

The subdivision of the Quaternary of Norden: a discussion

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The proposal for Quaternary stratigraphy of Norden published 1974 by Mangerud, Andersen, Berglund & Donner was discussed at a Nordic meeting 1978. On the basis of this discussion some recommendations are proposed here which deviate slightly from the 1974 proposal: (1) the term Flandrian should not be used in Norden until it is properly defined in the type area, (2) the Middle/Late Weichselian boundary should provisionally be defined as 25,000 ^{14}C years B.P. In addition it was stated that there is an urgent need for complete subdivision of the Weichselian into a continuous chronozone sequence.

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A proposal about formalizing the nomenclature of the Quaternary stratigraphy of Norden was published by Mangerud, Andersen, Berglund & Donner in 1974, as a result of a Nordic symposium. This proposal has since been used by most Quaternary scientists in Norden. During the XIII Winter Meeting of Nordic Geologists in Copenhagen, January 1978, Dr. S. Th. Andersen organized a symposium to discuss it. Several problems were taken up, but here only suggestions for changing the nomenclature proposed in 1974 are reported.

Flandrian

Mangerud et al. (1974) proposed using Flandrian as a stage name, with the lower boundary identical with the Pleistocene/Holocene boundary. In a recent paper, however, Paepe et al. (1976) have pointed out the great confusion created by the term Flandrian. They therefore propose finding a type locality in Belgium, and state that the lower boundary may not be identical with the lower boundary of the Holocene. We now recommend that the term Flandrian should not be used in Norden until it is properly defined in the type area.

Holocene, with the provisional boundary definition of 10,000 ^{14}C years B.P. (Hageman 1969), should be used as the youngest *series* (and *epoch*), and, according to Hedberg (1976:72), the series should not necessarily be broken up into stages. If a tripartition has to be used, Holocene

may be subdivided in the same way as previously proposed for Flandrian (Mangerud et al. 1974).

Middle/Late Weichselian boundary

This boundary was vigorously discussed during the Copenhagen meeting, the alternatives being 13,000 B.P. and somewhere around 23,000–26,000 B.P. It was also seriously discussed during the symposium preceding the proposal of Mangerud et al. (1974). At that time, however, there was general agreement on the 13,000 B.P. boundary, even though the older alternative was proposed in the report (Mangerud 1973) distributed before the symposium.

The arguments for the 13,000 B.P. are:

- (1) Late Weichselian developed as a formalization of Late Glacial (with capitalized L and G) introduced by the pollen analysts. This position of the boundary must be considered the original one; it is also the most extensively used in NW Europe (e.g. van der Hammen 1957; Menke & Behre 1973; Mangerud et al. 1974; Zagwijn & Staaldin 1975).
- (2) In NW Europe there is an important geological event around 13,000 B.P. – distinctly marked in marine as well as in limnic/terrestrial strata. 13,000–10,000 years B.P. is therefore a well-defined geological unit, starting with the main climatic amelioration after 'the Weichselian maximum', and including the oscillations before the final end of the Weich-

selian. In other areas, e.g. North America, the climatic amelioration and deglaciation was more gradual according to available data.

The arguments for the older position of the boundary are:

- (1) The duration of the Weichselian is probably more than, or at least near, 100,000 years. Subdivision into three units would be most logical with at least some more equal units than with a Late Weichselian covering only 3,000 years.
- (2) Experience shows that inclusion of the last well-defined glacial maximum (18,000–22,000 B.P.) in the Late Weichselian is useful. In this way it can easily be distinguished from earlier maxima even in the main stratigraphic nomenclature. During the Copenhagen meeting this was advocated by several scientists (e.g. B. G. Andersen, A. Berthelsen, O. Salvigsen) with experience from glacial stratigraphy. This has also previously been proposed by Mörner (1970, 1976).
- (3) The stratigraphical subdivision of NW Europe should certainly be based on the record in that region. Nevertheless, it would be useful to have a Late Weichselian which approximately corresponded with for instance Late Wisconsin (Dreimanis & Karrow 1972), and Late Devensian (Mitchell et al. 1973).

