

## STAMPING AND SMELTING AT UPPER MERRIVALE TIN MILL : PRELIMINARY RESULTS 1991 - 1993

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**Abstract:** This paper summarizes the results of the first three seasons of excavation by the Dartmoor Tinworking Research Group of a tin mill at Upper Merrivale in west Devon, which was abandoned in the years around AD 1700. Two multi-phase mill structures have been revealed, one of which contains the remains of a furnace for smelting tin.

### INTRODUCTION

The Dartmoor tin industry, which is documented from the 12th to the 20th century, has been studied since the 1860s. Sporadic fieldwork in the late 19th century was replaced by more systematic investigation, especially of mills, in the first half of the 20th century, by R. Hansford Worth (Greeves, 1981a). Since 1970, the industry has been the subject of more detailed archaeological and historical work (Greeves, 1981b; 1985; 1991; 1992; 1993. Newman, 1987; 1094).

With the establishment of the Dartmoor Tinworking Research Group in 1991, a vigorous new phase of study has, for the first time, combined field survey and excavation, concentrating on the Walkham Valley on western Dartmoor. The site chosen for excavation is a stamping and blowing mill where tin was crushed and smelted in the period before c.1700 (Figure 1). Only one other tin mill of this period has been excavated before, at West Colliford on Bodmin Moor in Cornwall (Austin et al, 1989). The latter was a stamping mill, with no evidence of smelting, so the excavations at Upper Merrivale are revealing an early modern south-western tin blowing mill for the first time.

### THE SITE AND SURVEY

The site lies right beside the west bank of the River Walkham, on open moorland within the parish of Peter Tavy, at an altitude of 1100ft (335m), National Grid Reference SX 55197664. About 750m to the south are the fields and farmhouse of Shillapark, a settlement almost certainly of medieval origin but with documentation so far traced back only to the mid-17th century (West Devon Record Office/796/22). The mill has been given

the name of Upper Merrivale, to distinguish it from two other blowing mills, known as Middle and Lower Merrivale which lie respectively 0.5 km and 1.3 km further down the River Walkham, on the opposite bank. All three mills have superficial similarities, suggesting approximate contemporaneity in their last phases. The presence of these and other mills even further down the valley added weight to the selection of Upper Merrivale for excavation, as it was felt that information gained from the latter would shed light on other milling activity in the Walkham valley. Besides excavation of the Upper Merrivale site, a programme of fieldwork of all tinworking features along the 19 km length of the Walkham valley watershed has been initiated.

Detailed earthwork survey of Upper Merrivale in the Spring of 1991 revealed a complex site, consisting of at least two wheelpits associated with two major structures, Mill A and Mill B (Fig 1). Within one of the structures a fine granite mouldstone for casting ingots of tin was clearly visible, as was a mortarstone on which tin ore was crushed under stamps. Half of another mouldstone was visible in the river, and tin slag was noted above Mill A. A terraced dressing floor, apparently with two phases of settling pits or buddles cut into it, was visible upstream of Mill A, and a larger terraced area downstream also appeared to be a likely dressing floor. Clear earthwork evidence of at least one leat leading to the site was visible, as was an apparent triangular hollow identified as a reservoir. Another leat appeared to lead from the mill down the valley beyond Shillapark.

In summary, the field evidence alone showed the site to be multi-phase, which was another reason for its selection for excavation. The site also appeared to have been left relatively undisturbed since

abandonment, with little or no stone robbing. The River Walkham has eroded part of the site, and will continue to do so over a relatively long time scale, which adds a 'rescue' element to the project. The site is a Scheduled Ancient Monument (Devon 969) and Scheduled Monument Consent has been obtained from the Secretary of State for the Environment for the work to be carried out.

