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PLANT COMMUNITIES OF STRZELECKIE MEADOWS IN KAMPINOS FOREST*

The present paper presents the results of phytosociological studies carried out in Strzeleckie Meadows within Kampinos Forest in vicinity of Warsaw. Five associations and six variants have been distinguished within the studied area. From the order *Phragmitetalia* there occur following associations: *Glycerietum maximae*, *Caricetum elatae* in three variants, and *Caricetum appropinquatae*. The order *Caricetalia fuscae* is represented by one only association — *Carici-Agrostetum caninae*, which developed in three variants. Finally the last association, related to *Stellario-Deschampsietum*, belongs to the order *Molinietalia*. Apart of the floristic characteristics, soil studies, and observations of fluctuations in ground water have been carried out in individual communities. There has been prepared, moreover, the map of actual vegetation at a scale of 1:2500 (in the print diminushed 2:3).

We do not know much until now about plant communities on meadows in the Kampinos Forest. R. Kobendza in his monography from 1930, which, as a matter of fact, presents until to-day an only phytosociological elaboration of this forest massif, quotes only two tables for meadow communities. The first one concerns the association *Caricetum ripariae* et *Caricetum acutiformis* (11 records), another one — the association *Caricetum lasiocarpae* (21 records). This does not exhaust, obviously, the matter of phytosociological differentiation within this large group of communities, which occupies vast areas within the Forest. The insufficient knowledge of forest meadows presents the main reason for the beginning of phytosociological studies on these communities. The choice of Strzeleckie Meadows as a preliminary work in this

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sphere was motivated so, that from many years they instituted an object of zoological studies, and recently, in 1964, the complex research on productivity within the International Biological Program was located there. The need for a rapid phytosociological elaboration of the area became an urgent and indispensable matter.

The paper aims at three main problems:

1. differentiation, identification and phytosociological characteristics of occurring communities,
2. preparation of phytosociological map in a large scale,
3. indication of relations between individual meadow communities and soil factors (soil types, variation in some soil properties, moisture relationship).

I. DESCRIPTION OF AREA

Strzeleckie Meadows are situated on the outskirts of a southern chain of dunes in the north-eastern part of a broad and boggy depression Ciechowąż, in the vicinity of villages Sadowa, Dziekanów Leśny, and Sieraków, at a distance of only 20 km to north-west from Warsaw. This small, since having 66 ha in area, chain of forest meadows adjoins from the north to one of most beautiful forest preserves of Kampinos National Park – Sieraków. Strzeleckie Meadows has been put under strict protection. They constitute a part of the forest district Laski and occupy following compartments: 33f, 34d, 35j, 53a, b, and 54a, b.

So characteristic for the whole terrace II (dunal one) striped pattern of huge dune and bogg belts (Kaczorowska 1926, J. Kobendza and R. Kobendza 1957) is entirely confirmed in a very small scale in the microrelief of the studied area. One can meet here also the parallel pattern of two main geomorphological elements: dry, sandy elevations and alternate boggy depressions and channels. This pattern is closely connected with the distribution of meadow communities, ground water table and many other soil properties.

II. METHODS

Field studies were carried out from 1961 until 1963. Altogether 133 records have been prepared with the aid of Braun-Blanquet's (1951) method. Records have been prepared from June until August during two vegetation seasons. The area of record amounted, in general, to ca 20 m^2. In record tables, apart of the presence and its grades, the cover coefficient *C* of species (Braun-Blanquet 1951, Pawłowski 1959) was described. Owing to a difficult in many cases identification of meadow communities the systematic values *D* of individual syngenetic groups (Tüxen and Ellenberg 1937, Pawłowski 1959) and totals of their cover coefficients have been calculated for each of differentiated units. These calculations are presented in Tables VIII and IX.

Field works started with a detailed survey of all meadows and covering the terrain with a network of range poles put parallely to compartment lines at 50 m intervals. The obtained grid of squares 50 × 50 m has been immediately densified during the charting to squares 25 × 25 m or still smaller ones. The application of this method made to a considerable extent casy the detailed location of records and the preparation of the map of actual vegetation in a scale of 1:2500 (Fig. 1, in the print diminushed 2:3).

Since December 1960 until mid-April 1963 the measurements of ground water table were taken almost in all meadow communities. Metal tubes with side openings were used for this purpose. Observations were recorded each 2 weeks. Results obtained thus are inserted in Figure 2 together with diagrams of precipitation.

In order to examine soil relations 41 pits have been dug out. Several of them have been sampled for botanical analysis of peat and physical-chemical analyses[1], which were carried out with the use of following methods:

mechanical composition by aerometric method,
pH in H_2O and KCl – by electrometric method,
hydrolytic acidity – according to Dajkuhara,
total exchangeable bases – according to Kappen,
the content of available P_2O_5 and K_2O – with the aid of Egner's method,
the content of total nitrogen – according to Kieldahl,
the content of total carbon – according to Tiurin's method.

III. FLORISTIC CHARACTERISTICS AND SYSTEMATIC POSITION OF DISTINGUISHED UNITS

In the identification of meadow communities one meets quite frequently serious difficulties. The variation in local conditions of habitat character and variety of applied management treatments (grazing, cultivation, amelioration, etc.) – create an enormous range of factors, which govern the floristic composition of individual tapes of meadows. When the natural variation of communities resulting from regional differences is added one can understand the fact (not rare one) of a considerable floristic variation of communities classified by various authors to the same association. These differences consist in the number of species, different proportion of individual groups of characteristic species, not to mention about great differences in quantitative relations.

When we would accept the principle of a narrow approach to associations, as it is practiced in many west European papers, particularly in the sphere of forest communities, the number of fundamental units (associations) would be excessively increased, what in the situation of poor understanding of meadow communities in general, could lead exclusively to the greater confusion

[1] Author is indebted to Dr. Z. Czerwiński from the Chair of Soil Science on the Warsaw Agricultural University for carrying out of soil analyses.

and increased number of synonyms. In the present state of development in the classification of meadow communities mainly within poorly known groups (e.g. order *Caricetalia fuscae*), it is better to approach associations more broadly, paying, the attention to the local differentiation within the association. Apart of the characteristic combination of species and of characteristic species as main criteria for the differentiation of associations, one cannot avoid the valorization of prominently dominant and constant species, yet with a lower degree of fidelity, as it occurs, for instance, in associations from the alliance *Magnocaricion*. Fact that this criterion is respected in the classification of meadow communities is rather fully justified, when one will consider an enormous role of these species in the formation of habitat and biomass of meadow vegetation. Due to this only, the indication of specific cover coefficients *C* in record tables seems to be very purposeful. Also the calculation of the systematic value *D* for groups of characteristic species constituting the floristic list of the definite unit appears to be a really good method in the identification of meadow associations (and not only meadow ones). The method used comparatively in a combination with the estimate of cover coefficient for species or whole groups of characteristic species (Pawłowski, Pawłowska and Zarzycki 1960) considerably facilitates: 1) the proper identification and classification of units, 2) quantitative evaluation of the proportion of groups of species in meadow vegetation and the evaluation of their phytosociological role in associations, and finally 3) in many cases it elucidates the problem of successive transformations occurring in floristic composition of communities.

The acceptation of above methodical assumptions in the elaboration of record material has enabled the differentiation of following associations and smaller units, which systematic position is presented below:

I. Class: *Phragmitetea* Tx. et Preis. 1942
Order: *Phragmitetalia* W. Koch 1926
Alliance: *Phragmition* W. Koch 1926
Association: 1. *Glycerietum maximae* Hueck 1931
Alliance: *Magnocaricion* W. Koch 1926
Association: 2. *Caricetum elatae* W. Koch 1926
Variants: a) with *Glyceria fluitans*
b) typical
c) with *Phragmites communis*
Association: 3. *Caricetum appropinquatae* Tx. 1947

II. Class: *Scheuchzerio-Caricetea fuscae* Nordh. 1936
Order: *Caricetalia fuscae* W. Koch 1926
Alliance: *Caricion canescentis-fuscae* Nordh. 1937
Association: 4. *Carici canescentis-Agrostetum caninae* Tx. 1937
Variants: a) with *Carex gracilis*
b) with *Calamagrostis neglecta*
c) typical
facies: c_1) with *Calamagrostis canescens*

III. Class: *Molinio-Arrhenatheretea* Tx. 1937
Order: *Molinietalia* W. Koch 1926
Alliance: *Molinion coeruleae* W. Koch 1926
Association: 5. *Stellario-Deschampsietum* Freitag 1957

1. *GLYCERIETUM MAXIMAE* HUECK 1931 (TABLE I)

There occurred altogether 58 plant species in this association, 22 species occurred on an average per one record. The large immersive perennials from the order *Phragmitetalia* predominate here overhelmingly. Their systematic value *D* amounted to 19.68, while the total of cover coefficient *C* as much as 10,770. Remaining two groups of characteristic species, namely: *Scheuchzerio-Caricetea fuscae* and *Molinietalia* indicate *C* values of only 129 and 243. The association *Glycerietum maximae* belongs really to the alliance *Phragmition*, but the number of species from the alliance *Magnocaricion* in studied patches is higher and the systematic value of this group is almost twofold greater, than in the alliance *Phragmition* (9.12:5.83). This indicates the local relation of this association with communities of large sedges, particularly with *Caricetum elatae*. Comparing these two association we cannot find fundamental differences in floristic composition, only quantitative relations within certain groups or single species are different. This concerns the group *Scheuchzerio-Caricetea fuscae*, which in *Glycerietum maximae* is represented only by 8 species, while in *Caricetum elatae* – by 16. The same concerns numbers of two dominant and at the same time characteristic species: *Glyceria aquatica* and *Carex elata*. The first one reaches in *Caricetum elatae* the cover coefficient 5, while in *Glycerietum maximae* as much as 7,750. An enormous growth of this grass excludes the occurrence of many other species and decides about an extraordinary physiognomic and structural distinction of this reedswamp. Above reasons support the approach to this community as to a separate association, similarly as many authors do. Kępczyński (1960) considers the reedswamp with *Glyceria aquatica* as a variant of the association *Scirpo-Phragmitetum* and substantiates this approach by the lack of characteristic species. In this connection it should be noted, that although *G. aquatica* is not a species exclusively related with *Glycerietum maximae*, but undoubtedly it is here, where it reaches its ecological optimum and may be considered as a characteristic species with prominent habitat-forming importance, mainly due to its mass occurrence. It should be mentioned that within the order *Phragmitetalia* there are very frequently differentiated association on the base of even one, but overhelmingly dominant characteristic species.

2. *CARICETUM ELATAE* W. KOCH 1926 (TABLE II)

This reedswamp association consists of three groups of characteristic species with a distinct domination of *Phragmitetea* group (*D* more that 23). The prolonged flooding in patches of this association results in an everhelming predominance of immersive plants from the alliance *Magnocaricion*. Two remaining groups: *Scheuchzerio-Caricatea fuscae* and *Molinietalia* reach considerably lower values *D* and *C* (compare Tabs. I and II). The domination

of *Carex Hudsonii* Bennet (= *C. elata* Bell. ex All.) gives a specific appearance to this community. High tussock of *Carex Hudsonii* differentiate also the structure and habitat of the community. Flooded depressions present places of the occurrence of such immersive perennials as: *Rumex hydrolapathum*, *Iris pseudoacorus*, *Ranunculus lingua*, *Sium latifolium*. Tussock of *Carex Hudsonii* are colonized by numerous emersed plants and even plants from periodically moist meadows belonging to the order *Molinietalia*. Particularly tops of these clumps present a habitat similar to communities from the order *Molinietalia*, mainly owing to water relations: they are seldom flooded, although almost permanently moistened by water ascension. The distinction of ecological conditions of depressions and clumps enables thus the development of these two different ecological groups.

Three variants have been distinguished within the association: with *Phragmites communis*, with *Glyceria fluitans*, and typical one. In the variant with *Phragmites communis* there were recorded only 33 plant species, and 21 species occurred on an average in one record, while in typical variant – 73 species and on an average 28 species in one record. The variant with *Phragmites* is thus floristically poorer, but more flooded and less tufty. A considerable proportion of reed occurs in two separate patches in the southern portion of meadows on the ecotone with sedge communities and alder wood.

Unfrequently occurring variant with *Glyceria fluitans* is characteristic by a poor occurrence of *Carex Hudsonii* clumps and a distinct domination of *Glyceria fluitans*, as well as a higher constancy of *Heleocharis palustris* and *Agrostis canina* var. *stolonifera*. It seems that it is of anthropogenic origin, since it develops itself only in places with intensive grazing previously. The frequent trampling and destruction of sod favoured the development of these three species.

Typical variant, which presents one of the best preserved natural fragments of *Carex* reedswamp in the Forest, occupies large areas, especially to the south from amelioration ditch.

3. *CARICETUM APPROPINQUATAE* TX. 1947
(TABLE III)

The community of wonder sedge (*Carex paradoxa* Willd. = *C. appropinquata* Schum.) is in permanent contact with patches of *Caricetum elatae*. It frequently forms the edge of sandy elevations flooded with water. In comparison with two previously discussed reedswamp associations it occupies places with a higher elevation and less flooded. This is reflected by a distinctly different quantitative proportion of certain groups of species. Tables VIII and IX enable the comparative analysis is this respect. First of all the species from the alliance *Phragmition* reach here its systematic value *D* amounting only to 0.71 (in two previous associations 5.83 and 7.33). On the other hand the

proportion of species *Scheuchzerio-Caricetea fuscae* (group II) is increased from 3.74 to 12.94, while the cover coefficient rises from 129 to 4,880. The number of species from *Molinietalia* is increased from 10 to 24, and their value *C* from 243 in *Glycerietum maximae* to 930 in *Caricetum appropinquatae*. *Carex paradoxa* becomes the dominant species (*C* = 4,987). These few differences, generally, after all, discussed, are sufficient to substantiate the separation of this community into another association.

4. *CARICI (CANESCENTIS)-AGROSTETUM CANINAE* TX. 1937 (TABLES IV–VI)

The community located mainly to the north from the ditch in narrow channels and depressions, where the water floods and stagnates seasonnally on the surface.

