

Note

Clay minerals in some samples from Opstad and Høgemork on Jæren, southwest Norway

E. M. F. FUGELLI

Fugelli, E. M. F.: Clay minerals in some samples from Opstad and Høgemork on Jæren, southwest Norway. *Norsk Geologisk Tidsskrift*, Vol. 72, pp. 217–219. Oslo 1992. ISSN 0029-196X.

The clay mineral composition of 12 samples from two stratigraphic sections has been studied. The sediments are of Quaternary age. The results show a large amount of kaolinite and smectite, considered to be pre-Quaternary products.

E. M. F. Fugelli, Statoil, Forushagen, Postboks 300, 4001 Stavanger, Norway.

The Jæren area is located south of Stavanger (Fig. 1). It is covered with glacial deposits of mainly Weichselian age, which reach thicknesses of 100 m in some areas. Much attention has been paid to investigations of these sediments including lithostratigraphy, biostratigraphy and dating of selected sections (see review in Andersen et al. 1987). Only a few detailed surveys of the clay mineralogy have been carried out (Jørstad 1964; Augedal 1978; Telleman 1986). This note is a contribution to our knowledge of the Quaternary sediments in the Jæren area.

Opstad (175 m a.s.l.) and Høgemork (210 m a.s.l.) are both locations on Høg Jæren (Fig. 1). A short review of the litho- and chronostratigraphy is presented in Fig. 2 (for further discussion, see also Andersen et al. in press). The sediments are mainly glaciomarine clays of Weichselian age. Eight samples from Opstad and four samples from Høgemork were selected for mineral analysis (Fig. 2). The clay fraction ($< 2 \mu\text{m}$) has been used, and the calculation method is described by Weir et al. (1975). The mixed layered minerals are mainly composed of smectite-illite and smectite-chlorite, where smectite is the dominating mineral.

The samples reflect compositional variability.

Discussion

The underlying basement consists mainly of Caledonian gneiss/phyllite to the west, and Precambrian gneiss to the east (Birkeland 1981). The non-clay minerals, such as quartz, plagioclase and feldspar, are most likely related to these rocks. Illite, chlorite and the above-mentioned minerals may be taken as indicators of crystalline rock sources on the Norwegian mainland. Chlorite is found in areas where mechanical weathering is dominant, and both illite and chlorite point to glacial erosion of bedrock.

Kaolinite and smectite are normally found in areas where weathering is chemical rather than mechanical. Acidic, warm and humid conditions, as in the tropics, enhance such weathering (Kenneth 1982). These minerals probably reflect older sediments of Mesozoic age.

Since the sediments are glaciomarine, the main transport mechanism seems to be by glaciers. Anundsen (1990) indicates different ice movement directions during Weichsel time in this area. The samples may reflect several sources because of changing transport directions

