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THE RESULT OF PALYNOLOGICAL STUDIES OF SEDIMENTS FROM THE CULTIVATED LAYERS OF THE LATE BRONZE AND EARLY IRON AGES IN THE STEPPE REGIONS OF GEORGIA

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ABSTRACT. The results of palynological studies of the cultivated layers from ten archaeological sites belonging to the Late Bronze-Early Iron Age period showed that both the vegetation and climate of that time differed significantly from those at the present day. Forest-steppe landscapes were rather widespread due to the wetter climate. In the human activity of that epoch agriculture was predominant.

KEY WORDS: palynology, cultivated layer, forest-steppe, humidity

INTRODUCTION

In East Georgia the Late Bronze-Early Iron Age period has been most intensively studied between the 12th and 7th centuries B.C. (Pitskhelauri 1973, 1988). In this period the plains and foothills with steppe vegetation were quite densely populated. No other archaeological epoch is characterized by as many monuments as the Late Bronze-Early Iron Age (Kikvidze 1988). However, at the present time the steppe regions of Georgia, like other similar places in eastern Europe, are characterized by the absence of settlements. One of the reasons for this is the very dry climate and extremely poor water availability. For example, in the extreme south-east of Georgia (right bank of the river Iori) in the Udabno Garedji steppe regions, (Fig. 1), the annual precipitation barely

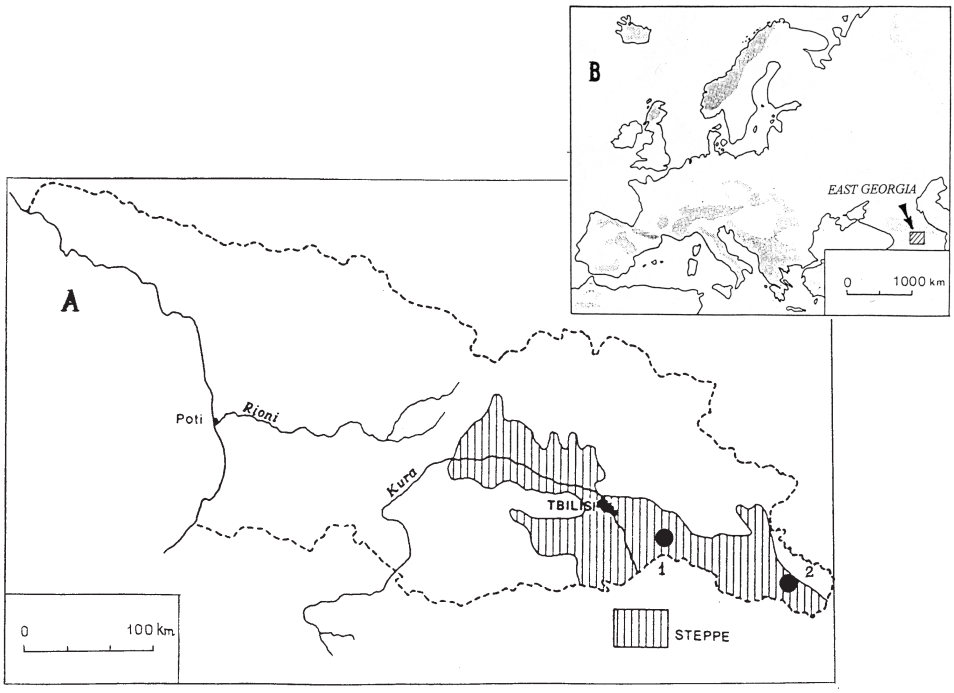

Fig. 1. A – Map of Georgia. Shading shows the extent of steppe; circles show the study regions:1 – Udabno Garedji; 2 – Shiraki; B – Map of Europe

