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INTERIM REPORT
ON

SCHEELITE PROSPECTING
AND
GEOLOGICAL MAPPING

Ausvatnet - Lassemovatnet,
Namsskogan Kommune

August 11, 1978

INTRODUCTION AND METHODS.

Geological mapping and stream-sediment heavy mineral surveying has been in progress to date from June 13th, 1978, the objectives being the appraisal of known scheelite occurrences, exploration for new prospects and concurrently, investigations into the parageneses of scheelite within the area west of the River Namsen in Namsskogan Kommune.

The general geology of the area, as previously mapped by S. Foslie, consists of schists and gneisses containing marble horizons which have been intruded by rocks of predominantly acid composition, dipping steeply south-eastward and lying off the south-eastern flanks of the Bindals granite.

Recent investigations include those by Elkem A/S, Skorovas Gruber in the form of stream sediment sampling, and by Berg. Ing. O.S. Hembre (Elkem A/S) and Statsgeol. A. Nissen (N.G.U.) who carried out surveys along selected roadcuts and stream sections using ultraviolet lamps. The latter method resulted in the discovery of several scheelite occurrences, the most notable of which being that on the mid-southern shore of Lassemovatnet which was claimed on behalf of Namsskogan Kommune in 1977.

The present investigation has been carried out by Geol. I. L. Ferriday and studentgeol. C. Pease (R.S.M. London) together with panning assistants A. Karlsen (June 13th – 23rd, Strompedalen, Ausvatnet – Lassemovatnet areas) and T. Lund (July 11th – 25th, Lassemovatnet - Gasvasselva areas)

GEOLOGICAL MAPPING.

Geological mapping has been carried out at 1:25000 scale over the area so far covered. In addition, detailed section surveying of the Lassenovatnet prospect has been carried out at 1:50, together with 1:10.000 mapping of the surrounding area for reduction to 1:25.000. To date the area mapped extends from 2 km N.E. of Ausvatnet in a belt south-westward approximately 3 km in width to 3 km S.W. of Lassenovatnet (approx. 90 km²). In addition, a geological / panning traverse at 1:50.000 has been carried out along Strompedalen and south-eastward to N. Ausvatnet.

Mapping has revealed the amphibolite grade schists and gneisses to be variable in composition between pelites and semi-pelites, the varying proportions of the major minerals biotite, amphibole, garnet, felspar, quartz and muscovite representing sedimentary facies variations, with a locally variable overprint of metamorphic differentiation. Such variations commonly take place irregularly over relatively short distances, there being no major facies change occurring through the sequence of metasediments between the stratigraphic / structural levels of Strompedalen and Ausvatnet-Lassenovatnet. However, the metasediments contain a strongly variable proportion of minor granitic to granodioritic intrusives of several phases, the earliest of which have suffered extreme dislocation such that the schists containing abundant minor intrusives grade into mixed schists with 'augen' gneisses. Thus generally speaking, the proportion and type of minor acid intrusive material present is responsible for the variable appearance of the schists and gneisses across the area. At a stratigraphic level lying approximately 1 km above the Ausvatnet-Lassenovatnet level however, the metasediments undergo a

significant facies change, containing a higher proportion of amphibole and amphibolite horizons, being commonly finely banded and containing a much higher iron content, principally as pyrrhotite, in thin discreet horizons and in broad zones over 20 m in thickness. These sulphide-rich schists are also notable for their much lower content of minor acidic intrusions and total lack of marble horizons compared with the schists and gneisses lower in the succession. The contact between between the relatively basic, sulphide-rich schists and the mixed, acid-intruded schists and gneisses runs approximately along the 300 m contour above Millavatnet and Osvatnet, and approximately along the 350 m contour above Lassenovatnet, where the contact zone contains several pods of ultramafic material to 100 × 50 m in size. The schists and gneisses throughout the area have been very strongly folded in a flattened, commonly dislocated isoclinal style.

Numerous marble horizons occur within the schists and gneisses, particularly at the Ausvatnet - Lassenovatnet level. According to Foslie, four discreet marble horizons occur in the area, however mapping has revealed marble-rich zones to occur much more commonly within the succession, with the discovery of at least five new horizons, together with strike extensions to those mapped by Foslie. In addition, marble horizons clearly tend to be rapidly eroded and covered by glacial drift in valley bottoms and trough-line depressions, and it is a certainty that several horizons lie yet to be recorded. The marbles vary greatly in thickness, both as a primary sedimentary feature and to a great extent due to tectonism, during which they have obviously behaved 'like toothpaste', having been thinned out and forcefully injected along planes both along

and at angles to schistosity and bedding. They are generally impure, notably with respect to graphite, muscovite, qtz and felspar, pyrrhotite and and unidentified very fine-grained opaque, and to a lesser extent to calc-silicates, garnet, biotite. The marbles also contain, almost invariably, boudinaged horizons and blocks of amphibolitic and granitic composition which in most cases appear to represent tectonised minor intrusions. The schist wallrocks also commonly contain thin amphibole-rich horizons rich in pyrrhotite with minor amounts of chalcopyrite. Although the marbles and their wallrocks have been strongly intruded by basic and later acid material, products of reaction i.e. skarn or even simple contact metamorphic mineral assemblages are, surprisingly, not as common as one would expect. Development of calc-silicate / garnet rich assemblages have been found at only 11 localities in the area, the majority of which lie in the Hassenovatnet area.

