Crannogs; a diminishing resource? A survey of the crannogs of southwest Scotland and excavations at Buiston Crannog

J.W. BARBER & B.A. CRONE*

Investigations in the 19th century demonstrated that Scottish crannogs, the distinctive waterlogged settlements in the shallow waters at the edge of lochs, were very rich in organic remains of all types. Have the crannogs survived, years after so many of the lakes were drained? Are there organic remains left? A new survey and new excavations at the Buiston crannog shows how much has gone, and the great value of what remains.

Introduction

Within the archaeological community the increasing emphasis on environmental reconstruction and the concomitant importance of organic deposits has refocused attention on sites in wetland environments where the waterlogged, anaerobic conditions have preserved the organic dimension of human habitation, the dimension that is usually missing on 'dryland' sites (Coles 1986). This interest parallels a world-wide change in the public's perception of marginal environments, such as wetlands. Areas that were once considered marginal wastelands are now perceived as a precious resource where forms of life, vegetable, animal and human, have been preserved free from the 'polluting' aspects of 20th-century life (Maltby 1989). There is a growing public awareness of the value of marginal wetlands, and concern with the rapidity with which they are being damaged and destroyed. It is against this background that the survey of the crannogs of southwest Scotland and the re-excavation of Buiston crannog were conceived. Both projects were funded by Historic Scotland and carried out by the writers.

Historical and archaeological background

The term 'crannog' is commonly used to refer to any wholly or partly artificial island and, as such, covers many variations on the theme in terms of construction, function, location and date. Morrison (1985: 16–20) calls them 'built-up islets', a term which encapsulates two general and unvarying aspects of their form. They are always built with solid foundations of timber, peat, brushwood or stones, dumped on the loch or river bed or used to extend a natural island, and they were always intended to be surrounded by water. With a single exception in South Wales, crannogs are confined to the lochs and rivers of Scotland and Ireland.

Interest in Scottish crannogs peaked during the 19th century when land improvement schemes resulted in the drainage of many small lochs to create cultivable land or to extract marl for use as fertilizer. Many previously unknown crannogs were exposed while other known crannogs became accessible for the first time. In a surge of antiquarian interest, stimulated by Keller's (1866) reports of continental discoveries of submerged lakeside dwellings, many were 'investigated', often by the landowners themselves.

Between 1850 and 1920 some 36 Scottish crannogs were examined and recorded, to a varying degree (Oakley 1973: 23). Elaborate wooden structures and a rich assemblage of artefacts are described but, unhampered by the rigours of stratigraphic control, accounts of the excavations are often unclear and the

* AOC (Scotland) Ltd, The Schoolhouse, 4 Lochend Road, Leith, Edinburgh EH6 8BR, Scotland.

ANTIQUITY 67 (1993): 520–33

modern researcher is given only a tantalizing glimpse of the wealth of the revealed evidence. The most thorough and well recorded of these excavations, by the standards of the day, were carried out by Dr Robert Munro on the trinity of Ayrshire crannogs, Lochlee, Lochspouts and Buiston, accounts of which he published, together with all known information about Scottish crannogs, in his *Ancient Scottish lake dwellings* of 1882. His observations on the construction, chronology and distribution of crannogs, recorded in that volume, have not been substantially challenged until very recently.

Munro (1882: 248) believed that the distribution of crannogs was concentrated in southwest Scotland and felt that the investigations, by Rev. Odo Blundell and others, on the Highland crannogs (summarized later by Blundell 1910) would not radically alter the general distribution. Crannogs lay mainly within 'those districts formerly occupied by Celtic races' (Munro 1882: 248) and the artefact assemblages were predominantly Romano-British with a strong Celtic element (Munro 1882: 277). From their apparently political distribution and cultural affinities Munro concluded that the crannogs were built by the native Celtic populace in response to the turbulent events following the Roman withdrawal from south and southwest Scotland, sometime in the 2nd and 3rd centuries AD (1882: 249).

Interest in crannog studies tailed off during the first half of the 20th century, perhaps because of the physical difficulties and high cost of applying improved standards of archaeological excavation and recording in the murky, watery environs of a crannog. A handful have been excavated this century, again mainly in response to drainage schemes or lowered water-tables. With the exception of the underwater excavation in Loch Tay (Dixon 1984) excavation has, quite literally, only scratched the surface (e.g. Loch Glashan, Scott 1960; Loch Arthur, Williams 1971; Milton Loch, Piggott 1953).

The last 20 years have seen a resurgence of interest in Scottish crannogs, partly because of their potential as reservoirs of the 'organic dimension' of the prehistoric and early historic periods. Modern diving equipment and techniques make possible excavation and survey of completely submerged crannogs (Morrison 1985; Dixon 1982). Surveys in Loch Awe and Loch Tay have found large numbers of hitherto unknown crannogs in these Highland lochs and radiocarbon dates from sampled piles indicate that they were being

