

Ironworking in the Blackdown Hills: Results of Recent Survey

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Abstract

A recent programme of investigation into early ironworking in the Blackdown Hills is discussed. The origins and subsequent development of the project is given and fieldwork methodology is summarised, including the use of documentary evidence, aerial photographic reconnaissance, field investigation and geophysical prospecting. Much new evidence has come to light as a result of the survey, encompassing extraction and smelting. The results demonstrate ironworking to have been carried out here as early as the Roman period, continuing until the middle ages. A strategy for future investigation of this area is also proposed.

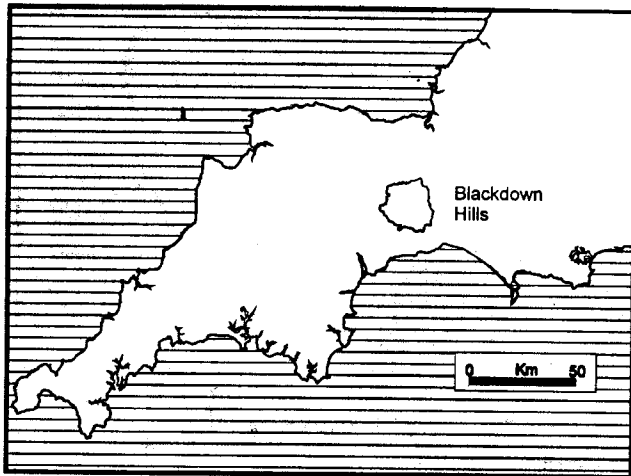


Fig.1. The Blackdown Hills. Location.

INTRODUCTION

This paper provides an introduction to and summary of the Blackdown Hills Ironworking Project, which is jointly organised by Devon County Council Archaeology Service and Exeter Archaeology. The project is still at a preliminary stage and our knowledge of the ironworking industry in the Blackdown Hills is still expanding. However, the following is intended to provide an outline of the origins of the project, the methods used and the different types of evidence used to demonstrate the nature and extent of the industry. This discussion is non-technical and deals mainly with the archaeological and historical aspects of the survey. The approach to the survey has from the outset sought to be comprehensive. It has employed a variety of techniques including field survey, aerial photography, documentary and cartographic research, palaeoenvironmental study and geophysical survey.

THE BLACKDOWN HILLS: TOPOGRAPHY AND GEOLOGY

The Blackdown Hills occupy an area of some 400km² in the south-eastern corner of Devon and the south-western corner of Somerset. The study area is bounded approximately by the towns of Wellington, Honiton, Axminster, Chard and Taunton (Fig. 2). The hills rise to a height of over 300m in the north-east although the flat-topped plateaux on the Devon side are generally no higher than 250-270m. The natural extensions of the Blackdowns, the long dissected ridges which reach the coast of east Devon around Sidmouth and Seaton, add to the overall distinctiveness of the landscape,

which is unique in southern England (Plate 1).

The character of this landscape is determined by that of the underlying geology, the key factor in the location of the industry. The area is dominated by the outcrop of Upper Greensand which creates the characteristic long level plateaux described above. The Greensand is in places capped by a thin layer of clay with flints and chert and is underlain by impermeable Keuper Marls. To the south the Greensand has been eroded into long, finger-like ridges separated by deep combs and valleys. The work carried out so far suggests that the iron is located in the upper levels of the Greensand. The plateau is dissected by the valleys of the rivers Sid, Otter and Axe which extend to the south coast.

ORIGINS OF THE PROJECT:

1992-3 Blackdown Hills ESA Survey

In 1992-93 a preliminary archaeological survey of the area of the Blackdown Hills Environmentally Sensitive Area (ESA) in Devon and Somerset was commissioned by English Heritage (EH) at the request of Devon and Somerset County Councils. The study area for the preliminary survey was based on the Blackdown Hills Area of Outstanding Natural Beauty as designated in 1989. The survey was commissioned as a result of the proposal to designate the Blackdown Hills an ESA. This designation, with its requirement for management plans, highlighted the lack of archaeological information on the area, particularly on the Devon side where archaeological survey had previously been seen as a priority for many years and a number of proposals for survey had been put forward by the County Council.