The identification of certain forms of the association is very difficult on the studied area. It concerns first of all the community distinguished as the variant with *Carex gracilis*. It distinctly relates to communities from the alliance *Magnocaricion*, particularly to *Caricetum gracilis*. The presence of species characteristic for the association *Carici-Agrostetum caninae* suggest the maintenance of the community within this association. They are: *Agrostic canina*, *Carex canescens* and *Veronica scutellata* as well as numerous species from the class *Scheuchzerio-Caricetea fuscae*. The systematic value *D* of this group amounts as much as 23.69, while for the group of reedswamp species (*Phragmitetea*) – to 11.40. Similar numerical relations are to be found in cover coefficients. In spite of fact that the proportion of large sedges, first of all that of *Carex gracilis*, is very high (their cover coefficient – more than 6,130, while for *Carex gracilis* – 3,388), nevertheless, in the total they yield to species from *Scheuchzerio-Caricetea fuscae*. This is distinctly sedge--moss community with the domination of *Calliergon cordifolium* and *Drepanocladus aduncus*. The association *Carici-Agrostetum caninae* cannot be separated in the studied area from *Caricetum gracilis*, both are apparently overlapping. It seems that there ought to be some succession relations among each other. A similar example can be found in Kępczyński (1960), who states that near Święte Lake in a complex of Skępskie Lakes the association *Caricetum gracilis* indicates trends to transform itself into the community from the order *Caricetalia fuscae*.

The next variant with *Calamagrostis neglecta* is characteristic by the smaller number of *Phragmitetea* species. Cover coefficients in the group are almost four times smaller, when compared with the variant with *Carex gracilis*. On the other hand, cover coefficients and the systematic value of *Scheuchzerio-Caricetea fuscae* groups reach here their highest value (*D* = 27.91, *C* = 16,055). The variant can be distinguished by physiognomy owing to a distinct domination of *Calamagrostis neglecta*, which frequently occurs in 4 and 5 grade of number and reaches *C* = 4,908.

In typical variant characteristic species, particularly *Carex canescens* reveal greater proportion and apart of the facies with *Calamagrostis canescens* there was not found any distinct domination of a single species. Patches of this variant are quite frequently situated among *Caricetum elatae* or between the variant with *Carex gracilis* on the one side, and *Stellario-Deschampsietum* on the other.

5. *STELLARIO-DESCHAMPSIETUM* FREITAG 1957 (TABLE VII)

The community with *Deschampsia caespitosa* occupies the greatest area of meadows and develops on all sandy elevations, unflooded by waten.

A synthetic review of floristic composition in above discussed communities revealed that they consist mainly of 3 large groups of characteristic species: *Phragmitetea*, *Scheuchzerio-Caricetea fuscae* and *Molinietalia*, while in the community now discussed almost exclusively the *Molinietalia* group takes part. In spite of a direct spatial contacts with *Carex* reedswamp (*Phragmitetea*) there did not occur single bog species. This is the best indication of entirely different sites of these groups of communities. Although the species from *Caricetalia fuscae* penetrate here sporadically into the contact zone or in small depressions within sandy elevations, but their significance is negligible. When one excludes the constant occurrence of *Carex fusca* (*C* = 1,558 and presence V) the remaining species from this group would have a negligible cover coefficient amounting scarcely to 15. This is, therefore, very homogeneous community with a prevailing domination of species from the class *Molinio-Arrhenatheretea* and from the order *Molinietalia*. The classification of this community to periodically moist meadows (order *Molinetalia*) is unquestionable (compare Tabs. VIII and IX). The matter of the classification to association, and even alliance, is more difficult. One can be said, that within periodically moist meadows from the order *Molinietalia* there exists a group of communities with *Deschampsia caespitosa*. They were studied by Horvatić 1930, Wagner 1950, Freitag 1957, Kovačević 1959, Grynia 1962. The comparison of the floristic composition of this large group of communities with the association *Molinietum coeruleae* did not permit its classification to this association. The community with *Deschampsia caespitosa*, which occurs on Strzeleckie Meadows, confirms this conclusion entirely. There is a lack of not only species characteristic for the association, but also the majority of species characteristic for the alliance *Molinion*. It reveals most relations with the association *Stellario-Deschampsietum* described by Freitag (1957), and from regions of Poland to one from Wełna river valley – by Grynia (1962), although even here there are great differences to be noted. Some 15 species with high degrees of cover (III–V), which occur on meadows within the present study, were not found in tables by mentioned authors; these species are: *Ophioglossum vulgatum*, *Carex fusca*, *Aulacomium palustre*, *Lothus uliginosus*, *Lathyrus pratensis*, *Trifolium pratense*, *Leontodon*

hispidus, etc. There did not occur, among others, *Carex gracilis* ssp. *tricostata*, which is, according to Freitag (1957), characteristic for the association. Owing to the fact that the question of the classification of community with *Deschampsia caespitosa* is not sufficiently elucidated, in spite of floristic differences I reckon this community to the association *Stellario-Deschampsietum* Freitag 1957 and to the alliance *Molinion coeruleae*, and not to the alliance *Deschampsion caespitosae* Horvatić 1939, with which it has almost no relations.

Few words should be devoted to wooded patches. Although the mere presence of trees does not constitute a forest, but it presents an unquestionable index of natural plant succession. The penetration of forest on meadows proceeds at a rather rapid rate. This can be distinctly seen in southern portions of meadows, which have not been mowed from very long ago. Communities of large sedges evidently give place to wicker thickets or directly to alder wood. In certain patches of *Stellario-Deschampsietum* there were formed conspicuous clumps of trees, which undoubtedly increase their range. They are presented on the map as wooded patches of *Stellario-Deschampsietum*. The influence of trees as outstanding edificators of site is undoubtedly marked. Although in these patches there are still many meadow species from the *Stellario-Deschampsietum*, but there can be seen already a considerable proportion of woody species, particularly in the vicinity of trees, in shady places. The analysis of these patches enables the supposition that they transform themselves ever more into the mixed coniferous forest (*Pino-Quercetum*). For the sake of an illustration of floristic relations within these patches I would like to cite in an abbreviated form only one record (out of five) taken on an "islet" situated in NE portion of the meadow.

Density of tree layer 80%: *Quercus robur* (4.5), *Betula verrucosa* (2.3). Shrubs 10%: *Betula verrucosa* (1.2), *Carpinus betulus* (1.2), *Pinus silvestris* +, *Juniperus communis* +, *Frangula alnus* +. Herb layer 40%: *Vaccinium myrtillus* (2.3), *Vaccinium vitis-idaea* +, *Veronica officinalis* +, *Solidago virga-aurea* +, *Epipactis latifolia* +, *Anemone nemorosa* (1.2), *Scrophularia nodosa* +, *Poa nemoralis* +, 2, *Festuca ovina* (2.2), *Sieglingia decumbens* +, *Calluna vulgaris* +. 2, *Polytrichum commune* (1.3), *Entodon Schreberi* (1.2), and *Armeria elongata*, *Dianthus deltoideus*, *Viola canina*, *Carex leporina*, *C. hirta*, and predominating number of meadow species from *Molinio-Arrhenatheretea* class.

IV. SOILS AND WATER RELATIONS

In the water balance of the discussed region an exclusive role is played by precipitation and ground water. Water excess flows through the amelioration ditch dug through the centre of meadows, only seasonally. Movements of these waters have, however, a negligible range of activity and are restricted to small stripes adjacent directly to the ditch. Almost the whole area of meadows remains under the constant influence of ground waters, which are

situated near the surface or stagnate almost the whole year round on the soil surface (Fig. 2). Fluctuations of ground water table depend very closely upon the precipitation and the rate of infiltration is low. The main obstacle present loamy sediments of water origin, lining all depressions of terrain. They form a strongly impact bedding with a thickness from 15 to 30 cm, which developed during the intensive activity of surface waters flowing in narrow gushes from Vistula river, taking advantage of all depressions with even minimal fall to the west. Particularly narrow, channel-like streaks reveal ways and direction of water flow: they are always situated in the direction east-west and show best preserved layer of loamy sediments.

Strzeleckie Meadows, as it was already mentioned, are situated on the northern edge of a vast boggy basin called Ciechowąż. It is strongly depressed in relation to surrounding it dunes and lies at the elevation of 78 m above the sea level. It does not reveal any greater topographic differentiation. Highest tops are to be found on sandy elevations (locally flooded), lowest situations – in southern patches of tall sedge communities. Relative differences between elevations and depressions on the area of meadows do not exceed 90 cm, and within depressions differences in altitude amount from few to several centimetres, maximum 40 cm. (These data have been derived from levelling survey carried out in 1961). The area of meadows is, therefore, very flat. Precipitation, low situation of meadows within the general topography of area, overgrown ditches and sediments with poor permeability create conditions, in which stagnation of waters and their high level persisted throughout almost the whole year. The effect of these waters upon soil relations is enormous.

In depressions there developed shallow peat and muck bog soils, in somewhat higher situations, on elevations – "mursh" soils. They all belong to one type of bog or hydromorphic soils (Musierowicz 1958) and all reveal marked gley horizon – reducing one (G_r) or oxidable (G_o).

More than 40 soil pits dug out on the area, as well as carried out laboratory analyses of mineral samples and botanical analyses of peats enable the more detailed characteristics of soils in individual communities. The classification of bog soils I have accepted after Musierowicz (1958).

The *Glycerietum maximae* association develops itself on strongly gleyed muck peat soils. The peat with brownish-black colour reaches down to 45 cm. It consists mainly of remnants of *Glyceria aquatica* and sedges (90–95%) with slight admixture of alder wood. Beneath there is to be found a small, 10–20 cm layer of sandy loam, gleyed one, with livid-blue coloration. Downward there occurs a livid, loose sand, which represents the parent rock on the whole area of meadows. The reaction of these soils fluctuates from pH 5.5 to 6.5.

The same type of soil is found also in patches of *Caricetum elatae* association. The thickness of the peat layer amounts to 30–50 cm. This is sedge peat (95% of sedges) laid on sandy strongly gleyed loam, sometimes directly on loose sand. In few profiles the peat horizon consisted of two parts: upper

one (c. 20 cm) was built of sedges (60%) and *Salix*, *Betula* wood, while the lower one – belonging to sedge-wooden peat indicated the predominance of remnants of the wood *Alnus*, *Betula*, and *Salix* (65%) over sedges and horsetails (35%). This would indicate a secondary origin of all, and, at any rate, of some patches of *Caricetum elatae* association from forest communities (*Alnetalia*). Lower mineral horizons in these profiles are permanently within the range of ground waters and reveal reducing gleization (G_r). The pH value of peat amounted to 5.3–6.0.

Somewhat different soil relations occur in patches of *Caricetum appropinquatae*. Upper horizons are formed either by a thin layer of sedge peat (30–40 cm), or by organic-mineral clay. In mineral layers, particularly in loamy layer there occurs oxidable gleization (G_o) in a form of glaring, rusty stains and spots. This proves a periodical drying in these layers and a possibility of the existence of aerobic conditions which cause the oxidation of ferrous compounds.

These three associations belonging to reedswamp communities (order *Phragmitetalia*) are characteristic by a very high level of ground waters (curves 1, 2, 3 in Fig. 2). Only in September and October 1961 it dropped slightly below the soil surface. The time of observations occurred in rather moist years. During drier years, as, for instance, in 1964, from July as long as to November the water had dropped down to the depth of several centimetres below the surface even in lowest situated depressions.

The association *Carici-Agrostetum caninae* occupies channels and depressions rather higher situated, than reedswamp communities. This is reflected by the depth and duration of ground water table (curves 4 and 5 in Fig. 2). From July until a late autumn there is noted as a rule no flooding in patches of this association. During observations the ground water table fluctuated from plus 30 to minus 45 cm, while in the association *Caricetum elatae* from 7 to 75 cm above the soil surface. Values of these fluctuations are, within both associations, of the same order of magnitude (c. 70 cm), but averages of these fluctuations are different.

All three variants of *Carici-Agrostetum caninae* occur on muck bog soils. The thickness of humus horizon is generally small and does not exceed in examined profiles 25 cm. It is formed by organic and mineral deluvial accumulation, strongly humified (particularly in the variant with *Carex gracilis* – profile 1 and 6 on Tabs. X and XI), with medium sand or sandy loam in mechanical composition. The next horizon (10–20 cm in depth) consisted of sandy loam, strongly impacted, with a livid-blue coloration (in patches of variant with *Carex gracilis*) or with distinct rusty stains or spots in remaining variants of the association. The substrate is loose, gleyed sand, as after all on the whole area of meadows. The soil indicated acid or slightly acid reaction (from 5.3 to 6.0); the degree of base saturation is rather high.

The content of available P_2O_5 and K_2O, and particularly the per cent of C and N are distinctly higher in soils under the variant with *Carex gracilis*, than in typical one (Tab. XI).

Quite different are corresponding values is soils under *Stellario-Deschampsietum* (profiles 3, 4, 5). They are seriously lower. The content of mineral components is low in these soils. In order to improve the crop there should be applied phosphoro-potassium-nitrogen fertilization. When pH values and properties of the absorbing complex are considered we do not find almost any differences in relation to above discussed communities. On the other hand, soil types and water relations are differently formed. Soils occupied by *Stellario-Deschampsietum* belong to "mursh" soils. Owing to the fact that all soil profiles (9 have been described) do not reveal differences, I shall quote, as an example, the description of one of them:

0–20 cm medium, blackish-brown sand, humous one, in lower portion with brown, rusty stains, the gradual transition in a form ot blots into
20–65 cm medium sand, fair with numerous rusty stains and spots, gradual transition into
65–90 cm loose sand, livid-bluish.
Ground water at the depth of 80 cm.

