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Palaeoenvironmental assessment of the Carpow Logboat samples and recommendations for C14 Dating

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1. Introduction

This document has been produced by CFA Archaeology Ltd and submitted to Historic Scotland on behalf of the Perth and Kinross Heritage Trust (PKHT). Sections 1-3 provide a summary of the background and nature of the environmental remains. Section 4 contains recommendations for radiocarbon dating.

In 2002 the author visited the Carpow log-boat site (NGR NO 2001 1859) to assess the environmental potential of the inter-tidal peat in the immediate vicinity of the boat. More recently a programme of palaeoenvironmental sampling has been carried out in conjunction with lifting the Carpow Logboat (RCAHMS NO 21NW 61). This work included recovery of environmental samples from within and below the boat and from exposed outcrops of exposed inter-tidal peat containing *in-situ* tree stumps. The boat has been dated to 1260-910 cal BC, GU-9597; AA-45634). The boat lay close to the confluence of the Rivers Tay and Earn and has been subjected to the effects of scouring particularly in spate conditions. The abrasive effect of shifting alluvial sand and gravel is effectively eroding the inter-tidal peat and tree-trunks, both of which will certainly vanish within the next ten years.

The palaeoenvironmental significance of these remains cannot be assessed without radiocarbon dating. The Lower Strathearn region has a robust relative sea-level curve that was constructed by Cullingford *et al* (1980) this was largely based on 1cm thick peat samples for conventional dating (Sites 1-6 in Figure 1). AMS dating was then in its infancy and single entity dating procedures were yet to be established (Ashmore 1999). Based on radiocarbon dated biostratigraphic profiles obtained at six locations within the Lower Strathearn, Cullingford was able to show that sea level rose to around 9m OD at around 6000BP. Radiocarbon determinations on marine shell recovered at a depth of 3m below the present flood plain surface at the Carse of Gowrie (Cressey 2001 Fig 2), fitted well with Cullingfords Early Flandrian relative sea-level curve for the Lower Strathearn and showed the potential for environmental sampling remains below the carse clay.

2. Aims and Objectives

The aims of this research is to address the following questions:

- What is the age of the inter-tidal peat and the *in-situ* tree-stumps?
- Is the intertidal peat contemporary with the Carpow Logboat?
- Can inter-tidal remains further advance our knowledge of relative sea-level changes within the locality of the Carpow Logboat?
- Are the environmental samples recovered from below the log-boat contemporary with or later than the log-boat?
- Is the hazel nut cache within the boat contemporary with or later than the boat.
- Are the hazel nuts below the boat contemporary with those within the boat?.

3. Methodology

Field assessment

An assessment of the inter-tidal peat was carried out to determine suitable sample locations and to identify the position of *in-situ* tree stumps that were known to survive close to the Carpow log-boat. Following an assessment of the peat the mean High Watermark Spring Tide (MHWST) and the Low Watermark Spring Tide was plotted using a Leica GS50 global positioning recorder. Three stumps (SP1-3) were found in-situ and their position was recorded following sub-sampling.

A stratigraphic profile of the peat below SP1 was obtained using a series of Kubiana tins that were hammered into the peat below the tree-stump. The depth of peat below the stump was 0.35m. The biostraigraphy was examined in the laboratory and is summarised below.

4. Analytical results

The SP2-3 stumps were found *in-situ* on inter-tidal peat but were severely eroded. The SP1 peat is considered here to represent the most complete area of peat which at other locations are suffering from scouring in this highly dynamic environment.

A biostratigraphic profile of the peat below the SP1 stump sample was constructed and a summary description of the peat prior to radiocarbon sampling.

Biostratigraphic analysis of the inter-peat below the SP 1 stump.

UNIT 1: 10YR 2/1 Black, very fibrous peat, with 90% organic remains, marsh reeds *(Fragmites communis)* it is highly compacted. Boundary between Unit 1 and 2 is faint and merging. (

UNIT 2: 10YR 2/1 Black main colour, 10YR 2/2 very dark brown subsidiary colour. Very fibrous compacted peat, 90% organic remains, marsh reeds. Boundary between Units 2 and 3 is faint but identifiable.

UNIT 3: 10YR 2/1 Black main colour, 10YR 2/2 very dark brown subsidiary colour. Very fibrous compacted peat, 90% organic remains, marsh reeds. Boundary with Unit 4 is sharp.

UNIT 4: 10YR 3/1 Very dark grey marine fluvial deposit underlying the peat. There is no mottling or banding within the unit itself. Unit 4 rests directly on top of gravel.

Tree-ring identification

Wood sub-samples were obtained from the SP1-3 stumps and frozen prior to thin sectioning for species identification. The species types are listed in Table 3. Two species of tree are represented and include *Quercus* (oak) and *Betula* sp (birch). Both are native to Scotland and common in Prehistory. Birch is a light demanding pioneer that can tolerate acidic damp ground and normally lives no longer than 150-200 years. Oak is tolerant of a wider type of soil and is at the apex of woodland species and has a slow rate of growth living up to and beyond 500 years.

