides and flat top, is very similar to the archetypal examples recorded in Loch Tay (Dixon 1982). Lochend may also have had a flat top until slumping occurred on the deeper side. Both Lochend and Port of Menteith crannogs displayed horizontal oak timbers within a boulder matrix, suggesting a common structural technique at these two sites. Similar use of horizontal timber is known from Firbush Crannog in Loch Tay (Dixon 1982, 29). It, too, is a flat-topped crannog with steep sides and has produced a radiocarbon date of (GU-1324) 2140 ± 55 BP.

Inchmahome East has a circular extension connected to the main body of the crannog. Similar features have been recorded from two other sites: Oakbank Crannog, Loch Tay (Dixon 1982, 22, fig 2) and Site No 10 at Loch Awe (Morrison 1985, 32). Evidence from excavations at Oakbank (Dixon 1984a) suggests that the circular extension was used as a byre. The dimensions of all three sites are very similar with the circular features on both Oakbank and Inchmahome East being about 5 m in diameter. This incidence of a similar feature at three sites in separate lochs suggests they share a common building form and perhaps date. The high potential of close contour survey of crannog sites is underlined by the recognition of these common features from three separate sites. More extensive survey work of this sort will ultimately lead to a fuller classification of these sites.

Circular boulder mounds are the characteristic artificial islet type of northern Scotland and contrast with those found in the south-west. It was Munro (1882, 242) who first made the distinction between a Highland type and a Lowland or south-western type of crannog, but the two most recent excavations of Scottish crannogs — at Buiston, in Ayrshire (Crone forthcoming) and Oakbank, in Perthshire (Dixon 1984b) — have served to underscore the distinction. The Highland type is a circular, or near circular (ovoid) mound of stone, with or without evidence of timber, which bears no structural, coursed, drystone remains such as walling, but can have remains of causeways, jetties or canoe docks. Highland boulder mound sites are usually completely, or almost completely, submerged, unless they have been affected by later processes

