# SHORT SURVEY OF ARRHENATHERETALIA GRASSLAND IN GERMANY

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ABSTRACT - Based on a comprehensive synoptic table, a short syntaxonomical survey of mesic grassland of Germany is presented, concentrated on associations and alliances. Four alliances have been distinguished: *Arrhenatherion elatioris*, *Cynosurion cristati*, *Poion alpinae*, and *Polygono-Trisetion* (with two suballiances). The species-poor meadows, developed under very intensive farming, are classified as a fragmentary community within the class *Molinio-Arrhenatheretea*.

KEY WORDS - *Arrhenatheretalia*, alliances, suballiances, fragmentary community, synoptic table, syntaxonomy.

## INTRODUCTION

Since 1985 a group of German phytosociologists are working on the elaboration of a German Vegetation Survey, based on synoptic vegetation tables (see also Mucina *et al*., 1993b). In contrary to some other European countries, this group works voluntarily, without any direct financial support. This handicap hinders a quick presentation and publication of results although well documented regional surveys are available, such as Oberdorfer (1977 ff.), Preising *et al*. (1990 ff.) for South and Northwest Germany respectively, as well as syntaxonomic overviews without tables by Pott (1995) and Schubert *et al*. (1995). Another problem is the high diversity of plant communities in central Europe; a huge amount of relevés has been made in a period of about 80 years of intensive phytosociological research.

Nevertheless the first results are now available, published in a new series "Synopsis der Pflanzengesellschaften Deutschlands". In 1996 the first issue appeared containing the class *Erico-Pinetea*, in 1997 followed by a second (*Quercion roboris*) and a third (*Arrhenatheretalia*) issue. The following contribution summarizes some main results of the latter (Dierschke, 1997a). It concentrates on the associations and higher classification levels. The synoptic table only contains species that have a higher constancy in one or more units (at least two times II or one time III). The nomenclature of species follows Ehrendorfer (1973).

## DIFFERENT PROPOSALS FOR HIGHER VEGETATION UNITS OF MESIC GRASSLAND

My opinion about the delimination and differentiation of the class *Molinio-Arrhenatheretea* follows mainly traditional concepts, e. g. Koch (1926), Tüxen (1937), and Tüxen & Preising (1951). A similar survey for central Europe was presented at the IAVS symposium in Bailleul 1994 (Dierschke, 1995). For the European Vegetation Survey it seems to be preferable to give broader outlines instead of a lot of detailed information. Therefore the synoptic table of *Arrhenatheretalia* in Germany, presented here, based on more than 10700 relevés, shows only the associations with a broad range of distribution which cover most of the mesic meadows and pastures in this area. They may be seen as representative for larger parts of central Europe.

The table shows a number of species groups which combine two or three columns. There are several major groups that are used as a background for different syntaxonomical solutions. The most obvious group, beginning with *Trisetum flavescens*, unifies all meadow communities (4-6) against the pastures and similar units. Many of them are commonly classified as character species of the *Molinio-Arrhenatheretea* (e.g. *Ajuga reptans*, *Colchicum autumnale*, *Lathyrus pratensis*) or *Arrhenatheretalia*. Oberdorfer (1990) proposed to divide this order into two suborders: *Trisetenalia flavescentis* (with *Arrhenatherion* and *Polygono-Trisetion*) und *Trifolienalia* (with *Cynosurion* and *Poion alpinae*). Sougnez & Limbourg (1963) proposed even an own order *Trifolio-Cynosuretalia* next to the *Arrhenatheretalia*. However, our table shows neither good character species for this order nor differential species for the disfunction of a suborder. Even the name giving *Cynosurus cristatus* is not restricted to the *Cynosurion* but has a second optimum of appearance in meadows of higher mountains (5-6). Therefore a single order of *Arrhenatheretalia* seems most appropriate.

Another proposal to distinguish an extra order, coming from Austria (Mucina *et al*., 1993a), is based on a group of species, which can also be recognized in our table. This group, beginning with *Alchemilla vulgaris* agg., differentiates all communities of higher altitude (5-7), and has been proposed as an own order *Poo alpinae-Trisetetalia*. However, the communities of lower areas have no own species group. Therefore, again, I plead for a more conservative, relatively simple solution.

## ALLIANCES AND SUBALLIANCES WITHIN THE ARRHENATHERETALIA

In many cases our old phytosociological forerunners have had already good overviews and ideas for classification. The proposals of Tüxen & Preising (1951) for instance, seem to be appropriate until today. Within the *Arrhenatheretalia* we can distinguish four alliances:

*Arrhenatherion elatioris* Koch 1926 (column 4 of the table).

