ACTA BIOL. SZEGED. 35. PP. 39—51 (1989)

THE VEGETATION MAP OF THE TRIPOLISZ UNESCO BIOSPHERE RESERVE CORE AREA, KISKUNSÁG NATIONAL PARK, HUNGARY

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(Received: January 19, 1989)

Abstract

The paper presents the vegetation map, on a scale of 1:5000, of the Tripolisz UNESCO biosphere reserve core area and a short description of the main vegetation units. A detailed analysis of the nature conservation problems of the core area is also given.

The dominant associations on the higher reliefs of the territory are *Astragalo-Festucetum rupicolae, Achilleo-Festucetum pseudovinae* and *Potentillo-Festucetum pseudovinae*. The majority of the deepest reliefs is covered by stands of *Agrostio-Caricetum distantis, Astero-Agrostetum stoloniferae, Agrostio-Alopecuretum pratensis, Caricetum melanostachyae* and *Caricetum acutiformis-ripariae* associations. Most of the core area is covered by halophilic plant communities adapted to the different haloecological conditions; the most characteristic associations are *Artemisio-Festucetum pseudovinae, Lepidio-Puccinellietum limosae* and *Lepidio-Camphorosmetum annuae* on saline and sodic soils. The cenological characterization of these associations is reported at a depth necessary for the interpretation of the units on the vegetation map.

Key words: biosphere reserve, environmental conservation, halophilic vegetation, vegetation mapping, water management.

Introduction

The Tripolisz UNESCO biosphere reserve core area is situated in territory II of the Kiskunság National Park (Fig. 1). It has been demarcated in the northernmost part of the National Park. Its area is close to 1 km^2 (TÓTH, 1984; cf. BATISSE, 1982).

In addition to natural processes, the anthropogenic impacts have played an important role in the development of the present relief. The Tripolisz core area belongs in the flood-plain of the River Danube, and therefore the most sweeping changes were caused by the inundations of the river; the loess deposit from the glacial period has not come down to us in its original form. Downwards from a soil horizon depth of 0.5—1.5 m, a river-gravel layer can be found. The operation of the surrounding gravel-pits points to the existence of a very thick gravel layer under the surface. Alluvium of varying width and primary particle composition has been deposited from the receding water onto the gravel layer (MOLNÁR, 1961; 1970; 1977). Prior to the highest dikings, the high water-table meant that the lower parts of the core area were inundated for most of the year. The water-table came so close to the surface that the ground-water occasionally gushed out at time of the Danube's average water-level. A connection between the river and the low flood-plain was ensured by the predominance of the sand and gravel layers (PÉCSI, 1959). The high