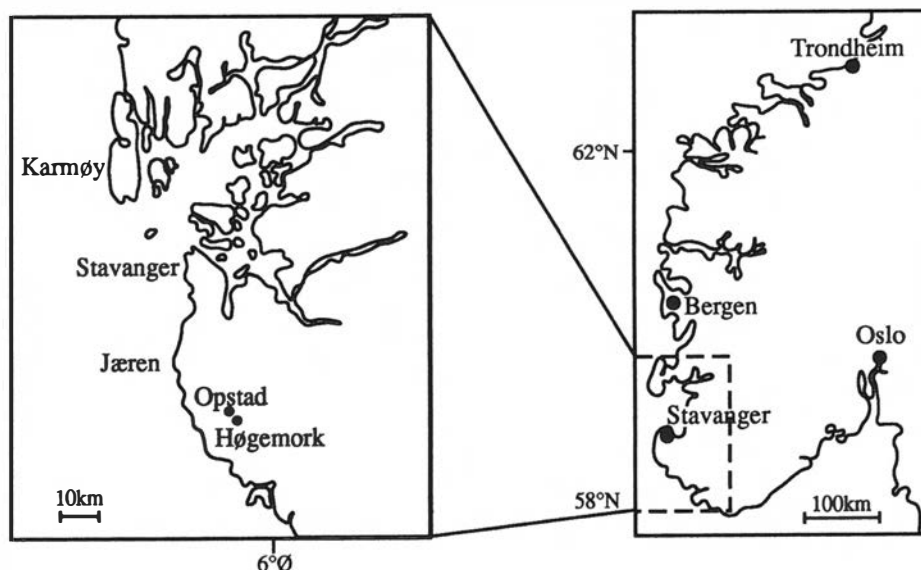
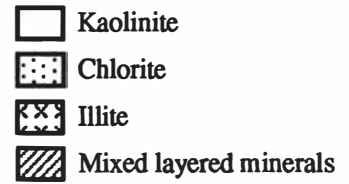
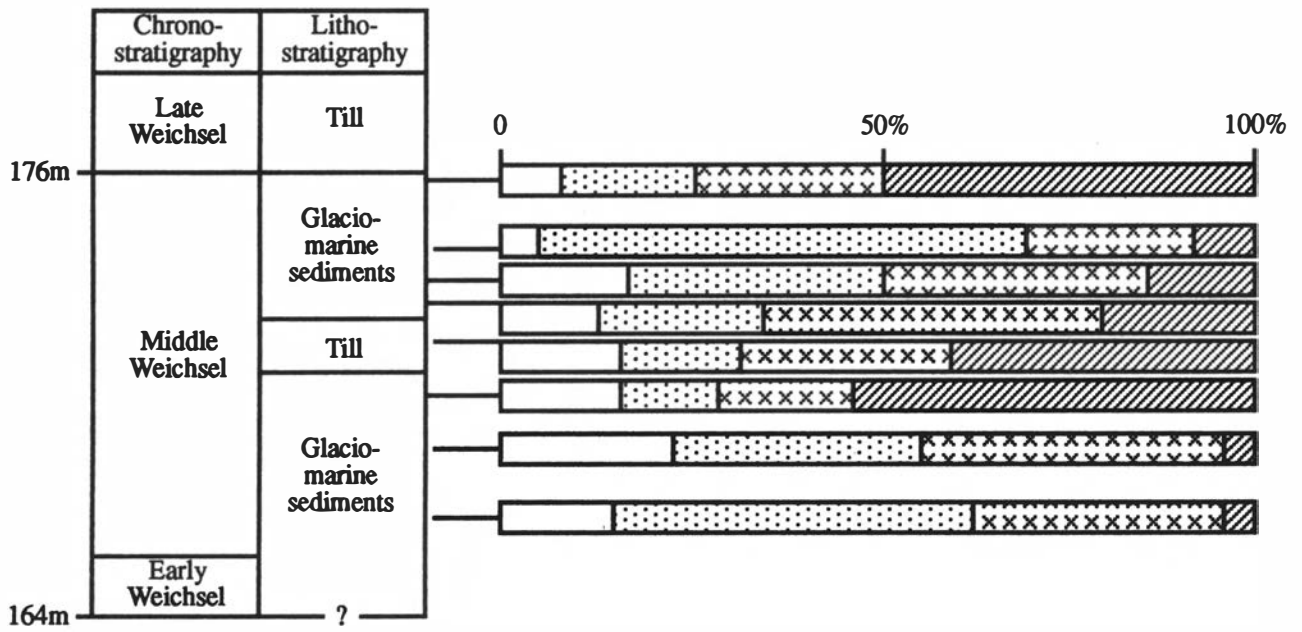


Fig. 1. Jæren with the sampled localities.

2a OPSTAD



2b HØGEMORK

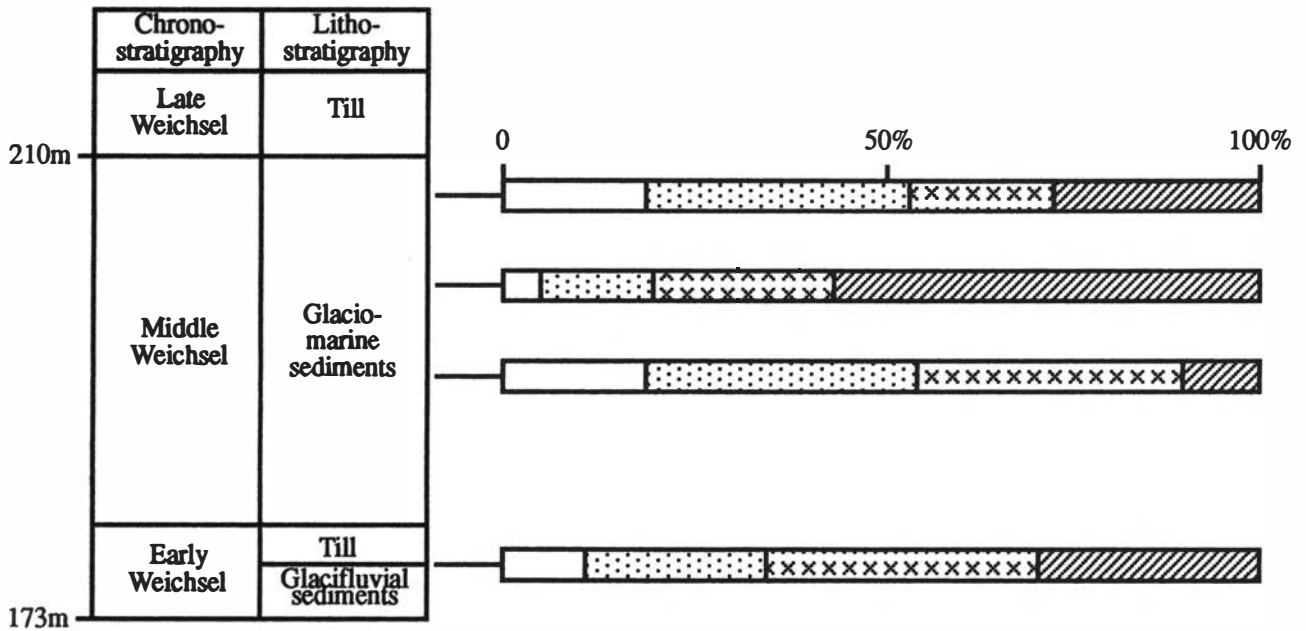


Fig. 2. The stratigraphy of Opstad and Høgemork with percentage of clay minerals in selected samples.