During the tree-ring study, grab-samples of branchwood were identified from samples obtained from within and below the boat (Table 1).

Sample No	Summary description	Sample Location
SAMPLE 1	Highly compressed peat containing *Phragmites communis* (common reed) stems. Two fragments of small diameter branchwood extracted from the centre. Compressed, probably *Betula*.	Beneath boat c. 2m from prow
SAMPLE 2	10 hazel nut shells, 4 have rodent damage. 1 stake with two oblique facets forming a point. Abundant small twigs	Beneath boat between 1 to 2m from prow
SAMPLE 3	Gravel rich sample containing small branch wood, 1 fir cone	Beneath boat between 1 to 2m from prow
SAMPLE 4	Grey alluvial silt and sand with pea-sized gravel	Beneath boat between 1 to 2m from prow
SAMPLE 5	Alluvial sand and gravel	Beneath boat between 1 to 2m from prow
SAMPLE 6	Fragments of roundwood and hazel nut shells	Inside boat mid section
SAMPLE 7	Twigs with some identified as hazel	Inside end section of boat
SAMPLE 8	Alluvial sand and gravel	Inside end section of boat
SAMPLE 9	Large fragment of wood, 360mm x220mm x80mm identified as birch	Beneath end of boat
SAMPLE 10	Missing	Beneath end of boat
SAMPLE 11	Grey estuarine clay	Beyond end of boat
SAMPLE 12	Trunk wood identified as hazel, 160mm diameter encrusted with gravel and iron oxide	Part of a larger log beneath the boat
SP1	Birch tree stump resting on inter-tidal peat	c. 25m north-east of boat
SP2	Large oak stump with eroded inter-tidal peat	c. 30m south-east of boat
SP3	Small birch stump resting on shallow inter-tidal peat	C 100m south

Table 1 List of samples examined during laboratory analysis

Sample No	Sample type	Species	C14 Dating	Wet weight
1	SP2 tree-stump	*Quercus* sp	AMS	5.7g
2	SP2 tree-stump	*Quercus*	AMS	5g
3	SP3 tree-stump	*Betula* sp	AMS	6.8g
4	SP3 tree-stump	*Betula* sp	AMS	4.4g
5	SP1 tree-stump	*Betula* sp	AMS	4.7g
6	SP1 tree-stump	*Betula* sp	AMS	9.5g
7	SP1 middle peat	Peat undiff	Humic acid	4.2g
8	SP1 basal contact	Peat undiff	Humic acid	4g
9	Sample 1 (from within the peat below the boat)	*Betula*	AMS	1g
10	Hazel nut shell (in boat)	*Corylus avellana*	AMS	1g
11	Hazel nut shell (in boat)	*Corylus avellana*	AMS	1g
12	Hazel nut shell (below boat	*Corylus avellana*	AMS	1g
13	Hazel nut shell (below boat)	*Corylus avellana*	AMS	1g

Table 2 List of proposed radiocarbon dating samples, type, species and weight.

5. Recommendations for radiocarbon dating and diatom analysis

The following programme of works would be required to address the research questions listed in Section 2 above.

Wood and peat

Table 2 lists the proposed radiocarbon dating samples. In order to address the question regarding the age of the inter-tidal peat, it is proposed to obtain dates on all three tree stumps. The SP1 and SP3 stumps should have two replicate AMS radiocarbon dates in order to establish the age range between the two dates attained. The SP2 sample from the oak stump will require only a single date. This stump was on its side as it fell, but is certainly *in situ* and was surrounded by eroding tabular inter-tidal peat.

Peat (Units 2/3) and Estuarine silt, (Unit 4) below stump 1 (SP1)

Radiocarbon dates derived from the humic acid fraction from samples obtained from the middle of Units 2/3 and from the contact zone at the base of the peat column will establish its onset and development. A date on the contact zone between Unit 3 and 4 will also establish the terminus *anti-quem* for the deposition of an estuarine silt layer. The significance of this layer lies in the fact that it possibly represents a marine incursion observe elsewhere by Cullingford *et al* (1980) and was proposed to represent one of several marine transgressions that occurred before 6000BP. The date of the marine regression that effectively allowed the growth of peat would enable us to compare this event with Cullingford's sea-level model with much greater precision.

Environmental samples obtained from below the boat.

A sample of very compressed peat was recovered from below the boat and was found to be in the region of 5cm thick. Two fragments of branchwood have been identified as birch and suitable candidates for AMS radiocarbon dating. A date from the *in-situ* wood will provide reliable evidence on whether the peat below the boat represents an earlier hiatus when marsh conditions prevailed to be followed by a marine transgression which receded to allow the SP1-3 peats to form, or if both the peat below the boat and the SP1-3 peats are contemporary. There are two probabilities for the formation of the peat below the boat:

- Marsh conditions were followed by a marine transgression which receded to allow the SP1-3 peats to form;
- The peat below the boat and the SP1-3 peats are contemporary.