Meadows of lowlands and lower mountains (planar-colline-submontane belts).

*Polygono-Trisetion* Br.-Bl. et R.Tx. ex Marschall 1947 nom.inv. (5-6).

Meadows of higher mountains (montane-subalpine belts).

*Cynosurion cristati* R.Tx. 1947 (1-2).

Pastures and lawns (planar to montane belts).

*Poion alpinae* Oberd. 1950 (7).

Pastures (subalpine belt).

The *Arrhenatherion* (4) has its floristic centre in the southern parts of central Europe. There are some regional floristic differences which resulted into the descriptions of several associations in Europe. However, a clear survey is still missing. Therefore, at this time, a large association *Arrhenatheretum elatioris* Braun(-Bl.) 1915 is described here with a clear group of character species.

Within the *Polygono-Trisetion* (5-6) there is a clear floristic differentiation into the meadows of the central European mountains and the Alps. Passarge (1969) distinguished already two suballiances which can be seen also in our table: *Phyteumo-Trisetenion* (central Europe) and *Rumici alpestris-Trisetenion* (Alps) (see also Dierschke, 1981). Both suballiances contain a number of associations. In Germany several names have been given to regional units of different mountains. However, the floristic differentiation is rather poor, and it is better to unify this regional vicariants of Germany into one association: *Geranio-Trisetetum* (see Dierschke, 1997a). In the Alps more associations can be distinguished, but Germany touches only a small part of the *Astrantio-Trisetetum*. Both associations and suballiances show a clear differentiation in our table (5-6).

Though there are some floristic connections to the subalpine meadows, the *Poion alpinae* (7) (with the *Crepido aureae-Festucetum commutatae*) has also its own profile. On the contrary the *Cynosurion* is floristically badly characterised. Only *Lolium perenne* and some plants of flooded and trampled areas like *Agrostis stolonifera*, *Plantago major* and *Ranunculus repens* have a high presence degree. Because of the increasing importance of *Lolium perenne* and the decrease of *Cynosurus cristatus* under more intensive farming conditions, I propose to go back to the original name of the association as given by Braun-Blanquet & De Leeuw (1936): *Cynosuro-Lolietum* (instead of *Lolio-Cynosuretum*). With increasing interest in urban ecology also the lawns of parks and gardens are investigated; for these grasslands a new association has been described: *Crepido capillaris-Festucetum rubrae*. Here the only spreading neophyte in mesic grassland, *Veronica filiformis*, is gradually becoming a character species.

## SPECIES POOR GRASSLAND UNDER MODERN FARMING PRACTICES

In modern agriculture, especially in lower areas, the management of grassland has been intensified and the species combinations have changed very much. Mowing several times a year or alternate changes of mowing and grazing, combined with high amounts of fertilizer (especially nitrogen) has steadily increased in the last decades. Instead of species-rich, many-coloured meadows today we often find species-poor, dark-green grasslands. Only the yellow flowering aspect of *Taraxacum officinale* gives some extra colour in spring time. There are very few species with a higher constancy, e.g. *Alopecurus pratensis*, *Cardamine pratensis*, *Cerastium holosteoides*, *Poa pratensis*, *P. trivialis*, *Ranunculus repens*, *Rumex acetosa*, and *Taraxacum officinale*. Nitrophytes like *Rumex obtusifolius* and *Urtica dioica* are characteristic too, just like weeds as *Capsella bursa-pastoris* and *Stellaria media*. Besides, there are many species with very low constancy, often remnants of previous plant communities.

The basic species combination of this new and spreading grassland community seems to be very equal over large areas. Column 3 in our table gives a synopsis of 277 relevés of different parts of Germany. A more detailed table is given by Dierschke (1997b). The community shows strong floristic affinities to the *Molinio-Arrhenatheretea* but a low relationship to any order or alliance. Environmental and structural similarities can be seen to meadows of the *Arrhenatherion* (an own alliance *Alopecurion pratensis* as proposed by Passarge (1964) and accepted by Schaminée *et al*. (1996) in the Netherlands seems to have no clear floristic background). Floristically, the community is more linked with the *Cynosurion*, but important species are absent. Also some relationships with the *Agrostietalia stoloniferae* can be recognized.

Considering all these facts, it seems to be most appropriate to include this species-poor meadows in a fragmentary community with the name *Ranunculus repens-Alopecurus pratensis* community that can be classified into the *Arrhenatheretalia* or *Molinio-Arrhenatheretea* (see also Dierschke, 1997b).

