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THE METALLIFEROUS MINES OF CARTMEL AND SOUTH LONSDALE

by

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INTRODUCTION

'Where all is whist and still,

Save that the sea playing on yellow sand…'

Christopher Marlowe

Forty years have elapsed since what was intended at the time as a preliminary report on some previously little-known haematite and copper mines in the district between Arnside and Carnforth on Morecambe Bay in North-West England was hastily put together and published.[1] Almost nothing had been written or recorded about these mines, the last of which had been abandoned in the final decade of the 19th century, until local cavers began exploring and documenting surviving workings during the decade preceding publication of that report. Although the initial motivation driving those uncomfortable, dirty and sometimes risky underground explorations had been the possibility that the miners had broken into unknown cave systems within the limestones, it soon became evident to the early investigators that the mines themselves and the ore deposits exposed within them were of considerable intrinsic historical interest and scientific importance.[2] The intent behind publication of an interim report in 1969 was in large part to put this on the record and, it was also hoped, to stimulate the expanded investigation of the area that would be needed before anyone could write a definitive report on the metalliferous mines of the district.

Cave fragments such as the Dog Holes and Fairy Hole offer a tantalizing glimpse of ancient cave systems believed to exist somewhere beneath Warton Crag but the hopes of finding a way in from the underground mine workings were never realized. Though, for many reasons including the personal circumstances of myself and others, it never became possible to write and publish the planned more comprehensive account the subsequent four decades did see episodic continuation of field and archival research leading to the discovery and accumulation of a great deal of significant new information about the mine sites, their history, and the mineral geology of this small but fascinating district. Much of this accumulated data and information, some of it relating to sites that are unfortunately now no longer accessible, has remained for many years as unpublished manuscript notes and records and was at increasingly serious risk of being lost.

The current report largely realizes the original aim although the area has never received the attention that I believe it deserves from professional investigators. It presents a comprehensive account of what is currently known of the ores and mineral geology, industrial archaeology and history of the metalliferous mines of the limestone country between Arnside and Carnforth together with those of the closely-related neighbouring Cartmel peninsula to the west (Figure 1). Perhaps the long delay before publication will be forgiven when it is realized that the final definitive British Geological Survey report[3] on the adjacent and economically far more important Furness/Millom district, first requested by industry representatives in 1871, was likewise long delayed – so long in fact that it was not published until nine years after the closure in 1968 of the last working haematite mine on the Furness peninsula.

