

Illus 1 Location of ice houses listed by the RCAHMS in Perth and Kinross and in Fife. (Crown copyright, licence number AL 100034704)

Three Perthshire ice houses: selected results of a desk-based assessment and a programme of field investigations

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Introduction

This paper presents some of the results of a desk-based assessment of the nature, level of recording and condition of surviving ice-houses in Perthshire and Fife, along with selected results of a small programme of field investigations undertaken with a view to highlighting site management and conservation issues. The results of investigations of three ice houses in Perthshire are presented in depth here, and discussed in the light of an overview of the historical background to ice house construction and use. Both the desk-based assessment and subsequent field investigations were sponsored by Historic Scotland.

Although important features in the 17th- to 19th-century landscape, many ice houses across Scotland have disappeared and others are threatened with gradual erosion and collapse. It is hoped that the information revealed by this ongoing study of the surviving remains in selected areas will help to address issues of conservation policy and interpretation strategy.

Brief historical background

Until the widespread availability of refrigeration, people had to cope with seasonal fluctuations in the supply of foodstuffs, and developed a variety of means of storing and preserving food from one season to the next. On wealthier estates, landowners were able to store perishable foodstuffs for longer periods by making use of ice houses. Ice houses only began to be constructed in significant numbers in Britain in the 17th century, when social and economic changes gave rise to a boom in building construction (Buxbaum 1998, 3). In the late 17th and 18th century, mention of the widespread domestic use of ice is often found in contemporary letters and journals.

By the 18th century, the concept of storing ice in ice houses was beginning to be popularly accepted (Ellis 1982, 2). In November 1733, the *London Journal* recorded that an ice house was built in Green Park 'to keep ice in for the use of the Royal family', and a further entry in January 1734 recalls that '...several cartloads of ice above three inches thick, were carried from the canal in St James' park to the new ice house lately made in the Upper Park' (*The London Journal* 1733 and 1734). Published in 1768, the 8th edition of the *Gardener's Dictionary* (Miller 1768) gave a description

of building an ice house. Its compiler, Philip Miller, stressed the importance of a dry situation for the building, noting that moisture was prejudicial to the storage of ice. A raised position, to facilitate drainage, was also desirable.

The fishing industry was the largest consumer of ice in Britain, and the last user of natural ice. The earliest large-scale use was in Scotland, where ice collected from lochs was used in the late 18th and 19th centuries for packing salmon for transportation. By around 1820, ice was becoming routinely used in the salmon trade across Britain.

During the late 18th and early 19th centuries, the wealth of landowners increased rapidly, leading to increased demand for ice in summer to cool drinks and make exotic desserts. It was during this period that many domestic ice houses, attached to the mansions of the wealthy, were built (Ellis 1982, 12). By the end of the 19th century, ice dealers are referred to in gardening magazines, hinting that family ice houses may sometimes have been stocked with commercial ice.

By the end of the 19th century, global temperatures were rising steadily, the 'little ice age' (c 1430–1850) having come to a close. The mean rise in temperatures, between c 1880 and 1940, amounted to only a few degrees (Calder 1961, 88–90), but a critical threshold was crossed, above which lochs and ponds no longer froze over for long enough to supply sufficient ice to fill ice houses.

It was not until the beginning of the 20th century that an economical domestic refrigerator was produced, however the use of electric motors to run compressors, from 1916 onwards, represented a great step forward in household refrigeration and hastened the demise of the domestic ice house. When large numbers of labourers from country estates joined the forces in the First World War of 1914–18, many ice houses were abandoned as there was no-one to harvest the ice and fill them.

The nature and function of ice houses

Ice houses were often sunk into a sloping bank near to a source of fresh water (for example a pond, or a hollow in which a shallow pond could be formed by blocking field drains). In their construction a hole or trench was excavated, sufficiently large to contain the structure, and inside this the ice house was constructed,

often in the form of an egg-shaped or inverted conical structure with a domed roof. Considerable variation exists in the detail of the structures.

