The Cynosurion cristati Tx. 1947 of central, southern and western Europe: a tentative overview, based on the analysis of individual relevés

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ABSTRACT. – Over 1500 relevés of Cynosurion pastures and meadows from across Europe have been classified using computerised multivariate analysis. The vegetation types characterised are described with reference to existing associations in the literature and in relation to climatic trends, soil conditions and grassland management. The value of the approach and the significance of the results for nature conservation and syntaxonomy are assessed.

I. INTRODUCTION

As a contribution to the European Vegetation Survey, this paper presents a preliminary overview of the Cynosurion cristati Tx. 1947 of Europe.

These grasslands have been chosen as they have a widespread distribution and their classification poses many problems at the level of the association. Another reason is their threatened position owing to the modern farming systems, while on the other hand it seems that these species-rich pastures, like the Arrhenatherion hay meadows may be relatively simple to restore and develop. Concerning this social relevance we consider that it is useful to describe these more common and "less interesting" vegetation-types, as they are poorly protected. For example, in the European Habitats Directive, the Cynosurion pastures are hardly mentioned.

Cynosurion pastures are still common in several countries, but their area is shrinking, like in Britain and Ireland, where not only the area of Centaureo-Cynosuretum, but even of the Lolio-Cynosuretum is decreasing. Also Foerster (1983) writes that in some areas in Nordrhein-Westfalen, the nutrientpoor Cynosurion types have disappeared within twenty years. In the Netherlands, the Cynosurion grasslands were the most widespread grasslands until about 1970. Nowadays you have to search for them outside the agricultural areas, in nature reserves or on the sea and river dykes. They have become rare plant communities. Widespread vegetation types can easily become rare as has been seen from the past. For example the Calthion hay meadows have also almost disappeared in the Netherlands within at least forty years. This shows the importance of getting an overview of the Cynosurion and knowing which types still remain and where, before too much has disappeared.

II. Method

For this study we have chosen to work with individual relevés. The sources they come from are both literature and computerized databases. So far, we have obtained relevés from the following countries: Great Britain (252), The Netherlands (313) (both computerized databases), Ireland (27), Belgium (150), France (253), Germany (100), Switzerland (27), Austria (15), Spain (74), Portugal (106), Italy (68), Slovakia (91), Poland (38), Slovenia (6), Romania (57). The British data have been chosen from 1200 computerized Cynosurion relevés. We have made a random selection by taking every fifth

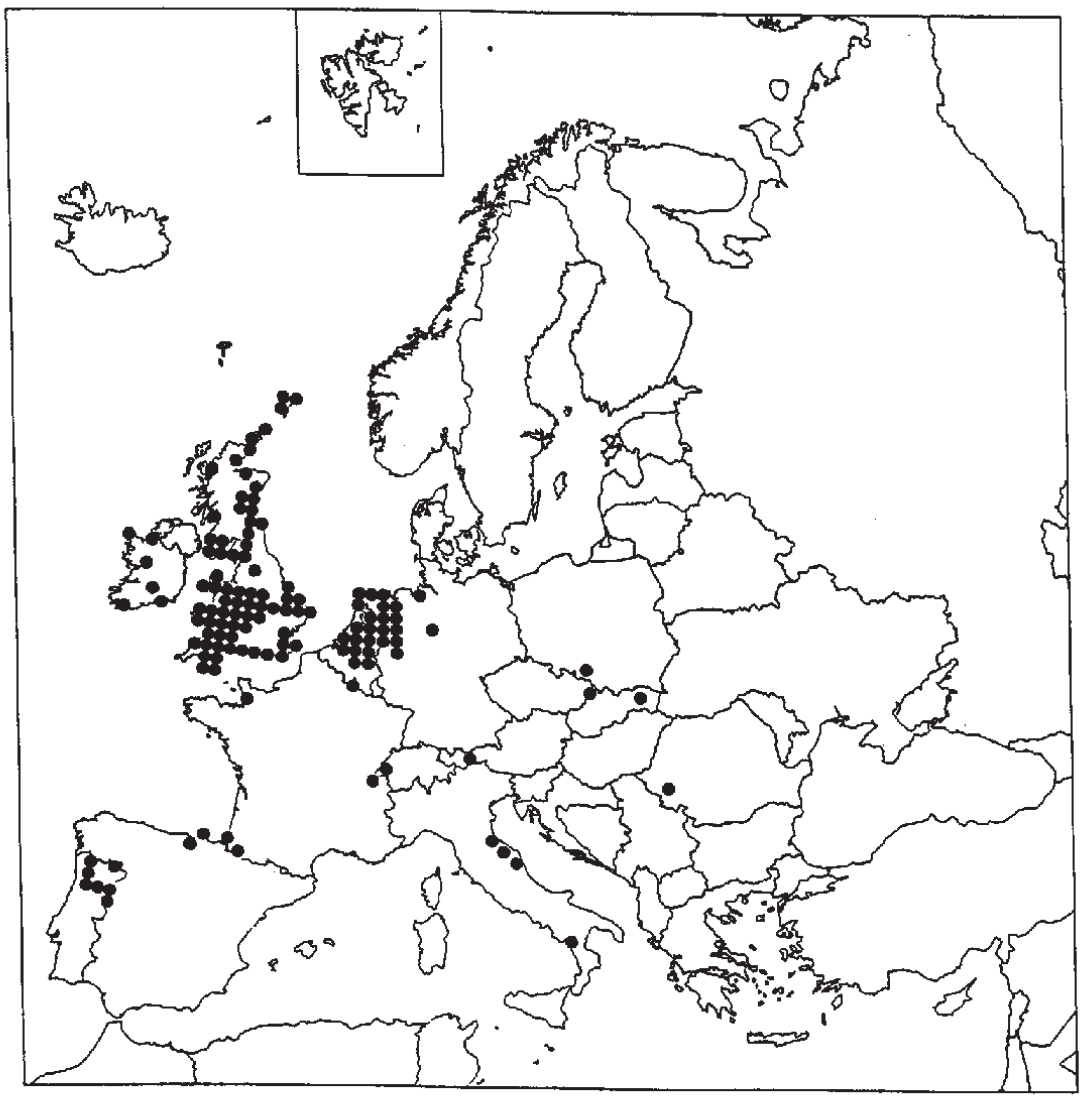

Fig. 1 – Origin of the data.

relevé of the total number of 1200. This is possible, because both the (sub)communities and the different geographical areas are equally presented. Otherwise, a table of the random selection has to be compared with a table of the original data. After that, the missing "groups" could be incorporated into the selection and from larger groups relevés could be rejected. Where the data were found in the literature, they do not represent the whole country but one or more particular areas. Therefore it is clear that this paper will only give a rough picture of some important Cynosurion types and their distribution through Europe. Figure 1 roughly shows the origin of the data, based on UTM-codes.

The relevés were computerized with a European version of the program TURBOVEG (Hennekens 1994), which uses the species list of Ehrendorfer (1973). Flora Europaea (Tutin *et al.* 1964 et seq.), Heukels' flora van Nederland (1975 and 1990), De Nederlandse bladmossen (Touw & Rubers 1989) and The Moss Flora of Britain and Ireland (Smith 1978) were used to translate and incorporate species names that were found in the different tables and databases. For the actual classification of the data, TWINSPAN was used.

The first part of the paper gives a view of the alliance Cynosurion and the main syntaxonomical ideas. Next, we discuss the results of the analysis in relation to the literature. Finally, a proposal is made for classifying the Cynosurion at a European level and the methodology evaluated.