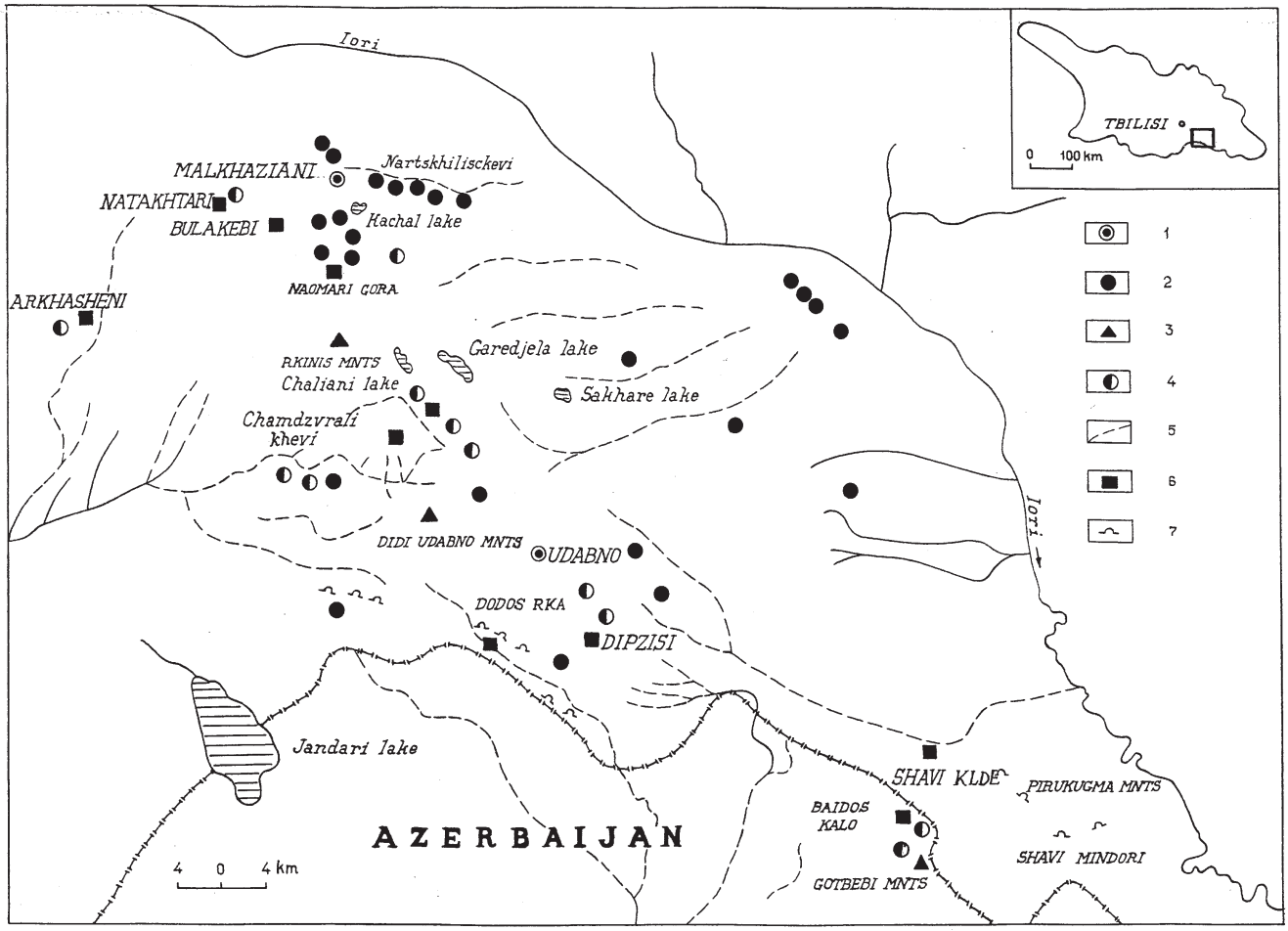

Fig. 2. Schematic map of Udabno Garedji. 1 – present-day villages; 2 – Late Bronze-Early Iron Age settlements; 3 – mountains; 4 – sampling sites; 5 – beds of former rivers; 6 – sites of the studied profiles from sediments of the Late Bronze-Early Iron Age archaeological monuments; 7 – caves

reaches 350–374 mm at a mean annual temperature of 10.3°C. (Spravochnik po klimatu SSSR, 1971). There exist neither rivers nor settlements. Throughout the huge steppe territory there are only two small villages, while in the Late Bronze-Early Iron Age period there were up to 40 settlements there (Fig. 2) (Pitskhelauri 1973, 1988).