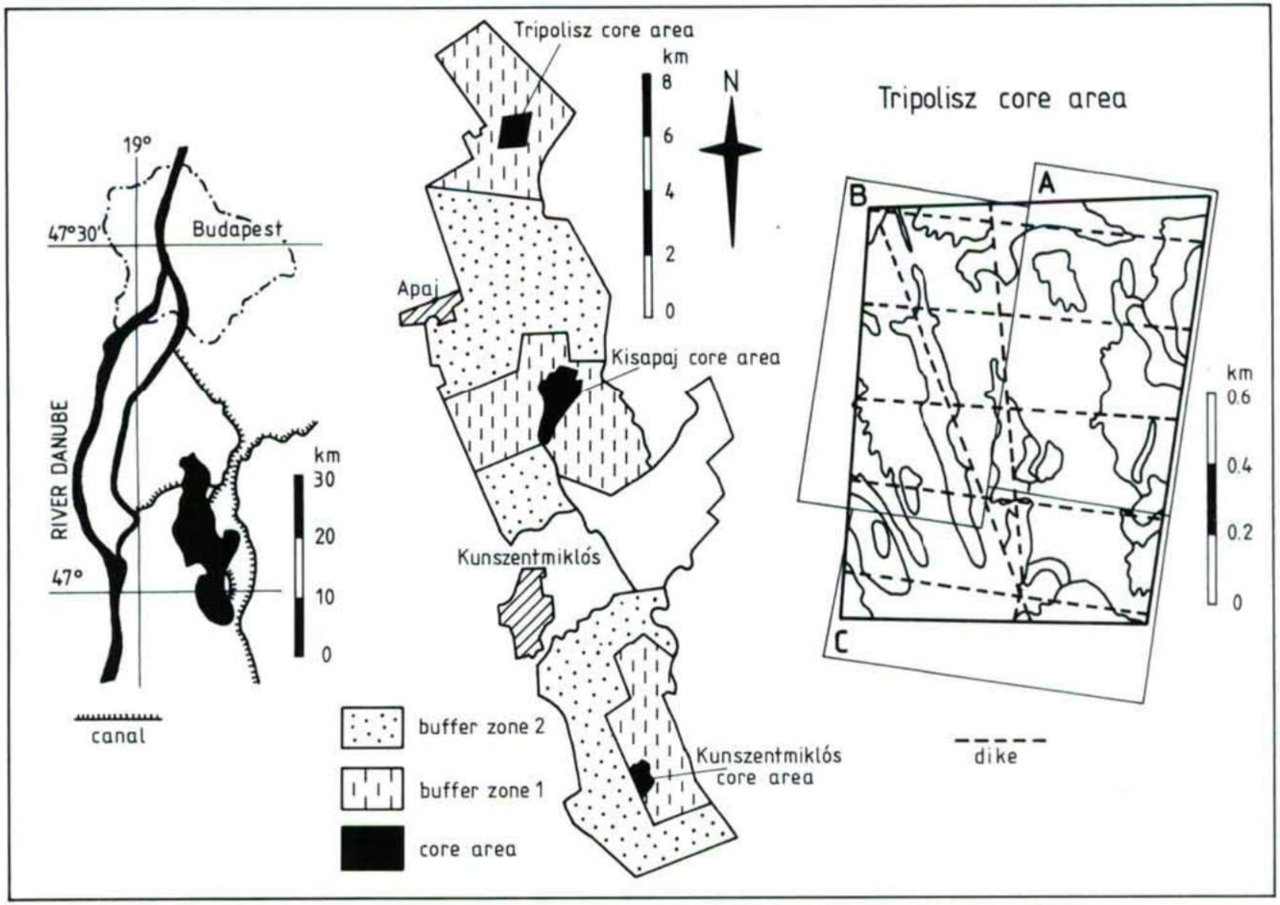

Fig. 1. Geographical location of territory II of the Kiskunság National Park and the Tripolisz biosphere reserve core area. The third sketch-map shows the connection of the three map sheets (A, B, C).

water-table affected the soils of the higher reliefs in another manner: the high concentration of water-soluble sodium salts in the ground-water and their accumulation in the surface layers of the soils caused the alkalization of the core area (VÁRALLYAY, 1965; VÁRALLYAY et al., 1984).

Prior to the dikings, *Lepidio-Puccinellietum* and *Lepidio-Camphorosmetum annuae* associations lived on sandy solonchak soils. Similar vegetation occured on the heavy alluvial soils of the lower reliefs (RAPAICS, 1927; MOESZ, 1940; SOÓ, 1947). On the heavy alluvial soils of the higher reliefs, the *Artemisio-Festucetum pseudovinae* association lived on solonetz soil. There were *Molinietum* grasslands on the evenly wet soils; this seems to be verified by the survival of *Betonica officinalis* in the territory. As a result of the sinking of the water-table (caused by the water management), the size of permanently water-covered areas decreased, and they finally disappeared; the solonchak soils become leached and turned into solonetz soils; the vegetation of the higher reliefs was transformed into the relevant more dryness-tolerant types (BAGI, 1987; 1988b).

The wind played an important role in the development of the present relief. The long depression in a NW-SE direction emerged due to the prevailing north-westerly wind. This seems to be verified by the emergence of a bay-bar form at the south-eastern end of this depression. Such a form of the relief should have developed if there was open water in the depression for a long time (cf. CAILLEUX, 1952).

The anthropogenic impacts had an important role in the shaping of the present landscape of the core area. In approximately a north-south direction, a 3—4 m wide canal (which has long lost its function) runs through the area; in addition to this wide canal, five small canals run through the area in approximately a west-east direction. Additionally, numerous dikes form a complicated network. Everything points to the earlier plan to introduce rice cultivation to this territory.

The difference in height between the highest and deepest reliefs in the core area is not more than 1.5 m.

Materials and methods

The vegetation map has been prepared on the basis of field surveying. The mapping was particularly facilitated by the dikes and canals; after the determination of their positions, the preparation of the map was greatly simplified. In spite of this, the exactness of this map is poorer compared with a map prepared on the basis of aerial photographs (BAGI, 1987; 1988a). However, the great number of fixed points permits the subsequent transfer of the results onto an aerial photograph.

The map is issued in the form of sheets joining without overlap. The three map sheets and their key are formally published as an appendix to this paper.