III. The Alliance *Cynosurion cristati* Tx. 47

The Cynosurion (order Arrhenatheretalia, class Molinia-Arrhenatheretea) was first described by Tüxen in 1947 and includes grasslands on mesotrophic, moist but generally freelydraining brown soils. The soils are generally circumneutral, but may vary from calcareous to relatively acid. The stands are mainly grazed by cattle, but also by sheep or horses and sometimes mown, usually once a year in midsummer. On previously less mesotrophic soils the community can develop under the influence of agricultural improvement. In the montane zone, the Cynosurion pastures are replaced by mountain pastures of the Poion alpinae. The maximum altitude increases towards the south and decreases towards the east of Europe (Nowak 1992). In Italy (Appennines), the alliance is found between 1000-1300 m (Ubaldi 1978, Cortini Pedrotti 1973, Corbetta & Pirone 1981). In northwest Spain, these grasslands occur both in the lowlands and in montane areas up to about 1300m (Tüxen & Oberdorfer 1958). In Austria and Switzerland, the Cynosurion pastures are still found at an altitude of 1300m (Berset 19?, Smettan 1981, Ellmauer & Mucina in Mucina *et al.* 1993). In Slovakia, Cynosurion grasslands become rare above 900 m (Jurko 1974).

TABLE 1

CYNOSURION CRISTATI TX. 47 OF EUROPE (12-06-95)

Syntaxon	1	2	3	4	5	6	7
Number of relevés	104	367	367	293	218	172	54
dA Trifolium repens	86^{I}	89^{II}	74^{I}	83^{I}	67^{+}	84^{+}	44
Cynosurus cristatus	88^{I}	74^{I}	83^{+}	74^{I}	83^{+}	74^{I}	70
Lolium perenne	25^{I}	71^{I}	65^{I}	92^{II}	42^{+}	48^{I}	●
Leontodon autumnalis	●	47	12	45	12^{+}	56	●
cO Bellis perennis	39^{+}	56^{+}	52^{+}	73^{+}	44^{+}	52	●
Trifolium dubium	76^{+}	27^{+}	43^{+}	26^{+}	21^{+}	3	4^{II}
Ranunculus bulbosus	85^{+}	4	44^{+}	29^{+}	60^{+}	39	6
Achillea millefolium	17	20	55	65^{+}	51^{+}	88	37
Lotus corniculatus	10	11^{+}	55^{+}	29	84^{+}	73	26
Poa pratensis	14	37^{+}	23^{+}	41^{+}	26^{+}	22	13
Leucanthemum vulgare	●	17	49^{+}	27	52	25	85
Lathyrus pratensis	●	16^{+}	17	11	22	16	17
Taraxacum officin agg.	●	63	43	57^{+}	32^{+}	47	●
Festuca pratensis	●	40^{+}	17	34^{+}	23^{+}	30^{+}	6^{+}
Daucus carota	3	2	22	7^{+}	34	21	2
Trisetum flavescens	●	5^{+}	29^{I}	35^{+}	49^{+}	22^{+}	
Centaurea jacea	●	8^{+}	3	25	19^{+}	30	
cC Plantago lanceolata	87^{I}	62	83^{+}	70	91^{+}	79	41
Trifolium pratense	73^{+}	56^{+}	76^{+}	67^{+}	78^{+}	88^{+}	54
Rumex acetosa	21	68	56	58	23	35	65
Prunella vulgaris	39	43^{+}	46	38	62	60^{+}	37
Holcus lanatus	86^{I}	89^{I}	76^{+}	57^{+}	43	3	28
Cerastium fontanum	16	100	100	83	59	66	80
Ranunculus acris	1	89^{+}	56^{+}	74^{+}	29^{+}	37	7
Dactylis glomerata	30	14	69^{+}	67^{+}	75^{+}	31	7
Poa trivialis	46	67^{I}	37^{+}	60^{I}	15^{+}	16^{+}	6
Veronica chamaedrys	●	7	35	17	26	25	13
CONSTANT SPECIES							
Anthoxanthum odoratum	64^{I}	69^{I}	71^{I}	41^{+}	26^{+}	67^{+}	87
Festuca rubra	89^{I}	56^{I}	73^{I}	49^{I}	53^{II}	72^{I}	100^{II}
Agrostis tenuis	1^{IV}	54^{I}	73^{I}	49^{I}	38^{I}	61^{+}	100^{II}
d Agrostis castellana	89^{II}	●	0.5^{I}	●	●	0.6	●
Leontodon saxatilis	75	6	9	12	9	●	
Carum verticillatum	63^{+}	2^{+}	2	●	●	●	
Chamaemelum nobile	58^{I}	0.5^{+}	3^{II}	1^{II}	●	●	
Vulpia bromoides	38	0.8	3	1	●	0.6^{I}	●
Orchis sesquipedalis	33	●	●	●	●	●	
Bromus commutatus	35	●	0.3^{I}	●	●	●	9
Gaudinia fragilis	26^{+}	2	19^{+}	1	●	0.6^{I}	●
Mentha pulegium	32	0.5	●	0.3	●	0.6	●
Cerastium glomeratum	26	0.3	1	1^{+}	●	●	
Convolvulus arvensis	23	●	2	4	9	1	2
Holcus mollis	22	0.8^{I}	0.5^{I}	2^{+}	0.5	●	
Narcissus bulbocodium	20	●	0.3	●	●	0.6	●
Cardamine pratensis	●	58	15	14	9^{+}	0.6	●
Lychnis flos-cuculi	●	38	7	0.3	●	5	●
Juncus effusus	6	30^{+}	0.5	●	●	●	2
Cirsium palustre	2	29	11	●	4	2	
Bromus racemosus	●	16^{I}	7^{+}	3	0.5	●	
Juncus articulatus	1	14^{+}	0.3	●	●	0.6	
Centaurea nigra	4	11	53^{+}	11	16^{+}	●	
Luzula campestris	3	17	50	11	25^{+}	17	28
Trifolium patens	●	●	7^{I}	●	●	●	

TABLE 1 (continued)

CYNOSURION CRISTATI TX. 47 OF EUROPE (12-06-95)

Syntaxon	1	2	3	4	5	6	7
Number of relevés	104	367	367	293	218	172	54
Centaurea deb. s. thui	●	●	8+	●	●	●	
Eryngium bourgatii	●	●	2	●	●	●	
Cirsium arvense	6	21	10	49+	16	7	
Agropyron repens	●	5	1	24	3	7	
Bromus mollis	29	10+	19+	31+	9	15+	2
Sanguisorba minor	17I	0.3	4+	●	67+	30	6
Carex flacca	●	6I	10	0.7	57+	9	2
Festuca ovina	1I	1	5I	2+	42II	2I	
Cirsium acaule	●	●	2	●	47+	5	
Avenochloa pubescens	●	●	3+	1	42	●	
Carex caryophyllea	●	1	15	0.3	39	11	6
Campanula rotundifolia	●	0.3	4	2	35	6	
Koeleria macrantha	●	●	3+	1	32	9	●
Primula veris	●	1	11+	1	36	2	
Scabiosa columbaria	●	●	0.5	●	29	1	
Pseudoscleropodium pur	1	3+	5	0.3	28	1	
Avenochloa pratensis	●	●	0.8I	●	27	0.6	
Bromus erectus	●	●	0.8	1+	27I	12I	
Agrimonia eupatoria	●	0.3I	4+	3+	22	6	
Thymus pulegioides	●	●	2	0.7	7+	48+	2
Carlina acaulis	●	●	●	●	2	20	7
Euphorbia cyparissias	●	●	●	0.7	3	34	17
Carlina vulgaris	●	●	0.5	●	5	23	
Stellaria graminea	5	14	11	11	5	13	78
Campanula patula	●	●	0.3	0.3	●	11	78
Rhinanthus rumelicus	●	●	0.3	●	●	●	74
Trifolium montanum	●	●	●	●	0.5	7	50
Trifolium campestre	4	0.3	2I	2+	6	5	48+
Filipendula vulgaris	●	●	2	●	11	12	48
Dianthus carthusianoru	●	●	●	●	●	7	43
Trifolium alpestre	●	●	●	●	●	2	43
Genistella sagittalis	●	●	●	●	3	2	39II
Gymnadenia conopsea	●	●	1	●	2	3	39
Ranunculus polyanthemo	●	●	●	●	●	6	30
Viola canina	●	1	3	0.3	0.9	14	26
Moenchia mantica	●	●	●	●	●	●	26
Rorippa pyrenaica	●	●	●	●	●	●	24
Rumex tenuifolius	●	●	●	●	●	●	24
b ARRHENATHERION							
Heracleum sphondylium	5	5	18+	16+	15	3	
Arrhenatherum elatius	17+	4I	16+	23I	18+	2	
Festuca arundinacea	39+	2+	13+	3+	8+	6+	
Equisetum arvense	3	3	2	10	2	2	2
Ajuga reptans	8+	18	25	0.3	9+	6	
Alopecurus pratensis	●	21+	5+	30+	5	0.6	
Vicia cracca	●	14	8+	13	16	11+	2
Crepis biennis	●	2	8	14	4	2	11
Phleum bertolonii	●	0.5	4	10+	11+	13	
Phleum pratense	●	32+	7	32+	14	16	
Carum carvi	●	1	●	15	5	20	11
b PLANTAGINETEA MAJORIS							
Ranunculus repens	14I	77I	28	54+	12	8	2
Potentilla reptans	14	8	10+	28	20	13	4
Agrostis stolonifera	●	33I	5+	39+	21	16+	