when the sediments were deposited. Sea ice, icebergs and ocean currents could also account for some of the minerals in the sediments. The high elevation of the marine deposits is probably a result of both glacioisostatic depression and neotectonic movements (Fugelli & Riis in press).

For the time being there is no evidence of Mesozoic sedimentary rocks on Jæren. Such rocks are suggested to occur in the Lista basin, and have probably covered the land areas to the north of Lista (Holtedahl 1988). Seismic data also indicate Mesozoic rocks in Karmsundet outside Karmøy (Sigmund pers. comm. 1990). Thus there is a possibility that similar rocks underlie the thick glacial deposits on Jæren. The clays may only reflect remnants of these rocks and are relicts of a sub-Triassic surface.

The samples examined most likely have a mixed origin, partly derived from older sediments and partly derived from Pleistocene tills and Scandinavian-derived material.

Acknowledgements. – The work was financed by the Norwegian Research Council for Science and the Humanities (NAVF). The manuscript was critically reviewed by Per Blystad and Espen Andersen. Bjørn G. Andersen reviewed and earlier version. Sincere thanks are also extended to Bjørn G. Andersen for organizing part of the project and for his encouragement and discussions at various stages of the work.

Manuscript received November 1990

References

- Andersen, B. G., Bakken, K., Dale, B., Fugelli, E. M. G., Henningsmoen, K. E. Høeg, H. I., Nagy, J., Read, A. & Telleman, H. (in press). Weichselian Stratigraphy at Oppstad, Høgemork and Foss-Eigeland, Jæren, SW Norway. Manuscript.
- Andersen, B. G., Wangen, O. P. & Østmo, S. R. 1987. Quaternary geology on Jæren and adjacent areas, Southwestern Norway. *Norges geologiske Undersøkelse, Bulletin 411*, 00–00.
- Anundsen, K. 1990. Evidence of ice movement over Southwest Norway indicating an ice dome over the coastal district of West Norway. *Quaternary Science Reviews* 9, 99–116.
- Augedal, H. 1978. Teksturell, mineralogisk og kjemisk sammensetning av kvartære marine leirer fra Sør-Norge. Cand. real thesis Univ. i Oslo.
- Birekland, T. 1981. The geology of Jæren and adjacent districts. A contribution to the Caledonian nappe tectonics of Rogaland, southwest Norway. *Norsk Geologisk Tidsskrift* 61, 213–235.
- Carrol, D. 1970. Clay minerals: A guide to their X-ray identifications. *Am. Geol. Soc. Spec. Pap.* 126, 80 pp.
- Fugelli, E. M. G. 1987. Bio- og litostratigrafiske undersøkelser av sedimenter på Opstad og Høgemork, Syd-Jæren. Cand. scient. thesis Univ. i Oslo.
- Fugelli, E. M. F. & Riis, F. in press. Neotectonism in the Jæren area, Southwest Norway. 7th TSGS Conference in Stavanger 1990, extended abstract. *Norks Geologisk Tidsskrift*.
- Haldorsen, S., Jørgensen, P., Rappol, M. & Riezebos, P. A. 1989. Composition and source of the clay-sized fraction of Saalian till in the Netherlands. *Boreas* 18, 89–97.
- Holtedahl, H. 1988. Bedrock geology and Quaternary sediments in the Lista basin, South Norway. *Norsk Geologisk Tidsskrift* 68, 1–74.
- Jørstad, F. 1964. Utgliding i Gannsområdet, Sandnes, august 1963. Kvartærgeologiske forhold på Jæren, spesielt i Sandnes-området. Norges Geotekniske Institutt, Oslo, unpubl. rep. F-256-6, 26 pp.
- Kenneth, J. 1982. Marine geology. In Kenneth, J. (ed.): *Marine Geology*, Prentice-Hall. 431 pp.
- Rosenqvist, I. Th. 1985. Mineralogy of material from the Upper Quaternary Skagerak sediment core GIK 15530-4. *Norsk Geologisk Tidsskrift* 65, 74–75.
- Telleman, H. 1986. Litostratigrafi i kvartære overflatesedimenter ved Foss-Eikeland, Jæren. Cand. scient. thesis Univ. i Oslo.
- Weir, A. H., Ormerod, E. C. & El Mansey, I. M. I. 1975. Clay mineralogy of sediments of the western Nile delta. *Clay Minerals* 10, 369–386.