### THE HISTORICAL CONTEXT

The Dartmoor tin industry reached a well-documented peak in production in the first half of the sixteenth century, thereafter gradually declining to a low point in the mid-17th century (Greeves, 1992). There was a relative revival of activity at the end of the 17th century which lasted into the early years of the 18th century (Greeves, 1981). Before excavations began, our expectation was that Upper Merrivale mill was most likely to belong to the 16th century, and perhaps the early 17th century. This reasoning was based on its remote location, and also because we believed that the late 17th century renewal of tinworking activity was most likely to have been focused on the fringes of Dartmoor in the highly mineralised zones around Tavistock, for example, where deep shaft mines were operating.

### THE EXCAVATIONS

Since 1991 three seasons of excavation have been completed, totalling nine weeks of work in all. The first two seasons were co-directed by Dr Sandy Gerrard and Dr Tom Greeves, but the 1993 season was under the sole direction of Dr Tom Greeves.

Work so far has concentrated on the two mill structures, A and B. A considerable amount of stone tumble from walls and, in the case of Hill A, from a possible furnace chimney, has had to be cleared. Some limited work has been done on leats and other features around the mill structures.

Within Mill A (Fig. 2), clearance of tumble revealed a structure measuring approximately 11m x 4m internally. The key internal features are:

- i) a mouldstone, almost certainly *in situ*
- ii) a furnace structure
- iii) a bellows platform, with post-holes
- iv) internal channels leading from a presumed stamping area
- v) a stone-lined pit of unknown function

Outside the mill, on its upstream side, is a wheelpit which was the energy source for the machinery (both stamps and bellows). It is clear that the surviving walls of Mill

A have been rebuilt, at least on the east and south sides. The wall against the wheelpit contains at least one mortarstone well-buried within its structure. Several discarded mortarstones were found in the tumble from the walls, almost certainly indicating that they, too, had once been built into the walls.

The furnace, which had collapsed inwards, probably due to the destruction of the supposed chimney, had been built against a massive granite boulder, at this stage presumed to be *in situ* and natural. This boulder formed the back of the furnace. The side walls of the furnace were formed by two large granite slabs. The front of the furnace as excavated was open. Within the furnace a lining of fire-hardened clay appears to have formed the outer skin of the furnace itself. The clay lining was continued up the back of the furnace and over the lip of the massive natural boulder. The upper part of the furnace lining had collapsed and was mixed with small pieces of killas (a local slate) which may have come from a roofing structure.

At the upper end of Mill A is a raised and levelled platform, containing evidence of four post sockets which are interpreted as supports for a pair of water-powered bellows to create a forced draught for the furnace. In 1993 excavation established that this platform was made of redeposited material including broken pieces of slagged and vitrified stone which almost certainly represent furnace lining from an earlier furnace structure.

There is evidence of three channels, set at different levels, running from the upper end of Mill A. Each channel is likely to have been originally stone-lined and stone-capped, though only one still had both its lining and capping intact, which has parallels with a similar channel found at Colliford (Austin et al, 1989, p101-3). Like the Colliford example, this channel was found to be full of sediments which have been sampled. All three channels are interpreted as having come from at least one stamping pit predating the existing furnace in Mill A, and which was probably sited under the later bellows platform, though at this stage this remains a working hypothesis.

The stone-lined pit on the west side of Mill A is a relatively late feature as it cuts across the uppermost stone-lined channel. On excavation it was found to be clean and empty, so its function is unknown. However, it would appear to be contemporary with the last smelting phase, and may have been used for washing ore or charcoal before loading into the furnace.