TABLE 1 (continued)

CYNOSURION CRISTATI TX. 47 OF EUROPE (12-06-95)

Syntaxon	1	2	3	4	5	6	7
Number of relevés	104	367	367	293	218	172	54
Plantago major	1	22	5	21+	1	18	
Poa annua	1	11	6	23+	3	11	
Potentilla anserina	•	18+	2	9	0.5	11	
OTHER SPECIES							
Agrostis canina	1	10+	1	1	•	•	
Aira caryophyllea	19	0.5	3	0.3	0.9	1	
Alchemilla glaucescens	•	•	•	•	•	11+	
Alchemilla vulgar agg.	•	0.5	•	•	0.9	18	2
Alchemilla xanthochlor	•	4+	2	3	13	5	
Alopecurus geniculatus	•	19+	1	2	•	•	
Armeria alliacea	•	•	•	•	•	11	
Armeria canescens	•	•	•	•	•	11	
Asperula cynanchica	•	•	•	•	12	9	6
Betonica officinalis	1	3	17+	0.7	9+	6	39
Brachypodium pinnatum	1I	•	0.5	1	18I	11I	2
Brachythecium rutabulu	1I	14+	15+	17+	16+	0.6	
Briza media	14	6+	18	1	57	55	56
Briza minor	13	•	•	•	•	•	
Calliergonella cuspida	4	12I	6+	2I	17+	0.6	
Caltha palustris	1	7	•	•	•	•	
Campanula glomerata	•	•	•	1	8	12	7
Carex disticha	•	7+	•	0.3	•	•	
Carex hirta	12	22+	5	10	2	8	7
Carex laevigata	16	0.5	0.3	•	•	•	
Carex leporina	38	27	0.8	1	0.5	2	4
Carex nigra	•	17+	0.3	•	•	0.6	
Carex panicea	1	12+	4I	1II	0.9+	4	2
Carex spicata	15	3+	2	6	2	0.6	
Carlina acanthifolia	•	•	•	•	•	•	13
Centaurea jace s. prat.	•	7	4	•	20	•	
Centaurea nigra s. riv.	16+	•	•	•	•	•	
Centaurea scabiosa	•	•	•	•	13	2	
Centaurea stenolepis	•	•	•	•	•	•	11
Cerastium arvense	•	0.5	0.8	2	4	16	
Chrysopogon gryllus	•	•	•	•	•	•	11
Cirsium eriophorum	•	•	•	•	•	15	
Cirsium vulgare	•	9	7	15	12	11	
Conopodium majus	•	2	17	1	•	•	
Crepis capillaris	29	0.8	18	2	6	1	
Cruciata glabra	4	•	0.3	•	•	22	15
Cynodon dactylon	15	•	0.3	0.3	0.5	•	
Cyperus badius	19+	•	0.5	0.3	•	•	
Danthonia alpina	•	•	•	•	•	•	15
Danthonia decumbens	49+	5+	13+	1II	12	25	2
Deschampsia cespitosa	12+	18+	1	12	2+	8	
Eleocharis palustris	11	3	•	•	•	•	
Equisetum palustre	•	13	0.3	3	1+	0.6	
Erigeron annuus	•	•	•	•	•	•	17
Euphrasia nemorosa	•	•	0.5	•	15	1	
Euphrasia rostkoviana	•	0.3	0.3	•	4	34	30
Filipendula ulmaria	•	17	5I	1II	0.5I	•	
Fragaria vesca	•	0.3	0.3	0.3	3	11	
Galium palustre	9	18	0.5	•	•	•	
Galium verum	7+	3+	14I	7+	46	48	37
Genista tinctoria	•	0.3	0.5	•	4	13	11

TABLE 1 (continued)

CYNOSURION CRISTATI TX. 47 OF EUROPE (12-06-95)

Syntaxon Number of relevés	1 104	2 367	3 367	4 293	5 218	6 172	7 54
Geranium dissectum	14	0.5	6	2	3	0.6	
Glechoma hederacea	•	7	2	18	4	•	4
Helianthemum nummulari	•	•	0.8^{I}	•	15	6	6
Hieracium pilosella	•	3^{+}	10^{I}	5^{+}	36	56	15
Homalothecium lutescen	•	0.3	0.3	•	15	•	
Hordeum secalinum	•	7^{I}	1^{I}	18^{I}	•	•	
Hypericum perforatum	1	0.3	0.5	2	10	19	11
Hypochoeris radicata	86	23	63	26	8	14	26
Juncus acutiflorus	48^{+}	18^{II}	4^{+}	•	•	•	
Juncus squarrosus	14^{+}	0.3	0.5	•	•	•	
Knautia arvensis	•	0.5	8^{+}	1	29	22	24
Leontodon cichoraceus	•	•	•	•	•	14^{+}	
Leontodon hispidus	•	3	19^{+}	7	60^{+}	55^{+}	17
Lepidium heterophyllum	20	•	1	•	•	0.6	
Linum bienne.	13^{+}	•	13^{+}	2	•	1	
Linum catharticum	•	1	6	•	41	33	30
Lotus uliginosus	46	43	6	2	0.5	•	
Luzula multiflora	25	6	2	0.7	0.5	19	
Lychnis viscaria	•	•	•	•	•	•	13
Lysimachia nummularia	•	14	2	6	5	0.6	4
Medicago lupulina	8	1	13	13	53	46	2
Mentha rotundifolia	14	•	0.3	0.3	•	•	
Muscari comosum	•	•	•	•	•	1	19
Myosotis palustri agg.	•	20	2	•	0.9	•	
Nardus stricta	14^{+}	6^{+}	3^{+}	0.7	0.9	19^{+}	
Oenanthe peucedanifoli	•	4	0•5	•	•	•	
Ononis spinosa	2^{I}	•	0.5	11	11	16	
Orchis coriophora	13	•	0.3	•	•	•	11
Pimpinella saxifraga	•	2	9^{+}	1	63	39	20
Plantago media	•	4	21^{+}	12	73^{+}	82^{+}	20
Poa alpina	•	•	0.8	•	•	17	
Polygala comosa	•	•	•	•	0.9	1	22
Polygala vulgaris	3	0.3	4	•	13	22	33
Potentilla argentea	•	•	0.5	•	•	6	11
Potentilla erecta	17	9	14^{+}	1	6	29	17
Potentilla heptaphylla	•	•	•	•	•	20	
Prunella laciniata	2	•	0.5	•	•	6	17
Ranunculus flammula	5	13	•	•	•	•	
Ranunculus nemorosus	•	•	2	2	5	18	
Rhinanthus minor	20^{+}	6^{+}	14^{+}	4	8	23	2^{I}
Rhinanthus serotinus	•	2^{+}	4^{+}	0.3	•	11	
Rhytidiadelphus squarr	1	15^{+}	15^{I}	5^{I}	25^{I}	2^{+}	
Rumex acetosella	•	4	2	2	2^{+}	20	9
Rumex crispus	5	13	5	13•	3	0.6	2
Salvia pratensis	•	•	0.3	0.3	4	13^{+}	7
Scabiosa ochroleuca	•	•	•	•	•	5	13
Scilla ramburei	14	•	•	•	•	•	
Scutellaria minor	16	•	0.5	•	•	•	
Senecio jacobaea	12	3	13	7	31	2	2
Sherardia arvensis	11	•	1	•	0.5	2	
Silene nemoralis	•	•	•	•	•	•	11
Succisa pratensis	2^{II}	13	23^{+}	1	21	2	4
Thymus glabrescens	•	•	•	•	•	•	19
Thymus praecox	•	•	5^{+}	0.3	18	•	
Thymus serpyllum	•	•	0.8^{+}	•	13	13	
Tragopogon orientalis	•	•	0.5	0.3	3	4	11