The starting points for the survey were the data from the county Sites and Monuments Registers, a rapid transcription of vertical aerial photographic cover, cartographic and selective documentary research. The latter included a systematic search of field names to identify sites of potential archaeological interest using the mid-19th century tithing apportionments for the parishes of the area. The rapid field survey, which was all the project funding permitted, was directed toward previously known sites and those identified by the desktop survey as having archaeological potential. Very little primary prospective survey, in the form of fieldwalking, could be carried out within the parameters of the project. However, the fieldwork element received important assistance from local farmers and landowners who proved to be a fund of valuable local knowledge.

The survey provided much new evidence for the ironworking industry in the Blackdowns but at the same time



Fig. 2. An extract from the Ordnance Survey 1st edition 1" map (amended 1883), which admirably illustrates the topography of the Greensand plateaux.

area. The farmer or landowner was also asked about the locations of any known findspots of ironworking material, samples of slag and ore being carried by the fieldworkers to initiate discussion. Inquiries were made as to the location of any earthworks, such as pits or mounds, either on their land, or nearby. If access was granted to the site, examination of bare areas, in pasture, was made to recover slag, ore etc. If the field was recently ploughed, or harvested, it would then be systematically fieldwalked, and representative samples of any ironworking debris would be collected.

Geophysical prospecting

In addition to visual observations, a magnetic susceptibility meter was used in a prospecting role to determine the extent of any ironworking site in selected pasture fields. This was also used to investigate the locations of slag findspots, to establish whether they were indicative of substantial slag dumps and associated smelting sites or were just isolated fragments derived from work such as pot-hole repairs. Magnetic susceptibility measurements for the upper 0.2m of soil in areas away from known iron-smelting or extraction sites was between 1 > 20 units, in the vicinity of iron extraction pits 40 > 100 units and near iron-smelting sites the soil's magnetic susceptibility is enhanced for decametres around the site giving readings from 100 > 900 units. The magnetic susceptibility meter proved invaluable in determining the extent of smelting sites under pasture.

Aerial photographs

In 1994 the 1947 RAF vertical air photo collections for Devon

and Somerset were re-examined to identify quarries, pits, spoilheaps and other surface irregularities. This search produced some 40 new sites which were not recorded in the original ESA survey. The sites recognised included other significant earthworks and mounds. The RAF photographs were particularly useful in identifying areas of former iron extraction pits which had since been reclaimed and improved. (It is worth noting that these features had been subliminally edited out by the specialist air photo contractor who had carried out the transcription for the ESA survey.)

Documentary sources

Only selective documentary research on locally available material has so far been undertaken on the project, the major resources having been concentrated on fieldwork. The main primary sources which have been consulted include the earliest detailed available maps, namely the mid-19th century parish tithes maps and apportionments and the 1st edition Ordnance Survey 6" and 25" series maps.

All the Blackdown Hills parish apportionments were searched for names which were indicative of potential ironworking or associated activity. Searches were made of the Devon and Somerset Record Offices' indexes for any direct references to ironworking activities in medieval or later sources. More detailed checking of manorial court rolls and rentals was carried out for a few east Devon manors where the material was available.

The secondary sources which were examined included all locally available antiquarian writings, such as county histories and travel diaries. Particular attention was paid to those with



Plate 1. The Blackdowns landscape. Dumpton Hill in the centre of the photograph is occupied by an Iron Age hillfort.

a detailed knowledge of the area such as Peter Orlando Hutchinson and James Davidson. The publications of the Devon and Cornwall Record Society and Somerset Record Society were examined as they contained useful indexed collections of medieval documents.