Similar climatic conditions are observed in the second region under investigation the Shiraki steppe situated between the areas drained the Iori and Alazani rivers. Shiraki differs from Udabno Garedji only in the somewhat higher air humidity. Nowadays there are no settlements there, but in the epoch under consideration there were up to ten. The natural vegetation on the plains is represented mainly by *Andropogon* steppe. Higher, on the hills thorny shrub-steppe formations of *Paliurus spina-christi, Spiraea, Juniperus* and *Ephedra* are widespread. To the south at altitudes below 500 m, the steppe changes into semidesert with a predominance of wormwood.

Our palynological study of cultivated layers from the sites occupied by prehistoric man in the above-mentioned regions began in 1991–1992 (Kvavadze & Todria 1992).

The main purpose of this report is to compare the natural processes which took place in these two regions in the Late Bronze-Early Iron Ages on the basis of palaeobotanical data. A secondary one is to establish the effect of climatic changes on the human activity of that period.

PECULIARITIES OF THE POLLEN SPECTRA FROM THE CULTIVATED LAYERS OF THE UDABNO GAREDJI SETTLEMENTS

Unlike the plain steppe of Shiraki the Udabno Garedji relief is characterized by cuesta-like ridges running parallel to the Main Caucasus Range.

The Late Bronze-Early Iron Age cultivated layers are best of all represented by the Naomari Gora settlements at an altitude of 940 m a.s.l. These settlements date back to the 12th-7th centuries B.C. (Pitskhelauri 1973, 1988).