TABLE 1 (concluded)

CYNOSURION CRISTATI TX. 47 OF EUROPE (12-06-95)

Syntaxon	1	2	3	4	5	6	7
Number of relevés	104	367	367	293	218	172	54
Tragopogon pratensis	●	●	0.5	4	5	8	13
Trifolium incarnatum	●	●	0.5	1^{+}	●	2	13
Trifolium ochroleucon	●	●	●	2	0.9	12	7
Verbena officinalis	12	●	1	●	●	●	
Veronica arvensis	2	0.8	2^{I}	2	8	12	
Veronica serpyllifolia	1	12	13	9	4	9	
Vicia angustifolia	●	0.5	11	5	1	1	6
Viola arvensis	●	●	●	●	●	●	11
Viola tricolor	●	●	●	●	●	1	20

1 = Anthemido-Cynosuretum & Bromo-Cynosuretum
2 = Junco-Cynosuretum
3 = Centaureo-Cynosuretum
4 = Lolio-Cynosuretum
5 = Galio-Trifolietum
6 = Anthoxantho-Agrostietum
7 = Festuco-Agrostietum

Diagnostic species: The Cynosurion is mainly negatively characterized compared with the hay meadows of the Arrhenatherion and Polygono-Trisetion and the pastures of the Mesobromion. Character species fail or do not cover the whole distribution area of the alliance. When the hay-management changes into a grazing-management, species which are sensitive to the grazing and treading, will slowly disappear and only a few new species will take their places. However, the high constancy of a number of species and the striking vegetation structure make these grasslands clearly recognizable and well delimited.

Diagnostic species through the whole of Europe are *Cynosurus cristatus*, *Trifolium repens* and *Lolium perenne*. The first and the last species are differential compared to the Arrhenatherion. Their frequency and cover vary according to soil conditions and geographical position. In less eutrophic situations, first *Lolium perenne* and then *Cynosurus cristatus* are replaced by a higher abundance of *Festuca rubra*, *Agrostis capillaris* and *Anthoxanthum odoratum*. *Lolium perenne* and *Cynosurus cristatus* also disappear in northern Europe (Passarge 1964). *Trifolium repens* is differential compared to all other alliances of the class. For most of the countries, *Leontodon autumnalis* is a character species, although it is not found in the relevés of Spain and Portugal. Several authors also consider *Phleum pratense* s.l. as a character species of the alliance, although an overview of the Arrhenatheretalia by Dierschke (mscr.) shows that this "species" is only differential compared to the Arrhenatherion. On drier somewhat baserich soils; *Phleum pratense* ssp. *pratense* is replaced by *Phleum pratense* ssp. *bertolonii*. However, the distinction between the two subspecies is hard to make and often not made at all. Both subspecies are

missing in literature from Portugal and Romania and in the other countries their frequency is certainly not high. Constant species are *Prunella vulgaris, Bellis perennis, Plantago lanceolata* and *Trifolium pratense*. These are all character species of the class, except for Bellis perennis which is more restricted to the order (Dierschke 1990 and mscr.).

Physiognomy: The communities of the Cynosurion are mainly characterized by hemicryptophytes. The ratio between the dicotyledons and grasses varies, but the first often compose a substantial proportion of the herbage. In comparison with the grasslands of the Mesobromion and Arrhenatherion, there is a large percentage of legumes (e.g. *Trifolium repens, T. pratense, Lotus corniculatus; L. uliginosus*) and rosette plants (*Taraxacum officinale, Plantago major, P. media, Leontodon hispidus*). Also, there is a higher frequency of less tasty, mostly rough plants like *Cirsium vulgare, C. arvense* and *Eryngium campestre* and the vegetation often has an higher amount of annuals such as *Poa annua* or *Capsella bursa-pastoris*. If the pasture is less intensively grazed or regularly mown, larger amounts of coarse grasses appear like *Arrhenatherum elatius, Dactylis glomerata* and *Alopecurus pratensis*.

The pastures of the alliance show a variable appearence: they may have a tight short sward, a rather tall and dense vegetation and sometimes a mosaic of both structures. The colour is mostly bright green during the growing season. From a distance, these green fields can be very prominent among the more yellowish, brownish or greyish green less improved grasslands.

Zonation and succession: By frequent mowing and more or less intensive grazing the Cynosurion may develop from the Arrhenatherion in lowland areas and from the Polygono-Trisetion at higher altitude. In addition, it occurs in places where Mesobromion and Nardo-Galion grasslands have been manured and grazed. Under the influence of grazing, *Cynosurion pastures* can also develop from Calthion hay meadows. On grazed saltmarshes, a type of the alliance can be found, where *Cynosurus cristatus* and *Trifolium repens* grow together with *Juncus gerardii, Trifolium fragiferum* and *Ranunculus sardous*. Even on sandy soils, for example on river banks in the Netherlands, northwest Germany and Slovakia or in the dunes in the southwest of Britain, Cynosurion pastures can occur, when the site conditions are rather moist and mesotrophic. The fact that all these different communities can develop into rather the same, clearly shows the convergent effect of a grazing (and improving) management: the structure changes and the sward becomes rather short and dense, although locally patches with taller vegetation will survive, because of the local manuring and the selected grazing. The species which are sensitive to the damage and treading will disappear and there is an increase of species that are rather constant throughout Cynosurion pastures like *Lolium perenne, Trifolium repens* and *Cynosurus cristatus*. Further improvement

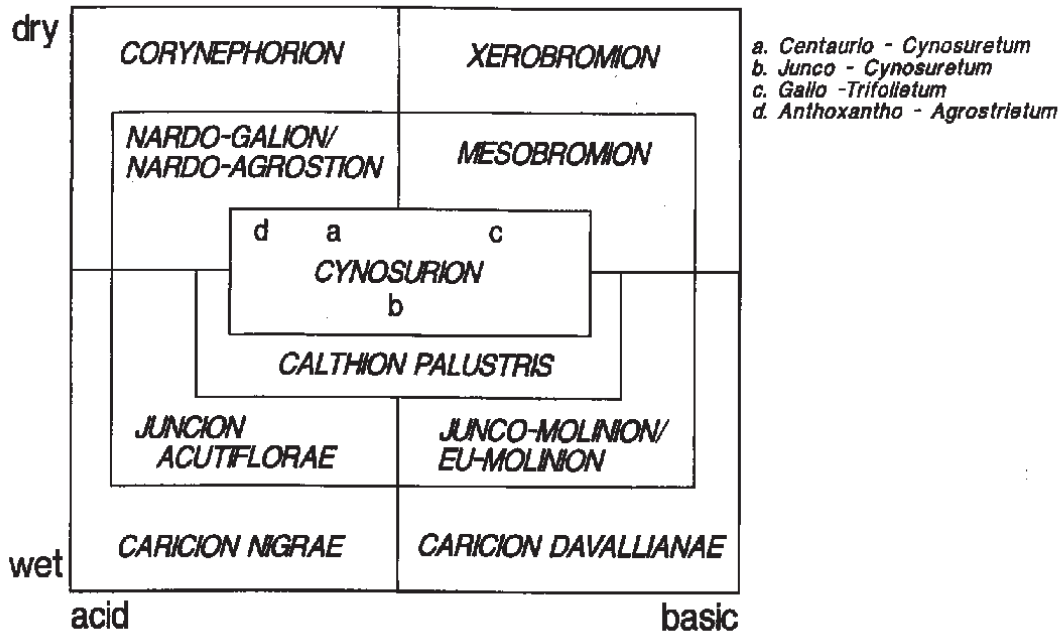

Fig. 2 – Ecogram of the Cynosurion in relation to other alliances in Europe.

eventually will change the Cynosurion grasslands into basal communities. In older literature, these were described as Poo-Lolietum within the class Plantaginetea majoris (Westhoff & Den Held 1969). In our view these communities cannot be classified on the level of the association. (Kopecky & Hejny 1978; Schaminée *et al.* 1995).

