24. SOME REMARKS AND RECOMMENDATIONS CONCERNING A PROPOSAL FOR A TYPE-SECTION OF THE PLEISTOCENE/HOLOCENE BOUNDARY

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According to the definition by the Holocene Commission of INQUA, the Pleistocene/Holocene boundary has an age of 10 000 years B.P. (Libby half-time of ^{14}C). Furthermore the same Commission, together with the INQUA Subcommission for North-west European shore-lines, had proposed a stratotype for this very boundary to be chosen in the Göteborg area, south-western Sweden. A working group, conducted by Eric Olausson, Göteborg, has since investigated several sites, the most appropriate being Moltemyr and Solberga, since both exhibit a long marine record, can be absolutely dated, and are easily accessible by flat borings.

The drawbacks of these sites are that
a, they have experienced an isostatic uplift,
b, the marine environment was replaced by freshwater later in the early Holocene,
c, ^{14}C-datings of marine shells are prone to errors, and
d, the former submarine topography may have exerted an unknown influence on the circulation of the ocean water. These difficulties must be taken into consideration.

In view of the handicaps a, b, and d, it must be suggested that local factors may have influenced the palaeoecological environment. Accordingly more general criteria should be chosen to accurately define the Pleistocene/Holocene boundary. With this in mind an intensive investigation of neighbouring former lakes could prove worthwhile. These may be Rörmyr and Vägen or some other site. An essential, synchronous event is the onset of long-distance transport of pollen grains of certain tree species, provided that the local vegetation was open. The pollen diagrams of Rörmyr, Vägen and Moltemyr generally exhibit the following sequence in the evolution of vegetation at about the Pleistocene/Holocene boundary and during the early Holocene: herb vegetation, dominated by *Artemisia* → *Empetrum-Salix-Betula nana* heath → juniper heath → copses of *Hippophaë* and *Betula,*

sometimes with some poplar. This sequence depicts the transition from an open, more or less treeless vegetation to sparse *Hippophaë – Betula* forests. It is improbable that already at the onset of this forest-formation *Corylus* could thrive in the area investigated. Thus the beginning of its pollen curve should indicate ± synchronously the beginning of the long-distance transport. If so, this very point may be used as one reference layer, although already at the Preboreal/Boreal transition.

This horizon was preceded in Moltemyr, Rörmyr and Vägen by a phase, relatively rich in tree pollen, consisting only of birch and pine. The pollen curves of both these trees run inversely, with a very high amount of *Pinus,* when the nonarboreal pollen had predominated. This indicates long-distance transport of pine pollen, when the pollen production of the autochthonous vegetation was very low. In my view the last transition from the open, herb-dominated vegetation to the immigrating woody species, including *Betula,* should be the second synchronous reference layer, the Younger Dryas/Preboreal transition, *i.e.* the Pleistocene/Holocene boundary.

If so, this boundary is placed in the Moltemyr section at a depth of about 4.65 m and at Solberga about 18.25 m below the surface. This is in general corroborated by the mollusc fauna, although not by the diatoms, foraminifers, $\delta\ ^{18}O$, nor the coccoliths, all of them being strongly influenced by changing depths and the chemistry of the water too.

Consequently although the Solberga section covers a longer interval, the documentation of events at the Pleistocene/Holocene boundary in the Moltemyr section seems to be better. Both these sections should be taken together as typelocalities (holo- and para-type locality) for the Pleistocene/Holocene boundary. It may be questioned whether the hitherto published ^{14}C-datings are reliable. In general they do not fit into the scheme given here, whereas palaeomagnetism (Abrahamsen) seems to corroborate the said theory.

If the suggestions made here should prove correct, the final influx of freshwater into both these basins cannot have happened synchronously, *i.e.* it cannot result from the Billingen event. This is easily understood in view of the local topography at Moltemyr. Finally I recommend the complex investigations to be continued, principally to detect general governing factors at that time, *i.e.* true climatic factors. This could be done by a continuation of the pollen-analytical work, implying a comparison of the pollen spectra of lacustrine *versus* marine environments, further by geomorphological, geological and palaeontological definitions of the Billingen event and its correlative sediments in the palaeoecology of the Göteborg area.