THE EVIDENCE FOR IRONWORKING

Evidence for the production and extraction of iron in the Blackdown Hills had been noted since the 19th century and chance finds of slag had been discovered in succeeding years, sometimes in large quantities (Hutchinson 1872). Even so, little documentary evidence for this activity survives and a general lack of fieldwork in much of the area had led to the subject being neglected and sometimes dismissed (Downes 1882; Harris 1930-1). More recent fieldwork undertaken by local researchers such as the Chard History Group, and Robin Stanes (1978) had pinpointed a number of new individual findspots. The ESA survey allowed for an initial overall perspective of the industry. It demonstrated that primary iron processing had been carried out at a number of separate sites within the area, exploiting the abundant timber resources of the Hills, and the hitherto unrecognised ore sources. The ore was quarried from extensive areas of shallow, surface pits on the Greensand plateaux. Some of these survived in excellent condition until modern times but many areas have been reclaimed in the past fifty years (see below).

Slag finds

The majority of the evidence for ironworking came in the

form of finds of distinctive tap slag. This material was found to be widely distributed all over the Blackdowns from Hemyock in the north to Chardstock in the south. The larger pieces display a glossy, rippled surface produced by the hardening of successive flows of molten slags from the base of the furnaces. The main type of slags encountered were dense fayalitic (iron silicate) tap slags, which would have been tapped from the furnace in a fluid state. The method of ironworking indicated is, to a certain extent, a reflection of the type of ore available. Siderite (carbonate) ores are self-fluxing, which means that they have the correct proportions of calcium, alumina and silica to form a free-running slag. This process was used mainly in the Roman and medieval periods, but there is some evidence for slag-tapping also in the prehistoric period.

Local farmers provided some of the best sources of information relating to the location of slag. Several were able to point to the location of slag deposits which they had seen during the course of their working life, but which they had never considered to be of any interest or historic value. They frequently used the material to infill pot-holes and resurface farm tracks and it was often dumped in field entrances or other soft ground. [The extensive 'recycling' of slag has meant that a certain amount of caution has to be used in attributing significance to the findspot. Only relatively dense concentrations of unabraded material may be considered indicative of the presence of a nearby smelting site and figures given below for site identification use this stringent criterion. They may thus be taken as minimum figures.]