Mill B was powered by a waterwheel set outside its upper gable end. Overall

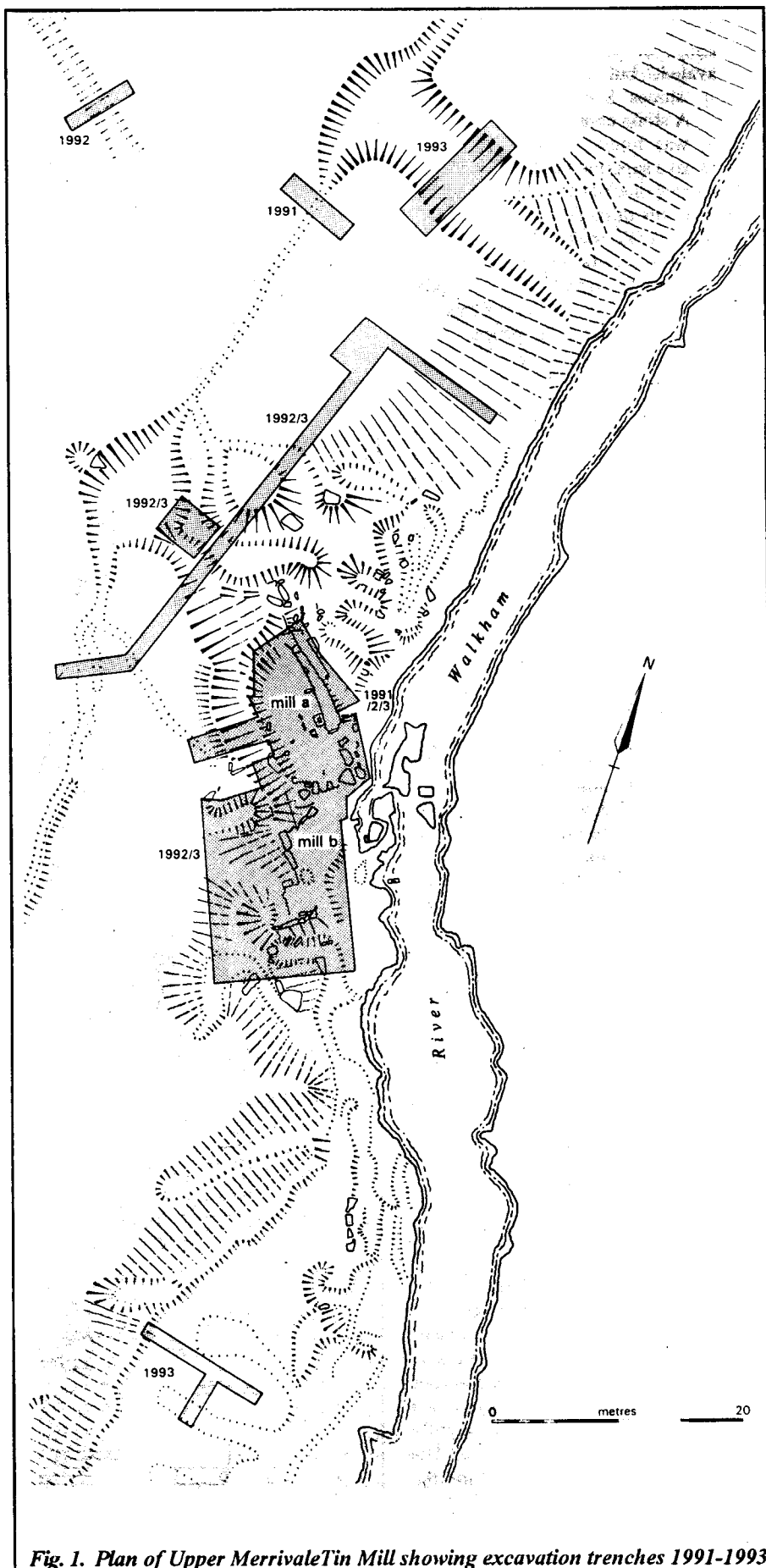


Fig. 1. Plan of Upper Merrivale Tin Mill showing excavation trenches 1991-1993.

dimensions of Mill B are of a sub-rectangular building measuring approximately 7.5m x 2.8-3.5m (Fig. 3). At the lower end of the structure is a substantially built recess, internally approximately 1.5 x 1.3m, which is tentatively identified as a domestic hearth. At the upper end of Mill B is a stamping

area, which still contains a mortarstone apparently *in situ*. This is as yet unexcavated, but it appears to have packing stones keeping it wedged in position. A stone containing a small open bearing was found nearby, and this is likely to have supported the extended axle of the stamps mechanism. Above the mill are three heaps of more or less uniformly fractured quartz rock. These are piles of tin ore (cassiterite) apparently broken by hand in preparation for feeding under the stamps. Their presence confirms that the mill was intended to process lode material, from sources as yet unknown.