## Conclusions and Outlook

The meadows and pastures on mesic sites of Germany and other parts of central Europe may be clearly classified into four alliances, comprising a limited number of associations. Especially with regard to the European Vegetation Survey, a rather simple and easily understandable syntaxonomical solution should be looked for, also for other vegetation types. Long lists of syntaxa without clear tables or other clear explanation should be avoided. Such an increase of the number of syntaxa is to be

TABLE 1 - SYNOPSIS OF ARRHENATHERETALIA IN GERMANY

| No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Mean species number | 31 | 18 | 21 | 35 | 29 | 43 | 42 |
| Number of releves | 4920 | 464 | 277 | 3323 | 1568 | 84 | 104 |
| **Cynosurion cristati** | | | | | | | |
| Cynosurus cristatus | IV | I | I | I | III | IV | II |
| Phleum pratense | III | I | I | I | II | I | I |
| Leontodon autumnalis | III | I | I | I | II | . | II |
| Carex leporina D | II | I | I | . | I | . | I |
| Lolium perenne | IV | IV | II | II | . | I | I |
| Plantago major | II | II | I | I | I | . | I |
| Veronica filiformis | I | III | . | . | . | . | . |
| Crepis capillaris | I | II | . | I | . | . | . |
| Poa annua | I | II | I | I | I | . | I |
| Ranunculus repens | IV | III | V | II | I | I | II |
| Agrostis stolonifera | I | III | II | I | I | . | I |
| **D Meadows** | | | | | | | |
| Trisetum flavescens | II | I | I | IV | IV | V | . |
| Heracleum sphondylium | I | I | I | III | IV | IV | . |
| Veronica chamaedrys | II | II | I | III | IV | III | I |
| Lathyrus pratensis | I | . | I | III | III | III | . |
| Anthriscus sylvestris | I | . | II | III | III | II | . |
| Vicia sepium | I | I | I | III | III | I | . |
| Knautia arvensis | I | . | I | II | III | II | . |
| Ajuga reptans | I | I | I | II | III | II | I |
| Avenochloa pubescens | I | . | I | II | III | II | . |
| Colchicum autumnale | I | . | I | II | II | III | . |
| **Arrhenatherion elatioris** | | | | | | | |
| Arrhenatherum elatius | I | I | I | V | II | I | . |
| Galium album | I | I | I | IV | II | I | . |
| Crepis biennis | I | I | I | III | II | II | . |
| Tragopogon pratensis | I | . | I | II | I | . | . |
| Campanula patula | . | . | I | II | I | . | . |
| Daucus carota D | I | . | I | II | I | . | . |
| Geranium pratense | . | . | I | I | . | . | . |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Polygono-Trisetion** | | | | | | | |
| Geranium sylvaticum | . | . | . | I | III | V | I |
| Polygonum bistorta D | I | . | I | I | IV | III | I |
| Potentilla erecta D | I | . | . | I | III | III | II |
| Phyteuma spicatum | . | . | . | I | III | II | I |
| Crepis mollis | . | . | I | I | III | II | . |
| Centaurea pseudophrygia | . | . | . | I | I | III | I |
| Meum athamanticum D | . | . | . | I | III | . | . |
| Hypericum maculatum D | . | . | I | I | III | I | I |
| Sanguisorba officinalis D | I | . | I | I | III | . | . |
| Stellaria graminea D | I | I | . | I | III | . | I |
| Campanula rotundifolia D | I | I | I | I | III | I | I |
| Phyteuma nigrum | I | . | I | I | II | . | . |
| Lathyrus linifolius D | I | . | . | I | II | . | . |
| Poa chaixii D | . | . | . | I | II | . | . |
| Anemone nemorosa D | . | . | . | I | II | I | . |
| Astrantia major | . | . | . | . | I | III | I |
| Rumex alpestris D | . | . | . | . | . | III | I |
| Rhinanthus alectorolophus | . | . | . | I | I | III | . |
| Chaerophyllum hirsutum D | I | . | . | I | I | III | I |
| Silene dioica D | I | . | I | I | I | III | I |
| **D Higher mountains** | | | | | | | |
| Alchemilla vulgaris agg. | II | I | . | I | V | V | V |
| Ranunculus polyanthemos agg. | I | . | . | I | II | IV | III |
| Trollius europaeus | . | . | . | I | II | IV | II |
| Briza media | I | . | I | I | III | III | II |
| Primula elatior | I | . | . | . | I | III | II |
| Nardus stricta | I | . | . | . | II | I | III |
| Carlina acaulis | . | . | . | . | I | II | II |