Figure 2 shows the position of the Cynosurion compared to other grassland communities. Transitions may occur, both spatial and temporal; the communities can be transformed into each other by improvement and impoverishment respectively.

Distribution: The Cynosurion is a rather widespread community of central, west and southwest Europe, where the rainfall is rather high (more than 500mm.) and the temperatures moderately low. The optimal conditions are found in the Atlantic and Subatlantic regions of Ireland, Great Britain, The Netherlands, Belgium, west France, north and west German and northwest Spain. However, the community also occurs in the middle and east of Europe in Austria, Slovakia and Poland and even in south and southeast Europe in Portugal, Italy, Romania and Slovenia. Due to the climate in these southern regions, Cynosurion pastures are concentrated in the submontane and montane zone.

Syntaxonomy: The international literature about the Cynosurion shows that there are roughly two tendencies in classifying these pastures. The

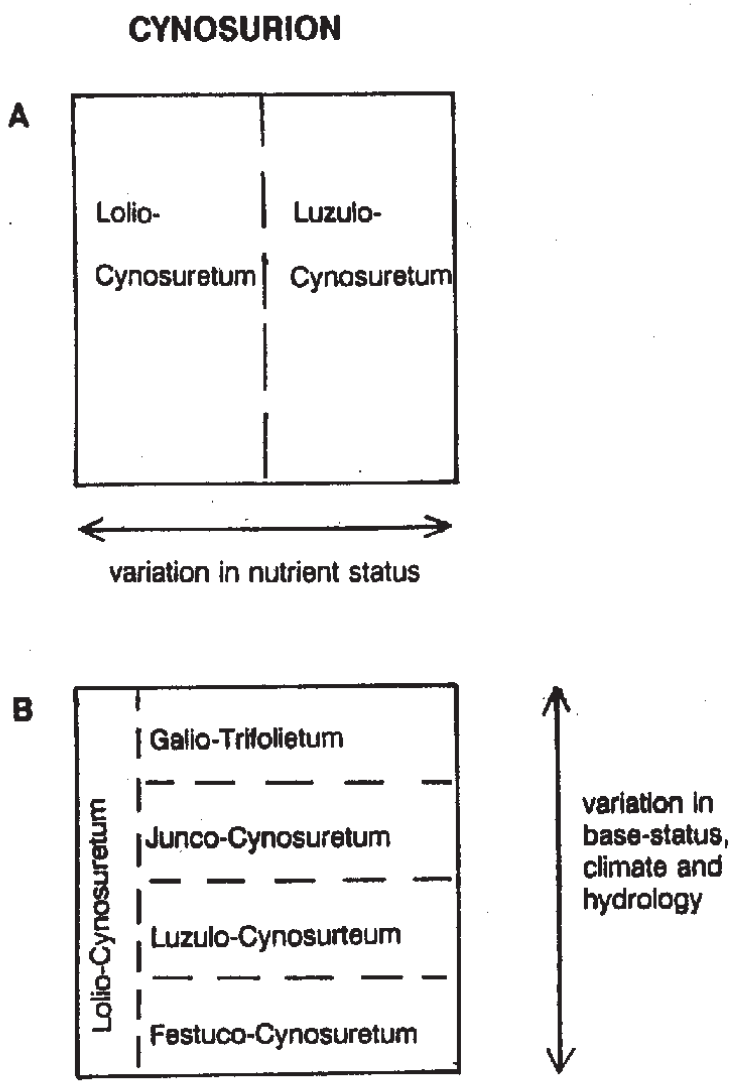

Fig. 3 – Scheme of two syntaxonomical approaches to classify the alliance Cynosurion: A. after Sougnez (1963) and de Foucault (1981). B: after Oberdorfer (1983), Meisel (1966).

different syntaxonomical approaches are shown in figure 3. In Germany, the alliance is generally divided in two broad associations. On the one hand the Cynosurion contains the intensively used and improved grasslands of the Lolio-Cynosuretum and on the other hand the less mesotrophic and more extensively used pastures of the Festuco-Cynosuretum (Luzulo-Cynosuretum Meisel 1966). The division is mainly based on the nutrient availability and is consequently often parallel to the difference between lowland and upland. The associations mainly differ in frequency and cover of a small group of species like *Lolium perenne, Festuca rubra, Agrostis capillaris* and *Anthoxanthum odoratum*. Within the two associations, many subassociations have been

distinguished based roughly on differences in management, soil basestatus, hydrology and altitude; the subassociations are floristically well defined by species groups of several other syntaxa (e.g. Mesobromion, Nardo-Galion, Molinietalia). This idea is followed by, among others, Oberdorfer (1983), Klapp (1965), Meisel (1966), Mucina (1993) and also adopted by Jurko (1969a, 1969b, 1974). Jurko, in Slovakia, has described the Anthoxantho-Agrostietum grasslands next to the Lolio-Cynosuretum, which are quite similar to the Festuco-Cynosuretum, but on even less improved soils and containing some continental species. Also the Festuco-Agrostietum of Romania (Boscaiu 1970, Coldea 1977) may be seen as the Festuco-Cynosuretum of this area.

On the other hand, Sougnez (1957, 1963), in Belgium, distinguishes several associations in addition to the most improved and mesotrophic grasslands of the Lolio-Cynosuretum. The differences between the associations are related in the first place to the characteristics of soil basestatus, hydrology and altitude. They are well distinguished by a high number of species which are characteristic for related grassland communities from which they can also develop (e.g. Mesobromion, Nardo-Galion, Molinietalia). Within these associations, subassociations could be described based mainly on the degree of improvement and distinguished by the differences in the frequency and cover abundance of a small group of species as mentioned before. De Foucault (1981, 1986a) adopts this view, though he also takes some ideas of Passarge (1969). Passarge himself, though he recognizes many regional and suballiances, comes in fact closely to the view of Sougnez.

Also obvious from the literature is that in several countries there is a practice of distinguishing new associations based mainly on the presence of local species (Tüxen & Oberdorfer 1952, Seliskar 1993, Teles 1970, Bruno 1968, Ubaldi 1978, Cortini Pedrotti 1973).

IV Results

The classification of the data shows the following division:

A: It can be seen from the synoptic table that the relevés of Portugal form a striking and seperate group, characterized especially by the constant presence of *Agrostis castellana* and the absence of many species that are characteristic for the class Molinia-Arrhenatheretea like *Ranunculus acris, Taraxacum officinale, Leontodon autumnalis, Lathyrus pratensis, Leucanthemum vulgare, Cardamine pratensis* and *Lychnis flos-cuculi*. Constant species are *Danthonia decumbens, Hypochaeris radicata, Trifolium dubium* and *Leontodon saxatilis*. The Pôrtugese relevés are clearly divided into the two groups that are recognized by Teles (1970): the Anthemido-Cynosuretum (Teles 1963) Teles 1966 and the Bromo-Cynosuretum (Teles 1963) Teles 1966.

