

MACROFOSSIL RECORDS OF TREE SPECIES IN THE SEDIMENTS OF LAKE PANICHIShte (NORTHWESTERN RILA MTS.)

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Abstract: Plant macrofossils of tree species found in the sediments of Lake Panichishte (NW Rila Mts.) are presented and discussed in relation to regional forest history during the last 2000 years. The results supplement the information obtained from pollen analysis.

Key words: plant macrofossils, trees, sediments, Lake Panichishte, NW Rila Mts.

INTRODUCTION

Plant macrofossils preserved in Quaternary deposits are important proxies in the reconstruction of the past vegetation in a given area (Wasylikova, 1986). This palaeoecological approach usually complements the information obtained from pollen analysis as it is well known that most pollen types are determined only at genus or family level. In many cases, the macrofossil record contributes to obtain a more reliable picture which tree species had formed the local vegetation for a definite period of time.

Plant macrofossil investigations from the Bulgarian mountains are still scarce. From the Rila Mts. only two such studies were performed on Holocene sediments until now (Bozilova et al., 1990, 2002). The aim of this paper is to present in details the characteristics and the ecological importance of plant macrofossils from trees found in sediments of late Holocene age from Lake Panichishte in the Northwestern Rila Mts.

STUDY AREA

Lake Panichishte is located in the coniferous belt of the Northwestern Rila Mts. at 1345 m asl. It belongs to the small group of mountain lakes found at mid-altitudes. The lake has an elliptic shape and occupies an area of several decars. The maximum water depth is about 2 m. Today the lake is surrounded by a dense forest composed of *Pinus sylvestris* and *Picea abies* with admixture of *Abies alba* and some *Fagus sylvatica* (Bozilova et al., 2002)

MATERIAL AND METHODS

The plant macrofossils were recovered from core P₂ with a capacity of 1.5 m taken from the central part of the lake with a square-rod piston sampler (Wright, 1991). The lower part (150-50 cm) of the sediment consists of highly decomposed peat and lake mud while the upper part (50-0 cm) contains coarser peaty sand and plant fragments. The sampling interval was at about 10 cm. The sample volumes were 50 cm³. After soaking in 10% KOH the material was sieved through meshes of 0.40 and 0.16 mm and analysed under magnification from 10 to 80x. The sections of woody fragments were studied with a light microscope. For identification of seeds the reference collection of the Herbarium at Sofia University and the seed atlases of Bejerink (1949) and Katz et al (1977) were used.

RESULTS AND DISCUSSION

The results of the study are plotted on Figure 1. The calibrated age in years AD of three sediment samples is also indicated on the left side of the graphics thus providing a reliable depth/age chronology. Microphotographs of the most important records from tree species are shown on Figure 2.

