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

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Abstract

The paper comprises the vegetation map, on a scale of 1:5000, of the Kisapaj UNESCO biosphere reserve core area which is under increased protection.

The majority of the core area is covered by halophilic plant communities, with smaller of sandy *(Astragalo-Festucetum rupicolae, Potentillo-Festucetum pseudovinae)* and loess *(Salvio-Festucetum rupicolae)* associations, which also become halophilic, to a larger or lesser extent. The variegated microrelief, as well as the two meters' grade difference between the highest and deepest reliefs have promoted the development of a vegetation variedness, expanding from the *Salvio-Festucetum rupicolae* to *Caricetum acutiformis-ripariae* associations, along the environmental gradient(s) defined by the groundwater level. The most characteristic association are: the *Salvio-Festucetum rupicolae, Achilleo-Festucetum pseudovinae, Artemisio-Festucetum pseudovinae, Agrostio-Alopecuretum pratensis, Caricetum acutiformis-ripariae.* In the present report, the cenological characterization of these associations is given at a depth necessary for the interpretation of the units on the vegetation map.

Key words: aerial photograph, biosphere reserve, environmental conservation, halophilic vegetation, vegetation mapping

Introduction

The thorough phytogeographical-floristic exploration of the northern part of the Kiskunság (a district in South-Central Hungary) was started after the establishment of the Kiskunság National Park (KNP) (TÓTH, 1985). It is interesting that the early floristic studies on the halophilic vegetation in Kiskunság were carried out more intensively in the southern regions that in the northern area, which is almost in the immediate neighbourhood of Budapest. Elaborate reports are given by RAPAICS (1927) from the environs of Szeged and by PRODÁN (1914) about the alkali plains in the former county of Bács-Bodrog. Regarding the evaluation of vegetational changes taking place in the mapped area, the paper of MOESZ (1940) is supplementary and of great importance. The publication enables conclusions to be drawn as to the vegetation in the Kunszentmiklós-Apaj area at that time (in 1929), by means of precise position designations used to compare the alkali plains of the Northern Kiskunság and the Jazygia.

The documentation on the present state of vegetation is necessitated because of the increased endangerment of the area, owing to the scant number of publications, greater protection, and direct and indirect anthropogenic effects (water management and grazing). The first step means the preparation of a vegetation map, as a map of similar precision has not yet been published about the area.

Materials and methods

The vegetation map was prepared on the basis of a black and white aerial photograph, the magnification of which corresponded to a map on scale 1:5000. A great advantage of vegetation maps prepared by means of aerial photographs is that their preciseness, and fullness of details surplass those of maps prepared on the ground. The unevenness of the field, as well as the relief and microrelief do not cause problems during the course of preparation (JAKUCS, 1966). An aerial photograph reveals many details which are imperceptible and unseen close to the surface. The stands of the vegetation units are detectable in varying shades on a black and white aerial photograph, mostly in connection with the vegetation coverage. On salt-affected (light) soils communities of high coverage are seen to be dark. The labellings on the vegetation map were chosen on the basis of the intensity of shades observable on the aerial photograph. With the shades of identical intensity, the varying consistence of the shades on the aerial photograph (blades, homogeneity, patchiness) also serves to delineate the different communities. Despite this, the extension of objects which are difficult to differentiate on the photograph should be checked by means of measuring with a tape-line on the spot. The stands of the communities, and their units within the community, of the most characteristic and adequately large surface (larger in area than five metres) found in the region are indicated on the vegetation map. A detailed cenological review of these would require an analysis greatly beyond the possible extent of this paper — due to the rather compliceated transitional character of the communities, often even being of a degradative nature. The preliminary mapping was accomplished in 1984, the detailed map was elaborated in 1985.

In approximately a north-south direction, a 30—40 cm deep ditc — which has long lost its function — runs through the area; this is indicated on the map by thick dotted line.

The map is issued in the form of sheets joining without overlap. The four map sheets (A, B, C, D) are formally published as an appendix to this paper. The contiguous combination of the sheets can be clarified on the basis of Fig. 1.c., indicating the most characteristic community boundaries. The scale of the sheets is 1:5000: The explanations of the labellings on the map are given in Fig. 2. The boundaries of the vegetation units, which are easily distinguisable in the region are indicated on the map by a continuous line, and the boundaries of the vegetation units forming transitions to each other, but not sharp community limits, by dotted line (cf. SIMON, 1957).

