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Life at the interface of two distinct landscapes– relationship of humans and environment in the periphery of the Danube-Tisza Interfluve between Hajós and Császártöltés

Communication

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Abstract: Recent archeological and geoarcheological investigations have corroborated the notion of close interaction between man and environment in our study area during historical times. The riparian Sárköz, forming an interface between two major geographical regions of Transdanubia and the Great Hungarian Plains, has been continuously inhabited for the past 8000 years. Settlements were generally confined to areas above 90.5-91m ASL, with the exception of a few drier periods. This elevation can therefore be regarded as the margin of human settlement. The lower-lying areas correspond to the actual floodplain inundated for the major part of the year from which lag-surfaces stand out as island-like natural highs hosting the settlements themselves. The endowments and settlement pattern persisted from the Neolithic onwards until the terminal Modern Age, when measures aimed to ordain the area substantially altered the natural landscape.

Keywords: environmental history • Sárköz (Great Hungarian Plain)• Chopper Age • Bronze Age • Migration Age • Middle Age

1. Introduction

The relationship between human communities and the environment surrounding these communities can be disclosed by the application of different archeological, geological and environmental historical methods. These include the deployment of numerous tools in scientific investigation including the application of chronological, sedimentological, geochemical and paleoecological analytical methods on sequences accumulated in historical catchment basins of lakes and marshlands. The final outcome will firstly help us understand the natural conditions that prevailed at the site before the arrival of human groups, and secondly the study will also shed light onto potential transformations in the natural endowments due to perturbances attributed to human activities or climate change.

In order to reveal the relationship between man and environment a complex geoarcheological and environmental historical analysis was implemented at several sites located at the interface of the alluvial plain of the River Danube on the so-called Sárköz Danube side, and the adjacent plateau of the loess-covered area of the

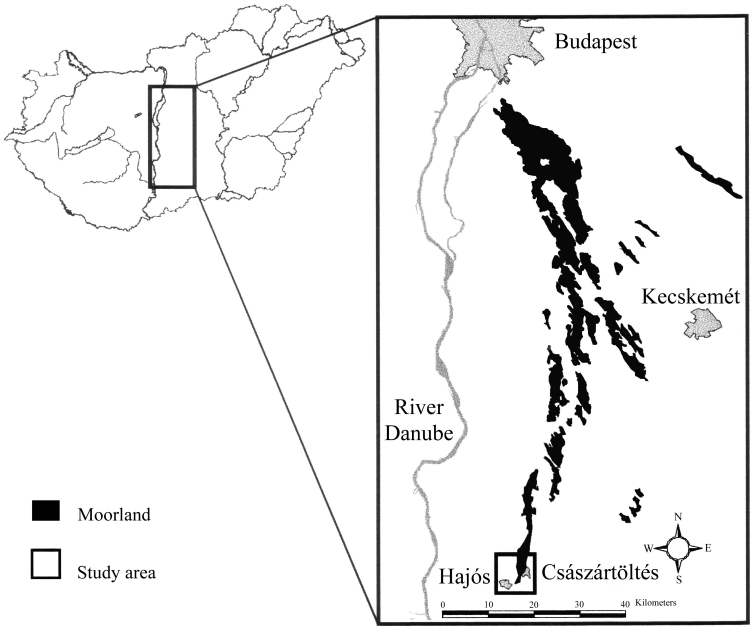

Figure 1. Location of the study area on the southern parts of the Danube floodplain.

Danube-Tisza Intefluve between the villages of Hajós and Császártöltés.

More than fifteen segments of this interface, including the catchment basins of Kaszálók wetland of Hajós and the Red-marsh of Császártöltés, were subjected to detailed sedimentological, geochemical, palynological, macrobotanical and malacological analysis with absolute dating of the deposits in order to reveal long-term relationships of man and environment in the referred area before and after the arrival of first cultural groups.

Results were integrated into a complex archeological assay via the incorporation of information gained from a detailed archeological topographic survey (field trip of Hajós and Császártöltés area), and data from rescue excavations on the track of the M9 motorway. The archeological topographic survey yielded about 200 new deposits. Furthermore, another 6 deposits were subjected to excavation along the trajectory of the M9 motorway.