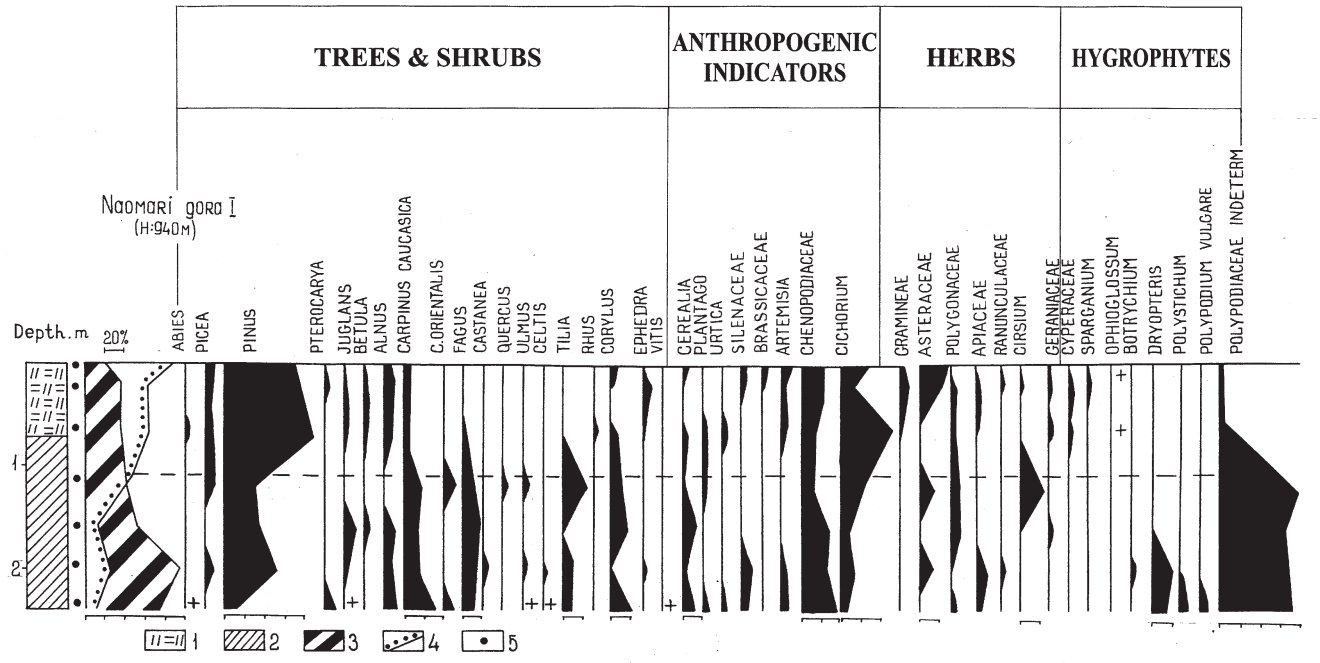

Fig. 3. Spore-pollen diagram of cultivated layer sediments in Naomari Gora I. 1 – recent soil; 2 – loam; 3 – arboreal pollen and forest fern spores; 4 – herbs; 5 – sampling location

In the pollen spectra of the lower part of the layers pollen and spores of forest plants predominate. Hornbeam and beech pollen prevail, while *Betula, Pterocarya, Alnus, Juglans, Quercus, Tilia* and *Carpinus orientalis* pollen grains are also plentiful. Spores of ferns such as *Dryopteris, Polystichum* and *Polypodium vulgare* (Fig. 3) are found in large quantities. The total content of fern spores extends to 61–87%, which is a direct indication of the existence of forest communities. It should be mentioned here, that in recently obtained pollen spectra from Udabno Garedji, the proportion of spore-bearing species does not exceed 0.5–2.8% (Kvavadze & Stuchlik 1993).

In the herbaceous pollen group from the Naomari sediments Chenopodiaceae and Asteraceae are predominant. The pollen of cultivated grasses, most of which is referable to the *Triticum* type, is frequent and Cerealia pollen accounts for 3–8% of the total herbaceous content, suggesting the existence of agriculture. The high content of Chenopodiaceae pollen in the sediments indicates the development of stock rearing.

South-east of the Naomari Gora I settlement, approximately 7–8 km from Udabno village, lies the Dipzisi I settlement. It occupies the uniformly gently sloping side of a rather large hill at an altitude of 909 m. From the pollen spectra one may deduce that the Dipzisi settlement appeared somewhat later than Naomari Gora I (Kvavadze & Todria 1992). Already there was no continuous forest there. The peculiarities of the pollen complex of herbaceous species suggest that the people in of Dipzisi were mainly engaged in livestock breeding. The pollen of crop plants and accompanying weeds in the ashes layer is present in very small amounts.

Stock rearing was mainly developed further to the south and south-east in regions with a dry climate and hilly relief. This is evidenced by the spore-pollen spectra from sediments of the Shaviklde settlement situated in the extreme east of the region in the gorge of the dried up Alandara river. This settlement is situated on a rather high cuesta, some 749 m above the valley floor. Arable farming was of secondary importance here. The archaeological data show a highly developed metallurgical industry with furnaces for primary iron smelting present.

5–6 km south of the Shaviklde settlement, in Azerbaijan, the Baidos-Kalo settlement (Fig. 2) has been studied (Kvavadze & Stuchlik 1993). In the Late Bronze-Early Iron Age period the population of this region was not engaged in arable farming. The main human activities here were livestock rearing and metallurgy, evidence of the latter being provided by the remains of red slag and forges. Nearby, the population of Chamdzvraliskhevi I and II was also engaged in metal refining. These settlements are in the eastern part of Udabno Garedji at an altitude of 821–826 m a.s.l. along the gorge of the former river.

The pollen spectra of the ash layers of Chamdzvraliskhevi show equal amounts of arboreal and herbaceous pollen. Large quantities of the pollen grains of crop plants are recorded in the layers of the second settlement, generally of the *Triticum* type.

The Natakhtari, Dodosrka and Bulakebi settlements (Fig. 2) are situated even higher up. The palynospectra from the cultivated layers of these sites are very similar to those of Naomari Gora I, although arboreal species are found in higher quantities with hornbeam and beech pollen prevailing. Crop plants are also rather abundant.