The excavated earth was normally replaced over the top of the structure to provide insulation, and access to the interior of the ice house was provided usually by means of a short, covered passage. When in use, the entrance passage was often the most visible part of an ice house, along with a mound enclosing the structure.

Essentially, ice houses functioned as cold storage chambers for ice and foodstuffs, before the widespread use of refrigeration. There appear to be two basic types of ice house, the first functioning as a cold store for perishable foodstuffs, and the second providing a store for ice which was subsequently removed for various uses such as fish packing and confectionery manufacture (Walker 1976, 564). The first type was especially popular during the 17th and 18th centuries on country estates, while the second type, usually used for commercial purposes, played a vital role in both the dairy and fishing industries in the later part of the 18th century and the 19th century. The examples described in this paper are associated with domestic establishments and belong to the first category.

Snow, or ice taken from a nearby fresh water source, was placed into the lower part of the chamber, filling it usually to the level of the entrance passage. Once filled, the ice house would be sealed until the summer months, when it would function as a cold store. In the autumn or early winter, the structure would be emptied and cleaned, ready for re-filling during the winter months.

The ice would be compressed into a solid block within the chamber. Although generally transported from the loch or pond to the ice house as slabs, the ice was often crushed before being loaded into the structure. It was then pounded, rammed or trampled into a dense mass. Additives such as saltpetre and water were sometimes added at this stage. When ice is harvested from the top of loch or pond in winter, the water surface will rapidly re-freeze, allowing more ice to be collected. In this way, ice houses were maintained without requiring a Scandinavian or Canadian winter climate.

It was important for the ice house to incorporate a drain below the ice, as water accumulating below it would have acted as a conductor of heat and made the store less efficient. Some ice houses were also designed with a ventilator pipe incorporated into the upper part of the structure, in order to counter the problems of dampness within the ice chamber and any build-up of latent heat which could cause the ice mass to thaw. Writing in 1853, Charles MacIntosh referred to the advantages of using this type of ventilation in ice houses to lower the internal temperature and remove any dampness (MacIntosh 1853, 509).

Perishable foodstuffs could be stored in a number of different ways within the ice house, hanging from the walls or dome, laid upon timber floors, ledges or

shelves above the ice, or placed directly on top of the ice, on a layer of cloth or straw. An ice house at Elmdon Hall in the West Midlands was used to store fruit (eg pears and peaches), suspended in wooden trays from the roof (Yorke 1954, 22). In the ice well itself, a timber lining was sometimes used to prevent contact between the ice and the outside wall. Well-insulated ice houses could have remained in use as effective cold storage facilities throughout the year, being replenished with ice each winter.

Details surviving in the interior of an ice house can often be an aid to reconstructing the manner in which the structure was used. For example, hooks or straps on the sides of the ice well may indicate the former presence of a timber lining, and bolts or hooks within the chamber or entrance passage may have been used to attach a pulley for the filling or emptying of the ice house. Because of their year-round use and function as storage chambers, quantities of discarded material would sometimes build up within the chamber. Upon going out of use as cold storage chambers, some ice houses also provided receptacles for the dumping of household rubbish.

The role of ice houses within the landscape

Often functioning as integral components of rural estates, ice houses were an essential means of providing a reliable supply of food to a large household. This helps to explain the considerable outlay of effort and expense given to their construction, preparation and maintenance.

As with other types of buildings in the Scottish countryside, considerable variation in the form of ice houses exists, and systematic classification of types can prove difficult. Also, as with other building types, examples with special or atypical qualities may have commanded most attention, and therefore surviving examples may be atypical of the majority.

By the beginning of the 20th century, the heyday of ice house building was over, and mechanical refrigeration was providing an alternative source of ice. Although most British ice houses had fallen out of use by the 1930s, victims of changing technology and socio-economic conditions, some were in fact still in regular use as recently as 1960 on Skye and on the W coast of Scotland, to store fish caught at sea (Beamon and Roaf 1990, 115).

As Naismith (1989, 70) points out in relation to a range of countryside buildings, it would be wrong to form a conception of these structures only on the basis of their salient features. They were an integral part of a wider landscape and land use system, required a water management system and were part of a food management and supply system, in many cases now completely redundant.