Although the ground water table in patches of *Stellario-Deschampsietum* is high (curves 5, 7) it seldom comes to the occurrence of water on the surface. That occurs, in general, following to very heavy rainfalls, as e.g. in May 1962 (117.4 mm). The curve 7 on Figure 2 concerns fluctuations in ground water table in woody ones and higher situated patches of *Stellario-Deschampsietum*, which are being gradually transformed into *Pino-Quercetum* association. For the sake of comparison there are also inserted measurements taken from a well in *Vaccinio myrtilli-Pinetum*, adjacent to the meadow (curve 8), in order to indicate completely different soil and water conditions prevailing on the area of meadows and neighbouring pine forests growing on completely low, dune areas. Differences in elevation between the well in coniferous forest and the lowest situated well on meadows amounts hardly to 140 cm. One can easily imagine how extremally different site and water relations prevail on meadows and on high (20–30 m) dune elevations built up of loose, highly premeable sands. These great site contrasts are very significant for the majority of dune areas, and water relations present the main differentiating factor. On the example of described here meadows one can easily find that even slight (several centimetres), but persistant differences in the level of ground water table decide in a serious way about the soil forming process and the variation in some meadow communities.

The enormous role played by waters in the formation of sites and plant communities was indicated in numerous papers (Kulczyński 1939, Motyka 1947, Pawłowski 1950, Ellenberg 1952, Tüxen 1954, Zarzycki 1958). Since the water level is subjected not only to seasonal and annual fluctuations, but also, as it has been indicated by numerous data, to directional, long termed changes (trends toward the decrease), one could venture a prognosis concerning matters of a general transformation of meadow communities. It is difficult to outline the full course of succession within so limited area, where occur hardly few meadow communities, but certain complicated plant combinations become more understandable, when approached in their suc-

cesive variation aspect, assuming as a basis the undoubted fact of a strict connection and action of water relations upon vegetation. One can consider, for instance, the floristic situation found in the community classified as *Carici-Agrostetum caninae*, the variant with *Carex gracilis*. Taking as a starting point the fact of the constant lowering of ground water table on the area of Forest (J. Kobendza and R. Kobendza 1957) the interpretation of the floristic composition and its genesis would be following. In conditions of the higher level of water there occurred here the association *Caricetum gracilis* or locally *Caricetum rostrato-vesicariae*. (Small patches of these associations may be found even to-day in channels, generally in the vicinity of dug out ditches, where the action of stagnant water is constant). Along with the lowering of ground water table and the shortening of flooding duration there begin to develop species from the class *Scheuchzerio-Caricetea fuscae*. The present floristic composition of this community presents a combination of this group of progressive species together with species from the alliance *Magnocaricion*, as a recessive group. The further direction of natural transformations of this community is an alder wood, similarly as in remaining communities of large sedges. Meadow communities related to *Stellario-Deschampsietum* occupying drier, sandy elevations will undergo further transformations into mixed coniferous forests. Some fragments of elevations grown with oak and birch provide evidences in this respect.

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ZBIOROWISKA ROŚLINNE ŁĄK STRZELECKICH W PUSZCZY KAMPINOSKIEJ

Streszczenie

O zbiorowiskach łąkowych Puszczy Kampinoskiej wiemy dotychczas niewiele. R. Kobendza w swojej monografii z roku 1930 przytacza charakterystykę tylko dwóch zespołów łąkowych. Nie wyczerpuje to, rzecz prosta, kwestii zróżnicowania fitosocjologicznego łąk, które w Puszczy zajmują duże obszary. Powyższy wzgląd był głównym powodem rozpoczęcia fitosocjologicznych badań nad tymi zbiorowiskami. Wybór Łąk Strzeleckich jako wstępnej pracy z tego zakresu podyktowany był tym, że od szeregu lat stanowiły one obiekt badań zoologicznych, a od 1964 r. zlokalizowano na nich zespołowe prace nad produktywnością w ramach Międzynarodowego Programu Biologicznego.

Niniejsza praca ma na celu trzy główne sprawy:

1. Wyróżnienie, identyfikację i charakterystykę fitosocjologiczną zbiorowisk.
2. Wykonanie mapy roślinności rzeczywistej Łąk Strzeleckich w skali 1:2500 (w druku zmniejszona 2:3).
3. Wykazanie związków pomiędzy poszczególnymi zbiorowiskami łąkowymi i czynnikami glebowo-wodnymi.

Łąki Strzeleckie leżą w północno-wschodniej części zabagnionej niecki Ciechowąż w pobliżu wsi Sadowa i Dziekanów Leśny, w nadl. Laski. Obejmują one 66 ha w oddziałach: 33f, 34d, 35j, 53a, b oraz 54a, b.

Łącznie wykonano 133 zdjęcia fitosocjologiczne metodą Braun-Blanqueta (1951). W tabelach uwzględniono, poza stałością, również współczynniki pokrycia gatunków. Dla każdej z wydzielonych jednostek zostały obliczone wartości systematyczne grup syngenetycznych – *D* (Tüxen i Ellenberg 1937) oraz sumy współczynników pokrycia. Wyliczenia te ilustrują tabele VIII i IX.

Wyniki powyższych analiz ułatwiają znacznie nie tylko prawidłową identyfikację jednostek, lecz także pozwalają na ilościową ocenę udziału charakterystycznych grup gatunków, a ponadto rzucają światło na kwestię przemian sukcesyjnych, jakie zachodzą w składzie gatunkowym zbiorowisk.

W celu poznania stosunków glebowych wykopano 41 odkrywek, opisano profile, a z niektórych pobrano próbki do analiz fizyczno-chemicznych oraz analizy botanicz-

nej torfu (tab. X i XI). Przez okres dwóch lat dokonywano pomiarów zwierciadła wód gruntowych w płatach ważniejszych zbiorowisk. Wyniki tych obserwacji łącznie z wykresem opadów zamieszczono na figurze 2.

Na Łąkach Strzeleckich wyróżniono następujące jednostki fitosocjologiczne: z rzędu *Phragmitetalia* W. Koch 1926: 1) zespół *Glycerietum maximae* Hueck 1931, 2) zespół *Caricetum elatae* W. Koch 1926 z trzema wariantami: a) z *Glyceria fluitans*, b) typowy, c) z *Phragmites communis*. Z rzędu *Caricetalia fuscae* W. Koch 1926: zespół *Carici (canescentis)-Agrostetum caninae* Tüxen 1937, z wariantami: a) z *Carex gracilis*, b) z *Calamagrostis neglecta*, c) typowy oraz fację z *Calamagrostis canescens*. Z rzędu *Molinietalia* W. Koch 1926 wyróżniono zbiorowisko zbliżone do zespołu *Stellario-Deschampsietum* Freitag 1959.

Z każdą grupą zbiorowisk wiąże się odmienny kompleks czynników glebowych. Pierwsze trzy zbiorowiska z rzędu *Phragmitetalia* rozwijają się na silnie oglejonych glebach mułowo-torfowych, o wysokim poziomie wód gruntowych, stagnujących przez cały niemal rok na powierzchni gleby. Zbiorowiska z rzędu *Caricetalia fuscae* zajmują gleby mułowo-bagienne. Występują w smugach i obniżeniach wyżej położonych niż zbiorowiska poprzednie. Odbija to się na poziomie zalegania wód gruntowych. Z reguły od lipca do późnej jesieni nie stwierdzono tu zalewów. Gleba wykazuje odczyn kwaśny lub słabo kwaśny (pH 5,3–6,0). W odmiennych warunkach rozwija się zbiorowisko zbliżone do *Stellario-Deschampsietum* z rzędu *Molinietalia*. W płatach tego zbiorowiska woda utrzymuje się stale poniżej powierzchni gleby i tylko wyjątkowo, po długotrwałych ulewach, może dosięgać powierzchni. W tych warunkach tworzą się gleby murszaste oglejone. Zasobność ich w składniki mineralne jest stosunkowo niższa niż gleb poprzednich zbiorowisk. Na podstawie obserwacji wahania wód gruntowych w płatach opisanych zbiorowisk można stwierdzić, że niewielkie nawet, lecz stale utrzymujące się, różnice w zaleganiu wód gruntowych decydują w zasadniczy sposób o procesie glebotwórczym i zróżnicowaniu zbiorowisk łąkowych. Ponieważ poziomy wód gruntowych ulegają nie tylko sezonowym wahaniom, ale i zmianom długofalowym, kierunkowym (tendencja do obniżania), przeto proces ten powoduje również kierunkowe zmiany sukcesyjne zbiorowisk, które można by streścić następująco: niektóre zbiorowiska rzędu *Phragmitetalia* przekształcają się bezpośrednio w olsy, zespół *Caricetum gracilis* w zbiorowiska rzędu *Caricetalia fuscae*, a te z kolei również w olsy, wreszcie zbiorowisko *Stellario-Deschampsietum* wykazuje tendencje do przekształcania się w bory mieszane. Dodać należy, że zmiany te mogą nastąpić, o ile zaprzestanie się koszenia i wypasania łąk.

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Glycerietum maximae Hueck 1931

Tab. I

Successive number of the record	1	2	3	4	5	6	7	8	9	10	Presence %	Presence	Cover coefficient
No. of record	147	148	193	196	207	214	213	217	221	222			
Cover of the herb layer %	90	90	90	100	100	100	100	100	100	100			
Cover of the moss layer %	10	–	–	–	–	–	–	–	10	–			
Number of the species	38	27	27	27	16	19	19	20	19	18			
I. Species characteristic of the association:													
Glyceria aquatica	4.4	5.5	4.4	5.5	5.5	4.5	5.5	4.3	5.5	5.5	100	V	7750
II. *Phragmition*:													
Rumex hydrolapathum	+	+	+	+	+	1.1	+	+	+	+	100	V	59
Ranunculus lingua	+	+	+	.	.	+	.	+	.	.	50	III	5
Phragmites communis	+	1.1	.	.	.	.	+	.	.	1.1	40	II	102
Glyceria fluitans	+	.	+	.	.	.	.	.	.	.	20	I	2
Sium latifolium	.	+	.	+	.	.	.	.	.	.	20	I	2
Heleocharis palustris	.	.	.	.	1.1	.	.	.	.	.	10	I	5
Rorippa palustris	.	.	.	2.3	.	.	.	.	.	.	10	I	175
Sparganium ramosum	.	.	.	.	+	.	.	.	.	.	10	I	1
III. *Magnocaricion*:													
Galium palustre	+	1.1	+	+	2.2	+	+	+	+	+	100	V	233
Carex Hudsonii	2.3	1.2	1.2	.	1.3	2.3	+.2	1.3	2.3	1.3	90	V	776
Carex acutiformis	.	+.2	.	.	.	1.1	1.1	2.1	1.2	.	50	III	326
Peucedanum palustre	+	+	.	.	.	.	+	.	+	+	50	III	5
Carex vesicaria	1.2	.	1.1	.	+	+	.	.	.	.	40	II	102
Lysimachia thyrsiflora	.	.	+	.	.	+	+	.	+	.	40	II	4
Carex rostrata	+.2	.	+	.	1.1	.	.	.	.	.	30	II	52
Carex gracilis	.	.	+	+	.	.	+	.	.	.	30	II	3
Scutellaria galericulata	+	+	.	.	.	.	.	.	.	+	30	II	3
IV. *Phragmitetea*:													
Iris pseudoacorus	1.2	1.2	3.3	+	1.1	1.1	1.1	1.1	+	1.2	100	V	726
Equisetum limosum	+	+	+	.	+	+	+	1.1	1.1	1.1	90	V	156
V. *Alnetea glutinosae*:													
Lycopus europaeus	+	+	+	.	.	+	+	+	+	+	80	IV	8
Calamagrostis canescens	2.2	1.2	2.2	.	.	1.2	.	1.1	+	1.2	70	IV	551
VI. *Scheuchzerio-Caricetea fuscae*:													
Stellaria palustris	+	+	+	+	+	.	.	+	.	.	60	III	6
Menyanthes trifoliata	+.2	+	.	.	.	.	+	1.2	.	1.1	50	III	103
Veronica scutellata	+	.	+	+	.	.	+	+	.	.	50	III	5
Comarum palustre	+	.	+	.	.	+	.	.	.	.	30	II	3
Epilobium palustre	+	.	.	.	.	.	.	.	+	+	30	II	3
VII. *Molinietalia*:													
Lysimachia valgaris	+	+	+	+	.	+	+	+	+	+	90	V	9
Lythrum salicaria	+	+	+	+	+	+	+	.	+	+	90	V	9
Stachys palustris	+	+	+	+	.	.	+	+	+	+	80	IV	8
Myosotis palustris	.	+	1.1	1.1	1.1	.	+	+	.	.	60	III	135
Caltha palustris	+	+	+	.	.	+	.	.	+	.	50	III	5
Equisetum palustre	1.1	.	.	.	.	.	.	.	+	+	30	II	52
VIII. Accompanying species:													
Lemna minor	.	.	+	1.3	.	2.3	3.3	+.2	2.3	3.3	70	IV	1152
Mentha aquatica	.	2.3	1.1	+	+	.	.	.	.	.	40	II	227

Sporadic species:

In the group III: *Carex paradoxa* (1), *Carex riparia* (3, 4), *Carex rostrata* (8), *Cicuta virosa* (2), *Poa palustris* (2, 8); IV: *Alisma plantago-aquatica* (1), *Heleocharis palustris* (3, 5), *Oenanthe aquatica* (1); V: *Salix cinerea* (1), *Solanum dulcamara* (r); VI: *Calamagrostis neglecta* (3, 6), *Calliergon cordifolium* (1), *Ranunculus flammula* (1, 5); VII: *Cardamine pratensis* (2, 8), *Filipendula ulmaria* (1, 2), *Juncus effusus* (1, 6), *Poa trivialis* (2); VIII: *Agrostis alba* (1), *Alnus glutinosa* (1), *Lysimachia nummularia* (4), *Mnium Seligeri* (1, 9), *Ranunculus repens* (1).