PECULIARITIES OF THE POLLEN SPECTRA OF CULTIVATED LAYERS OF THE SHIRAKI STEPPE SETTLEMENT

As has already been mentioned, the Shiraki plain steppe lies in the east of Georgia in the area between the Iori and Alazani rivers. The climate there is somewhat less dry than in Udabno Garedji with a mean annual precepitation of up to 490 mm. The Shiraki vegetation reflects strongly the influence of man. Chernozems are fully ploughed and used for cereal and other crops. The adjacent hills are occupied by pasture.

Particularly interesting and important are the results of the resumed archaeological excavations of the joint Georgian-German expedition (of 1996) on the Tsiskaraant Gora settlement with its clay walls, paved streets and sewerage systems, which indicate the existence of a highly civilized culture there in the past. This settlement was of an urban type and the abundant archaeological material enables one to date this monument to the 8th-7th centuries B.C. In approximately the 6th century B.C. the settlement was burnt and destroyed. Since that time it has remained abandoned.

From the cultivated layer sediments, in squares H-9d and G-12c, 37 samples were selected for spore-pollen analysis (Figs. 4, 5). The thickness of the sediments under investigation was 260cm. From the lower layers (depth 155–260 cm), which the archaeological data suggests date from the 8th-7th centuries B.C., the pollen spectra have a high tree and bush pollen content (typically up to 22%). This indicates the existence of forest-steppe, rather than the steppe landscapes which are widespread nowadays. The tree spectrum composition in the sediments indicates the importance of *Pinus eldarica* showing that it must have been widespread in Shiraki.

At that time, in addition to *Pinus eldarica*, *Juniperus, Pistacia* and *Celtis* contributed to the formation of scrubby forest. The more gently sloping hills at an altitute above 600 m were probably covered by broad-leaved forest where *Quercus* and *Carpinus orientalis* would have been predominant. A low *Fagus, Ulmus* and *Tilia* was also observed. The understorey consisted of *Corylus* and *Rhus*. In the south, on the more rocky and dry hills thickets of such shrubs as *Ephedra* and *Spiraea* were also widespread. *Populus, Salix, Alnus and Hippophaë* occupied flooded areas.The plain consisted largely of water meadows rich in Ranunculaceae, Poaceae, Boraginaceae, Asteraceae,Polygonaceae Geraniaceae, Brassicaceae, etc.

The peculiarity of the spectra of the period under investigation is the high incidence of pollen belonging to the group indicating the presence of man, especially the pollen of cultivated grasses and accompanying weeds and pasture elements indicating intensive grazing. Among cereals, rye and wheat were predominant with a strong prevalence of the former according to the spectra. Millet and barley were relatively unimportant. The pollen composition of cultivated tree species shows the development of gardening, principally walnut, hazel and fig. In terms of human economic activity the rearing of livestock was of secondary importance (Pitskhelauri & Kvavadze 1997).

CONCLUSION

Thus, comparison of the pollen spectra of the cultivated layers of the East Georgian steppe settlements shows that both the vegetation and climate of the Late Bronze-Early Iron Age in the two regions investigated differ significantly from those of the present day. At the very beginning of the epoch under consideration continuous broad-leaved forest covered the hills of Udabno Garedji at altitudes of 600–1000 m. At that time the hilly uplands surrounding the Shiraki valley might also have been occupied by forest, but broad-leaved species were far less important than *Pinus eldarica*.

In the 8th-7th centuries B.C. the forested area became progressively smaller due to human impact. In Udabno Garedji agriculture and stock rearing were developed equally in the western regions. In the south-east with its more hilly relief livestock breeding prevailed. In many parts of Udabno during this period metallurgical industries developed, resulting in the possible destruction of forest vegetation. At that time the Shiraki population was mainly engaged in agriculture. Rye and wheat were cultivated, often apparently intermingled, as the spectra reveal significant amounts of the pollen of each in one and the same sample. According to the data given in the literature, mixed sowing was used in many regions of East Georgia in order to increase the yield in those places where irrigation was absent (Kikvidze 1988). The early cultivation of rye in East Georgia is also evidenced by seeds found in Arukhlo settlements in layers dated to the 7th century B.C. (Lisitsina & Prischepenko 1977).