In the present paper, the description of vegetation units follows the system and nomenclature of the Zürich—Montpellier Phytosociology School (BRAUN-BLANQUET, 1951), despite the fact that the categorization of several transitional vegetation units (which have developed due to the intensive vegetational transformation processes) encountered difficulties. The denomination of the species and cenosystematic units accordings to the work of SOÓ (1973), completed with the cenological results of BODROGKÖZY (1958; 1960; 1970).

The map was elaborated in 1988.

Results

1. A SHORT CHARACTERIZATION OF THE VEGETATION UNITS

For the sake of a good arrangement, the system of cenotaxa of the vegetation map can be outlined as follows;

Cypero-Phragmitetea SOÓ 68
Phragmitetea TX. et PRSG. 42
Magnocaricetalia BR.-BL. 25
Caricion gracilis SOÓ 71
Caricetum acutiformis-ripariae SOÓ (27) 30
— *caricetosum acutiformis*
Caricetum melanostachyae
Puccinellio-Salicornea SOÓ 68
Festuco-Puccinellietea SOÓ 68
Festuco-Puccinellietalia SOÓ 68
Puccinellion peisonis WENDELBG. 43
Lepidio-Puccinellietum limosae (RAPCS. 27) SOÓ 57
Lepidio-Camphorosmetum annuae (RAPCS. 27) SOÓ 57
Junction gerardii WENDBG. 43
Astero-Agrostetum stoloniferae BODRK. 60
— *typicum (agrostetosum stoloniferae)*
— *asteretosum pannonici*
— *bolboschoenetosum maritimi*
Agrostio-Caricetum distantis (RAPCS. 27) SOÓ 30
— *typicum (agrostietosum stoloniferae)*
— *Carex distans* facies
Caricetum divisae SLAVNIC 48
Beckmannion eruciformis SOÓ 33
Agrostio-Alopecuretum pratensis SOÓ (33) 47
— *agropyretosum repentis*
Artemisio-Festucetalia pseudovinae SOÓ 68
Festucion pseudovinae SOÓ 33
Achilleo-Festucetum pseudovinae (MAGYAR 28) SOÓ (33) 45
Artemisio-Festucetum pseudovinae (RAPCS 16) SOÓ (33) 45
— *typicum*
—— *Artemisia santonicum* facies
—— *Hordeum geniculatum* facies
—— *Podospermum canum* facies
Festuco-Bromea BR.-BL. et TX. 43
Festuco-Brometea BR.-BL. et TX. 43
Festucetalia valesiacea BR.-BL. et TX. 43
Festucion rupicolae SOÓ (29) 64

Astragalo-Festucetum rupicolae (MAGYAR 33) SOÓ (56) 64
Potentillo-Festucetum pseudovinae (MAGYAR 28) SOÓ 50
Cynodonto-Festucetum pseudovinae SOÓ 57
Cynodonto-Poetum angustifoliae (RAPCS 26) SOÓ 57

The lowest parts of the core area are covered by *Caricetum acutiformis-ripariae* association. Its habitat in the depressions is often completely dried out for several years. Therefore, a dryness tolerant *caricetosum acutiformis* subassociation has now developed. If the lack of water continues, the stands of this community will disappear from the territory. Towards the higher reliefs, *Caricetum acutiformis-ripariae* is substituated by *Caricetum melanostachyae* community. The largest stands of this community can be found in a depression in the western part of the core area, but the community is also extensive in the north-western and south-western parts of the territory. The inundation still persists for most of the year and the high organic matter content in the surface layers of the soil saves their stands from salinization. *Bolboschoenus maritimus* or other species indicating increasing salinity do not occur in the stands of sedgy associations.

Along the wide canal, the stands of the *Astero-Agrostetum stoloniferae* association are largest in the depressions dug during the development of the canal crossing the core area in a roughly north-south direction. Depending on the depth of these depressions and dips, the subassociations of the *Astero-Agrostetum* community have developed, adapted to the different hydro- and haloecological conditions; these subassociations involve *bolboschoenetosum maritimi* in the deepest depressions, *asteretosum pannonici* in the intermediate ones, and *agrostetosum stoloniferae* in the higher depressions.

An important environmental protection problem results from the development of *Astero-Agrostetum* under such an anthropogenic effect; the *Caricetum* communities of the saline plains could not be restored by the scouring of the depressions and the simple sinking of their original habitats. After these interventions, not the anticipated *Caricetum* associations would develop, but *Bolboschoenetum maritimi* or (on the not so deep parts of the territory) the *Astero-Agrostetum* community. The protection of the *Caricetum* communities may be solved by delaying the organogenic sedimentation, i. e. the mowing and removal of the biomass.

