Komořanské jezero Lake (CZ, NW Bohemia) - A Unique Natural Archive

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ABSTRACT. Last remains of the Komořanské jezero Lake and its sediments were destroyed completely ten years ago. Palaeobotanical findings confirmed that the lake had already existed in the Late Glacial and thereafter throughout the whole Holocene. Palaeobotanical and archaeological data on the vegetational, hydrological and climatological situation, as well as on the landscape and its colonization in the past thousands years, were contained in its sediments (algal gyttja and peat). The until now available palaeobotanical results are the only information presented by sediments of the unique biotope. However, further data obtainable by means of new methods are no more accessible due to the destruction of all sediments during intensive mining of brown coal.

KEY WORDS: pollen analyses, palaeoalgology, gyttja, Late Glacial, Holocene.

Introduction

The Komořanské jezero Lake (50°30'N, 13°30'E, 230 m a.s.l.) was one of only a few natural lake biotopes in the territory of the Czech Republic. Its uniqueness was given by the fact that its remains persisted nearly up to the present. A relatively extensive area of free water surface (about 12x6 km) became gradually overgrown since the beginning of the Holocene. The remaining area of the lake was 1.95 km^2 before its thorough drainage in 1834 (Pokorný, 1963; Hurník, 1969; Brezák and Klápště, 1983). Wetlands having the character of small water bodies, magnocariceta, reed and alder stands were gradually destroyed in the second half of the 20th century together with sediments of the original lake. The reason was the surface mining of brown coal. The first palaeobotanical study of lake sediments was performed by Rudolph (1926). In continuation of Rudolph's research, detailed palaeobotanical analyses of then still undamaged sediments were performed by Losert (1940). Later on, the palaeobotanical research had at its disposal only remaining dispersed islands of the original sediments (Jankovská, 1983), or material already earlier sampled in connection with archaeological research (Neustupný, 1985; Jankovská, 1988). The main subject of this contribution is the presentation of most important results of pollen analyses of sediments collected during a salvage project in the 1980s.

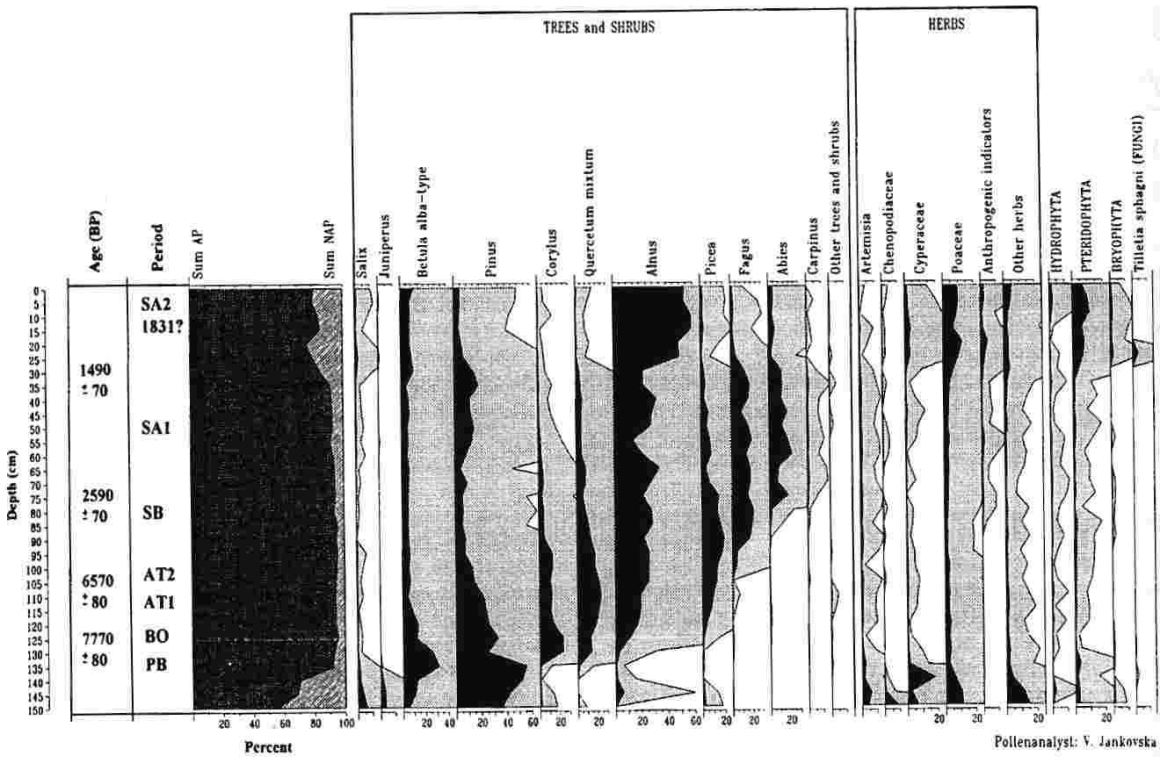
Methods

The analysed profile PK-1-E was taken from the wall of a trench. Gyttja and peat samples for pollen analyses were processed according to the acetolysis method after pretreatment with hydrofluoric acid. Four radiocarbon dates (WIS 1410-1413) performed at the C-14 Laboratory, University of Wisconsin - Madison, USA, were used for profile PK-1-B (Jankovská, 1983). Finds of water algae undestroyed by chemical preparation were also determined when possible. The results of this palaeoalgological analysis contributed to a large extent to the accuracy of interpreting the character of water environment in individual phases of the lake biotope evolution. This way, they also completed the results of diatom analyses by Řeháková (1986).