Gardening in Shiraki as in other regions at that time developed intensively, with walnut, hazel and fig being mostly cultivated.

The raising of livestock was of rather secondary importance and its development began only when the climate in Shiraki became very dry in the 6th century B.C.

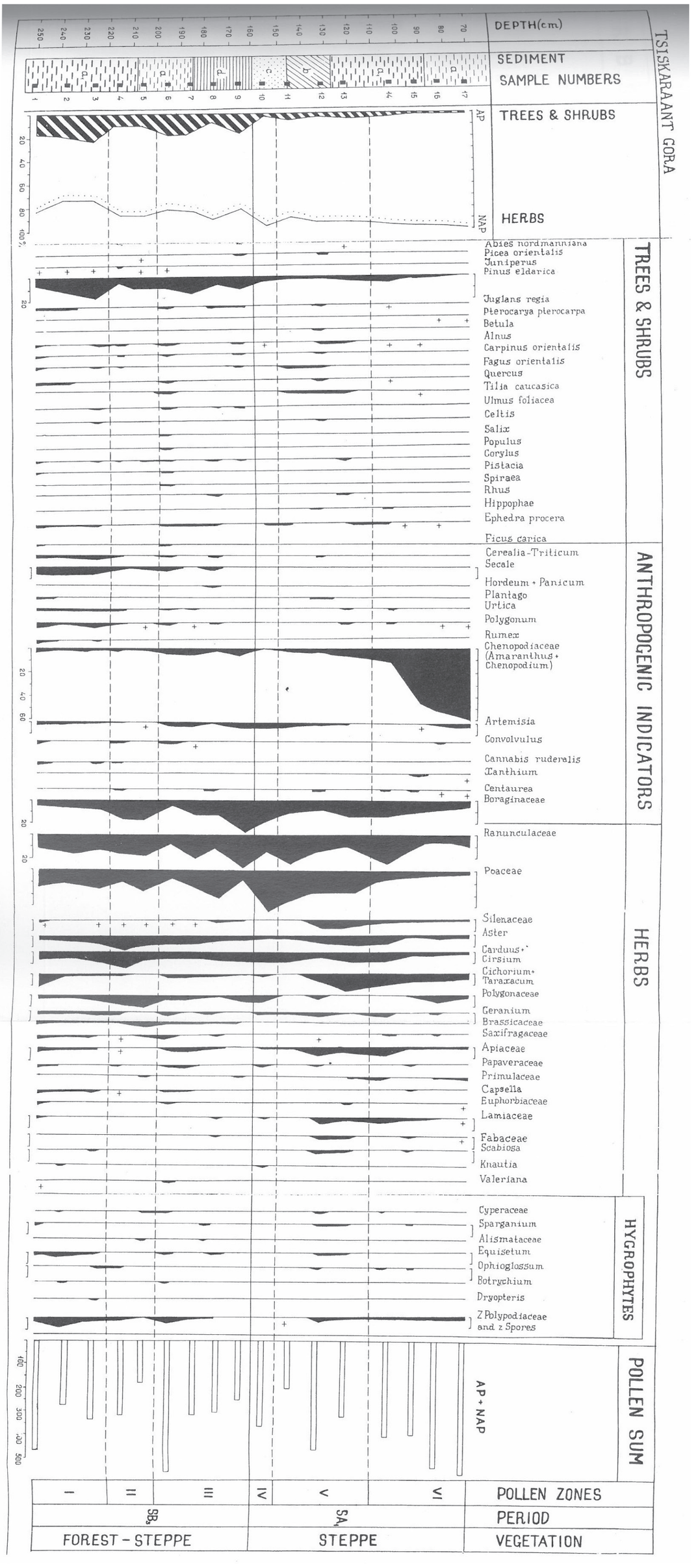

Fig. 4. Pollen diagram of cultivated layer sediments in the Tsiskaraant Gora I site (square H-9d). a – loam with humus; a1 – loam without humus; b – mud with loam; c – ash layer; d – clay

