Red Gill Mine, Cumbria

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Introduction

Red Gill Mine is one of a number of mainly small mines in the Caldbeck Fells, in the northern part of the Lake District, from which lead and copper ores were worked from veins which cut rocks of the Ordovician Eycott Volcanic Group. The Qre minerals were galena and chalcopyrite. However, the main mineralogical interest of the site lies in the abundance and quality of specimens of the large variety of supergene minerals found within the veins, including the recently described species redgillite, for which this is the type locality.

Red Gill Mine is said to have been worked by the Elizabethans and some of the workings may be even older. There are documentary records of working here in the 18th century, but best recorded are the 19th century operations. Production figures are far from complete, although records from the 19th century workings indicate that 47 tons of dressed copper ore were raised between 1863 and 1869: a little under 18 tons of lead ore were produced between 1861 and 1866. Historical descriptions of the mine include those by Shaw (1970), Adams (1988), and Cooper and Stanley (1990).

Descriptions of the geology, with particular reference to the veins worked, have been given by Eastwood (1921), and Dewey and Eastwood (1925). Comprehensive descriptions of the minerals found at Red Gill have been published by Young (1987a), and Cooper and Stanley (1990). Exhaustive lists of references to the site are contained in these two latter publications. Spectacular specimens of many of the minerals for which the site is famous are to be seen in major museum collections throughout the world.

Description

Three veins, all predominantly within andesites of the Eycott Volcanic Group, are known at Red Gill, although most of the workings were within the NNW–SSE-trending Main or South Vein. Eastwood (1921) recorded that where seen in an 8 m-deep shaft near the junction of Red Gill with Swinburn Gill this vein was found to be up to 1.2 m wide and composed of '...quartz-ribs with broken country rock in a matrix of sand and clay stained with 'manganese'...'. Several short crosscut levels have been driven to the vein. In one of these Eastwood (1921) described the vein as being up to 1.5 m wide, although, except for the local presence of traces of malachite, he gave no other description.

The courses of the other veins at Red Gill may be traced from small trial workings. The northernmost vein trends north-west– south-east across the junction of Swinburn Gill and Wet Smale Gill. A NNE–SSW-trending vein occurs on the east side of Swinburn Gill.

More details of the known extent of the underground workings at Red Gill may be found in Eastwood (1921), Shaw (1970), and Adams (1988).

Although mine explorers are known to have gained access to parts of the Red Gill workings, none is permanently accessible today and there are no good in *situ* exposures of the mineralization for which the mine is celebrated. The small dumps, mainly derived from workings on the Main or South Vein, provide small but representative examples of this mineralization despite having been the focus of attention for many generations of mineral collectors. The site lies within the area in which mineral collecting is controlled by a permit system administered by the Lake District National Park Authority.

Although Red Gill has long been famous for fine specimens of a number of colourful supergene species, it is perhaps best known for magnificent crystals of linarite which occur within cavities in quartz-sulphide veinstone (e.g. Greg and Lettsom, 1858; Hessenberg, 1864a,b). Cooper and Stanley (1990) described and figured beautiful examples of thick deep-blue crystals up to 25 mm long, and commented that these were probably the finest examples of the species known

when they were collected in the 19th century. Red Gill is also noted for superb specimens of leadhillite and caledonite, commonly found in association with linarite. Cooper and Stanley (1990) described and figured fine examples of these species and, in addition, provided a comprehensive list of the minerals recorded from this mine.

It is interesting to note that despite the long history of mineral collecting from this site, and thus the considerable depletion of the available amount of mineralogically interesting veinstone, significant finds of minerals hitherto unrecorded from this locality continue to be reported. These include macphersonite and mattheddleite (Cooper, M.P. *et al.,* 1988; Wirth, 1989), two species previously known only from Leadhills, Strathclyde Region, and a few very small specimens of native silver, of supergene origin (Wirth, 1989). Red Gill Mine has provided the first British occurrence of the rare lead-zinc sulphate silicate mineral queitite (Braithwaite *et al.,* 1989) and is the type locality for the recently described mineral redgillite ($Cu_6(OH)_{10}(SO_4)\ .H_2O$) (Pluth *et al.,* 2005).

Ryback *et al.* (2001) have demonstrated that the late A.W.G. Kingsbury falsified the localities of numerous rare mineral species, including many from the Lake District, especially in the Caldbeck Fells. Although no conclusive proof has been established of deception relating to specimens from this site, great care should be exercised when considering claims by Kingsbury which have not been substantiated or duplicated by subsequent collectors.

Interpretation

Red Gill Mine worked deposits typical of the lead- and copper-bearing veins of the Caldbeck Fells. The veins at Red Gill exhibit a complex primary mineralogy like those of other Caldbeck Fells mines including Roughtongill (see Roughtongill Mine GCR site report, this chapter). The importance of the site, however, lies in the abundance of supergene minerals, principally lead and copper sulphates, carbonates and phosphates, formed within the upper, oxidized zone of these deposits. The date of this supergene alteration is unclear but clearly results from a prolonged circulation of oxygen-rich groundwaters within the veins. Stanley and Vaughan (1982a) have proposed a Jurassic age for at least some of the supergene alteration of the Caldbeck Fells veins. The great wealth of species here no doubt results, in part, from the varied chemistry of the primary mineralogy as well as from the input of elements, perhaps most notably phosphorus, from the leaching of the locally much-altered igneous wall-rocks (Cooper and Stanley, 1990). The supergene assemblage at Red Gill, like that of Roughtongill, has much in common with that known from some of the deposits of the *Leadhills–Wanlockhead* GCR site mining area in southern Scotland, where similarly complex primary assemblages have been subjected to intense supergene alteration.

Conclusions

Red Gill Mine has long been known as a rich source of a great variety of lead- and copper-bearing supergene minerals. Many of these have been found as superbly crystallized specimens, and spectacular examples are prominent in many of the world's major mineralogical collections. Whereas no significant mineralization is permanently exposed in *situ* at the site, and although the relatively small dumps have suffered intensive collecting over many years, they still contain small representative examples of supergene veinstone. Interesting and important finds of rare minerals are still, from time to time, reported from the site, which is also important as the type locality for the hydrated copper sulphate, redgillite.

References