Regarding the development the Alföld (Great Hungarian Plain), the alluvial plain of the Danube is of special interest because the eastern side, with hydrologically ideal conditions, is bordered by an elevated dry plateau covered by loess and wind-blown sand ca. 10-15 m above the floodplain (Fig.1.). According to the geology [1, 2], the river Danube and its tributaries crossed the area of the Danube-Tisza Interfluve and created a vast alluvial fan during the Pleistocene, which fundamentally determined further evolution of the study area. As a result of neotectonic subsidence during the penultimate glacial period in the area of the so-called Baja-Kalocsa-Solt depression, the river was drawn to its present valley as a result of avulsion. Due to intensive uneven subsidence a gradually widening and deepening floodplain developed, which dissected the adjacent alluvial fan of the Danube-Tisza Interfluve forming an elevated plateau with low subsoil water levels [1, 2].

Sediment accumulation in the newly developed depression kept pace with subsidence resulting in the formation of minor water courses on the alluvium, which turned into marshlands as freshwater supply from the main reach gradually ceased. These swamps, marshes or muskegs are located at the interface of two significantly distinct landscapes. One of the most notable swamps (Turján, Őrjeg, Red-marsh) has an orientation of north to south running parallel with the River Danube [3]. The southern part of this marshland system is known as Red-marsh and Hajós Meadows (46°23'40" N, 19°09'30" E). It was this area where our investigations were implemented. The study area is in the warm temperate zone (Köppen type Cfa climate zone). Average winter temperatures are higher than -2 °C and winter lasts only for 2.5-3 months. The general climate is Continental, with Oceanic, Sub-Mediterranean climatic influences present as well, forming a typical transitional area from a climatic point of view. The average annual rainfall is 500-600 mm. Thanks to the ideal endowments the area is at the margin of peat formation from

Table 1. Environmental history of the dead arms of Hajós and Császártöltés.

Age	Sediment	Plant remains	Pollen	Mollusks
Middle Ages	peat and lacustrine mud	sedge, reed shallow lake	Open parkland with hornbeam and oak as well as extensive grassland and arable lands	Peat and lake dwellers
Migration Period	reed and willow peat	Reed and willow swamp	Grasslands reach maximal extent due to human influences	Marshland elements
Imperial Age	sedge and reed peat	Shallow lake with reeds and tussocks	Open parkland of anthropogenic origin	Terrestrial and ditch elements
Iron Age				
Bronze Age			Beech and hornbeam gallery forests, arables, pasturelands	Marshland and ditch elements
Copper Age	reed peat with intercalated mud	Shallow lake studded with reed	Beech, hornbeam on floodplain expansion of grasslands	Shallow lake dwellers
Neolithic			cereal and weed pollens, decrease in APs	
Mesolithic	peatmoss	Brown-moss marsh	closed oak-dominated gallery forests and forest steppe	Gilled snails
Epipaleolithic	lacustrine mud	Swampy lake	mixed taiga on the floodplain and open parkland taiga on the plateau	Cold-resistant elements dominate
Paleolithic	Fluvial sand	River	Horsetail swamp and cold resistant taiga	Rheophyl elements

an ecological point of view as a result of the high subsoil water level. As a result, vast peatlands developed in the cut-off channels of the Danube with reeds and sedges in the marginal areas fringed by ash-alder gallery woodlands of the alluvial plain [3]. The elevated plateaus with a sandy bedrock hosted vast grasslands studded with aspen-juniper steppe shrubs and pedunculate oaks. Unfortunately the natural vegetation has almost fully disappeared in our study area as a result of human activities such as peat mining, the creation of vineries, arable farming and aspen fields. Therefore, the natural vegetation of the area can only be deduced from the pollen and macrobotanical record of the referred catchment basins alone.

2. Results of environmental historical examinations

The two profiles of the Hajós-Meadow and Császártöltés-Red Marsh that were studied [4] yielded a sedimentary sequence of 3 and 4 m corresponding to the past 15 kys (Table 1.). The bedrock of both cores was given by fine-grained sands rich in muscovite fragments. The overlying deposits were characteristic of an alluvial plain sequence representing evolution from the turn of the last ice age and the present interglacial onwards (Fig. 2.). On the basis of the observed characteristics of the profiles the evolutionary history of the area is given as follows:

2.1. Fluvial stage.

According to the findings of radiocarbon dated paleoecological investigations, the catchment basins of the Hajós swamp and that of the Red Marsh emerged during the terminal part of the Pleistocene, when, as a result of increased stream activity due to the neotectonic subsidence of the Danube valley, active branches developed along the main channel. The Hajós swamp occupied a meander, while the Red-marsh developed in a long projected yazoo tributary of the Danube. Following the cessation of fluvial sand deposition, the different regions of this lat-

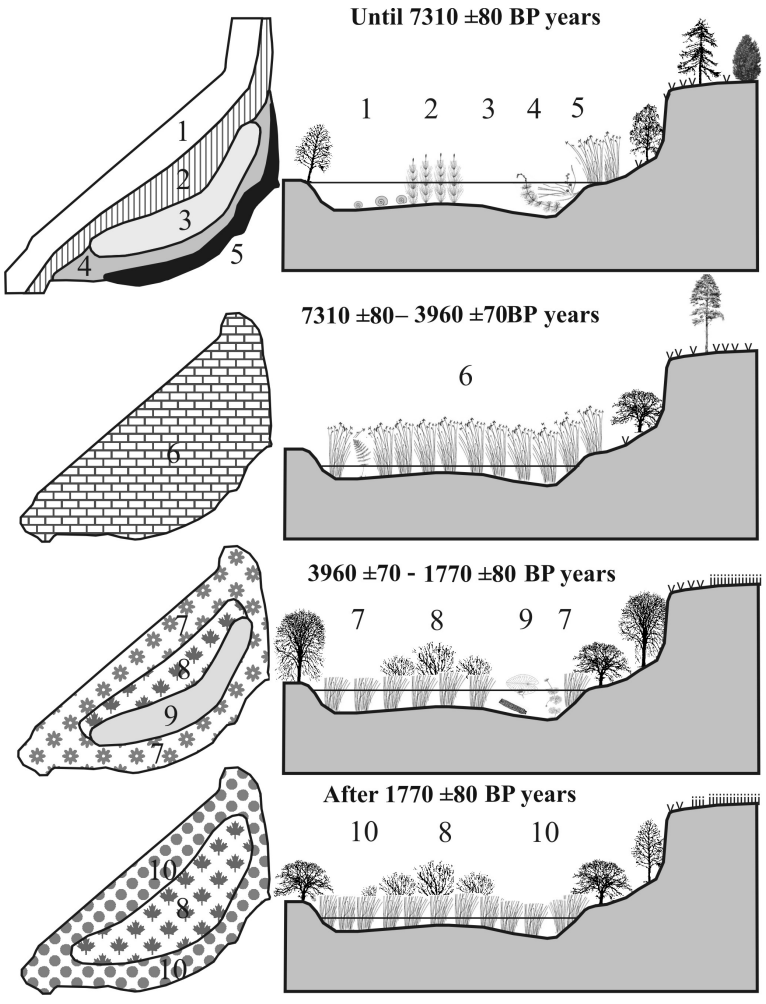

Figure 2. The development of local vegetation in the Hajós-Kaszálók Mire [4] Aquatic plants: 1. moving water, 2. horsetail swamp, 3. Standing water, 4. Ranunculacae 5. Polygonum, 6. Floating marsh 7. Tussocks 8. Willow swamp 9. Nymphea and Juncus 10. Sedge.

ter marshland underwent differing ecological evolution resulting in the emergence of multiple ecotones within the catchment of the Red Marsh even as early as the terminal part of the Pleistocene. The river and the newly emerged lake was fringed by a horsetail marsh which is nowadays widespread in alpine, Carpathian settings. The vegetation of this horsetail marsh was composed of elements including pine, Siberian pine, mugo pine, larch, alder, dwarf birch, birch with shrubs and highlander-tundra elements, including spike moss. The banks of the river hosted a mixed taiga while the elevated sandy plateau was home to dry continental non-arboreal elements studded with stands of pine and birch.

2.2. Terminal lacustrine and peatland-lake system phase at the Pleistocene/Holocene boundary

After the cessation of fluvial activity in the referred channels cold, deep lakes emerged with relatively high water level and minimal bioproduction rate due to the climatic endowments. This oxygen rich lake was an ideal harbor for numerous gilled aquatic gastropods and mussels. Alongside the emergence of lakes in the referred cut-off channels, the vegetation also changed, demonstrated by the complete disappearance of cold resistant elements from the floodplain and the adjacent plateau.