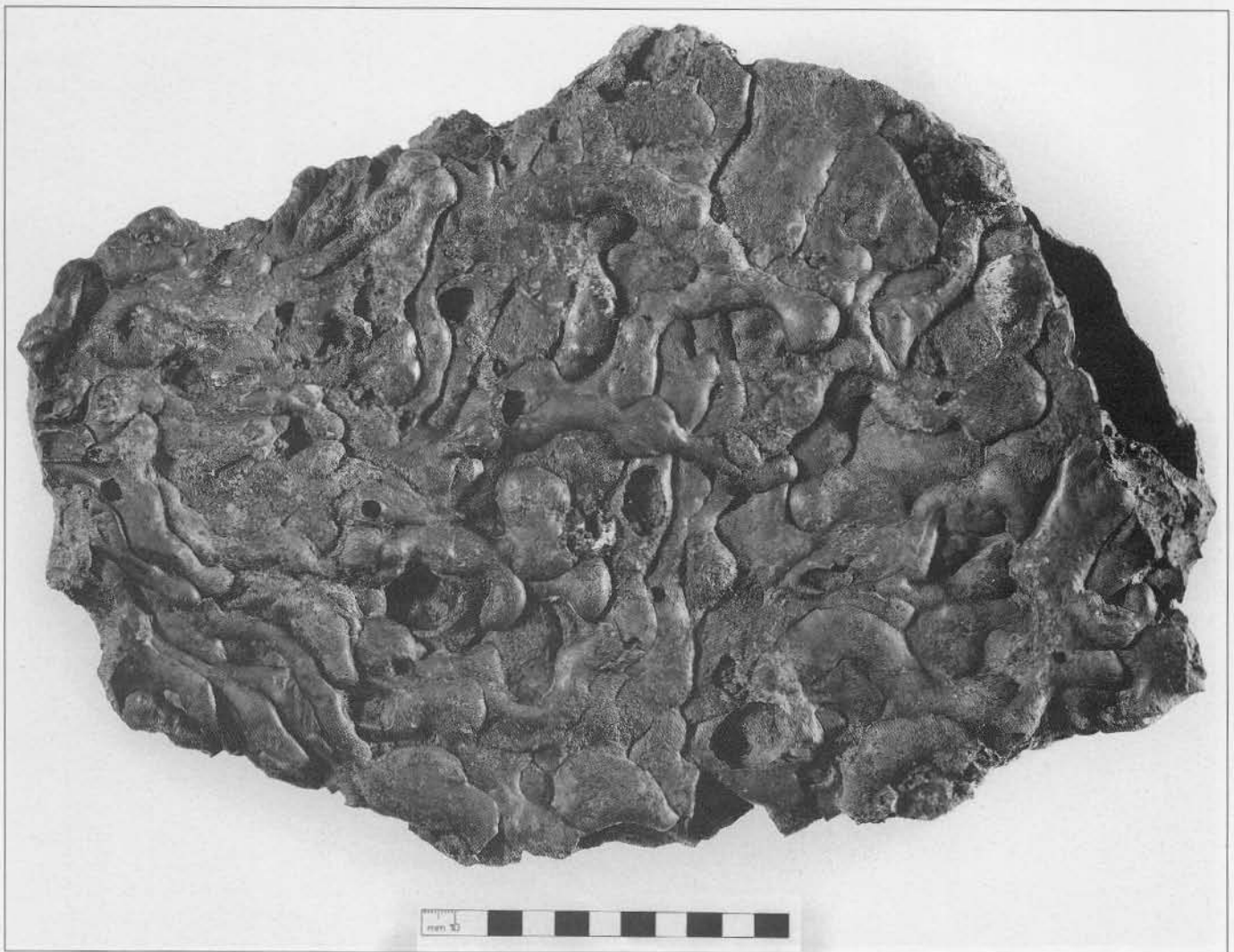


Plate 2. This exceptional find, the largest tap slag fragment found so far, was recovered from a ploughed field in Upottery parish.

Larger pieces of tap slag are quickly broken down by ploughing. The largest piece so far recorded was 370mm by 270mm in extent, 65mm thick and weighed 8.84kg (Plate 2). This exceptional find came from a smelting site in Upottery parish which had only recently been disturbed by the plough.

Slag fragments have been used as building materials in various contexts. The earliest known example of this is the 14th century fabric of the walls of Hemyock Castle (Blaylock 1989, 2). This context also provides some rare indirect dating evidence for the ironworking operations in the Blackdowns. Perhaps the most impressive example of the use of ironworking debris is at Mountstephens Cottage, Luppitt, where it was used extensively as a decorative material in a porch extension built in 1932. This demonstrates how readily available the material was in the past.

Smelting sites (slag mounds)

Some very significant primary smelting sites, identified as substantial surviving slag mounds, were located, particularly in the parishes of Yarcombe, Hemyock and Upottery. One of the largest known sites was formerly in Hemyock parish; this was unfortunately levelled and cleared away in living memory. It is estimated to have been some 30m long 12 wide and 2.5m - 3m high. It could have contained between 500 and 1000 tonnes of slag, and was thus as large as any bloomery slag mound in Britain (Crew 1993). The mounds have produced a range of finds as well as tap slags, including furnace bottoms, furnace lining, ores and possible smithing slags. This demonstrate the enormous archaeological potential

of the features, particularly in relation to the development of ironworking technology. Land use in the vicinity of these features is of a pastoral nature and therefore there is a good chance that structural features including furnaces may be well preserved.

The limited distribution of sites so far recorded suggests that they were located away from the ore sources on the plateaux but probably closer to the timber stands on the upper valley slopes (but see below). Further mounds undoubtedly await discovery. The prevalence of pasture makes their identification more difficult, as fresh slag fragments are not exposed to view. To this end magnetic susceptibility survey has been used successfully to distinguish extensive spreads of slag from isolated finds. In addition the close observation of the sides of streams, animal burrows and other available exposures has proved a valuable though random source of additional information.