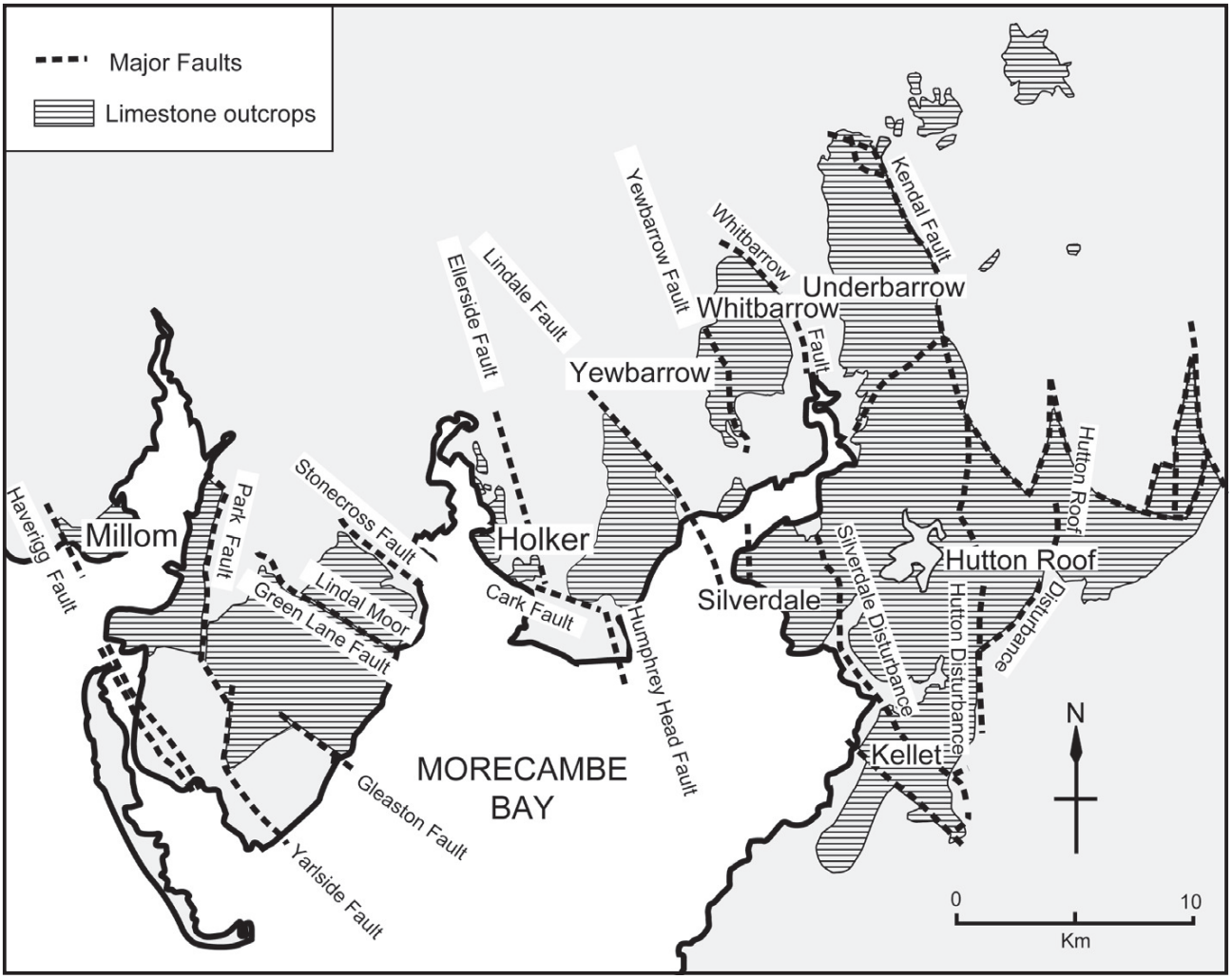

Figure 1. Morecambe Bay showing limestone outcrops and major faults. The iron and copper deposits are emplaced within the limestones and most are associated with minor NW-SE trending faults (after Gale[18] with permission).

Christopher Marlowe's lines, quoted above, would today be an apt description of the region covered by the present report. The northern coastal region of Morecambe Bay is an area of spectacular scenery created by a series of fault-bounded Carboniferous Limestone blocks that form low hills separated by estuaries and the coastal raised mires known here as 'mosses'. The saltmarshes that fringe parts of the coastline give way on the seaward to extensive intertidal sands and mudflats whilst the higher ground inland to the north is underlain by older Silurian rocks. Excluding Cartmel, much of the area covered here is formally recognised and managed under trust as the 'Arnside/Silverdale Area of Outstanding Natural Beauty'.

Although there were a few small-scale ventures, copper or any other non-ferrous metals were never available or extracted to any significant extent from the limestones around Morecambe Bay. However the mining and smelting of iron was a factor in the local economy for many hundreds of years. Documentary evidence proves that the haematite ore that occurs in the discontinuous belt of Carboniferous limestone fringing the northern coast of the bay was being exploited in monastic times and it was certainly being used much earlier than this and probably from prehistory. In the centuries before

the Industrial Revolution this was a small-scale activity mostly catering to local demand and mainly concentrated on working the large and easily accessible deposits found in Low Furness. Exploration and mining increased as the Industrial Revolution gathered pace during the 18th century but the greatest period of production there was during the second half of the 19th century when introduction of the Bessemer process led to almost unlimited demand for the low phosphor haematite produced in the district. When huge new deposits of this valuable ore were discovered the Furness Orefield became for some time the most productive in the world. Industrial mining steadily declined thereafter and finally died out in the years after the Second World War. The last industrial-scale iron mine in the Furness peninsula closed in 1968 and the only modern remnant of this once great industry is the retail-scale production of haematitic ochres from South Cumbria and Warton marketed as specialist artists' pigments.

