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ANALYSIS OF MACROFOSSILS IN BOTTOM DEPOSITS OF LAKE STRAŻYM (BRODNICA LAKE DISTRICT)

Analiza makroszczątków w osadach dennych Jeziora Strażym (Pojezierze Brodnickie)

ABSTRACT. The work presents an analysis of macrofossils from two profiles of Lake Strażym. Macrofossil diagram (Profile 3) has been divided into 6 biostratigraphic units (local macrofossil assemblage zones MAZ): 1 — *Menyanthes* MAZ, 2 — *Carex* MAZ, 3 — *Typha* MAZ, 4 — *Najas marina* MAZ, 5 — *Cladium mariscus* — *Carex pseudocyperus* MAZ, 6 — *Chara* MAZ. In Profile 1 three phases are distinguished: 1 — *Najas marina* MAZ, 2 — *Cladium mariscus* — *Carex pseudocyperus* MAZ, 3 — *Najas marina* — *Utricularia* MAZ.

INTRODUCTION

Analysis of macrofossils was carried out on Profiles 1 and 3 according to Wasylikowa's (1979) methodology. Profile numbering is in accordance with the description by Niewiarowski (this volume). Chronozone classification follows the pollen diagram worked out by Noryśkiewicz (this volume). The purpose of the present macrofossil analysis is to study local flora and to try to reconstruct plant communities. Bioindicative data make it possible to determine water level fluctuations (Digerfeldt 1972). Macrofossil diagram has been divided into biostratigraphic units — local macrofossil assemblage zones (MAZ). The zones have been named after species prevalent in a given diagram section and numbered.

LOCAL MACROFOSSIL ASSEMBLAGE ZONES

Profile 3 (Fig. 1)

1. *Menyanthes* MAZ (depth 640—610 cm). During the Alleröd and Early Younger Dryas period there existed in the environ of the lake open pine forest with *Arctostaphylos*. Vegetational succession began probably with oligotrophic