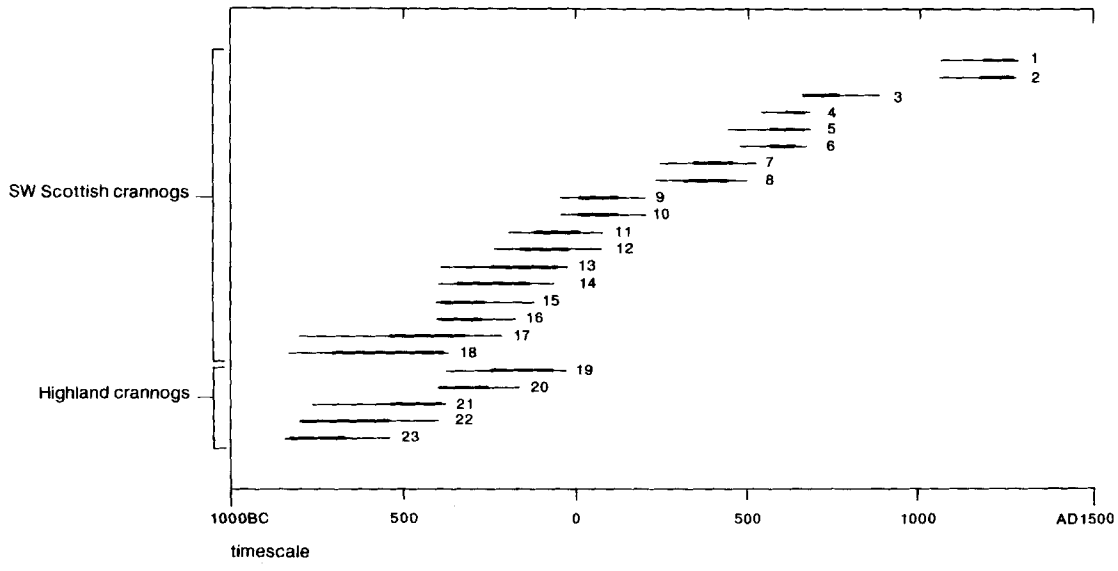

FIGURE 1. *Radiocarbon dates from Scottish crannogs. (The thick line represents the shortest continuous range within which there is a 68% probability that the date will fall. The thin line represents the shortest continuous range for a 95% probability.)*

occupied during the greater part of the 1st millennium BC (FIGURE 1 & TABLE 1). The improved database has also prompted the formulation of theories about their functions and their positions within the landscape (Morrison 1985).

The dating of crannogs has been heavily

no.	site	context	lab. no.	^{14}C determination	calibrated dates 68%	95%
1	Lochrutton	pile	GU-2639	820±50 b.p.	AD 1180–1270	AD 1060–1280
2	Lochrutton	pile	GU-2640	830±50 b.p.	AD 1175–1270	AD 1055–1275
3	Barean Loch	pile	GU-2641	1280±50 b.p.	AD 655–765	AD 655–880
4	Buiston	pile	GU-2636	1430±50 b.p.	AD 605–665	AD 540–680
5	Milton Loch 3	pile	GU-2646	1460±70 b.p.	AD 565–665	AD 440–680
6	Milton Loch 3	pile	GU-2645	1470±50 b.p.	AD 560–640	AD 475–670
7	Buiston	hearth ash	GU-2688	1640±50 b.p.	AD 340–450	AD 245–520
8	Buiston	hearth ash	GU-3004	1680±50 b.p.	AD 310–440	AD 230–495
9	Buiston	brushwood	GU-3000	1950±50 b.p.	AD 10–120	AD 45–200
10	Erskine Bridge	pile	GU-2328	1950±50 b.p.	AD 10–120	45 BC–AD 200
11	Milton Loch 2	pile	GU-2647	2060±50 b.p.	120 BC–AD 15	195 BC–AD 75
12	Milton Loch 1	pile	GU-2648	2080±50 b.p.	160 BC–20 BC	235 BC–AD 70
13	Barean Loch	pile	GU-2642	2140±60 b.p.	250 BC–50 BC	390 BC–30 BC
14	Erskine Bridge	pile	GU-2383	2170±60 b.p.	350 BC–135 BC	400 BC–65 BC
15	Loch Arthur	pile	GU-2644	2240±60 b.p.	400 BC–265 BC	405 BC–120 BC
16	Loch Arthur	pile	GU-2643	2260±50 b.p.	400 BC–275 BC	405 BC–175 BC
17	Milton Loch 1	ard	K-1394	2350±100 b.p.	545 BC–320 BC	805 BC–215 BC
18	Milton Loch 1	pile	K-2027	2440±100 b.p.	705 BC–380 BC	835 BC–375 BC
19	Firbush Pt	pile	GU-1324	2140±55 b.p.	250 BC–65 BC	380 BC–30 BC
20	Ederline	pile	GU-2415	2220±45 b.p.	395 BC–255 BC	400 BC–170 BC
21	Oakbank	pile	GU-1325	2410±60 b.p.	540 BC–385 BC	765 BC–380 BC
22	Fearnan Hotel	pile	GU-1322	2475±55 b.p.	805 BC–45 BC	805 BC–405 BC
23	Oakbank	pile	GU-1323	2545±55 b.p.	835 BC–665 BC	845 BC–540 BC

TABLE 1. *Radiocarbon dates from Scottish crannogs.*

https://doi.org/10.1017/S0003598X00045737 Published online by Cambridge University Press

biased by the relatively few diagnostic finds recovered amongst a welter of undatable or chronologically insensitive materials, of which wooden objects constitute an interesting and varied assemblage. Apart from structural timbers of all types, bowls, boxes, spoons, mallets, clubs, ards, logboats and oars have been recorded. The list of stone objects includes querns, whetstones, polishing stones, pounders and hammerstones, whorls, shale rings, objects made from jet and flint assemblages; all chronologically insensitive. It is little wonder that the readily identifiable and more securely dated artefacts of the Roman period (Robertson 1970: table III) and the Dark Ages have been accepted as dating their occupation. Thus, at Milton Loch, the artefactual assemblage was interpreted as indicative of a period of use in the 2nd century AD (Piggott 1953); subsequently radiocarbon dates (from a pile and an ard found within the substructure of the crannog) indicate use in the middle of the 1st millennium BC (Guido 1974, and see FIGURE 1 & TABLE 1).

The radiocarbon dates from Milton Loch 1 convinced the excavator that the 2nd-century brooch, on which the original dating was based, represented no more than accidental loss on a site which had already been abandoned for over half a millennium. The uppermost structures and deposits of a crannog, necessarily above the water-table, would decay following abandonment until the water-table was reached or a sufficient depth of soil had formed to preserve the underlying deposits. Inorganic materials originally held in those upper deposits, and precipitated onto the surface of the surviving deposits, would become incorporated into that surface by bioturbation, forming a conflation horizon. Thus it remains a possibility that there were two phases of activity at Milton Loch 1. A re-assessment of the finds from 19th-century excavations of other crannogs in the same area provides some support for this contention, in that it has identified two distinct phases of activity (Oakley 1973: 111); earlier, in the Late Bronze Age/Early Iron Age and later, in the post-Roman period.

