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Quaternary freshwater ostracode fauna from Krumvíř (Czech Republic)

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Introduction

During the pipe-line excavations in year 2000 unusual succession of Quaternary sediments was temporarily open to study in the flood-plain of the Spálený Brook ca 1.5 km to the North from the Krumvíř village. The basal member of the succession is more than 50 cm thick light gray marl broken by open fissures filled by black clays from overlay. The next member is 196 cm thick black and gray calcareous clay overlaid by 35 cm thick brown peat horizon. The topmost fourth member consists of 190 cm brown and gray loams with silt laminae. The whole section was sampled in detail (18 samples). Abundant aquatic gastropod fauna in lower three members evidences the water environment. At the same time, assemblages of microfossils comprise mostly abundant ostracodes, characean and plant remnants, fish otoliths and bones, agglutinated foraminifers and rare testate amoebae.

Taphonomy

The ostracode valves are translucent and well preserved. The obtained associations are rich on juveniles of different ontogenetic stages. This signalizes autochthonous origin of the microfossils. The ostracodes occur along entire profile. The light gray marls (15 taxa in one sample) and the bog deposits (23 taxa in 4 samples, max. 14 taxa per sample) contain the most diversified community. Number of preserved individuals ranges from 160 to 570 per sample besides the uppermost part of the bog with remarkable decrease of the valves (67 individuals). Nine samples taken from the black and gray calcareous clays (?gyttja) contain in total 15 taxa with maximum of 6 taxa per sample. The abundance of preserved individuals is low, in range from 4 to 87 per sample. A significant decrease of diversity and abundance is observed in the gray and brown loam. The samples are free of fossils or they contain only broken valves of 4 species with the maximum 3 species per sample.

Paleoecological interpretation

Previously known ostracodes are freshwater palearctic and holarctic living in pure freshwater or tolerating an increase of salinity from oligohaline (0.5-5 ‰) to mesohaline (5-18 ‰). They are frequently found in running water with various velocity (9 taxa) or they are associated with running water. Estimated water temperature may range from warm (5 taxa) to intermediate cold/warm (5 taxa) with an influence of the cold spring (3 taxa). Titanoeuryplastic species (8 taxa) prevail but the meso/polytitanophilic taxa (5 taxa) signalize the calcium content of water environment near or higher than 72 mg.l⁻¹. They are euryplastic on the pH (6 taxa).

Four lithologic members of succession as well as their ostracode assemblages reflect the evolution of the shallow lake from its formation to terminal stage (filling by sediments), and overlaying by loam deposits.

Light and gray marl

These deposits can reflect an early evolution of the oligotrophic lake.

Ilyocypris bradyi is the most abundant (39 valves) species following by *Candona meefeldiana* (21 valves), *Candona candida* (16 valves), and *Cyclocypris ovum* (15 valves). The juveniles of *Pseudocandona* are also numerous. The mentioned species document a littoral zone of the lake influenced by slowly moving or running water. *Psychrodromus olivaceus* is also numerous in the sample (10 valves) and signalizes an influence of the spring.

Cyclocypris laevis, *Cypridopsis vidua*, *Physocypria kraepelini*, *Pseudocandona albicans*, *Ps. eremita*, and *Ps. marchica* are the minor species living in littoral lakes and temporary milieu. They can live also in the springs. *Cyclocypris laevis*, *Cypridopsis vidua*, and *Pseudocandona albicans* indicate submerged vegetation.

Black and gray calcareous clay - ?gyttja

Ilyocypris bradyi proliferated in this environment (103 valves in total, 1 to 57 individual per sample). It is the most abundant species together with the juveniles of *Pseudocandona*. *Cyclocypris laevis* is frequent in the deposits

but not numerous (one to 4 valves per sample). It tolerates a wide range of environmental conditions in littoral and profundal milieu.