The nature of the walls of Mill B suggest considerable rebuilding here too, with large granite boulders superimposed on to a base of earlier and smaller drystone walling. There is some evidence to suggest that the irregular shape of Mill B in its present form may be a response to erosion of an earlier structure by the river.

Tin slag has been found in all parts of the site, some of it finely crushed, presumably under stamps for resmelting. Peat charcoal, which was a primary fuel for smelting, has also been found. Small quantities of medieval pottery have been recovered, most interestingly outside the lower end of Mill B, so clearly there was a medieval presence on the site. It is not yet known whether this relates to tin streaming predating any mill on the site, or whether it is an indicator of an earlier mill structure. The bulk of ceramic evidence so far recovered, including the presence of clay tobacco pipes, puts the last phases of both mills in the late 17th or possibly early 18th century.

Fig. 4 is a reconstruction drawing of the mill complex in its last phase, showing the bellows-driven smelting furnace in Mill A, and the stamps in Mill B. Note also the ore dumps above Mill B.

## CONCLUSION

There is still much to learn from the site. We know there is an earlier stamping phase at the upper end of Mill A, perhaps under the raised bellows floor. We also know that there was at least one earlier smelting phase, on account of abandoned and re-used mouldstones of a slightly different design to the one *in situ*. The presence of furnace lining within the material used to create the bellows platform suggests the possibility of an earlier furnace in a different location.

The dressing floors have yet to be explored - the upper one will be tackled in 1994. The destination of a large leat running around the back of Mill A is as yet unknown. A length of this leat is