Ice houses listed by the RCAHMS

(Illus 1, Table 1)

As part of an initial desk-based study, a search of the RCAHMS' CANMORE database revealed records of 17 ice houses within Perth and Kinross and 16 in Fife (see Table 1). Six of the Fife examples are of listed status. The field investigations subsequently undertaken (see 'Field investigations', below) served to record additional information (including a detailed photographic record), to determine the extent of survival and to note any potential threats to the surviving remains.

Although not listed in the CANMORE database, a probable ice house within the gardens of St Mary's House, St Andrews, was excavated by E Proudfoot in the early 1980s (Proudfoot 1982), and a range of important information revealed.

Survival

Ice houses are a rapidly diminishing archaeological resource. It is clear from an examination of the RCAHMS records of these structures, that ice houses survive in varying states of completeness, ranging from almost intact structures to mere traces of the insulating mounds. Many sites across the country must be under considerable threat from erosion and/or demolition.

From the existing recorded notes on ice houses in Perthshire and Fife, it is clear that there is a variety of potential threats to structures. For example, an ice house situated in dense coniferous woodland near Tulliallan Castle, recorded in 1988, was then overgrown and part had collapsed, although it was in otherwise good condition. In the absence of remedial treatment, gradual collapse of the standing remains may be a consideration in

Table 1 Ice houses listed by the RCAHMS, in Perth and Kinross and Fife (see Illus 1)

map number	name (brief)	NMRS number	parish
Perth and Kinross			
1	Taymouth Castle	NN74NE 14.11	Kenmore
2	Monzie Castle	NN82SE 50	Crieff
3	Monzie Castle	NN82SE 109	Crieff
4	Strathallan Castle	NN91NW 27.06	Blackford
5	Tulchan	NN92NW 26	Fowlis Wester
6	Dollerie House	NN92SW 18.03	Madderty
7	Abercairney policies	NN92SW 25.20	Fowlis Wester
8	Invermay House policies	NO01NE 85.18	Forteviot
9	Dunrub House	NO01SW 26.05	Dunning
10	Pitcairns	NO01SW 26.05	Dunning
11	Dupplin Loch Wood	NO02SW 98	Tibbermore
12	Kilgraston House policies	NO11NW 30.08	Dunbarney
13	Moncrieffe House policies	NO11NW 41.10	Dunbarney
14	Grange of Elcho	NO12SW 109	Perth
15	Megginch Castle policies	NO22SW 1.12	Errol
16	Arthurstone House	NO24SE 69.04	Coupar Angus
17	Bamff House	NO25SW 9	Alyth
Fife			
18	Lathrisk House	NO20NE 1.01	Kettle
19	Ramornie House	NO30NW 83.01	Kettle
20	Durie House	NO30SE 61.01	Scoonie (Kirkcaldy)
21	Fernie Castle	NO31SW 1.02	Monimail
22	Birkhill House	NO32SW 37.01	Balmerino
23	Mountquhanie	NO32SW 43	Kilmany
24	Tentsmuir Point	NO42NE 112	Leuchars
25	Balcaskie House	NO50SW 54	Carnbee
26	Tulliallan Castle	NS98NW 56.01	Tulliallan
27	Hill House	NT08NE 34.01	Dunfermline
28	Broomhall	NT08SE 21	Dunfermline
29	Wellfield	NO11SE 48	Strathmiglo
30	Pitlour House	NO21SW 46	Strathmiglo
31	Pitcairlie House	NO21SW 142	Newburgh
32	Hill of Tarvit	NO31SE 80	Cupar
33	Balcarres House	NO40SE 5.04	Kilconquhar

such a case. An ice house near Dupplin Loch, visited by the RCHAMS in 1995, was recorded as being in good condition but overgrown with mature trees. Damage caused by roots and other vegetation could be a consideration in this case. Ice houses were often built among trees or accompanied by the deliberate planting of dense shrubbery in order to provide them with shade and thus protection from heat.