Results

GENERAL CHARACTERIZATION OF THE AREA

The mapped core area is situated in the "Kiskunság alkali plain", II. area of the KNP (Fig. 1. a,b.) Three biosphere reserve core areas have been demarcated in the II. area of the KNP, from which the area between Apaj and Kunszentmiklós is the mapped Kisapaj core area (Fig. 1. b,c.). This core area, just as the entire II. area of the KNP, belonged to the flood area of the Danube prior to its controlled in the 1870s. Its relief bears all the marks of the inundations of the Danube (PÉCSI, 1959).

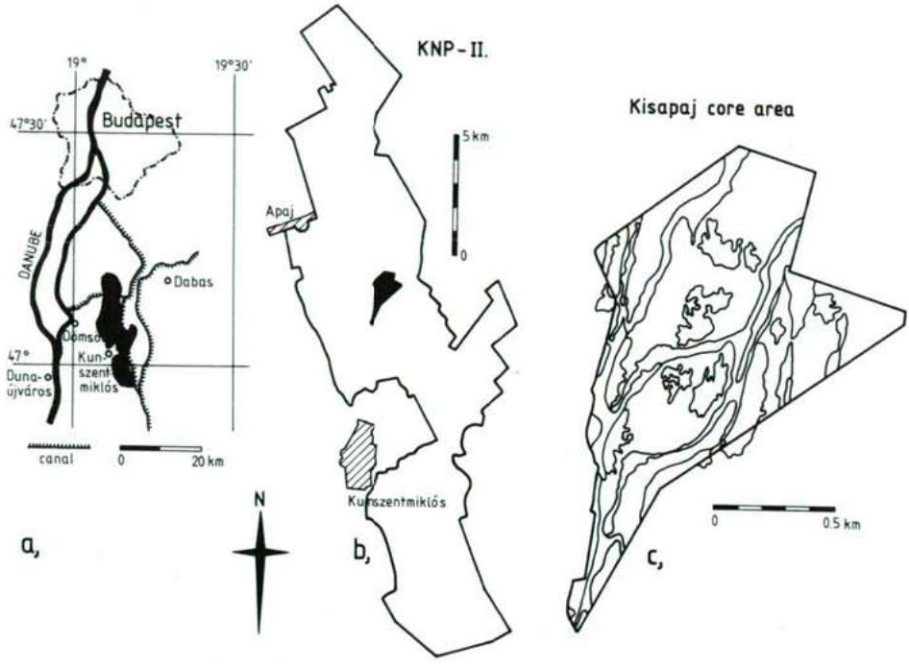

Fig. 1. The geographical localization of the Kisapaj UNESCO biosphere reserve core area

The water receding after the inundations established streamlets, mostly in a north-south direction, which connected to each other, form a complicated network. Saline ridges are found between them, and the larger ridges have become cultivated plough-land. These are located on the border of the core area. Since these parts of high relief are not large within the core area, they are not suitable for plough-land cultivation. Thus, being unaffected by most drastic anthropogenic impacts, a "natural-like" vegetation has developed and still maintained here.

The heterogeneity of the microrelief has led to the mosaic-like nature of the vegetations. In case of salt affected, sodic, alkaline or saline soils, the development of the various associations is determined by the relief, under given climatic conditions — by means of the influence on the groundwater depth, hereby on the trend of salt and carbonate migration processes, and on the possibilities of organic matter accumulation (VÁRALLYAY and MIRONENKO, 1979; BRESLER et al. 1982).

A BRIEF CENOLOGICAL CHARACTERIZATION OF THE VEGETATION FOUND IN THE AREA

The description of the vegetation in the core area is given only to the depth necessitated for the interpretation and evaluation of the vegetation units indicated on the vegetation map. The nomenclature of SOÓ (1964) is used for the designation of the cenosystematic units found in the paper, taking into consideration the subsequent changes in name of the species.

1. *Salvio (nutanti-nemorosae)* — *Festucetum rupicolae* ZÓLYOMI 58.
Salvio nemorosa — *Festuca rupicola* loess meadow association

Dominating species: see below.