Besides the general presence of Scotch pine, larch, spike moss and dwarf birch, an increase in the proportion of pine and common birch was noticed during the terminal part of

the last ice age on the basis of pollen data. Several deciduous, thermophylous elements such as oak, linden and elm also turned up on the floodplain indicating the emergence of moderate climatic conditions. Similar vegetation changes are discernible for the area of the adjacent sandy and loess-covered plateau. Namely, classical tundra elements are overtaken by temperate grassland elements with scattered stands of boreal pine and birch yielding forest steppe conditions. Swamps with brown moss [4] occupied the shores of the lakes as well as the area of the isolated bays. It was this period when peat accumulation started along with the appearance of numerous peatland elements unique to the area of the Alföld; like *Sparganiaceae*, *Menyanthes*, *Comarum palustre* and *Carex vesicaria*. Peatland conditions were preserved until the 4th millennium BC in the catchment basins fringed by a mixed deciduous gallery woodland of oak, elm, ash, linden and filbert. Due to the relatively low groundwater table, grassland conditions were preserved in the area of the plateau with patches of forest steppe. Transformation in peat formation and the complete disappearance of brown moss swamp in our study area hallmarks the appearance of the first food-producing communities at the turn of the 7th/6th millennia BC. Only a few traces of these groups were detected in the study area. Deposits are mainly confined to the area of the Sárköz, specifically to flood-free natural highs ideal for a sedentary way of life.

2.3. Development of reed marsh during the Holocene.

There is a major transformation in the sediment composition of the sequence studied as well as that of the inferred flora and fauna at the turn of the 7th and 6th millennia BC. This process is highlighted by the retreat of brown moss from the area and the expansion of reed onto some parts of the peatland. It was within this period that reed peat accumulation initiated in the catchment basin and altered hydrological conditions leading to the disappearance of gilled snails and giving room to pulmonate ditch elements [5].

Parallel with the evolution of the reed marsh, substantial changes were inferred for the terrestrial vegetation as well in the adjacent areas; demonstrated by the appearance of numerous ash peaks marking extensive forest clearance by fire. As a result hardwood elements harboring the catchment basin declined; giving way to herbs such as Artemisia and Asters. The beginning and the middle part of the Holocene was characterized by the emergence of an extensive Artemisia steppe with scattered patches of oak woodland on the high plateau of Hajós. It is likely that the intensified silting up of the catchment basins and the spread of reed must be linked to erosion as a side effect of human activities. The technical knowledge of Neolithic communities was not developed enough to cause major transformations in hardwood woodlands, but deforestation via burning of the vegetation must have initiated notable erosion. Concentrations of inorganic material in reed peat follow an increasing yet highly fluctuating pattern during the Neolithic implying that soil erosion became more and more pronounced. The highest peak observed in the concentration of inorganic matter in the peat material, highlighting the climax of human influences in the area, is confined to the end of the Neolithic and opening of the Copper Age (4th millennium BC). The initial impacts of these communities on the environment were only overprinted during the early Iron Age when a classical retreat of reeds and the emergence of tussocks can be inferred.

In contrast to the Neolithic, several Copper Age sites were identified in the vicinity of our study area. The earliest representatives belonged to the so-called Tiszapolgár Culture as shown by the archeology. Pastoralist groups generally settled onto the marginal, natural highs of the floodplain like the plateau at Hajós and Császártöltés [6–8].

Representatives of the Bodrogkeresztúr Culture carried on the traditions of the Tiszapolgár group during the Middle Copper Age. Numerous settlements of this cultural group were identified on the plateau. Furthermore, as shown by the results of the most recent excavations along the trajectory of M9 motorway, their presence in the area of the Sárköz can also be hypothesized. Two notable cemeteries were found; one of them, next to the motorway, was even excavated. The referred cemetery is among the most extensive ones identified so far in relation to the Bodrogkeresztúr Culture, yet as seen from the artifacts it belonged to the poorest group as well [9, 10].

The Late Copper Age marked the settlement of the Badenian Culture to this area, which was also engaged in stockbreeding. The number of sites and finds are much higher compared to the previous periods. Furthermore, a notable change in landscape pattern is observable. Namely, whilst the sites of the Tiszapolgár and Bodrogkeresztúr Cultures are confined to the area of the elevated plateau, settlements of this Late Copper Age group turn up in the area of the Sárrét on flood-free natural highs of the Danube floodplain. The earliest settlers must belong to the Boleráz group of the civilization. The origin of the local group must be connected to Transdanubia, from where they would have arrived through Middle and East Slovakia finally reaching the Great Hungarian Plains. This early group was followed by the classical Badenian civilization. This group was also a pastoralist one but with

little knowledge of intensive stock breeding. So after pasturelands were overgrazed the population simply went on the move [7, 8].