Aims and methods of the survey

As it has been suspected for some time that the underwater crannogs are slowly decaying and that the dryland and seasonal sites are decaying quite rapidly, it is Historic Scotland's intention that these sites be protected, where possible, by scheduling and by appropriate management. In consequence, there is a pressing need for basic information on the location and condition of these sites. Gathering this information was the first aim of the survey. Munro's excavations at Buiston indicated that much of the artefactual richness of the these sites may lie outside the built structure of the crannog, presumably as the result of continuous dumping (Munro 1882: 204). The outer limit of archaeological interest is in many cases further extended by gangways, causeways and harbours. It is therefore important that the full extent of the sites be established to define boundaries for scheduling and management agreements.

If, as seems likely, only some of the sites can be preserved, some evaluation of relative archaeological value must also be undertaken. Thus the survey's second aim was the dating of the duration of settlement. A clarified chronology would determine whether the southwestern Scottish crannogs are, like the earlier of the dated Highland sites, initiated in the mid 1st millennium BC or, like the Irish sites, predominantly Dark Age and later.

In the first stage of the project the known resource was to be reviewed, surveyed and sampled to provide a limited but valuable overview of the general state of the sites. The next stage would involve limited excavation at a few sites to retrieve detailed information on the mechanisms and rates of decay and to gain a better appreciation of their chronological complexity. A third stage of work would then be dedicated to identifying and evaluating preservation techniques and effective monitoring methods.

Crannogs: the resource

Crannogs and possible crannogs have been identified in lochs, lochans and estuaries all over Scotland except southeast Scotland and parts of northeast Scotland, (Morrison 1985: figure 1.3). Southwest Scotland was selected for the present survey because the work of Munro and others in this area presented an extensive database which could be used to assess the fates of the sites

over the past century. The survey area, initially restricted to the Region of Dumfries and Galloway, was latterly extended slightly beyond that area into Strathclyde. The identification of crannogs by Munro and his contemporaries had been expanded upon by the Ordnance Survey Archaeology Division (now NMRS) and some 73 crannogs or possible crannogs were listed before the survey (TABLES 2 & 2a list the sites in this study and FIGURE 2 illustrates their distribution).

The original condition and extent of the

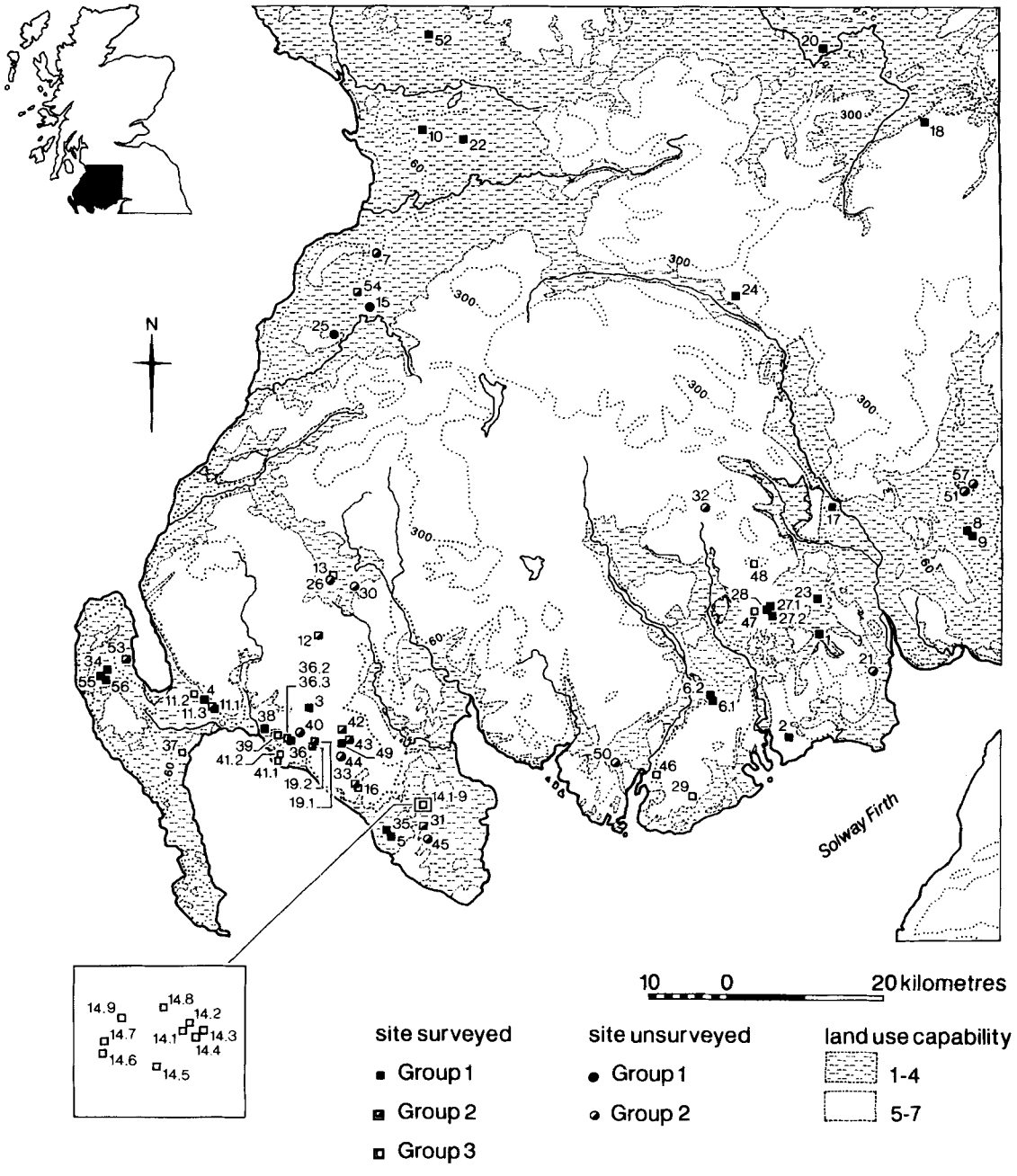

FIGURE 2. *Distribution of sites in TABLES 2 & 2a.*

https://doi.org/10.1017/S0003598X00045737 Published online by Cambridge University Press

