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## Considerations on the phytogeographic division of Slovenia

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### SUMMARY

The paper constitutes an attempt at a further supplemented, changed and more detailed phytogeographic division of Slovenia. Slovenia is divided into an Alpine-highnordic, a Euro-Siberian-Northamerican and a mediterranean region. The regions are divided into 4 provinces, 5 sectors, 7 subsectors and 25 districts.

Ever since the II<sup>nd</sup> World War, especially so in the last thirty years, a systematic and continued research of the vegetation in Slovenia has provided a solid basis for the phytogeographic division of Slovenia. The first attempt at such a division was made by M. Wraber as early as in 1960 when presenting a phytosociological division of the forest vegetation of Slovenia. Taking into account older authors (G. Beck-Mannagetta 1907-1913, A. Hayek 1907, 1923) and his own contemporaries (J. Braun Blanquet 1951-1964, I. Horvat 1954, S. Horvatić 1957, 1967) he later prepared and published the first phytogeographic division of Slovenia together with a corresponding phytogeographic map. He divided Slovenia into 6 phytogeographic regions: Alpine, Dinaric, submediterranean, sub-Pannonian, pre-Dinaric and pre-Alpine. The basis for this division was derived from the then available investigations and maps of the real forest vegetation. His phytogeographic division met with a general and favourable reception. M. Wraber was aware of the imperfection of his thesis and drew attention to the necessity of supplements and amendments.

The present state of science and an ever deeper knowledge of the real and the potential natural vegetation of Slovenia, as well as of the phytogeographic division of flora and fauna of Central Europe and Yugoslavia in particular (H. Meusel et al. 1965-1978, M. Wraber 1969, I. Horvat, V. Glavač, H. Ellenberg 1974, P. Fukarek 1977, 1979, I. Trinajstić 1974, 1976, 1977, 1978, 1980, 1981, 1986) have made it possible for us to introduce some amendments into the basic phytogeographic division of Slovenia, its division into smaller units - districts - and also the inclusion thereof into higher phytogeographic units.

Our supplements and amendments were based on the reconstruction of the potential natural vegetation of Slovenia and Yugoslavia which for Slovenia was presented on 1: 400 000 and 1: 1 000 000 maps (L. Marinček, I. Puncer, A. Seliškar, M. Zupančič 1979, 1983). Taken into account were also older and numerous recent investigations on the real vegetation and the specialities of our flora.

By applying the afore-mentioned results and new experiences, changes and supplements were effected with respect to the borders between the Alpine and the submediterranean, the pre-Alpine and the pre-Dinaric, the Dinaric and the pre-Alpine region.

According to M. Wraber 1969, the inclusion of "regions" into higher phytogeographic units required that the term "region", having no place of its own in the phytogeographic nomenclature, be replaced by two more adequate terms, namely: sector and subsector. Sectors and subsectors were further divided into districts.

Appearing in Slovenia are three phytogeographic regions. In the Alpine world, the Alpine-highnordic region with an Alpine province and a south-eastern Alpine sector. In our opinion this region covers a smaller surface. Generally spread is the Euro-Siberian-North-American region including the not so large Central European province with a trans-Alpine, a sub-Alpine and a pre-Pannonian subsector. The Illyrian province with a southeastern Alpine and a western Dinaric sector is larger. The first sector is further divided into a sub-Alpine, a pre-Pannonian and a pre-Alpine sector, whereas the second into a northwestern Dinaric and a pre-Dinaric subsector. The third is the mediterranean region with an Adriatic province and a Slovene coast sector which from the floristic and the vegetational aspect is not so well-defined since with us there appear only some submediterranean and rare mediterranean species. Here and there one can observe a fragmentary development of the mediterranean vegetation, while the submediterranean vegetation includes numerous elements from the Euro-Siberian-North-American region. We therefore determined it as a special sector with a district of Goriška brda, district of Kras (Karst) and Vipava valley, district of Brkini and district of Koper and Šavriška brda. Presented in the first synoptic table (Tab. I) is our phytogeographic division of Slovenia which is compared also with the previous "regions" according to M. Wraber 1969. Its references correspond to those in the map as enclosed.

In the second table (Tab. II) we wished to define single districts on the basis of the "dominant" and the "specific", respectively, or the "differential" vegetation and flora.