Other 9 species (*Cyclocypris ovum*, *Fabaeformiscandona fabaeformis*, *Heterocypris salina*, *Ilyocypris biplicata*, *Ilyocypris gibba*, *Plesiocypridopsis newtoni*, *Pseudocandona albicans*, *Pseudocandona eremita*, *Pseudocandona sucki*) are occasional and only their fragments or one to two valves occur in the deposits. They prefer littoral zone of the lake, swamp, small and shallow temporal habitats, springs and other slowly flowing waters such as brook and river. The ecological and taphonomical characteristics signalise these species were transported to the gyttja deposits from littoral part and surrounding of the lake.

Bog deposits

These sediments represent eutrophic stage of the shallow alkaline lake covered by vegetation. *Candona meefeldiana* has the greatest abundance (more than 400 valves obtained). Its ecological characteristics are little known. It lives in lake and ditch habitats. Dominant species is accompanied by *Heterocypris salina* and *Pseudocandona sucki* (269 resp. 81 valves). The juveniles of *Pseudocandona* are also very numerous. Both the mentioned species indicate a shallow saline water body influenced by spring. *P. sucki* signalises alkaline environment covered by vegetation.

Candona candida, *Cyclocypris laevis*, *Cypridopsis vidua*, *Ilyocypris bradyi*, *I. gibba*, *Plesiocypridopsis newtoni*, *Pseudocandona compressa*, *Ps. pratensis* are less abundant. A quantity of the preserved valves ranges from 10 to 32 valves. They could occupy a shallow saline environment covered by vegetation influenced by flowing water environment like brook and river. Warm stenothermal *Plesiocypridopsis newtoni* documents a warm climate.

Cyclocypris ovum, *Fabaeformiscandona fabaeformis*, *Ilyocypris biplicata*, *I. cf. inermis*, *Physocypris kraepelini*, and *Pseudocandona albicans* are minor species (1 to 9 valves) which prefer shallow water environment and tolerate flowing water. The milieu was influenced by mineralised water flowing from the springs.

Occurrence of agglutinated foraminifer *Haplophragmoides manilaensis* represent important paleoenvironmental indicator of brackish water. This species tolerates very low salinity and is known from salt marshes along sea shores worldwide. Recently the small subfossil populations were found at two salt meadows in south Moravia (Balík & Bubík, 2004).

Gray and brown loam

The deposits are barren or contain only rare damaged valves of *Candona* sp. juv., *Ilyocypris bradyi*, *Ilyocypris* sp. A, and *Physocypris kraepelini* – probably reworked. This sediment represents probably the flood loam reflecting human activities (deforestation, agriculture)

List of the determined species at locality Krumvíř:

Family Candonidae

Candona candida (O.F. Müller, 1776)

Candona meefeldiana Scharf, 1983

Candona sp. juv.

Cyclocypris laevis (O.F. Müller, 1776)

Cyclocypris ovum (Jurine, 1820)

Fabaeformiscandona fabaeformis (Fischer, 1851)

Fabaeformiscandona sp. A

Physocypris kraepelini G.W. Müller, 1903

Pseudocandona albicans (Brady, 1864)

Pseudocandona compressa (Koch, 1838)

Pseudocandona eremita (Vejdovsky, 1882)

Pseudocandona marchica (Hartwig, 1899)

Pseudocandona pratensis (Hartwig, 1901)

Pseudocandona sucki (Hartwig, 1901)

Pseudocandona juv.

Family Ilyocyprididae

Ilyocypris biplicata (Koch, 1838)

Ilyocypris bradyi Sars, 1890

Ilyocypris gibba (Ramdohr, 1808)

Ilyocypris cf. *inermis* Kaufmann, 1900

Ilyocypris sp. A

Ilyocypris sp. juv.

Family Cyprididae

Cypridopsis vidua (O.F. Müller, 1776)

Heterocypris salina (Brady, 1868)

Plesiocypridopsis newtoni (Brady & Robertson, 1870)

Psychrodromus olivaceus (Brady & Norman, 1889)

Cyprididae gen. et spec. indet A

Cyprididae gen. et spec. indet B

Potamocypris sp. A

Family Limnocytheridae

Paralimnocythere sp. A

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