Intrusives of acid (granitic to granodioritic) composition occur throughout the schists and gneisses of the Strompedalen - Hassenovatnet sequence, varying from minor but pervasive veinlets and dykes <1 cm - < 1m thick to large pod-like bodies of length 1km and over. The history of acid intrusive activity is obviously complex, the majority of exposures displaying at least 2 or 3 phases of injection. The types of acid intrusive material occurring in the area can, for the present, be divided into : a) pink granitic, medium to coarse grained, b) white granitic, muscovite rich, medium to coarse grained, c) grey granodioritic to basic granodioritic, fine to medium grained, d) white granitic ± fine garnet, fine to coarse grained, e) granitic, muscovite-garnet-hornblend, coarse grained, f) coarse felspar porphyry (Bindals granite, g) medium to coarse, variably felspar porphyritic granodiorite-

basic granodiorite (Foslie's 'Basic granodiorite'). Of these, apart from the Bundals granite, where contact relationships have not been studied in detail, the earliest appear to be a) and b), both of which occur in strongly tectonised pods within the marbles, followed in approximate order by c), d), g) and e), which appears to be the latest phase and which is locally gradational to qtz-fels-musc-garn-hornblend pegmatite. The chronology of intrusive history and tectonism is even more complex, it being evident that acid intrusion was still taking place after the main deformational event.

Intrusives of basic composition occur as amphibolitic dykes less than 0.5m in thickness within the marbles and schists. All such intrusive pre-date their acid equivalents. Where the amphibolites occur as blocks within the marbles, they are commonly thickly mantled or veined by calc-silicates as a result of reaction between marble and amphibolite, either during the phase of intrusion of acid material or during regional metamorphism. Locally, amphibolite occurs veined by pure carbonate.

Results of panning.

Over a period of 4 weeks, 176 heavy mineral concentrates were collected between Strompedalen, N. Ausvatnet and S. Lassemofjellet. Both panning assistants appeared to collect equally representative heavy mineral concentrates as indicated by the regionally abundant heavy minerals zircon, magnetite and garnet, so it is considered that the results of both workers are adequately comparable.

Over the region as a whole, the Lassemovatnet area clearly yielded higher values of scheelite in concentrates. This could be due either to the presence of stronger scheelite mineralization in the

area, or to the effect of accumulation by glacial drift from the Ausvatnet direction. From the results (the number of grains of scheelite per sample, counted under u.v. light) the following anomalies appear:

1) E. Osvatnet

2) N. Litlaudumpen

3) Mid. S. Lassenovatnet

4) S. Lassenovatnet

6) S. Lassenofjellet

(see map)

In area 4), samples of drift were taken along the stream banks sa upstream from the anomaly site, in order to ascertain the contribution of drift to anomalous values. It was found that values of scheelite in the drift were below background levels for the region, although one must admit that a more sophisticated test is needed to estimate the contribution of scheelite from glacial drift with adequate accuracy.

MINERALIZATION.

Scheelite mineralization has been found in the following localities:

a) N. Ausvatnet — in grey, fine-grained marble with pyrite, local granite + amphibolite (sulphide-rich)

b) W. Millavatnet — in sulphidic amphibolite, with coarse-grained marbles and granitic veins.

c) E. Osvatnet — as above.

d) S. Osvatnet — in thin granitic vein (post amphibolite), with coarse marble.

e) W. Litlaudumpen — in white coarse-grained marble and concentrated at the contact with garnet-diopside skarn

f) Mid E. Lassemoratnet – in qtz-epidote-sulphide rock transitional to amphibolite, veined by granite with marble. Small quantities also occur in the granite, particularly with calc-silicates. Clinozoisite-quartz skarn locally particularly well developed but is peripheral to mineralization

Of the above localities, only a), c) and f) have scheelite in amounts greater than that of fine isolated grains. At a) however, extensive sampling reveals mineralization to occur only over ~20 cm. At e), a blasted roadcut, lack of exposure prevents realistic estimation of the prospect. Locality f) is that claimed on behalf of Namsskogan kommune in 1977, containing ore-grade scheelite over a strike length of several metres. It is possible that the W grades are high enough in the strongest mineralization to form an ore zone of workable magnitude extending into the wallrocks. However, the extent of mineralization down dip is unknown.

Of the mineralized localities, only c) is indicated by panning, although b), d), e) and f) are unlikely to have been indicated due to their topographic locations. Geological investigation of the panning anomalies did not yield any positive results, although apart from anomaly 3), the geology of the areas around the anomalies was found to be favourable for the occurrence of scheelite, i.e. within a short distance of a marble + amphibolite + granite association.

However, the greatest problem in scheelite exploration is that of follow-up sampling, where one can easily miss mineralization by normal geological sampling methods. It is concluded that, in addition to panning and geological mapping, considerable u.v. surveying should be carried out, both of stream sections and individual localities shown to be promising by the latter methods. The ideal prospecting procedure is thus considered to be

firstly geological mapping and panning of an area of 1-2 km^2, panning taking place slightly in advance of mapping, followed by u.v. surveying of certain localities and the recording of definite prospects, possibly with detailed geological mapping. A region could be covered in such 'cells' using light camping equipment and 2-day periods from base-camp.

I Hesketh.