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PECULIARITIES OF THE PALAEOGEOGRAPHY IN THE VICINITY OF THE KRIVINA PEAT-BOG IN THE LATE GLACIAL AND HOLOCENE

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ABSTRACT. The results of investigations of sediment and pollen spectra have revealed that the Krivina mire, situated in the Belarusian Poozerje, originated c 7 800 BP on the site of a palaeolake. Several regression levels are recognized in the development of this lake. Stages in the formation of the vegetation in the study area are described. Three phases of human impact on the environment are outlined.

KEY WORDS: peat-bog, palaeolake, deposits, regression stages, pollen diagrams, human impact

INTRODUCTION

The peat massive Krivina (54°58′ N, 29°32′ E) is situated in the Belarusian Poozerje among terminal moraines, formed during the Vitebsk stadial of the most recent glaciation. The study area lies in a zone of oak-coniferous southern taiga forest. Six boreholes were sunk within the mire for the purpose of palaeogeographical reconstruction and study of human impact on the environment (Fig. 1). Four of these boreholes were situated on archaeological sites of the Neolithic-Early Bronze Age. The deposits consist of lacustrine clay, silt, carbonaceous gyttja, organic mud, sedge and wood peat. The most complete set of deposits was found in the Osovets IV borehole (Fig. 2).

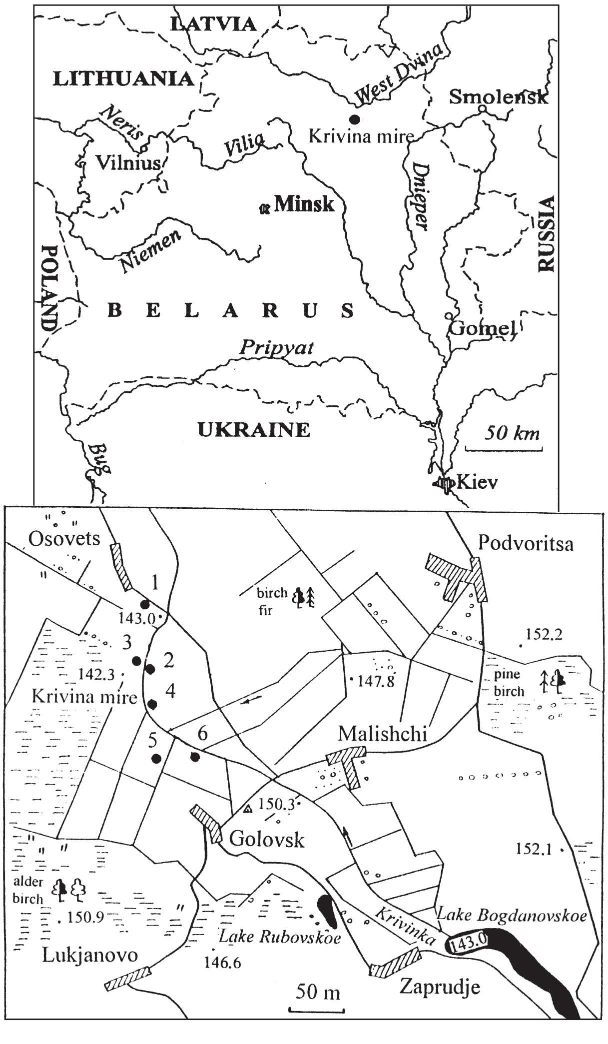

Fig. 1. Map showing Belarus, location of the Krivina mire and the studied sections. 1 – Osovets III, 2 – Osovets II a, 3 – Osovets II b, 4 – Osovets IV, 5 – Krivina I, 6 – Krivina – III

RESULTS

Six pollen diagrams reflect the history of vegetation development in this area from the Middle Dryas up to the present. That history may be characterized by the following sequence of local pollen assemblage zones: (LPAZ): Os-1, *Betula – Pinus*, 12100–11800 BP; Os-2, *Pinus – Betula* – NAP, 11800–10900 BP; Os-3, *Picea* – NAP, 10900–10200 BP; Os-4, *Pinus – Betula – Picea*, 10200–9800 BP; Os-5, *Betula – Pinus,* 9800–9000 BP; Os-6, *Pinus – Corylus – Ulmus*, 9000–7800 BP; Os-7, *Ulmus – Corylus – Tilia – Alnus*, 7800–6600 BP; Os-8, *Quercus – Ulmus – Tilia – Alnus*, 6600–6000 BP; Os-9, *Quercus – Corylus – Ulmus – Alnus*, 6600–5000 BP; Os-10, *Betula – Quercus – Carpinus*, 5000–4200 BP; Os-11, *Betula – Pinus – Quercus – Carpinus*, 4200–3200 BP; Os-12, *Picea – Pinus – Betula – Quercus,* 3200 – 2800 BP; Os-13, *Picea – Pinus*, 2800–2000 BP; Os-14,