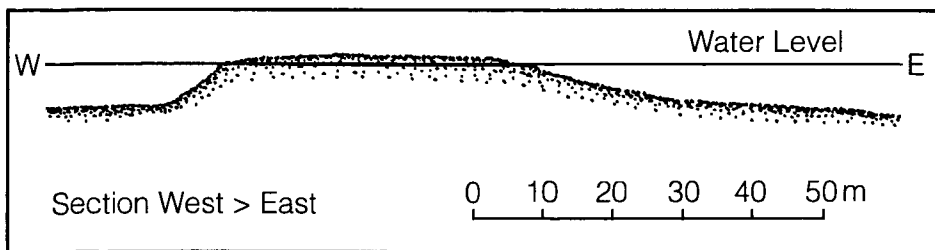
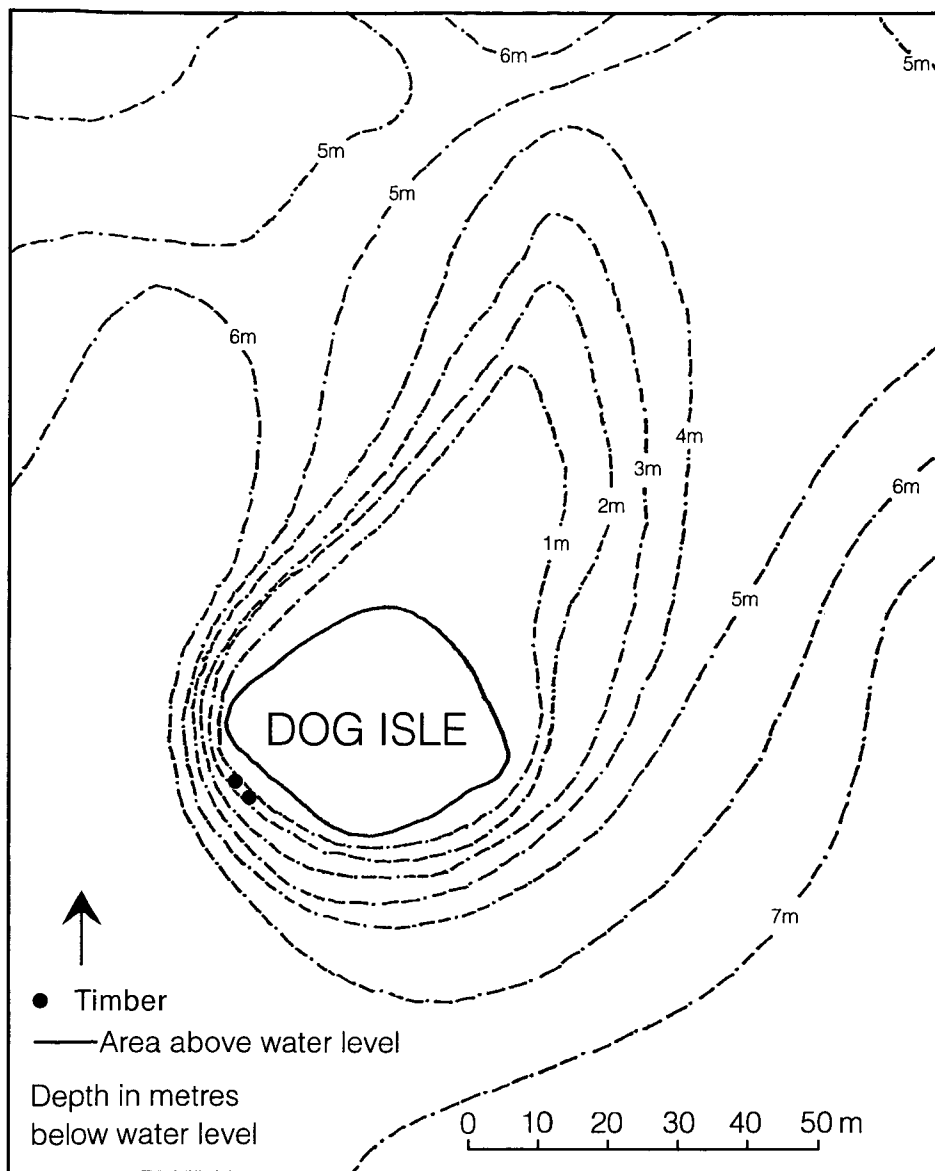
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● Timber

— Extent of boulders

ILLUS 7 Port of Menteith Crannog



ILLUS 8 Dog Isle Crannog

such as drainage or glacio-isostatic uplift.² The south-western type is commonly a mound of peat, brushwood and timber and reflects a different building tradition to the Highland sites although, on the whole, it shares the same general features of artificial island construction. It can be argued that these sites also are mainly of later prehistoric date (Henderson 1998).

When one considers the current radiocarbon dating evidence for crannogs as a whole (Barber & Crone 1993, 521; Crone 1993; Holley & Ralston 1995, 595–6), it can be seen that the majority of dates (so far at random) reflect mainly later prehistoric activity. Almost every radiocarbon-dated timber sample from a site of the Highland type has yielded a later prehistoric date, with the vast majority of dates falling within the second half of the first millennium BC (31 dates from 10 sites fitting the boulder mound description are currently available; Henderson 1998).³ It is not unreasonable to assume, therefore, that Port of Menteith, Lochend and Inchmahome East, as examples of the Highland type, would also be of later prehistoric date.

Though it is heavily covered with silt, Dog Isle Crannog reveals both stone and peat in its structure and does not fit neatly within either the Highland or south-western types. The tradition of its use in the later medieval period and the apparent use of a shaft-hole hafted, flat edge iron axe on the worked timber which was recovered combine to suggest a relatively late date (though earlier activity, also, remains a possibility).

The distinction between the Highland and south-western type has stood for over a century. Most authors have accepted the division but, unfortunately, there has been no sustained attempt at further definition or examination of its significance. Morrison (1985, 20), however, has claimed the division is simplistic and points out that many stone mounds in the Highlands have timber components. This is undoubtedly true, but it does not alter the fact that the stone component of these sites is a significant and recognizable difference from the structural appearance of the south-western sites.