Across the UK there are examples of ice houses that survive particularly well. This may be because their importance and potential has been recognised in time to prevent damage and loss of the resource. In a few cases, not only does the ice house itself survive, but also in evidence are the access routes, drainage systems and water supplies that functioned alongside it (as at Dupplin Castle; see below).

Conservation issues and accessibility

There is a wide variety of potential threats to the surviving ice houses in Perthshire and Fife. Structures will have gone out of use at different times and for different reasons, some were doubtless demolished and others perhaps converted to different uses. Ice houses were sometimes abandoned when their structure became unsafe, as is recorded for an ice house built in the 1660s by Earl Patrick at Glamis Castle (Urquhart 1960, 248).

Many ice houses are, by their nature, relatively accessible structures, being built on low-lying ground, often within the grounds of large rural buildings or within carefully-managed estates. Some structures, however, have become overgrown and some may have become unstable.

Interpretation

Ice houses provide evidence of past life and how it changed over time, and how science and technology have been developed to meet human needs. In studying a recent, but now redundant technological innovation such as an ice house, people are able to understand the effects of technological developments on everyday life. Also of great interest is the amount of work and effort required to maintain a cold storage facility in the days before mechanical refrigeration was available—an aspect of 17th- and 18th-century life with which children, for example, are not generally familiar, and which, in the author's experience, can prove fascinating and informative. The procurement and storage of food for everyday living is, after all, a primary human need which is universally understood and as such can provide a focus for understanding life in the 17th and 18th centuries. There may be great potential for worthwhile interpretation at particular sites, if problems of access and safety can be overcome.

Field investigations

Following on from the desk-based assessment, a number of investigations was carried out by the author in 2003, focusing upon sites which either did not appear on the RCHAMS database or for which very few records appear to exist. Site owners were approached in advance for permission to visit the sites concerned, and only those sites whose owners gave permission were investigated. The results of three field investigations of Perthshire ice houses which illustrate contrasting construction techniques and site management issues are described below. Additional photographs and field sketches are available as part of the project archive.

Grounds of Monzie Castle, Perthshire

NMRS number NN82SE 109

Date of visit 18 September 2003

Site location and situation

Monzie Castle lies approximately 2km N of Crieff and slightly less than 1km SW of the small settlement of Monzie. An ice house is set into a steep, wooded, N-facing bank around 350m SE of Monzie Castle (NN 8764 2426).

Description

The ice house, which may have been built around 1890 (Beamon and Roaf 1990), is approximately D-shaped in external ground plan, and measures 4.6m from N to S (from front to back) by 4.1m transversely. The maximum depth of the structure is at its S side, where the distance from the top of the wallhead to the top of the leaves within the ice chamber is 5.4m. The lower part of the flat N face of the structure is constructed of dressed stone (Illus 2). The upper part is built from coursed rubble, as are the side walls. The maximum height of the external N face is 3.2m.

There are two rectangular openings in the N face (Illus 2). These appear to be modifications to the original structure, which probably had a single entrance. Holes for hinges or bolts associated with an original doorway can be seen in the stonework immediately to the W of the modified openings. Both openings taper inwards. The top of the upper opening is 1.25m below the top of the N face of the structure. It is 0.87m in height externally and 0.59m internally, and has a width of 0.66m. The lower opening is 0.40m below the base of the upper one and is the same width. It measures 0.70m in height externally and 0.64m internally.

Internally, the structure is approximately circular in plan at the level of the openings in the face, but becomes increasingly irregular further up the walls. The internal walls have been smoothed by the application of plaster or cement. The structure has no roof and is