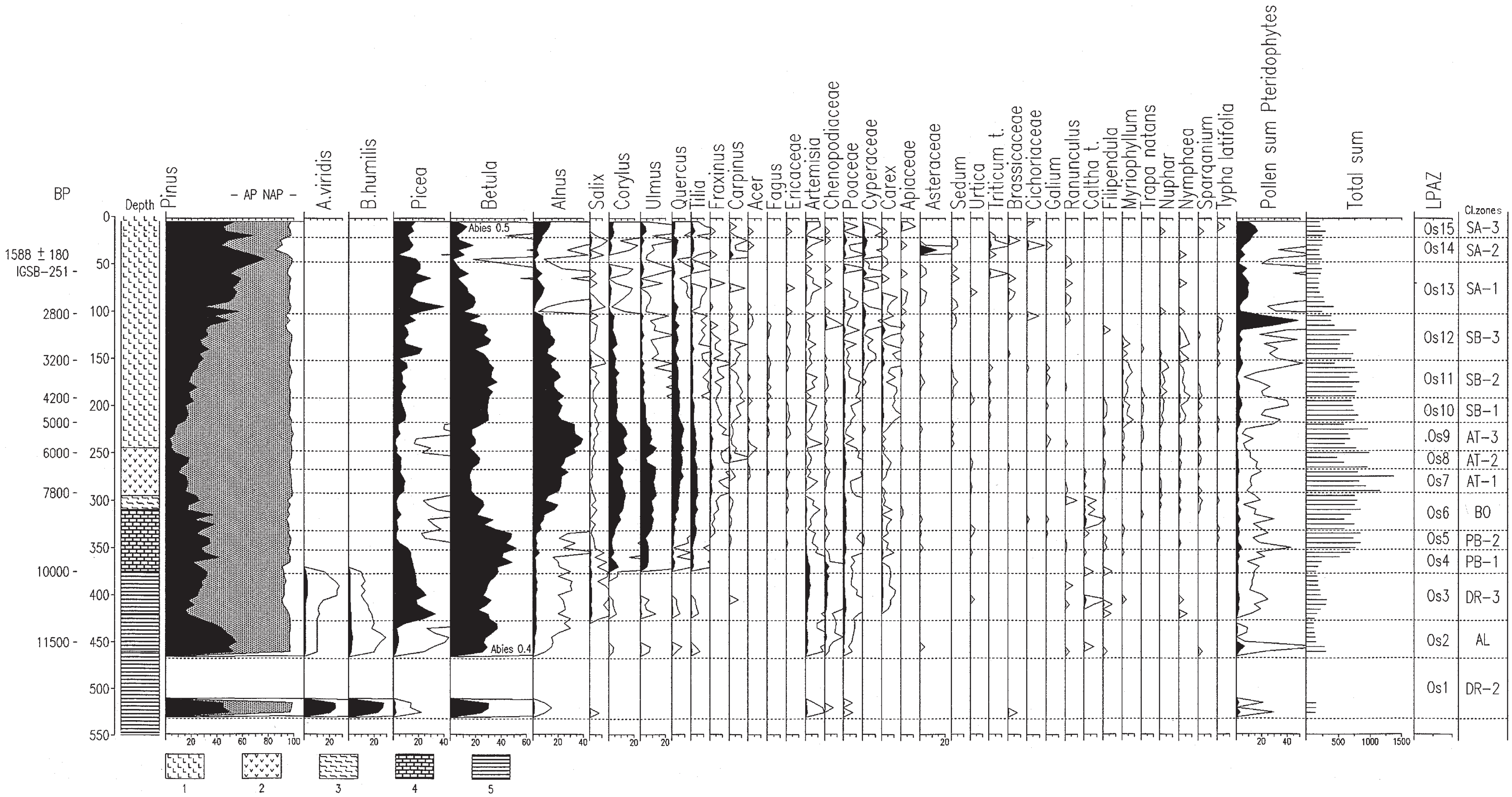

Fig. 2. Reduced pollen diagram of the Osovets IV section (analysed by G. Simakova). 1 – wood peat, 2 – sedge peat, 3 – organic mud, 4 – carbonaceous gyttja, 5 – lacustrine clay

Pinus, 2000–1000 BP; Os-15, *Pinus – Picea – Alnus*, 1000–0 BP (Fig. 2). Dates shown on the diagrams were estimated on the basis of radiocarbon dating of sections situated less than 50 km from the study area, as well as by correlations with the pollen data. Furthermore, the regional palynological scheme of vegetation development in Belarus in the Late Glacial and Holocene (Zernitskaya 1998) was used.