| Campanula scheuchzeri | . | . | . | . | I | V | V |
| Polygonum viviparum | . | . | . | . | . | III | II |
| Soldanella alpina | . | . | . | . | . | II | IV |
| **Poion alpinae** | | | | | | | |
| Crepis aurea | I | . | . | . | . | II | V |
| Trifolium badium | . | . | . | . | . | . | II |
| Poa alpina | . | . | . | . | . | I | V |
| Phleum alpinum | . | . | . | . | . | I | IV |
| Potentilla aurea D | . | . | . | . | . | . | III |
| Galium anisophyllum D | . | . | . | . | . | . | III |
| Plantago alpina D | . | . | . | . | . | I | III |
| Ranunculus montanus D | . | . | . | . | . | I | III |
| Carex pallescens D | . | . | . | . | I | I | III |
| **Arrhenatheretalia** | | | | | | | |
| Dactylis glomerata | III | III | II | IV | IV | V | I |
| Achillea millefolium | III | III | II | IV | V | I | III |
| Bellis perennis | IV | V | II | III | II | I | IV |
| Leucanthemum vulgare | II | II | I | III | V | V | III |
| Agrostis tenuis D | IV | II | I | II | IV | IV | V |
| Leontodon hispidus | II | I | I | II | III | III | V |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lotus corniculatus | II | I | I | II | II | III | III |
| Plantago media D | II | II | I | II | II | III | I |
| Pimpinella major | I | I | I | II | II | IV | I |
| Trifolium dubium | II | II | I | II | II | I | . |
| Carum carvi | I | . | I | I | II | II | II |
| Bromus hordeaceus D | I | I | II | III | II | . | . |
| Rhinanthus minor | II | . | I | I | II | . | . |
| **Molinio-Arrhenatheretea** | | | | | | | |
| Taraxacum officinale | V | V | V | V | IV | IV | II |
| Trifolium repens | V | V | III | III | IV | IV | IV |
| Ranunculus acris | V | I | III | V | V | IV | III |
| Trifolium pratense | IV | I | III | IV | V | IV | V |
| Cerastium holosteoides | IV | III | III | IV | IV | III | IV |
| Poa pratensis | V | IV | IV | IV | III | I | I |
| Rumex acetosa | IV | I | IV | V | V | II | I |
| Festuca pratensis | III | III | III | IV | II | IV | II |
| Prunella vulgaris | II | III | I | I | II | III | III |
| Deschampsia cespitosa | II | I | II | I | III | I | V |
| Centaurea jacea | II | I | I | III | II | II | I |
| Holcus lanatus | IV | I | III | IV | IV | II | . |
| Cardamine pratensis | III | II | IV | II | III | I | . |
| Alopecurus pratensis | I | I | V | IV | III | I | . |
| Vicia cracca | I | . | II | II | III | II | . |
| Myosotis palustris agg. | I | . | I | I | II | I | I |
| Lychnis flos-cuculi | I | . | II | I | II | I | . |
| Filipendula ulmaria | I | . | II | I | II | I | . |
| Cirsium palustre | II | . | . | I | II | I | I |
| **Companions** | | | | | | | |
| Festuca rubra agg. | V | IV | III | IV | V | IV | V |
| Plantago lanceolata | IV | III | II | V | V | IV | II |
| Anthoxanthum odoratum | IV | I | II | III | V | V | III |
| Poa trivialis | IV | III | V | IV | III | II | I |
| Luzula campestris | II | I | I | II | IV | I | I |
| Hypochoeris radicata | II | I | I | I | II | I | I |
| Veronica serpyllifolia | II | I | I | I | I | I | II |
| Glechoma hederacea | I | II | II | II | I | . | . |
| Lysimachia nummularia | I | I | II | II | I | . | . |

1-7 *Arrhenatheretalia* R. Tx. 1931
1-2 *Cynosurion cristati* R. Tx. 1947
1 *Cynosuro-Lolietum* Br.-Bl. et De Leeuw 1936
2 *Crepido capillaris-Festucetum rubrae* Hülbusch et Kienast in Kienast 1978 nom. inv.
4 *Arrhenatherion elatioris* Koch 1926
*Arrhenatheretum elatioris* Br.-Bl.1915
5-6 *Polygono-Trisetion* Br.-Bl. et R. Tx. ex Marschall 1947 nom. inv.
5 *Phyteumo-Trisetenion* Pass. 1969
*Geranio-Trisetetum* Knapp ex Oberd. 1957
6 *Rumici alpestris-Trisetenion* Pass. 1969
*Astrantio-Trisetetum* G. et R. Knapp 1952
7 *Poion alpinae* Oberd. 1950
*Crepido aureae-Festucetum commutatae* Lüdi 1948
3 *Ranunculus repens-Alopecurus pratensis-(Arrhenatheretalia-)* community

considered rather as a step backwards than a step forwards with respect to the attempted overview of the vegetation of Europe.

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