with the other two, but, since this was below the water level at the time, it
not be investigated.

R. SURVEYS

1960 occasional notices of crannogs have been included in field surveys
example Campbell and Sandeman 1964, 61). Other work included a final-
lertation by a student of Edinburgh University, outlining the Scottish
ice (Savory 1971) and a more extensive thesis submitted for an MPhil
in Archaeology by G. Oakley at Newcastle University in 1973 (Oakley).
The latter work is a good summary of the past work and includes a
revised bibliography and site gazetteer. In 1973 archaeologists from
burgh University in conjunction with a team of Naval Air Command
qua Club divers carried out a survey of Loch Awe to establish the
and form of artificial islands in the loch. Possible sites were noted from
photographs, Ordnance Survey maps and old references prior to the
ork and 20 were eventually confirmed.

Seven

PROBLEMS IN
INTERPRETATION

The previous chapters show that a great deal of work was carried out in the
past on the subject of Scottish crannogs particularly in the second half of
the nineteenth century and the first two decades of the twentieth. Many
general surveys and observations were recorded in the south-west of the
country and others were examined in the Highlands. Excavations were carried
out mainly by Robert Munro in the nineteenth century and occasionally by a
number of excavators throughout the twentieth century when the opportunity
arose. It might have been expected that such a large effort would have
produced a range of comprehensive statements applicable to the construction
techniques and structure of the sites and the economy, industrial activities and
way of life of their inhabitants; in fact the great majority of these records are
merely descriptive accounts which add little in terms of cultural insight into
the crannogs or their inhabitants.

Robert Munro was the only archaeologist who attempted to consider
 crannogs with any deeper insight but in 1882 he expressed doubt that the time
was right:

Notwithstanding the variety and number of objects found in these remains,
and the copiousness of details with which the investigations are described,
it may still be doubted whether the time has arrived for applying to them
the rigid principles of induction, with the view of materially enlarging our
knowledge of the early inhabitants of this country. (Munro 1882, 240)

His decision to go ahead and make certain inferences was tempered by reserva-
tions with regard to his own lack of experience and archaeological abilities.
He saw no distinction between the utilisation of natural islands where available and both stone and timber crannogs and thought it reasonable to infer that artificial islands were only resorted to where natural ones were absent. He saw no evidence to suggest that the three types were not contemporary, neither did he see wood as a necessary structural component but thought that stone crannogs were more likely to be found in larger lochs with a firm gravel bed while timber was essential as a foundation material on muddy bottoms. Munro inferred that stone buildings had greater advantages than wooden ones and that they were a natural progression from the crannogs, culminating in moated Medieval castles.

The distribution of crannogs, according to Munro, was restricted to the ‘districts formerly occupied by Celtic races’ with the majority in the south-west and fewer to the north in the area of the Picts and the Scots. He made the ambiguous statement:

Nor is this generalisation much affected by an extension of the list, so as to include those stony islets so frequently met with in the Highland lakes. (Munro 1882, 249)

These ‘stony islets’ he had earlier described as ‘... mere shapeless cairns, without any indications of having been formerly inhabited’, but he does not suggest an alternative function for them. In fact, the evidence from Oakbank Crannog shows a site that is effectively the same as Milton Loch Crannog in structure and function and therefore the same as his classic crannog-type from the south-west, at least in their original form. The inclusion of the Highland crannogs in the archaeological record does indeed make a significant difference to the overall distribution of artificial islands but Munro’s assertion that ‘proper’ crannogs were concentrated in the south-west became so well accepted that it has lasted until the present time.

With regard to the structure of crannogs, Munro reiterated the sequence noted by earlier observers of brushwood and logs overlain by stones and earth surrounded by one or more rows of piles. With reference to his excavations of B froston, Lochlee and Lochspouts crannogs in Ayrshire he praised the skills of the crannog-builders:

... all the wooden islands were constructed after one uniform plan, this plan was actually the outcome of the highest mechanical principles that the circumstances could admit of. (Munro 1882, 261)

and he formulated a more detailed description of the method of construction consisting of six major elements.

His theory was that a circular raft of logs was positioned above a foundation deposit of branches and brushwood and was then covered with more timbers as well as stones and gravel until the mass rested on the loch bed. Ready-cut oak piles were then inserted through holes in the structure ‘and probably also a few were inserted into the bed of the lake’ (Munro 1882, 262). The logs in the raft were occasionally pinned together by thick oak pegs and the uprights were fixed with morticed oak beams while other beams were morticed together to give lateral strength at various levels. When the mass of material extended above the water level the oak piles which surrounded it were joined with more morticed beams and a ‘prepared pavement of oak-beams was constructed’. Munro added, ‘The margin of the island was also slantingly shaped by an intricate arrangement of beams and stones ... ’ producing a well-formed breakwater. He suggested that turf was laid over the protruding points of piles and that ‘... a superficial barrier of hurdles, or some such fence ... ’ was erected close to the edge. He also postulated the frequent erection of a submerged wooden gangway giving secret access to the site. Because of the lack of evidence for superstructure elements he made no mention of the type of dwelling or shelters which may have surmounted the pavement.

The inhabitants of the crannogs were, according to Munro, ultimately descended from European Celts who had constructed the lake-dwellings in Switzerland and elsewhere on the Continent. These people had migrated to Britain, because of pressure and conflict in their own lands which resulted in the abandonment of the lake-dwellings there, and had been driven to the far north and west by ‘successive waves of immigrants’. Their occupation of the crannogs coincided with the Roman presence in the south-west of Scotland and the crannogs were built as a response to the times when the Romans withdrew and left the provincial population to the mercies of their less civilised neighbours to the north. The close connection, which Munro proposed between the crannog-builders of Scotland and the lake-dwellers of Switzerland, was based mainly on the similarities of the two types of site and he was not in a position at the time of his researches to know that there were in fact few points of comparison either chronologically or structurally between the two.

He proposed three reasons for the submergence of crannogs: compaction of the structural material of the site; sinking into soft bottom muds or general
comprison; and sinking of the loch-bed sediments. He suggested that
the latter process was the most evident. He did not see water level changes as
significant. His conclusions were derived from the results of the excavations
which he carried out in the south-west. However, work in Loch Tay (see
below) shows that the reasons for submergence of sites there are not in ac-
cordance with Munro's statements.

The conclusions arrived at by Munro in *Ancient Scottish Lake Dwellings*
have been covered here in some depth since they still represent, for many, the
core of crannog thinking. Although he stated his reservations before making inferences at that time, he did not significantly alter his views in his later work.

The high standard of Munro's work for his day is demonstrated by its
endurance to the present time and contrasts with the lack of lasting impact of
the subject itself. Crannogs are usually treated in a cursory manner by archae-
ological writers but where they are referred to, it is in the terms laid out by
Munro. His structural sequence has not been superseded and the concentra-
tion of the distribution of sites in the south-west of Scotland is still accepted.
Although archaeological evidence does not now support the notion of
crannog-builders originating from the Continental lake-dwellers no other
hypothesis has yet replaced Munro's, and although they are no longer restricted
chronologically to the post-Roman period, as stated by Munro, the earlier
dates now available have not yet become firmly fixed in the archaeological
record although recent contributors are changing that view (Barber and Crone
1993, Henderson 1998). Munro's ideas have been so firmly established that they
can only be replaced by systematic studies carried out in a chronological
and cultural framework not available to him and excavations underwater such
as that being carried out at Oakbank Crannog in Loch Tay.

INADEQUACIES OF PAST WORK

Neither Munro and his contemporaries nor the later excavators produced the
level of interpretation of either the structure of artificial islands and the
dwellings upon them or the way of life of their inhabitants that would be
expected now, considering the wealth of well-preserved organic material that
was uncovered. This is not a reflection upon the skill of the archaeologists who,
given the constraints which applied when they were working, carried out their
excavations to an acceptable standard and, in the case of Munro, to a higher
standard than was normal for the time.