2.4. The emergence of tussocks & wet meadows

The opening of the 3rd millennium BC was characterized by major transformations in the natural endowments of the study area. This is demonstrated by an amplified decrease of oak accompanied by an advance of hornbeam and beech as well as an increase in the area of grasslands to about 75-80%. Gallery forests of beech and hornbeam occupied the area of floodplain. The forest steppes with studded stands of oak and beech were similarly overtaken by pasturelands and arable lands at the end of the Copper Age and beginning of the Iron Age. Although the climate turned wetter, resulting in higher water levels in the catchment basin, intensive sediment accumulation due to pronounced human activities prevented the emergence of closed woodlands in the study area. It was this period when the evolution of the Hajós Mire and the Császártöltés Red-Marsh separated and went on individual paths. While the latter preserved conditions ideal for the accumulation of reed peat, intensive erosion and infilling of the catchment basin of Hajós led to the cessation of peat formation and the development of tussocks. Among the meter high tussock shallows, unbalanced water leveled swampy meadows developed with tang associations consisting of nymphaea and nuphar, as well as toad-sedge and frog-sedge, and pioneer sludge living communities. It might be probable, that tang associations appeared during spring and the beginning of summer after floods due to higher water levels. Conversely, sludge living communities appeared at the end of summer and autumn when the area of the Hajós-Kaszálók Mire dried out. This tussock vegetation was preserved for about 4000 years as far as the beginning of the Age of Great Migrations. Conversely, reed peat formation was characteristic in the Császártöltés area from the opening of the Holocene for about 7500-8000 years in a constant form.

This period – measured on historic scale – encompassed the Bronze Age, the Iron Age, as well as the Imperial Age of the Alföld and the Sarmatian period. At the beginning of the Bronze Age populations of the Makó Culture occupied the area of the Danube-Tisza Interfluve. This land sometimes formed a borderline between the Somogyvár-Vinkovci and Makó Cultures. The rarely allocated deposits of the Makó Culture can be typically found in a narrow strip of the plateau. Main finds are stem dishes decorated with geometrical patterns divided into chased triangles on the inner side and found in this area alone [7]. Plant cultivation again came to the frontline and is parallel with the appearance of the Makó Culture in the area, whose activity was fundamental during the entire Bronze Age. The Makó Culture was followed by members of the Nagyréve Culture in the area of the Danube-Tisza Interfluve. Few scattered finds and settlements were identified in the area of the Sárköz and the sandy plateau. Only from a single small, whole mug collected at Császártöltés, can it be certainly stated that it belongs to the Nagyréve Culture [7]. In the relatively peaceful period of the Middle Bronze Age members of the Vatya Culture occupied the area. During our field trip, only minimal vessel fragments characteristic of this civilization could have been collected, while in the neighboring area of Kecel, traces of the civilization could be asserted in several deposits [6]. In the area of Hajós-Hildpuszta urn-cells connected to the civilization were excavated. Near them an earth fortress of the Vatya Culture was also attested.

The almost vertical wall of the plateau, dissected by smaller valleys, offered an ideal shelter for humans and had a high defensive value when fortified with a rampart. Some suggest that the civilization's last line of defense, the earth fortress system, was in this area. Hajós-Hildpuszta was one component of this system.

The appearance of militant stockbreeding conquerors arriving from the Alps and Rhine – stack cell civilization – marked the end of the peaceful, prosperous period of the Middle Bronze Age. Traces of their locations, - polished vessel-fractions decorated with flutings – can be found in Császártöltés and Hajós also [7].

According to our present knowledge, during the Late Bronze Age the size of the community significantly decreased, as well as the number of settlements. On the basis of the spatial distribution of finds, members of the Gáva Culture conquered the entire area of the Great Hungarian Plains during this period [7, 8].