If the former can be proven to be true, then this would indicate that the boat had settled within a peat landscape that is much earlier than the Bronze Age.

Environmental samples obtained from within the boat

A collection of hazel nut shells and roundwood fragments were found at the mid-section within the boat. Several more rodent-gnawed shells were found beneath the boat. It would be desirable to determine if the shells in the boat represent contemporary Bronze Age food stuffs relating to the last use of the boat prior to abandonment.

Diatoms

It is recommended that a sample of the silt (Unit 4) be submitted to Dr Susan Dawson at the School of Environmental Sciences, University of St Andrews. The results will confirm

conclusively if the silt layer was formed in either full marine or freshwater/brackish conditions.

6. References

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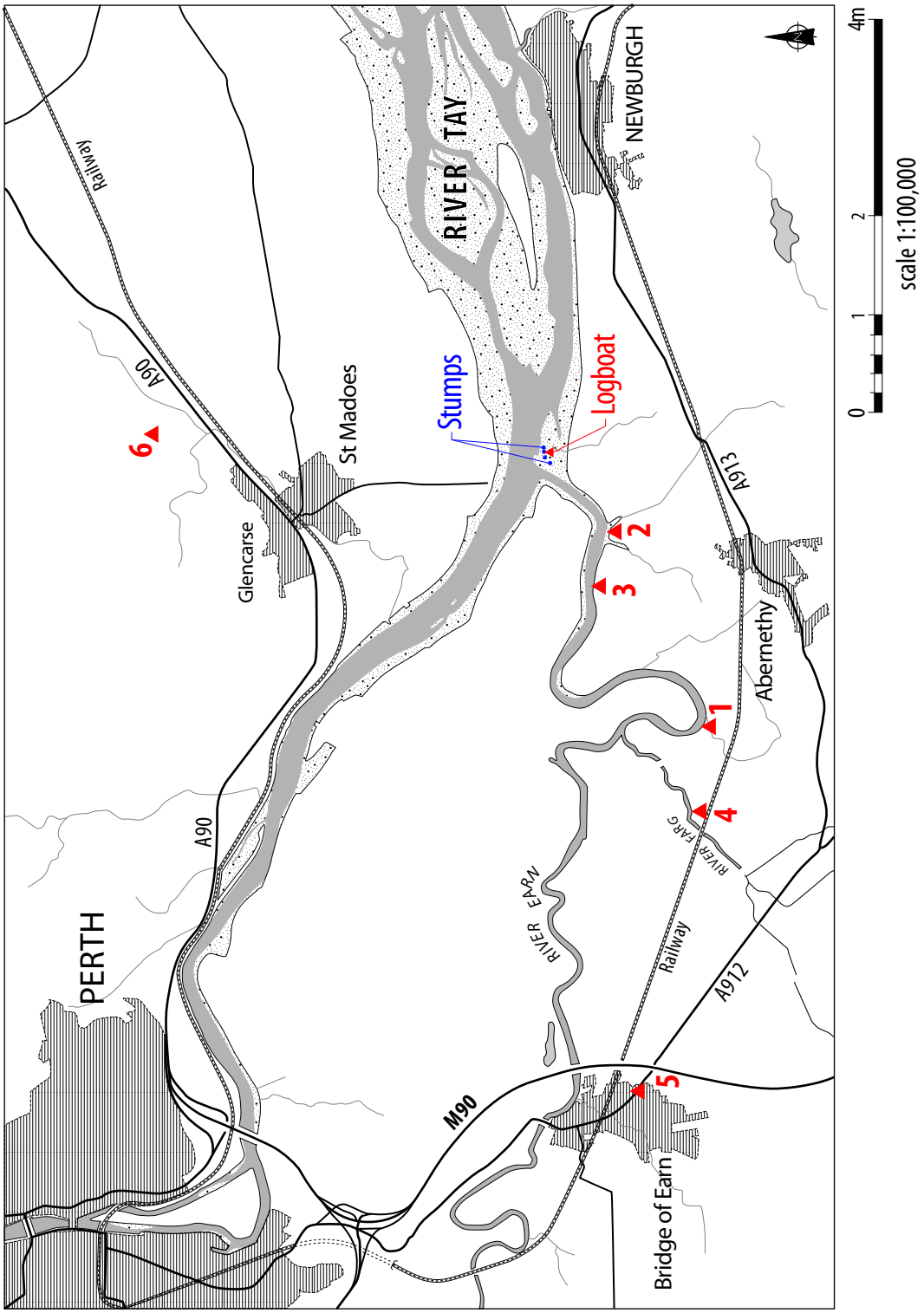

Fig 1. Location map showing the position of the Carpow log boat and the sampled tree stumps. No's 1-6 indicate the position of C14samples recovered by Cullingford et.al (1980)