This latter community includes a range from dry to wet meadows, which are mown for hay or cut green several times a year and found on a number of plateaus (500-1100 m.) in the north of Portugal. A continental influence prevails, with three or four dry months in the summer and 572-1148 mm rainfall per year. The syntaxon is named after *Bromus racemosus* ssp. *commutatus* and besides this species is distinguished from the next community by the presence of e.g. *Festuca arundinacea, Gaudinia fragilis, Orchis coriophora* and *Cyperium badius*. Constant species of the alliance, compared with the Anthemido-Cynosuretum, are *Lolium perenne* and *Bellis perennis*. The association contains three subcommunities: one of wet places with more Atlantic species like *Carum verticillatum, Juncus acutiflorus* and *Carex ovalis* and related to the Junco-Cynosuretum; a second that is quite similar to the Lolio-Cynosuretum, cut green several times a year and located close to the farms; a third which is found on less mesotrophic soils, characterized by e.g. *Vulpia bromoides, Sanguisorba minor, Aira caryophylla* and *Linum bienne*. The last group shows affinity with the Lino-Cynosuretum of Spain, although there is no *Centaurea nigra*.

The Anthemido-Cynosuretum includes poor and moderately wet hay meadows, usually irrigated and rather extensively managed. The fertility of the soil is higher and the grasslands are less intensively grazed in comparison with the former assocation. The community occurs in the mountainous areas (800-1100 m.) of northern Portugal mainly on litholic soils derived from granites. The species composition differs from the Bromo-Cynosuretum in the first place by the lack of *Lolium perenne* and *Bellis perennis* and second by the presence of e.g. *Chamaemelum nobile, Orchis sesquipedales, Holcus mollis, Centaurea nigra, Galium broterianum, Gladiolus illyricus* and *Anthoxanthum amarum*. These species, like *Arnica montana* ssp. *atlantica* and *Peucedanum lancifolium*, show an south-Atlantic influence, while Mediterranean species are more poorly represented in contrast to the Bromo-Cynosuretum. The constant presence of Molinietalia species like *Lotus uliginosus, Juncus articulatus* and *Carum verticillatum* is striking and is partly due to the poor soil drainage and the extensive management (Teles 1970). The community shows affinity with the Junco-Cynosuretum pastures of France.

B: The second group that is distinguished are damp Cynosurion pastures of the lowlands of western and central Europe. Here are put together both the Lolio-Cynosuretum lotetosum communities of Germany, The Netherlands, Great Britain and Poland and the Junco-Cynosuretum grasslands of France and Belgium. The group differs from the other ones by the high presence of *Lotus uliginosus* and *Carex leporina*. In addition, *Cardamine pratensis, Lychnis floscuculi, Cirsium palustre, Alopecurus geniculatus* and *Juncus effusus* are rather constant.

Sougnez (1957, 1963) has described the Junco-Cynosuretum Sougnez. 1957 from Belgium, as developed from and so closely related to the Moliniet-

alia communities. The Junco-Cynosuretum includes the rather productive pastured grasslands of mesotrophic brown earths, that are kept moist and sometimes waterlogged by ground or surface water. Such soils frequently shows gleying in the surface horizons and although they may develop a humose topsoil, the community is characteristically absent from true organic soils. The Junco-Cynosuretum is characterized by tall hygrophytes like *Filipendula ulmaria, Juncus effusus* and *Epilobium hirsutum* and less sensitive Molinietalia species like *Carex disticha, Cirsium palustre, Lychnis floscuculi, Lotus uliginosus* and *Bromus racemosus*. In our analysis, the relevés of the Lolio-Cynosuretum subassociation lotetosum are put together with this Junco-Cynosuretum group. Also, within the Junco-Cynosuretum a less mesotrophic group can be recognized that contains species of the Junco-Molinion and Nardetalia grasslands like *Carex panicea, Carex flacca, Succisa pratensis, Luzula campestris* and *Hieracium auricula*. This group is not well delimited and rather diffuse in the table. De Foucault (1981) also recognizes the association Oenantho peucedanifoliae-Brometum racemosi, which differs from the Junco-Cynosuretum in the rather constant presence of *Bromus racemosus, Oenanthe peucedanifolia* and *Scorzonera humilis*. This group tends to the Calthion meadows and is clearly distinguished in the table.

C: The next group is less clearly delimited, but differs from the other groups in the constant presence of *Luzula campestris, Centaurea nigra* and/or *Centaurea jacea* agg. The group contains relevés that have been described by de Foucault (1981) as Luzulo-Cynosuretum Meisel 1966. This association should in his view deal with the nutrientpoor Cynosurion types of the submontane and lowland areas and includes extensive pastures of rather wet to dry, acid to somewhat calcareous soils. Very similar to and mixed with these French relevés are the relevés of Britain and Ireland that belong to the Centaureo-Cynosuretum Br.Bl. et Tx. 1952. This community, divided into subassociations in relation to soil conditions, is widely distributed in Great Britain (O'Sullivan 1965, 1968, Page 1980, Rodwell 1992). The management of these grasslands in the different countries is the same, as they generally are mown once a year. Both the French, Irish and British data show transitions to both the Mesobromion grasslands of dry and calcareous soils and to the Nardo-Galion grasslands of more acid soils. The first group contains a higher frequency of species like *Plantago media, Leontodon hispidus, Galium verum* and *Koeleria macrantha*, whereas in the second group the frequency of *Danthonia decumbens, Hieracium pilosella, Potentilla erecta* and *Nardus stricta* is higher. The Mesobromion elements are much more clearly represented in the data, but this is partly caused by the availability of samples. The literature shows that the Centaureo-Cynosuretum Danthonia subcommunity is certainly widespread in Great Britain (O'Sullivan 1965, 1968, Page 1980, Rodwell 1992). The French relevés also include a transition to the Junco-Cynosuretum with *Ranunculus repens, Cardamine pratensis* and *Cirsium palustre*.

The group includes also most of the Spanish relevés that are, as shown by the table, closely related to the Centaurea-Cynosuretum and the Luzulo-Cynosuretum. In Spain, these relevés are generally put in the Lino-Cynosuretum Oberd. et Tx. 1954. This community is visible in the table as a rather separate subgroup and is composed of either Spanish and some southern French relevés. They differ from the British and Irish Centaureo-Cynosuretum and the French Luzulo-Cynosuretum by the high frequency of the warmth-loving species *Trifolium patens, Gaudinia fragilis* and *Linum bienne.* This syntaxon has been described first from the lowlands of northwest Spain. Here the community includes meadows, that are grazed and mown, on moist mesotrophic brown soils. The community is widespread and in some areas the most abundant vegetation type. De Foucault (1986b, 1986c) has described this community from France (Hautes-Pyrenées, Pays Basque and Landes de Gascogne). Here *Centaurea nigra* is replaced by *Centaurea thuillieri,* which is taxonomically close to *Centaurea nigra.*

Finally, the group includes more nutrientrich grasslands from The Netherlands and Belgium that are related to the Lolio-Cynosuretum and the Arrhenatherion hay meadows. Within this group, they differ in the high frequency of e.g. *Lolium perenne, Ranunculus repens, Poa pratensis* and *Arrhenatherum elatius.*

D: In the centre of the table are placed the pastures of the Lolio-Cynosuretum. This community contains relevés of all countries included except Portugal, Spain, Romania and Austria. The group is mainly negatively characterized, but has a relatively high frequency of *Cirsium vulgare, Agropyron repens, Leontodon autumnalis* and *Alopecurus pratensis.* The presence of such Cynosurion elements as *Lolium perenne, Trifolium repens, Bellis perennis* and *Prunella vulgaris* is very constant. Within the community, there is a diffuse variety of species composition caused by differences of soil conditions and sometimes of altitude. For example, the Swiss relevés are characterized by the montane species *Alchemilla xanthochlora.* From The Netherlands, the grasslands of moist rather heavy clay with *Hordeum secalinum* and *Carum carvi* are put together as a seperate subgroup.

E: A very striking group is composed of the grasslands that are transitional to the alliance Mesobromion. This community is characterized by the high presence of *Cirsium acaule, Sanguisorba minor, Carex flacca, Avenula pubescens* and *Carex caryophylla.* The group contains relevés of France, Belgium, The Netherlands, Germany, Switzerland and Great-Britain.