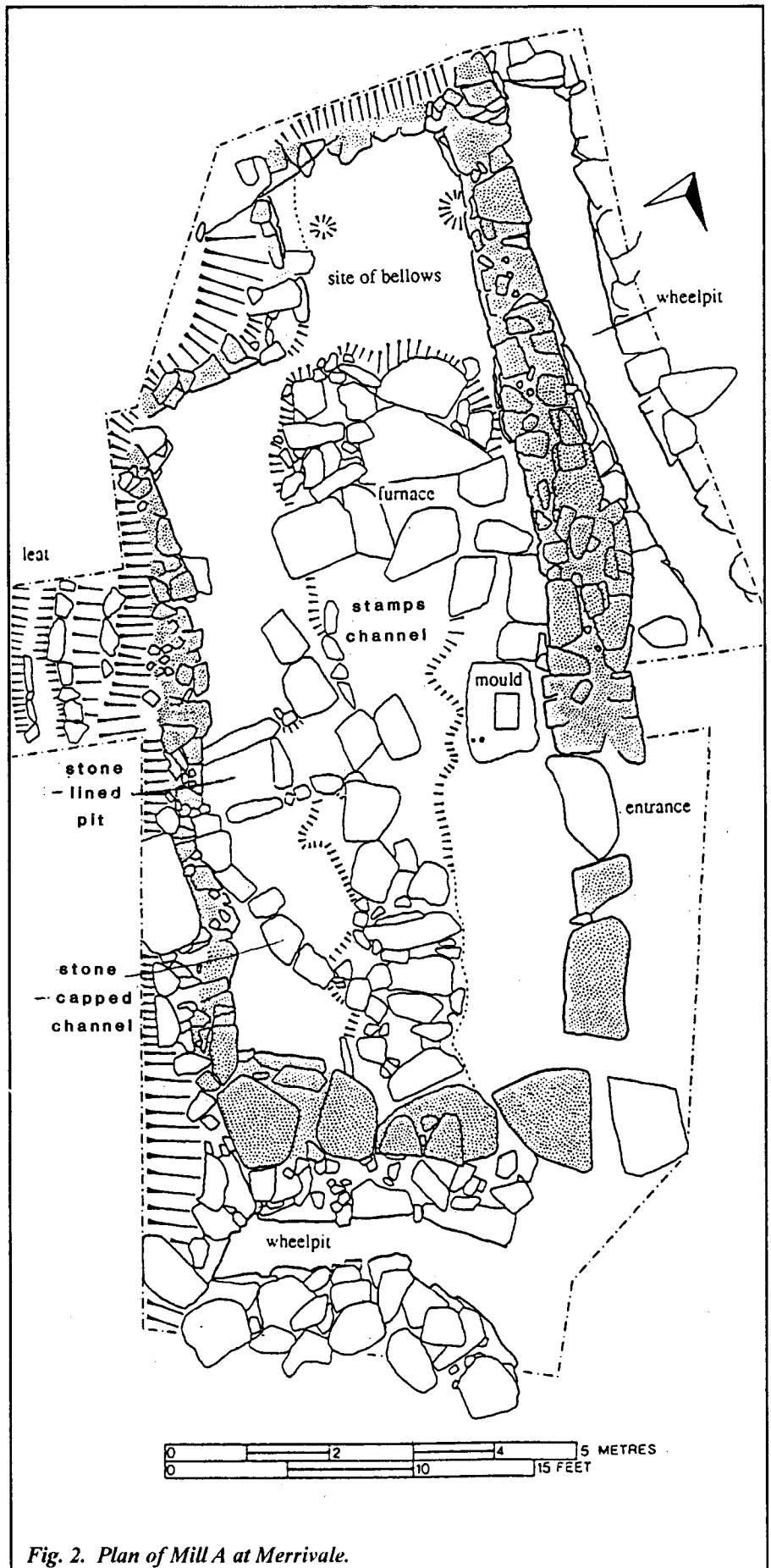


Fig. 2. Plan of Mill A at Merrivale.

shown on Fig. 2. Much work still remains to be done on detailed survey of associated features in the wider landscape of the

Walkham valley.