His structural sequence was so convincing that it has been accepted appar-
tently without question to the present day. However, a number of points are
not clear. For instance, how would the layers of brushwood, earth or peat be
deposited effectively underwater since the brushwood would float and earth

would dissipate or change into mud if dropped into any reasonable depth of
water? Peat could only be laid in cut blocks but there is no evidence, accord-
ing to excavation reports, of peat in that form. It may reasonably be argued
that these deposits were built up in a less systematic manner, probably above
water as floor covering and evidence presented below from Oakbank Crannoo
supports this theory.

Munro did not explain why the sites were not built as free-standing pile
dwellings since he demonstrated in his excavations, of Bustom and Loche
Crannogs in particular, that the walkways surrounding the sites were skillful-
ly constructed of jointed piles and beams in this way (14). In fact, Munro seen
have been the only archaeologist to ask why the crannog-builders built the
sites by dumping layers of material into the water and he gave the answer th
the bases of the lochs were too soft and yielding to support true pile-dwelling.
If this were the case, then the same reason would prevent the well-mortice
pile construction of the surrounding platforms. None of the twentieth-centur
excavators was in a position to challenge Munro's sequence since in no case did
they carry out complete excavation, usually because the bottom of the site w
still underwater or was heavily waterlogged.

Most of the past work on crannogs emphasised the structural elements of th
island itself, understandably, since most of it would have been permanently
underwater and therefore better preserved than the actual house which was always intended to be above the surface. However, features of the dwelling were preserved and have been recognised in most of the excavations. Log pavements or platforms usually constructed of small unworked tree-trunks were common and were often associated with one or more hearths. Some of the piles surrounding the site and other timbers nearer the centre probably represented remains of the house exterior walls, supports for the roof and internal partitions.

Munro said nothing about the form of the houses that stood on the crannogs which he excavated. Reconstructions were attempted by Professor Ritchie with regard to the crannog in Loch Treig and Mrs Piggott for Milton Loch crannog. The first of these was highly speculative as it was based on evidence mainly from the substructure which was itself conjectural and was not completely uncovered. The Milton Loch house is also speculative but at least the upper layers were uncovered and the plan is based on observed uprights and floor timbers.

There is no record of efforts by past workers to delineate the area of the house and the boundaries of specific activity areas. It would have been more difficult to do so if the material overlying the floors which contained debris indicative of industrial and domestic functions was treated as spoil, which it usually was. The number of hearths was often recorded and their vertical distribution was also occasionally noted but there is seldom an accurate record of the association of other features and with each other.

The dates assigned to crannogs in the days prior to the development of radiocarbon or dendrochronological techniques were based on the evidence of finds and in most cases fell between the time of the Roman occupation and the Medieval period. Munro was adamant in his assertion that no crannog which had been examined was earlier than the Roman Iron Age (Munro 1886, 465). Piggott was of the opinion that Milton Loch Crannog was built and inhabited in the second century AD but was proved to be some 700 years too late by radiocarbon dates. It is reasonable to accept the dates based on finds assigned by early researchers as relating to phases of occupation, at which time the particular find was deposited, but many sites may have been occupied a number of times and the first structural phase cannot be assigned by finds unless they are unambiguously associated with that phase. It is notable that the great majority of radiocarbon dates from crannogs, so far, fall in the first millennium BC and a number as early as the eighth century BC (Henderson 1998).

It can be seen from the summary of past results that emphasis was placed on study of the structural timbers, mainly from foundation layers, and surrounding piles and stakes. Where the lower foundation deposits were underwater greater emphasis was placed on upper foundation layers and the remains of floors. Very little was said about the crannog-builders and dwellers or about the details of houses and internal features even though a mass of data was lying on and under the floors in the form of organic debris. It will be shown in the report and summary of the excavations being carried out on Oakbank Crannog, Loch Tay that these and broader aspects of crannog work can be successfully studied through excavation, analysis and interpretation using modern methods and techniques which were not available to the early archaeologists.

**THE PROBLEMS OF PAST EXCAVATIONS**

One of the main problems with early crannog research was the method of excavation. Usually a gang of workmen were employed to shovel the spoil from the site into barrows and dump it on nearby spoil-heaps. The work was supervised and observed by the archaeologist who would make sketches of what he considered were important features. If he was not on site at all times he would examine the spoil heaps and any finds that the workmen had picked up upon his return. This method of working would have serious consequences for the number and range of finds discovered but more importantly the context and association of finds and features would in many, if not most, cases be lost.

The inadequacy of such methods would be particularly severe on a crannog where many of the features are constructed of soft timbers which can easily be cut through with a spade. An imbalance would be created in the types of wood recognised in structures since oak would not be cut or broken while other types would be easily destroyed. Robert Munro was one of the most conscientious excavators in the nineteenth century and records sieving the spoil from Buston crannog but this was obviously not wholly effective as he discusses elsewhere cases where finds were discovered later having been removed from the site during the excavation. An ancient forgery of a Saxon coin was found in material removed from the site by a local schoolteacher. It was brought to the attention of Munro, but many other finds must have been dispersed without record such as a number of objects ‘publicly exhibited at a bazaar in Kilmarnock’.

Another aspect of the early methods of excavation, which would inhibit efficient study, was the habit of digging pits into the top of the site or opening small trenches. The problem has been discussed already in relation to the excavations at the Loch of Kinellan. This practice in conjunction with the problem of using untrained workmen must make the results from many of the early sites of dubious accuracy.

Accurate recording of features in the form of measured plans and sections was not carried out on many sites and even where it was the results were often at a scale too small to be of much use. Not only does this mean that there were
few plans for future research and comparison, but with the complex arrangements of timbers and layers on a crannog the excavator would not be able to retain them all in his memory and site interpretation must have suffered. Usually only areas which seemed to be of particular structural interest to the excavator were sketched so that records of the site are highly subjective. This same problem of subjectivity was practised with regard to finds in that attractive artefacts were collected for museum or personal display but the many unassuming wooden objects which must have been uncovered on crannogs were hardly mentioned.

DISADVANTAGES OF DRAINED SITES

The single major problem which has done most to prevent the systematic study of crannogs and has caused the greatest difficulties with the work that has been carried out is that of waterlogging. Crannogs by definition are built in water and their remains are still in or under water. Although some efforts have been made to examine sites which are still islands the difficulties which these endeavours encountered are demonstrated by the work carried out in the Loch of Kinellan. Even sites which were substantially drained but where the lower layers were still submerged, as in the cases of Milton Loch Crannog and the site in Loch Glashan, could not be excavated completely.

Total drainage has usually been accepted as the best method, until recently the only method, of approaching excavation of an artificial island. However, working on a drained site is very much a compromise as there are many problems associated with drainage. The cost of damming a site is very expensive and would probably not be seen as justifiable for archaeological research. The cost of damming a number of crannogs which would be required for systematic studies would be prohibitive.

In past work the sites have been drained for other purposes, mainly agricultural in the nineteenth century and hydro-electric power schemes in the twentieth. The later excavations have often been restricted in time by the necessity to re-flood the loch and could not guarantee a fully drained site. Furthermore, since there was no question of choice of site the work could not be systematic or prepared for. Even sites which were totally drained, such as Lochlee which had been dry for 40 years before Munro excavated it, were in areas with a high water table and suffered from water leaking into the low levels of the excavation. Munro’s records of the excavations at Lochlee, Buxton, Lochspouts, Barhapple and Friar’s Carse make up the greater part of his book, Ancient Scottish Lake Dwellings, on which so much has been based. Yet he talks in every case of work being curtailed to one extent or another because of water.

It would be difficult to observe fine or subtle features in the unavoidable muds of a drained, but still wet, crannog and small finds such as pins and beads would not be easy to see. All of the objects from the excavation would have to be washed clean to establish the degree of working and cut-marks of tools, if any. None of the past excavators record carrying out such a task and it would seem inevitable that a large number of small finds and features were missed.

