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THE VEGETATION MAP OF THE SZÍVÓS-SZÉK UNESCO BIOSPHERE RESERVE CORE AREA, KISKUNSÁG NATIONAL PARK, HUNGARY

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Abstract

The paper comprises the vegetation map, to a scale of 1:5000, of the Szívós-szék UNESCO biosphere reserve core area and a short description of the distinguished vegetation units.

The dominant association of the territory is the *Agrostio-Caricetum distantis* (RAPCS. 27) SOÓ 30.Most of the core area is covered by subassociations and facies of this community adapted to the different hydro- and haloecological conditions. At the deepest reliefs, there are *Scirpo-Phragmitetum* KOCH 26, *Puccinellietum limosae* (RAPCS. 27) SOÓ 30 associations, as well as *Bolboschoenetum maritimi continentale* SOÓ (27) 57 on the lake bed. In smaller patches there are *Brometum tectorum* SOÓ (25) 39, BOJKO 34 and *Lepidio-Puccinellietum* (RAPCS. 27) SOÓ 57 associations.

28 vegetational units have been destinguished on the vegetation map. The nature protection problems of the core area have been mentioned also.

Key words: aerial photograph, biosphere reserve, halophilic vegetation, saline lake, vegetation mapping

Introduction

Szívós-szék (formerly Zsíros-szék) biosphere reserve core area is situated in the IV-th territory of the Kiskunság National Park. Its area is 68 hectares. It is one of those saline lakes which has emerged in a dip between the sandy dunes which consist of sand of Danubian origin (Fig. 1).

These lakes have an orientation in a NW — SE direction due to the most frequent NW direction of the wind. The shape of the Szívós-szék differs from that of other lakes. Already at the time of its emergence, several parallel dune lines were probably crevassed, and this presumably caused the recent shape of the lake. However, the orientation of the small lakes have been isolated from the main lake in a NW—SE direction.

The lake emerged in the Holocene period. It has been proved that the water-impermeable carbonate mud layer was not sedimented directly to the loess of Würm3 glacial, but onto a fine-grained sandy layer of postglacial origin and 2—6m thick (MOLNÁR and MURVAI, 1976). The terrestrial sedimentation in the Holocene can be studied in the works of MIHÁLTZ and FARAGÓ (1946), ZÓLYOMI (1953), MUCSI (1963), and JÁRAI—KOMLÓDI (1966;1969). The difference in the location of carbonate mud and the present situation of the lake bed shows that the extension and location of Szívós-szék had changed a lot from the time of emergence.

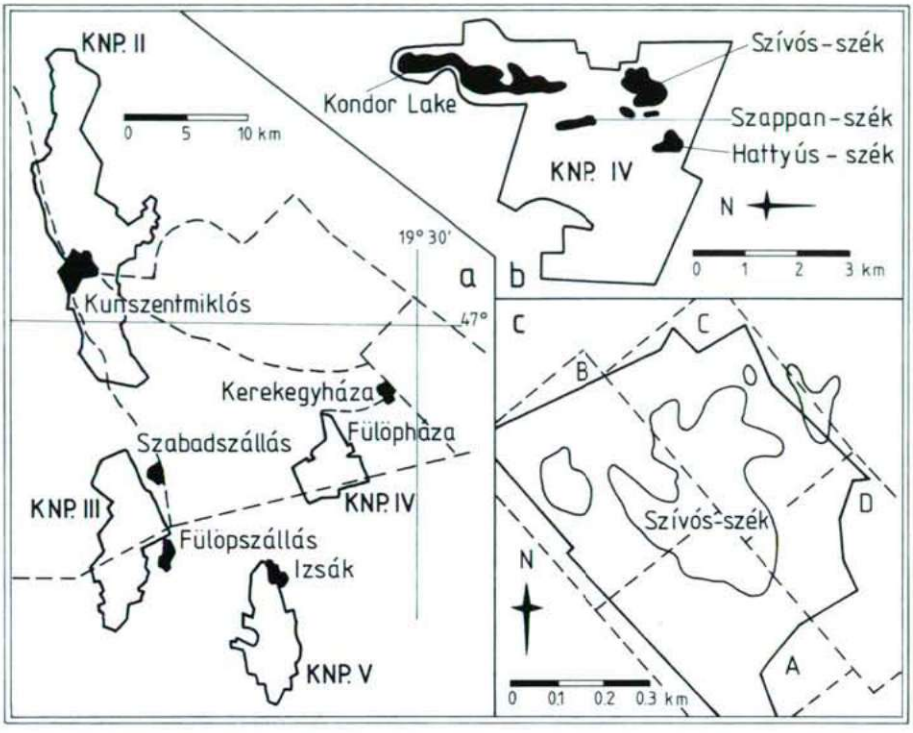

Fig. 1. Geographical location of the IV-th territory of the Kiskunság National Park (a) and the Szívós-szék biosphere reserve core area (b). The figure 'c' shows connection of the four map sheets (A,B,C,D).

The water management works implied a drastic interference in the life of lakes in our century.It led to a regional decrease of the water table, which is the water source of the lakes (ANDÓ, 1964). The direction and intensity of salt and water transport were considerably modified by the diking. Due to canalization, the water impervious carbonate mud layer has been damaged. Therefore, a large amount of water may escape (MOLNÁR, 1985).