The *Agrostio-Caricetum distantis* association grows on the less salt-affected soil. The high organic matter content and the less heavy soil are very important for the development of this vegetation type. This hydrophilous community occurs in small patches in the western part of the core area; a larger stand can be found in the north-eastern part of the core area. The survival of the typicum and *Carex distans* facies of this community depends on the stabilization of the water relations.

On similar reliefs, but with more heavy soil, an *Agropyron* repens and an *Agropyron intermedium* facies of the *Agrostio-Caricetum distantis* community have developed. It would be better to consider these stands as the *agropyretosum repentis* subassociation of the *Agrostio-Alopecuretum pratensis* community because the soil is close to a typical solonetz (BODROGKÖZY, 1970). These stands are almost identical with those described in the Kisapaj core area. Those stands were in successional connection (towards the deeper reliefs) with the typical *Agrostio-Alopecuretum association* (BAGI, 1987). An especially high similarity is observed between the Kisapaj stands and a large eastern stand at Tripolisz. This vegetation type can be found in smaller or larger patches in all parts of the core area; it sometimes forms zones encircling the deeper parts. The territorial distribution of the *Agropyron* species is characteristic: *Agropyron repens* is more frequent in the eastern and central parts, while *Agropyron intermedium* forms large stands in the south-western part of the core area.

The stands of the *Lepidio-Puccinellietum limosae* community lie only on the western side of the wide canal. They grow in the greatest extents in the western part of the core area and outside its boundary. For the effective protection of these stands, movement of the boundary to the west would be reasonable. The *Lepidio-Puccinellietum* community is connected to the *Artemisio-Festucetum* community of higher reliefs with a berm 40—60 cm in height. In the contact zone, a *Lepidio-Camphorosmetum* association has developed along the berms. These alkaline berms have scenic significance; the protection of this unique landscape is a very important task.

In the central part of the core area, the stands of *Caricetum divisae* community can be found in the contact zone of *Lepido-Puccinellietum* and *Artemisio-Festucetum* communities. Consequently, some of the stands contains elements of *Junction gerardii,* while others contain *Festucion pseudovinae*. Typical stands of the association are circumscribed to a small area.

Towards the higher reliefs, the *Lepidio-Puccinellietum* association is substituted by *Artemisio-Festucetum pseudovinae* association. Where the two communities are not separated by berms, transitional stands have developed.

The majority of the mapped territory is covered by the *Artemisio-Festucetum pseudovinae* association. Especially large stands can be found in the eastern part of the core area. This part is of scenic significance, and therefore its protection is needed. The association is tolerant towards anthropogenic impacts and grazing. It is endangered only by a further decrease in the water-table. This is why one of the most important needs is the maintence of the water-table at the required level.

In the western part of the core area, a *Hordeum geniculatum* facies of the *Artemisio-Festucetum* association has developed on transitional solonchak-solonetz soil at the deeper parts of this community type. In the other parts of the core area, due to the more heavy soil, the typical *Artemisio-Festucetum* is connected to the other associations of deeper reliefs, with a *Podosperum canum* facies of the *Artemisio-Festucetum*. The stands of this facies form wide zones on the gently sloping territories. At the time of flowering, the typical stands of wormwood saline plain association are surrounded by the flowery fields of *Podosperum canum*.

The stands of *Artemisio-Festucetum* connected with the higher reliefs show strongly degradative characteristics indicative of the salt outwashing from the soil of the higher reliefs; there is a decrease in the coverage of *Festuca pseudovina* and

Artemisia santonicum forms facies. In the open grassy *Artemisio-Festucetum pseudovinae, Bromus mollis* appears with high coverage (BAGI, 1988b).

Towards the higher reliefs, transitional stands of *Artemisio-Festucetum* and *Achilleo-Festucetum pseudovinae* have developed on leached soils. These units show a degradative character. The ubiquitous weeds (primarily *Bromus mollis*) have a high coverage. These degraded territories can be found near the northern and southern boundaries of the core area, forming strips about 50—60 m wide.