The decay of organic deposits starts within minutes of exposure, even underwater, as was demonstrated during the excavation of Oakbank Crannog (see below). Thus, the effect of draining a site must be the loss of a great deal of archaeologically important material. Damage caused subsequently by wind, rain and sun would be enormous. The deposits which have been drained are thus necessarily in a worse state of decay than if they had remained beneath the water surface.

Decay is not the only danger to organic objects on a drained site, as mechanical damage would have been far greater than when the object was underwater. Thin pieces of wood and material like basketwork would not in their weakened state support their own weight so the chance of successful exposure and removal of many finds would be slight. One of the most severe causes of mechanical damage may be illustrated by the results of a simple experiment. A number of timbers from Oakbank Crannog were weighed underwater with a spring balance. The total weight was 1.36kg. The same timbers weighed out of the water totalled 14kg, an increase of more than tenfold.

The implications of this may be more fully appreciated by looking at the photographs of Milton Loch Crannog during excavation. The considerable numbers of large timbers express a significantly heavy force upon the archaeological features and artefacts underlying them. This force would only be exerted by bringing the mass of timbers above the surface, at which time damage to delicate archaeological material is inevitable.

Another disadvantage of draining a crannog would be the task of removing timbers during excavation, presuming that they were required to be kept in one piece. A number of people would be required to lift and carry the larger timbers across the slippery, muddy surface of the site. Since a timber weighing 20kg underwater would weigh 200kg in air the potentially disastrous results of a slip by only one of the carriers can be appreciated. Of more concern archaeologically is the effect of trampling upon underlying deposits during such an operation and throughout the work of excavation.

There are other disadvantages of carrying out archaeological excavation of crannogs only when they are fortuitously drained for agricultural purposes or exposed for industrial development. It is possible that a site, where continued access relies upon the scheduling of other projects, may not be available long enough for effective examination or excavation to take place. This was the case
during the excavation in Lochend Loch when the local council required the site to be reflooded for use as a boating pond.

Crannogs presented in this randomly selected manner may well be in isolated locations, as in the case of Loch Treig, without close association with regional or local groups and although this does not lessen the inherent importance of any site it would be more useful to choose one which might add to established knowledge than to be forced to study an isolated monument. A serious disadvantage of studying unassociated crannogs is that they will only fit into the existing body of knowledge relating to artificial islands in the same haphazard manner that applied to previous excavations. Given the probable impediments to effective study presented above, they are likely to add little more to the archaeological record than those examined in the past.

CHRONOLOGY

Absolute methods of dating archaeological sites, like radiocarbon assay and dendrochronological analysis, were not readily available to crannog excavators prior to the 1960s. Thus, as with other sites, dating was by association of finds which placed crannogs in a range from the Roman Iron Age to the post-Medieval period. Since many crannogs have apparently been reused a number of times, there is no way of dating the primary construction unless the finds were definitively associated with established elements of the original structure. The above difficulties of excavation, observation and recording make it unlikely that such elements were, or could be, established so the finds upon which the loose framework of crannog chronology is based may be from periods of occupation long separated from either the date of construction or other periods of habitation.

A major problem in assimilating the broad range of crannog knowledge into the archaeological record was directly related to the common tradition of examining the record by periods. Since crannogs were dated by artefact association to a number of periods, but did not fit neatly into one, they were occasionally briefly mentioned by archaeologists specialising in the study of a specific period but the greatest effort of these researchers was expended upon site types which were confined chronologically within their particular area of research. Crannogs were neglected and there is no corpus of knowledge developed and established in the same manner as that referring to other types of sites.

Efforts do not seem to have been made in the past to construct relative site chronologies with different phases distinguished by archaeologically distinct features and arrangements of timbers. Munro observed superimposed hearths at Lochlee and Lochspouts; Fraser distinguished upper and lower phases on the island in the Loch of Kinellan and many distinct layers; Scott referred to two separate houses at Loch Glashan and an earlier phase under the water but none of them attempted to define chronologically the length of different phases or the overall period of habitation. The problems of excavating on drained or partially drained sites, particularly in terms of detailed observation and recording difficulties, may be major factors to blame for the lack of definition.

FUTURE RESEARCH

Although a substantial amount of work has been carried out in the past on the subject of crannogs, with relatively systematic study in the nineteenth century and a number of excavation reports from the twentieth, little of substance was added to the archaeological record in Scotland. This is slowly changing with the involvement of other researchers using modern techniques. The most important change which has taken place since the early crannog research is the progressive development in all aspects of archaeology but in particular, for the problems discussed above, in the standards of excavation. Rigorous observation and recording of context, stratigraphy and association has improved both quantitatively and qualitatively the information derived from these archaeological sites.

The problem of dating has been substantially overcome by the invention and adoption of radiocarbon dating and latterly dendrochronological dating. Both of these techniques require amounts of organic material; small amounts of a wide range of substances in the case of radiocarbon determinations, and discernible tree rings on substantial timbers in the case of dendrochronology and both are therefore applicable to the dating of organic and timber-rich sites like crannogs. As noted above, most radiocarbon dates available so far from crannogs fall in the first millennium BC suggesting that sites already excavated may have been constructed earlier than had been supposed (see below).

One of the most potentially productive associations may be that between the examination and analysis of organic debris from crannogs and the wide range of environmental studies which have become established in the last three decades. Seeds, pollen and macro-plant remains are found on many artificial islands and may also include insect remains, eggs, larvae, snails and excreta from a wide range of organisms. Whereas in past work this mass of material was treated much as spoil it may now be used in various ways: to delineate specific working areas; to indicate the range of plants used for food and the types and level of crops cultivated; to suggest climatic variations; and to chronicle the evolution of the landscape. Sophisticated and well-considered sampling techniques now available make possible the recognition and interpretation of a wide range of naturally and artificially deposited materials from crannogs.
The problems of crude methodology, inadequate dating and the lack of effective analysis of organic deposits can now be overcome with modern developments in archaeology. The effects of draining a site and the ensuing problems of working it cannot be overcome in archaeological terms. If drainage on demand is too expensive and inadvisable anyway because of the effects listed above, the alternative is to excavate the site underwater in the environment which has already protected it for so long.

The excavation of crannogs underwater with the benefit of modern excavation techniques and standards of recording allows important information to be derived scientifically from these sites. Examination of timbers in situ enables close dating of the sites and recognition of different phases of habitation, while sampling of other organic deposits makes possible accurate studies of climatic changes and the development of the landscape. Many of the problems of excavating crannogs on land do not apply on an underwater excavation.

A submerged site to be excavated may be chosen with regard to the results of pre-excavation survey. Exposed timbers and organic deposits can be readily sampled and analysed for dating and environmental indications before a stone is moved. Since the work is not related to the timetables of industrial development or agricultural land use the imposition of working to a deadline need not apply.

The limited information now available from past excavations is no longer the best that can be expected, although the basis of new research and much of the new work is based upon questions posed by the early researchers. The surveys of Loch Awe in 1973, Loch Tay in 1979 and Loch Lomond in 1997 demonstrate that many crannogs are located relatively close to each other. Where contemporaneity can be proven, as in the case of Oakbank Crannog and a nearby site in Loch Tay, comparisons and contrasts of the material from these sites are very important and ambiguous questions on one site may be answered by work carried out on the other.

More practical problems are also overcome by underwater excavation. The difficulties of observation on a muddy site do not exist as such under water. There is no restriction upon the depth of layers of excavation. The basal layers are as accessible as the upper features and work can also be carried out on the surrounding loch bed where fish traps and canoes may be suspected. The weight of timbers is no threat to delicate finds and archaeological features and they can be easily removed with the minimum of disturbance since the worker under water can float across the site without touching it if need be. Delicate artefacts sustain their own weight underwater and may be moved into storage containers with the minimum of handling.

The removal of spoil is facilitated by a number of tools now available to underwater archaeologists with a great deal less effort than on land and large areas of loch bed are available for convenient dumping. Underwater areas for storage are also available for large finds which are not undergoing immediate conservation in a laboratory.