Lithological and palynological data show that from the Middle Dryas untill the Atlantic period of the Holocene a lake existed in the study area. Several regression stages occured during its history. The first regression took place in the Alleröd, when laminae of mud appeared among the lacustrine clay layer (Fig. 2). According to Pavlovskaya and Zernitskaya (1995) the valley drainage system of the West Dvina river between Vitebsk and Beshenkovichi was formed during the Alleröd. The lowering of the erosion threshold in the Alleröd led to river incision and the release in residual lakes in the Polotsk lowland (Pavlovskaya 1994). These events are recorded in the deposits of the central part of the Krivina palaeolake, which belonged to the West Dvina basin. The next regression level is reflected in the replacement of lacustrine clay by carbonaceous gyttja at the Late Glacial – Holocene transition (10 000 BP). At the beginning of the Atlantic period (7 800 BP) release of the palaeolake took place and the mire began to form. This stage is also revealed in sediments of Rubovskoye lake in the same locality which have been dated at 7550 ± 80 BP (Zhukhovitskaya & Generalova 1991). At the beginning of the Subboreal phase when wood peat accumulation was taking place, increasing inundations of the mire occurred predominantly caused by climatic factors. Evidence for this is provided by the abundance of aquatic plant pollen in the deposits of that phase: *Myriophyllum, Trapa natans, Nuphar, Nymphaea, Typha latifolia* and *T. angustifolia.*

The data obtained correlate well with records of fluctuations in the levels of Lake Usviatskoe and others situated in the south of Pskov oblast in Russia between the West Dvina and Lovat rivers (Mikliaev 1995); of Belarusian lakes (Zernitskaya *et al.* 1998, Zhukhovitskaya *et al.* 1998), and of lakes in northern Poland (Ralska-Jasiewiczowa & Starkel 1988). In all of these water levels were relatively low at 11 500; 10 000; 9 000–8 500 and 5 000 BP.

Along with the general trend of vegetation development a number of human impact phases may be inferred from the data obtained.

The first phase (6 600–5 000 BP) was marked by a rise in the curves of ruderal weeds, *Artemisia, Sedum, Urtica* and others, in the deposits of the Middle Atlantic (Behre 1981, Ralska-Jasiewiczowa 1982). This was probably a consequence of the distribution of tribes of the Narva Neolithic culture and the existence of settlements (Fig. 3). The economy of these tribes was appropriative. According to Zajkovski *et al.* (1997) sediments correlating with early and late stages of the Narva culture date from 5 450 ± 75 BP (LE – 960) and 4 270 ± 40 BP (G2N – 5 125).

The second stage of human impact (5 000–3 000 BP) is marked by the appearance of evidence of a productive economy in the deposits of Subboreal age. This is indicated by the rise in the curves of pasture weed pollen (*Rumex acetosa / acetosella, Plantago lanceolata, Polygonum aviculare* and *Potentilla*) and arable weed pollen (*Fagopyrum, Fallopia convolvulus, Polygonum persicaria, Galium* and *Centaurea cyanus),* as well as by the presence of single grains of cultivated cereals such as *Triticum* (Figs 3, 4). These features bear witness to the development of primitive agriculture and cattle breeding. Further development of the productive economy was associated with the penetration of tribes of the North Belarusian culture. Mikliaev (1995) provided some absolute dates for that culture: 3 700 ± 70 BP, 3 690 ± 70 BP, 3 620 ± 40 BP.

The third stage (from 3 000 BP till now) is characterized by the human impact which was of greatest significance for the environment. It is marked by a rise in the curves of all anthropogenic indicators: cultivated cereals (*Triticum, Secale*), ruderal, arable and pasture weeds, as well as such indicators of open woodland as *Fragaria, Sambucus* and *Rhamnus,* and by evidence of widespread meadows and marshland (*Lysimachia, Ranunculus, Thalictrum, Polygonum bistorta, Valeriana, Mentha longifolia* and *Epilobium palustre*). At the end of the Bronze Age and during the Early Iron Age the population used a complex economy based on cattle breeding and slash-and-burn agriculture, although fishing, hunting and gathering were practised as well. However, cattle breeding remained the mainstay of the economy in the Belarusian part of the West Dvina basin until approximately the first millennium AD. Osteological material from the ancient towns of the Dnieper – Dvina culture show that 66% of all the remains are bovine (Shcheglova 1969), while the bones of pig, which may be regarded as an indicator of a settled way of life and a developed agriculture, are also present. In the pollen spectra of Subatlantic – 3, the content of pasture weeds decreases, while that of cultivated cereals and arable weeds increases (Fig. 4). So, it is reasonable to suppose that arable farming and cattle breeding were the main branches of the economy during the first millennium AD in the drainage area of the upper West Dvina.