Lake Panichishte-2

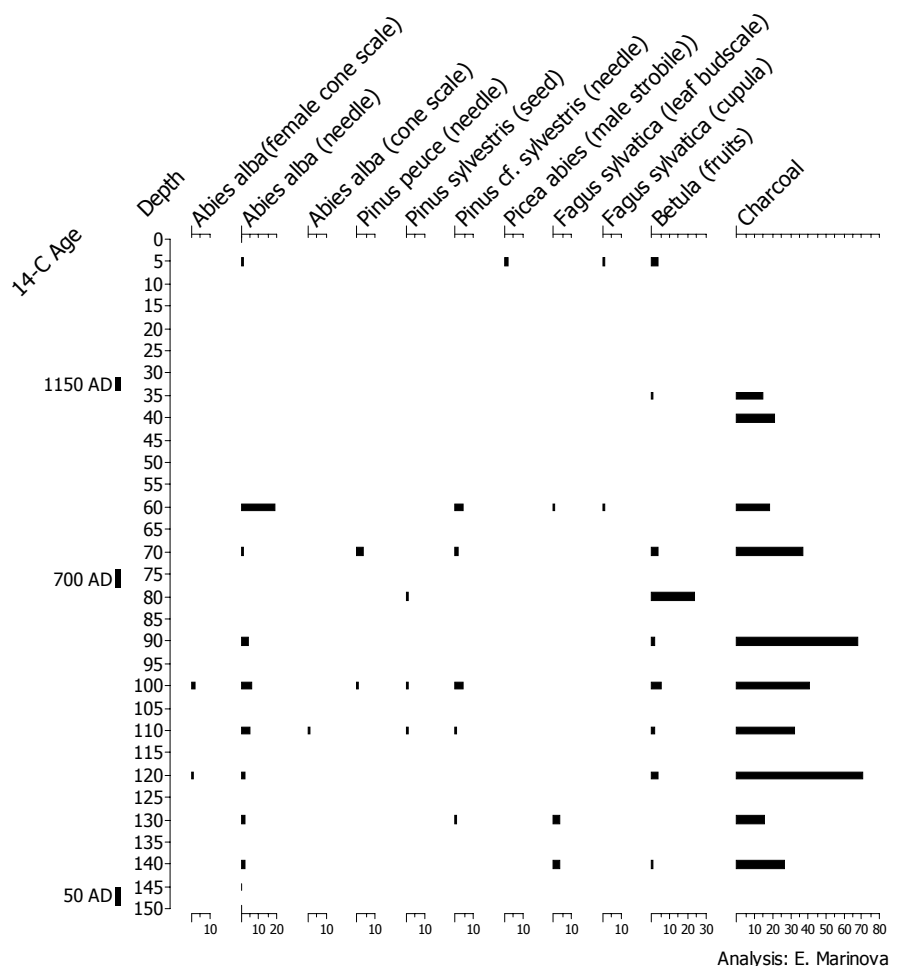


Fig.1. Simplified diagram of plant macrofossil remains from tree species in core P2 from Lake Panichishte (in absolute number per 50cm³)

In the lower part of the diagram (140-90 cm) macrofossils from *Abies alba* (few female cone scales - Fig. 2a; needles - Fig.2b, 2c); *Pinus sylvestris* (needles and several seeds - Fig. 2g) and *Fagus sylvatica* (leaf budscale - Fig.2h) were found in almost all samples. At levels 100 cm and 70 cm few needles of *Pinus peuce* were established (Fig.2f). In the uppermost sample (5 cm) the only macrofossil evidence of *Picea abies* (male strobile - Fig.2d, 2e) appears. An interesting find at level 110 cm was a piece of *Pinus* wood. Most probably, according to anatomical features, it originates from *Pinus sylvestris*.

In the entire profile quite common are macrofossils of *Betula pendula* (fruits) with a pronounced maximum at level 80 cm, shortly before 700 yrs. AD. It is worth to point out that almost no macrofossils from tree species were found in the interval 35-5 cm. Numerous charcoal fragments were identified in the samples with characteristic maxima at levels 120 cm and 90 cm.