TIMBER COMPONENTS

If the situation at Menteith is typical, the existence of timber on Highland crannogs may be more widespread than previously believed. Clearly, problems in the recognition of timbers may be a factor. From initial dives on the four crannog sites in Menteith it appeared that only Lochend had evidence of timber within its boulder matrix. Port of Menteith and Inchmahome East appeared as featureless stone mounds, while the appearance of Dog Isle was quite ambiguous, with stone visible in some places but thick silts in others. Only further exploration revealed that there were in fact timbers present in the Port of Menteith and Dog Isle mounds too.

As described above, there is a high level of biological activity at Menteith, creating a murky green hue to the water and very poor visibility. Such conditions are common in Lowland lochs and can usually be attributed to agricultural activity in the area. In particular, the use of modern fertilizers and the effects of nitrate run-off are known to have significant effects on the ecology of freshwater lakes. In a survey of crannogs in the south-west of Scotland, Barber & Crone (1993, 528) noticed that Lowland lochs had higher degrees of biological activity than those in more upland locations and that this activity may be responsible for the decay of organic remains by promoting bacterial and algal degradation on crannog sites in these settings. Similarly, such activity may be responsible for the erosion of timbers on the sites in Menteith.

This view is borne out by a number of observations. Firstly, underwater investigation of the site at Lochend, along with evidence from the contour survey, indicates that the entire site is slumping on its deeper or offshore side. The visibility of the two timbers identified by initial dives on the site may be a direct result of this, especially if the slumping was a relatively recent event.

Doubtless, these exposed timbers are now also being eroded by water action and the active algal regime of the loch. Furthermore, Lochend seems to have less silt build-up around it than the other sites. This is probably because the only outlet of the loch, the Goodie Water, is also situated within the south-east bay. This bay offers the best visibility in the loch and the relative firmness of the bottom is in stark contrast to the dark, silty conditions evident in the other bays. Both the Dog Isle and Port of Menteith crannogs are buried by silt build-up around their sides due to the minimal current in the bays they occupy. There is also some silt build-up around Inchmahome East, although this is lessened by active currents due to its central position in the loch.

The crannog in Loch Arthur, in south-west Scotland, lies in a Lowland water which features a high level of biological activity not unlike the conditions at Menteith. Here, Barber & Crone (1993, 527) reported that timbers were located only in the soft silt that surrounded the site. Also, at Oakbank Crannog in Loch Tay, timbers are continuing to be discovered under the silt around the site as excavation progresses, in some cases quite far from the original mound (T N Dixon, pers comm). These timbers were previously invisible as they tend to be eroded to the surface of the loch bed and are revealed only by removal of surrounding silts.

The initial surveys of Loch Awe and Loch Tay considered the ethical and practical problems of limited trial-pit excavations and, consequently, aimed to leave silts surrounding crannogs undisturbed (Morrison 1985, 86). During the Menteith survey, however, it was felt that the information to be gained from fanning away a small area of silt by hand at the edges of the sites (typically an area of about one square metre) would far outweigh the minimum disturbance caused to these deposits of low intrinsic archaeological interest. This proved to be the case and previously invisible timbers were revealed at two sites, Port of Menteith and Dog Isle. Searching for timbers where Highland boulder mounds meet the surrounding silt may reveal timbers at a much larger number of sites than previously recognized. As suggested by excavation of the boulder mounds of Oakbank Crannog and Redcastle, an estuarine site in the Beaully Firth (A Hale, pers comm), it is the existence of boulder mounds without timber components which has yet to be demonstrated in Scotland, rather than the opposite.

SITE SELECTION

One of the aims of the Menteith survey was to examine the selection criteria for the siting of crannogs in a Lowland setting and to compare this with survey data from Loch Awe and Loch Tay. Morrison first proposed that by studying the positions of crannogs within lochs we can gain some insight into the crannog builders' decisions in choosing particular areas. Once we have identified 'the physical constraints on islet builders and users' and established these as the lowest common denominator in the placing of crannogs, 'we can secure a clearer view of the less tangible but no less important human criteria in locational decisions' (Morrison 1985, 59).