The district covered in the present report is geologically within the same mineral field as the Furness Orefield proper but there are no large ore deposits and although there were intermittent efforts to mine iron ore, copper ore and ochreous pigments it was never an industrially significant producer of any kind of ore. Geographically the mineral region lies within the modern administrative counties of Cumbria and Lancashire. Cartmel (Cumbria) was, together with Furness, within the old Lancashire hundred of Lonsdale North-of-the-Sands. From the Kent Estuary the mineral district continues south-eastwards through Arnside (formerly in the historic county of Westmorland) then from the Cumbria-Lancashire boundary at Silverdale continuing to Warton, Carnforth and the Kellets (South Lonsdale). Some distance inland to the north and north-east, haematite mineralisation can be traced as far as Whitbarrow and Underbarrow (South Lonsdale). For convenience, the district dealt with will be referred to as the 'South Lonsdale mineral district' or simply as South Lonsdale, although it includes Cartmel which is in North Lonsdale and the limestone district near Kendal.

The last company attempting to mine copper in South Lonsdale was wound up in 1841 and the last working iron ore mine ceased operations in 1894. The workings and buildings were abandoned and left to deteriorate. Many of the physical remains of the metalliferous mining industry here and elsewhere around Morecambe Bay have already been lost. This great industry is an important part not only of local industrial heritage but also of the Industrial Revolution and it is important that what remains is now preserved. Little survives now of the industry in Furness and thus the industrial archaeology of South Lonsdale has assumed a greater and perhaps unique importance as a surviving physical remnant of a significant episode in the British national cultural and industrial heritage.

The following report is divided into three main sections: geology and ores, history of the mines and industrial archaeology. It is commonly difficult to make definite correlations between the earlier industrial archaeological sites and the historical record gleaned from surviving fragmentary documentary archival sources. Accordingly 'history' and 'industrial archaeology' are treated separately. The intent is to provide (a) a compendium of known facts and information about the mine sites and mining history and (b) an attempted overview and synthesis. It is hoped that these will both

Figure 2. View of concrete reservoir, Crag Foot Mine. The exact date of this photograph is unknown, but it is believed to have been circa 1940.

reinvigorate and aid ongoing research and conservation efforts and, if this happens, I will consider it successful. These are however tasks that I will have to leave it to others to undertake.

HISTORY OF RESEARCH

Research on the mines and ores of the South Lonsdale mineral district has always been overshadowed by the attention demanded by and given to the economically vastly more important haematite mines farther west in Furness and on the western side of the Duddon estuary at Millom. Consequently the area was essentially ignored in the literature until the 1960s.

Interestingly however the area had come to the notice of the early geologists including William Smith, 'the Father of British Geology'. In a note dated 29 April 1807, Smith says: *'At Underbarrow Scar a high cliff is the shaft of an ancient copper mine now filled up. It is singular to observe how this and another ancient Copper Mine to the South of it towards Wharton Crags and other Mines to the Northward towards Staveley are in a Line which is paralleled to the Western side of the Limestones*'.[19]

In an 1837 consultant's report on the prospects of finding coal and other minerals, prepared for the Lancaster Mining Company, Smith's nephew John Phillips[4] did briefly allude to the known presence of copper ores, which were being actively worked around this time near the line of the Warton Crag Fault and also to those further east at

Kellet. Incidentally he also made the very perceptive observation for the period that the sandstones exposed on the downthrow side of the fault are equivalent in age to those at Heysham (i.e. stratigraphically above the limestones) and not to the 'Old Red Sandstone' beds that were known to lie beneath the Carboniferous strata elsewhere in Britain. The British Geological Survey mapped the area in the late 19th century[5] and in a classic field investigation carried out during the decade before the outbreak of war in 1914 Garwood[6] worked out the Lower Carboniferous biostratigraphy but neither geological report made any substantive mention of the mineral resources of the present district.