In the highest reliefs of the core area, elements of three basic associations *(Achilleo-Festucetum pseudovinae, Potentillo-Festucetum pseudovinae* and *Astragalo-Festucetum rupicolae)* can be recognized. The anthropogenic, strongly degradative *Cynodonto-Poetum angustifoliae* and *Cynodonto-Festucetum pseudovinae* are often associated with them. These associations form transitions. Exceptional in this respect is the vegetation of a steeply protuberant, isolated ridge with its typical *Potentillo-Festucetum* and *Astragalo-Festucetum rupicolae* associations in the south-western part of the core area. This is surrounded by stands of the *Lepidio-Puccinellietum* association. A small population of *Iris pumila* can be found only here within the core area. Unfortunately, another ridge in a similar position has degraded vegetation. Therefore, the undisturbed territory needs increased protection.

The size of territories with degraded vegetation is well reflected by the occurence of *Bromus mollis*. Its coverage may be high in the *Achilleo-, Potentillo-* and *Artemisio-Festucetum* associations. The stands of vegetation with a high coverage of *Poa angustifolia* can also be regarded as degradative.

2. RECOMMENDATIONS FOR PROTECTION OF THE VEGETATION AND UTILIZATION OF THE CORE AREA

The lack of water is the general factor which seriously affects every community. Moreover, the short-term survival of some communities is endangered. The lack of water has two components: the lack of surface water and the increased sinking of the water-table. There is no practical solution to the problem of the lack of surface water because there is no appropriate canal near the core area from which the lack of rainfall could be compensated. The most important causes of the sinking of the water-table can be ascribed to the inappropriate water management (BAGI, 1988b). The water-consuming effect of the surrounding gravel-pits is also appreciable (cf. HERKE, 1983). The gravel-pits are expanding towards the core area. The authorization of new pits nearer the core area is undesirable. Besides the effects of these pits on the water-table, the noise and air pollution are also disadvantageous for the territory.

In the territory, there is a complicated network of disused canals. They are really incongrous scenically, but their levelling is not a feasible proposition. The reparation work would have harmful effects on the vegetation, and for years subsequently only ruderal vegetation would develop in place of the canals. Further, the territories separated from one another by canals may be the objects of isolated experimental investigations. It is also of importance that the canals do not permit vehicles to be driven across the core area. The problem of such passage arises strongly in the earlier studied core areas (BAGI, 1987; 1988a).

The natural depression (oriented in a NW—SE direction)divides the core area into two parts which differ significantly from one another. The large stands of *Artemisio-Festucetum* and *Agrostio-Alopecuretum agropyretosum* need increased protection on the eastern side. These large vegetational blocks are able to preserve the biocenoses characteristic of them. The dominant association on the western side is *Lepidio-Puccinellietum limosae*. Unfortunately, a significant proportion of this community is outside the declare core area. If these territories were annexed to the core area, the area would not be more than 20% bigger. Hereby, territory with increased protection would be formed, in which two such characteristic communities of the Hungarian saline plains as *Artemisio-Festucetum pseudovinae* and *Lepidio-Puccinellietum limosae* would have closely similar extents.

The most urgent environmental tasks require not a local, but a regional solution. At the same time, local measures are needed to prevent the impairment of the vegetation from reaching such a degree that the degradative processes become irreversible.

Acknowledgements

Thanks are due to Dr. GY. BODROGKÖZY, Reader at Attila József University, for his useful cenological help. The author expresses his sincere thanks to the Directorate of the Kiskunság National Park — especially to Dr. I. TÖLGYESI, Botanical Inspector and I. NAGY, warden of territory II — for their generous help. This work was supported by the Hungarian Ministry of Environmental Protection and Water Management.