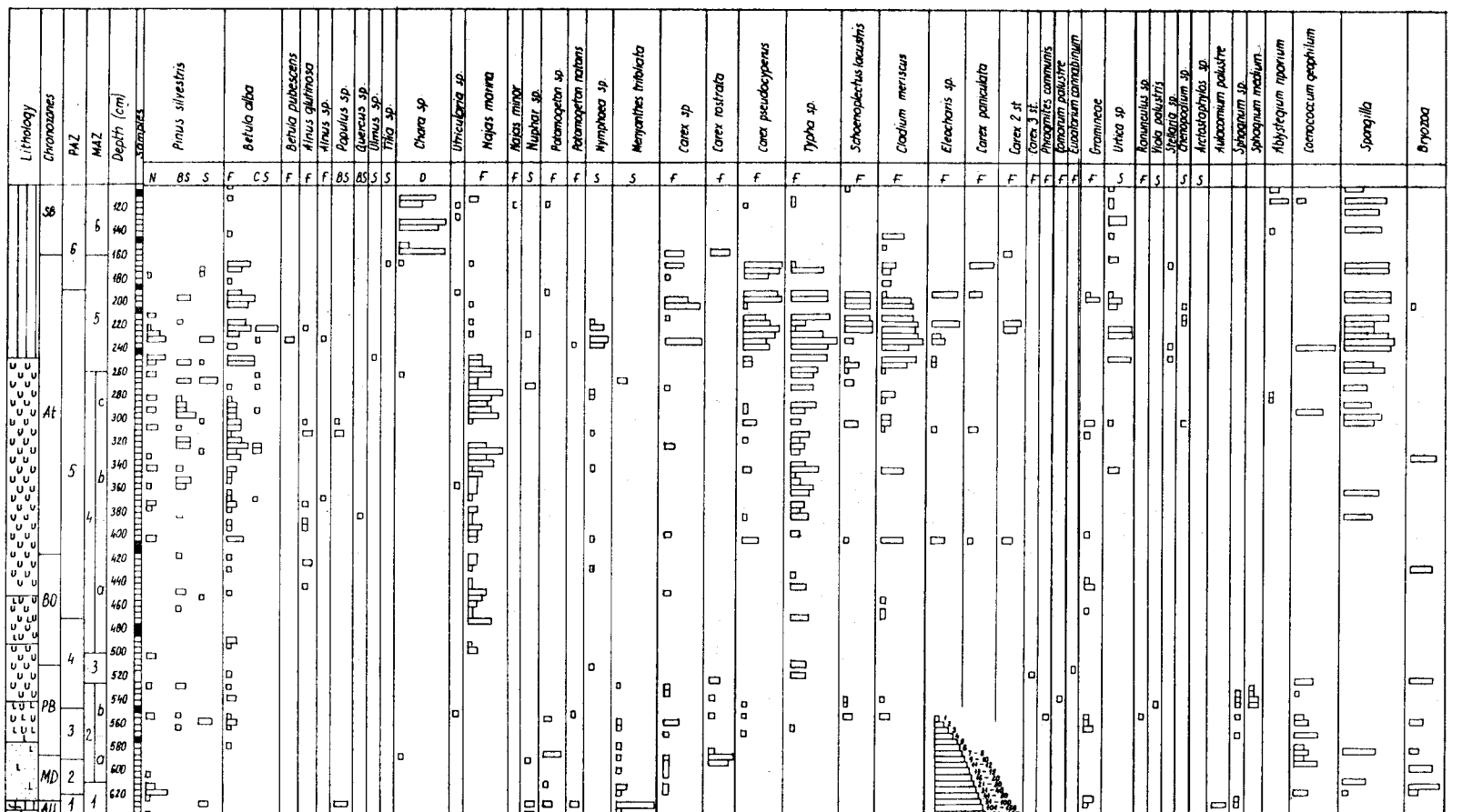

Fig. 1. Macrofossil diagram. Profile 3. BS — bud scale, CO — cone, CS — catkin scale, F — fruit, N — needle, O — oospore, S — seed

communities of class *Oxycoco-Sphagnetea* and transitional peatbog of class *Scheuchzerio-Caricetea fuscae*. This is borne out by presence of *Menyanthes trifoliata* and mosses — *Aulacomnium palustre* and *Sphagnum* sp. These plants are peat — forming species and led to formation of peat of 10 cm thickness. Apart from *Menyanthes trifoliata*, there existed during that phase aquatic plant species — *Nuphar luteum*, *Potamogeton natans* and *Potamogeton* sp.

2. *Carex* MAZ (depth 610—575 cm). This phase began at the end of the Younger Dryas and continued till the end of the Pre-Boreal period. It can be further divided into two subphases:

2a. MASZ — during that period sedges *Carex rostrata* and *Carex* sp. developed. Less important were *Menyanthese trifoliata*, *Chara* sp. and *Potamogeton* sp. Probably during that phase the lake level rose. In contrast with the subsequent subphase, the subphase 2a is distinguished by lack of *Sphagnum*.

2b. *Sphagnum* MASZ. *Sphagnum medium* and *Sphagnum* sp. found in nearly every sample are evidence of the basin shallowing and redevelopment of peatbog. Probably from the lakeshore there developed formed by peatmosses and *Carex rostrata*, *Carex* sp. and *Menyanthes trifoliata*. In water there appeared *Cladium mariscus*, *Schoenoplectus lacustris* and *Carex pseudocyperus*.

3. *Typha* MAZ (depth 575—500 cm). This phase covered the end of the Pre-Boreal and beginning of the Boreal period. Floristically it was a poor phase. Apart from *Typha* sp. there existed sporadically *Nymphaea* sp., *Carex* 3 st. and *Eupatorium cannabinum*. This phase is characterized by a small rise of water level.

4. *Najas marina* MAZ (depth 500—240 cm). This phase lasted from the beginning of the Pre-Boreal period till the middle of the Atlantic period. This phase has been further divided into three subphases.