group 1 sites confidently identified as crannogs	group 2 possible crannog sites	group 3 sites listed as crannogs on little or no evidence
2 Barean	33 Aireolland (Rough Lough)	47 Auchenreoch Loch
3 Barhapple	11 Cults Loch; 3	39 Barnsallzie
38 Barlockhart	12 Dernaglar Loch	11 Cults Loch; 2
34 Black Loch	43 Fell Loch	14 Dowalton; 7
49 Black Loch	53 Grey Loch	14 Dowalton; 8 Heron Isle
5 Black Loch of Myrton	19 Heron Loch; 1	14 Dowalton; 9 Inner Wood Hill
52 Buiston	19 Loch Ronald; 2	16 Eldrig Loch
6 Carlingwark; Ash Island	42 Loch Wayoch	54 Laigh Woodston
6 Carlingwark; Fir Island	31 Ravenstone	46 Loch Fergus
17 Carse Loch (Friar's Carse)		41 Loch Sunonness; 1
8 Castle Loch; 1		41 Loch Sunonness; 2
9 Castle Loch; 2		48 March Burn
10 Craigie Mains		37 Mye Plantation
11 Cults Loch; 1		29 Newlaw
14 Dowalton; 1		36 Whitefield Loch; 2
14 Dowalton; 2		36 Whitefield Loch; 3
14 Dowalton; 3		
14 Dowalton; 4		
14 Dowalton; 5		
14 Dowalton; 6 Miller's Cairn		
18 Green Knowe		
20 Hyndford		
1 Loch Arthur		
22 Lochlee		
55 Lochnaw; Bramble Island		
56 Lochnaw; 2		
23 Lochrutton; A		
24 Lochside		
27 Milton Loch; 1		
27 Milton Loch; 2		
28 Milton Loch; 3		
35 White Loch of Myrton		
36 Whitefield Loch; 1		

TABLE 2. *Sites visited during survey.*

group 1 probable crannog sites	group 2 possible crannog sites
4 Black Loch	50 Borgue
15 Drumore Loch	7 Carcluie Loch
25 Lochspouts	51 Corncockle Moss
	58 Formannoch
	21 Kindar Loch
	40 Loch Robin
	26 Maberry Loch
	44 Mochrum Loch
	30 Ochiltree Loch
	45 Ravenstone Moss
	57 Spedlins Flow
	13 Dornal Loch
	32 Lough Urr (Rough Island)

TABLE 2a. *Sites not visited during survey.*

https://doi.org/10.1017/S0003598X00045737 Published online by Cambridge University Press

sites indicate three general groups, defined, not on archaeological grounds, but on the basis of what was known about them. The first group of sites have been 'examined' or excavated or have yielded artefacts; these are relatively well known in the archaeological literature. The second group comprises sites referred to as crannogs in earlier literature but with no supporting evidence. The third group comprises small islands within lochs which have, from time to time, been nominated as possible crannogs on no real basis whatsoever.

These three groups, coded 1 to 3 on TABLE 2, may be thought of as 'crannogs', 'possible crannogs' and 'unlikely crannogs'.

Some 58 sites were visited. The literature showed that 32 of these sites were crannogs when first discovered and a further site was revealed in Milton Loch during the underwater survey. Thus 33 sites are identified as group 1 sites. There are nine group 2 'possible crannogs' and 16 group 3 'unlikely crannogs'.

Of the 16 sites which were not visited, the three which yielded anthropic materials are included with the group 1 'crannogs'. The remaining 13 sites are included in the group 2 'possible crannogs'.

Stage 1: the survey

In the initial survey 58 sites, identified in TABLE 2, were visited, those sites in lochs being examined from the adjacent shoreline. Subsequently, a number of submerged crannogs were investigated by diving. Sites were investigated in order of their archaeological richness combined with potential threats to their survival. The former was based solely on published accounts while their 'threat status' was evaluated in terms of the Land Use Capability classification of the area around the site and based on the simple, but hopefully not simplistic, assumption that sites in richer agricultural areas would be under greater threat.

Results

Visits to five of the 16 group 3 sites have demonstrated that these features never were crannogs. The possible locations of the site in Auchenreoch Loch proved to be either natural or modern; Laigh Woodston is a stone platform in a marshy area used as a shooting stance for duck hunting; the timbers reported from March Burn are the remains of a natural, sub-fossil woodland; Mye Plantation is a pit alignment (Mann 1902 and R. Ritchie pers. comm.); and the timbers reported from Newlaw were probably the trough liners of a linear group of burnt mounds observed during this survey. The other 11 in this group have only their locations to suggest that they ever were crannogs. This group is not discussed further.

Of the 42 certain and possible crannogs (i.e. groups 1 and 2) visited, some 20 group 1 sites and 6 group 2 sites lie in lochs and are partly or wholly underwater. A further 2 group 1 sites are seasonally flooded. Eleven group 1 sites and 3 group 2 sites are now accessible on foot, usually as a result of loch drainage, although the access is still in many cases *via* wet marshy areas. These sites, together with the seasonally flooded sites, are referred to here as 'dryland' crannogs.

The dryland crannogs

Two of the dryland crannogs have been destroyed. Green Knowe has been removed by quarrying while Craigie Mains has been buried beneath landfill. Hyndford and Cults Loch Site 3 seem completely desiccated, revealing only charcoal and some burnt bone when cored. The Black Loch of Myrton site is also desiccated but some organic deposits, one containing fragments of wood, were observed during coring. The site at Aireolland may have been a fortified natural island and is now isolated within a forest area of young trees. Forestry furrows approach to within a few metres of the wall which defines the site and undoubtedly the related organic deposits outside the site have been ploughed into. Furthermore, the site's deposits will now begin to desiccate as the plantation progressively lowers the local water-table.

Coring produced no evidence for organic remains on the six crannog sites identified at Dowalton. While there must be some doubt that all of these ever were crannogs, the rings of stakes and beams described by Lord Lovaine in 1863 (Munro 1882: 38) appear to have surrounded and extended the natural islands. The range of material variously attributed to them seems to have come from unspecified areas of the lake bed when the loch was drained. The islands have become

completely desiccated, but it seems likely that organic deposits and anthropic materials survive in the surrounding waterlogged deposits, together with some fraction of the original structures.