Extraction pits

The evidence from the fieldwork and historical research at this stage suggests that the iron ore had been extracted from sources within the Greensand belt. The locations of the known quarry pits are all within the level ground on the plateaux surfaces. Unfortunately these sites are the ones most likely to be reclaimed by landowners, as the pits are frequently infilled and the spoil heaps razed to create usable pasture (see Plate 3). Fortunately the earthworks associated with the pits were noted by early antiquarians, although their interpretation of the features, as 'British' dwellings was somewhat wide of



Plate 3. Aerial view of the iron extraction pits at North Hill Common. The abrupt change at the boundary line in the top left-hand corner represents the limit of reclamation, the pits originally continued well beyond this line (F.M. Griffith DCC, 1993).

the mark (eg Lysons 1822, cccliii). Davidson (1861, 49) recorded the presence of 'cinders and scoriae found near them' in such large quantities 'as to have been used for making roads'.

The observations of the French geologist de Luc, who visited the area in the early part of the 19th century, are of great interest as they seem to contradict the conclusions about the location of smelting sites noted above. He was shown some iron pits by General Simcoe who lived at Wolford Lodge, Dunkeswell. De Luc observed that the upper strata of the Greensand in some places contained 'ferruginous concretions, fragments of which have been spread over the surface'(de Luc 1811, Vol. III 23). He concluded that, because of the presence of 'heavy blackish stones and scoriae' within the pits, the ore was smelted on the spot. However, during the recent phases of fieldwork no finds have of slag or other debris have yet been made in the vicinity of the pit sites.

The best-preserved iron extraction pits are centred on Downland Plantation, Kentisbeare, across the road on North Hill, Broadhembury, and just to the north-east at Blackdown Plantation, Sheldon. They are preserved within conifer plantations at Downlands and Blackdown Plantations and are still extant on common land at North Hill Common (Plate 3). In areas identified as pitted by iron extraction on aerial photographs which are now pasture, the sites ranged from featureless pasture, (e.g. Hackpen Hill) to undulating pasture with discernible infilled pits. The diameters of the pits vary

considerably, even within close proximity to one another. The smallest are between 2.5m and 5m across, but pits with diameters of 10m or more are visible at North Hill. The surviving depressions here are up to 2.5m deep, suggesting a very substantial original depth. However, opportunistic recording undertaken by Bill Horner (DCC) and Stephen Reed (EA) during forestry work in Downlands Plantation did allow some observations to be made. A pit just over 2m in diameter was excavated to a depth of 0.5m. The fills of the pit were surprisingly compact, with silty clays. No slag or other ironworking debris was encountered, although charcoal was present. Augering within the base of the trench reached a depth of only 3.1m, which may indicate the original depth of the excavation for iron ore. The excavation of a sample of pits is seen as a priority for the next phase of work.

Woodlands and charcoal-burning

The characteristic Blackdown Hills landscape nearly always includes a zone of woodland on the steeper slopes of the Greensand scarp. This should have provided an ample supply of fuel for the iron smelting furnaces. However, very little, if any, evidence has so far been forthcoming for associated charcoal burning sites in the Blackdowns. The areas visited included plateau, hillside and valley floor woodland. On the steepest scarp slopes conifers have often been planted in recent years. Within these plantations, with the exception of those on the plateau above Blackborough, the ground had been prepared for planting, either landscaped and flattened

or ridged and furrowed, to such an extent that any earthworks have been destroyed.

Many of the hillside woods were overgrown quarry sites or fields situated along the spring-line making them very wet. In both cases they are largely unusable and left to nature. The lower hillside and valley floor woodlands visited were generally neglected marshy areas, presumably because of their marginal potential for farming.