A major aim of this book is to demonstrate that the underwater excavation of crannogs is feasible, financially viable and archaeologically valuable. The developments in underwater excavation which have made this work possible are outlined, as are the results of underwater surveys in both large and small Scottish lochs, supplying a context for the excavation of Oakbank Crannog. The work carried out there since 1980 and the exciting results are discussed in depth.
the different phases without total excavation or the use of laboratory techniques. This means that a much greater number of uprights than would have been extant during occupation are being observed together. Second, many of the uprights are sloping, presumably mainly because of structural collapse, and they do not appear in their original positions when first observed. This situation becomes less confusing as excavation proceeds and the direction and angle of slope can be used to work out the original position of the point. Third, the impracticability of observing all the timbers at once and the poor visibility underwater make it impossible to view the area as a whole.

The situation is slightly clearer when the site plans and sections are referred to but part of the problem is that the drawings try to represent in two dimensions what is a three-dimensional area with piles standing up to a metre high. In one case it was decided to make a simple three-dimensional model based on the site plans with sticks in the positions where it was decided the uprights had been placed rather than where they now lay. The extrapolated positions were to a certain extent subjective, since the bottoms of many uprights have not yet been excavated, but the results clearly demonstrate a more coherent view of the structure (39). The model was particularly useful for breaking down preconceived groupings based on early observations of the tops of piles and for indicating associations which had not been previously considered. It also emphasised areas in which greater care in recording and examination were required such as an accurate determination of the direction and angle of the

Photomosaics
Unfortunately, the technique of creating photomosaics to show a complete picture of a whole site in gloomy conditions underwater, often used very successfully in representing whole shipwrecks, is not very satisfactory on crannogs due to the fact that the depth of water over the top of the site is not sufficient to allow an adequate distance between camera and subject. This means that a very wide-angle lens has to be used to cover a reasonable area resulting in unacceptable distortion in all except the centre of the frame. A better result could be achieved on deeper parts of the site or by carrying out the operation in winter when the water is 1.5-2.0m deeper, thus enabling a less distorting perspective to be used. Efforts have been made using stills taken from a video scan but they are not much more useful although the video is more effective as a part of the overall site record.

Practical model building
One of the most frustrating aspects to develop during excavation at Oakbank is the lack of immediately perceptible order or pattern in the large number of piles exposed. Except for a few obvious features it is very difficult to make sense of the mass of timbers on the site. This is due to three main reasons. First, more than one phase of building accounts for the piles and stakes and, since the tops of them are eroded to a common level, it is not possible to distinguish
slope of uprights which would allow more accurate calculations of their original positions before complete excavation (colour plate 16).

The reconstruction of the entrance with flanking walls, outside walkway supports, internal roof supports and a partition screening the floor area from the outside was only appreciated by examination of the model. Not all of the timbers indicated in it were necessarily contemporary, as had been shown above by the different levels of penetration of the site, but in many cases the later uprights were erected to strengthen weakened earlier ones thus establishing a contact between different chronological phases of occupation. The sequence of building and rebuilding on the crannog will eventually be established by dendrochronology or archaeological recording and the model will then be useful for demonstrating that sequence, by removal or insertion of the sticks. Now the same effect may be produced by computer but 3D computer imaging software is complicated and really needs the assistance of a skilled operator. For the first time, in 2004, a postgraduate student at Edinburgh University, Rosa Mendoza Roble, is using elements of Oakbank Crannog to create a three-dimensional model which can be used to interpret features that are not clear on the two-dimensional drawings.

SUMMARY

A number of methods of illustrating the crannog at Oakbank have been outlined above. Some are traditional and others less so, but all have been found useful to some degree in presenting the site as a whole, or in part, or in exhibiting certain aspects of the work being carried out there. Over the years many methods of displaying Oakbank Crannog have been attempted but none is as compelling as the full-scale crannog built in Loch Tay.

It would have been inconceivable for archaeologists prior to the second half of the twentieth century to consider carrying out excavations underwater. The value of observations beneath the surface was appreciated by Blundell but the weight of the diving equipment and its unwieldy nature in use prevented effective work.

Modern equipment and techniques of working underwater have removed many of the difficulties of early research and Scottish crannogs can now be examined at the convenience of the archaeologist and not only when they are exposed as a result of other work. Exploitation of these sites to the highest archaeological standards is now possible and the mass of important data which they contain is available for systematic research.

Eleven

UNDERWATER EXCAVATIONS AT OAKBANK CRANNOG, LOCH TAY

Excavation has taken place intermittently since 1980 and in that time a total of 68 weeks was spent on site. It may help to understand the structural issues discussed in this chapter by referring to the site grid plan (40). The early work at Oakbank, from 1980 to 1983, makes up the major part of the author’s PhD thesis (Dixon 1984).

It is instructive to survey crannogs around the country, but there comes a time when it is necessary to go further to establish a greater depth of knowledge about the sites. The next logical step is excavation, and work at the site of Oakbank Crannog has proved highly productive in explaining the structure of that site and the way of life of the people who lived there. Obviously, limited excavation of a selection of sites can only clarify certain elements of their structure and more work is needed but what has been carried out so far has been useful in laying down ground rules for further research and for showing what might be expected from similar submerged sites.

This book is not the place to go into great depth on the detailed scientific analyses that have come about from the Oakbank excavation. A number of researchers have been involved over the years and their contributions have been invaluable in helping to decode the site. Where appropriate they will be referred to in the text and their publications and dissertations are listed at the end on pages 183–86.

‘Oakbank’ is named after the cottage of that name located near the crannog in the village of Fearnan, four-and-a-half miles from Kenmore, on the north
The crannog mound stands about 1.5m proud of the loch bed nearest the shore and about 3.5m high on the offshore side. The top of the site is never less than 1.5m underwater in summer, while in winter it may be up to 3m underwater.

**Shape**

In plan it is roughly pear-shaped with the narrow end to the west and the wide end to the east. Adjoining the west end is a sub-circular extension with the superficial appearance of a low mound of boulders resembling a very small, almost independent, crannog. The top of the small mound is considerably lower, and therefore deeper underwater, than the top of the main mound suggesting that it was not a living platform in the same manner as the crannog proper.

The two mounds are joined with a narrow neck of large boulders and the loch bed on the north or landward side of the neck is almost 1m higher than on the south side because of silt build-up. Prior to excavation, on the southeast edge of the extension, four evenly-spaced pile stumps of a softish wood were visible with a number of horizontal timbers of the same wood interspersed haphazardly among them (41). Later work showed there were two concentric circles of piles around this part of the site. Near the edge of the

**Reasons for Choosing Oakbank Crannog**

Archaeologically the site showed a great deal of potential as timbers were exposed and the odd shape suggested that the crannog had a complex structural history. Superficially it appears to be a mound of boulders rising from a flat, sandy loch bed which slopes slightly down from north to south, away from the shore.

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40 Grid plan of Oakbank Crannog showing important features and excavated areas.

41 Piles and timbers in the lochbed at Oakbank prior to starting excavation. N. Dixon
crannog, but close to the other timbers, was the stump of an oak pile embedded in the loch bed. This was sampled and gave a radiocarbon date of 460±60 BC (GU-1325). Initially, the layout of piles in this area seemed haphazard but later examination showed that the evenly-spaced soft wood piles were only part of an arrangement of 70 piles which surrounded the extension.

Leading from the north edge of the main site into the shallows there is a low ridge on the loch bed. Along the length of this ridge, and projecting from it, are the stumps of 40 oak and elm piles. Some horizontal timbers were observed projecting from beneath the crannog at the south end of the ridge and from the boulders in the shallows at the north end. Clearly these are the remains of a walkway from the crannog to the shore.

Later examination of the walkway showed that it stops just short of the shore leaving a gap of about 2m. There are four piles in the loch bed across the end of the walkway and it is most likely that there was a gate across the end. This theory is supported by the discovery of a row of small pile points in the loch bed running parallel to the shore from the end of the walkway to the west and to the east, presumably supporting a fence in the shallow water to prevent access to the site. Clearly defence began at the shore end of the walkway and not on the crannog itself.