# SR. SLOVENIJA

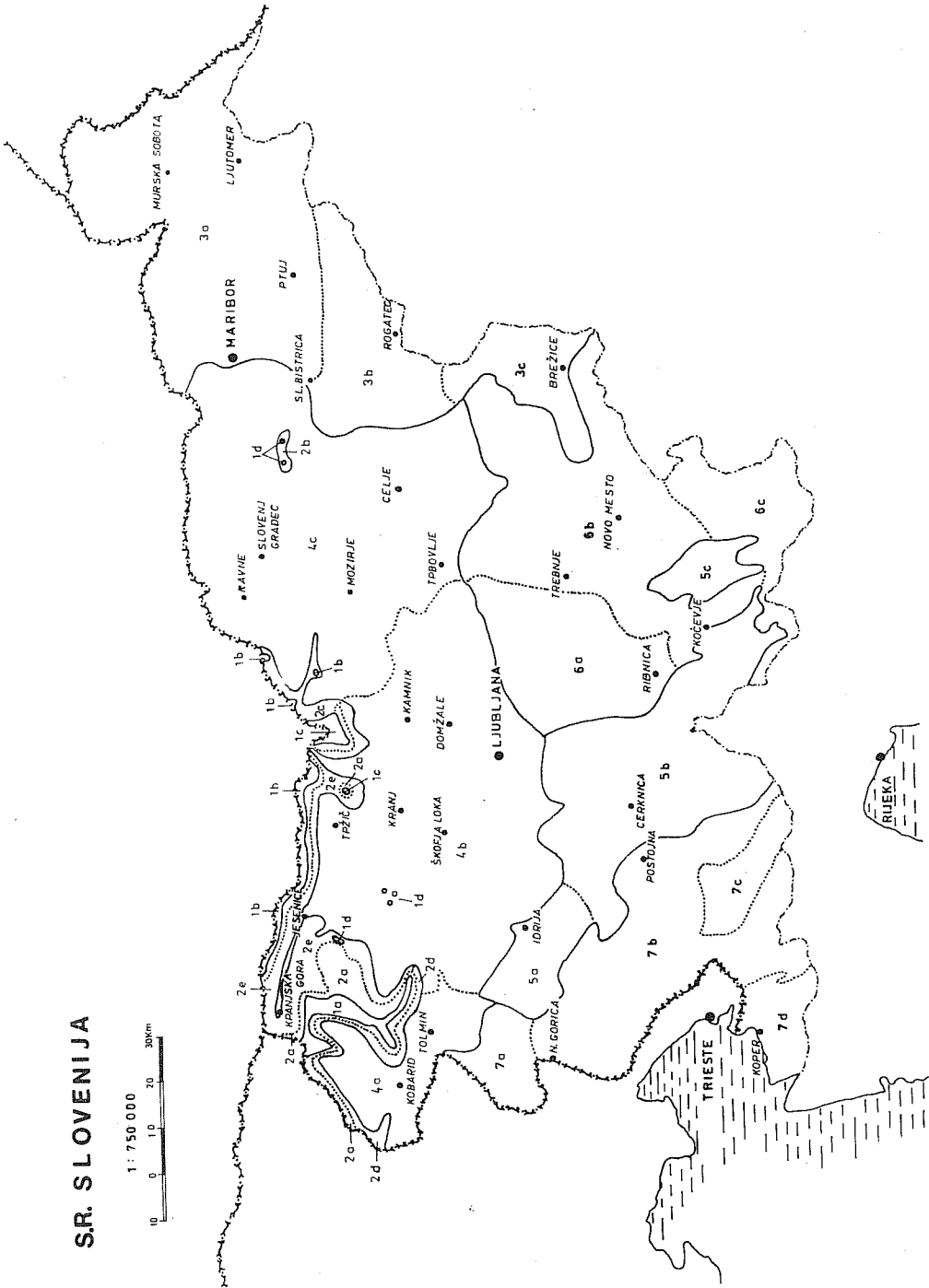
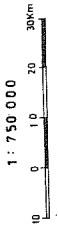


FIG. 1 - Phytogeographic division of Slovenia.

TABLE I - Phytogeographic division of Slovenia.