Other than through references to Leighton Furnace at Silverdale the district was also overlooked in all the major works describing the iron industry.[7-9] Leighton Furnace was a major and economically important 18th century smelting enterprise but it was located here for access to water-power and peat fuel, relying for its supply of iron ore upon Furness haematite (and old bloomery slag) shipped across Morecambe Bay. It thus properly belongs to that industry and not with that of South Lonsdale. Cartmel was included in the wartime BGS pamphlet on the geology of the haematites[10] but this report did not extend its coverage into South Lonsdale.

It was not until the early 1960s that local amateur cavers from the Red Rose Cave and Pothole Club and the Black Rose Pothole Club began to reopen, explore and document old metalliferous mineworkings beginning in the vicinity of Crag Foot on Warton Crag (Figure 3) and later elsewhere in South Lonsdale. The first accounts that appeared as semi-formal articles in caving club journals[2, 11-13] and a guidebook[14] were followed by the interim account of the industrial archaeology, history and ore geology of the area that was published as one of the earliest Northern Cavern and Mine Research Society monographic reports in 1969.[1]

All subsequent investigations have continued to be done by amateur enthusiasts. South Lonsdale was not considered in the definitive Geological Survey publication on the South Cumbria haematites published in 1977.[3] Between 1967 and 1977 members of the, unfortunately short-lived, Lancaster Cave and Mine Research Society (LCMRS) continued field and archival research, and published three numbers of a journal, North-West Speleology,[15] devoted to speleology, cave archaeology and local mining history. Extensive archival investigations undertaken during the same decade were unfortunately incomplete and remained unpublished on the untimely death of their author, Peter Ashmead. However a bound set of notes and early drafts[16] that has survived proved to be an invaluable entry point to the scattered primary literature. A brief but useful summary of the history of the mines[17] published a few years later was based mainly on the LCMRS work.

The present author was closely involved as an active participant in the early investigations during the 1960s and in 1999-2002 and in 2007 had opportunities both to consult and check original archival sources and to re-examine, survey and reassess many of the surviving sites in the field.

The following account of the metalliferous mines and mining history of the South Lonsdale mineral district is based on primary documentary evidence and on original fieldwork. It is necessary however to point out that, of necessity, secondary sources have been entirely relied on for historical and technological context.

ABBREVIATIONS

The following abbreviations are used throughout the following report:

CCROB - Cumbria Record Office, Barrow-in-Furness.
CCROK - Cumbria Record Office, Kendal.
CCROW - Cumbria Record Office, Whitehaven.
LLA - Lancaster Reference Library Archive Department. (Some of these documents have been transferred to the LCRO).
LCRO - Lancashire Record Office, Preston.
NAK - The National Archives, Kew, London.

Gillow MSS - Gillow family archives, Leighton Hall.

BGS - British Geological Survey.
CWAAS - Cumberland and Westmorland Antiquarian and Archaeological Society.
LCMRS - Lancaster Cave and Mine Research Society.
LCAS - Lancashire and Cheshire Antiquarian Society.

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GEOLOGY AND MINERALOGY

Here is such a vast variety of phenomena and these many of them so delusive, that 'tis very hard to escape imposition and mistake'.

John Woodward, Essay Toward a Natural History of the Earth, 1695.

Both iron and copper are found though in limited quantity in the South Lonsdale mineral district and their ores were mined at various times for smelting. Iron minerals occurring as ochres were also exploited for use as pigments. The ores are hosted within Dinatian (Lower Carboniferous) limestones and occur as replacement deposits and as cavity infills. The deposits are similar to those of Furness, with which they are undoubtedly analogous and contemporaneous, the South Lonsdale mineralisation representing the eastwards margin of the South Cumbrian Orefield.

The ores and other minerals occurring in the district were provisionally described by Moseley.[1] Some further occurrences of minor mineral species and additional details were recorded by Ashmead.[2] The mineralogical details in the following are based upon these sources and new (unpublished) data.

There are recent general reviews of the geology of the area by F. Moseley[3] and less formally by Gale[4] and where specific references are not given in the following it may be assumed that these works are the authority for the statement.