Successive number of the record	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	Presence %	Presence	Cover coefficient
No. of record	97	122	128	167	194	204	104	105	112	114	116	117	123	131	1	135	153	168	229	198	134	98	203	206	209	159	155	172	218	173	160	210	219			
Cover of the herb layer %	90	90	100	80	70	70	90	100	100	100	100	90	100	100	100	100	80	90	80	80	100	100	80	90	100	90	100	100	100	90	70	100	100			
Cover of the moss layer %	10	<10	40	20	<10	<10	30	20	10	10	10	30	30	50	<10	<10	–	<10	<10	50	10	20	20	<10	<10	<10	20	<10	<10	<10	–	10	–			
Number of the species	34	25	32	21	18	17	29	32	34	30	33	31	36	26	42	29	31	21	18	28	26	25	28	26	26	28	20	19	21	24	20	19	22			
Variant with	*Glyceria fluitans*						typical																							*Phragmites communis*						
I. Species characteristic of the association:																																				
Carex Hudsonii	3.3	1.3	2.3	1.3	.	+.2	3.4	5.5	5.5	4.4	4.5	4.4	5.5	5.5	3.4	5.5	4.4	4.4	5.5	4.4	5.5	5.5	4.4	4.4	4.4	5.5	5.5	5.5	4.5	4.5	3.3	3.3	3.4	97	V	5765
II. *Magnocaricion*:																																				
Carex vesicaria	1.2	.	2.2	1.3	+.2	1.1	2.2	3.2	3.3	2.3	2.3	2.3	1.2	2.2	3.3	1.2	2.2	2.3	1.2	+.2	2.2	2.2	1.1	1.1	1.1	1.2	1.3	1.1	1.1	1.1	1.2	.	.	91	V	1299
Galium palustre	1.1	1.1	+	1.1	1.1	1.1	+	1.1	+	+	1.1	+	1.1	+	1.1	.	+	.	+	+	1.1	1.1	1.1	+	.	+	.	+	+	+	+	+	+	88	V	187
Peucedanum palustre	+	.	+	.	.	.	.	1.1	1.1	+	1.1	.	+	+	+	1.1	.	.	+	+	+	1.1	+	+	1.1	+	1.1	+	+	+	+	+	+	76	IV	111
Lysimachia thyrsiflora	.	.	.	+	.	+	.	+	+	+	+	.	+	.	+	+	+	1.2	.	+	+	.	+	+	+	+	+	+	+	+	+	+	+	73	IV	22
Scutellaria galericulata	+	.	+	.	.	.	.	+	+	+	.	.	+	.	+	+	.	.	.	+	+	+	+	+	+	+	.	.	+	+	+	.	+	57	III	6
Carex paradoxa	.	.	2.3	.	.	.	.	.	.	.	1.3	.	.	.	+.2	+.3	+.2	.	.	.	.	1.2	.	1.3	2.3	+.2	.	.	.	1.3	.	2.3	1.2	36	II	236
Carex acutiformis	.	.	.	.	.	.	.	.	+.2	2.2	.	.	2.3	.	.	.	1.2	.	.	.	.	.	.	.	2.3	1.1	.	.	2.2	.	.	.	1.1	24	II	256
Carex rostrata	+	.	+	.	1.1	.	2.2	.	.	.	.	+.2	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	21	II	70
Poa palustris	+	.	+	.	.	.	.	.	.	.	.	.	.	.	1.2	+	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	21	II	17
Carex gracilis	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	+	+	.	.	.	.	.	.	12	I	16
Carex riparia	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	I	15
III. *Phragmition*:																																				
Rumex hydrolapathum	+	+	+	+	.	.	+	+	+	+	+	+	+	+	+	+	1.1	+	1.1	1.1	+	+	+	+	+	+.2	+.2	+	+	+	+	+	+	94	V	54
Ranunculus lingua	1.1	.	.	.	.	+	+	+	+	1.1	+	+	+	+	1.1	+	+	+	1.1	+	1.1	+	1.1	+	+	+	+	+	+	+	.	+	+	85	V	16
Glyceria fluitans	3.4	4.4	2.2	4.5	3.4	4.5	+	1.1	+	+	2.2	+	.	1.1	1.2	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	48	III	949
Rorippa amphibia	+	1.1	.	1.1	+	.	2.2	.	+	.	+	1.1	+	+	.	.	.	+	1.1	+	1.1	.	+	.	.	.	+	.	.	.	.	.	.	48	III	132
Sium latifolium	.	.	.	.	+	+	.	+	+	+	+	+	+	+	+	.	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	42	III	4
Glyceria aquatica	+	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	1.2	+	.	.	.	1.2	.	+	.	.	.	.	+	.	.	.	.	27	II	5
Sparganium ramosum	.	+	.	.	.	.	1.1	.	.	.	1.1	1.1	+	.	1.2	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	24	II	62
Phragmites communis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	3.4	3.4	3.4	12	I	357
IV. *Phragmitetalia*:																																				
Iris pseudoacorus	+.2	.	+.2	+	+	+	1.2	1.2	1.2	1.2	1.2	1.2	+	1.2	1.2	1.2	1.2	+	+	1.2	+.2	1.1	1.1	1.1	1.1	2.2	+	1.2	2.1	1.1	1.1	+	+	97	V	382
Equisetum limosum	1.1	.	+	+	+	1.1	+	1.1	+	1.2	1.2	.	.	.	1.1	1.1	1.1	1.1	+	+	1.2	2.3	2.1	1.1	1.1	1.1	1.1	1.1	2.1	2.2	.	+	+	85	V	442
Heleocharis palustris	1.1	1.1	.	2.4	3.4	2.1	+	.	.	.	+	1.2	.	.	+	.	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	36	II	267
Alisma plantago-aquatica	.	+	.	+	+	.	+	+	+	.	.	+	.	.	+	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	30	II	3
Oenanthe aquatica	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	I	1
V. *Alnetea glutinosae*:																																				
Calamagrostis canescens	1.1	+	.	.	.	.	1.3	.	2.2	2.3	.	+	1.2	+.2	1.2	1.2	2.2	+	+.2	1.2	2.2	2.2	1.2	1.1	1.2	.	1.3	1.2	1.1	3.3	.	1.1	1.1	76	IV	479
Lycopus europaeus	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	+	+	.	.	+	+	+	+	.	.	+	.	+	+	+	1.3	.	.	45	III	5
Salix cinerea	.	.	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	15	I	16
VI. *Caricetalia fuscae*																																				
Stellaria palustris	+	+	+	.	+	.	+	+	+	+	+	+	.	+	1.1	+	+	+	.	.	+	+	.	+	+	+	+	+	+	+	+	.	+	79	IV	23
Ranunculus flammula	1.1	1.1	1.1	+	+	+	+	.	+	.	+	1.1	+	+	1.2	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	45	III	79
Veronica scutellata	.	+	.	+	.	+	.	+	+	.	.	+	+	.	+	.	+	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	+	42	III	4
Agrostis canina var. *stolonifera*	1.2	2.3	2.2	2.2	1.2	2.1	.	.	+	+	.	+.2	1.1	2.2	1.2	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	39	II	327
Epilobium palustre	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	+	+	.	+	30	II	3
Juncus articulatus	+	+	.	.	.	+	+	+	.	+	+	+	.	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	27	II	18
VII. *Scheuchzerio-Caricetea fuscae*:																																				
Comarum palustre	1.1	.	+	.	.	.	+	1.2	+	+	+	+.2	1.1	2.2	1.2	+	1.1	.	+	1.1	1.2	+	+	1.1	1.1	.	.	.	.	+	.	+	.	67	IV	193
Drepanocladus aduncus var. *polycarpus*	+.2	1.2	2.2	2.3	+.2	.	3.3	2.2	2.2	2.2	.	3.3	2.3	2.2	+.2	.	.	.	.	+.2	2.3	.	2.2	.	+.2	.	.	.	.	.	.	.	.	51	III	721
Carex lasiocarpa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.2	1.2	+.2	2.3	1.3	1.2	1.1	1.1	1.2	1.1	+.2	1.2	.	36	II	228
Menyanthes trifoliata	.	.	1.1	.	.	.	.	.	.	.	1.1	.	+	.	+	1.2	1.2	.	.	.	.	2.2	.	.	2.3	+.2	.	.	.	.	.	.	.	27	II	170
Eriophorum angustifolium	+	.	+	.	+	.	+	.	.	.	.	+.2	.	.	+.2	.	.	.	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	27	II	3
Pedicularis palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	3	I	1
VIII. *Molinietalia*:																																				
Lythrum salicaria	+	+	+	+	.	.	+	+	+	+	+	+	+	+	+	+	+	1.1	+	+	+	.	+	+	+	+	+	+	+	+	+	+	+	91	V	22
Lysimachia vulgaris	+	.	+	.	.	+	+	1.2	+	+	.	+	1.1	+	1.1	1.1	+	+	+	+	1.1	1.1	1.1	1.1	+	+	1.1	1.1	1.1	+	+	1.1	1.1	+	88	V	202
Caltha palustris	1.1	1.1	1.1	+	+	+	1.1	1.1	1.1	1.2	1.1	1.1	1.1	2.2	1.1	+	+	+	+	.	1.1	.	+	+	+	+	+	.	.	.	+	.	+	.	79	IV	239
Stachys palustris	.	.	+	.	.	.	.	+	+	+	+	.	+	+	+	.	.	+	+	+	+	+	+	.	+	+	+	.	+	.	.	+	+	64	IV	6
Cardamine amara	+	.	+	.	.	.	.	+	+	+	+	+	.	+	+	+	+	+	+	+	.	+	+	.	.	+	+	.	.	+	+	.	.	61	IV	6
Myosotis palustris	+	1.1	.	+	+	+	+	+	+	.	.	1.1	+	+	1.1	+	+	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	48	III	49
Juncus effusus	+.2	+.2	+.2	.	+.2	.	1.3	+.2	.	+.2	1.3	+.2	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	30	II	33
IX. Accompanying species:																																				
Ranunculus repens	1.1	1.1	1.1	.	.	.	1.1	1.1	1.1	1.1	2.2	1.1	1.1	+	1.1	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	45	III	206
Mentha aquatica	.	.	.	+	.	.	.	.	1.1	1.1	+	.	1.1	.	.	.	.	.	.	.	+	1.1	.	+	.	+	.	.	.	.	.	+	+	33	II	63
Mentha arvensis	+	+	1.1	.	.	.	.	1.1	.	.	1.1	.	+	.	+	+	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	30	II	48
Acrocladium cuspidatum	.	.	2.2	.	.	.	.	.	.	.	.	+.2	1.3	.	.	+	.	.	.	1.1	+.2	+.2	1.3	.	.	.	.	2.2	.	.	.	1.3	.	30	II	168
Hottonia palustris	.	+	.	+	.	.	.	+	.	.	+	.	+	+	.	.	.	.	+.2	+.2	.	.	.	.	.	.	.	.	+	.	.	.	.	27	II	3
Lysimachia nummularia	.	+	.	.	.	.	.	+	+	+	+	.	1.2	.	.	.	.	.	.	+.2	.	+	.	.	.	.	.	.	.	.	.	.	.	24	II	17
Mnium Seligeri	+	.	.	.	.	.	.	2.3	+	1.2	1.2	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	+.2	.	.	.	21	II	85

Sporadic species: In the group VIII: *Cirsium palustre* (3, 16), *Equisetum palustre* (1, 3, 7, 12, 15, 17), *Lathyrus paluster* (9), *Lotus uliginosus* (15), *Lychnis flos-cuculi* (14, 15), *Poa trivialis* (13), *Scirpus silvaticus* (8); IX: *Agrostis alba* (7), *Alnus glutinosa* (16, 26), *Alopecurus aequalis* (2, 26), *Berula erecta* (18), *Fontinalis antipyretica* (9, 11, 19), *Lemna minor* (33), *Lemna trisulca* (17, 26, 31), *Mnium cuspidatum* (13), *Polygonum hydropiper* (15).