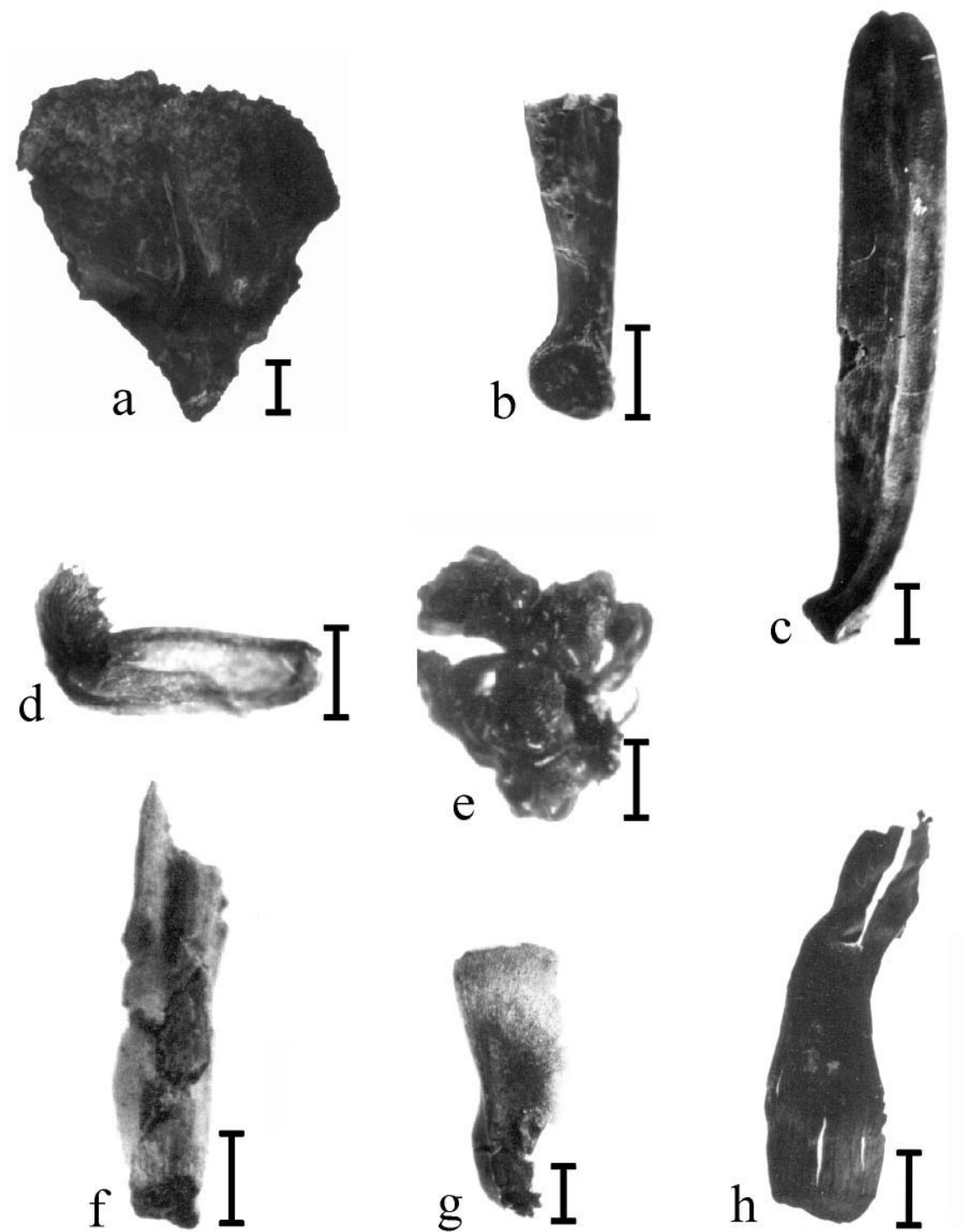


Fig. 2. Microphotographs of the most important plant macrofossils (each bar corresponds to 1 mm)
a – female cone scale of fir (*Abies alba*, level 110 cm); **b** – the base of needle of fir (*Abies alba*, level 80 cm), **c** – needle of fir (*Abies alba*, level 140 cm); **d** – male cone scale of spruce (*Picea abies*, level 5 cm); **e** – male cone of spruce (*Picea abies*, level 5 cm); **f** – fragment of needle of Balkan pine (*Pinus peuce*, level 100 cm); **g** – seed of *Pinus* sp. (level 100 cm); **h** – leaf budscale of beech (*Fagus sylvatica*, level 140 cm).

In general, a very good coincidence of the plant macrofossils found with the pollen record (Bozilova et al., 2002) is observed. The tree vegetation surrounding the lake between 50 and 700 yrs. AD was dominated by conifers, namely *Pinus sylvestris* and *Abies alba*. The presence of *Pinus peuce* and *Picea abies* in these forests was quite restricted. Stands of *Betula pendula* were distributed on poorer soils or on the steep stony slopes in the approaches to the lake. Monodominant forest communities of *Fagus sylvatica* or mixed in some places with fir and pine were also developed around the lake or at lower altitudes.

The low macrofossil concentration of tree species in the upper part of the profile after 900 yrs. AD (with the exception at level 5 cm) could be explained by conditions not suitable for their preservation in the sediments. On the other hand, the pollen record testifies to an important change in the forest composition characterized by a partial destruction of *Abies alba*, a wider spread of *Pinus sylvestris*, and a late invasion of *Picea abies* at mid-altitudes on north-facing slopes. Quite probably, the sporadic appearance of needles of *Pinus peuce* indicates that this tree was growing in the higher parts of the study area or the macrofossils were transported with the rain water as a result of erosion. The last suggestion seems valid especially for level 70 cm where signs of forest clearance are noticeable in the pollen diagram - an increase for the pollen frequencies of *Betula* and a number of heliophilous herbs. A peak in the presence of fossil fruits of *Betula* at level 80 cm is also recorded (Fig.1). The high quantities of charcoal fragments found at level 85 cm presumes the occurrence of natural or man-made forest fires.

The find of macrofossil from *Picea abies*, related to recent times, confirms that suitable ecological conditions were established during the last centuries for the growth of this coniferous tree in the area of Lake Panichishte (Bozilova, Tonkov, this volume).

CONCLUSIONS

The results from the analysis of plant macrofossil remains from tree species confirm the palynological data for the proposed palaeovegetation reconstruction in the area of Lake Panichishte during the last 2000 years. Two distinct stages of forest development could be recognized. The first one lasted between 50 and 700 yrs. AD when the forests around the lake were dominated by pine and fir. In Medieval times, after 700 yrs. AD, the forests were partly disturbed and finally spruce invaded the surrounding of the lake together with pine.

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МАКРОФОСИЛНИ ОСТАНКИ ОТ ДЪРВЕСНИ ВИДОВЕ В СЕДИМЕНТИ ОТ ЕЗЕРОТО ПАНИЧИЩЕ (СЕВЕРОЗАПАДНА РИЛА)

(Резюме)

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От седименти в езерото Паничище разположено при 1345 м н.в. в долната част на иглолистния пояс в СЗ Рила са изследвани запазените растителни макроостанки (листа, семена, шишаркови люспи, дървесина и пр.) от дървесни иглолистни и широколистни видове. Въз основа на получените резултати както и на информацията от поленовия анализ е извършена реконструкция на промените в горската растителност за последните 2000 година. Ясно се открояват два етапа в развитието на тези гори. Първият се отнася към периода 50-700 г. н. е., когато около езерото са доминирани иглолистни гори от бял бор и ела, на места с примес от бяла мура или бук. Количеството на запазените растителни макроостанки е значително. През втория етап, след 700 г. н. е., се регистрира нарастване участието на смърча в състава на иглолистните съобщества. Овъглената дървесина свидетелства за горски пожари и засилено антропогенно въздействие през Римско време и Средновековието.