Illus 2 *Monzie Castle ice house, the north face of the structure.*

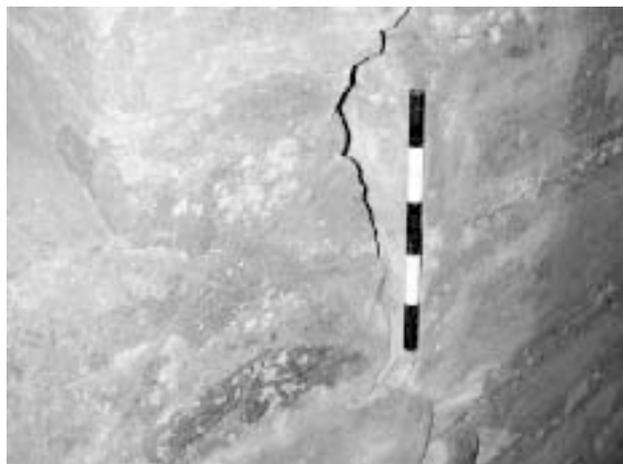
open to the elements. As large, deciduous trees overhang the structure, the ice chamber has been partially filled with leaves and branches, to an estimated depth of at least 0.5m. A concrete capping has been added to the tops of the walls, presumably to stabilise them. A wooden fence or barrier has been erected across the S side of the structure, presumably for safety reasons.

A small stream or ditch runs from E to W a short distance N of the structure, at the bottom of the slope on which it stands. The ice house probably drained into this water course, which appears, in turn, to drain into the Shaggie Burn, to the west. The nearest substantial sources of standing water, for the former supply of ice, appear to be the series of ponds or lochs around 300–400 m NW of Monzie Castle.

There is, unfortunately, no surviving evidence of the original roof of the structure. It would not appear to have been domed, and may, instead, have been a flat or sloping timber construction, possibly slated.

Present role

The present owner, Mrs Crichton, noted that the ice house had been modified in the 1950s as a silage pit, and that the concrete wall-capping was added at this time. Possibly the entrance in the N face was also modified at this time, and the wooden fence or barrier added at the S side. The structure no longer serves any function.



Illus 3 *Crack to the west of the openings in the north face (the scale is in 100 mm divisions).*

Condition and threats to the structure

The ice house does not appear to be in immediate danger of collapse. Although basically sound at present, it is open to the elements and its condition is likely to deteriorate. A number of potentially significant cracks exist in the structure. These do not appear to represent an immediate threat but could worsen. There is a large crack in the N face, to the W of the openings (Illus 3), and the base of the NE corner of the structure is also damaged, where the coursed rubble side wall meets the dressed stone face. The stonework at the base of the NW corner is also eroded. A further crack runs across the structure from E to W, splitting the concrete cap on both sides. This crack can be traced down the walls. The concrete cap is also cracked (a 30mm gap) at a point around half way along the S wall, and a smaller crack (10mm wide) exists in the capping above the N face, directly above the openings.

Animal burrows exist in the earthen bank close to the walls of the structure, particularly on its W side, and the root systems of the large trees adjacent to the structure could threaten it, particularly on the S and W sides.

Recommended responses

The cracks in the structure could be inspected in order to assess their seriousness. Low-level wire mesh fencing around the base of the walls would deter animals from burrowing close to the walls of the structure.

Potential for public access and interpretation

Access is difficult. There is no track or footpath leading to the structure. This ice house is not considered a good candidate for interpretation since it has been substantially modified and several original parts of the structure (including its roof) are missing. Although a

wooden fence offers some protection from the dangers of the steep drop into the ice chamber, the approach to the structure is potentially hazardous.

Dupplin Castle, Perthshire

Not listed by RCAHMS (CANMORE)