Thus, on the basis of lithological, palynological and archaeological data and radiocarbon dating, the first stages of human impact on the environment in the study area have been recognized. Man's influence occurred against a background of constantly changing natural events. A synchronism of the palaeoenvironmental dy-

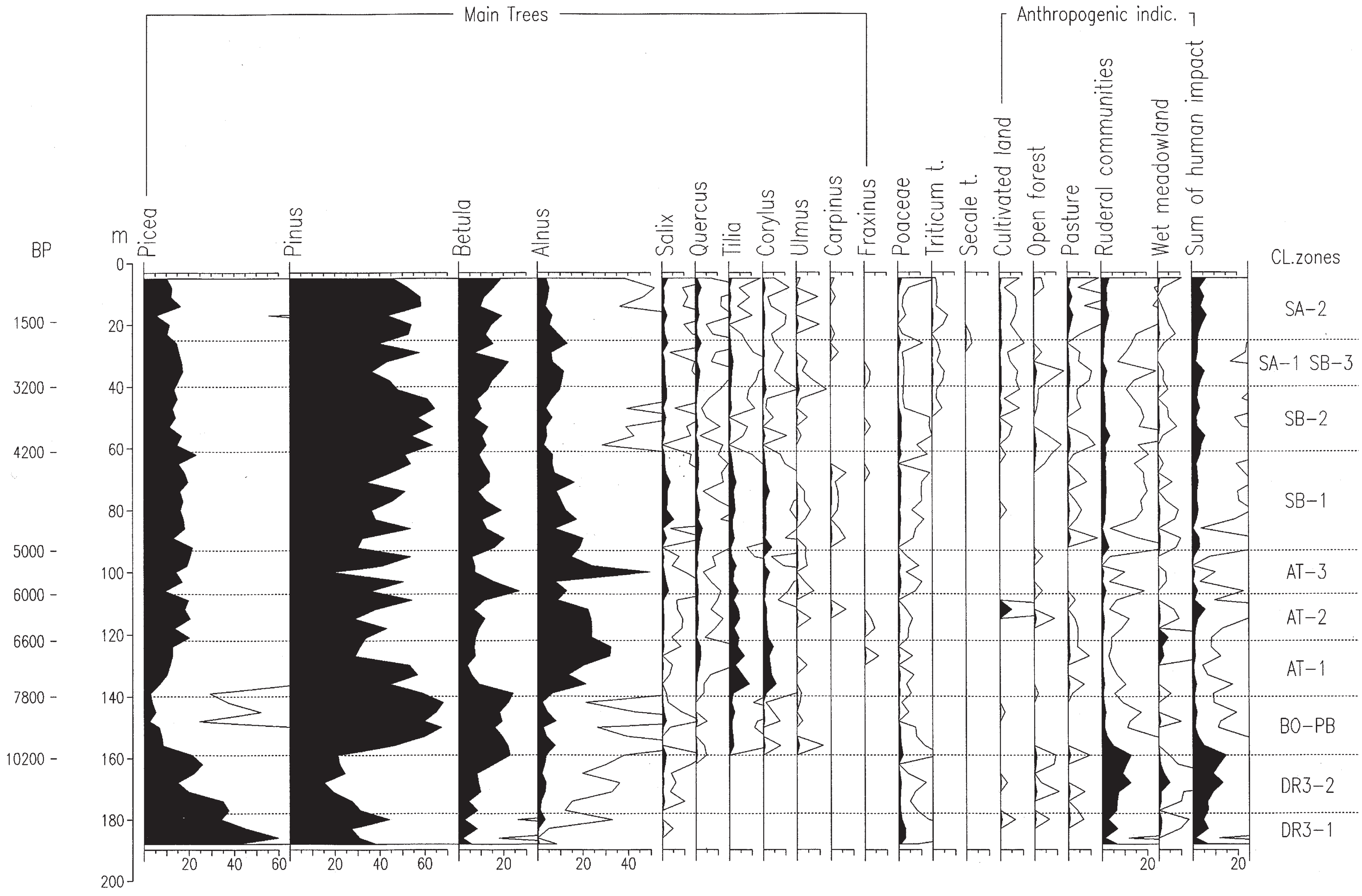

Fig. 3. Human impact diagram of the Osovets III section (analysed by G. Simakova)