Tab. III

Successive number of the record	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Presence %	Presence	Cover coefficient
No. of record	138	139	151	154	156	157	158	161	174	152	176	177	181	186	187	205	216	223	230			
Cover of the herb layer %	100	100	90	80	90	100	90	80	90	80	90	90	100	100	90	100	100	90	100			
Cover of the moss layer %	60	40	70	50	60	30	20	60	70	10	100	60	30	40	40	40	40	40	30			
Number of the species	40	40	43	29	31	31	39	31	39	33	28	38	39	33	33	35	36	33	32			
I. Species characteristic of the association:																						
Carex paradoxa	4.5	5.4	3.3	4.3	3.4	4.5	4.5	1.2	4.4	+.2	2.2	4.3	4.4	4.5	3.4	4.3	3.3	4.4	4.4	100	V	4987
II. *Magnocaricion.*																						
Carex vesicaria	2.2	1.2	2.2	2.2	2.1	1.1	+	3.3	1.1	+	1.1	2.1	2.3	1.1	3.3	1.1	1.1	+	.	95	V	1133
Galium palustre	1.1	1.1	1.2	+	+	1.2	1.2	1.1	1.1	+	.	1.1	+	.	+	+	+	+	+	89	V	215
Peucedanum palustre	1.1	+	+	+	.	1.1	1.1	.	+	.	.	+	1.1	1.1	1.1	+	+	1.1	+	79	IV	188
Scutellaria galericulata	+	+	.	+	+	+	+	+	+	+	.	.	+	+	+	+	+	+	.	79	IV	8
Poa palustris	1.2	1.1	+	+	+	+	+	.	+	.	.	+	+	+	+	1.1	.	.	1.1	74	IV	110
Carex gracilis	3.1	2.2	+	.	+	.	.	+	+	.	.	+	3.3	1.1	.	+	2.1	2.1	.	63	IV	700
Carex acutiformis	.	1.2	1.1	2.1	.	1.1	1.2	.	+	4.5	.	+	.	.	+	1.1	.	1.1	+	63	IV	581
Carex rostrata	+.2	1.2	1.2	+	+	1.2	.	1.2	.	+	+	+	.	2.1	.	+	.	.	.	63	IV	201
Lysimachia thyrsiflora	+	.	.	.	+	.	.	+	+	.	.	+	+	+	.	+	.	+	.	47	III	5
Carex Hudsonii	.	.	.	.	1.3	.	.	.	+.2	.	.	.	.	+.2	.	.	.	.	.	16	I	27
III. *Phragmitetalia:*																						
Iris pseudoacorus	+.2	+.2	+	.	+	+	1.2	+	+	1.1	+	+	1.2	1.1	.	1.1	1.1	+	.	84	V	163
Equisetum limosum	+	+	1.1	+	+	+	2.1	+	1.1	1.1	1.1	+	1.1	1.1	1.1	1.1	1.1	+	.	95	V	333
Rumex hydrolapathum	+	+	.	.	.	.	.	.	.	+	.	.	+	+	.	+	+	+	+	47	III	5
Heleocharis palustris	.	.	+	+	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	26	II	3
Ranunculus lingua	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	.	+	+	26	II	3
IV. *Alnetalia glutinosae:*																						
Calamagrostis canescens	1.2	1.2	3.3	1.2	2.2	2.2	2.3	2.2	3.3	2.3	1.1	2.2	2.2	1.1	2.1	2.2	2.2	2.2	2.2	100	V	1631
Lycopus europaeus	.	.	+	.	.	+	+	.	.	+	.	.	+	+	+	+	+	+	+	58	III	6
Salix cinerea	.	+	+	.	.	.	+	.	.	.	.	+	.	.	+	+	.	+	+	42	III	4
Dryopteris thelypteris	.	.	.	+.2	.	1.2	.	.	.	+.2	.	.	2.2	.	.	.	+	.	2.2	32	II	212
V. *Scheuchzerio-Caricetea fuscae:*																						
Comarum palustre	2.1	2.2	2.2	1.1	2.2	1.1	1.1	1.2	2.1	1.1	2.1	2.1	2.1	.	+	2.1	.	1.1	1.1	89	V	2013
Eriophorum angustifolium	1.1	+	+	+	1.1	1.1	+	1.1	.	+	2.1	2.1	1.1	.	+	+	1.1	+	.	84	V	346
Carex lasiocarpa	+.2	1.3	+	.	1.1	+	+	.	1.1	+	.	1.2	1.2	2.3	2.3	3.3	+.2	.	2.3	79	IV	608
Stellaria palustris	+	+	+	+	.	+	+	+	+	+	.	+	+	+	.	.	+	+	.	74	IV	7
Veronica scutellata	+	+	+	.	+	+	+	+	+	+	.	.	+	.	+	+	+	.	+	74	IV	7
Epilobium palustre	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	+	68	IV	7
Carex fusca	+	+.2	2.2	.	.	.	.	1.2	2.1	.	2.3	1.1	.	+.2	+.2	1.1	2.2	.	.	58	III	449
Drepanocladus aduncus var. *polycarpus*	3.3	1.2	2.2	.	.	.	+.2	2.3	1.2	.	2.2	1.2	1.2	.	.	.	.	.	.	47	III	579
Menyanthes trifoliata	.	1.2	+.2	.	.	1.2	.	.	2.3	+	.	1.1	.	+	2.3	.	.	.	.	47	III	291
Ranunculus flammula	+	+	.	.	+	.	.	+	+	.	1.1	+	.	.	+	+	.	.	.	47	III	30
Agrostis canina var. *stolonifera*	1.2	+.2	+	1.2	.	.	1.2	3.3	.	+	.	.	+	.	.	.	.	.	.	42	III	278
Carex canescens	1.2	1.2	+.2	.	.	.	.	2.2	1.2	.	4.4	1.2	.	.	.	.	.	.	.	37	II	526
Calliergon cordifolium	1.2	.	.	1.2	.	.	.	.	.	.	.	2.3	3.3	3.3	.	2.2	.	.	.	32	II	631
Pedicularis palustris	.	.	+	+	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	32	II	3
VI. *Molinio-Arrhenatheretea:*																						
Lysimachia vulgaris	.	+	+	+	1.1	1.1	1.1	+	1.1	+	+	+	+	+	1.1	+	+	+	+	95	V	138
Caltha palustris	2.1	1.2	1.1	+.2	1.1	1.1	1.2	1.2	1.1	+	1.1	+	1.1	2.1	.	1.1	+	+	.	89	V	450
Lythrum salicaria	+	+	+	+	+	+	.	.	+	+	+	+	+	+	+	+	+	+	+	89	V	8
Cardamine pratensis	+	+	1.1	+	.	+	+	.	+	+	+	+	.	+	.	+	.	.	.	63	IV	32
Filipendula ulmaria	.	+	+	+	.	+	+	+	.	.	.	+	+	.	.	.	+	+	+	58	III	5
Rumex acetosa	.	+	+	.	+	+	+	.	+	.	.	.	.	+	+	.	+	+	+	58	III	5
Lychnis flos-cuculi	+	+	.	.	.	+	+	.	+	.	.	+	+	.	.	.	+	+	+	53	III	5
Orchis latifolia	+	.	+	.	+	+	+	+	+	.	.	+	.	.	.	.	+	.	.	47	III	4
Ranunculus acer	.	.	.	.	+	+	+	.	+	.	.	.	.	+	+	.	+	+	+	47	III	4
Cirsium palustre	+	+	.	+	.	+	+	.	.	.	.	.	.	+	+	.	.	.	+	42	III	4
Juncus effusus	.	.	.	.	+.2	.	.	.	.	.	.	+.2	+	+	.	+	+	+	+	42	III	4
Stachys palustris	+	+	+	.	.	.	+	.	.	+	.	.	+	.	.	.	+	.	+	42	III	4
Climacium dendroides	.	.	.	.	.	.	.	.	2.2	.	+.2	.	+.2	+.2	+.2	.	1.2	1.2	.	37	II	146
Myosotis palustris	.	.	1.1	.	.	.	+	.	.	+	.	+	.	+	.	.	.	.	+	32	II	29
Deschampsia caespitosa	.	.	.	.	+	+	+	+	.	.	+	.	.	.	+.2	.	.	.	.	32	II	3
Poa pratensis	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	+	+	+	26	II	2
Poa trivialis	.	.	.	.	+.2	.	+	.	.	.	.	.	.	.	.	1.1	1.2	.	.	21	II	54
VII. Accompanying species:																						
Acrocladium cuspidatum	2.2	3.3	3.4	3.4	.	.	2.3	3.4	3.3	1.2	5.5	3.4	.	2.2	2.3	3.3	3.3	3.3	2.3	84	V	2723
Ranunculus repens	1.1	1.1	+	+	+	.	1.1	+	1.1	+	1.1	1.1	+	1.1	1.1	1.1	.	+	.	84	V	240
Mnium Seligeri	.	.	1.2	.	.	.	+.2	+.2	1.2	1.2	+.2	+	1.2	.	.	1.2	.	+.2	1.2	58	III	160
Mentha arvensis	.	.	+	+	.	.	.	+	+	.	.	.	.	+	+	+	+	+	.	47	III	5
Mentha aquatica	+	+	.	.	+	+	+	.	.	+	.	.	.	.	.	.	.	.	1.1	37	II	29
Valeriana officinalis	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	21	II	2

Sporadic species:

In the group III: *Glyceria aquatica* (2, 18), *Glyceria fluitans* (1, 2, 8); IV: *Carex elongata* (1, 2), *Salix pentandra* (1, 3); V: *Agrostis canina* (9, 11, 12), *Calamagrostis neglecta* (3), *Juncus articulatus* (3, 11, 16); VI: *Cirsium oleraceum* (17), *Equisetum palustre* (1), *Galium uliginosum* (13), *Lathyrus paluster* (1, 3), *Lotus uliginosus* (9), *Vicia cracca* (18); VII: *Agrostis alba* (5, 8), *Alnus glutinosa* c (15), *Aulacomium palustre* (11, 15), *Carex leporina* (17), *Lysimachia nummularia* (9), *Phalaris arundinacea* (13, 19), *Potentilla erecta* (5), *Salix rosmarinifolia* c (12), *Trifolium repens* (3).

Carici-Agrostetum caninae Tx. 1937 variant with *Carex gracilis*

Tab. IV

Successive number of the record	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Presence %	Presence	Cover coefficient
No. of record	100	101	102	110	120	135	136	137	144	145	140	141	142	146	162	164	166	170	171	183			
Cover of the herb layer %	90	90	80	80	80	80	80	90	70	80	90	70	90	100	100	80	90	80	90	100			
Cover of the moss layer %	70	80	70	90	60	90	60	50	90	30	60	20	60	10	30	90	100	60	90	50			
Number of the species	22	25	24	27	22	26	26	22	26	22	23	23	28	24	27	27	27	21	21	27			
I. Species characteristic of the association:																							
Agrostis canina var. *stolonifera*	2.2	2.3	2.2	3.3	3.3	2.2	1.2	2.3	1.2	3.3	1.2	+	1.2	3.3	1.2	.	2.2	+	1.2	2.2	95	V	1514
Veronica scutellata	.	.	.	+	.	+	.	+	+	.	+	.	+	+	.	+	+	.	+	+	55	III	5
Carex canescens	.	.	.	.	.	.	.	.	2.2	+.2	.	.	+.2	+.2	1.2	.	.	.	+.2	.	30	II	114
II. *Caricion canescentis-fuscae*:																							
Stellaria palustris	+	+	+	1.1	+	+	+	+	+	.	+	+	+	1.1	.	+	+	+	+	+	90	V	58
Juncus articulatus	+	+	+	1.1	+	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	40	II	28
Epilobium palustre	.	.	.	.	.	.	.	.	.	+	+	.	.	+	+	+	.	.	.	+	30	II	3
III. *Scheuchzerio-Caricetea fuscae*:																							
Comarum palustre	+	2.3	2.3	+	1.1	+	1.1	+	2.1	2.3	1.1	+	1.1	2.2	2.2	2.2	1.2	1.1	2.1	1.1	100	V	877
Calliergon cordifolium	2.2	4.4	4.5	3.2	4.4	4.4	3.3	3.3	4.5	2.3	3.4	2.2	3.4	1.2	.	4.5	5.5	3.3	3.4	3.4	95	V	4100
Drepanocladus aduncus var. *polycarpus*	4.4	2.3	2.3	4.4	2.2	2.3	2.3	2.2	2.3	2.2	2.3	2.2	2.2	.	2.3	2.3	1.2	2.3	4.4	1.2	95	V	2212
Eriophorum angustifolium	+	1.1	1.1	1.1	.	1.1	2.2	1.1	1.1	2.3	1.1	+	1.1	1.1	1.1	1.1	+	1.1	1.1	2.1	95	V	589
Carex fusca	.	2.3	3.3	1.2	3.4	+	1.2	2.2	2.2	1.2	.	.	1.2	+	1.2	1.2	1.2	.	.	.	70	IV	813
Ranunculus flammula	2.2	1.1	1.1	1.1	1.1	+	1.1	.	+	+	.	.	.	.	+	+	+	+	.	.	65	IV	216
Menyanthes trifoliata	.	.	.	+	+.2	.	.	.	+	1.2	.	1.3	.	.	+.2	1.2	.	.	.	.	35	II	77
Calamagrostis neglecta	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	+	+	.	25	II	2
Pedicularis palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	10	I	1
IV. *Magnocaricion*:																							
Carex gracilis	3.3	3.3	2.2	2.3	2.3	4.4	2.2	4.5	1.2	1.2	1.1	+.2	3.4	4.5	4.4	4.5	4.5	1.1	3.4	4.5	100	V	3388
Carex vesicaria	3.3	+.2	1.2	2.3	2.2	2.2	3.3	1.2	+.2	2.3	4.4	1.2	3.4	2.3	3.3	+	+	3.3	2.2	2.1	100	V	1939
Galium palustre	1.2	1.1	1.1	1.2	1.1	1.2	1.2	2.2	+.2	1.1	2.2	1.1	2.3	2.3	1.2	1.2	2.2	2.2	2.2	+	100	V	888
Carex rostrata	+.2	1.2	.	2.2	.	.	1.1	.	.	3.3	2.3	3.4	1.2	.	+	+	.	2.3	.	+	60	III	714
V. *Phragmitetalia*:																							
Glyceria fluitans	+	1.1	1.1	1.1	+	1.2	+	1.2	.	+	.	1.2	1.1	+	+	+	+	+	.	.	80	IV	179
Iris pseudoacorus	.	+.2	+.2	1.2	.	.	+.2	+.2	.	1.1	+	+	+	1.1	+	+	.	+	+	+	75	IV	81
Heleocharis palustris	+	+	.	+	.	1.1	+	.	.	.	.	1.1	+	+	.	.	+	+	+	.	55	III	54
Equisetum limosum	.	.	.	.	.	+	1.1	.	+	.	1.1	.	.	+	+	.	+	.	1.1	+	45	III	78
VI. *Molinietalia*:																							
Caltha palustris	1.1	2.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	+	+.2	1.1	.	1.1	95	V	488
Cardamine pratensis	+	1.1	+	.	+	+	+	1.1	.	+	1.1	+	+	+	+	+	+	+	+	+	90	V	82
Lythrum salicaria	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	+	90	V	9
Myosotis palustris	1.2	+	+	+	+	+	+	+	.	.	+	2.2	1.1	.	+	+	+	.	.	+	77	IV	143
Juncus effusus	1.3	+.2	2.3	2.3	1.3	1.2	1.2	1.2	.	.	+.2	.	1.2	.	+.2	.	+.2	+	.	.	65	IV	327
Lysimachia vulgaris	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	+	.	.	1.1	25	II	27
VII. Accompanying species:																							
Ranunculus repens	2.2	1.1	3.3	1.2	2.2	1.1	2.1	1.1	+	.	+	+	+	.	1.1	2.1	1.1	+	+	1.1	90	V	715
Lysimachia nummularia	.	1.1	+	+	.	+	.	1.1	+	+	.	.	1.1	+	+	.	.	+	.	.	55	III	79
Calamagrostis canescens	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+.2	+	.	.	+	3.4	25	II	189
Mentha arvensis	+	+	.	.	+	.	+	.	.	.	+	.	.	.	.	+	+	.	.	1.1	40	II	28

Sporadic species:

In the group IV: *Poa palustris* (2, 6, 14, 19), *Lysimachia thyrsiflora* (6, 14, 15, 20), *Carex acutiformis* (7, 9), *Carex diandra* (19), *Carex Hudsonii* (12), *Carex paradoxa* (9), *Peucedanum palustre* (20); V: *Alisma plantago-aquatica* (4, 9, 12), *Rorippa amphibia* (5, 17), *Ranunculus lingua* (8), *Rumex hydrolapathum* (14); VI: *Equisetum palustre* (3, 5, 6, 7), *Lotus uliginosus* (13), *Lychnis flos-cuculi* (1, 3, 6), *Poa pratensis* (17); VII: *Abietinella abietina* (1), *Acrocladium cuspidatum* (15, 16, 20), *Alnus glutinosa* (4), *Alopecurus aequalis* (8), *Carex elongata* (9, 10, 13, 14), *Carex gracilis* x *C. fusca* (9, 10, 13), *Hottonia palustris* (4), *Lycopus europaeus* (20), *Mnium* sp. (11, 13), *Potentilla anserina* (17), *Salix cinerea* c (3), *Scirpus silvaticus* (7), *Utricularia vulgaris* (9).