The weather has an extreme influence on the water volume of the lakes. As a consequence of last years' dry weather period, such a rarely dry saline lake as Szappan-szék (next to Szívós-szék) dried out of late years. The decrease of the water level of Szívós-szék was especially drastic in the '60s. Therefore, in the last 10—15 years it usually dries out to towards the middle or end of summer. Due to the changes of salt conditions, by the end of the '70s the whole surface of Szívós-szék has become covered with *Bolboschoenus maritimus*.

The fast hydro- and haloecological changes caused a stormy transformation of the vegetation of the region. Hence, it is important to elaborate and documentate the present state of the vegetation of this UNESCO biosphere reserve core area. The first step of the work to be done is the preparation of a vegetation map.

Materials and Methods

The vegetation map has been prepared on the basis of a colour aerial photograph, the magnification of which close corresponds on a map to a scale of 1:5000. The method of vegetation mapping was similar to the one used in the Kisapaj core area (BAGI, 1987). The vegetation map shows the core area with its surrounding. The map is issued in the form of sheets joining without overlap. The four map sheets and their key are formally published as an appendix to this paper.

In the present paper the description of vegetation units is made with the assistance of the Zürich—Montpellier Phytosociology School. Nevertheless, the categorization of several transitional vegetation units — which has developed due to the intensive vegetational transformation processes — has hit against difficulties. The denomination of the species and cenosystematic units is according to the work of SOÓ (1964), though a significant part of the section describing the *Agrostio-Caricetum distantis* association is based on the cenosystematical results of BODROGKÖZY (1960; 1962a; 1962b).

The map was elaborated in 1987.

Results

The Szívós-szék UNESCO biosphere reserve core area and the mapped territories lie on soil deposited onto the terrestrial sediment of the former lake. Due to the water impermeability of carbonate mud, associations with high water demand have evolved. Fixed wind-blown sand covers only a little area of the mapped territory. Most of this is cultivated as plough-land, or orchard. A characterless *Brometum tectorum* association grows on the old fields. The forests and clumps of trees indicated also live on fixed wind-blown sand. The predominant trees are *Robinia pseudo-acacia* and *Populus alba*.

The majority of the mapped territory covered by the *Agrostio-Caricetum distantis* association and the subassociations and facies of this community have become adapted to the different hydro- and haloecological conditions. Coverages of 5—25% of *Carex distans* and of 15—30% of *Agrostis stolonifera* are characteristic for the typical (*agrostetosum* SOÓ) association. The cenological optima of the *Triglochin maritimum* and *Orchis palustris* fall into this vegetation unit. Towards the higher reliefs, the *Cynodon dactylon* forms a great extended facies with a transition through a series of grades. In this unit, less *Orchis palustris* can be found, and the *Triglochin maritimum* is extinct. At the same time, the *Linum perenne* forms a facies with a usual coverage of about 10%. The *Cynodon dactylon* has a coverage of 10—30%. The high cover degree of *Rhinanthus serotinus* ssp. *grandiflorus* is characteristic in the vegetation units mentioned. Its measure may be of a level of 25—30% in the *agrostetosum*.

The subassociation *festucetosum pseudovinae* of the *Agrostio-Caricetum distantis* develops on the higher terrains of the territory. The *Agrostis stolonifera* is extinct, the coverage of *Carex distans* decreasing to a measure of 1—5%. In typical cases, the coverages of *Festuca pseudovina* and *Cynodon dactylon* are 40—50% and 5—10%, respectively. The 10—25% coverage of *Achillea collina* is characteristic. Occurrence of the *Cynodon* facies of this subassociation is more frequent in this territory. This facies means a transition between the typical *Agrostio-Caricetum*

association and the *festucetosum pseudovinae* subassociation of this association. In the *Cynodon* facies of *festucetosum*, the coverage of *Festuca pseudovina* is from to 5—10% up to a maximum of 15%, whereas the *Cynodon dactylon* has a coverage of 40%. The *Linum perenne* is often another facies-forming species; in these cases, the coverage of *Cynodon* decreases. The unit of *Agrostio-Caricetum festucetosum pseudovinae Cynodon* facies was distinguished on the vegetation map. But it is important to emphasize: that the transition between every single subassociation and facies seems to be continuous. For example, the *Linum perenne* facies can not be distinguished on the map. A *Limonium gmelinii* variante can be relatively well separated from the *Agrostio-Caricetum festucetosum pseudovinae* subassociation. It develops on a soil which has turned into solonetz. Its physiognomic structure is similar to the *Artemisio-Festucetum pseudovinae* (MAGYAR 28) SOÓ (33) 45, wormwood saline plain association. It may also be regarded as a *limonietosum (staticetosum* BODRGK.) subassociation of *Artemisio-Festucetum.*

The *Lotus tenuis* facies of the *Agrostio-Caricetum distantis* association develops on the next deeper relief. The occurrence of *Alisma plantago-aquatica*, *Cirsium brachycephalum* and *Mentha aquatica* expresses the more hygrophilous character of the facies. On more binding soil — initially, in the lake beds isolated from the main lake — the same is indicated by the occurrence of *Scorsonera parviflora*, *Sonchus arvensis* and *Bolboschoenus maritimus*. The *Juncus compressus* near the *Lotus tenuis* is another facies-forming species. Its occurrence reveals a transition into the *Juncetum gerardii* WENDELBG. 50 association. The *Juncus compressus* forms stands on trampled places and on soils with a high salt content. It has a coverage of 30—40%, up to a maximum 70%.