These grasslands have been described by Sougnez (1957, 1963) in Belgium as Galio-Trifolietum Sougnez 1957. In Germany, this vegetation is put in the Festuco-Cynosuretum together with the grasslands that are closely related to the Nardo-Galion communities. The association includes speciesrich grasslands on calcareous mesotrophic brown soils, that are grazed by cattle. The

association is characterized by a high number of constant species of the Molinio-Arrhenatheretea on the one hand and of the Festuco-Brometea on the other hand. Grasses like *Festuca rubra, Agrostis capillaris, Trisetum flavescens, Avenula pubescens, Anthoxanthum odoratum* and *Dactylis glomerata* are often prominent. Besides, legumes such as *Trifolium pratense, Trifolium repens, Trifolium dubium, Lotus corniculatus* and *Medicago lupulina* are well presented. This grassland type occurs mostly in mosaic with other pastured communities like the Gentiano-Koelerietum and the Lolio-Cynosuretum.

In the table the relevés of Great-Britain are put together as a subgroup. These grasslands lack several Cynosurion- and Arrhenatheretalia species like *Lolium perenne, Bellis perennis, Rumex acetosa, Ranunculis acris* and *Cerastium fontanum.* Besides, they differ from the other subgroup in the virtual absence of *Anthoxanthum odoratum, Agrostis tenuis* and *Festuca rubra* and the high frequency of *Avenula pratensis, Filipendula vulgaris, Scabiosa columbaria, Koeleria macrantha* and *Festuca ovina.* In Great-Britain this assemblage is more clearly part of the Mesobromion. It has been described as part of the *Festuca ovina-Avenula* pratensis grassland where the Mesobromion extends on to more fertile and less droughtprone brown calcareous earths in pastures that are often grazed by cattle rather than sheep (Rodwell 1992).

F: The last group includes most of the montane Cynosurion grasslands of Slovakia, Austria, Germany, Switzerland, Italy, Spain and Romania. The group is very heterogeneous, but can be characterized by the absence of *Holcus lanatus* and the presence of species of both somewhat baserich soils like *Plantago media, Leontodon hispidus, Sanguisorba minor, Briza media* and *Linum catharticum* and also of basepoor soils like *Danthonia decumbens, Potentilla erecta* and *Hieracium pilosella.* In this group, samples from the countries compose different subgroups.

A striking group is shown by the Romanian relevés and characterized by the absence or low frequency of both Cynosuron and Molinio-Arrhenatheretea species like *Trifolium repens, Cynosurus cristatus, Trifolium pratense, Plantago lanceolata, Lolium perenne, Ranunculis acris, Bellis perennis* and *Prunella vulgaris.* Constant species are *Anthoxanthum odoratum, Festuca rubra and Agrostis tenuis,* while *Genista sagittalis, Rhinanthus rumelicus, Trifolium montanum, T. alpestre* and *Gymnadenia conopsea* are differential. The pastures belong to the Festuco-Agrostietum Horv. 1951 and are found in the lowlands and submontane areas (500-1000 m.) in the east Carpathian of Slovakia and Romania (Jurko 1969b, Boscaiu 1970, Coldea 1977, 1991). Considering the absence of the species named above as giving the main character to the Cynosurion in the centre of its distribution area, these grasslands can hardly be placed in this alliance.

Also there is a separate group of Italian relevés that is characterized by a high frequency and cover of common Lolio-Cynosuretum species. Striking constant species are *Trisetum flavescens, Luzula multiflora* and *Rumex aceto-*

sella. However, within the Italian group there is a big difference in the species composition of the various stands.

The Slovakian relevés, together with the Austrian, some Swiss, French and German, coming mainly from submontane and montane areas, are characterized by constant species like *Thymus pulegioides, Euphrasia rostkoviana* and *Euphorbia cyparissias*. In addition, there is a relatively high percentage of *Carlina acaulis, C. vulgaris* and *Alchemilla vulgaris*. The Slovakian grasslands have been described by Jurko as Anthoxantho-Agrostietum Sillinger 1933 em. Jurko 1969. Originally this association included the less improved, grazed and sometimes mown grasslands, on both basepoor and base-rich soils, of the montane zone in Slovakia. However, this vegetation type is also found in the lowland areas of Slovakia from rather warm and moist to colder and wet areas. The association is somewhat less mesotrophic and more species rich than the grasslands of the German Festuco-Cynosuretum. They are not usually improved and are more extensively grazed. The influence of the subsoil on the species combination is often low, nonetheless three subassociations are distinguished which are gradiënts to both the Mesobromion (calcareous soils), Nardetalia (basepoor soils) and Arrhenatherion/Polygono-Trisetion grasslands. The association is typical of the west Carpathians, in Slovakia, southern Poland and northern Hungary (Jurko 1969a, 1969b, 1971, 1974).

In Austria, these grasslands have been put in the Lolio-Cynosuretum alchemilletosum (upland-subcommunity), while in Germany they are classified as Festuco-Cynosuretum Tx. in Büker 1942. De Foucault partly describes them as an montane variety of the Galio-Trifolietum and partly as the Festuco-Cynosuretum. In Switzerland, this vegetation belongs to the Phleo-Leontodontetum Br.-Bl. et Berset 56 that contains several subcommunities based on soil conditions, microclimate and degree of improvement. The relevés that have been put in this group, belong to the montane subcommunity of the Phleo-Leontodontetum. In Spain, similar grasslands have been described as Merendero-Cynosuretum by Tüxen & Oberdorfer (1958) from the submontane and montane areas (altitude 600-1000 m) of the Pyrenean and Cantabrian mountains in north-west Spain. It includes grasslands grazed by cattle, sheep or horses on neutral to baserich soils. They differ by having some Mediterranean species such as *Eryngium bourgati, Trifolium bonannii* and *Merendera montana*, though at a very low frequency.

Next to the Anthoxantho-Agrostietum, Jurko describes the Lolio-Cynosuretum, from which the relevés have also been placed in this last "montane" cluster. These grasslands are characterized by the constant presence of Cynosurion species like *Lolium perenne, Cynosurus cristatus, Trifolium repens* and *Bellis perennis*. They differ from the other Lolio-Cynosuretum pastures by a high frequency of *Plantago media* and *Medicago lupulina* and a relatively high amount of *Hieracium pilosella* and *Euphorbia cyparissias*, which species are characteristic for the Anthoxantho-Agrostietum.

V Tentative Conclusions and Discussion

Despite the incompleteness of the data and the fact that they are not contemporaneous (time-range from 1930 to 1993), the classification, as described above, shows some clear results that can be used for a classification of the Cynosurion at the level of association.

The division into the several groups that has been described above as a result of the TWIN-SPAN-classification, corresponds roughly with one of the two approaches in the literature to classify the alliance: the distinction of the groups can mainly be understood by differences in soil basestatus, geographical position and altitude and is therefore quite similar to the ideas of Sougnez (1963) and De Foucault (1981). A clear division based on the level of improvement has not been made. The diagnostic species of the alliance generally conform to the literature, although in the communities at the edge of the distribution area several species are lacking; the same applies for species of the order and class.

The major trends of the floristic variation among the data will now be summarized. In figure 4, the associations and their distribution across Europe are shown.

First, a large group has been recognized, containing the grasslands of less improved, base-poor to baserich, moist to relatively dry soils of the lowlands and submontane areas in western and central Europe. They occur under the influence of an Atlantic or Subatlantic climate and do not extend in areas with much continental or Mediterranean influence. These grasslands have many different names in the included countries, but they were first described from Ireland as Centaureo-Cynosuretum by Braun-Blanquet & Tüxen in 1952. Within this community, several subcommunities can be distinguished on the basis of the local climate and differences in soil conditions. The Lino-Cynosuretum of Spain can be seen as a southern vicariant of the association.

Second, there is a lowland grassland type of wet to moist, more or less mesotrophic soils that are distributed throughout west and central Europe under the influence of an Atlantic or Subatlantic climate. This community shows an affinity with the Lolio-Cynosuretum, but is also characterized by a group of differential species. In the light of our data, we would prefer to adopt the view of Sougnez and De Foucault and distinguish the association Junco-Cynosuretum Sougnez 1957 next to the Lolio-Cynosuretum lotetosum. However, within the Junco-Cynosuretum there is a strong relation with the Calthion meadows, and therefore the syntaxonomical position of these grasslands is still open to discussion.