WATER DEPTH AND LOCH BED CONDITIONS

Morrison examined the positions of crannogs within Loch Awe and suggested landscape criteria for the siting of crannogs in a deep Highland loch. The physical constraints on crannog construction are identified as the water depth, and the geomorphology of the loch bed in terms of stability for prospective structures. As we have seen, water depth is not a significant factor in a shallow, Lowland loch such as Menteith. In terms of foundations, large Highland lochs, where major bedrock structures have been exposed to many episodes of Pleistocene glaciation, tend to offer firmer sediment than Lowland lochs, such as gravel and till, or even bedrock itself. In

contrast, Lowland lochs tend to be bedded with soft homogenous muds and peat. Morrison's work at Loch Awe demonstrates that the islet builders avoided unnecessary effort by seeking out pre-existing natural hummocks, shoals and ridges.

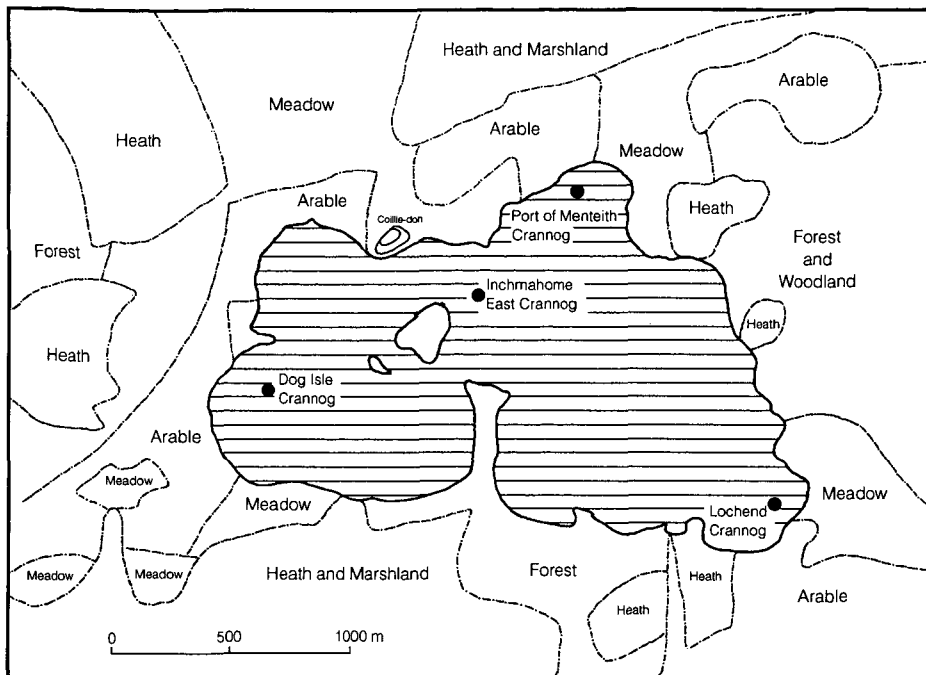
Three sites from Menteith — Dog Isle, Inchmahome East and Port of Menteith — provide evidence that natural hummocks amongst the soft muds were sought out. As can be seen from the contour survey (illus 8), the Dog Isle rises on average 6 m from the surrounding loch bed, suggesting that its construction capped an existing natural feature. The distance from the shore (182 m) is therefore unimportant, in terms of perceived hazards to security, as it is the natural hummock which dictated the position of this site. Inchmahome East occupies the end of a large gravel deposit (probably a submerged moraine). Within the limits of this feature it is situated as far from the main shore as possible (194 m); beyond this, the gravel surface drops off sharply to the south. The lack of timber on the site is perhaps significant: it may not have been necessary to secure a structure further which sits on apparently stable foundations. Alternatively, the loch bed may have been too firm here for the use of piles. The survey of Port of Menteith revealed that it also sits on a natural ridge (although this ridge is covered with silt and its form is therefore unclear at present). Again, this crannog seems to have been constructed as far from the shore as possible (112 m); beyond this, to the south, the bed drops off to depths of over 5 m. Only Lochend offers no evidence of siting on a prominent natural feature. This may partly explain why the site has suffered episodes of severe slumping (illus 4).