Entrance to the crannog

On the top of the crannog around control point A3 a number of irregular oak timbers were observed possibly representing the remains of an entrance. Nearby were the tops of two piles: one of oak and the other alder. The larger oak pile (103) was sampled for radiocarbon dating and eventually produced a date of 595±55 BC (GU-1323). Around the base of the radiocarbon-dated sample a deposit of organic material was observed and a preliminary examination revealed cereal, grass and a wide variety of well-preserved seed types.

The substantial amounts of organic material in the form of timbers and plant debris, along with the well-defined morphological features of the crannog, extension and causeway are not all found on the other sites in Loch Tay. Oakbank Crannog was accordingly selected for excavation with a degree of confidence in the prospect of uncovering more well-preserved organic features and deposits within the mound, underlying the cover of boulders.

As this was the first underwater excavation of a crannog, practical considerations also played a role in the choice of Oakbank Crannog. Permission to set up a field office and equipment base in a field beside the shore was given by the landowners who have given tremendous support ever since. The site is adjacent to the main road that runs along the north shore of the loch and accommodation, post office, general store and hotel were all within a few yards of the site (colour plate 17).

The underwater conditions were equally favourable. The loch-bed silt is not too fine and so it is relatively easy to keep the water clear even with a considerable element of disturbance during excavation. The water is clean and visibility is generally very good except in turbulent storms or after periods of heavy rain.

THE EXCAVATION

Overlying stones

A layer of large boulders, ranging in size from 30-80cm, covers and surrounds the site and the first task in 1980 was to remove these stones from a small trench laid out on the top of the site. These boulders are a consistent feature of almost all of the Highland crannogs and their presence was an issue that needed explanation. At first, it was not clear whether they were scattered randomly throughout the makeup of the mound at Oakbank. It was with some surprise that the layer of stones on top of the site was seen to be in some places only two or three stones deep, although they were up to 3m deep around the edges possibly to protect the site from wave action.

The thin layer of boulders overlying the area on top of the mound is also difficult to explain. If it had been laid before a structural timber phase, possibly to raise the overall level of the site, it would then be impossible to drive stakes into the underlying material. The resulting stony mound would support a stone structure, but no remains of foundations were found to indicate such a structure had existed. It seemed likely therefore that the stones were laid after the insertion of upright wooden stakes to help consolidate them during a later construction phase.

Underlying the layer of large boulders was a layer of smaller, roughly fisted stones. They had the appearance of having been deliberately laid down, possibly as a firm base for the upper stones to lie on. However, there is no evidence to prove contemporaneity of the two deposits. The smaller stones overlay a thin covering (1-5cm) of grit and silt with very small stone chips which is probably the result of degradation of the upper layers and natural deposition of waterborne silt and requires no explanation in terms of human involvement.

Removing the stones is an exhausting task but gives the excavators a chance to get used to working in the shallow waters and to become accustomed to the site. Stone dumps were established around the perimeter of the mound and originally each stone was carried to these dumps by hand. It may not have been the most exciting work but it certainly developed the fitness of the team. Since 1980 we have moved many tons of stones to these dumps that now surround the site like a range of small mountains.
Organic Matrix

Immediately underlying the upper, stony layers is a deposit of organic material which, given the height of the mound, must be 3m thick in places (colour plate 16). While organic material had already been sampled from the site prior to excavation, there had been no suspicion of the range and richness of the debris. It included: upright stakes and more substantial piles, some more or less vertical and others sloping steeply; longitudinal branches and timbers, some in clearly associated groups and others of a single, random nature; compacted plant debris consisting mainly of bracken and fern stems, twigs, straw, leaves and animal excreta, insect remains; and a wide range of seeds and nuts.

This mass of organic debris initially gave the impression of being one massive layer but excavation proved that it is made up of many lenses of compacted material. Upper lenses can be peeled from those underneath occasionally with a seam of insect puparia, seeds or animal droppings marking the boundary between them. In other cases the distinct strata are accentuated by different alignments of bracken laid down as bedding material. Sometimes more random deposits are encountered such as, concentrations of wood chips, coarse sawdust, fibrous bracken stems and straw or soft and creamy dung-like material. In some cases these layers are compressed to less than 1cm thick.

Being used to uncovering dark patches of soil representing postholes and pits on land sites, it is a revelation to be confronted with the materials as if they had just been gathered from the landscape. In the first excavation season it became immediately apparent that this would be a very different sort of excavation and that there was effectively no 'spoil'. Everything on the site looked as fresh as when it had been deposited by the people who once lived there. It is not possible to recover and analyse cubic tons of this material so selection of specific areas or deposits is critical; almost everything has some archaeological value and contains information about the local environment and its exploitation.

Timbers and structural features

For an archaeologist used to the postholes of land excavation there is something particularly exciting about excavating and handling the actual timbers cut down by the crannog-builders (42). Most of the timbers still have the bark on them and often the stumps of small branches and twigs that have been trimmed off are still there. The majority of piles are alder with some oak, elm and the occasional willow. Smaller pieces are generally hazel and birch. Some have cut marks and obvious evidence of working while others seem to have been dragged in straight from the woods. When the exposure of one timber leads to others in close proximity obviously representing a complex feature, then the uncovering of that feature brings home the true thrill of archaeological discovery.
The wooden elements of the site are mostly embedded in the deep layer of organic debris and owe their excellent state of preservation to that deposit. Where timbers project from the organic matrix they are eroded back to the surface of the deposit. Only oakwood survives in open water and even here the bark and sapwood are eroded away and only the heartwood survives. The heartwood becomes what is commonly termed 'bog oak' and is harder than fresh new oak. Timbers and other organic remains are also well preserved in the silts of the loch bed but they are eroded to the level of the silt surface. Certainly the standard of preservation of plant and insect material protected by the organic matrix is very high. Vivid examples are the discovery of a wild cherry complete with its flesh and sheep droppings with parasite eggs preserved in them.

Threshold timber
One of the most important structural finds to date was a large, complex beam with holes cut through it (43). This has been interpreted as the threshold timber of the entrance, although it may possibly have been a lintel instead. The threshold would be the timber that was stepped over to get through the door while the lintel would be the timber over the door. There is a considerable element of speculation as to how the timber was actually used and, according to the number, size and arrangement of holes, it is possible that it was a timber re-used from an earlier function. There is not space here to go into the full range of speculations but the timber may have served as a base for the construction of hazel hurdles or wall panels, and was then re-used later as a part of the entrance structure. It is notable that it is more complex than anything that has been used in the modern reconstruction and indicates the skill and sophistication of the carpenters on the original crannog.

Hazel rods
Overlying the threshold timber was a bundle of long thin hazel rods of the sort that would be used to make hurdles for walls and fences (colour plate 19). They may have been stored there for later use or perhaps they had been laid down to cover up an uneven part of the floor or fill a gap between floor timbers. Similar hazel withies were discovered on a deeper part of the site in the extension to the west of the main mound.

Uprights
The hundreds of stakes and piles on the site range between 5cm and 45cm in diameter, with the majority around 10-15cm (44). Most of the wooden uprights in the main crannog mound are the remains of structural features which had different functions on the platform. Straight lines of stakes may
represent the preserved elements of partition walls and dividers inside the house. Curved and circular arrangements around the edge of the mound may have supported an unroofed walkway around the outside of the house and may also have supported a stockade at the outer edge of the walkway. Other curves of piles and stakes, further in from the edge, may show the line of the outside wall of the house and may also have supported a ring beam to take the strain of the roofpoles.

While these ideas may seem reasonable and logical, one of the biggest problems is trying to establish which uprights go together as parts of a feature. They all look alike but may have been driven in during building or repairs at any time in a 200-year period. This is one of the most important issues on the site since only by assigning timbers to specific common groups is it possible to create the elements that made up the dwelling in the many different phases of occupation.