Documentary sources

Selective documentary research undertaken during the various phases of the project did not produce any direct information about the operation of the industry in the medieval period. However, some limited references in secondary sources suggest that the industry may have been under the supervision of the monastic houses in early medieval times. Two murderous Welsh metal founders were recorded as being under the control of the Abbot of Dunkeswell in 1238 (Summerson 1985, 21). Perhaps the most interesting aspect of the documentary research is the indirect evidence it provides for the importance and value of iron. Bickenhall and Whitestaunton in Somerset are both recorded as rendering blooms of iron at the time of the Domesday survey (Darby 1977, 360). In Chardstock parish, iron was used as an alternative to money payments for rents even in the 15th century (Roger Carter, *pers comm*). In addition there is some evidence to suggest that the cinders (or slag) were valued in their own right. An account of the manor of Honiton for 1288 includes money for the purchase of iron and cinders (Coxhead 1970, 173) and 14th and 15th century rentals of the manor of Yarcombe include annual payments for *syndergavell* (DRO Ref: CR1429 - 1460).

No parallels for this have so far been found either in Devon or further afield. It presumably represents a money payment for gathering cinders, possibly to re-use in the furnace or for general purposes such as hardcore. These references give some idea of the vast amounts of waste slag in the area at the time, and consequently of the enormous scale of the industry which must have generated it.

Place-names and field-names

There is little evidence for ironworking from the major place-names in the area, although the name Blackdown itself, recorded in the 13th century, may possibly have originated at a time when the landscape was more 'industrial' in character. The most profitable sources of information have been the field names extracted from the mid-19th century tithing apportionments for the Blackdowns parishes. These were searched for any names with the elements such as cinder, ash, or black which were potentially indicative of smelting sites. Names such as pit, burrow or ridgy were likely indicators of former quarrying or digging for iron.

As part of the 1994-5 project a search was made of the Devon Record Office to identify possible medieval documentary material. Clayhidon was one of the parishes which was anticipated to be of potential interest. The

programme included a search of uncatalogued records in the DRO DD series which contains miscellaneous family and estate records. Few medieval records were located, the only substantial collections of court rolls being of 16th-century or later date. Abstracts were made of 16th-century court rolls of the Dinham estate which included parts of Hemyock and Clayhidon. These contained useful place-name references in Clayhidon such as pitland, pitts, pitmeade; smethez or smethes; aishefielde and blackland. These will require further research to identify their location more precisely. In all these cases the place-names refer to the past uses of the fields in question: many of the pit fields were actually under arable cultivation indicating that the quarrying activity had ceased a long time ago.

The paucity of medieval documentary references to the industry identified during the documentary searches has therefore suggested that an earlier date was likely, for at least some of the sites.

Palaeoenvironmental deposits

The fieldwork stages of the project included the identification of sites of palaeoenvironmental interest, particularly peat deposits. Such material should provide valuable information about the environmental impact of ironworking. Only one peat deposit, at Aller Farm, Stockland, has so far been excavated and sampled as part of a separate project (Hatton & Caseldine 1991). Pollen from this site did not reveal any substantial evidence for dramatic environmental change, but it is only one small sample from one area of the Blackdowns and further research is required. As peat deposits accumulate they trap pollen and, in some cases, atmospheric debris. X-ray dispersion combined with chemical analyses can identify horizons within the deposit which contain higher than normal levels of iron and pollutants produced by smelting, which themselves often travel long distances. These horizons can be dated by radiocarbon assaying and if the deposit covers a substantial period of time episodes of smelting may be identified and placed in a chronology. During the course of fieldwork one deep peat deposit was encountered at Bywood Farm, Dunkeswell; the nature of the deposit here suggested that it had accumulated over a long period of time.

DATING EVIDENCE

Trial excavation

During 1994 as part of the DCC-funded survey small-scale trial-trenching was undertaken at Upottery on a site which contained an extensive slag heap which was being eroded by continuous ploughing. The excavations located a substantial quarry pit adjoining the main slag spread, which had been infilled with dumps of ash and slag fragments. Pottery from these layers produced a date in the second half of the 1st century AD (c. AD 50 - 70), within the date range of the occupation of the legionary fortress at Exeter. This was the first conclusive evidence that ironworking was of Roman date and indicated Roman military exploitation of the industry, and perhaps the whole Blackdowns area, in the 1st century AD.