ARABLE LAND

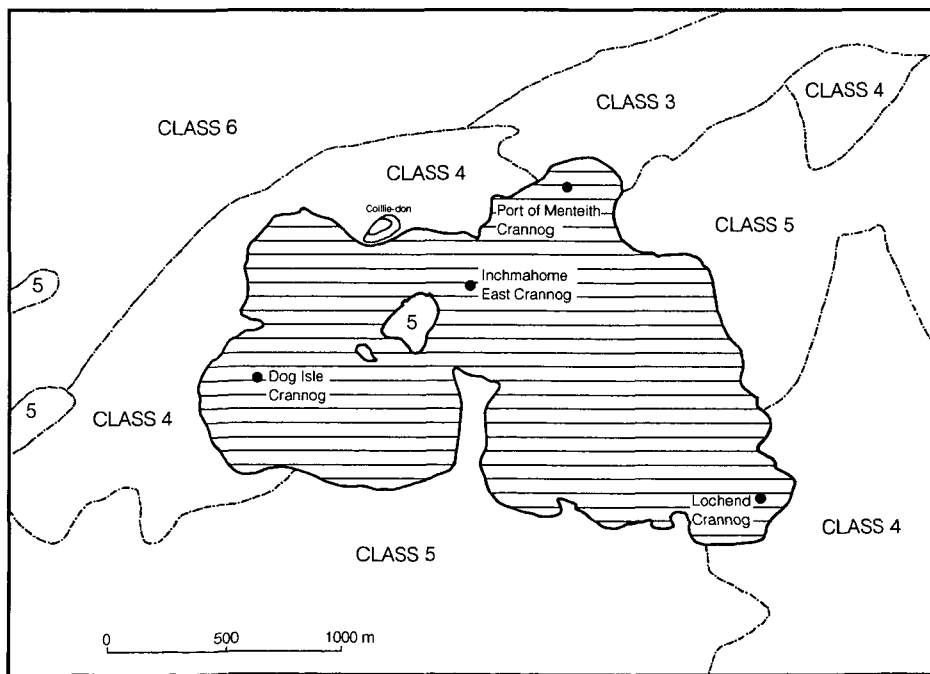
A further factor in site selection suggested by Morrison (1985, 65) is the availability of arable land, but only where the loch bed is favourable to crannog construction. At Loch Tay, Dixon (1984a, 173) noted that the positions of crannogs 'clearly correspond to areas of lesser slope and . . . suitable land for cultivation'. Likewise Morrison (1985, 74) concludes that 'seventeen of the twenty built-up islets in Loch Awe can be said to lie immediately adjacent to patches of land of arable potential'. Thus, stretches of land unsuitable for cultivation tend to be crannog free, while good land is more likely to have crannogs offshore, unless the loch bottom gradient is too steep to facilitate crannog construction.

Land-use capability was considered at Menteith, using the *Land Utilisation Survey of Britain* (1932–3, Sheet 66) (illus 9) and the *Soil Survey of Scotland: Stirling and the Trossachs* (Macaulay Institute 1986, Sheet 57) (illus 10). Only land of Class 3 and Class 4 (illus 10) can be used effectively for cultivation. Class 3 represents land capable of producing good yields of cereals and grasses and moderate yields of a wider range including potatoes and vegetable crops. Class 4 represents land capable of producing a narrower range of crops with management often including rotation. Despite this, high yields of grain can still be achieved and Class 4 can be seen as an effective class of soil for agriculture. Class 5 is land capable of use only as improved grassland while Class 6 has severe limitations and can be used only for rough grazing (for further details see Bibby & Thomas 1986).