The stakes and piles excavated so far all show evidence of having been cut to a point at the lower end to facilitate driving them into the organic matrix or the loch-bed silts. In some cases cutting could be seen at the place where the stake projected from the organic material. These stakes were only set into the matrix to the level of the facets of the cut point and are clearly evidence of secondary construction on the site since the organic matrix must have been laid down prior to their insertion. A number of small stake points were discovered on the uppermost part of the site and two were sent for radiocarbon dating. They produced dates of $410 \pm 60$ BC (GU-1463) and $455 \pm 60$ BC (GU-1464). Because they were just the points of stakes, the upper parts having been completely eroded away, they must be some of the last stakes used on the site and so are of particular importance. In fact, no later dates have come from the site.

It is interesting to note that one of the earliest radiocarbon dates from the site came from the top of an oak pile, with a date of $595 \pm 55$ BC (GU-1323), not far from the two small stakes. This may seem strange but as the two stakes were just sticking into the top of the organic matrix and the oak goes all the way through it, probably into the loch bed itself, they all played a part in the structure at the same time. The difference is that the oak was a major structural timber helping to hold up the house for the whole life of the crannog while the stakes were just introduced towards the end.

The range of radiocarbon dates from Oakbank is informative. All of the dates fall into two main areas of time which are around 400-450 BC and around 550-600 BC. Unfortunately, because of a problem in the calibration curve for this period, the range of dates when calibrated is from about 800 BC to about 300 BC. As there are a number of calibration methods available, the dates in this book are left uncalibrated, unless otherwise stated. The list of dates shows where the samples that were analysed came from (see page 178).
The first floor remains were uncovered in 1981, in Area B3, but a bigger area came to light in 1990, in Area C2, when the remains of fallen uprights were also discovered lying across the floor. The 1990 section is sloping into Area C1, towards the outside of the east side of the site and seems to have collapsed down in that direction.

Floor foundation
The exposed floor was backfilled with silt over a net cover to protect it until we could return to continue the excavation there, which resumed in 2003 with exciting results. Important elements of the floor foundation were uncovered including the remains of broken piles in association with many other timbers that are part of the period of habitation immediately preceding the construction of the floor. Other structural timbers in Area B3 represent the foundation of the floor there and also of part of the walkway around the house (48). Six radially aligned beams, 7-8cm in diameter and roughly 50cm apart, are crossed at around 90° by other transverse timbers.

ACCURATE RECORDING
The mass of material remaining at Oakbank Crannog means that it is possible to reconstruct with great detail many aspects of the structure and the way of life of the inhabitants. The site was inhabited for a considerable period of time, 200 years or more according to the radiocarbon dates, and it was repaired and rebuilt a number of times. Clear evidence of different phases of collapse and repair were seen with the excavation of a large wooden bowl from an abandonment layer that had had a large pile driven through it during later rebuilding (colour plate 20). So far, almost 2,000 major timbers have been recorded on the site and many thousands of smaller pieces of wood have been observed but not recorded in detail. It is very difficult to work out the different phases of occupation and building on the crannog, so detailed and accurate recording is needed to help the interpretation.
TIMBER STRUCTURES

In some cases, the groups of timbers represent obvious features, such as the two areas of flooring discovered so far. In other cases the arrangement of timbers does not make for easy recognition of features but if the timbers are all accurately recorded it may be possible to reconstruct elements after interpretation. For example, the floor timbers along with the small stakes beside them and the lack of upright piles on each side of the partition clearly suggests an entrance area and the inner floor of the house. Even very confusing jumbles of timbers (49) must still be fully and accurately recorded as their purpose may become clear with future excavation.

TOOLMARK SIGNATURE MATCHING

One of the most exciting elements of the well-preserved piles uncovered at Oakbank, were the very obvious ridges and grooves on the facets of the cut points (45). They were made by notches or roughness on the cutting edge of the axe or adze used to shape them. It seemed that some of the patterns of ridges and grooves were the same on different timbers suggesting that they had been cut using the same tool. Effectively the signature that was noted was like a fingerprint unique to a single tool.

In 1988 a student was given six piles from Oakbank to see if he could ‘read’ the signatures of the toolmarks and if possible match them to each other. He was able to state confidently that three of the piles had been cut using one axe, two had been cut with another and the last did not match any. The work was part of his final year dissertation and he went on to develop the study as a PhD at the University of Edinburgh. He was able to match many of the piles from the site and even tie in some of the cut woodchips that are also found throughout the organic material (Sands 1997). This work was important as it allowed timbers that were not actually associated with each other to be assigned to the same period of construction.

However, this is an over-simplified description of Sands’ work as he went on to examine the sorts of tools that were used, how they were used and the felling processes involved in acquiring the timbers to build the site. Possibly his most useful contribution after the importance of signature matching was his recognition of the importance of combining signature analysis with dendrochronology and the support that each method can give to the other (Sands 1997).

DENDROCHRONOLOGY

The wealth of timbers on Oakbank Crannog should be a useful reservoir of material for dendrochronological studies, however, there are problems. The
first problem is that there is not yet a master chronology for Scotland. There is no continuous sequence of dates from the present projecting progressively further into the past into which Oakbank timbers might fit to give an absolute date. A number of oak samples were taken from Oakbank Crannog by Dr M. Baillie of Queen's University, Belfast in the hope that they might correlate with master chronologies for Ireland but unfortunately they did not match, probably because of climatic differences in the two areas.

A more useful area in which dendrochronology could contribute to our understanding of Oakbank is in the creation of a relative chronology of different phases of habitation and construction on the site. Positive results in this area of tree-ring studies have been achieved from Neolithic Continental lake-dwellings and from the prehistoric trackways of the Somerset Levels. Archaeologically different phases of building and repair are obvious at Oakbank but it is not always clear by visual observation which timbers relate to which chronological phases. The fact that distinct features and groups of piles are so readily discernible would seem to make this a case where site-specific dendrochronology would prove useful.

During the 1982 and 1983 seasons of work at Oakbank a large number of samples (> 250) were taken from timbers of all sorts, mostly alder, hazel and oak. The samples represented structural elements of the site and were examined by A. Crone at Sheffield University as one of two case studies for a PhD thesis (Crone 1988). Crone’s work proved useful in supporting the idea of groups of timbers being cut down together and the same groups being used in distinct features on the site. However, she had to concentrate on alder timbers as they predominate on the site and there are few useful oaks, the preferred species for tree-ring analysis. Alder trees are very susceptible to poor weather and can stop growing for up to as much as five years making it very difficult to match them. Another problem with the Oakbank alder is that most of the trees are less than 40 years old which means there are too few rings to create long sequences of patterns for matching. The outcome is that Crone’s work showed a number of ‘blocks’ of timbers that seem to have been felled at the same time and most of these can be matched visually on the site plans making useful corroboration although the groups of matching timbers are relatively small and in some cases they are inconclusive. However, there is great promise in the combination of her work with the signature matching developed by Sands and it is hopeful that in the future a research project can bring the two studies together and produce useful results for examining the details of the construction sequence.

SECTION B3-B4

In an effort to better understand the relationship between linear and vertical structural features, a 5m-wide section was cut through the site between control points B3 and B4 (50, 51). The aim was to examine the foundation deposits and the relationship between the peripheral boulders and the many uprights around the edge of the site.
Stratigraphy
Another reason for cutting the section was to see if it was possible to identify distinct stratigraphy within the organic deposit. It was already established that there were differences in texture and that in places layers could be clearly peeled off exposing deposits, obviously in situ, of insect puparia, animal droppings or seeds.

Clearly stratified deposits were observed in the section. The most obvious layering was seen in the east half of the section separate from the area of horizontal radial timbers. This may have been the result of differential disturbance. The material in the area where most construction and reconstruction took place would be periodically disturbed and mixed while the area with few timbers, and therefore with no building or rebuilding, would be relatively undisturbed.