4a. *Najas marina* MASZ (depth 500—385 cm). Apart from *Najas marina*, fruits of *Typha* sp., *Cladium mariscus*, *Carex* sp. were found there and a water plant — *Nymphaea* sp. As for wood species fruits of *Alnus glutinosa* were found, pine and birch still growing.

4b. *Typha* MASZ (depth 385—310 cm). During this phase the most abundant were *Najas marina* and *Typha* sp. and rarely *Carex pseudocyperus*, *Nymphaea* sp. The subphase is characterized by basin shallowing.

4c. MASZ (depth 310—260 cm). *Najas marina* and *Typha* sp. continued to grow abundantly and *Cladium mariscus* grew in large proportion. In comparison to other subphases the lake basin was the shallowest.

5. *Cladium mariscus* — *Carex pseudocyperus* MAZ (depth 260—190 cm). This phase began in the Mid-Atlantic period and lasted till the end of it. It may be assumed that the lake's environs were overgrown with fully formed deciduous forest of oak-hornbeam forest type. Both oak and linden reached their maximum. In lower terrain marshy meadows and seasonal marshes developed (Noryśkiewicz, this volume). Development of deciduous forests influenced lake's fertility and shallowing. Therefore there probably developed on the lake reedswamp vegetation associations similar to contemporarily described (Bed-