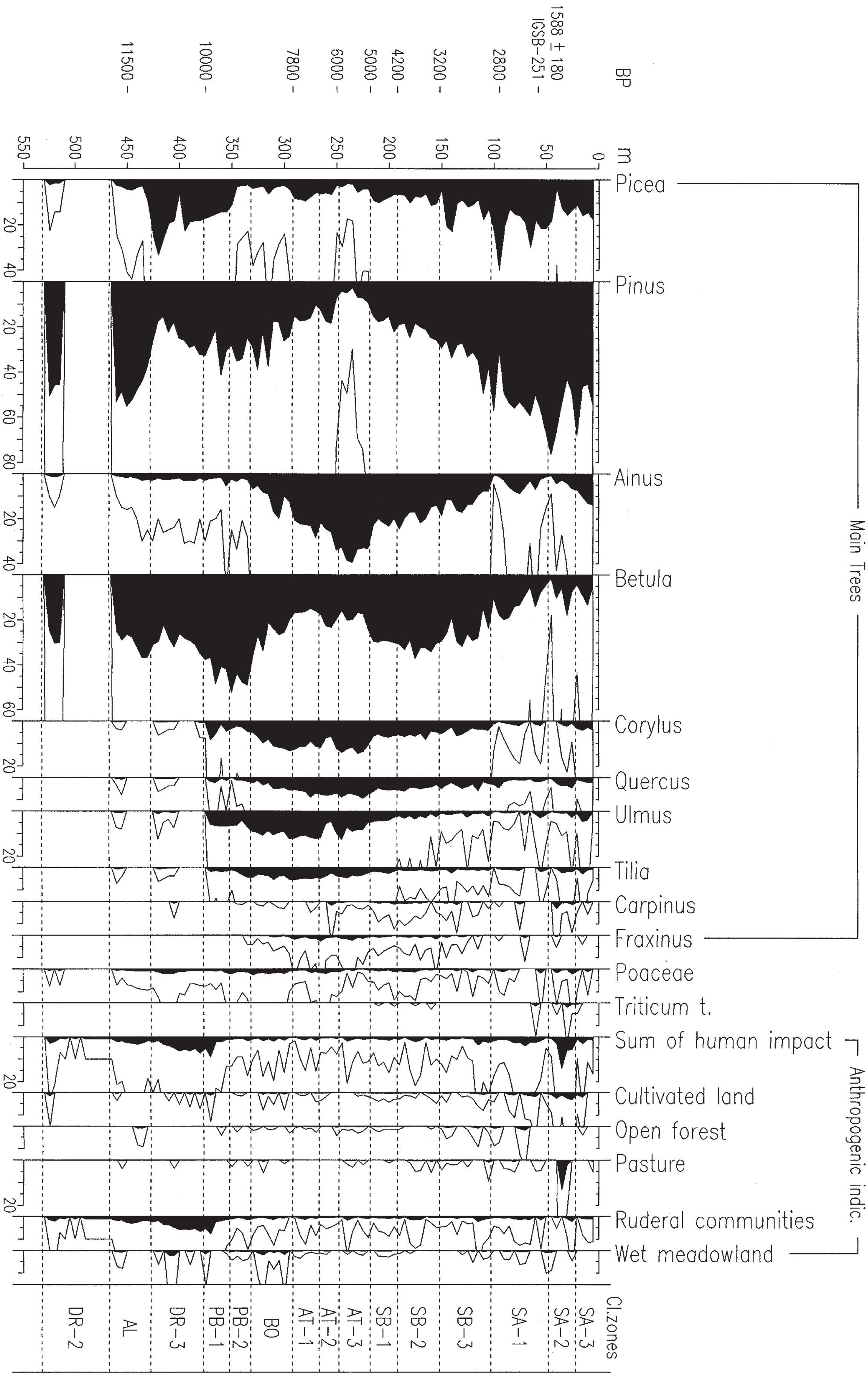

Fig. 4. Human impact diagram of the Osovets IV section (analysed by G. Simakova)

namics (hydrological peculiarities) in the region and adjacent territories of Belarus, Russia (Pskov oblast) and northern Poland has been demonstrated.

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