Third, there are the grasslands of rather dry calcareous mesotrophic brown earths, that are closely related to the grasslands of the Mesobromion. These communities belong to the Galio-Trifolietum Sougnez 1957 and occur throughout western and central Europe, mainly in the colline and montane zone. Corresponding with their geographical position in Europe, these grass-

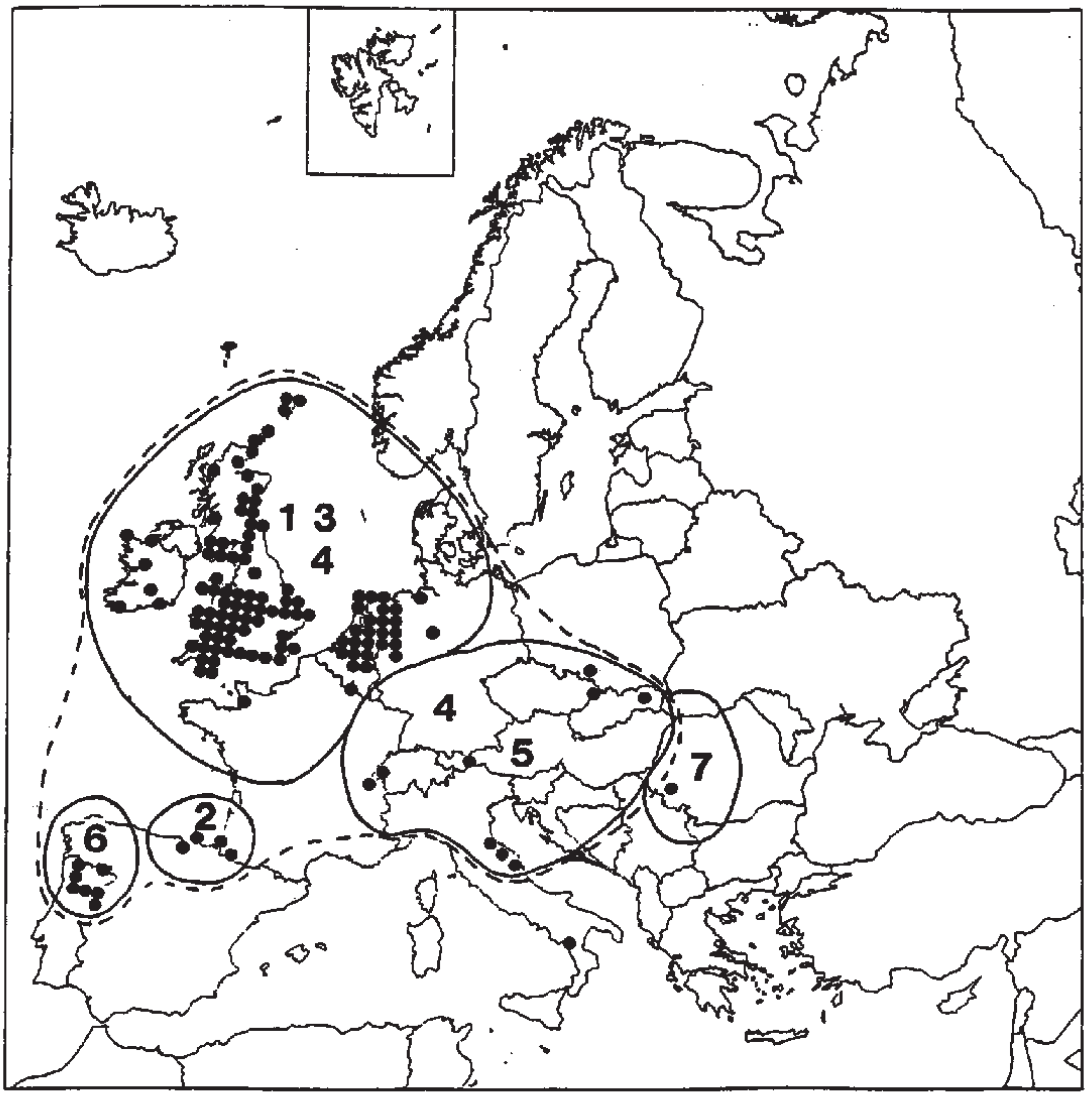

Fig. 4 – Distribution of the main Cynosurion types in Europe:
-- = Cynosurion (Lolio-Cynosuretum)
1 = Centaureo-Cynosuretum
2 = Lino-Cynosuretum
3 = Junco-Cynosuretum
4 = Galio-Trifolietum
5 = Anthoxantho-Agrostietum
6 = Anthemido-Cynosuretum & Bromo-Cynosuretum
7 = Festuco-Agrostietum

lands show more or less resemblance with the Festuco-Brometea. In central Europe, these grasslands are generally assigned to the Cynosurion, in Great Britain to the Mesobromion.

Fourth, the submontane and montane Cynosurion grasslands of Slovakia, Austria, Switzerland, France, Italy and Germany have been shown

to be rather similar to each other. They can be recognized as the upland Cynosurion of central and eastern Europe. This assemblage is characterized on the one hand by a high frequency of "weaker" Mesobromion species and on the other hand by a regular amount of Nardo-Galion and mountainous species. For reasons of priority, the correct name for this community (assuming that it is one association) is the Anthoxantho-Agrostietum Sillinger 1933. The name Festuco-Cynosuretum Tx. in Büker 1942 is also often referred to and is a synonym of later date. The Merendero-Cynosuretum as described by Tüxen & Oberdorfer (1958) may be seen as the south-western example of this community, as also proposed by the authors themselves.

The grasslands at the edge of the distribution area of the alliance are clearly separated from the rest of the table. The relevés of Portugal remain as a well delimited group that differs mainly by the constant presence of Agrostis castellana, several south Atlantic and Mediterranean species and the lack of many species that are characteristic of the class Molinio-Arrhenatheretea. Nevertheless, the frequency of Cynosurion species is high. In spite of the clear distinction that has been made of all the Portugese data, these relevés can not be assigned to the same community: the group is clearly divided in two different communities that correspond with those described by Teles (1970). More data from this country are necessary to understand the syntaxonomical position of these Portugese Cynosurion types in a European context. The Romanian grasslands of the Festuco-Agrostietum probably show how the character of the Cynosurion pastures changes in the southeastern edge of the distribution area. It can be concluded from the table that the Festuco-Agrostietum probably belongs to another alliance than the Cynosurion and maybe even to another class.

Finally, a "central" community has been shown that is mainly negatively characterized and rather species poor. In this community, all relevés are gathered that are recognized as Lolio-Cynosuretum Tx. 1937. This association includes the most improved grasslands of the Cynosurion and can probably be recognized throughout the whole distribution area. Within the association, the species composition varies only a little, dependent on climate, altitude and soil conditions.

The study shows the advantages of using individual relevés like detail, subtlety, reference to real places as against the loss of information in constancy tables. Certainly, the main disadvantage of using synoptic tables is that they do not show the internal heterogeneity of the (sub)communities and this makes it difficult to determine their meaning. The difficulty of using individual relevés is the labour and time taken due to the large quantity of relevés that is required. Despite the disadvantages of synoptic tables, they can of course be very useful for a classification on an international level; their value will be higher when % frequencies instead of Roman numbers are used.

Concerning the conservation value referred to in the introduction, it can be said that this study certainly shows the importance of the Cynosurion

pastures in terms of biodiversity: some grasslands, can still be seen as lowinput systems with a floristic composition that is strongly influenced by climate and soil basestatus and quite species-rich. This means that within the main associations too, the species composition varies across the distribution areas as has been seen from the classification described above. Considering the area of these grasslands is still shrinking and that their protection is very poor, it is essential to emphasize the importance of these communities for nature conservation and management on a European level.

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