It would seem that Morrison's basic landscape criteria can indeed be applied to the Lake of Menteith. Each crannog site, apart from Inchmahome East, occupies its own bay with land of arable potential immediately adjacent to it. Port of Menteith exploits the bay with the best arable land (Class 3) in the catchment. Bays which are shallow enough to site crannogs but do not feature good land — represented as Heath and Moorland or Forest and Woodland (illus 9) or Class 5 land (illus 10) — are seen mainly to the south and east, where there are no crannog sites. The absence of a site in the north-west bay, despite the fact that there is good arable land nearby,



ILLUS 9 Land use around the Lake of Menteith



ILLUS 10 Land-use capability around the Lake of Menteith

is of some interest. Consultation of the bathymetry clearly shows that the gradient of the loch bed (c 60%) is too steep to effectively hold a crannog, even if pile driving was employed. This would also correspond with Morrison's landscape criteria.

According to Morrison, in such an area a dun may be found to have existed, exploiting the good land in the absence of a nearby crannog site. One of the surprising elements of the survey was the discovery of a new site on a prominent hilltop known as 'Coillie-don', overlooking the deepest part of the loch, by this north-west bay (Henderson 1995, 9). The name may derive from the Gaelic for 'brown wood', or may even be a corrupted form of 'dun wood'. The site itself consists of a group of four flattened areas or platforms, measuring up to 35 m by 33 m. Steep slopes and near vertical rock-faces afford natural protection to the south, east and west of the site. To the north, which slopes more gently, there are visible remains of two grass-grown walls linked by an earthen bank which extends across the exposed northern perimeter of the site. The interior of the site is featureless and no trace of an entrance could be found. While this site is of unknown type, a recent date seems unlikely due to its denuded condition, dense tree cover, and its absence from maps and from historical accounts of the locality.

There are problems in applying the arable land criterion at the Lake of Menteith. The body of water is so small that no part of it is remote from the available areas of arable land on its shores. Furthermore, the Menteith sites are undated and their contemporaneity cannot be assumed. In any case, it is quite possible that these sites had no actual relationship to arable land, even where it lies close at hand, as their function has not been established. And yet, it does seem that the Menteith sites are sited nearer to land of agricultural potential than a purely random distribution would allow.

HAZARDS

Finally, Morrison also suggests that perceived hazards to the security of the crannog formed another criterion in site selection. This also can be applied to the sites in the Lake of Menteith, where the shallow water offered the possibility of siting further out from the shore than is seen at Loch Awe or Loch Tay. Here, both Port of Menteith and Inchmahome East appear to have been sited as far as possible from the shore; indeed, the distances from shore of the Dog Isle, Port of Menteith and Inchmahome East crannogs are all double the average distance seen at Loch Tay. (This would help to explain why no evidence for causeways was found in Menteith.) Furthermore, each of the crannogs seemed to be as far apart from the others as the Lake would allow, with each one exploiting its own area of arable shoreline. Thus, as at Loch Awe and Loch Tay, there was no 'clustering' of sites.