The site at Grey Loch could not be located. It seems safe to assume that it has also become fully desiccated and no longer exists as a reservoir of organic archaeological materials.

Lochlee, one of the seasonally flooded sites, was not located despite extensive coring. However, the nature of the terrain at Lochlee leaves reason for hoping that the site may be 'mislaid' rather than lost. The other seasonally flooded site is Buiston (Munro's 'Buston', but pronounced 'Biston'), where, despite considerable loss, much still remains in the way of organic deposits and wooden structures (below). Similarly, the site at Barlockhart, on the margin of a small loch, seems well preserved, and timbers were encountered beneath roughly 60 cm of peat.

Thus, of all of the group 1 and 2 dryland sites, only Buiston and Barlockhart appear to have significant organic deposits surviving. Partial survivals on 2 out of 17 sites indicates that the lot of a dryland crannog is not a happy one. It would appear that a crannog can disappear in less than a century even where, as at Lochlee or Buiston, the deposits originally stood more than 2 m above the surrounding terrain.

The submerged crannogs

The underwater survey: methods

The Scottish Trust for Underwater Archaeology was commissioned to examine some of the underwater sites. They surveyed and retrieved samples of timbers from six sites in four lochs, three sites in Milton Loch and one each in Lochrutton, Barean Loch and Loch Arthur (TABLE 2 & FIGURE 2). As no trace of the group 3 site at Auchenreoch was located, it can be dismissed. One site, Milton Loch 3, was discovered during this operation. In this reconnaissance operation the selection of lochs and of sites within lochs was effectively random. Several samples were retrieved from each site to test, by radiocarbon dating, the hypothesis that the sites were multi-period structures. Where possible, piles were to be sampled so that the 'decay gradient' could be examined. This latter relates to our preconception that timbers projecting upwards into the loch waters are commonly heavily eroded while those same timbers below the enveloping deposits of the crannog can be very well preserved. This implies the existence of a vertical erosional gradient, the mechanisms of which are clearly of interest and importance to the conservation of crannogs.

The underwater survey: results

Only the larger of the two islands in Lochrutton gave evidence of artificial construction, with timbers visible in the loch bed around the site. Four samples were retrieved. The first of the Milton Loch sites (ML 1) is that partially excavated by Piggott (1953). The excavated areas are still relatively free from silt, and piles and horizontal timbers are clearly visible on the loch bed. Three piles were sampled from this site. The shallow water around the site is heavily infested with animal and plant life, which are causing damage to the site. Freshwater mollusca are tunnelling into the softer timbers while snails and arthropods abound in the sediments. *Equisetum* appears, rooted in the exposed timbers and in the sediments. The second site in Milton Loch, noted by Piggott (1953), is surrounded by piles projecting up from the loch bed, three of which have been sampled. The site is noticeably less heavily infested than ML 1. A third site (ML 3), one of two in the middle of the narrowest part of the loch was found to be man-made; five timbers were sampled from it. There seems to have been some recent disturbance of deposits close to the shore of the island, where vertical and horizontal timbers have been revealed. Some of its timbers display damage similar to ML 1, although somewhat less extensive.

The site in Loch Arthur lies in shallow water in which much evidence for biological activity was observed. The silts covering the site are very soft and vertical and horizontal timbers are visible around the site. Two samples were taken. The site in Barean Loch had been recently vandalized, and deposits from the edge of the island dislodged into the surrounding water. Horizontal timbers and piles were clearly visible, the latter projecting up to 70 cm above the loch bed. Two were sampled from this site.

The present condition of the resource

The principal threat to the organic deposits on all wetland sites is drainage. Fourteen crannogs which became dryland sites as a result of loch drainage in the 19th century have all suffered further damage from drainage operations over the past century but, except for the quarried site and the site buried beneath landfill, they survive as accessible archaeological sites, even if, in the main, their organic deposits are severely reduced or absent. As dryland sites they are now threatened by further drainage, afforestation and agricultural cultivation. These sites, having lost their organic remains, appear poor and little deserving of attention. Yet excavation of a range of these sites is essential to any elucidation of the relationships between crannogs and dryland archaeology.

Under water, only the site in Lochrutton appeared well preserved and free from heavy infestation. This loch serves as a fresh-water reservoir; monitoring and control of inputs to the loch may account for lower levels of biological activity since it is assumed that nitrate run-off is the principal cause of accelerated biodegradation in other lochs. Observations from the bank seem to indicate that sites in upland lochs, set in uncultivated areas, are far less heavily infested than their lowland counterparts. None the less the exposure of relatively large areas of timbers in lochs, otherwise free of macroscopic infestation, is worrying; it implies that the organic materials which originally covered them are now being removed, possibly by bacterial and algal degradation.

Stage II: excavations at Buiston

The survey had concluded that, of the dryland crannogs, only Buiston and Barlockhart still held significant organic deposits. For the second stage Buiston was selected because it was assumed that Munro's excavations had removed the archaeologically sensitive deposits and it would, therefore, be relatively cheap and quick to retrieve the information on condition and decay processes from the timbers and deposits in the substructure.

The excavations, carried out in the summers of 1989 and 1990, proved how wrong this assumption was. Rather than the unitary structure of Munro's interpretation (1882: 205), the excavations revealed a history of construction and refurbishment with spreads of occupation deposits surviving virtually intact. The results are described, by structural phase.

Phase I

The primary 'core' of the crannog (recorded only in section) was a mound, at least 28 m in diameter, created by dumping alternating layers of turves and brushwood over a primary layer of large boulders and massive oaken beams.

Phase II

The earliest occupation for which there is evidence is represented by the residual remains of a series of three superimposed floors and hearths. The sub-rectangular, stone-built hearths lay over beds of sand and wattle hurdles while the associated floors are represented by patches of clay, peat and brushwood. Two concentric circles of squared stakes, inserted into the primary mound and centred on the hearths, formed a double stockade around the settlement.