This cenological name sums up the vegetation found in the highest parts of the area. The name actually covers the complicated mosaic complexes of the association mentioned here, as well as of the *Astragalo-Festucetum rupicolae*, *Potentillo-Festucetum pseudovinae*, and *Cynodonto-Poetum angustifoliae* associations developing on the effect of anthropogenic impacts (drying up as a consequence of ground canalization, grazing, and disturbing the soil), and also of the transitional stands of these associations.

The complexity, mosaic-like nature of the associations can be traced to pedological causes. First of all, the *Salvio-Festucetum rupicolae* loess association did not develop here on typical loess soil, but on clayey alluvial soil, being rather similar to loess — as regards the composition of the grain size. This layer is rather thin, gradually being replaced, by sand in a downward direction. As a consequence, sandy associations may develop on it as an effect of the slightest erosion, or soil disturbance: *Astragalo-Festucetum rupicolae*, *Potentillo-Festucetum pseudovinae*. Sand may settle on this layer; even this case, the *Astragalo-Festucetum rupicolae* association can be found on it. These association-fragments cannot be distinguished on a map drawn on a given scale.

The *Salvio-Fastucetum rupicolae* unit indicated on the map gives a summary of those stands in which the following *Festucion rupicolae*, *Festucetalia valesicae*, *Festuco-Brometea* species occur with a high coverage and frequency: *Asperula cynanchica*, *Astragalus asper*, *Astragalus austriacus*, *Bothriochloa ischaemum*, *Coronilla varia*, *Festuca rupicola*, *Filipendula vulgaris*, *Galium pedemontanum*, *Galium verum*, *Hieracium bauhini*, *Hiearcium pilosella*, *Koeleria cristata*, *Linum austriacum*, *Medicago falcata*, *Potentilla recta*, *Salvia nemorosa*, *Scabiosa ochroleuca*, *Stipa capillata*, *Thymus glabrescens* and *Verbascum phoeniceum*. From the characteristic species of the great coverage of other cenosystematic groups, the *Carduus nutans*, *Cynodon dactylon*, *Dactylis glomerata*, *Euphorbia cyparissias* and *Ononis spinosa* are typical.

The *bothriochloetosum ischaemi* and *stipetosum capillatae* units — indicated as subassociations — can be distinguished in the region relatively easily. In case of these, the predominant coverage of the denominative species, and the lower abundance and diversity of species (facies character) as compared to a typical

association, are characteristic (cf. SOÓ 1964). The degradative character of the *bothriochloetosum* is not doubtful here (VIRÁGH and FEKETE, 1984).

2. *Achilleo — Festucetum pseudovinae* (MAGYAR 28) SOÓ (33) 45. *Achillea collina — Festuca pseudovina* alkali plain grassland association

Dominating species: *Achillea collina, Alopecurus pratensis, Artemisia santonicum, Cynodon dactylon, Festuca pseudovina, Inula britannica, Plantago maritima, Podospermum canum.*

The *Achilleo-Festucetum pseudovinae* category indicated on the map sums up the following units within the association, adopted to the various hydroecological and salt conditions: *alopecuretosum* and *artemisietosum* subassociations and the *Plantago maritima* variant. Typical *Achilleo-Festucetum pseudovinae* stands occur mainly on the higher reliefs; in case of maps drawn to a given scale, they cannot be illustrated in an exact manner separated from the communities indicated on these reliefs.

3. *Artemisio — Festucetum pesudovinae* (RAPCS. 16, MAGYAR 28) SOÓ (33) 45. *Artemisia santonicum — Festuca pseudovina* wormwood alkali plain association

Dominating species: *Artemisia santonicum, Festuca pseudovina, Limonium gmelinii, Matricaria chamomilla, Poa bulbosa, Plantago maritima, Podospermum canum, Puccinellia limosa, Trifolium campestre.*

This association has the greatest extension in the core area. It has almost completely lost its features of origination from the *Lepidio-Puccinellietum limosae*, association being the dominating one in the area before the establishment of the drainage system (MOESZ, 1940). The majority of the *Artemiso-Festucetum pseudovinae* associations form typical stands.

In an essentially smaller area, under favourable relief conditions from the viewpoint of the existence of the *Puccinellia limosa*, the intermediate phases of the *Lepidio-Puccinellietum limosae — Artemisio-Festucetum pseudovinae* transition are observable: i.e. *puccinellietosum* and *artemisietosum* subassociations.