By reason of antropogenic impacts — presumably too early mowing and moderate cattle grazing — the *festucetosum arundinaceae* subassociation of *Agrostio-Caricetum distantis* develops. Coverage of *Festuca arundinacea* may be 50%. The decrease of species diversity and the extinction of some floristically valueable species (*Orchis palustris*, *Orchis coriophora*, *Polygala comosa* and *Triglochin maritimum*) is detectable because it develops from the typical *Agrostio-Caricetum distantis*. The irrigation of meadows must be subordinate to environmental conservation.

The *asteretosum* subassociation of *Agrostio-Caricetum distantis* can be found on more binding soil on a small extension of the contact zone of the *Agrostio-Caricetum distantis* and the *Puccinellietum limosae* associations. It shows a similarity with the *Astero-Agrostietum* association, which is characteristic of heavy solonetz soils. Large stands can be found in the II-nd (saline lakes) territory of the Kiskunság National Park.

Phragmites australis facies of the *Agrostio-Caricetum distantis* association develop in place of the former *Scirpo-Phragmitetum* association due to a decrease of the water table. Its species spectrum is similar to the *Agrostio-Caricetum* association. The *Phragmites australis* occurs in the community like a consociation-forming species. These characteristics distinguish it from the *Scirpo-Phragmitetum asteretosum* unit, which has a species spectrum characteristic of the *Scirpo-*

Phragmitetum. The most important identical factor in the emergence of these units is the draining of the territory. The survival of the *Agrostio-Caricetum Phragmites* facies may be explained by the high degree of tolerance of *Phragmites australis* against the draining.

Towards the deeper reliefs the *Agrostio-Caricetum* associations are substituted, partly by the *Scirpo-Phragmitetum* association. This transition is shown by the *agrostietosum* subassociation of the latter. The characteristic *Phragmitetea* species refers to reeds: *Alisma plantago-aquatica, Cirsium brachycephalum, Lycopus europaeus* and *Lythrum salicaria*. The habitat of *Campanula sibirica* can be found in this vegetation unit. The *Scirpo-Phragmitetum asteretosum* subassociation develops in its most characteristic form in the isolated small lake beds. This unit continuously transforms into a typical *Scirpo-Phragmitetum* with the increase in water depth. The height of the common reed is close to 3 meters in its most beautiful stands.

In other places, the *Agrostio-Caricetum* is substituted by the *Puccinellietum limosae* association towards the deeper reliefs. In Szívós-szék, the stands of this community emerged as a result of anthropogenic impacts after the ploughing of the *Bolboschoenus* stands. The *Aster tripolium* (*asteretosum* subassociation) has a significant coverage (of up to 25%) in the external zones of the association. The typical *Puccinellietum limosae* stands are poor in species, the vegetation almost entirely consisting of *Puccinellia limosa*.

If the *Agrostio-Caricetum* association has a direct contacts with the *Bolboschoenus* stands developing on the lake bed, the *Agrostis stolonifera* and the *Bolboschoenus maritimus* form mixed stands — firstly in the NW part of the lake: the *Bolboschoenus Agrostis* complex in the map.

The deepest part of the lake is covered by the stands of the *Bolboschoenetum maritimi continentale* association. The height of the *Bolboschoenus maritimus* is a uniform 100—120 cm. At the end of summer, grass of *Crypsis aculeata* develops, accompanied by less *Chenopodium glaucum*. These stands of *Crypsidetum aculeatae* (BOJKO 32) TOPA 39 may be regarded as a grass layer of *Bolboschoenetum*. The stormy spread of *Bolboschoenus maritimus* is one of the most catastrophic problems of environmental conservation. Organic matter production of the *Bolboschoenus* stands is much higher then that of the *Crypsis* grass which formerly covered the lake bed. The occurrence of *Bolboschoenus* involves an extremely high degree of eutrophication. Its extirpation and the explanation of the cause of its spreading are very important tasks as regards nature protection.

Usually the lake bed is not separated with berms from the higher reliefs. But, if it does, then the layer of salt accumulation is deeper than the surface of the berm. There are only a few places where the layer of salt accumulation and the berm surface are at an identical level. Therefore, this circumstance makes possible the development of the *Lepidio-Puccinellietum limosae* association on solonchak soil developed in this way. The predominant species are the *Lepidium crassifolium* (10—15%) and the *Puccinellia limosa* (40—60%). Due to grazing, the *camphorosmetosum* subassociation of the *Lepidio-Puccinellietum limosae* develops.

Specific associations have emerged on the former bird islands which can now

be found covered in reeds. On the ornithogenic soil, partly ruderal *Sisymbrion officinalis* (cf. ELIÁS,1981) associations occur. Characteristic species are the *Descurainia sophia, Sisymbrium orientale, Urtica dioica, Sambucus nigra, Lactuca serriola, Chenopodium* and the *Atriplex* species.

A significant part of the mapped area is under sheep grazing (Fig. 2.). The *Agrostio-Caricetum* associations of these territories have been transformed to a large extent. On the lower reliefs, the vegetation of the typical association, its subassociations and its facies have a low coverage. The predominant new species is the *Trifolium fragiferum*. The high coverage of *Festuca pseudovina* (60—70%) and the occurrence of *Medicago lupulina* are characteristic of the subassociations and facies, which can be found on reliefs higher those where the typical *Agrostio-Caricetum distantis* is located. This is generally characteristic of territory under intensive grazing, low species diversity and the extinction of sensitive species.