FORM AND OCCURRENCE OF THE ORE BODIES

The ore deposits in South Lonsdale are significantly more limited in size and extent than those that existed in Furness and there is nothing directly comparable in scale to the Furness 'sops'.[5] Although detailed geological mapping has not been carried out, most appear to be within the Holkerian stage Park Limestone, often near the junction with the underlying limestones of the Dalton Beds. Unlike Low Furness, where Lower Palaeozoic or Permo-Triassic rocks formed one wall of some of the ore deposits,[5] these strata are not found in direct physical contact with any of the South Lonsdale ore bodies.

The ore-bearing deposits are shallow, none of the known mine workings extending more than ca.30 m beneath the present-day land surface. The ores occur as veins, seams, pipes and stringers but most typically seem to have formed irregularly-shaped bodies. Some of the ore bodies are the result of replacement of the limestone bedrock by haematite but fine-grained argillaceous and coarser arenaceous consolidated bedded cavity-infill deposits are also common. There are also cavity-infill breccias and/or fault breccias in places. Unconsolidated reworked residual deposits derived in part from the primary ores are commonly present.

Nearly all the mineralisation is associated with Hercynian NW-SE (rarely NE-SW) oriented faults (Figure 1) but in places beds of ore have themselves been displaced by later faulting. At Crag Foot Mine this later faulting trends NE-SW, suggesting the

possibility that this system of faults is distinct from and later than, the predominant mineralised NW–SE fault system. The ores also commonly occur in close association with bentonite clays interbedded within the limestone ('clay wayboards') and sometimes with other structural features such as seams of aragonite.

MINERALOGY OF THE ORES

The mineral suite is somewhat less restricted than that in Furness, with occurrences of siderite, malachite and other species not reported there.[6] However, overall, the mineral species, their mode of occurrence and the geological context are so similar that they are undoubtedly part of the same mineralisation, constituting the eastern and north-eastern margin of the South Cumbrian Orefield.

Iron oxides predominate; the main ore is haematite. In its purest form it ranges in texture from hard reniform 'kidney ore' to the soft earthy ochres known in Furness as 'reddle' (sometimes reported as 'raddle' or 'ruddle') and the colloidal 'smit ore' of the Furness miners. Red ochreous haematite of very high purity, known as 'Warton Oxide of Iron' in the trade, found a market as a pigment. Judging from surviving underground sections and examination of the spoils, the greater part of the amorphous deposits in the main area of mineralisation, around Crag Foot, Warton, (Figure 3) consisted of soft ochreous forms, with hard massive haematite and kidney ore being rare. There is no crystalline 'specular' haematite. It might be that much of the haematite was unsuitable for smelting, though some of the soft ore produced from mines in the Arnside district was marketed as 'puddling ore'. Some of the softer haematite occurs as pipes, circular or lenticular in cross section, that locally give the appearance of having been intruded into the surrounding rock, displacing the bedding. Some at least of the amorphous iron-ores are limestone-replacement deposits; though deposits such as the soft ochreous haematites are possibly sediments or precipitates. Consolidated bedded sediments and breccias exposed in the mines are invariably iron-bearing to a greater or lesser degree.

Hydrated iron oxides appear to be more common in South Lonsdale than reported[5] in Furness but have not been investigated chemically. 'Limonite' is found as an amorphous ochre in breccias and elsewhere and probable goethite nodules with limonitic cores containing minor vivianite and malachite were found on spoil heaps. Turgite has been reported[2] but this is no longer considered to be an authentic mineral species.[5] Carbonates are also commonly present. Yellow-brown crystalline siderite is also recorded, in some cases as sphaerosiderite, or very rarely as tiny red crystals. Siderite has not been recorded in the Furness ores.[5]

Copper is also present mainly as carbonates. With the exception of minor showings of azurite, it occurs as malachite in the form of small nodules within the limestones and ore-bearing breccias or, less commonly, as small acicular crystals within bedding planes. Other copper minerals (cuprite, chalcocite and chalcopyrite) have also been reported as minor occurences.[2] Chalcocite and chalcopyrite were also present associated with iron ores in Furness, being found as lenses within the haematite at one mine.[3]