Other *Artemisio-Festucetum* units of a strongly degradative character refer to a connection with the vegetations of the higher reliefs; the *Agropyron repens* facies might be the result of the degradative process of *Astragalo-Festucetum rupicolae — Cynodonto-Poetum angustifoliae*. By means of the organic matter accumulation in its soil, the *Bromus mollis* variant presumably "prepares" the expansion of the communities found on higher reliefs (CLEMENTS, 1916; ref. FEKETE, 1985). In the upper 10 cm layer of its soil segment, the organic matter content is 3.5%, as opposed to the 2.0% humus content of a typical *Artemisio-Festucetum pseudovinae* (based on 5—5 samples).

4. *Agrostio — Alopecuretum pratensis* SOÓ (33) 47. *Agrostis stolonifera — Alopecurus pratensis* meadow foxtail sodic grassland association

Dominating species: *Agrostis stolonifera, Alopecurus pratensis, Inula britannica, Lysimachia nummularia, Rorippa sylvestris* ssp. *kerneri, Scutellaria hastifolia, Taraxacum officinale.*

Its coverage in the area is significant. In a typical floristic composition, it develops on deeper reliefs bordering the *Caricetum associations*. On higher reliefs the xeroseries members adapted to dryness can be distinguished in this association, too. This is caused by the drying out of the soil due to water management. Differential species are the *Agropyron repens*, the *Poa angustifolia*, the *Carex stenophylla* (BODROGKÖZY, 1970). As a collective designation, these are indicated on the map under the name of agropyretosum repentis, the most characteristic and most frequent subassociation.

5. *Caricetum acutiformis-ripariae* SOÓ (27) 30. *Carex acutiformis — Carix riparia* sedgy marshy-meadow association

Dominating species: *Carex acutiformis, Carex disticha, Carex melanostachya, Carex vulpina, Glyceria maxima, Iris pseudacorus, Lysimachia nummularia, Lythrum salicaria, Phragmites australis, Schoenoplectus tabernaemontani.*

The deepest reliefs of the core area are covered by *Caricetum* associations. The majority of these belong to the *Caricetum acutiformis-ripariae* association and its *caricetosum acutiformis* subassociation. The *Caricetum melanostachyae (Caricetum acutiformis-ripariae caricetosum melanostachyae), Caricetum distichae, Caricetum vulpinae association-fragments* covering small areas and having a mosaic-like appearence are illustrated as a part of these units. On the deepest reliefs, where *Caricetum elatae* associations were presumably present, about 30 — 40 years ago, the stands of the *Caricetum acutiformis-ripariae caricetosum ripariae* subassociations are found today. The subassociation is distinguished by the appearance of the *Glyceria maxima* and the *Typhoides arundinacea*, with high coverages.

Further studies

The vegetation map is a source for further studies of the core area. The enumeration already comprising about 300 species is still to be processed and complated. Detailed cenological processing is extremely important from the viewpoint of demonstrating anthropogenic impacts. Several sign refer to the degradative process of the vegetation at Kisapaj: on the higher reliefs the subassociation of the *Salvio-Festucetum rupicolae bothriochloetosum*, the *Bromus mollis* variant of the *Artemisio-Festucetum pseudovinae*, the reed formation in case of the *Caricetum associations*, and the decrease in the individual number of sensitive, but characteristic species, tending towards a value close to extinction. The main, hardly demonstrable danger is caused by the processes developing as an effect of water management, leading to the characterless state of the vegetation. Knowledge of the stages of these processes can be gained by means of studies pertaining to the interrelationship between the soil and the vegetation, for which the detailed cenological processing of the vegetation is indispensable. Parallel to this are measurements regarding the soil data as background factors. Studies should and can be performed with respect to both the general processes valid in case of every community (diversity- and pattern changes, niche segregation) and the manifestation of the

general effects in the various communities. From this point of view, the core area at Kisapaj, with its extremely heterogeneous vegetation, could be an ideal study site.

Only knowledge of the disadvantageous changes in background factors causing the degradation of the vegetation, and the termination of these by means of an appropriate management programme can ensure the maintenance of such characteristic alkaline plains of the Pannonicum — one of the most beautiful and most variegated representatives of which is the Kisapaj UNESCO biosphere reserve core area.