Phase III

Slumping of the crannog sub-structure may have precipitated the abandonment of the early occupation site. The crannog was extended to the northwest and its surface levelled. The focus of occupation then moved to the northwest.

A round house, *c.* 7 m in diameter, was constructed over a foundation of oak planks, fire-shattered stone and brushwood. A rectangular stone hearth lay at its centre surrounded by floors of clay and brushwood. The floor and hearth have been replaced at least four times.

A complex palisade of conjoined horizontal planks, pinned in place by stakes, was erected around the crannog during this phase. Along the southwestern perimeter of the crannog the palisade had collapsed outwards into the lake muds until it was virtually horizontal, thus preserving details of its upper structure which would otherwise have been lost.

The northwestern extension to the primary crannog 'core' eventually slumped outwards causing the collapse of the house described above. Almost a third of the floor slumped

down from the central hearth to settle 1 m below its original level and all that survives on the level surface in the northeastern quadrant of the site is the foundation deposits.

Phase IV

After the collapse the crannog was abandoned for some time and when building recommenced it was again concentrated in the northwestern quadrant. A massive timber framework, consisting of birch logs packed down between two concentric arcs of oak stakes, was laid down directly onto lake muds at the edge of the slumped deposits. The resulting log pavement may have formed a walkway between a defensive palisade formed by the outer arc of stakes and the walls of a circular building formed by the inner arc of stakes. The hollow into which the earlier structure had slumped lies within this framework and was filled up with dumps of peat, heather and pieces of wood, including fragments of hurdle screen, sillbeams, walling panels and other structural debris. This area also produced virtually all the contexted artefacts found on the crannog during the recent excavation.

There was no trace of the habitation associated with this timber framework. Presumably, this was at least partially destroyed during the 19th century when 'as many as thirteen cartloads of timbers were removed' from the site of the crannog (Munro 1882: 190). The horizontal timber framework that Munro exposed and recorded probably belonged to this late structural phase.

A logboat was uncovered lying just outside the crannog, its stern smashed by the insertion of a stake into the outer palisade.

The artefact assemblage

Virtually all of the rich assemblage of artefacts described by Munro was retrieved from the 'refuse-heap' which he discovered, outside the southeastern perimeter of the crannog (1882: 210). A bronze hanging bowl was found during the current excavations lying in lake muds in the general area of Munro's refuse-heap.

Artefacts were relatively rare in the occupation deposits examined during the current excavations. However, the exception to this proved to be the dumped deposits used, in Phase IV, to in-fill the hollow caused by slumping of the earlier crannog. These dumped deposits contained a varied range of wooden, domestic and dairying articles, an iron chisel, glass shards, fragments of leather shoes and plaited fibres. However, apart from an intricately carved wooden object and the hanging bowl, none of these finds is likely to be culturally or chronologically diagnostic.

Outline chronology

An outline chronology for the crannog is now available (FIGURE 1) although a fuller programme of radiocarbon and dendrochronological dating is being implemented. The calibration of the radiocarbon dates (Dalland unpublished) is based on the Belfast high-precision calibration curve (Pearson *et al.* 1986). In the text the dates, calibrated to 1 sigma, are quoted. The lowest brushwood layer of the primary mound has been dated to AD 10–120 (GU-3000) while the earliest hearth deposits in Phase II have produced a date of AD 310–440 (GU-3004). This, and the absence of deposits associated with the primary mound, suggest that all evidence for the settlement associated with the construction of the primary crannog, assuming that there was one, has been obliterated by later activity. Charcoal from the latest hearth in the Phase III structure has produced a date of AD 340–450 (GU-2688), indicating that the Phase III refurbishment of the crannog occurred rapidly after the abandonment of the Phase II structure. The last phase of construction for which we have evidence occurred after a long period of abandonment. A pile from the Phase IV timber framework, produced a date of AD 605–665 (GU-2636), more than 200 years after the latest dated activity in the Phase III house.

Buiston: the implications for preservation

In assessing preservation at Buiston it is important to detail the history of the site. In the early 19th century the loch around the crannog had already disappeared but the field still flooded seasonally. A small mound was visible in about 1830 which the farmer subsequently demolished to ground-level, removing the 13 cart-loads of timber mentioned by Munro (1882: 190). When Munro began his excavation he removed the

topsoil and a 'dark heterogenous understratum of debris' to reveal an extensive wooden structure (1882: 195).

The field in which the crannog stands still floods annually but during dry summers the water-table can fall to roughly 40 cm below the present ground surface. The very decayed tops of some stakes were just protruding above the ground surface before the recent excavations commenced.

As noted above, Buiston was chosen because of the presence of abundant organic deposits and because, after a century of exposure, we assumed that only the substructure of the crannog would be intact. The results of the excavation demonstrate otherwise.

The principal factor affecting the quality of preservation at Buiston, as at other waterlogged sites, is the persistence of anaerobic conditions, maintained here by a high water-table and by deposits high in humic matter which retain water, resist desiccation and exclude oxygen. All organic matter lying above the minimum water-table will eventually decay even though subjected to periodic wetting, while organic matter below that level will be preserved, to a greater or lesser degree. However, at Buiston decay was observed on the outer surfaces of stakes projecting down well below the level of the permanent water-table. More significant, perhaps, is the fact that these stakes extended below the rich organic layers. Our present understanding of this phenomenon is that oxygenated water is moving through the sand beds underlying the site and either decomposing the wood chemically, in redox reactions, or introducing wood-rotting bacteria, or both. As the superstructure of a crannog necessarily stands above the contemporary surface of its enclosing loch it may reasonably be assumed that it decays quite rapidly, following abandonment. At Buiston, two factors allowed for the preservation of parts of the superstructure together with its domestic debris. In the northwestern quadrant slumping meant that fragments of the domestic structures of Phases II and III came to rest below the water-table and important detail was preserved. Along the southwestern perimeter, the outer palisade collapsed outwards into the loch muds, thus preserving details of the superstructure.