Analyses and results

A relatively extensive but shallow lake supplied with water from the Krušné hory Mts. existed on their SE foot already during the Pleistocene, i.e. in the Würm Glacial. A nearly exclusively minerogenic sedimentation was taking place under subarctic (lower situated locations in the surroundings of the lake) and arctic (in the Krušné hory Mts.) conditions. The sporadic vegetation around the lake, and exceptionally some water and riparian plants, produced limited amounts of organic matter and pollen grains under the subarctic conditions. This was, in addition, regularly carried away from the lake by strong floods, e.g. during snow and ice thaw in the spring, or during downpours. The production of plant biomass increased both in the lake and on the shore with the warming in the Late Glacial, but a part of then deposited organic material was still carried away. This is why the Late Glacial deposits are of very small thickness. Species of the genus *Salix* prevailed in the rim of the lake along with plentiful *Cyperaceae* and *Poaceae*. Mossy areas with species of the genus *Sphagnum* were also present. The occurrence of algae *Pediastrum kawraiskyi, P. integrum, P. alternans* and *P. boryanum* var. *longicorne* points to the presence of a cool, oligotrophic lake. The landscape was open, with bushy growth of willows and junipers, and with sporadic birch and pine trees. Preboreal (PB) was characterized by the spreading of *Betula* stands and a relatively enhanced occurrence of *Corylus*. Species of open vegetation formations (tundra, steppe) and light demanding woody species (*Salix, Juniperus)* gradually retreated. Water vegetation in the lake was still sporadic and the phytoplankton consisted mostly of coccal green algae. The water environment was cool and oligotrophic, with a limited contri-

Fig. 4. Komořanské jezero Lake.



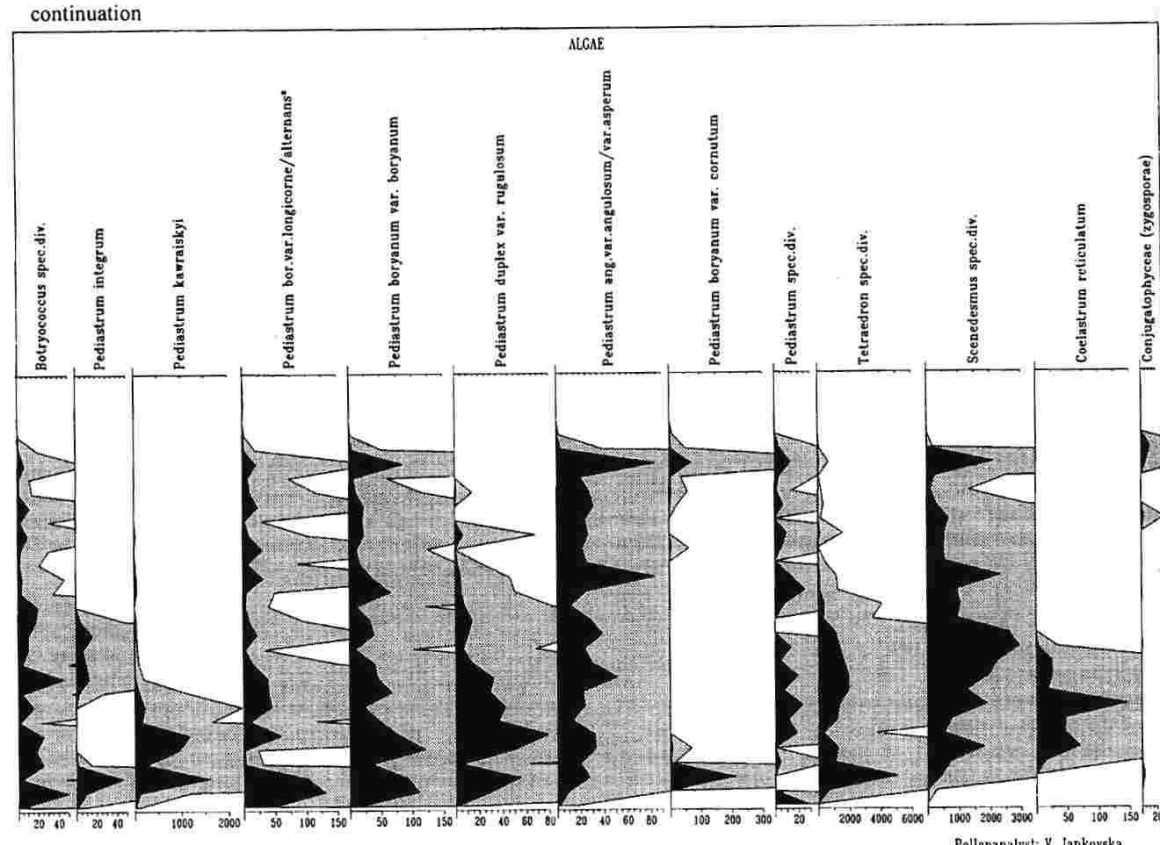


Fig. 2. Komořanské jezero Lake, Profile PK-1-E (50°30'N, 50°30'E, 230 m asl.), CZ, NW Bohemia.

bution of dystrophic water from nearby mossy grounds (see *Pediastrum boryanum* var. *longicorne)*.