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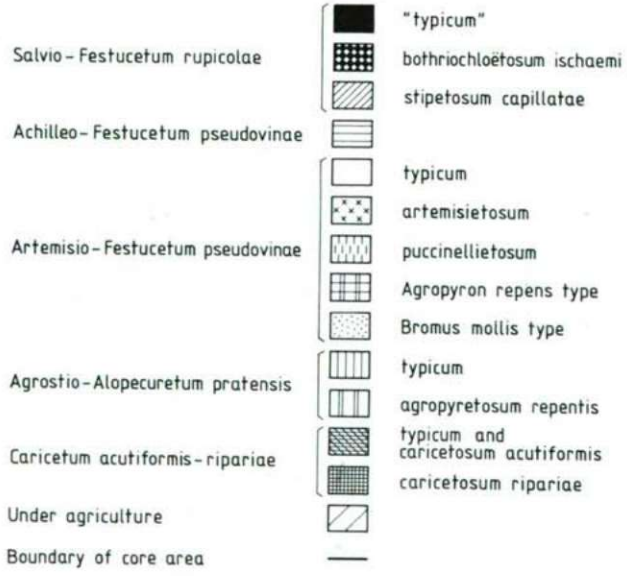
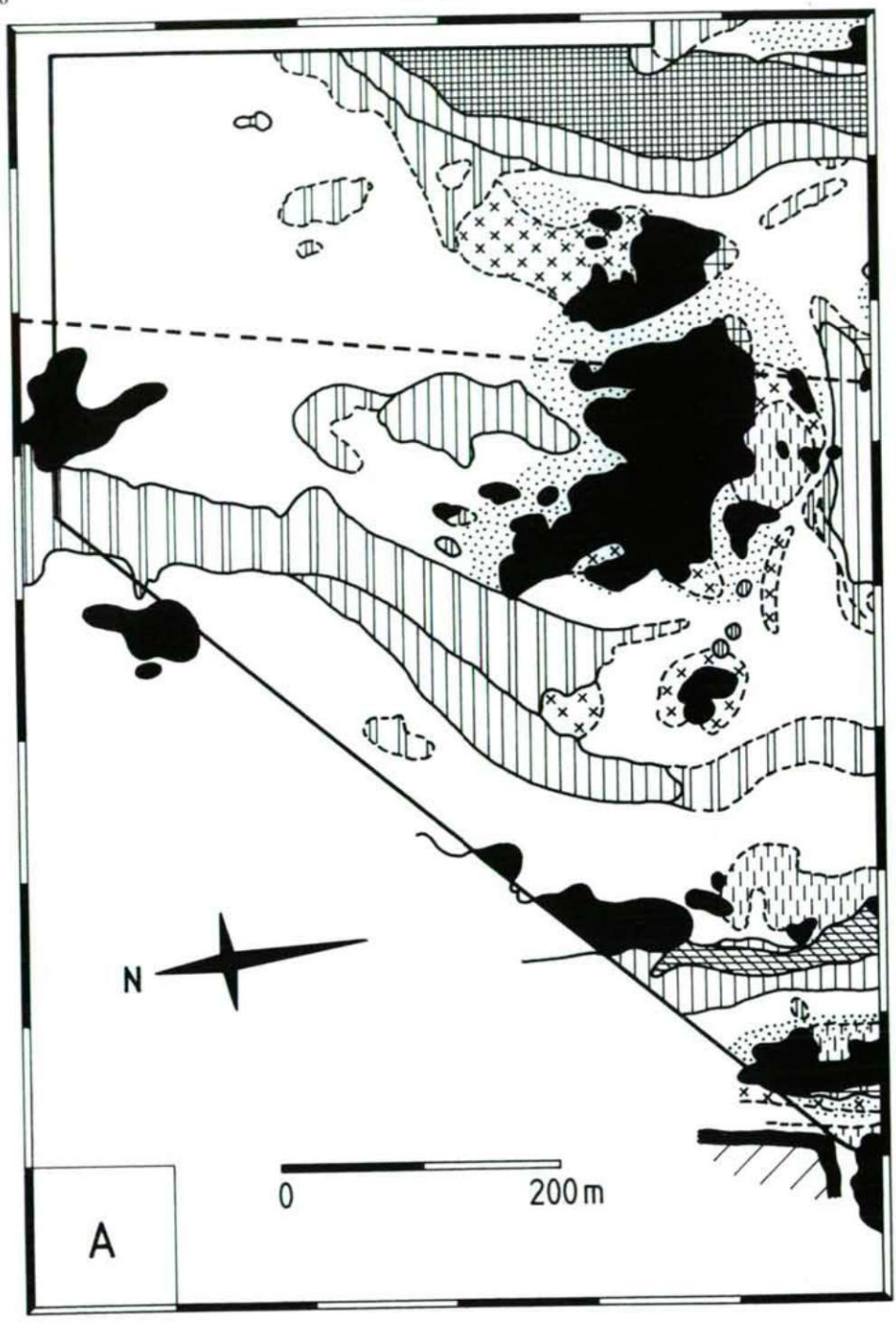