While slumping and collapse are events which are unpredictable they are probably not rare on loch margins. What can be more easily anticipated is the existence of an archaeological penumbra, the annular area outside the palisades, where domestic debris and unwanted objects were dumped. Munro discovered an artefact-rich midden extending for 2 m outside the palisade while the logboat revealed in his excavations was found some 11 m outside it. The recent excavation confirmed that artefacts and debris have been dumped outside the palisade. Delimitation of this penumbral area is clearly important in determining the area of the site to be preserved on purely archaeological grounds. However, there is a much wider zone around every crannog which contains evidence, microscopic and macroscopic, of the impact of the settlement on the ecology of the lake, and *vice versa*.

Indeed, given the palimpsest nature of the excavated remains at Buiston, it may well prove to be the case that fine resolution of the settlement sequences of crannogs can only be gained from analyses of deep, rapidly accumulating sediments close to crannogs, but sufficiently removed to have escaped mechanical disturbance from activities on the crannog. This emphasizes the need to conserve generous areas around crannogs. However, such analyses may not be as straightforward as might be desired. Preliminary results at Buiston, for example, indicate that the radiocarbon dates for the uppermost strata of loch sediment are inverted, i.e. older sediments over younger sediments, probably because of reworking of old organic carbon within the loch basin (Tipping 1992). This may prove to be a common feature of Scottish lochs (*cf.* Edwards & Rowntree 1980). Magnetic dating of sediments may help to resolve this problem at some sites.

The chronology of Scottish crannogs

The results of the dating programme are presented in TABLE 1 together with all other known radiocarbon dates for Scottish crannogs. Clearly, without excavation, we cannot know which dates relate to primary construction, subsequent refurbishments or later phases of occupation; they simply

indicate that there was activity on the crannog at that time.

Three of the crannogs dated in this programme have been the subjects of earlier excavations. The new date from Milton Loch 1 indicates a phase of activity in the late 1st millennium BC increasing the likelihood that the 2nd-century AD enamelled brooch represents settlement on the crannog rather than post-abandonment activity (Piggott 1953, and see above). (A fourth date was obtained from Milton Loch 1 but has not been included in the discussion here; a pile yielded a radiocarbon date of 6110±60 b.p. (GU-2649), a result interpreted here as either anomalous or indicating the use of older, possibly sub-fossil, wood in the construction.) Excavations at Lochrutton identified the stone structure on the crannog as a hall-house of the mid 13th century, while the large assemblage of pottery retrieved was all of a 13th- to 14th-century type (Truckell & Williams 1967). The new radiocarbon dates are entirely consistent with the excavated evidence but do not rule out the possibility that an earlier settlement existed on the crannog. This latter point is brought sharply into focus at Loch Arthur. The excavator interpreted the superstructure as late medieval, and a 15th-century tripod cauldron was found on the site (Williams 1971). Yet the new radiocarbon dates indicate a phase of activity 2000 years earlier in the mid 1st millennium BC.

There are now 18 radiocarbon dates for crannogs in southwest Scotland and the difference in age between the earliest and the latest is approximately 1500 years. On the available evidence (Armit 1989: 15), the Neolithic site at Loch Olabhat, on North Uist in the Outer Hebrides, meets the criterion of being at least partly man-made; if considered as a crannog it extends the date range for their use by a further two millennia. Although presently unknown in Scotland, wetland sites of Bronze Age date occur elsewhere in the British Isles, e.g. Flag Fen in Cambridgeshire (Pryor 1992) or Lough Eskragh in Co. Tyrone, Northern Ireland (Williams 1978). Bronze Age materials from Irish crannogs present particular problems of interpretation (Lynn 1983) but at the very least, they represent use of lake margin sites during this period.

Clearly, then, lake margins and wholly or partially man-made islands, i.e. crannogs, have enjoyed periods of use at various times over the past five millennia. There is, however, no evidence for their continuous use over this great time-span. The radiocarbon dates seem almost randomly spread over the period 2500 to 500 b.p., the only distinct hiatus lying between the flurry of activity on the crannogs at Buiston, Barean Loch and Milton Loch 3 in the 6th and 7th centuries AD and the construction/refurbishment at Lochrutton in the 13th century AD. Some 55% of the radiocarbon dates lie in the 500-year interval between 1950 and 2440 b.p., indicating a *floruit* for crannog building in the southwest of Scotland, during the pre-Roman and Roman Iron Ages. While Dark Age crannog building is only evidenced by radiocarbon dates from Buiston, Barean Loch and Milton Loch 3, the artefactual evidence from 19th-century excavations show that crannogs were extensively used in this period also. The use of crannogs in the medieval period is also under-represented as the radiocarbon dates identify only one site, Loch Rutton, as medieval in date. The apparent absence of man-made extensions to the many islands on which structures of medieval or post-medieval date have been noted, meant that they were ignored for the purposes of this survey. Thus, the scale of medieval and later use of island settlements in this area is significantly under-represented in the results of this survey.

Taken together, the radiocarbon, artefactual and structural evidence indicate, on closer examination, three distinct phases of crannog construction, in southwest Scotland, separated from each other by periods during which few or no crannogs were built.

Five radiocarbon dates, from sites in the Highlands, all fall within the 1st millennium BC (TABLE 1). However, the absence of dates in the 1st millennium AD and later from the Highland sites is probably more apparent than real. The crannog in Loch Glashan, Argyllshire is thought, from artefactual evidence, to have been occupied between the 6th and 9th centuries AD (Scott 1960) while there is documentary evidence for the use and even the construction of new crannogs in the 16th century in parts of the Highlands (Morrison 1985: 23).

The chronological complexity of the regional group is mirrored in the single site. The excavations at Buiston revealed four settlement phases, the first in the later end of the pre-Roman/Roman Iron Age group and the others in the Dark Age. The latter three phases represent distinct settlement episodes with a period of abandonment between Phase III and Phase IV. However, the interval between Phases II and III is too short to have been resolved by the radiocarbon method.

Thus, at every scale, crannogs exhibit a complexity of chronology which, as Morrison has noted (1985: 22), completely invalidates the continuing perception of crannogs as representative of a single cultural tradition (Laing & Laing 1990: 122).