Carici-Agrostetum caninae Tx. 1937 variant with *Calamagrostis neglecta*

Tab. V

Successive number of the record	1	2	3	4	5	6	7	8	9	10	11	12	13	Presence %	Presence	Cover coefficient
No. of record	178	180	185	188	190	191	199	202	211	197	215	227	231			
Cover of the herb layer %	70	70	100	100	90	100	90	80	90	100	90	80	100			
Cover of the moss layer %	90	80	70	30	40	60	70	90	40	20	80	90	70			
Number of the species	22	20	35	23	25	24	26	24	26	38	23	24	21			
I. Species characteristic of the association:																
Agrostis canina var. *stolonifera*	1.2	1.2	2.2	1.2	2.1	1.2	2.2	1.2	2.3	2.3	2.2	1.2	2.3	100	V	1173
Carex canescens	.	.	.	.	.	.	.	.	1.2	1.2	.	+	+	31	II	78
Veronica scutellata	.	.	1.1	.	.	+	.	+	.	1.1	.	.	.	31	II	78
II. *Caricion canescentis-fuscae*:																
Ranunculus flammula	+	+	+	+	+	+	+	+	+	+	+	.	+	92	V	9
Epilobium palustre	.	.	+	.	+	.	+	.	+	+	+	+	+	62	IV	6
Stellaria palustris	+	.	+	.	.	+	.	+	+	.	.	+	+	55	III	5
Juncus articulatus	.	.	+	.	.	.	.	+	.	+	+	+	.	38	II	4
III. *Caricetalia fuscae*:																
Calamagrostis neglecta	3.3	5.5	4.5	4.5	3.4	4.5	4.5	4.5	4.5	2.3	3.3	4.5	4.5	100	V	4908
Carex fusca	2.3	2.1	3.3	1.2	2.2	3.4	2.3	3.3	2.1	3.3	2.1	3.3	1.1	100	V	2865
IV. *Scheuchzerio-Caricetea fuscae*:																
Comarum palustre	1.1	2.2	1.1	1.1	1.1	2.2	3.3	2.2	1.1	3.3	2.3	3.3	2.3	100	V	1731
Eriophorum angustifolium	+	1.1	2.1	1.1	1.1	2.1	1.1	1.1	2.1	2.1	1.1	1.1	+	100	V	809
Drepanocladus aduncus var. *polycarpus*	4.5	1.2	.	2.2	1.2	2.2	4.3	2.3	1.2	1.2	3.3	4.4	2.3	92	V	2423
Calliergon cordifolium	3.4	4.5	3.3	2.2	3.4	1.2	1.2	1.2	+.2	+.2	.	1.2	2.3	92	V	1771
Menyanthes trifoliata	1.2	.	1.2	1.2	+	.	.	1.1	.	1.1	.	.	+.2	55	III	194
Carex lasiocarpa	.	.	+.2	.	.	.	.	.	.	.	.	.	.	8	I	1
V. *Phragmitetalia*:																
Galium palustre	1.1	+	2.1	1.2	+	+	+	1.1	+	1.1	1.2	+	+	100	V	332
Carex vesicaria	2.3	1.2	2.1	2.3	2.2	2.1	1.1	+	1.1	+	+	+	.	92	V	791
Iris pseudoacorus	+	+	+	1.2	+.2	+.2	+	+	.	+	+	+	.	85	V	46
Carex gracilis	1.1	.	.	+	1.3	,	.	.	+	+	1.2	.	.	46	III	115
Glyceria fluitans	+	1.1	+	.	.	.	.	.	+	+	.	+	.	46	III	42
Equisetum limosum	.	.	+	2.1	+	.	+	.	.	+	.	.	.	38	II	138
Carex paradoxa	.	+.2	1.2	.	.	.	.	.	.	1.2	.	+.2	.	31	II	78
Heleocharis palustris	.	.	+	.	.	.	.	.	+	+	1.1	.	.	31	II	41
Lysimachia thyrsiflora	.	.	+	1.1	.	.	.	.	.	.	+	+	.	31	II	41
Peucedanum palustre	.	.	1.2	.	+	+	.	.	.	.	.	.	.	23	II	40
Rumex hydrolapathum	.	.	.	+	+	.	.	.	.	+	.	.	.	23	II	40
VI. *Molinio-Arrhenatheretea*:																
Lythrum salicaria	+	+	+	+	+	+	+	+	+	+	+	+	+	100	V	10
Caltha palustris	1.1	+	2.1	1.1	1.1	1.1	1.1	1.1	.	1.1	1.1	1.1	+	92	V	482
Juncus effusus	+.2	.	.	.	.	+.2	+	+.2	+	1.2	+	.	.	55	III	43
Lysimachia vulgaris	+	.	+	+	+	+	+	.	.	.	.	.	+	55	III	5
Poa trivialis	.	.	+	+	1.2	.	+	+	.	+	+	.	.	55	III	35
Cardamine pratensis	.	.	+	+	.	.	.	.	+	+	+	.	.	38	II	4
Deschampsia caespitosa	.	+	.	.	.	.	+	.	.	.	.	.	+	23	II	2
Poa pratensis	.	.	+	.	.	.	+	+	.	.	.	.	.	23	II	2
VII. Accompanying species:																
Acrocladium cuspidatum	1.2	3.2	2.3	.	.	3.4	2.3	4.5	3.4	5.5	3.4	2.3	3.4	85	V	3038
Ranunculus repens	1.1	+	+	1.1	.	+	+	+	+	+	.	+	+	85	V	838
Calamagrostis canescens	.	.	+	1.1	2.1	.	+	1.1	1.1	+	+	1.2	+	77	IV	292
Mentha arvensis	.	+	1.1	.	+	.	+	.	+	+	.	+	+	62	IV	44
Lysimachia nummularia	.	.	.	.	.	+	+	.	.	+	+	.	.	31	II	3
Carex gracilis x *C. fusca*	.	.	+	.	3.3	.	.	.	.	2.3	.	.	.	23	II	424
Mnium sp.	.	.	+	.	.	.	.	.	+.2	+	.	.	.	23	II	2
Salix cinerea	.	.	.	.	.	+	.	.	+	+	.	.	.	23	II	2

Sporadic species:

In the group V: *Carex rostrata* (1, 9), *Sium latifolium* (5, 8); VI: *Myosotis palustris* (3, 7), *Lychnis flos-cuculi* (6, 10), *Ranunculus acer* (10); VII: *Alnus glutinosa* (2), *Carex elongata* (10), *Lycopus europaeus* (6), *Potentilla anserina* (12).

Carici-Agrostetum caninae Tx. 1937 variant typical

Tab. VI

Successive number of the record	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Presence %	Presence	Cover coefficient
No. of record	127	125	96	106	107	124	225	226	175	192	200	197	195	220	182	228			
Cover of the herb layer %	70	70	90	100	100	100	80	90	70	90	80	100	90	80	80	90			
Cover of the moss layer %	40	30	80	70	70	60	70	60	90	80	80	20	30	80	30	70			
Number of the species	28	25	31	28	30	27	33	31	23	28	22	29	22	21	27	27			
I. Species characteristic of the association:																			
Agrostis canina var. *stolonifera*	3.3	2.3	3.3	3.3	2.3	3.3	1.2	3.4	1.1	2.2	2.3	1.2	2.1	2.3	3.3	2.3	100	V	2266
Carex canescens	.	1.1	2.2	.	2.2	1.2	+	1.1	2.2	1.2	3.3	+	.	1.1	.	1.1	75	IV	751
Veronica scutellata	+	.	+	.	.	+	+	+	+	.	+	.	+	+	+	+	69	IV	7
II. *Caricion canescentis-fuscae*:																			
Ranunculus flammula	.	+	1.2	.	1.1	1.1	+	+	1.1	1.1	+	+	.	.	+	+	75	IV	160
Stellaria palustris	+	+	+	+	+	+	+	.	+	+	+	.	+	+	.	.	75	IV	8
Juncus articulatus	+	.	1.1	+	.	.	1.1	+	+	1.1	.	+	.	.	+	+	62	IV	98
Epilobium palustre	+	.	.	.	+	.	+	+	.	.	.	+	+	+	+	+	56	III	7
III. *Caricetalia fuscae*:																			
Carex fusca	1.2	3.3	3.3	2.4	3.3	2.3	3.4	3.4	3.1	4.4	1.2	3.3	2.2	2.3	2.1	3.4	100	V	2875
Calamagrostis neglecta	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	12	I	1
IV. *Scheuchzerio-Caricetea fuscae*:																			
Comarum palustre	1.2	2.2	3.3	1.1	2.2	1.1	1.1	2.3	3.3	3.3	3.3	2.3	2.1	2.1	2.1	3.3	100	V	1937
Drepanocladus aduncus var. *polycarpus*	3.3	.	4.4	2.3	2.3	3.3	2.2	3.3	1.1	.	4.5	1.2	2.2	1.2	.	+.3	81	V	2013
Eriophorum angustifolium	+	.	2.1	.	+	.	1.1	1.1	1.1	1.1	+	+	1.1	+	1.1	+	81	V	300
Calliergon cordifolium	1.2	.	2.2	4.3	.	.	3.4	2.3	3.4	.	1.1	.	+.2	3.3	2.3	2.2	69	IV	1594
V. *Phragmitetalia*:																			
Galium palustre	+	+	1.2	+	1.1	+	2.2	1.1	2.1	1.1	+	1.2	.	1.2	1.1	+	94	V	441
Carex vesicaria	1.2	+.2	2.2	.	1.2	+.2	+.2	.	2.1	1.1	+	1.2	2.1	1.1	1.1	+	87	V	518
Iris pseudoacorus	+.2	.	+	.	+.2	+	+	+	.	.	.	+	+	.	+	+	62	IV	6
Glyceria fluitans	+	+	1.1	.	+	+	+	.	+	.	+	+	.	.	.	.	56	III	36
Equisetum limosum	+	+	+	.	+	.	+	.	.	.	.	.	+	+	+	.	50	III	5
Carex gracilis	.	.	+.3	1.2	+	.	.	1.1	.	.	.	1.1	.	.	.	.	31	II	95
Lysimachia thyrsiflora	.	.	.	.	.	+	+	.	.	.	.	+	+	.	.	.	27	II	3
Scutellaria galericulata	.	+	+	.	.	.	.	.	.	.	.	+	.	.	+	.	27	II	3
VI. *Molinio-Arrhenatheretea*:																			
Lythrum salicaria	+	.	+	+	+	+	+	+	+	+	+	.	+	+	+	+	87	V	9
Caltha palustris	.	1.1	2.2	1.1	1.1	1.1	.	+	+	1.1	1.1	1.1	1.1	.	1.1	1.1	81	V	423
Juncus effusus	.	+.2	+.2	+	+.2	+.2	1.3	+.2	+.2	2.2	+.2	.	.	.	.	2.3	69	IV	225
Cardamine pratensis	.	.	+	+	.	+	+	+	+	.	.	+	+	.	+	.	62	IV	6
Deschampsia caespitosa	.	+	+	+.2	+	+.2	+	+	+	+	.	.	.	.	.	.	56	III	7
Lychnis flos-cuculi	.	+	+	1.1	+	+	.	+	+	+	.	+	.	.	.	.	56	III	36
Lotus uliginosus	+	+	.	1.1	.	.	.	.	.	1.2	.	+	.	.	+	+	44	III	65
Lysimachia vulgaris	+	+	.	.	.	.	+	+	.	.	.	+	+	.	.	+	44	III	4
Myosotis palustris	+	.	.	+	+	+	1.1	.	.	+	.	+	.	.	.	.	44	III	35
Poa trivialis	+	+	.	1.1	2.1	+	.	.	.	.	+	1.2	.	.	.	.	44	III	174
Galium uliginosum	.	+	.	1.3	.	.	.	+	.	+.2	.	.	.	.	.	.	27	II	33
Orchis latifolia	.	.	.	+	.	+	.	.	.	.	.	.	.	.	+	+	27	II	3
VII. Accompanying species:																			
Ranunculus repens	2.2	2.2	2.2	2.2	2.3	2.3	+	+	+	1.1	+	+	+	+	1.1	1.1	100	V	754
Acrocladium cuspidatum	.	3.3	1.3	1.3	4.4	.	2.2	2.3	3.4	5.5	2.3	2.3	2.2	2.3	1.2	4.4	87	V	2547
Mentha arvensis	1.1	+	2.1	1.1	1.2	1.1	+	+	.	+	1.1	.	+	.	+	+	81	V	270
Calamagrostis canescens	+	.	.	.	.	+	.	+	.	.	.	4.5	4.5	4.4	4.4	2.3	50	III	1673
Lysimachia nummularia	.	+	1.1	1.1	+	.	+	.	.	+	.	.	.	.	.	+	44	III	66
Salix cinerea	+	.	.	.	.	+	.	+	.	+	.	.	+	+	.	.	37	II	4
Potentilla anserina	.	1.2	.	.	.	.	.	.	.	+	+	.	.	.	.	+	27	II	33

Sporadic species:

In the group IV: *Menyanthes trifoliata* (1, 5, 8), *Calliergon stramineum* (5), *Pedicularis palustris* (15); V: *Carex paradoxa* (9), *Carex rostrata* (3, 14), *Heleocharis palustris* (7, 15), *Peucedanum palustre* (1, 12, 14), *Rumex hydrolapathum* (3, 12), *Sium latifolium* (5); VI: *Climacium dendroides* (14), *Equisetum palustre* (1), *Filipendula ulmaria* (1, 10), *Lathyrus pratensis* (4), *Leontodon hispidus* (8), *Lotus corniculatus* (7), *Poa pratensis* (7, 8), *Rumex acetosa* (4), *Trifolium pratense* (7, 10), *Trifolium repens* (2, 4); VII: *Agrostis alba* (4), *Carex elongata* (3, 5, 6), *Carex leporina* (10), *Lycopus europaeus* (15), *Mnium* sp. (8, 11).