Fig. 2. Key to the signs used in the vegetation map of the Kisapaj UNESCO biosphere reserve core area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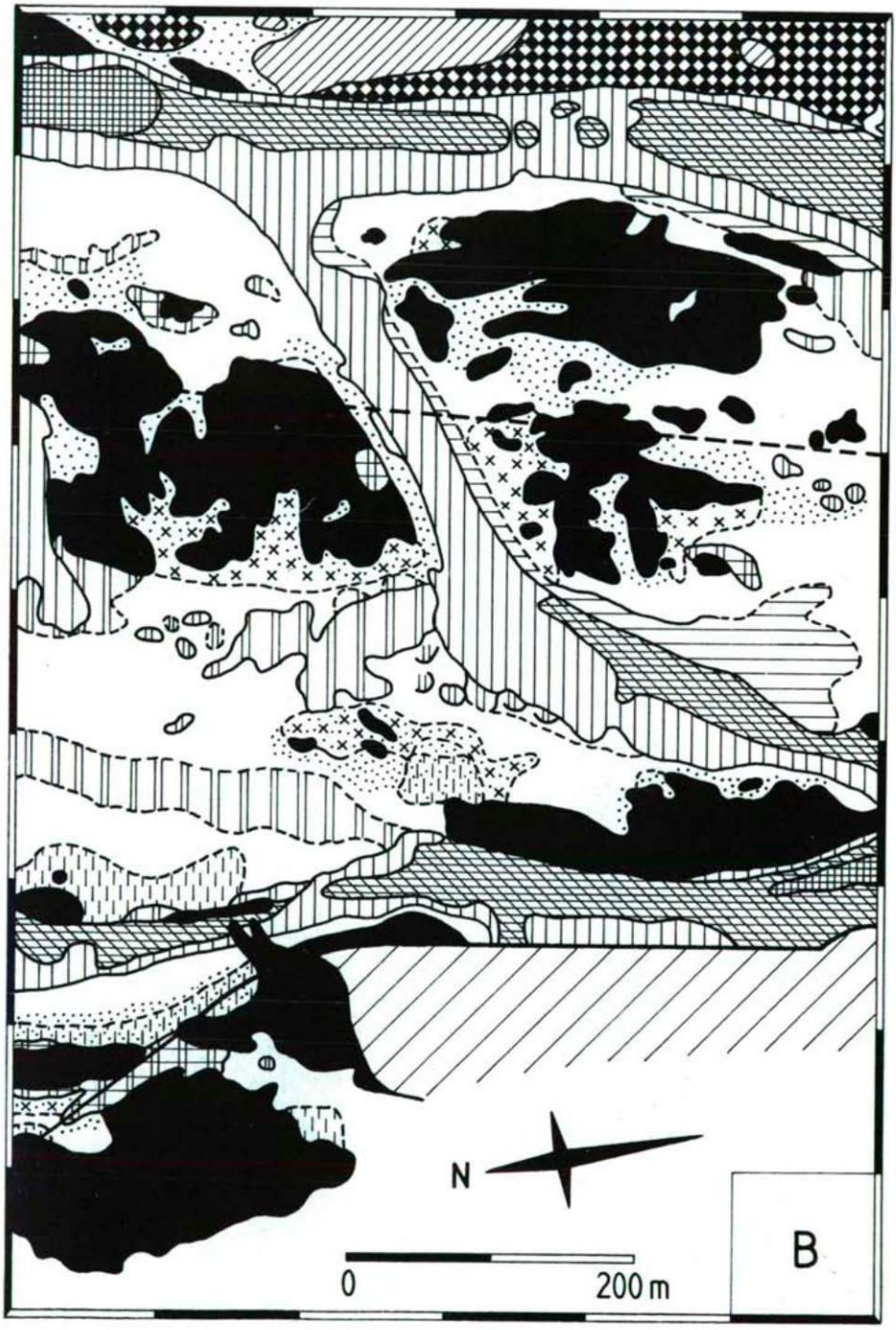
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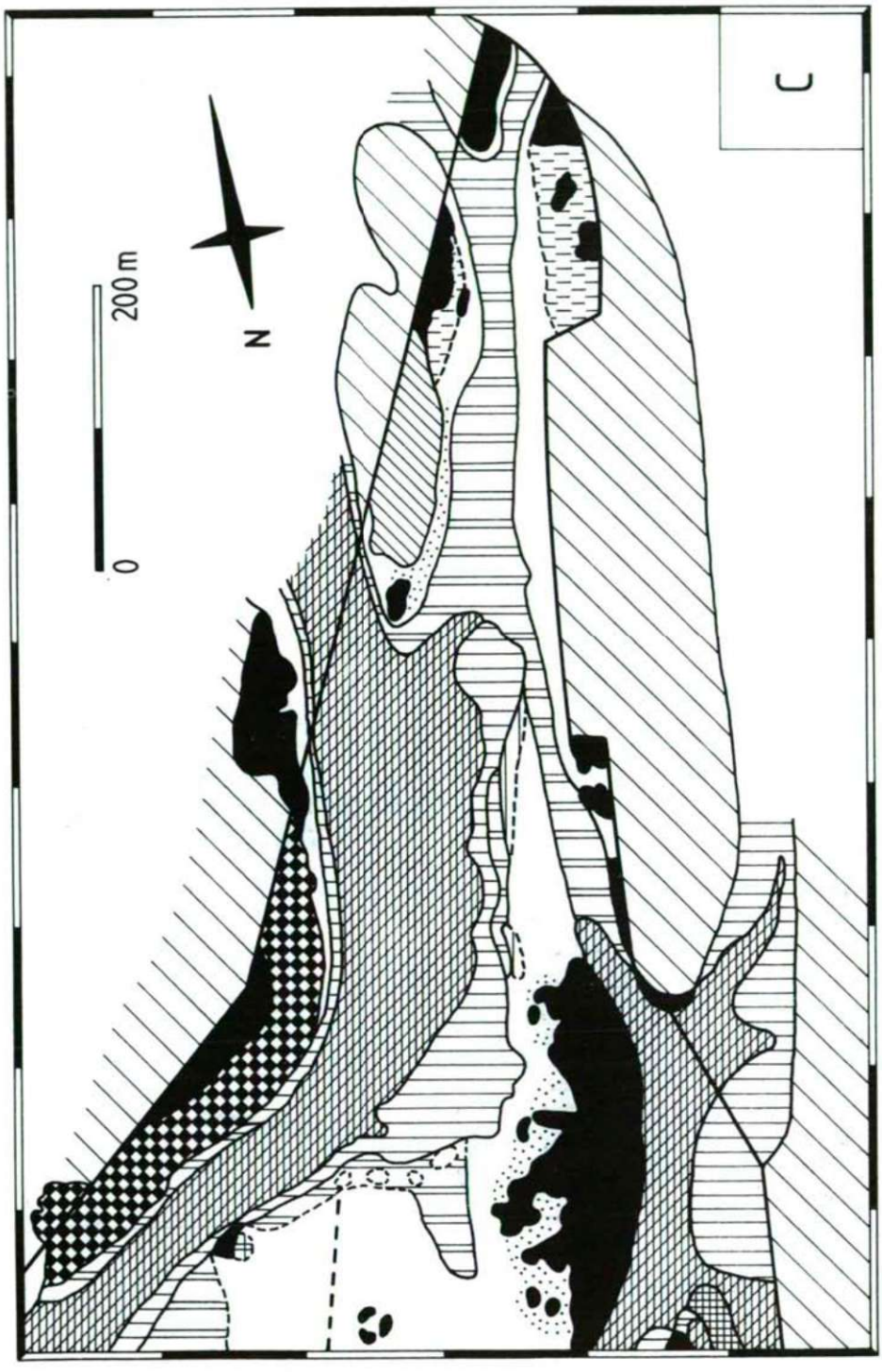