CONCLUSIONS

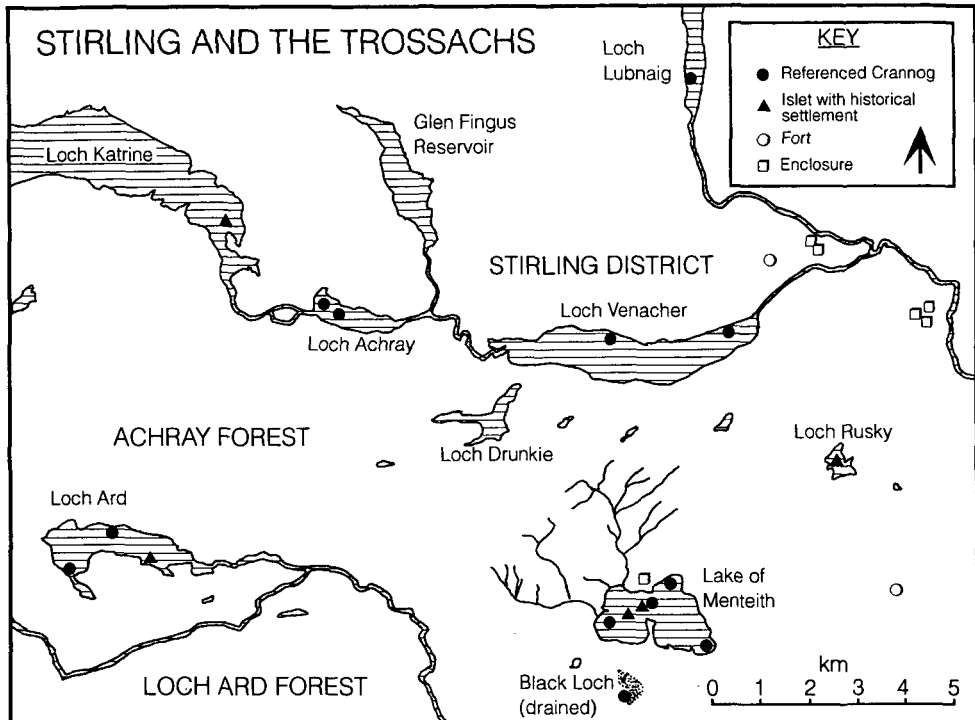
The most significant result of this survey is the number of crannogs identified. Four previously unknown sites within an area of only 2.64 sq km represents a high density of sites within a small loch and has significant implications for the archaeology of the area. This general point applies to the study of crannogs throughout Scotland. The discovery of crannogs within lochs is unsurprising in itself; what is surprising is the density of sites which can be revealed by limited survey work. Where intensive underwater survey has been carried out, a remarkably large number of sites has been discovered (20 sites at Loch Awe and 17 at Loch Tay). The intensive, though largely land-based, survey of crannogs in south-west Scotland by Barber & Crone (1993) has confirmed the high density of sites previously reported in the area by Munro (1882).

Field survey in the past has not been geared towards the discovery of crannogs, yet despite this there are already c 400 sites in the National Monuments Record of Scotland (NMRS), which suggests that we can expect to find many more. The three lochs surveyed to date — Loch Awe, Loch Tay and the Lake of Menteith — together have contained 41 sites. There are over 31,000 lochs in Scotland: a potential total of 1000 sites would have to be considered an extremely conservative estimate. As each of these sites potentially offers timbers and/or organic remains and the potential for absolute dating (ie through dendrochronology), it is not hard to envisage their vast potential for future research.

Practical constraints restricted the present study to a relatively small area. Nonetheless, in an effort to understand the Menteith sites in their wider context and to suggest the potential for further work, the neighbouring lochs in the Stirling and Trossachs area were also visited. Observations from the shore and examination of the National Monuments Record of Scotland revealed that many of the surrounding lochs also contain crannogs and suggests that the density of sites discovered in Menteith might not be unusual for the area. The number of local sites for which there are historical references (illus 11) further emphasizes the important role water has played in Scottish history and, again, it is worth noting that some of these sites may also have had much earlier occupation.