Timber phasing
It was hoped that it would be possible to examine timbers in the section to see if they had been inserted at different times, thereby representing different phases of occupation. In the section, uprights were recorded that are primary piles since they are solidly driven into the loch-bed silts far enough to completely cover the cut points. They should represent the earliest phase of construction on the site. In contrast, other piles are clearly secondary uprights from a later phase of rebuilding, as the cut points have been driven into the organic deposit after the deposit had been laid to a depth of at least 90cm and possibly deeper. They do not penetrate through the organic deposit and into the loch bed. They may have been used to strengthen or replace the earlier piles.

The elevation also shows the cross-sections of a substantial number of longitudinal tree trunks restricted to the west half of the section. It is notable that the great majority of these timbers lie more or less radially in relation to the crannog and are found mostly in the lower half of the section. It is assumed that most of these are not still in situ though they may not be far from their original position and alignment. These timbers were transverse supports jointed to the numerous uprights nearby to carry the circumferential beams forming the walkway around the crannog. Presuming that the walkway was above water then the radial supports must also have been either above water or close to the surface. Therefore, when the connecting joints degraded the transverse timbers dropped and came to rest on the organic deposit building up on the loch bed. If this is the case the higher timbers may represent periods of structural repair and the replacement of rotted supports.

Compaction
It was also a matter of interest to observe by how much the loch bed silts had been compressed by the weight of the crannog material since this was conjectured as one of the reasons for the eventual submergence of this and other sites. In fact, it was considered by Robert Munro to be probably the major process of submergence.

The base of the mound lies flat on the loch bed with no evidence of a depression in the silt. The cause of submergence of Oakbank Crannog, and of the other submerged crannogs in Loch Tay, may be considered in terms of internal collapse and compaction as a result of biological and mechanical degradation and not by subsidence into soft loch-bed silts. The collapse was followed by an average rise in the loch level sometime after abandonment of the site and clearly seen in the old drowned shoreline around many parts of the loch.

Siling
The amount of siling that had taken place in the last two-and-a-half millennia was answered by examining the section. A substantial build-up could mean the preservation within the silts of the remains of canoes, fish-traps and objects which had fallen from the crannog when it was inhabited, as well as early foundation elements not protected by being embedded in the organic matrix.

The section demonstrated that in this part of the site there has been effectively no build-up of silt since construction of the crannog. The boulders and organic deposit lie on the original loch-bed silts and show no evidence of having been covered around the edges by later material. This may be partly a result of increased wave action in the shallow water. On the deep side of the site, siling had taken place as the tops of oak timbers were discovered under about half a metre of silt.

Construction technique
Another objective of cutting the section was to see whether the method of building crannogs, as put forward by Robert Munro, applied at Oakbank. Munro said that a crannog was made by a timber raft that was floated out then sunk with stones, brushwood, peat and earth and held in position with piles driven through the material. There is no evidence in the section of any of these construction elements. Indeed, there is a significant lack of large stones within the organic matrix and particularly in association with the lower parts of uprights where they penetrate either the loch bed or the organic matrix and where they might be expected if Munro were correct. In fact, the evidence from Oakbank strongly suggests that the first structure on the site was a free-standing pile structure with open water under the platform that allowed the build-up of the stratified layers noted in the section.
The excavation of the section was proved justifiable by the information it supplied regarding the structure of the site and the formation of the remains in this area. It also showed that sections could be created and recorded and that their maintenance offered no significant problems underwater. The observations with respect to silting are of interest to this site and the discovery that no loch-bed subsidence has taken place is important for the contribution it makes to the general discussion of crannog submergence.

SMALL FINDS AND ENVIRONMENTAL MATERIAL FROM OAKBANK CRANNOG

ARTEFACTS

Many exciting finds have come from the excavations over the year, including everyday domestic utensils, wooden and stone objects, wood chips and the waste from carpentry and slag from metalworking. There is also limited evidence of pottery and the occasional, sometimes surprising, find such as an Early Bronze Age barbed and tanged arrowhead presumably picked up by the Iron Age crannog-dwellers. The largest group of finds is environmental material such as macro-plant remains, pollen, excreta and insects. The range of finds is wide and some of the evidence has never been seen before on prehistoric archaeological sites in Scotland. At Oakbank, all objects not natural to the site are classed as finds. Artefacts are objects made and modified by the human hand and include the residues of manufacture such as wood chips with cut marks on them. Other finds are natural objects brought into the crannog for one reason or another, such as the mass of plant remains.

The crannog at Oakbank is an almost wholly anthropogenic feature with minimal quantities of naturally deposited material. In a way, it can be regarded as a single, highly complex, artefact. Almost everything within, including the structure of the crannog is there by virtue of man's direct activities. This means that even a featureless stone on the site is there as a result of a purposeful act. The purpose may never be known, but its existence should be considered.
area, plus the large extent of the water/crannog interface. The range of environments available would have been the homes of many creatures such as spiders, woodlice, snails, worms and insects including beetles, flies, wasps and earwigs. The potential is excellent for examining this wide range of creatures in such a complete state of preservation; in many instances they are still within the remains of their unique environment.

CONCLUSION

Pollen and macro-plant remains analysed from the crannog excavation show a landscape in which a wide variety of plant types was available for exploitation. The evidence showing how early societies used the landscape as a resource is contained in the mass of material excavated at Oakbank Crannog. It is clear that the crannog-dwellers roved far and wide to collect plants and seeds for consumption and for use around the house from the fruit and nuts and other food plants they gathered to the bracken and ferns they laid on the floor and used for bedding and insulation. There can be no doubt that the crannog-dwellers were extremely knowledgeable about the environment around them and were very skilful in its exploitation. Today we can learn a great deal about sustainable development from understanding the practices of our Early Iron Age ancestors.

Thirteen

INTERPRETATION

INTRODUCTION

One of the basic aims of archaeology is to reconstruct the past in as much detail as possible. This does not mean simply reconstructing objects and buildings; it also means interpreting the way of life led by people in the past and every aspect of that life and its place in the environment. The task is immense and many parts of it will never be explained as we can never know what people actually thought or felt. Archaeological excavation is an important method of acquiring data to understand the past. The better preserved the material remains, the greater the level of interpretation that can be attained through scientific analysis.

After considering the evidence from Oakbank Crannog for many years, we believed that the remains were sufficiently comprehensive to allow the recreation of a full-scale crannog in Loch Tay and that project started in 1994. The original site evidence did not show the outline and details of a complete crannog but there were enough clear features to enable a credible construction.

There were a number of reasons for building the crannog at Loch Tay, but they fall into three areas of particular interest: experimental archaeology and interpretation; education and raising awareness; and fund-raising to further research and training.

EXPERIMENTAL ARCHAEOLOGY AND INTERPRETATION

Elements of the project can be considered as experimental archaeology where the experimental aspects can assist in the interpretation of the original site. Of particular interest are the use of traditional materials and the way they stand up to the conditions in the loch, particularly to the weather which can be harsh.
Many questions arose while excavating Oakbank Crannog relating to the structure and the methods that might have been used to construct it. We wanted to know how the crannog-builders drove the hundreds of piles, many of which were more than 7m long, into the loch bed. Initial experiments at Oakbank had been carried out by cutting down a small alder tree, cutting it to a point and attempting to drive it into the loch bed (colour plate 27). A branch was cut in the shape of a large mallet but proved totally inappropriate for driving even the small pile and some of those from the site were much bigger. Even hitting the pile with a large rock had no appreciable effect.

The method we used during the reconstruction was to cut the pile to a sharp point, pull it upright and wiggle it back and forth (colour plate 28). The weight of the timber and the sharp point, combined with the momentum generated by twisting, effectively drove the pile into the loch bed to a depth of about 1.5m. While observing this happening under water we made another discovery. As the pile was driven into the loch bed, water was injected into the underlying clay making it malleable and allowing the pile to penetrate. White clay, displaced by the pile, was seen bubbling up around the point (70). After a few hours the water came out of the clay and the pile was held firmly in the bottom. Once the clay was re-compacted the pile could not be moved sideways and could not be pushed deeper. The loch-bed clay is obviously a major feature in the strength of the overall crannog structure.