The relatively late date of the late phases

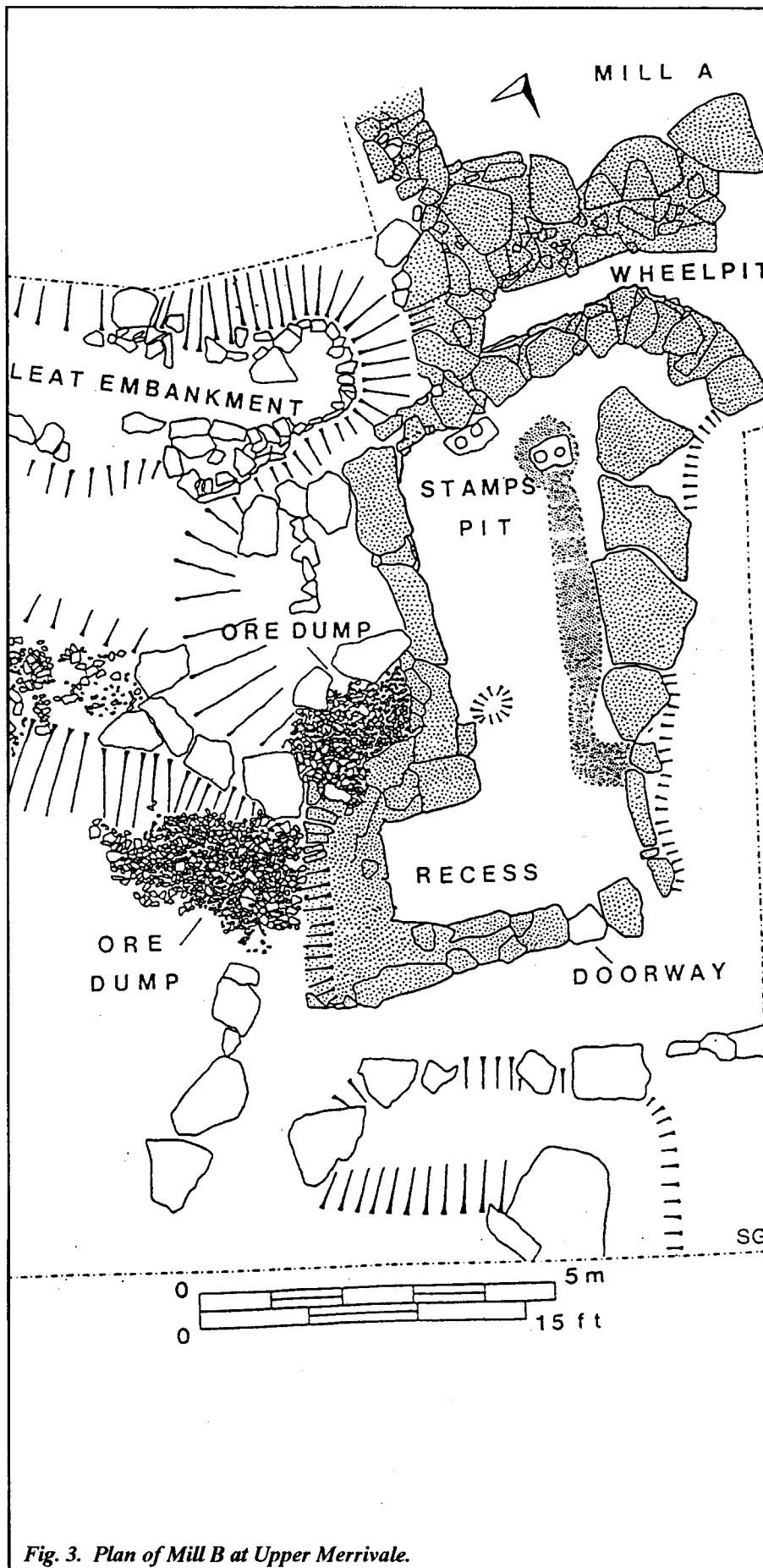


Fig. 3. Plan of Mill B at Upper Merrivale.

of the mill has come as something of a surprise, though Tavistock stannary, within which Upper Merrivale is sited, was the most active of the four Devon

tinworking districts at this time (Greeves, 1992 p46). If late 17th century and even early 18th century tin smelting was still being carried out this far into the moorland

of Dartmoor, the implication is that ore was being raised from even more remote locations. So we now have to consider a larger scale of tinworking activity on moorland Dartmoor around 1700 than had previously been thought.

The similarity of the two nearest mills to Upper Merrivale implies that they, too, in their final phases might be late 17th century in date. The obvious question to ask is where were the 16th century and earlier tin mills located? If on the same sites, then we should find evidence in our excavation at Upper Merrivale. If elsewhere, then detailed field survey may provide the answers.

For the first time, archaeological light is being shed on early modern tin smelting and ore processing in Devon. Regular summary reports of progress are published in the twice-yearly Newsletter of the Dartmoor Tinworking Research Group. Comparative excavated material is slight, though we do have the advantage of the published report on the West Colliford tin stamping mill in Cornwall which was abandoned in the early 17th century (Austin et al, 1989). Upper Merrivale mill and its wider landscape context are beginning to reveal a wealth of new information. Detailed analysis of slag, pottery and sediments should prove very rewarding, as will further excavation and field survey work.