Date of visit 29 September 2003

Site location and situation

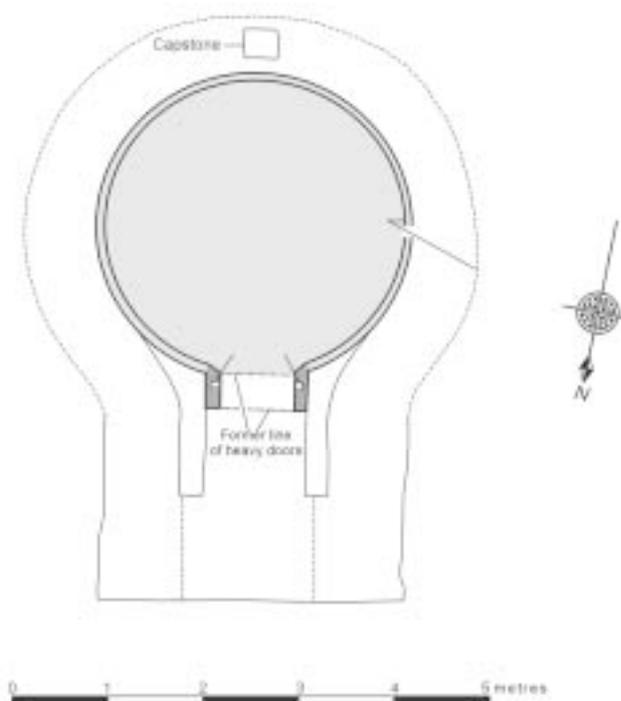
Although the RCAHMS records an ice house to the N of Dupplin Loch, this example, only *c* 30m to the SW of Dupplin Castle itself, appears not to have been recorded previously. The ice house (or ice well) (NO 0557 1943) lies adjacent to a tarmac-covered drive or roadway, with its entrance facing NW. The structure is almost entirely subterranean, the ice chamber lying under level lawns. There is no mound on the surface.

Description

The entrance to this ice house, which is probably of early- to mid-19th-century date, is via an opening in a dressed stone façade with a hinged wooden doorway on the N side. Beyond the opening, there is a drop of 2.30m to the floor of the entrance passage. There is no evidence of steps, so a ladder would presumably have been used to access the chamber, as it was on this visit.

The structure is entirely built of dressed stone, and the ice chamber itself is egg-shaped, with a roof of shallow domed form. Illus 4 shows a sketch plan of the interior. Two wooden doors formerly existed within the entrance passage, before one reached the ice chamber. Surviving evidence for these is in the form of large iron hinge pivots set into the stonework (Illus 5), and, in the case of the outer door, strap hinges with remains of wood adhering to them. In addition to the doors, the ice chamber may have been further insulated by removable wooden panelling occupying a vertical groove in the stonework on either side of the passage, immediately adjacent to the chamber. The entrance passage is 1m in width. The ice chamber is approximately 3m in depth below the floor of the entrance passage, and has a central drain, covered by an iron plate (*c* 0.25m in width) at the base. There was almost no debris in the ice chamber on the day of the visit. There is a circular recess at the apex of the ice chamber, approximately 0.20m deep (Illus 6).

An unusual aspect of this structure is that it possesses a passage that entirely encircles the ice chamber (Illus 7). This can be entered from either side of the main entrance passage. The encircling passageway is 0.91m in width at the two entrances, narrowing to 0.80m within the curving section around the ice chamber. It has vertical walls and a curved, arched roof, which has been coated with plaster or cement. In the NW and NE corners of the entrance passage, there are traces of attachments to the walls, which may, for example, have formerly held lanterns to light the interior.



Illus 4 Sketch plan of Dupplin Castle Ice House interior.



Illus 5 Dupplin Castle ice house, the hinge pivots set into stonework.

Decayed timbers within the encircling passage may represent a remnant of a wooden door.

It is not clear where the source of the ice for this structure lies. There appear to be two possibilities: The first is that ice was transported by cart from Dupplin Loch, over 2 km away. The second involves a small stream, running from Dupplin Loch towards the River Earn, passing close to the S side of the Castle. This is known to have been diverted in the past. Possibly this watercourse formerly fed a pond, nearer to the Castle, which has since disappeared. The ice house is drained by means of a well-constructed, stone-lined channel, down a slope into the aforementioned stream.



Illus 6 *Dupplin Castle ice house, the apex of the ice chamber.*

Present role

The structure has not been used for many years and there was no trace of any recent material in the interior. The current tenants of Dupplin Castle had not used or even entered the structure.

Condition and threats to the structure

The structure appears to be in sound condition. Despite its subterranean setting, the interior is mainly dry, although there is a slight seepage of water and fine sediment near the floor level of the encircling passage to the S of the entrance. The interior of the ice chamber is dry. White mineral deposits (possibly limescale) occur on the walls of the chamber and have been dripping from the roof of the encircling passage, but these do not appear to be causing structural damage.