Although the transitions usually occur between the vegetation units under grazing, and the drawing of every boundary is beyond the possibilities allowed by the scale of the map, some stands of antropogenic vegetational units were indicated on the map. The transitional stands between the *Agrostio-Caricetum festucetosum pseudovinae* and the *festucetosum arundinaceae* are caused by moderately intensive

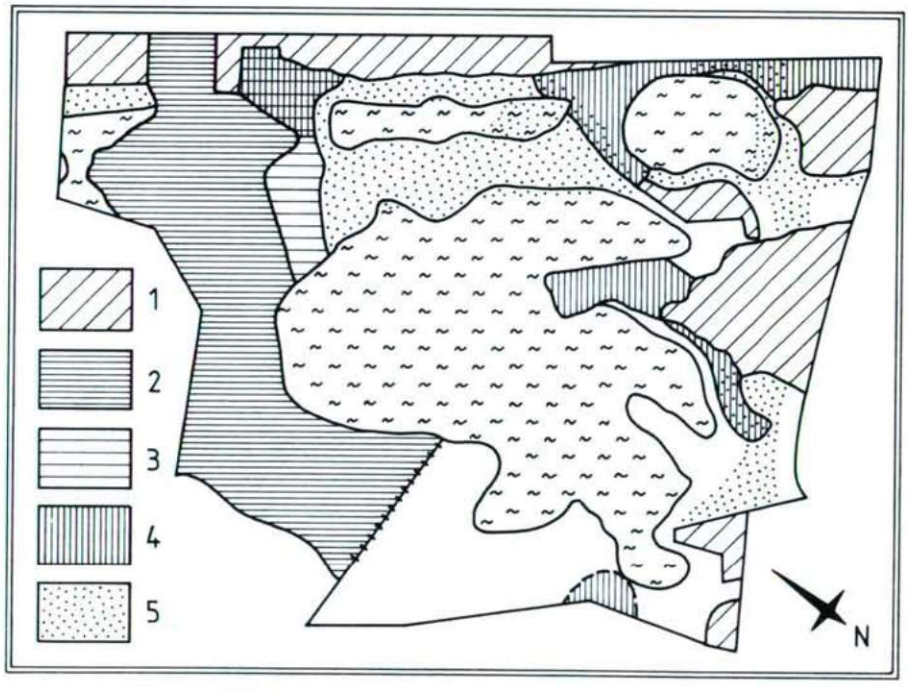

Fig. 2. Forms of economic utilization in the mapped area: 1. plough lands, orchards; 2. intensive sheep grazing; 3. moderate sheep grazing; 4. cattle grazing; 5. mowing in July.

grazing, similar to the development of *Agrostio-Caricetum Cynodon* facies and the *festucetosum arundinaceae* transition. Due to the intensive grazing, the stands of *Agrostio-Caricetum agrostietosum* (including its several facies) and *festucetosum* cannot be distinguished from each other. These transitional stands are categorized under the denomination: *Agrostio-Caricetum* x *festucetosum pseudovinae*.

The development of mosaic complexes between the *Agrostio-Caricetum Lotus* facies and the *Phragmites* facies, and also between the *Agrostio-Caricetum Lotus* facies and the *Cynodon* facies has been caused by continuous draining.

The description of the vegetation in the core area is given only to a degree necessary for interpretation and evaluation of the vegetation units indicated on the map. The ecological evaluation and the description of successional relations of vegetation will be subject of further investigation. The problems of environmental conservation were only touch upon here. A detailed description of these problems can be found in the Report of the Department of Botany of the Attila József University for the National Authority for Environmental Protection and Nature Conservation.

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References

ANDÓ, M. (1964): Geomorphologische und hydrographische Characterisierung des Kunfehérsees und seiner Umgebung. — Acta Geographica Univ. Szeged. *5*, Fasc. 1—7.

BAGI, I. (1987): The vegetation map of the Kisapaj UNESCO biosphere reserve core area, Kiskunság National Park, Hungary. — Acta Biol. Szeged *33*, 63—74.

BODROGKÖZY, GY. (1960): Phytozönologische und bodenökologische Untersuchungen an den Sumpfwiesen im Süden des Gebietes Kiskunság (Klein-Kumanien). — Acta Bot. Hung. *6*, 171—207.

BODROGKÖZY, GY. (1962a): Ökologische Untersuchungen der Mähwiesen und Weiden der Mittel-Theiss. Das Leben der Tisza. XIII. — Phyton, Graz *9*, 196—216.

BODROGKÖZY, GY. (1962b): Die standortsökologischen Verhältnisse der halophilen Pflanzengeselschaften des Pannonicum. I. Untersuchungen an den Solontschak Szikböden der südlichen Kiskunság. — Acta Bot. Hung. *8*, 1—37.

ELIÁS, P. (1981): A short survey of the ruderal plant communities of western Slovakia. — Acta Bot. Hung. *27*, 335—349.

JÁRAI—KOMLÓDI, M. (1966): Adatok az Alföld negyedkori klima és vegetációtörténetéhez. I. (Quaternary climatic changes and vegetational history of the Great Hungarian Plain. I. In Hungarian with English summary). — Bot. Közlem. *53*, 191—201.

