

## BOOK REVIEWS

Geochemical Division, Institute of Geological Sciences Experimental Cartography Unit, Highlands and Islands Unit, Institute of Geological Sciences. *Regional Geochemical Atlas: Shetland*. London (Inst. Geol. Sci.), 1978. xi + 21 coloured maps (1:250 000). Price £35 (by post £36.50).

The Geochemical Atlas of Shetland is the first of a series at a scale of 1:250 000 based on stream-sediment sampling. It contains separate maps for Ba, Be, B, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, U, V in water, V, Zn, and Zr. The choice of elements is generally appropriate but, given that only a limited number could be included, then it might have been preferable to replace Zr and Be by two elements from a group of pathfinders such as As, Sb, Cd, Se, and Bi. A comment on the criteria for element selection would also have been useful. Element concentrations are given for specific sample sites and are displayed as lines, whose lengths are proportional to concentration, and these are superimposed on a monochrome geological base map. Information on land use, relief, vegetation, pH, and conductivity and a summary of the geology and mineralization is also provided. The folding maps are clearly presented on a 61 × 50 cm format and bound within strong buckram covers giving a rather unwieldy Atlas measuring 62 × 28 cm. It would be helpful to the reader if a map scale-bar was provided on the geochemical maps and known mineralization was accurately marked on the geological summary map.

The principal stated purpose of these maps is to support metalliferous mineral exploration and it is on their success in this field that they must ultimately be judged. Regional geochemical surveys based on stream sediments have been used successfully in many countries either to locate ore bodies directly or to indicate favourable geological environments for mineralization. Usually such surveys are part of an integrated exploration programme utilizing various techniques.

Generally speaking, chemical weathering assists stream-sediment surveys since it increases the size of the secondary dispersion haloes around ore bodies, thus making them easier to detect. In areas such as Scotland, where post-Tertiary chemical weathering is limited and ice scouring is common, haloes tend to be very localized, as noted by the authors. It is, therefore, possible for small high-grade deposits to be missed by a survey based on an average sample density of one sample per 1.16 km<sup>2</sup>. The problem of locating such deposits is further

compounded by Shetland's small size, elongated shape, and extensive peat cover, which produces a drainage system that leaves a significant proportion of the bedrock and soil unsampled. This might partially explain why the base-metal deposits at the Sand Lodge Mine (Cu) and Vidlin (Pb, Cu, Zn), together with many other lesser occurrences, are not detected.

All the measured elements show variations, sometimes pronounced, from one part of Shetland to another and, as would be expected, these largely reflect lithological variation rather than mineralization. For example high Ni and Cr values are found on Unst, which are related to serpentinite, and high U values are found over the granitic rocks of the Northmaven complex. An interesting Mo anomaly also occurs over the latter group of rocks, which increases the number of post-orogenic Caledonian acid plutons known to contain molybdenite or to have associated Mo anomalies. In southern Yell high Ba, Pb, Zn, and Cu values suggest a wider area of base-metal mineralization than indicated by the known galena occurrence at Hamnavoe.

The authors note that glacial displacement is probably responsible for a Cr anomaly overlying migmatites in western Unst and one wonders what contribution the partial cover of glacial debris is making to the stream sediments elsewhere on Shetland. No doubt the authors have assessed all the factors which might adversely affect the quality of the data, but there is no discussion of these nor is there any critical assessment of the 'above background areas' in terms of their potential as target areas. It is, of course, a matter of opinion as to how much discussion an Atlas should contain. Perhaps a more detailed account of the planning of the programme and a discussion of the results could be made available as an optional handbook.

The Atlas will undoubtedly be of interest to the geochemist and the exploration geologist and possibly, according to the authors, those interested in crustal evolution and various environmental studies. As far as the last is concerned the Atlas should be used with caution by the non-specialist. Finally it is worth noting that this regional geochemical survey has been carried out over ground whose geology is exceedingly well known and which will therefore provide a critical testing ground for the technique. It is perhaps, unfortunate that the series started with Shetland, which is not the most suitable area for a stream-sediment survey, but the rest of the series will be awaited with interest.

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