Recommended responses

The author notes that there is a safety consideration in relation to this structure, given that there is a substantial drop from the entrance to the floor of the internal passages. The wooden door across the entrance should be secured to prevent entry and the possibility of an accident. Bearing this in mind, the main current threat to the structure could be in the form of human agencies, as it seems possible that the structure could be infilled in the future for reasons of safety.



Illus 7 *Dupplin Castle ice house, the encircling passage.*

Potential for public access and interpretation

Although this example appears structurally sound and survives in good condition, access to the interior is difficult. The structure is, however, an unusual and impressive example of a domestic ice well. Lying at the heart of a private estate, the opportunities for public interpretation would appear very limited.

Invermay House, Perthshire

NMRS number NO01NE 85.18

Date of visit 19 September 2003

Site location and situation

This ice house (NO 0612 1610) is situated approximately 40m to the E of Invermay House (NMRS No. NO01NE 85.00), at the top of a steep slope down to the Water of May. The ice house has a game larder, circular in plan, above it (Illus 8).

Description

The ice house is mainly stone-built, but bricks have been used occasionally. Entrance to the structure is from the S or SSE (Illus 8), through a rectangular entrance into a vertical-sided passage with a curved, arched roof. The passage is 2.44m long, 2.28m high and 1.25m wide. There would originally have been an



Illus 8 *Invermay House, the entrance to the ice house (bottom of picture).*

outer door, fitting against a rebate in the stonework. Beyond this, there was an inner door, and, beyond this, a vertical groove in the stonework at either side of the entrance passage accommodates wooden panelling to provide additional insulation. The panelling is still in use at present, but the doors are now gone. The ice chamber itself is egg-shaped and constructed mainly of stone, although bricks have been used at the apex of the chamber, possibly as a repair. Brick has also been used at the mouth of the chamber.

A game larder (4.34m in height at the W-facing doorway) stands above the ice house, and the two structures would appear to have been conceived at the same time, although the architectural style of the game larder is different. This may be due to the fact that it is visible from the adjacent grounds, whereas the ice house is largely obscured from view. The apex of the ice chamber would appear to lie immediately below the floor of the game larder. On the E side of both structures, there is a steep slope leading down towards the Water of May.

The ice house was supplied with ice from small lochs or ponds lying c 750m to the S. The ice house would have drained down the slope into the Water of May below. A stone-lined culvert (containing a ceramic pipe) was observed to the NW of the ice house, but this would relate to drainage from Invermay House rather than the ice house.

Present role

Although neither the ice house nor the game larder currently have a function, both are well-maintained. The game larder, in particular, has undergone restoration and is well cared for. Both structures appear to be valued features within the garden landscape.

Condition and threats to the structure

The ice house is basically sound, although some structural defects were noted. There is evidence of limited structural movement to the W of the entrance, although this appears currently to be stable. Part of an internal lintel within the entrance passage has collapsed, and fragments of it lie on the floor of the passage. The potential threat from animals burrowing into the bank adjacent to the structure appears to have been foreseen, and the base of the structure is protected by a low, wire mesh fence. On the S side of the game larder, a rainwater spout overhanging the S wall drips onto the wall itself, which is damp and mossy as a result.

Recommended responses

The problem of the rainwater spout (mentioned above) can be easily solved by extending its length so that dripping water misses the wall.

Potential for public access and interpretation

Since the structure, along with the game larder above, is basically sound and can be accessed fairly safely, it could potentially be a candidate for interpretation. However, the owner has expressed reservations about more general visits to the structure. As with other examples locally, this ice house lies at the heart of a private estate.

Discussion

The desk-based assessment of the existing recorded information on the ice houses of Perthshire and Fife revealed that, in some cases, little is known about what currently survives at these sites today. It also revealed a considerable number of sites of potentially great variety and interest, and that several sites are threatened by various factors.