JÁRAI—KOMLÓDI, M. (1969): Adatok az Alföld negyedkori klima és vegetációtörténetéhez. II. (Quaternary climatic changes and vegetational history of the Great Hungarian Plain. II. In Hungarian with English summary). — Bot. Közlem. *56*, 43—55.

MIHÁLTZ, I. and FARAGÓ, M. (1946): A Duna—Tisza közi édesvizi mészképződmények (Carbonate formations of terrestrial sedimentation from the Danube—Tisza Interfluve. In Hungarian). — Alföld Tud. Int. Évk. *1*, 371—384.

MOLNÁR, B. (1985): Földtani kutatások a Kiskunsági Nemzeti Parkban (Geological Explorations in the Kiskunság National Park. In Hungarian with English summary). In Tudományos kutatások a Kiskunsági Nemzeti Parkban 1975—1984 (Research in Kiskunság National Park 1975—1984). (Ed.: TÓTH, K.). — Kiskunsági Nemzeti Park, Kecskemét, 29—58.

MOLNÁR, B. and MURVAI, I. (1976): A Kiskunsági Nemzeti Park fülöpházi szikes tavainak kialakulása és földtani története (Bildung und geologische Geschichte der Sodaseen Fülöpháza im Kiskunság National Park. In Hungarian with German summary). — Hidrológiai Közlöny *56*, 67—77.

MUCSI, M. (1963): Finomrétegtani vizsgálatok a kiskunsági édesvizi karbonátképződményekben (Studies on the fine stratification of the carbonate formation of the terrestrial sedimentation in Kiskunság region of Hungary. In Hungarian). — Földt. Közl. *93*, 373—386.

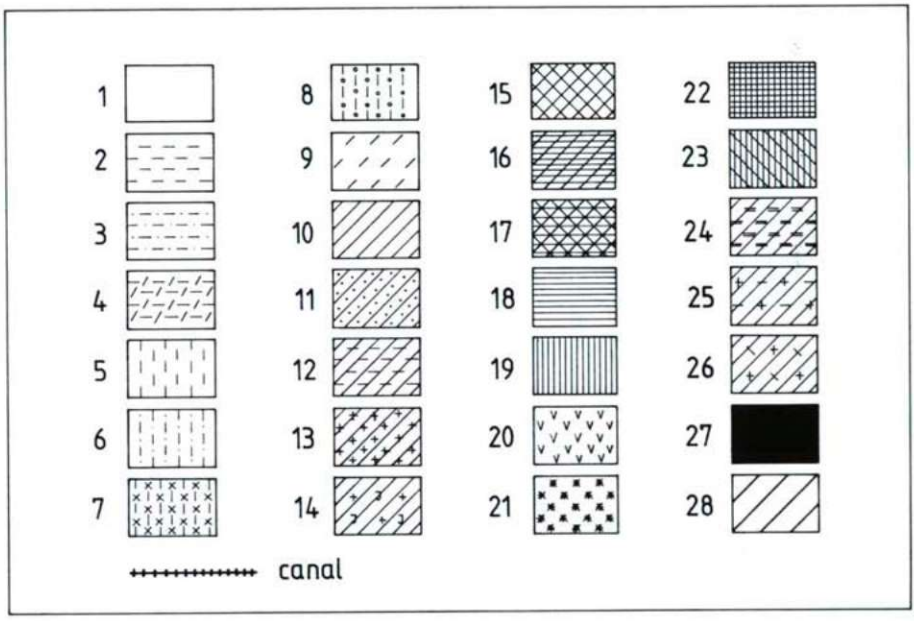
SOÓ, R. (1964): Synopsis systematico-geobotanica florae vegetationisque Hungariae I. — Akadémiai Kiadó, Budapest.