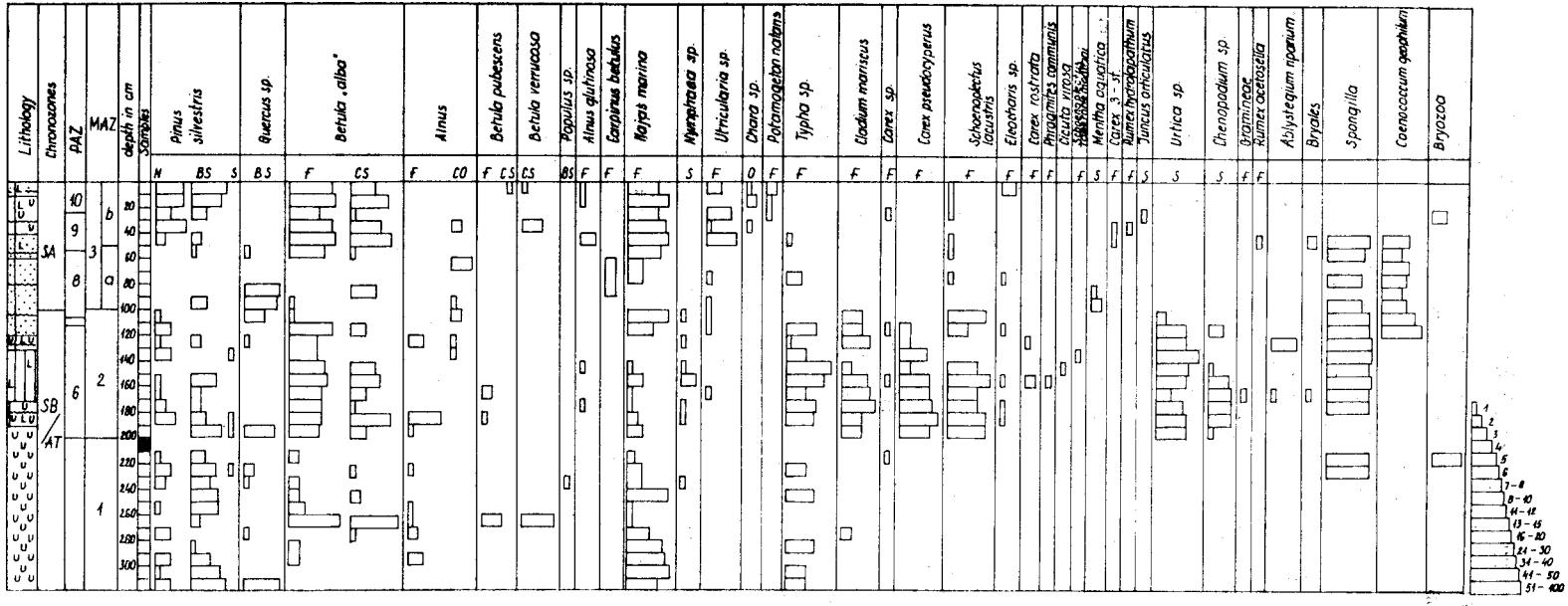

Fig. 2. Macrofossil diagram. Profile 1. BS — bud scale, CO — cone, CS — catkin scale, F — fruit, N — needle, O — oospore, S — seed

narek 1972). Significant amounts of *Urtica* sp. and *Chenopodium* sp. fruits proves human activity.

6. *Chara* MAZ (depth 160—100 cm). This phase began at the beginning of the Sub-Boreal period. Abundant growth of *Chara* sp. as well as presence of other aquatic species such as *Najas marina*, *N. minor*, *Potamogeton* sp., *Utricularia* sp. are proof of lake water level rise. This probably was also the result of partial deforestation. Wood species in macrofossils are represented only by birch.

Profile 1 (Fig. 2)

1. *Najas marina* MAZ (depth 320—210 cm). This phase is characterized by great proportion of *Najas marina* and *Typha* sp., *Cladium mariscus*, *Carex* sp. and *Nymphaea* sp. appeared sporadically. The lake was relatively shallow in its shoreline part. Among wood species quite numerous were remains of pine and birch and — less frequently poplar.

2. *Cladium mariscus* — *Carex pseudocyperus* MAZ (depth 200—100 cm). Apart from *Cladium mariscus* and *Carex pseudocyperus*, quite abundant were *Typha* sp., *Schoenoplectus lacustris*, *Nymphaea* sp. Supposedly, reedswamp communities — similar to contemporary associations *Ceadietum marisci*, *Scirpetum lacustris*, *Cicuto-Caricetum pseudocyperi* (Bednarek 1972) — were fully developed. Large participation of *Urtica* sp. and *Chenopodium* sp. during this phase is evidence of development in the nearest vicinity of the lake of alder wood *(Circaeo-Alnetum)* and indicates human activity. Shoreline part of the lake was much shallower than during the previous phase.

3. *Najas marina* — *Utricularia* MAZ (depth 100—0 cm). Characteristic for this phase is presence of *Najas marina*, *Utricularia* sp. and *Schoenoplectus lacustris*. It has been divided into two subphases.

3a. MASZ (depth 100—50 cm) marked for smaller participation of reedswamp species, which is evidence of lake water level rise.

3b. *Utricularia* MASZ (50—0 cm). Apart from aquatic plants — *Najas marina*, *Utricularia* sp., *Chara* sp., *Potamogeton natans*, swamp plant species are represented: *Schoenoplectus lacustris*, *Eleocharis* sp., *Carex* 3 st., *Rumex hydrolapathus*, *Juncus articulatus*. They are proof of lake water level beginning to fall. More abundant than in the previous subphase were wood species — pine and birch, which man helped spread. Another mark of human impact is a large proportion of *Artemisia* sp., *Plantago lanceolata* and *Cerealia* in the pollen diagram (Noryśkiewicz, this volume).

Synchronization of macrofossil phases of profiles 1 and 2

The *Cladium mariscus* — *Carex pseudocyperus* phase (2) in profile 1 probably corresponds to phase *Chara* (6) in profile 3. They lasted during the Sub-Boreal period. Since profile 1 is located in a short distance from lake shoreline during

the phase *Cladium mariscus — Carex pseudocyperus* MAZ the lake was relatively shallow. Reedswamp vegetation was able to develop here. The *Chara* MAZ distinguished in profile 3 located about 70 m away from the lake shore is characterized by numerous occurrence of *Chara* sp. oospores. Participation of other plants was very small. The water was deeper than in analogous phase developing close to the lakeshore.

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