NOTES – *NOTISER*

A Serpentinite Conglomerate on the Island of Leka, Nord-Trøndelag

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A small occurrence of a poorly consolidated serpentinite conglomerate from Leka is described. It is proposed that the conglomerate is most likely a partly lithified morainic deposit formed during Quaternary time.

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The general geology of the island of Leka has been outlined by Birkeland (1958), Prestvik (1972). The greater part of the island is made up of layered rocks of ultramafic and gabbroic composition. Only on the northeastern coast are supracrustal rocks of assumed Caledonian age found.

Description of the conglomerate

A serpentinite conglomerate of limited areal extent is situated at Solsem on the southwestern coast of Leka, some 30 metres above the present sea level, at the western foothill of a mountain made up of ultramafic and mafic rocks (Fig. 1). The conglomerate covers about 100 square metres with a maximum thickness of two metres. The contact with the underlying metagabbro is flat-lying.

It is a poorly consolidated conglomerate where fragments can be hand-picked without difficulty. The rock is also poorly sorted, with boulder dimensions up to 80 cm in their longest direction. Boulders, pebbles, and gritty fragments are mostly angular; however, both spherical and ellipsoidal boulders are present in minor amounts. The conglomerate constituents have no preferred orientation (Fig. 2).

Ultramafic rocks and metagabbro of the types occurring on Leka are the predominant constituents of the coarse fragments in the conglomerate. A few exotic boulders of granitic composition not found on Leka are also present. The sand fraction consists mainly of angular to subangular detrital rock fragments of mostly ultramafic and gabbroic composition. Some quartz, feldspar and granitic fragments are present.

The microcrystalline matrix is difficult to examine optically. Carbonate minerals, possibly magnesite or dolomite, occur visibly in small amounts as scattered grains, sometimes along grain boundaries. In some places, a brown-coloured matrix of limonite, FeO(OH) type, can be detected under the

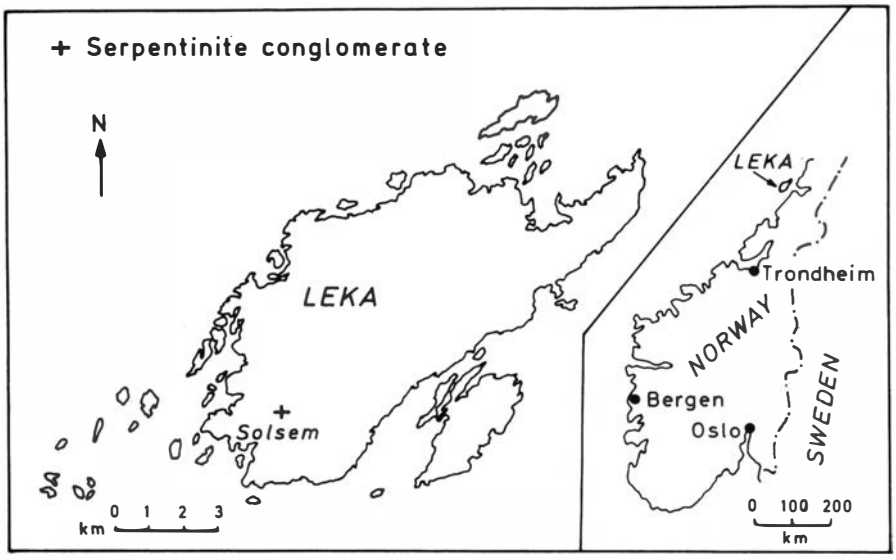

Fig. 1. Location map. Cross at Solsem shows position of the serpentinite conglomerate.

microscope. X-ray diffraction analysis of bulk matrix generally gives an antigorite pattern, indicating that antigorite serpentine is the chief mineral component of the matrix. This antigorite was probably derived from the ultramafic rocks by weathering.

Discussion

It appears that the diagenetic consolidation of the Leka serpentinite conglomerate has not been completed. The cementing material of the conglomerate seems to have very small amounts of carbonate minerals, this being the main reason why the rock disintegrates so easily. Recrystallization of serpentinite matrix does not play an important role.