As we have seen from current radiocarbon evidence, there is a good case for supposing crannog sites to reflect mainly later prehistoric activity. The number of later prehistoric forts and probable settlement enclosures in the Menteith area is quite small (illus 11), adding further weight to the argument that at least some of the crannog sites also represent later prehistoric activity. The concentration of sites on land occurs to the east and relates to areas of relatively flat lowland. To the north and west of these sites lies the higher land of the Trossachs and in these areas, around Loch Achray, Loch Venacher, Loch Lubnaig and Loch Ard, there are no known possible later prehistoric sites apart from postulated crannog sites. This distribution is somewhat typical for Stirlingshire as a whole, with the majority of later prehistoric sites being found in the Lowlands, particularly in the eastern Forth valley, while higher ground such as the Trossachs seems to have been sparsely populated. This is surprising when one considers that the topography of the southern Trossachs and areas such as the Menteith Hills is very similar to that of classic fort and dun locations in Argyll. Stirlingshire as a whole has a rather low density of recorded later prehistoric sites: only 23 forts, six brochs, 12 duns and 21 crannogs (including the crannogs discovered during this survey). Like much of central and north-central Scotland, Stirlingshire seems to occupy a veritable no man's land between Atlantic and north-east Scotland, both understudied and (historically) under-populated. The number of brochs and duns tapers off compared to those in Argyll, while the types of fortified sites characteristic of the north-east are simply not seen. It is interesting to note, then, the high number of crannogs in Stirlingshire, which is estimated to account for 34% of possible later prehistoric defended sites. Again it is worth stressing that apart from Menteith, no underwater survey has been carried out in this area. We can assume, therefore, that the actual number of crannogs in the Trossachs and southern Highlands is much greater than present figures indicate. There are a number of large lochs in Stirlingshire, all with untapped potential to reveal more sites. Significantly, the number of attested crannogs doubles to 46 sites (becoming the most numerous site type in the area) if we include all sites from Loch Lomond (only half of which is within Stirlingshire) and from Loch Tay (which lies on the Stirlingshire boundary line).

Most importantly, perhaps, this study should be seen as a springboard to work on a much larger scale, ideally a study which incorporated many more lochs in a given area and which was supported by a series of radiocarbon and dendrochronological dates (lamentably absent from the



ILLUS 11 Range of later prehistoric sites around the Lake of Menteith. (Based on the Ordnance Survey map © Crown copyright)

present survey). A survey of drainage catchments within Argyll, for example, where a comprehensive land database already exists, would do much to clarify the role of crannogs within the settlement record at large. The present survey project was run on a shoestring budget of about £200, with the goodwill of fellow divers and colleagues. It demonstrates that underwater survey should no longer be seen as impracticable or too expensive. Contour survey models of underwater sites were achieved during this survey and completed to an accuracy, standard and time-scale comparable to that of surveys on land. In addition, the techniques of sidescan sonar and echosounding offer the potential to survey an entire loch in a matter of hours, identifying anomalies which can then be examined by divers. Sidescan coverage of the Lake of Menteith, for example, took around five hours. These rapid surveying techniques would allow the investigation and survey of a number of lochs within a reasonable time-scale.

There is much talk of taking a complete, landscape view of archaeological sites, considering all the possible types of evidence available within a wide catchment area. Yet despite this apparently holistic approach, surveys and settlement reviews rarely consider the possibility of underwater sites in a given area, and almost never actually search for them. Any survey that has not considered the water bodies within its catchment must be regarded as incomplete. Unfortunately, we are still in a position where 'underwater' and 'land' archaeology are seen as separate entities; this can only be to the detriment of archaeology as a whole. This study has indicated, albeit briefly, that the survey and examination of crannogs and their surrounding landscape on a much larger scale could have immense implications for current views of particularly — though of course not exclusively — the later prehistoric settlement record. It is

time for the techniques of underwater and land archaeology to be used to complement and enhance each other. It is hoped that in the future, underwater archaeology will be seen as part of 'mainstream' archaeological practice and not as a marginal pursuit carried out by the few.

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NOTES

- 1 The Lake of Menteith was originally called the Loch of Inchmahome. Graham of Duchray, writing in 1724, was the first to substitute the name Monteath or Menteith for Inchmahome while retaining the word Loch (Stewart 1923, 1). The use of *Lake* instead of *Loch* is thought to date from Victorian times and the reasons for its use remain obscure. However, it seems likely that it was due to literary influence arising from the quiet and peaceful appearance of Menteith and its immediate surroundings compared to the more dramatic Highland lochs of the area.
- 2 Eleven crannogs at Loch Awe, all at the eastern side, are now found on dry land. Morrison (1980, 161) suggests that this may be due to the long-term tilting of the loch trough by land movements related to glaciation.
- 3 The one 'crannog' to have produced a radiocarbon date outwith the later prehistoric period is Ledmore, a small boulder mound of 11 m by 13 m, on the Isle of Mull, which yielded a date of 700 ± 50 BP (Holley & Ralston 1995, 595).

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