The following, warm Boreal (BO) was characterised by the intense spreading of *Corylus*. Hazel colonized in the first place the slopes and higher localities of the Krušné hory Mts. It seems also possible to speculate about intentional spreading of hazel by people of the mesolithic culture. At lower-altitude localities a fast spreading of mixed oak woods took place. Wetlands on the lake periphery were colonized by *Alnus*. Water vegetation *(Nymphaea, Potamogeton, Sparganium, Trapa natans)* expanded in the lake and great amounts of biomass were produced. The warming of the lake water and its eutrophication is corroborated by a copious occurrence of colonies of the alga *Coelastrum reticulatum* in the phase of a conspicuous retreat of *Pediastrum integrum* (Jankovská and Komárek, 2000). The sediment contained both pelagic species *(Pediastrum duplex* var. *rugulosum,* var. *duplex)* and those constituting the metaphyton *(P. angulosum)*. The presence of mesolithic settlements along the lake margins was confirmed by archaeological research (Velcl, 1970). Ideal conditions prevailed here for human cultures. The lake was undoubtedly rich in fish, attractive with respect to game and, moreover, *Trapa natans* (waternut) was growing here.

During the period of Early and Late Atlantic (AT1 and AT2), stands dominated by *Quercus, Ulmus, Tilia* and *Fraxinus* prevailed in the wider surroundings of the lake. The AT was characterized by the spreading of *Picea*. The stands of reeds, magnocariceta and willows were obviously penetrated by *Alnus*. Towards the end of AT2, *Fagus* also became one of the steady components of forests in the Krušné hory Mts. The open water surface still occupied a large area as shown by numerous finds of planktonic algae. The water environment was naturally eutrophic. The relatively cold water from the Krušné hory Mts., which was charging the lake, warmed up fast in the shallow basin during the growing season thus supporting the proliferation of phytoplankton. The sediments produced were of the diatoms gyttja type with a great amount of remains of other algae.

The fast entry of *Abies* into the region was typical for the Subboreal (SB). The expanding spruce, fir and beech gradually restricted the original extent of mixed oak forest at medium and lower altitudes. Even the spreading of spruce was restricted by the expansion of fir and beech. *Carpinus* appeared in insignificant amounts in the lower zone of the area. A continuous anthropic activity since the SB has been evidenced by closed pollen-analytical curves of cereals and other synanthropic plants (Neustupný, 1985; Jankovská, 1988). The lake was naturally eutrophicated and its soiling continued. The algal community of this period was diversified, but the *Pediastrum kawraiskyi,* and *P. integrum*, typical glacial relicts, were already missing. *Nymphaea* and *Trapa natans*, were abundant in the lake

In the Early Subatlantic (SA1), stands with fir, spruce and beech became spread in the Krušné hory Mts. Stands of mixed oak forests with newly arriving hornbeam dominated in the Krušné hory piedmont region. Alder was spreading on the periphery of the Komořanské jezero Lake and the area of free water surface decreased. The lake was naturally eutrophicated although it could reflect possible effects of the already stronger settlement at its rim. In addition, it can be assumed that also the dystrophic environment of riparial parts, where rushes and alders produced peaty sediments, had its influence. Some parts of the original lake acquired the character of marshes. This is corroborated by copious findings of zygospores of the fibrous *Conjugatophyceae (Mougeotia, Spirogyra, Zygnema)*.

In the course of the Late Subatlantic (SA2), a strongly increasing anthropic activity came distinctly to appearance in the vegetation conditions. A sudden decrease in occurrence was noted in fir, beech, spruce, oak and other woody forest species. the pollen analysis revealed a concurrent increase of cereals and other synanthropic vegetation. Although such changes of the vegetation cover of the area were taking place at different distances from the Komořanské jezero Lake, changes also occurred in its locality. A sudden disappearance of all water algae and pollen grains of water plants indicates the absence of the water medium and the beginning of peat sedimentation. This is corroborated by spore curves of *Sphagnum* and *Polypodiaceae,* pollen curves of *Typha angustifolia, T. latifolia, Poaceae (Phragmites)*, *Cyperaceae* (e.g. *Carex* sp.div.) and, in the first place, *Salix* and *Alnus*. Extensive alder clumps penetrated gradually the area of the original lake proper. It cannot be excluded that such changes are associated with the drainage of a substantial part of the original lake in 1834.

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