Conclusion

Despite its limited nature the survey has shown that drained sites have a very short lifespan. Fourteen of the sixteen drained sites examined have been lost in roughly 100 years. At best, small numbers of drained sites may survive longer, but it would be a mistake to consider that these sites are 'preserved' in any real way; they are just rotting less quickly. However, the desiccated sites are still extremely valuable because their excavation would link the archaeologies of contemporaneous dryland and wetland sites and because, as Buiston has shown, pockets of significant organic deposits may survive on otherwise desiccated sites.

More surprisingly, the sites in lochs are also undergoing erosion. That this has accelerated in the recent past may be deduced from the exposure of many structural timbers which are now under biological attack. Had this been the case for any appreciable length of time, we should not have the large exposures which are now apparent.

The apparent extent and rate of decay of the lacustrine sites is alarming. It had been anticipated that underwater sites would be relatively stable but this assumption has proved unwarranted. Indeed, in some cases, stabilization of the loch itself may be necessary if we are to stabilize the crannog deposits; this is likely to prove unpopular with other interested parties, ranging from the rivers authorities and water boards to nature conservancy interests. We clearly are in urgent need of a programme of primary research on this matter and the framework for this is now being formulated.

On balance, the survey and associated excavation have shown that the organic remains, the artefacts, structures and deposits revealed in the late-19th-century excavations of the crannogs in southwest Scotland are a considerably diminished resource, albeit one that is still of inestimable value. Preservation of the surviving sites must now constitute a high priority for Scottish archaeology.

Acknowledgements. The authors would like to thank the fieldworkers, John Bradley, Eoin Halpin, Heather King, V J McLellan and Jane Murray; the landowners, Montgomery Estates; and the tenants, the Kirkwoods of Mid-Buiston Farm. The account of the underwater survey is based on a report provided by Dr N Dixon of the Scottish Trust for Underwater Archaeology. Historic Scotland funded both the excavation at Buiston and the Crannog Survey, and supported the cost of publication.

References

ARMIT, I. 1989. *The Loch Olabhat Project, North Uist, 1989. Fourth interim report.* Edinburgh: Edinburgh University, Department of Archaeology. Occasional paper.

BLUNDELL, O. 1910. On further examination of artificial islands in the Beauly Firth, Loch Bruiach, Loch Moy, Loch Garry, Loch Lundy, Loch Oich, Loch Lochy and Loch Treig, *Proceedings of the Society of Antiquaries of Scotland* 44: 12–33.

COLES, J. 1986. Precision, purpose and priorities in wetland archaeology, *Antiquaries Journal* 66(2): 227–47.

DALLAND, M. N.d.. A programme for the calibration of radiocarbon dates with procedures for the analysis of age differences and adjusting for stratigraphic data. Unpublished.

DIXON, T.N. 1982. A survey of crannogs in Loch Tay, *Proceedings of the Society of Antiquaries of Scotland* 112: 17–38.

1984. Scottish crannogs: underwater excavation of artificial islands with special reference to Oakbank Crannog, Loch Tay. Unpublished Ph.D thesis, Edinburgh University.

EDWARDS, K.J. & K.M. ROWNTREE. 1980. Radiocarbon and palaeoenvironmental evidence for changing rates of erosion at a Flandrian stage site in Scotland, in R.A. Cullingford, D.A. Davidson & J. Lewin (ed.), *Timescales in geo*

morphology: 207–23. Chichester: Wiley & Sons.

GUIDO, M. 1974. A Scottish crannog re-dated, *Antiquity* 48: 54–6.

KELLER, F. 1866. *The lake dwellings of Switzerland and other parts of Europe*. London: Longman, Green.

LAING, L. & J. LAING. 1990. *Celtic Britain and Ireland: the myth of the Dark Ages*. Dublin: Irish Academic Press.

LYNN, C.J. 1983. Some 'early' ring-forts and crannogs, *Journal of Irish Archaeology* 1: 47–58.

MALTBY, E. 1989. Wetlands of the United Kingdom: character, values and threats, in J.M. Coles & B.J. Coles (ed.), *The archaeology of rural wetlands in England*: 4–9. Exeter: Wetland Archaeology Research Project.

MANN, L.M. 1902. Report on the excavation of prehistoric pile-structures in pits in Wigtownshire, *Proceedings of the Society of Antiquaries of Scotland* 37: 370–415.

MORRISON, I. 1985. *Landscape with lake dwellings: the crannogs of Scotland*. Edinburgh: Edinburgh University Press.

MUNRO, R. 1882. *Ancient Scottish lake dwellings*. Edinburgh: David Douglas.

OAKLEY, G. 1973. Scottish crannogs. Unpublished MPhil. thesis, Newcastle University.

PEARSON, G.W., J.R. PILCHER, M.G.L. BAILLIE, D.M. CORBETT & F. QUA. 1986. High-precision ^{14}C measurement of Irish oaks to show the natural ^{14}C variations from AD 1840 to 5210 BC, *Radiocarbon* 28: 911–34.

PIGGOTT, C.M. 1953. Milton Loch Crannog 1: a native house of the 2nd century AD in Kirkcudbrightshire, *Proceedings of the Society of Antiquaries of Scotland* 87: 134–52.

PRYOR, F. 1992. Current research at Flag Fen, Peterborough, *Antiquity* 66: 439–57.

ROBERTSON, A.S. 1970. Roman finds from non-Roman sites in Scotland, *Britannia* 1: 198–226.

SCOTT, J.G. 1960. Loch Glashan, *Discovery and Excavation in Scotland:* 8–9.

TIPPING, R. 1992. Interpretation of the radiocarbon dates from lacustrine sediments at Buiston Crannog. AOC (Scotland) Ltd internal report.

TRUCKELL, A.E. & J. WILLIAMS. 1967. Medieval pottery in Dumfriesshire and Galloway, *Transactions of the Dumfries and Galloway Natural History and Antiquarian Society* 44: 133–74.

WILLIAMS, B.B. 1978. Excavations at Lough Eskragh, Co. Tyrone, *Ulster Journal of Archaeology* 41: 37–48.

WILLIAMS, J. 1971. A crannog at Loch Arthur, New Abbey, *Transactions of the Dumfries and Galloway Natural History and Antiquarian Society* 48: 121–4.