Tab. VII

Succesive number of the record	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Presence %	Presence	Cover coefficient
No. of record	99	103	108	109	111	113	115	118	126	129	130	132	133	163	165	169	184	189	201	208	212	224			
Cover of the herb layer %	70	80	80	70	70	60	70	70	60	50	80	60	70	70	80	70	90	90	90	70	90	80			
Cover of the moss layer %	70	90	80	80	80	80	90	90	90	90	100	80	100	90	90	90	90	90	80	90	70	90			
Number of the species	35	30	34	24	38	44	35	40	35	37	40	39	35	29	33	28	29	33	30	36	30	41			
I. *Molinion*:																									
Ophioglossum vulgatum	.	+	.	+	+	+	+	+	+	+	+	+	+	+	1.1	+	+	+	+	+	+	+	91	V	31
Molinia coerulea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	4	I	22
Thalictrum flavum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	I	1
Succisa pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	I	1
II. *Molinietalia*:																									
Carex panicea	2.2	3.2	2.3	3.3	2.3	1.1	3.3	2.2	2.2	2.2	3.2	2.2	3.3	3.3	3.4	2.1	2.2	2.2	+.2	2.2	2.2	3.2	100	V	2341
Climacium dendroides	4.5	5.5	5.5	4.5	2.2	4.4	4.5	5.5	5.5	5.5	5.5	4.4	4.5	4.5	4.5	5.5	5.5	4.5	4.5	4.5	4.5	4.5	100	V	6954
Deschampsia caespitosa	3.2	2.3	2.3	2.2	2.2	2.2	2.2	3.3	1.2	+.2	1.2	2.3	1.2	2.2	2.2	3.3	3.3	4.4	2.2	2.2	2.3	2.2	100	V	2068
Galium uliginosum	1.2	1.3	1.2	1.3	2.3	2.3	2.3	2.3	1.2	1.2	1.2	2.2	2.3	+	+	1.2	.	1.2	1.2	1.1	+.2	+	95	V	729
Lychnis flos-cuculi	+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	+	+	+	+	+	.	+	91	V	90
Lotus uliginosus	.	1.2	1.2	1.2	+.2	1.2	1.1	1.3	+	+	1.2	+	+	+	+	+	.	+	+	.	+	+	86	V	164
Filipendula ulmaria	+	+	+	.	+	.	+	+	.	.	+	+	+	+	1.2	+	+	+	.	.	+	+	73	IV	29
Cirsium palustre	+	.	.	.	.	+	+	+	+	.	+	.	+	.	.	.	+	+	+	+	+	.	54	III	5
Lythrum salicaria	.	.	+	.	+	.	.	+	+	+	+	+	.	.	+	.	.	.	.	.	.	.	36	II	4
Linum catharticum	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	+	+	+	.	+	32	II	25
Orchis latifolia	.	+	+	.	.	.	.	+	+	.	+	.	.	+	.	.	.	.	.	+	.	.	32	II	3
Hypericum acutum	.	.	.	.	+	+	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	+	27	II	3
Juncus effusus	+	.	+.2	.	.	.	.	+.2	+.2	+	.	+	.	.	.	.	.	.	.	.	.	.	27	II	3
III. *Molinio-Arrhenatheretea*:																									
Holcus lanatus	+	+	1.1	1.2	+	1.2	2.2	1.1	1.1	+	+	1.2	1.2	+.2	1.2	1.2	2.2	1.2	2.2	1.2	1.	1.2	100	V	537
Ranunculus acer	+	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	+	+	1.1	1.2	+	+	+	1.1	+	1.1	+	+	+	100	V	277
Rumex acetosa	1.1	+	+	1.1	+	2.2	2.2	+	1.1	+	+	+	1.2	+	1.1	+	1.1	2.1	1.1	1.2	2.1	+	100	V	500
Festuca rubra	.	+	+	.	1.2	+.2	+.2	+	+	+.2	1.1	+	1.2	+	1.1	+	1.1	+	1.1	1.2	2.1	2.2	91	V	380
Plantago lanceolata	.	1.1	+.2	1.2	+.2	1.2	1.1	+	+.2	1.2	.	+	+	1.1	1.2	1.1	2.2	2.2	2.2	2.2	2.2	+	91	V	583
Poa pratensis	+	1.2	.	.	2.1	1.2	+.2	2.2	1.2	.	2.3	+	+	1.2	2.1	1.1	1.2	1.1	+	+	+	.	82	V	480
Prunella vulgaris	1.2	1.2	1.1	1.1	1.2	1.1	1.1	+	.	2.2	+	1.2	.	.	+	+	.	+	+	+	+	+	82	V	265
Lathyrus pratensis	1.1	+	+	+	+.2	+	.	+	.	1.1	+	+	.	1.2	+	+	.	+	.	+	+	+	77	IV	74
Cerastium vulgatum	+	+	1.2	+	+	+	+	+	.	1.2	+	+	+	.	.	.	.	.	.	+	.	.	59	III	50
Trifolium repens	1.2	.	2.3	2.3	1.2	1.2	.	+	.	+.2	+	.	.	.	1.2	.	+	+	.	.	.	+	54	III	253
Festuca pratensis	.	+	+	.	.	.	+	+	+	.	+	+	+	+	+.2	.	.	.	.	.	.	.	45	III	4
Leontodon hispidus	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	+	+	.	+	.	.	+	41	III	4
Trifolium pratense	.	.	.	.	.	+	+	+	.	+	+	.	.	1.2	+	.	.	+	.	+.2	.	.	41	III	26
Vicia cracca	+	.	.	.	.	.	+	.	.	.	.	+	+	.	.	.	+	.	+	+	.	.	32	II	3
Cardamine pratensis	.	+	.	.	.	.	.	.	.	.	+	.	+	.	+	+	.	.	.	.	.	.	23	II	2
Taraxacum officinale	.	.	.	.	.	.	+	.	+	+	+	.	.	.	+	.	.	.	.	.	.	.	23	II	2
Briza media	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	14	I	1
Daucus carota	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	14	I	1
Campanula patula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4	I	1
IV. *Scheuchzerio-Caricetea fuscae*:																									
Carex fusca	1.2	2.2	3.3	2.2	1.2	1.2	2.2	3.2	3.3	1.2	2.2	2.3	2.2	1.1	2.2	+	3.3	1.2	1.1	+	2.2	2.2	100	V	1558
Epilobium palustre	.	.	.	.	.	.	.	+	+	+	+	+	+	.	.	.	.	+	.	.	+	.	36	II	4
Stellaria palustris	+	.	+	.	+	+	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	32	II	3
Comarum palustre	+	.	.	.	.	.	+	+	+	.	.	.	.	.	.	+	+	+	.	.	.	.	32	II	3
Juncus articulatus	+	.	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	+	.	+	27	II	3
Agrostis canina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+.2	.	+.2	.	.	14	I	1
Pedicularis palustris	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	9	I	1
V. Accompanying species:																									
Geum rivale	2.2	1.1	1.1	1.1	1.1	1.1	1.2	+	+	+	+	+	+	+	1.1	1.1	2.1	+	1.1	1.1	2.1	+	100	V	470
Aulacomium palustre	2.2	1.2	1.2	1.2	1.2	2.2	2.2	2.2	+.2	1.2	1.3	2.2	3.3	2.3	3.3	+.2	2.3	+.2	1.3	1.2	3.3	2.2	100	V	1330
Potentilla erecta	+	+	+	+	+	+	+	1.1	+	2.2	+	.	+	+	+	+	1.1	1.1	1.1	2.1	1.1	1.1	95	V	301
Anthoxantum odoratum	+	+	+	+	1.2	2.	1.1	+	1.1	1.2	+	1.2	2.2	.	.	+	2.2	2.1	3.1	2.1	1.1	+	91	V	708
Mentha arvensis	+	+	+	+	1.1	+	+	1.1	+	1.1	+	+	+	.	1.2	.	1.1	+	+	+	1.1	+	91	V	143
Pamassia palustris	+.2	+.2	.	.	+	+	+	+	+.2	+.2	+	.	+	1.1	+	.	+	+	.	+	+	+	77	IV	30
Sagina nodosa	+	.	+	+	+	+	+	1.1	1.1	1.2	+	+	+	.	.	.	+	.	+	+	.	.	68	IV	74
Euphrasia curta	+	.	.	.	+	+	.	+	.	+	+	.	+	.	.	.	+	.	+	+	+	+	54	III	5
Carex leporina	+.2	+	+	.	.	.	.	+	+.2	+.2	+	+.2	.	.	+	.	.	+	+	.	.	.	50	III	5
Potentilla anserina	.	3.3	2.2	2.3	1.2	+.2	+	+	.	.	.	.	.	+	+	+	.	.	.	.	.	+	50	III	355
Abietinella abietina	+.2	.	.	.	4.4	+	.	.	.	.	+.2	1.2	1.3	.	.	.	.	.	+.2	+.2	.	2.2	41	III	411
Ajuga reptans	.	.	.	.	.	+	.	.	.	+	+	+	+	+	.	+	.	.	.	.	.	+	36	II	4

Sporadic species:

In the group V: *Acrocladium cuspidatum* (3), *Agrostis alba* (3, 9, 11, 15), *Agrostis vulgaris* (22), *Alectrolophus minor* (17), *Betula pubescens* (6, 10, 12, 17, 18, 21), *Carex diandra* (6, 7, 9), *Carex flava* (14, 19, 20, 22), *Dicranum scoparium* (5, 6, 7, 12), *Equisetum arvense* (6), *Frangula alnus* (6), *Galium mollugo* (6, 12, 13), *Galium palustre* (9), *Galium verum* (14, 20), *Hieracium pilosella* (1), *Hypericum perforatum* (1, 6), *Linaria vulgaris* (5), *Luzula campestris* (5, 6, 10, 12), *Mnium cuspidatum* (1), *Plantago maior* (2), *Platanthera bifolia* (1, 6), *Polygala comosa* (5), *Ranunculus repens* (3, 9, 15, 16), *Salix cinerea* (6, 7, 13), *Salix rosmarinifolia* (7, 22), *Senecio jacobaea* (5, 10, 12), *Trifolium arvense* (4, 6, 21, 22), *Valeriana officinalis* (21), *Veronica chamaedrys* (18, 21).

Comparative compilation of systematic value *D* in distinquished associations

Tab. VIII

No. of the group		*Glycerietum maximae*	*Caricetum elatae*		*Caricetum appropinquatae*	*Carici-Agrostetum caninae*			*Stellario-Deschampsietum*
			variant with *Phragmites communis*	typical variant		variant with *Carex gracilis*	variant with *Calamagrostis neglecta*	typical variant	
I	*Magnocaricion*	9.12	9.34	12.05	15.38	6.70	6.37	4.14	–
	Phragmition	5.83	6.34	7.33	0.71	1.02	–	–	–
	Phragmitetea	4.73	8.02	4.02	4.02	3.68	3.45	2.45	–
Sum total of group I		19.68	23.70	23.40	20.11	11.40	9.82	6.59	–
II	*Caricion canescentis fuscae*	–	–	–	–	7.84	4.81	10.69	–
	Caricetalia fuscae	–	9.39	2.77	6.08	3.27	6.91	3.23	–
	Scheuchzerio-Caricetea fuscae	3.74	3.36	2.94	6.86	12.58	16.19	6.90	2.53
Sum total of group II		3.74	12.75	5.71	12.94	23.69	27.91	20.82	2.53
III	*Molinion*	–	–	–	–	–	–	–	0.79
	Arrhenathheretea	–	–	–	–	–	–	–	0.66
	Molinietalia	–	–	–	–	–	–	–	16.37
	Molinio-Arrhenatheretea	9.47	9.68	6.89	10.83	9.60	9.14	9.91	18.55
Sum total of group III		9.47	9.68	6.89	10.83	9.60	9.14	9.91	36.37
	Alnetea	3.28	0.50	2.98	3.05	3.08	1.29	1.16	–
	Accompanying species	1.87	2.42	1.93	2.98	2.12	5.07	5.52	9.63

Totals of cover coefficients *C* in groups of characteristic species in associations

Tab. IX

No. of the group		*Glycerietum maximae*	*Caricetum elatae*	*Caricetum appropinquatae*	*Carici-Agrostetum caninae*			*Stellario-Deschampsietum*
					variant with *Carex gracilis*	variant with *Calamagrostis neglecta*	typical variant	
I	*Magnocaricion*	1.734	8.000	8.155	7.023	–	–	–
	Phragmition	8.101	1.579	–	–	–	–	–
	Phragmitetea	935	1.095	561	395	2.189	1.174	–
Sum total of group I		10.770	10.674	8.716	7.418	2.189	1.174	–
II	*Caricion canescentis fuscae*	–	–	–	1.722	1.353	3.295	–
	Caricetalia fuscae	–	–	–	–	7.773	2.876	–
	Scheuchzerio-Caricetea fuscae	129	1.786	4.880	8.887	6.929	5.877	1.573
Sum total of group II		129	1.786	4.880	10.609	16.055	12.048	1.573
III	*Molinietalia*	–	–	–	–	–	–	1.247
	Molinio-Arrhenatheretea	243	557	930	1.104	586	1.118	3.442
Sum total of the group III		243	557	930	1.104	586	1.118	4.689
IV	*Alnetalia*	565	500	1.881	–	–	–	–