The Early Iron Age Scythian population also occupied the area of the Alföld, although no traces of them were found during the field survey in our study area. During the later periods of the Iron Age, almost the entire area of the Carpathian Basin was under the rule of Gaelic tribes. Their first colonies surged into the Carpathian Basin through Austria from the German Bavarian Danube Basin, where they supposedly settled down after the Balkanian campaign and defeat in 279. It was at this time that the area of Transdanubia became part of their dominance . The referred area was also a starting point of further campaigns for occupation. They must have reached the area of the Alföld through the Danube Bend. Their presence was detected only in a few deposits in the examined area

[6, 7, 11]. In Transdanubia Gaelic tribes survived Roman conquest, while their scant settlements in the Alföld were holding sway over the new conquerors, the Samatians, who were arriving from the East.

Sarmatian jazyges colonies originating from Iranians, occupied the eastern part of the Carpatian Basin during the 1st century AD. Their earliest traces are known from the northern and middle parts of the Danube-Tisza Interfluve. During their lives the sandy areas of modern Bács-Kiskun County were unsettled or only scantly settled. The first immigrants are recorded during the second half of the 1st century AD in this area. The first intensive immigration wave is connected to the 2nd century AD, which marks the end of the Markomanian-Quadi war, and the movement of certain colonies of Roxolani into the Carpathian Basin. Gothic and Gepid immigration reshaped the previous Barbarian settlement system in the basin. Barbarian tribes put higher pressure on the Pannonia province at the beginning of the 3rd century. During the middle of 4th century AD, parallel with the surge of Gepids to the area of the Transtisza (Tiszántúl) region, several Sarmatians were forced to move on to the Temesköz and the Danube-Tisza Interfluve. The number of Sarmatian settlements significantly increased, evident from the results of our field survey. Sarmatians, who usually settled next to water onto natural highs, populated both the area of the plateau and the natural highs of the floodplain of the Sárköz as well [6, 7, 11]. Population growth initiated migration to other parts of the sandy landscape away from the plateau, but it always happened in deep and well watered valleys, perpendicular to the course of the Danube.

During the entire history of the Alföld, with exception to the Middle Ages, the most consistent settlement system with the highest number of people can be assigned to the Sarmatian Period. It is reflected by more than 60 deposits with traces of the culture identified. The emergence of drier conditions enabled the occupation of the deeper parts of the Sárrét. Nevertheless, new colonies were frequently inundated just like today.

2.5. Decline of tussocks and emergence of a willow swamp

A major ash peak in the studied profiles signals the development of intensive fires in the vicinity of the catchment basins studied; dated to the terminal part of the Imperial Age and the opening of the Migration Age. The concentration of pollen was equally low in line with the increased concentrations of charcoal. The clearly noticeable signs of treading and deforestation in the sedimentary sequence of the catchment basins imply an anthropogenic origin of the fire. However, the role of natural causes can not be fully excluded either. As shown by our geoarcheological record, the water level in the studied catchment basins is significantly reduced during this period as a result of less intense floods; attributable most likely to drier conditions. In a drier period the risk of natural fires in the vegetation is also higher. The lower water level brought about a disappearance of the tussocks resulting in the emergence of a more closed willow swamp in the area. In the area of Hajós this phase was preserved until the Middle Age, while Császártöltés was characterized by the continuation of reed peat formation.

In 567 Avars moved to the area of the Carpathian Basin. Traces of early immigration into the area of the Sárköz were not attested. Countless settlements in the area of the Danube-Tisza Interfluve developed during the middle third of 7th century AD after the failure of southern campaign[11]. The number of Avar (late Avar) deposits steadily increased after 700-720 AD in the Carpathian Basin. Avarian domination was bruised by Pepin the Short, who was obeisance of the Avars as far east as the Tiszántúl. Following the dispersion of the Avars, the area of the Sárköz was used as a protective borderline of the Frankain and Bolgarian empire. Their traces were attested by a few finds as well as the excavated cemetery at Hajós cellars and at Hajós-Cifrahegy.

2.6. Vegetation development during the Middle Age

After the Hungarian immigration the climate became more favorable, it remained warm, but it was also modestly dry. Mixed oak and hornbeam-oak forests spread into the major part of the examined area, but parallel with this, the influence of the man and extensive forest steppe with weeds and cultivated plants also can be observed on a huge part of the plateau.