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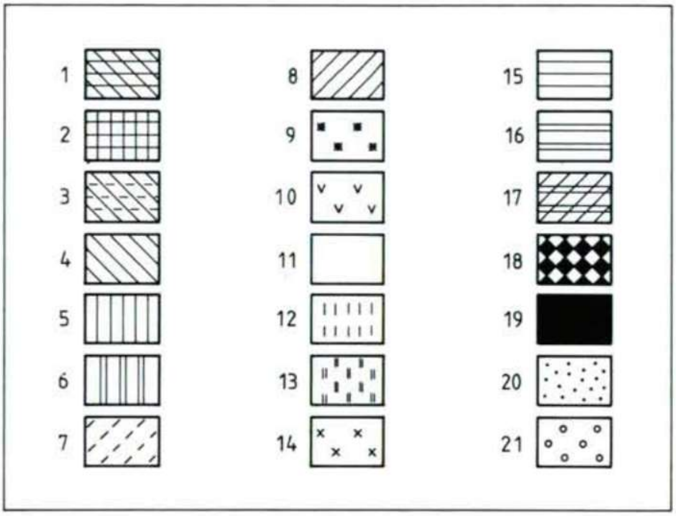
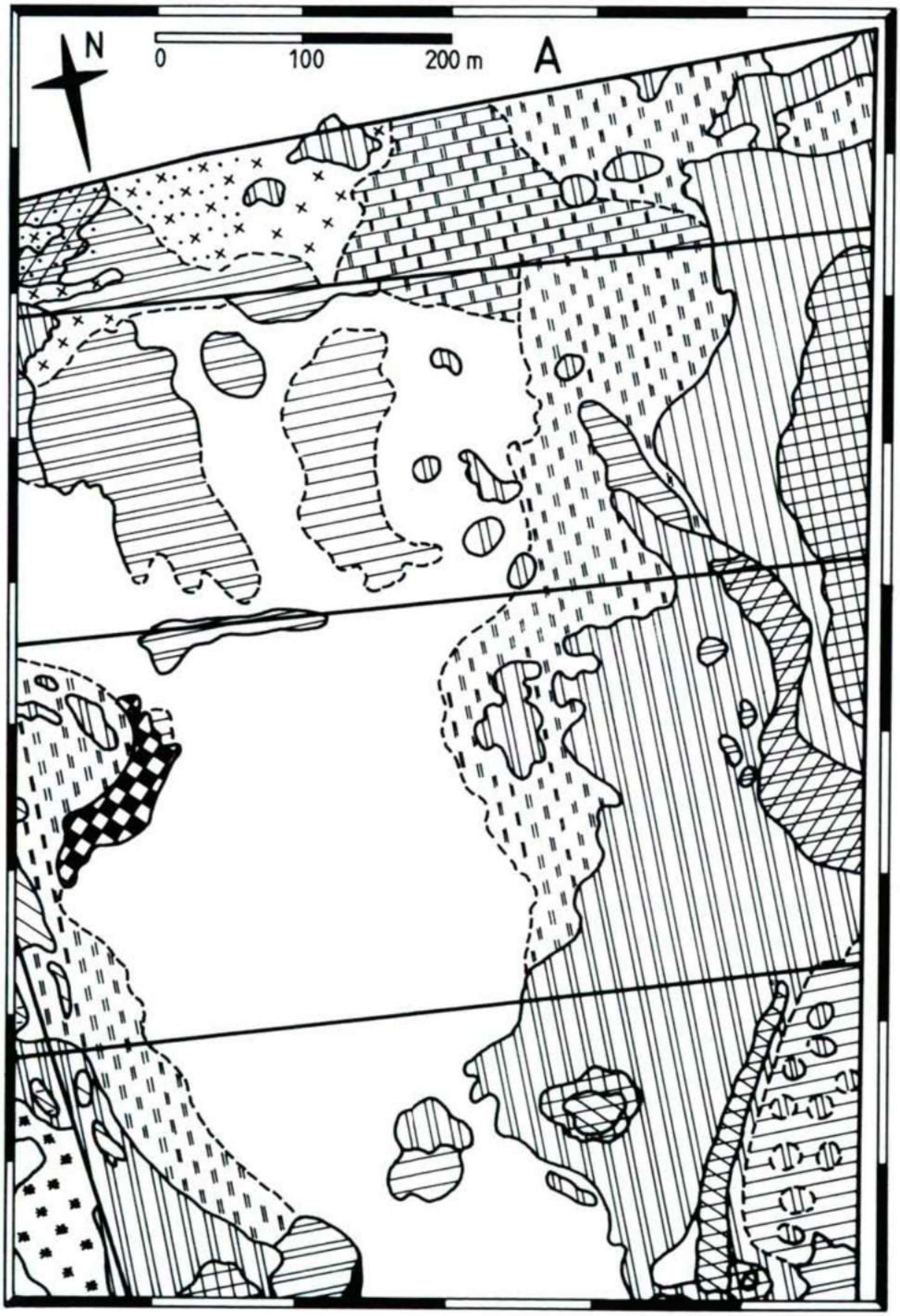
Appendix