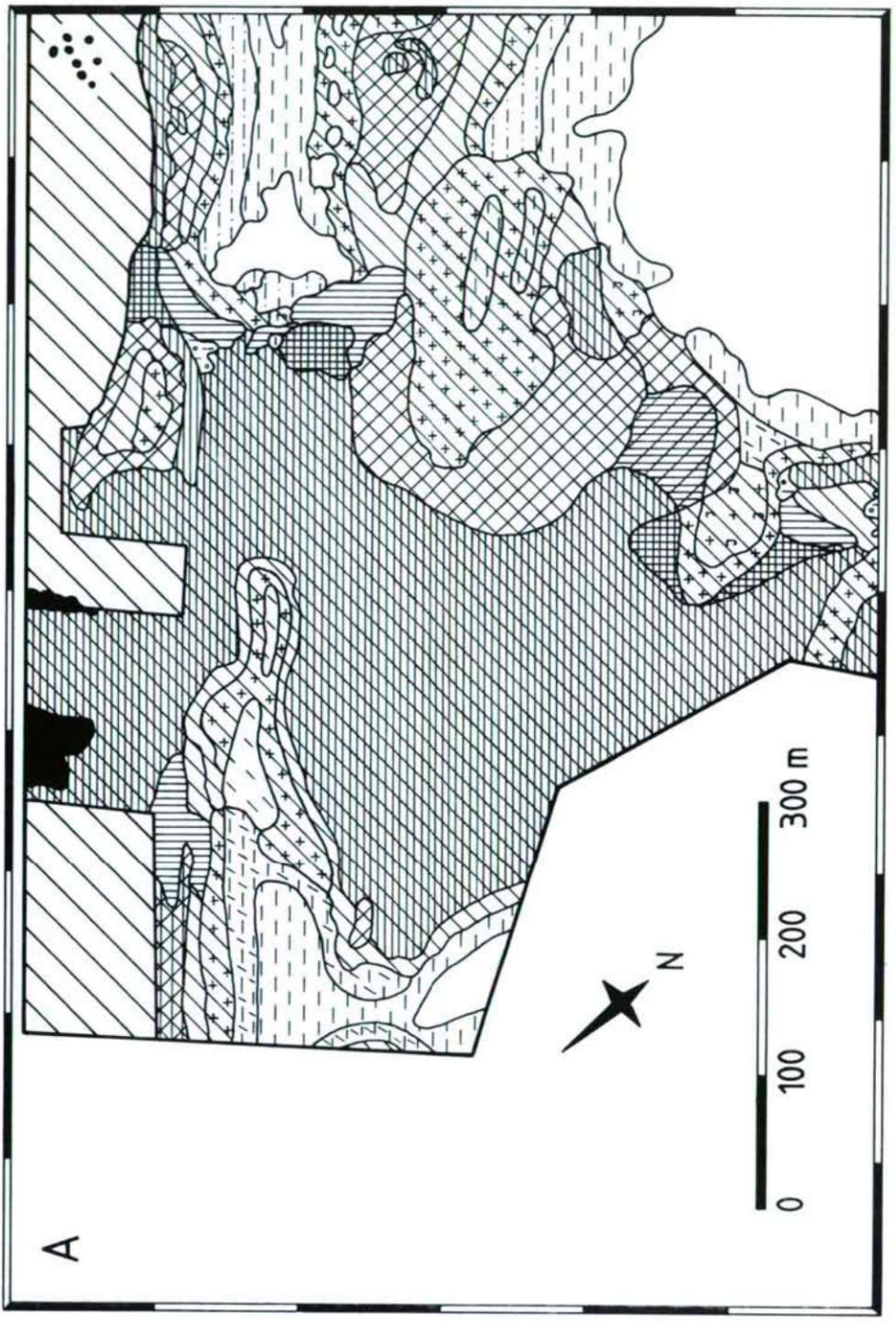
ZÓLYOMI, B. (1953): Die Entwicklungsgeschichte der vegetation Ungarns seit dem letzten Interglacial. — Acta Biol. Acad. Sci. Hung. *4*, 367—430.

Appendix

Key for the indentification of the units of the vegetation map:

1. *Bolboschoenetum maritimi continentale*, 2. *Scirpo-Phragmitetum*, 3. *Scirpo-Phragmitetum asteretosum*, 4. *Scirpo-Phragmitetum agrostietosum stoloniferae*, 5. *Puccinellietum limosae*, 6. *puccinellietum limosae asteretosum*, 7. *Lepidio-Puccinellietum camphorosmetosum*, 8. *Lepidio-Puccinellietum typicum*, 9. *Bolboschoenus-Agrostis* complex, 10. *Agrostio-Caricetum distantis typicum*, 11. *Agrostio-Caricetum distantis asteretosum*, 12. *Agrostio-Caricetum Phragmites* facies, 13. *Agrostio-Caricetum Lotus tenuis* facies, 14. *Agrostio-Caricetum Lotus tenuis — Juncus compressus* facies, 15. *Agrostio-Caricetum Cynodon dactylon* facies, 16. *Agrostio-Caricetum distantis festucetosum pseudovinae*, 17. *Agrostio-Caricetum festucetosum pseudovinae Cynodon* facies, 18. *Agrostio-Caricetum festucetosum pseudovinae Limonium gmelinii* variante, 19. *Agrostio-Caricetum festucetosum arundinaceae*, 20. *Brometum tectorum*, 21. *Sisymbrion officinalis*, 22. *Agrostio-Caricetum festucetosum pseudovinae* x *festucetosum arundinaceae*, 23. *Agrostio-Caricetum Cynodon* facies x *festucetosum arundinaceae*, 24. *Agrostio-Carticetum Lotus* facies x *Phragmites* facies, 26. *Agrostio-Caricetum Lotus* facies x *Cynodon* facies, 27. Forests, clumps of trees, 28. Cultivated lands: plough lands, orchards.