According to M. Wraber 1969	According to M. Zupančič, L. Marinček, A. Seliškar, I. Puncer
ALPINE REGION	ALPINE-HIGHNORDIC REGION ALPINE PROVINCE SOUTHEASTERN ALPINE SECTOR 1 a Julian District 1 b Karavanken District 1 c Kamnik and Savinja Alps District 1 d Alpine-Pohorje District (Central Alpine)
ALPINE REGION	EURO-SIBERIAN-NORTH-AMERICAN REGION CENTRAL EUROPEAN PROVINCE TRANS-ALPINE SECTOR SUB-ALPINE SUBSECTOR 2 a Southwestern Alpine District 2 b Pohorje (Central Alpine) District 2 c Upper Savinja-Carinthian District
PRE-PANNONIAN REGION	PRE-PANNONIAN SUBSECTOR 3 a Drava and Mura District
ALPINE REGION	ILLYRIAN PROVINCE SOUTHEASTERN ALPINE SECTOR SUB-ALPINE SUBSECTOR 2 d Primorje (littoral)-Julian Alps District 2 e Julian-West Karavanken-Kamnik Alps District
SUB-PANNONIAN REGION	PRE-PANNONIAN SUBSECTOR 3 b Haloze District 3 c District of Bizeljsko and Krško
PRE-ALPINE REGION	PRE-ALPINE SUBSECTOR 4 a Submediterranean-Prealpine District 4 b Kranj District 4 c District of Štajerska-Koroška
DINARIC REGION	WESTERN DINARIC SECTOR NORTHWESTERN DINARIC SUBSECTOR 5 a District of Trnovski gozd (Trnovo wood) 5 b Snežnik-Risnjak District 5 c Rog District
PRE-DINARIC REGION	PREDINARIC SUBSECTOR 6 a Western Dolenjsko (Lower Carniola) District 6 b Eastern Dolenjsko (Lower Carniola) District 6 c Bela Krajina District
SUBMEDITERRANEAN REGION	MEDITERRANEAN REGION ADRIATIC PROVINCE NORTHERN COAST SECTOR 7 a District of Goriška Brda 7 b Kras (Karst) and Vipava valley District 7 c Brkini District 7 d District of Koper and Šavrinska brda

TABLE II - Vegetational and floristical analysis of districts.

ALPINE-HIGHNORDIC REGION

ALPINE PROVINCE

SOUTHEASTERN ALPINE SECTOR

1 a) Julian District

Potentilletum caulescentis  
Salici retusae-Homogynetum discoloris  
Salicetum herbaceae

Saxifrago sedoidis-Arabidetum caeruleae  
Potentilletum nitidae  
Festuco violaceae-Rumicetum nivalis  
Leontodontetum montani

Festucetum calvae  
Gentiano terglouensis-Caricetum firmae

Papaveri julici-Thlaspietum rotundifolii

*Arabis caerulea*  
*Saxifraga sedoides*  
*Thlaspi rotundifolium*  
*Anemone baldensis*  
*Primula wulfeniana*  
*Festuca calva*  
*Aconitum angustifolium*  
*Thlaspi kernerii*  
*Papaver julicum*

1 b) Karavanken District

Potentilletum caulescentis  
Salici retusae-Homogynetum discoloris  
Salicetum herbaceae

Festucetum calvae  
Gentiano terglouensis-Caricetum firmae

Papaveri kernerii-Thlaspietum kernerii  
Festucetum laxae  
Potentillo clusianae-Campanuletum zoysii

*Ranunculus alpestris*  
*Ranunculus seguieri*  
*Festuca laxa*  
*Primula wulfeniana*  
*Gentiana froelichi*  
*Saxifraga hobenwartii*  
*Viola zoysii*

1 c) Kamnik and Savinja Alps District

Potentilletum caulescentis  
Salici retusae-Homogynetum discoloris  
Salicetum herbaceae

Festucetum calvae  
Gentiano terglouensis-Caricetum firmae

*Aconitum tauricum*  
*Primula wulfeniana*  
*Gentiana froelichi*  
*Leucanthemum lithopolitanicum*

*Allium kermesinum*

1 d) Alpine-Pohorje District

Pino-Sphagnetum s.lat. and other  
associations of classes Oxycocco-  
Sphagnetea and Scheuchzerio-Caricetea  
fuscae

*Oxycoccus microcarpus*  
*Andromeda polifolia*  
*Scheuchzeria palustris*  
*Swertia perennis*  
*Drosera* sp. div.  
*Sphagnum* sp. div.

EURO-SIBERIAN-NORTH-AMERICAN REGION  
CENTRAL EUROPEAN PROVINCE  
TRANS-ALPINE SECTOR  
SUB-ALPINE SUBSECTOR

2 a) Southwestern Alpine District

Sphagno-Pinetum mugo  
Carici brizoidis-Sphagno-Piceetum  
Rhytidiadelphi lorei-Piceetum  
Calamagrostidi arundinaceae-Piceetum  
  
Rhodothamno-Pinetum mugo  
Adenostylo glabrae-Piceetum  
Bazzanio-Piceetum  
Aposeri-Piceetum  
Aceri-Fagetum austroalpinum

*Picea abies*  
*Pinus mugo*  
*Rhodothamnus chamaecistus*  
*Rhododendron hirsutum*  
*Sphagnum girgensohnii*  
*Sphagnum flexuosum*  
*Sphagnum robustum*  
*Sphagnum palustre*  
*Carex brizoides*