Key for identification of the units of the vegetation map of the Tripolisz UNESCO biosphere reserve core area: 1. *Caricetum acutiformis-ripariae caricetosum acutiformis;* 2. *Caricetum melanostachyae;* 3. *Astero-Agrostetum stoloniferae Bolboschoenus maritimus* facies; 4. *Astero-Agrostetum typicum;* 5. *Agrostio-Caricetum distantis;* 6. *Agrostio-Alopecuretum pratensis agropyretosum repentis;* 7. *Lepidio-Camphorosmetum annuae;* 8. *Lepidio-Puccinellietum limosae;* 9. *Caricetum divisae;* 10. *Artemisio-Festucetum pseudovinae* x *Lepidio-Puccinellietum limosae;* 11. *Artemisio-Festucetum pseudovinae typicum;* 12. *Artemisio-Festucetum Hordeum geniculatum* facies; 13. *Artemisio-Festucetum Podosperum canum* facies; 14. *Artemisio-Festucetum Artemisia santonicum* facies; 15. *Artemisio-Festucetum* x *Achilleo-Festucetum;* 16. *Achilleo-Festucetum;* 17. *Achilleo-Festucetum* x *Potentillo Festucetum;* 18. *Potentillo-Festucetum pseudovinae;* 19. *Astragalo-Festucetum rupicolae;* 20. *Bromus mollis* facies; 21. *Poa angustifolia* facies.