King Andrew the 1st donated a part of the area of the Danube-Tisza Interfluve to the Abby of Tihany (1055.), it was established when the domain was estimated in 1211: *„meta, in qua est pinus, ... Feneues, ... in alia est pinus".* The area of forests was considerable at the ages of King Leslie the 4th; the gift of a deed to the Cumans also alludes to that: *„adván és adományozván nekik... úgy mint erdőkkel, rétekkel, halastavakkal... és sűrű erdőkkel bővelkednek" (the land donated to them is rich in natural treasures of lush pasturelands, deep woodlands and scattered fishing ponds)* [7].

Alongside these changes, at the deeper part of Hajós swamp the swampy meadows appeared again, as well as the horsetail marshes which are constrained to the earlier

river section. This change proves strong human disturbances in the development of the swamp, and it is possible, that after the Hungarian Conquest a 1-2 hectare large, and 1.5 meter deep fishing pond was created in the swamp. The water supply was solved from the floodwater of the living watercourse and from the spring which appeared periodically below the loess wall next to the swamp. The pond was there until the Turkish conquest and occupation in the 16th century. The creation of fishing ponds after the period of the Hungarian Conquest is not a unique phenomenon in the area. Numerous other examples are found in other parts of the Danube valley, the Bodrogköz, the Nyírség and Hanság dated to the 10-11th centuries. Based on this, the simplified conception about the production experience and social construction of the Hungarian immigrants has to be reevaluated, a task to be done by Hungarian history writers. The written records of this area are completely missing from Arpadian Ages, so the construction of the settlements in the early Middle Ages has to be deduced from field surveys alone. Notable numbers and sizes of settlements can be detected in the plateau as well as in the Sárköz, which periodically moved from this area [6, 7, 11]. The inner part of the sandy landscape, which is far from the plateau, was populated for the first time during archeological periods for a longer time with a large number of people. The most consistent settlement system developed in the early Middle Ages. In this time the villages were small; containing only 2-10 households. Population growth had a serious effect on the spread of the people, which influenced the development of the settlement system, resulting in the emergence of compact cores located 4-5 km away from each other. The Tartar demolition was devastating on this settlement system. In the following period a lower number of villages evolved with higher populations. These villages mainly were centered around the church and their location became permanent [11].

During the field trip seven medieval village remains were found; six could have been related to written sources of charters and other source materials. Late settlements, such as Csalaegyház, Morcs, Hajós, Csákányfő, Kál and Ilde have been localized. The place of the church of Csalaegyház, Hajós, Csákányfő and Kál is also known. These settlements existed during the period of the Turkish conquest as well. A part of them might have been demolished in the early part of conquest, while the others became taxpayers to Turkish authorities. Liberation fights were devastating to the area and part of the Danube valley was completely deserted. Until the first half of the 18th century, marked by German newcomers, there was no serious immigration to the area. This area was part of the Kalocsa archbishop's manor, and was prospering thanks to the tedious work of the newcomers [12].

2.7. 19^{th} century river regulations and their influences on the study area

19^{th} century river regulation measurements brought about a significant drop in the groundwater table resulting in the desiccation of the majority of floodplain marshes. Peat mining also introduced substantial perturbances into the natural succession of peatland evolution. The reed swamp turned into tussocky area at Császártöltés, while in Hajós the development a willow swamp continued. The originally diverse vegetation around the sites was homogenized as a result of human activities.

3. Summary

Recent archeological and geoarcheological investigations have corroborated the notion of close interaction between man and environment in our study area during historical times. The riparian Sárköz, forming an interface between two major geographical regions of Transdanubia and the Great Hungarian Plains, has been continuously inhabited for the past 8000 years. Settlements were generally confined to areas above 90.5-91m ASL, with the exception of a few drier periods. Thus this elevation can be regarded as the margin of human settlement. The lower-lying areas correspond to the actual floodplain inundated for the major part of the year from which lag-surfaces stand out as island-like natural highs hosting the settlements themselves. These endowments and the settlement pattern persisted from the Neolithic onwards until the terminal Modern Age, when measures aimed to drain the area substantially altered the natural landscape. The once flourishing natural wetlands hosting a unique flora and fauna disappeared and were displaced by vast arable lands. The original conditions were preserved only in some scattered spots. The same negative influences are recorded in our study area of the high bluff, where a significant drop in the groundwater table substantially transformed the natural vegetation. This was further enhanced by intensive human activities yielding a so-called cultural landscape of artificial woodlands, vineyards and orchards.

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