Serpentinite conglomerates have been reported from several localities in Scandinavia. Bjørlykke (1905), Øyen (1930), Hedstrøm (1930), Strand (1951, 1960), and Oftedahl (1969) described the fossiliferous serpentinite conglomerate at Otta, central Norway. Törnebohm (1896), Kulling (1933), and Du Rietz (1935) reported serpentinite conglomerates from the Swedish part of the Caledonides, while Gustavson & Grønhaug (1960) briefly described an occurrence from Norway. All these serpentinite conglomerates are somewhat metamorphosed, and interbedded in Cambro-silurian sequences. Goldschmidt (1913) and Holmsen (1963) described a Devonian serpentinite conglomerate at Røragen.

For the sake of comparison, samples from the Røragen serpentinite conglomerate have been examined. Macroscopically this Devonian conglomerate resembles that from Leka in being unmetamorphosed and relatively poorly consolidated. Microscopic examination, however, shows that the de-

Fig. 2. Close-up picture of the conglomerate with poorly sorted angular boulders and fragments of serpentinite.

gree of recrystallization of the matrix is greater than is the case with the Leka conglomerate. There is also a greater abundance of carbonate in the Røragen conglomerate. The Devonian sedimentary sequence at Røragen is somewhat tectonically deformed. According to Holmsen (1963) the rocks are folded, and perhaps also thrusted.

The Solsem serpentinite conglomerate on Leka is a single deposit, lacking stratification, and without any signs of penecontemporaneous or secondary deformation. The conglomerate borders are defined on all sides by erosional truncation. Evidence indicates that the deposit is post-Caledonian. It was probably not deposited in water.

The Tertiary uplift of the western landmasses of Norway possibly started as early as the Eocene (Torske 1972). This would suggest that a sedimentary deposit which is not bordered by marginal faults may be younger than the Tertiary uplift, e.g. middle to late Tertiary, or Quaternary. It does not seem likely that a sedimentary deposit older than the Tertiary uplift would escape complete erosion unless it was downfaulted into older rocks (cf. the Mesozoic rocks at Andøya, Vogt 1905).

If the serpentinite conglomerate on Leka is older than the Quaternary ice-age, the most plausible explanation for its formation would seem to be that it represents a deposit of a mass-wasting type on dry land.

The over-all impression of the conglomerate, however, is that of a partly lithified morainic deposit. Even though the serpentinite conglomerate is situated at the foot-hill of a higher mountain, the locational level indicates

that the base of the conglomerate belongs to the strandflat which at Leka is 10–30 metres above the present sea level (Vogt 1900).

Recent detailed investigations of Quaternary deposits from Trøndelag reveal that in the main the greater part of the morainic material has been transported over short distances, i.e. up to only three kilometres. A smaller fraction of the material, five to twenty percent, has in general more distant sources (Arne J. Reite, pers. comm.). Låg (1948) found that the material he termed 'autochthonic morainic soil' predominated in most of the morainic deposits investigated in east Norway.

Several types of morainic deposits from the Würm glaciation period in Norway may be consolidated to the same degree as the Solsem conglomerate, with the cementing material being compounds of iron and carbonate. Deposits of this kind comprise hard pans (Holtedahl & Glömme 1963) and calcareous tuffs (Nordhagen 1921). K. Anundsen (pers. comm.) reports a small deposit of iron pan with a breccia-like texture from the mouth of Sandådalen, Finse, Hardangervidda, southern Norway. The coarser fragments of this deposit are mainly of phyllitic composition, and the cementing material seems to have been furnished by groundwater activity.

However, the present conglomerate shows little resemblance to any consolidated Quaternary deposit known to the authors. This difference may be ascribed to its specific petrographical composition.

On the western side of Leka there are areas covered with non-consolidated poorly sorted material with a general sedimentological and petrographical appearance very much like that of the Solsem conglomerate. In the Solsem area such non-consolidated material, which is probably of morainic origin and from the latest glacial period (the Würm glaciation period), is not closely associated with the serpentinite conglomerate. The reason this particular deposit is consolidated is probably because of its location, which indicates that cementation took place in close relationship with groundwater.