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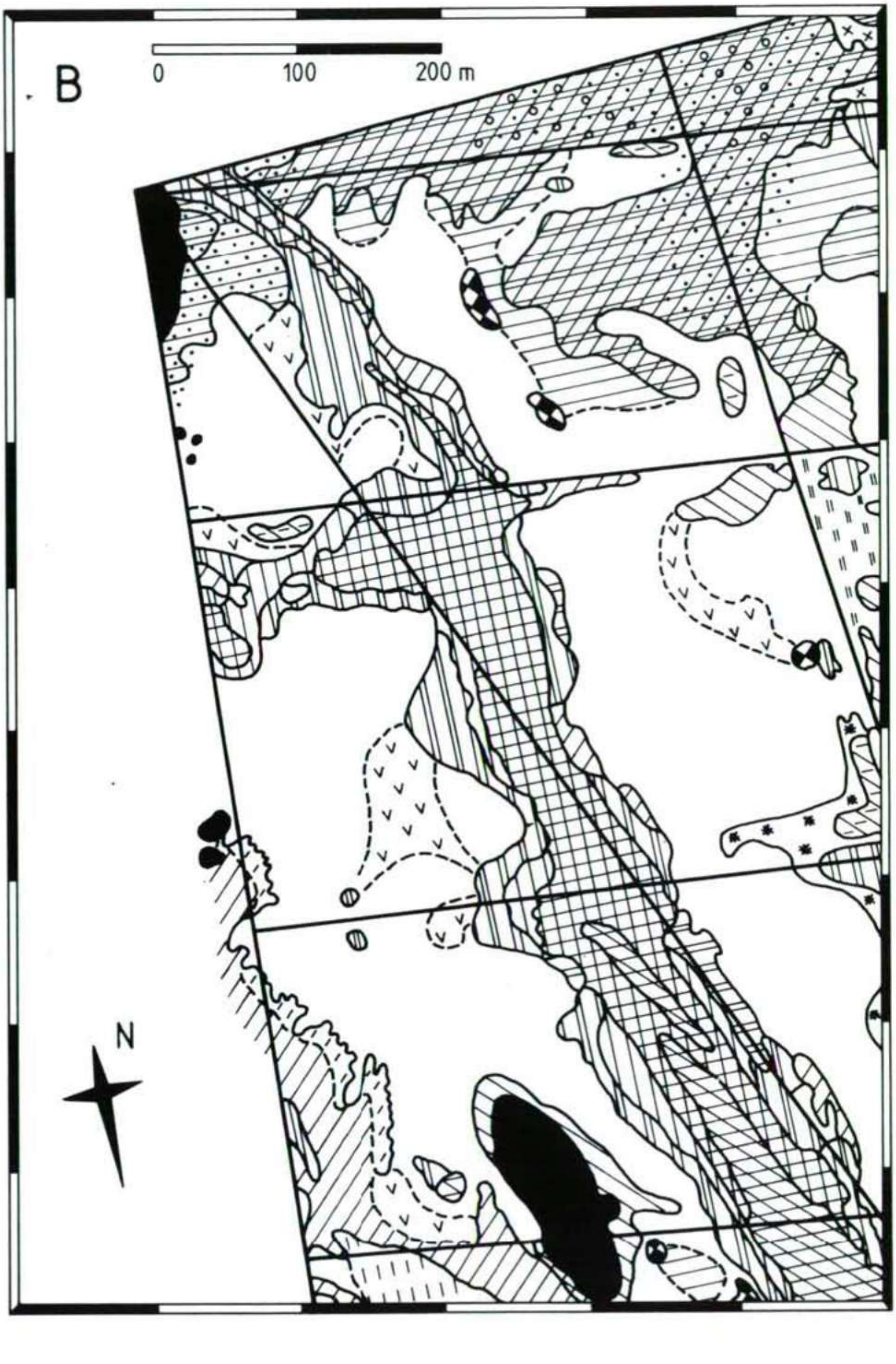
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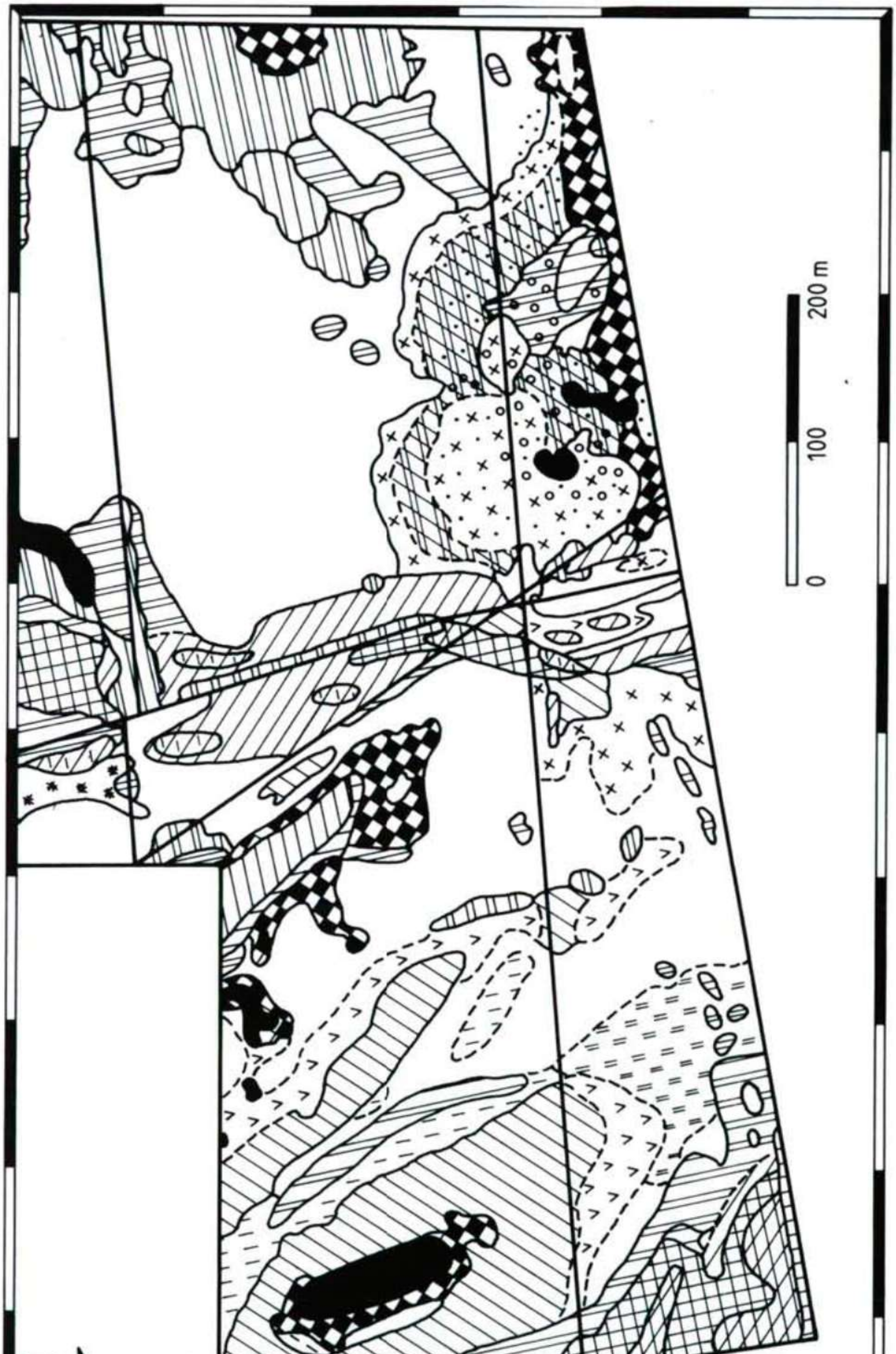
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