The field investigations undertaken in 2003 yielded significantly enhanced records of selected ice houses. It is evident, even from a small number of investigations, that the nature of an ice house can depend very much on the circumstances of the site and the requirements of its owners. No rigid standardisation of design is evident, although the principles of a well-insulated, well-drained structure, accessible to the main residence, have been applied in all cases. The three examples described above are, in fact, very different, and each has been constructed to take advantage of the local opportunities for

maximising the insulation of the ice chamber and ensuring a source of ice during the winter.

The local availability of building materials would to some extent determine the form an ice house would take. Although a wide range of variations exists, some quite strong regional characteristics have been noted across the UK. For example, thatch, made from reeds grown on the Broads, was used in ice houses in Norfolk. In areas where suitable bedrock lies relatively close to the surface (eg in Hertfordshire and the West Midlands), there are examples of rock-cut ice houses. In areas where stone building techniques are prevalent over brick construction, ice houses were often stone-lined and incorporated flagged floors (Beamon and Roaf 1990, 548). Use of a variety of materials and construction techniques was noted at the sites visited. The structures are mainly of dressed stone, with limited use of brick (mainly for repair work). The builders of the ice house at Monzie Castle, however, made extensive use of coursed rubble. In general, construction techniques appear to reflect local innovation rather than prescribed designs.

Across the UK, brick was the preferred material for construction of the dome of the ice chamber. A number of secondary covers could be used over the top of the dome. Coatings of bitumen or concrete coverings were used in some examples, while an unusual example at Croome Court in Hereford and Worcester had a thatched, timber roof.

Ice was occasionally carried many miles from the pond or loch at which it was harvested, to an ice house. The likely sources of the ice can be identified at the sites investigated (with more certainty in the case of Invermay House), although identification of the actual source is often reliant upon remembered history (oral evidence). Harvesting and transport of the ice, as well as filling the ice house, were labour-intensive tasks. Yorke (1954, 29) notes that as many as four carts were used to carry ice to the ice house from a nearby lake at Barford Hall in Warwickshire.

Drainage was an important factor in the success, or otherwise, of an ice house. A lack of good drainage would exacerbate the melting of the ice. Inadequate insulation could also cause problems. In ideal situations, the larger the ice house, the longer the ice could be stored, since a larger mass of ice takes longer to melt, and much of the melt-water that trickles downwards through a large mass of ice will re-freeze. It is evident that a drainage system was carefully planned for the Dupplin Castle ice house. Its construction must have entailed considerable investment in terms of labour. While no visible traces survive of the drainage systems associated with the ice houses at Monzie Castle and Invermay House, it is most likely that drains led from these structures to adjacent water courses (as described above).

Some ice houses have survived to the present day partly through having been provided with a new role. Some examples have been converted into water cisterns (eg an example at Belmont in Kent), others used as

stores for various commodities including fruit, hay and tools, and some used as reservoirs for water (Beamon and Roaf 1990, 150–1). During the Second World War, ice houses were used as air-raid shelters, and some were seen as potential nuclear fallout shelters during the Cold War. A use as a firewood store is recorded for an ice house at Moncrieffe House (Perthshire). The ice house at Monzie Castle was used as a silage pit (see above), and an example at Tayport in Fife has been converted into a double garage.

This study has highlighted some of the site management and conservation issues associated with this class of monument. While the intended role of ice houses has become a victim of the development of refrigeration, a warming climate and changing social and economic conditions, many examples have survived relatively intact thanks to alternative uses and to the care of their owners, and others can yet be salvaged from obscurity. The amount of information that can be gained, even from a small-scale study such as this, serves to highlight the value of recording what remains before the evidence is lost.

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Abstract

This paper presents results of a desk-based assessment of the nature, level of recording and condition of surviving ice-houses in Perthshire and Fife, along with selected results of a programme of field investigations undertaken with a view to highlighting site management and conservation issues. The results of investigations of three ice houses in Perthshire are described in detail, and discussed in the light of an overview of the historical background to ice house construction and use.

Keywords

ice house
ice well

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