

Reconstruction of ancient climates – clues to the future

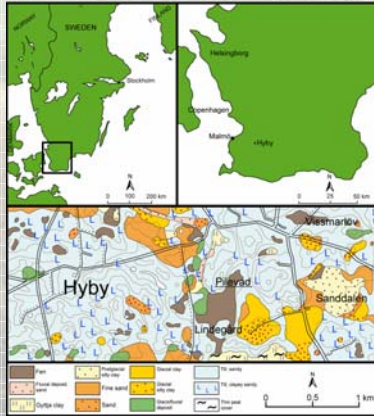
Department of Quaternary geology, KVG 530 vt 2007: Johanna Anjar, Marilen Fernandez,

Ida-Maria Jansson, Sverrir A. Jónsson, Barbro Noresten, Jonas Persson



Background

Knowledge of past environments and climate variations are of fundamental importance when trying to understand present conditions. The aim of this study has been to use palaeoecological methods in order to reconstruct past climate and vegetation. A core was extracted from Pilevad, a fen located in south-western Sweden. The stratigraphy was described and samples from the different intervals were taken for measurement of loss of ignition and analysis of pollen and macrofossil content.



Betula

Lake in tundra environment (PAZ1): The zone is characterised by high amounts of pollen from trees and shrubs. The dominating tree taxa are *Betula* and *Pinus sylvestris*, while *Juniperus* dominates the shrubs. No tree macrofossils were found, however one seed from *Betula nana* was obtained. The sediment consist of clay gyttja and gyttja clay.

As no tree macrofossils were found and the scarcity of herbs indicates harsh environmental conditions, it is likely that *Betula alba* and *Pinus* did not actually grow at the site. Hence, the pollen must have been long distant transported. This process was most likely facilitated by a vegetation characterised by low stature species.

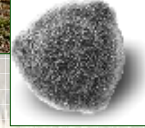
Establishment of birch forest (PAZ2): The interval is characterised by high values of tree pollen in the uppermost half. *B. alba* and *P. sylvestris* being the dominating taxa. In this zone *Artemisia*, Caryophyllaceae and Cyperaceae occur for the first time. *Poaceae* reaches a peak and *Pediastrum* is common in the bottom of the zone. Macrofossils of both *B. alba* and *B. nana* have been encountered, together with a high number of molluscs. The lowermost sediments mostly consist of clay gyttja; thereafter there is a change towards more organic fine detritus gyttja. This change coincides with a rise in tree pollen.

The first half of zone 2 represents an open landscape with light demanding vegetation such as grasses, herbs, *B. nana* and *Salix*. *B. alba* established at the site in the middle of the interval and gradually expanded to form an open birch forest.



Pinus

Salix



Corylus

Pine and hazel forest (PAZ3): In zone 3 *Corylus* pollen occur for the first time. The values are consistently high, approximately 30% through the entire zone. Both *Pinus* and *Betula* decreases but are still rather common. Low amounts of *Quercus*, *Tilia* and *Ulmus* were found. The sediments at this stage consist of gyttja.

The arrival of *Quercus*, *Tilia* and *Ulmus* indicates warmer climatic conditions. However, it is difficult to get a clear picture of the density of the forest as pollen from these trees are generally underrepresented in the samples. When *Corylus* arrived it partly out-competed *Pinus* and *Betula* and thus the forest changed from a *Betula* and *Pinus* dominated forest towards a mixed forest consisting of *Corylus*, *Pinus* and *Betula*.

Development of an Alnus-fen (PAZ4): The zone is characterised by high values of tree pollen. In the lower part of the zone there is a distinct drop in *Corylus* and *Pinus*, a large increase in *Alnus* and a slight increase in *Betula* pollen. In the upper part of the zone the values for Polyodiaceae sharply increases. The sediment is made up of woody peat and phragmites peat.

The lake has gradually become filled up with sediments and turned into an *Alnus*-dominated fen. Hence, the drop in *Corylus* and *Pinus* is interpreted as a consequence of increase of *Alnus* in the fen.



Alnus



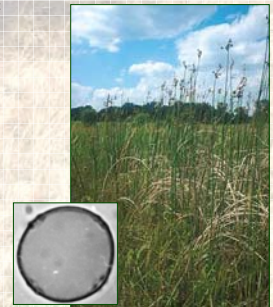
Quercus

Expansion of mixed oak forest (PAZ5): The zone is characterised by low levels of *Betula* pollen. *Alnus* decreases slightly throughout the interval. Increased amounts of pollen was detected from *Tilia* and *Quercus* as well as from herbs such as *Calluna*, Cyperaceae, *Plantago* and Poaceae. The deposited material consists of woody peat and the amount of organic material exceeds 80%.

The vegetation at the site was dominated by *Alnus*. The climate during this interval was warm and dry. This is supported by the expansion of *Tilia* and *Quercus*, which both require relatively warm and dry conditions. This interpretation is further supported by the occurrence of *Plantago*.

Opening of the landscape by human impact (PAZ6): The pollen assemblage in the last zone is characterised by low levels of *Betula*, a sharp peak in *Alnus* pollen and high amounts of Polygonaceae and Cyperaceae. *Picea* and *Urtica* appear in the pollen samples.

A colder and wetter climate has caused a decline in plants that require drier conditions, whereas species that can grow on more saturated soils, such as *Alnus*, increases. These wetter conditions can be detected as a change from woody peat in the lower part of the zone to phragmites peat in the upper part. Furthermore, the occurrence of *Scirpus lacustris* seeds indicates open water conditions. The increasing amount of pollen from grasses and herbs, such as *Urtica*, indicates a more open landscape as a result of escalating human influence on the area.



Urtica