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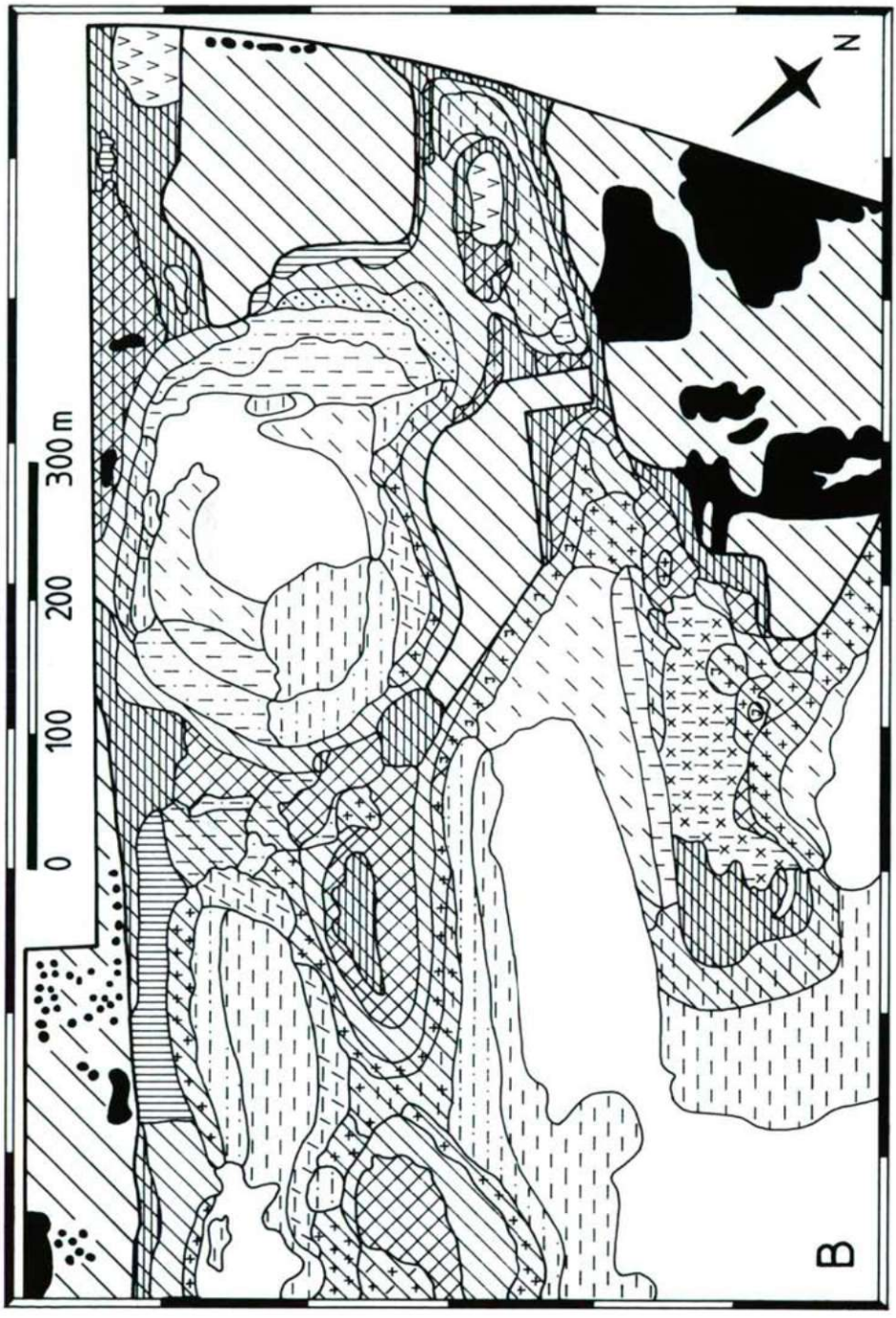
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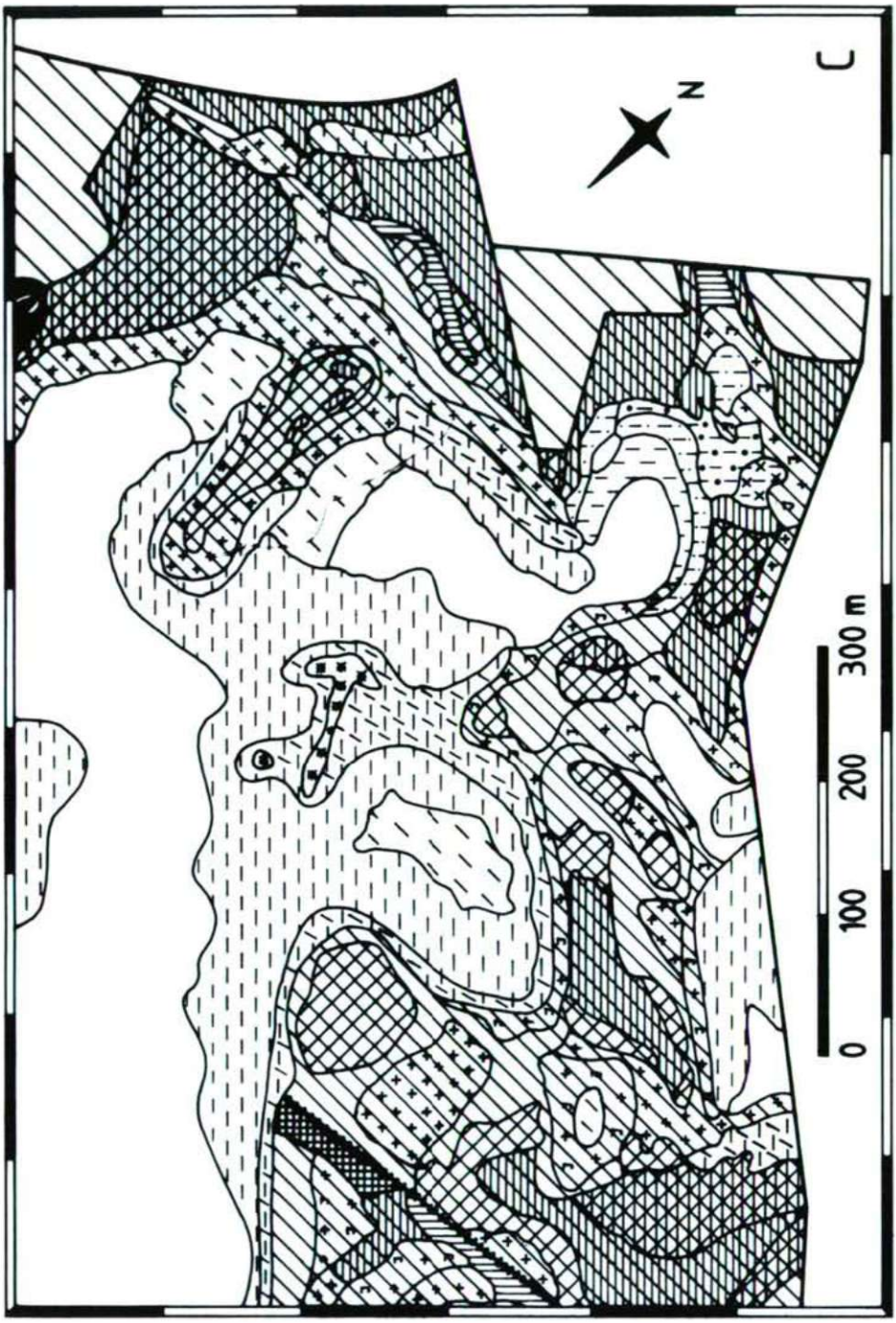