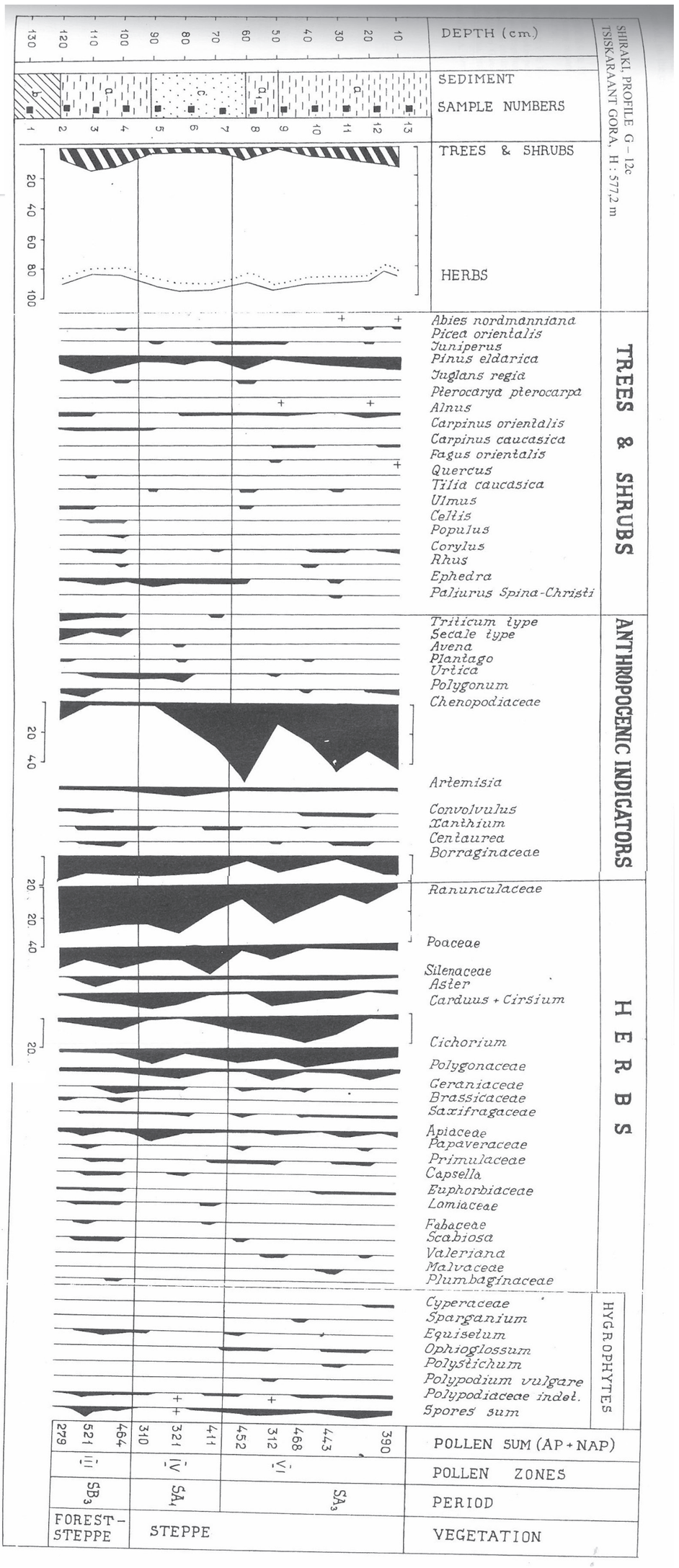

Fig. 5. Pollen diagram of cultivated layer sediments in the Tsiskaraant Gora II site (square G-12c). The symbols are the same as in Fig. 4

The climatic events which essentially determined human activity were the change from the wet and warm conditions of the 12th-8th centuries B.C. to a drier and cooler climate in the 6th century B.C. In the wetter periods the steppe vegetation belt contracted sharply, while in dry periods, on the contrary, it spread over larger areas.

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