Consequently, there are strong arguments for both alternatives. The present authors have been in doubt as to which boundary position would be scientifically most sound. However, on the basis of points (1) and (2) in favour of the older boundary, in addition to strong recommendations by many Quaternary geologists in Norden, we now propose the older boundary. According to the literature this is generally placed between 23,000 and 26,000 years B.P. In this provisional proposal we choose 25,000 years B.P. The exact definition, preferably a type locality, for this boundary should be found later.

As a consequence, there will be a tripartite subdivision of the Weichselian with an Early/Middle Weichselian boundary as previously defined (Mangerud et al. 1974; Zagwijn & Staaldunin 1975), and a Middle/Late Weichselian boundary provisionally put at 25,000 ^{14}C years B.P.

A complete nomenclature for Weichselian

Mangerud et al. (1974) used only already defined units – mainly names of interstadials – and their proposal therefore includes several gaps in the formal naming of chronostratigraphical units. The gaps must be filled through geological research, and new units must be defined as far as possible in accordance with the international stratigraphic guide (Hedberg 1976). In this way we may reach the main aim – a continuous sequence of Weichselian chronozones. There is one gap in particular which the Copenhagen meeting proposed would soon be filled with named units, namely the strata between 25,000 B.P. and the Bølling Chronozone.

Other nomenclatural problems

There was general agreement concerning the subdivision into chronozones for the Late Weichselian, and also concerning the redefinition of the Bølling zone now used as a chronozone name for the time interval 13,000 to 12,000 years B.P. There was no serious objection against the subdivision of the Holocene into chronozones proposed in 1974.

The future path towards a formal stratigraphy

No stratigraphical commission exists for Norden, nor for NW Europe, which is the natural geographical region for a common Quaternary stratigraphical nomenclature. We will continue to stimulate discussion at meetings, and especially in written form through the medium of *Boreas*. For the time being, we must just accept that different definitions are used for some stratigraphical units, as for instance the Late Weichselian. It is therefore very important to have a proper reference to the definition used. In order to get an official decision we have submitted this proposal to INQUA 'Sub-commission on European Quaternary Stratigraphy'.

References

- Dreimanis, A. & Karrow, P. F. 1972: Glacial history of the Great Lakes – St. Lawrence Region, the classification of the Wisconsin(an) Stage, and its correlatives. *24th Int. Geol. Congr., Sect. 12*, 5–15, Montreal.
- Hageman, B. P. 1969: Report of the commission on the Holocene (1957). *Etudes sur le Quaternaire dans le Monde* 2, 679. VIII Congrès INQUA. Paris.
- Hammen, T. van der 1957: The stratigraphy of the Late-glacial. *Geologie en Mijnbouw (NW. Ser.)* 19, 250–254.
- Hedberg, H. (ed.) 1976: *International Stratigraphic Guide*. 200 pp. John Wiley & Sons, New York, London, Sydney, Toronto.
- Mangerud, J. 1973: *Kritisk oversikt over stratigrafisk terminologi og klassifikasjon av Kvartaer i Norge*. 38 pp. Geol. inst., Dept. B, Univ. Bergen. Mimeogr. Report.
- Mangerud, J., Andersen, S. T., Berglund, B. E. & Donner, J. J. 1974: Quaternary stratigraphy of Norden, a proposal for terminology and classification. *Boreas* 3, 109–127.
- Menke, B. & Behre, K.-E. 1973: History of vegetation and biostratigraphy. *Eiszeitalter u. Gegenwart* 23/24, 251–267.
- Mitchell, G. F., Penny, L. F., Shotton, F. W. & West, R. G. 1973: A correlation of Quaternary deposits in the British Isles. *Geol. Soc. Lond. Spec. Rep.* 4, 99 pp.
- Mörner, N.-A. 1970: Comparison between Late Weichselian and Late Wisconsin ice marginal changes. *Eiszeitalter u. Gegenwart* 21, 173–176.
- Mörner, N.-A. 1976: Global correlations and Weichselian chronostratigraphy. In *IGCP-project 73-1-24: 'Quaternary glaciations in the Northern Hemisphere'*. Report 3, 327–338. Prague.
- Paepe, R., Sommé, J., Cunat, N. & Baeteman, C. 1976: Flandrian, a formation or just a name? *Newsl. Stratigr.* 5, 18–30.
- Zagwijn, W. H. & Staalduinen 1975: *Toelichting bij Geologische overzichtskaarten van Nederland*. 134 pp. Harlem.