Mechanical composition of the soil
Carici-Agrostetum (1, 6, 2, 9), *Stellario-Deschampsietum* (3, 4, 5)

Tab. X

No. of profile	Depth in cm	Earth parts				Name of the soil variety according to the classification of PTG
		1–0.1	0.1–0.05	0.05–0.02	0.02	
1	15–25	65	5	16	14	medium sand
	40–60	47	14	9	30	sandy loam
	70–80	93	1	1	5	loose sandy soil
6	10–20	60	4	13	23	sandy loam
	20–30	54	7	7	32	sandy loam
2	10–20	70	4	8	18	medium sand
	20–35	69	5	8	18	medium sand
	60–70	98	6	0	2	loose sandy soil
9	5–15	70	2	14	14	medium sand
	20–35	67	5	5	21	sandy loam
3	15–20	77	6	6	11	medium sand
	40–50	93	2	0	5	loose sandy soil
4	5–15	82	3	5	10	coarse sandy soil
	40–50	92	2	1	5	loose sandy soil
	80–90	93	2	1	4	loose sandy soil
5	5–15	76	4	5	15	medium sand
	18–30	78	5	4	13	medium sand
	50–60	96	0	0	4	loose sandy soil
	85–95	96	2	0	2	loose sandy soil

Results of chemical analyses of the soil

Tab. XI

No. of profile	Depth in cm	pH in		In milliequivalents to 100 g of the soil			V %	mg/100 g of the soil		C %	N %	$\frac{C}{N}$
		H_2O	1nKCl	H	S	T		P_2O_5	K_2O			
1	15–25	5.3	4.7	12.15	16.28	28.43	57.2	15.0	2.2	7.56	0.57	13.3
	40–50	5.8	4.8	2.39	13.02	15.41	84.5	2.3	0.2	–	–	–
	60–70	5.7	5.4	0.56	1.42	1.98	71.7	0.7	1.0	–	–	–
6	10–20	5.4	4.7	9.27	23.85	33.12	72.0	6.9	2.2	6.00	0.48	12.5
	20–30	5.0	4.7	3.47	19.72	23.19	85.0	3.6	3.1	–	–	–
2	10–20	5.4	5.1	4.74	15.42	20.16	76.5	4.6	2.5	2.82	0.30	9.4
	20–35	6.0	5.3	1.93	15.42	17.35	87.8	9.3	1.5	–	–	–
	60–70	5.9	5.5	0.17	1.89	2.06	91.7	0.3	1.0	–	–	–
9	5–15	5.3	4.6	7.44	17.28	24.72	69.9	1.0	2.3	3.84	0.33	11.6
	20–35	4.7	3.8	5.69	10.00	15.69	63.7	0.7	1.5	–	–	–
3	15–25	5.6	5.1	2.98	11.03	14.01	78.7	1.9	1.9	1.92	0.12	16.0
	40–50	5.9	5.5	0.41	1.89	2.30	82.2	0.7	1.5	–	–	–
4	6–16	5.7	5.2	2.91	9.82	12.73	77.1	0.4	1.1	1.74	0.19	9.2
	40–50	6.1	5.5	0.28	2.36	2.64	89.4	0.1	0.7	–	–	–
	90–100	6.1	5.7	0.46	2.36	2.82	83.7	0.6	1.3	–	–	–
5	5–15	5.7	5.4	3.41	18.22	21.63	84.2	0.3	0.8	3.00	0.27	11.1
	18–24	6.2	5.7	1.65	11.15	12.80	87.1	0.1	1.0	–	–	–
	50–60	6.8	5.7	0.57	1.90	2.46	77.2	6.5	1.3	–	–	–
	100–110	5.9	5.5	0.28	1.68	1.96	85.7	0.7	1.9	–	–	–
8	10–30	5.3	4.7	12.22	14.62	24.84	58.8	2.3	4.6	9.00	0.72	12.5
	40–50	4.5	4.3	2.25	7.02	9.27	75.5	0.4	1.4	–	–	–
10	10–35	5.4	4.7	13.55	–	–	–	15.5	2.4	–	0.80	–

Explanation of signs: H – total hydrolytic acidity, S – *total exchangeable bases*, $T = H + S$ – exchange capacity, $V = (S:T) \cdot 100$ – degree of bases saturation.
Numbers of profiles concern: 1, 6 – *Carici-Agrostetum caninae* variant with *Carex gracilis*, 2, 9 – *Carici-Agrostetum caninae* typical variant, 3, 4, 5 – *Stellario-Deschampsietum*, 8 – *Caricetum elatae*, 10 – *Glycerietum maximae*.

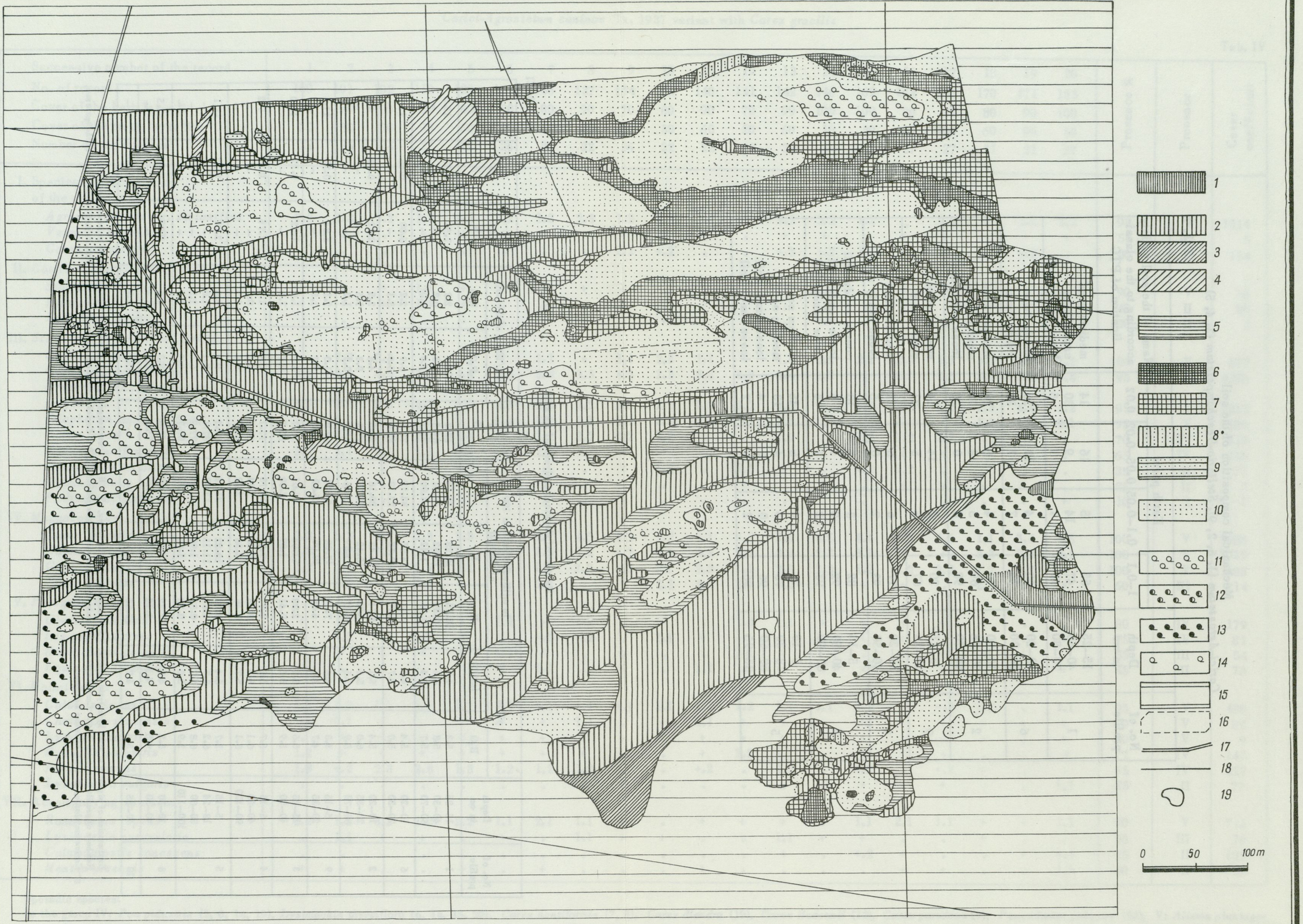

Fig. 1. The map of actual vegetation on Strzeleckie Meadows

1 – *Glycerietum maximae*, *2* – *Caricetum elatae*, typical variant, *3* – *Caricetum elatae*, variant with *Phragmites communis*, *4* – *Caricetum elatae*, variant with *Glyceria fluitans*, *5* – *Caricetum appropinquatae*, *6* – *Carici-Agrostetum caninae*, variant with *Carex gracilis*, *7* – *Carici-Agrostetum caninae*, typical variant, *8* – *Carici-Agrostetum caninae*, variant with *Calamagrostis neglecta*, *9* – *Carici-Agrostetum caninae*, facies with *Calamagrostis canescens*, *10* – *Stellario-Deschampsietum*, *11* – wooded patches of *Stellario-Deschampsietum*, *12* – wooded patches of *Caricetum appropinquatae*, *13* – wooded patches of *Caricetum elatae*, *14* – single trees, *15* – forest communities, *16* – manged plots, *17* – amelioration ditches, *18* – compartment lines, *19* – hollow

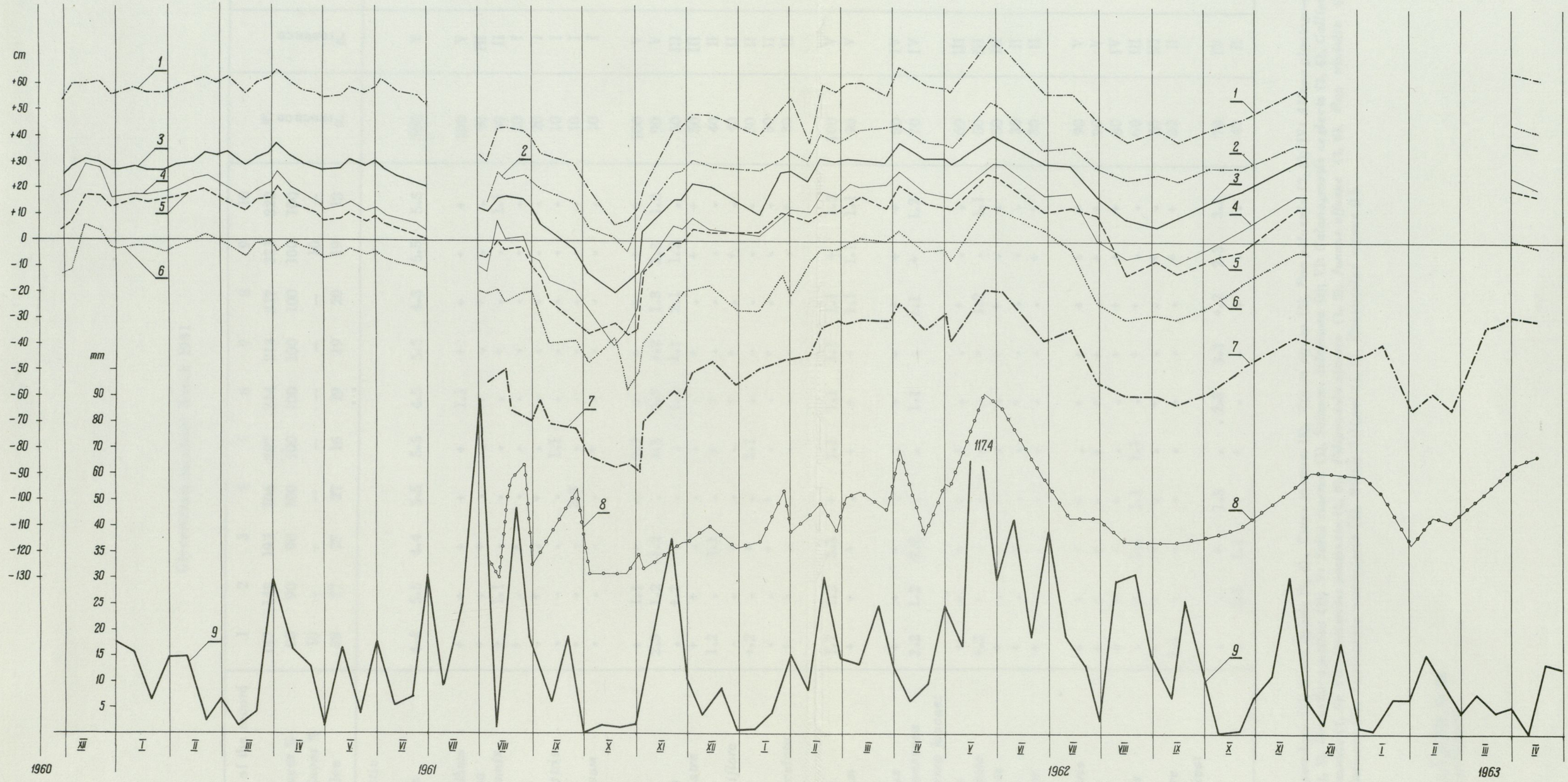

Fig. 2. Fluctuations of ground water table in patches of assotiations:

1 – Glycerietum maximae, 2 – *Caricetum elatae*, 3 – *Caricetum appropinquatae*, 4 – *Carici-Agrostetum caninae*, variant with *Carex gracilis*, 5 – *Carici-Agrostetum caninae*, typical variant, 6 – *Stellario-Deschampsietum*, 7 – wooded patches of *Stellario-Deschampsietum*, 8 – *Vaccinio myrtilli-Pinetum*, 9 – precipitation

Cena zł 20,—