Leading from this discovery another subject became clearer. There were stones on the top of the original site, presumably to support upright timbers, but there were none around the original piles in the loch bed. Clearly, in the original construction the piles in the loch-bed clay did not need any extra support. However, in secondary phases of construction the piles were only driven into the artificially deposited organic mound and that did not offer the same support as the clay and so the piles had to be supported with stones. It would in any case be much easier to pile stones around the base of relatively shallow piles rather than those in deeper water.

While all of the details of the crannog reconstruction at the Scottish Crannog Centre do not match exactly the discoveries from Oakbank Crannog, the overall effect is intended to be as close to the original as possible (colour plates 29, 30). Methods and materials which would have been available in the past were used where practicable. Much of the building work is clearly based on the results of archaeological research from a site where the species, size and condition of timbers is still readily observed. The floors and wall uprights in the reconstruction are true representations and many of the details of life on the crannog are very accurately portrayed. As work continues at Oakbank Crannog it is intended to incorporate new evidence into the reconstruction bringing it closer and closer to the condition of the original site.

BUILDING THE RECONSTRUCTION

Building the reconstruction taught us a great deal about what was required of the original crannog-builders (Dixon 2000). Many issues of the construction, the sourcing and harvesting of raw materials, the range of skilled and unskilled tasks performed and the size of workforce needed to perform them became clear. We have learned since that it is also important to observe the overall stability of the site and to examine the results of monitoring the different structural elements as time passes. In effect, the new crannog is a living experiment as we continue to learn from it both as a structure and as a home.

EDUCATIONAL RESOURCE

Another reason for building the reconstruction was to create a platform for teaching school children, university students and the general public about their heritage. We also hoped to encourage them to take an interest in history and archaeology, and specifically in underwater archaeology. Therefore, we explain the methods and techniques used to excavate Oakbank Crannog so that visitors know the background to underwater archaeology and how it contributes to our understanding of crannogs from the earliest times.

The people who lived on Oakbank Crannog in the Early Iron Age lived much of their lives on shore and ranged widely in the landscape around them.
It is the aim of the Scottish Crannog Centre to involve visitors and researchers at all levels with the craft skills and associated activities that may have been an integral part of the way of life of the crannog-dwellers. Associated activities include fire-making, turning wood, rope-making, spinning and weaving, making holes in stones and hurdle-making.

In conjunction with the local Education Authorities an education pack was produced and distributed to all the schools in the Tayside area. It covered the underwater excavation and interpretation of Oakbank Crannog leading to the crannog reconstruction. New teaching materials are continually being developed today.

RAISE AWARENESS AND RAISE FUNDS

An important reason for setting up the Scottish Crannog Centre with the reconstruction at its heart was to fund the continuing excavations at Oakbank Crannog and to allow the other 17 sites in the loch, and the hundreds of others throughout Scotland, to be examined in more detail. A programme of public talks is carried out each year and an integral part of the Centre’s work is to educate and enlighten everyone about the importance of Scotland’s submerged cultural heritage and the importance of Underwater and Experimental Archaeology.

Construction of the full-sized crannog began in June 1994 and the site was officially opened to the public in July 1997; since then more than 150,000 visitors have experienced the past that has been recreated there. Funding remains an issue, however, as the Centre is an independent organisation that receives no fixed subsidies and so relies on admissions and donations to meet operating costs.

HOW THE RECONSTRUCTION WAS CONCEIVED

The recreated crannog was not born of a ready-made kit or concept; it developed gradually from other sorts of reconstruction that had been attempted over the years.

Paintings and drawings

The first artist’s impression of Oakbank Crannog was produced in 1982 for the cover of a colour magazine, and the next was a painting for a television programme produced by the BBC in 1985 (colour plate 25). These were adequate at first, but soon many aspects became archaeologically unacceptable as more excavation enabled greater interpretation of Oakbank-Crannog. In particular, we determined that the original crannog was a free-standing pile-

dwelling and stones would not, originally, have been evident around the base of the supporting piles. Also, the slope of the roof in early illustrations was too low. Practical considerations dictated a steeper pitch to the thatched roof to allow rain to run off rather than penetrate and rot the thatch, and to help snow to slip off before the weight of it could cause collapse.

Eventually, an isometric view of the crannog with part of the roof and walls cut away so the interior can be seen was drawn by Alan Braby, a talented archaeological illustrator in Scotland (69). The scene is populated with the inhabitants of the site carrying out some of the everyday tasks that may have taken place. One man is building the fence around the outside of the platform while another cuts a point on large timbers for use as upright piles. Another man carries a coracle and others are bringing sheep onto the site. Another is sharpening his spear and a woman is talking to a young girl while a cauldron hangs over the fire. The site is divided into functional areas for living and working. While there is not evidence from Oakbank Crannog for every one of these activities the overall scene and construction are an accurate general representation of the site and activities that may well have been carried out there.
There is certainly clear evidence for some of the activities, such as pointing the piles, building the fence, bringing in the sheep and for much of the structure, such as the floor of undressed logs laid side by side, the hurdle partition walls and the division of the house into discrete areas. Necessarily in such an image, there are still many features missing, such as how the beams that supported the floor would have been attached to the supporting piles.

*Scale model*

The almost inevitable next step from drawings and paintings of the site is the construction of a model (Figure 26). In the case of Oakbank Crannog, this was undertaken by a long-standing member of the STUA, David Jones, who produced it from the materials found in his garden and based it on Brabys drawings and discussions with the archaeologists. Once more, while there are obvious omissions, particularly in structural details, the main interpretative strength of the model lies in the overall impression it conveys.

*Engineers’ drawings and model*

While the crannog model had a number of drawbacks it was sufficiently accurate to be shown to the planning authorities as an example of what was wanted in Loch Tay. However, impressed as they seemed to be the planners required more accurate and detailed engineers’ drawings to ensure that the intended structure would stand up safely to the rigours of an educational visitor centre with, potentially, 25,000 visitors a year.

**CONCLUSION**

Underwater archaeology is a useful interpretative tool; it provides a method of gaining insight into the details of buildings and other structures at a level unknown on dry land sites. The preservation and analysis of organic materials that normally rot away very quickly on land not only enables us to reconstruct past environments, but also yields a wealth of evidence for the architectural elements of past communities and the detailed aspects of their entire life and interaction with those environments. This clear picture also allows experimental reconstruction at all levels and enables public observation and participation of aspects of life in the past in an educational and exciting way. It is hoped that in the future the way of life of past communities will become more understood by the public through the combination of underwater archaeology, experimental archaeology, public archaeology and cultural tourism.

This book is a brief summary of crannog research in Scotland. The important work of the nineteenth century showed how much interest there was in the subject and the range of sites that were examined at that time. The researchers then made a significant contribution to the subject and produced excellent results given the restrictions they worked under. Even with these problems they produced plans, drawings and records of many sites. The recognition of common identifiers that are still looked for by today’s surveyor when examining new sites. They explained the excellent state of preservation that the sites offered and they produced many reports that make enlightening reading. Overall they created a solid base for later research.

The few excavations carried out in the first half of the twentieth century have been outlined with their varying standards and results. There was a clear development in scientific standards and archaeological understanding from the time of Fraser’s excavation at the Loch of Kinellan in 1917, to Piggott’s excavations at Milton Loch in 1950. Piggott was one of the first archaeologists to use radiocarbon dating and demonstrated one of the most useful techniques available to researchers on waterlogged sites today.

Improvements in the equipment for working underwater, and particularly the development of the aquaculture after the Second World War, meant that was no longer so difficult to go into the field to carry out underwater survey. The developments of archaeological techniques underwater, from Ruoff work in the 1960s to the present, has shown that standards achieved under water are as professional and accurate as those achieved on land sites.

The excavation of Oakbank Crannog has been, and continues to be, immensely exciting. Work at the site provided the first clear evidence of crannog built initially as a free-standing pile-dwelling that changed its form an