#### ACKNOWLEDGEMENTS

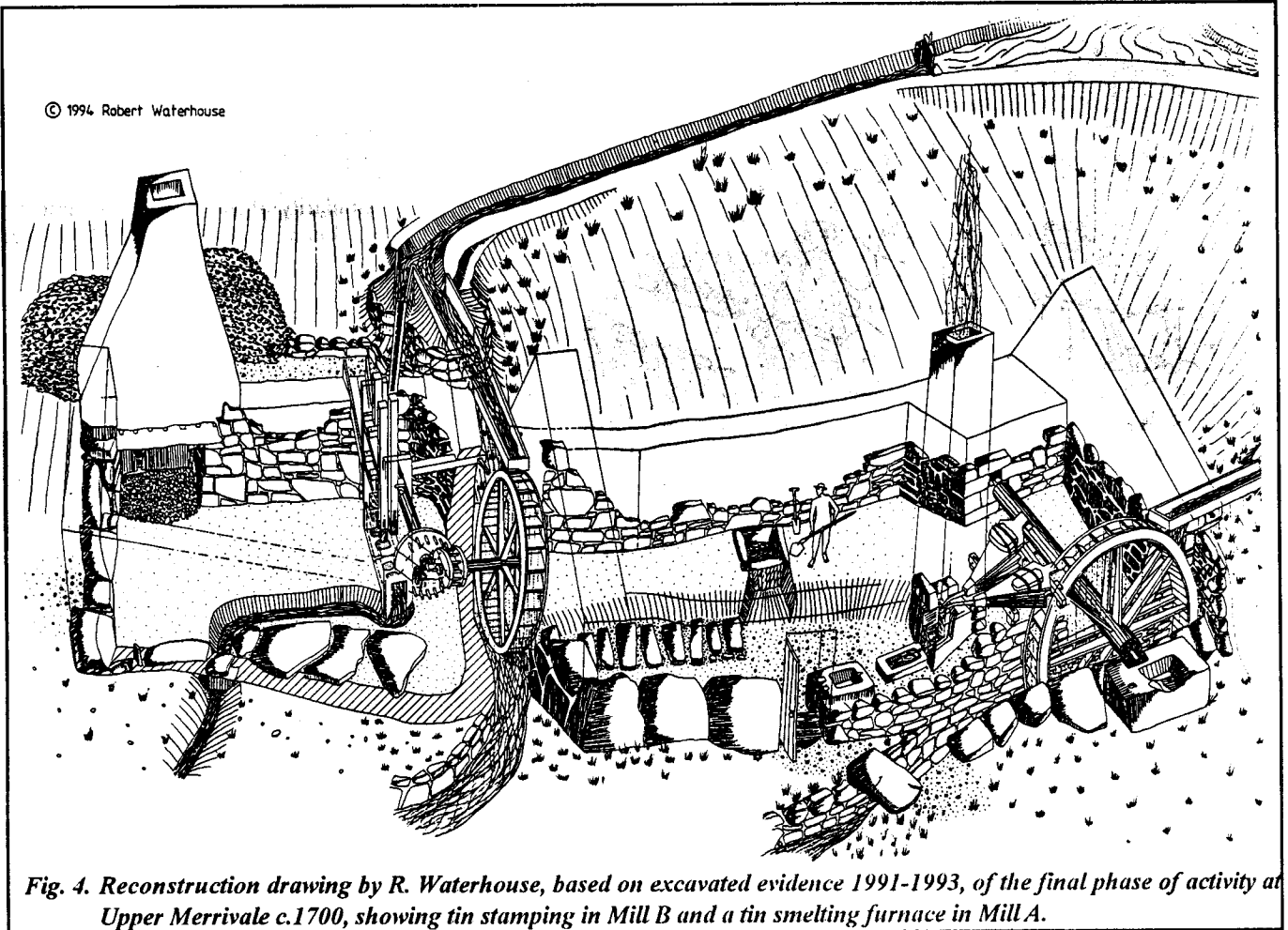
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**Fig. 4. Reconstruction drawing by R. Waterhouse, based on excavated evidence 1991-1993, of the final phase of activity at Upper Merrivale c.1700, showing tin stamping in Mill B and a tin smelting furnace in Mill A.**

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