Sample No.	C14 Age (years BP)	Callibrated Age 2σ	Site
BDH.HIS 547 529	1,260 ± 50	AD 664 - 889	Dunkeswell
BDH.HIS 547 538	1,815 ± 65	AD 72 - 395	Hemyock

Table 1

C14 dates

Further funding by Devon County Council enabled charcoal samples from two sites to be submitted for radiocarbon dating in 1995. The dates from the samples, from sites in Hemyock and Dunkeswell parishes, fell into two periods: (i) broadly within the Romano-British period; (ii) within the earlier period of Saxon occupation of Devon. These dates were obtained from ironworking debris recovered from the surface and necessitated no formal excavation operations. The dates were obtained from the University of Arizona (Ref. AA 17827-8) using charcoal from birch and hazel wood (see table).

CONCLUSIONS

As a result of the surveys carried out so far over 100 sites or findspots with ironworking associations had been located within the Blackdown Hills over an area of at least 400 sq km. Fifteen sites could be confidently classified as smelting sites, and a further 36 significant slag concentrations and eight discrete areas of extraction have been identified. Further areas are known from documentary references. The most successful mechanisms for the recognition of sites associated with the iron industry have been found to be local contact, documentary work, and geophysical survey. Each of these operates at a different scale and has provided a different segment of the known information. The application of these techniques has been refined during the survey, and it is anticipated that more detailed application of all of them will be highly rewarding in later phases of the project.

The iron industry in the Blackdown Hills has been demonstrated to date back at least so far as the period of the Roman conquest of south-west England. It is tempting to suggest that the military took control of a resource whose exploitation was already under way. No evidence for Iron Age working has so far been identified; it is hoped that subsequent work may allow this hypothesis to be tested. The radiocarbon dates so far obtained indicate continuing exploitation in the post-Roman period, while limited documentary references show that it continued into the medieval period. However, the comparative paucity of records for ironworking by the later medieval period, when record sources become more readily available, may be seen as indicating that the industry was in decline by this time. The use of what were obviously extensive slag deposits as a resource in their own right was clearly current in the later middle ages, and has indeed continued virtually to the present day.

The scope of the results so far obtained, and the high quality of the information that has been obtained, indicate that further work on this project is merited. A proposal for a multidisciplinary research project is being put together for submission to English Heritage. This will involve further work, both in greater depth on the sites already identified and in terms of more extensive survey and documentary research. It is proposed that the later should be undertaken both within the existing survey area (particularly on the Somerset side, where resources have meant that work to date has been less extensive) and within an area extended to cover the other neighbouring Greensand areas, including the southern extension of the ridge toward the coast. The intention is to expand our understanding of the iron industry of the south-western Greensand in chronological, technological and topographical terms, and to provide suitable comparanda for the better-known industries of the Weald and Dean. At the same time, the gathering of baseline information will be directed toward the design of suitable strategies for the conservation and management of a major archaeological resource whose existence, until very recently, was barely appreciated at all.

ACKNOWLEDGEMENTS

The Blackdown Hills Ironworking Project has been generously funded by Devon County Council since 1994. Since this time survey work has been carried out by Exeter Archaeology under the direction of DCC's Archaeology Service. We are also grateful to Somerset County Council for financial support and assistance. Most of the survey work has been undertaken by Stephen Reed, initially with Shirley Simpson and later Pru Manning. Bill Horner of DCC has also actively participated in fieldwork projects as well as providing information from the Devon County SMR. A large number of voluntary workers have contributed to the project, including members of the Devon Archaeological Society and Taunton Deane Community Archaeology. The co-ordinators for the latter bodies, Dot Butler and Colin Clements deserve special thanks as do Gerry Tyers, Nan Pearce and Roger Carter for their continuing assistance.

Abbreviations DRO Devon Record Office

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