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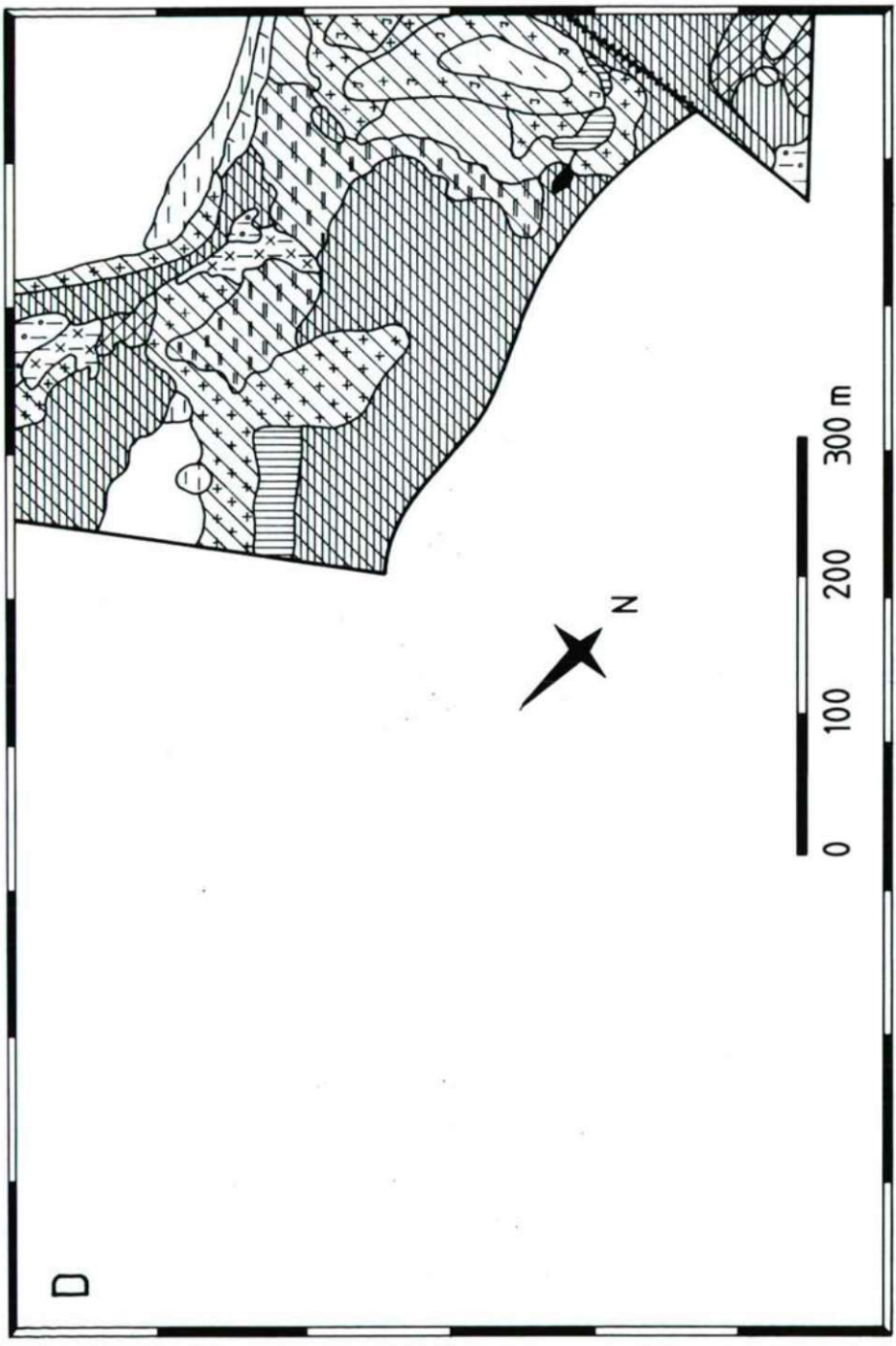
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