With the present state of knowledge it may be concluded that the Solsem serpentinite conglomerate is of either mass-wasting or morainic origin and was most probably deposited during Quaternary time. If it was deposited before the latest Würm glaciation, the conglomerate probably represents an erosional remnant of a more extensive deposit.

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REFERENCES

Birkeland, T. 1958: Geological and petrographical investigations in northern Tröndelag. *Nor. Geol. Tidsskr. 38,* 327–420.

Bjørlykke, K. O. 1905: Det sentrale Norges fjeldbygning. *Nor. Geol. Unders. 39,* 595 pp.

Du Rietz, T. 1935: Peridotites, serpentines and soapstones of Northern Sweden. *Geol. Fören. Stockh. Förh. 57,* 133–260.

Goldschmidt, W. M. 1913: Das Devongebiet am Röragen bei Røros. *Skr. Nor. Vidensk.-Akad. i Oslo, Mat.-Naturvidensk. Kl.,* No. 9, 27 pp.

Gustavson, M. & Grønhaug, A. 1960: En geologisk undersøkelse på den nordvestlige del av kartblad Børgefjell. *Nor. Geol. Unders. 211,* 26–74.

Hedstrøm, H. 1930: Om ordoviciska fossil från Ottadalen i det centrala Norge. *Skr. Nor. Vidensk. Akad. i Oslo, Mat.-Naturvidensk. Kl.,* No. 10, 10 pp.

Holmsen, P. 1963: On the tectonic relations of the Devonian complex of the Röragen area, East-Central Norway. *Nor. Geol. Unders. 223,* 127–138.

Holtedahl, O. & Glømme, H. 1963: *Geologi og jordbunnslære* 5. utg. 197 pp. H. Aschehoug & Co., Oslo.

Kulling, O. 1933: Berggrunden inom Bjørkvattnet-Virisen-Området i Västerbotten-fjällens centrala del. *Geol. Fören. Stockh. Förh. 55,* 169–422.

Låg, J. 1948: Undersøkelser over opphavsmaterialet for Østlandets morenedekker. *Medd. Det Nor. Skogforsøksves. nr. 35,* 223 pp.

Nordhagen, R. 1921: Kalktufstudier i Gudbrandsdalen. *Skr. Nor. Vidensk. Akad. i Oslo, Mat-Naturvidensk. Kl.* No. 9, 1–155.

Oftedahl, Chr. 1969: Caledonian pyroclastic (?) serpentinite in central Norway. *Geol. Soc. Am. Mem. 115,* 305–315.

Prestvik, T. 1972: Alpine-type mafic and ultramafic rocks of Leka, Nord-Trøndelag. *Nor. Geol. Unders. 273,* 23–34.

Strand, T. 1951: The Sel and Vågå map areas. *Nor. Geol. Unders. 178,* 117 pp.

Strand, T. 1906: The pre-Devonian rocks and structures in the region of Caledonian deformation. *In* Holtedahl, O. (ed.), *Geology of Norway. Nor. Geol. Unders. 208,* 170–284.

Torske, T. 1972: Tertiary oblique uplift of western Fennoscandia; crustal warping in connection with rifting and break-up of the Laurasian continent. *Nor. Geol. Unders. 273,* 43–48.

Tørnebohm, A. E. 1896: Grunddragen af det centrala Skandinaviens bergbyggnad. *K. Sven. Vetenskapsakad. Handl. 28,* No. 5.

Vogt, J. H. L. 1900: Søndre Helgelands morfologi. *Nor. Geol. Unders. 29,* 1–61.

Vogt, J. H. L. 1905: Om Andøens Jurafelt, navnlig om landets langsomme nedsynken under juratiden, og den senere hævning samt gravforkastning. *Nor. Geol. Unders. 43,* No. 5.

Øyen, P. A. 1930: Foreløpige bemerkninger om det centrale Norges serpentinkonglomerater. *Skr. Nor. Vidensk. Akad. i Oslo, Mat-naturvidensk. Kl.,* No. 9, 12 pp.