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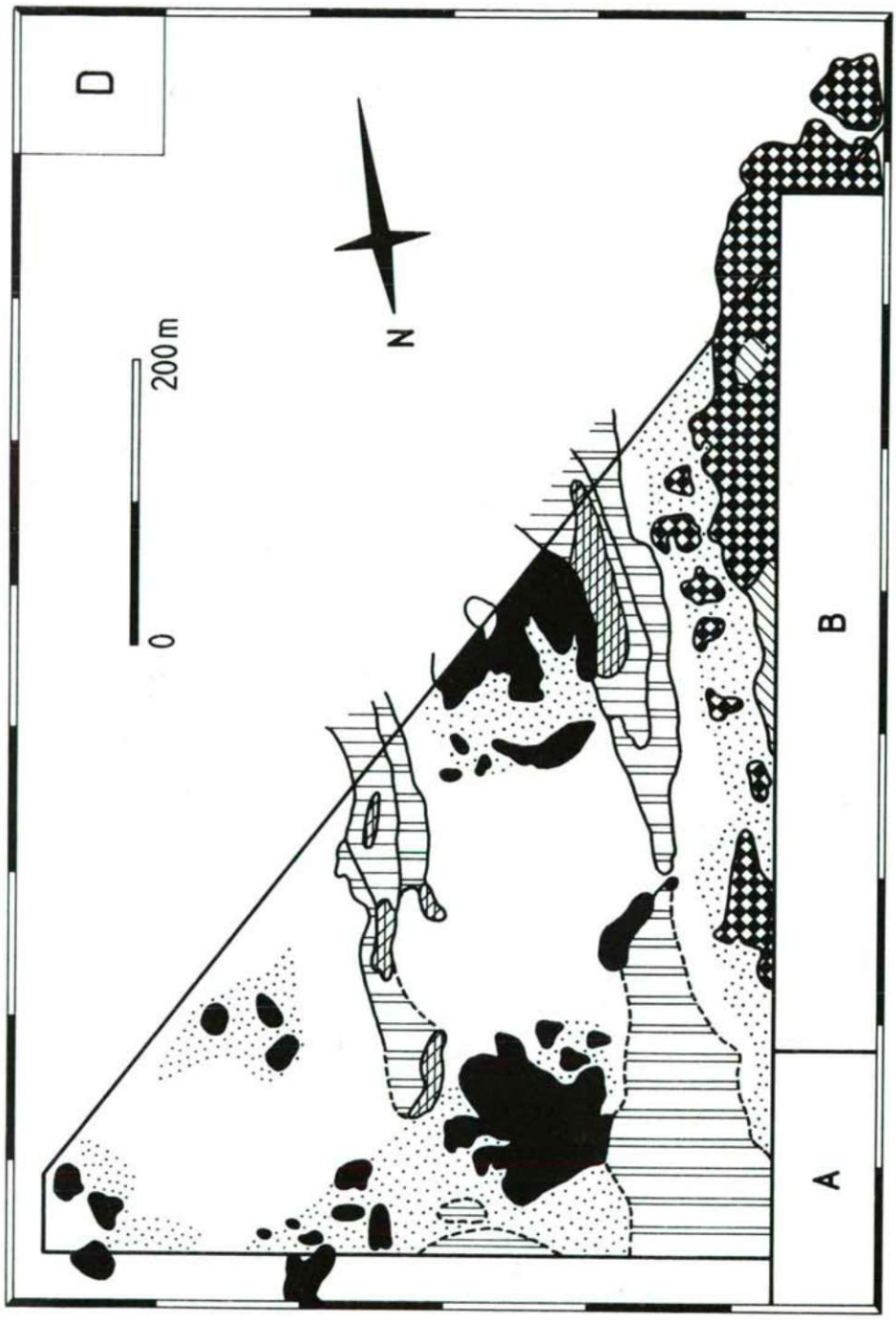
D
N
200 m
0
B
A

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