2 b) Pohorje (Central Alpine) District

Sphagno-Pinetum mugo  
Carici brizoidis-Sphagno-Piceetum  
Rhytidiadelphi lorei-Piceetum  
Calamagrostidi arundinaceae-Piceetum  
  
Sphagno-Pinetum mugo rhododendretosum ferruginei  
Luzulo sylvaticae-Piceetum  
Aceri-Fagetum pohoricum

*Rhododendron ferrugineum*  
*Hieracium transilvanicum*

2 c) Upper Savinja-Carinthian District

Sphagno-Pinetum mugo  
Carici brizoidis-Sphagno-Piceetum  
Rhytidiadelphi lorei-Piceetum  
Calamagrostidi arundinaceae-Piceetum  
Rhodothamno-Pinetum mugo  
Adenostylo glabrae-Piceetum  
Aposeri-Piceetum

*Woodsia alpina*  
*Cortusa matthioli*  
*Primula x seratifolia*  
(=*Primula minima* x *P. wulfeniana*)  
*Pinus cembra*

PRE-PANNONIAN SUBSECTOR

3 a) Drava and Mura District

Salici-Populetum albae  
Carici elongatae-Alnetum glutinosae  
(Carici brizoidis-Alnetum glutinosae)  
Leucojo-Fraxinetum angustifoliae  
Carpinetum subpannonicum  
Fagetum subpannonicum  
Galio rotundifolii-Pinetum  
(Myrtillo-Pinetum subpannonicum)

*Gaudinia fragilis*  
*Daphne cneorum* var. *arbusculoides*  
*Polystichum setiferum*

ILLYRIAN PROVINCE  
SOUTHEASTERN ALPINE SECTOR  
SUB-ALPINE SUBSECTOR

2 d) Primorje (littoral)-Julian Alps District

Anemone trifoliae-Faagetum var. geogr.  
Luzula nivea

*Luzula nivea*  
*Anemone trifolia*  
*Leontodon berinii*

2 e) Julian-West Karavanken-Kamnik Alps District

Anemone-Fagetum var. geogr.  
Helleborus niger  
Faagetum subalpinum var. geogr.  
Larix decidua

*Larix decidua*  
*Helleborus niger* subsp. *niger*  
*Anemone trifolia*  
*Pedicularis julica*

## PRE-PANNONIAN SUBSECTOR

### 3 b) Haloze District

Fagetum subpannonicum var. geogr.  
Festuca drymeia  
(Festuco drymeiae-Fagetum)  
Abieti-Fagetum praepannonicum

*Primula vulgaris*  
*Cardamine trifolia*  
*Dentaria trifolia*  
*Festuca drymeia*

### 3 c) District of Bizeljsko and Krško

Fagetum submontanum praedinaricum  
(fragments)  
Lamio orvalae-Fagetum praedinaricum (fragments)

*Pseudostellaria europaea*  
*Gagea spathacea*

Pseudostellario-Carpinetum  
Pseudostellario-Quercetum roboris

## PRE-ALPINE SUBSECTOR

### 4 a) Submediterranean-Prealpine District

Fagetum submontanum var. geogr.  
Sesleria autumnalis  
Ostryo-Fagetum var. geogr. Luzula nivea  
Cytisantho-Ostryetum

*Sesleria autumnalis*  
*Ruscus aculeatus*  
*Chrysopogon gryllus*  
*Luzula nivea*

Ornithogalo-Carpinetum ostryetosum (fragments)  
Asplenio-Piceetum (fragments)

### 4 b) Kranj District

Carpinetum prealpinum  
Fagetum submontanum praealpinum  
Lamio orvalae-Fagetum praealpinum  
Abieti-Fagetum praealpinum

*Dentaria digitata*  
*Lamium orvala*  
*Hacquetia epipactis*  
*Anemone trifolia*

Fagetum altimontanum praealpinum  
Querco-Luzulo-Fagetum

Fagetum subalpinum praealpinum  
Ostryo-Fagetum var. geogr.  
Anemone trifolia  
Blechno-Fagetum  
Carici remotae-Fraxinetum

### 4 c) District of Štajerska-Koroška

Carpinetum praealpinum  
Fagetum submontanum praealpinum  
Lamio orvalae-Fagetum praealpinum  
Abieti-Fagetum praealpinum  
Fagetum altimontanum praealpinum  
Querco-Luzulo-Fagetum

*Galium rotundifolium*

Galio-Abietetum  
Luzulo-Abieti-Fagetum  
Bazzanio Abietetum  
Querco-Luzulo-Fagetum var. geogr.  
Hieracium transsilvanicum  
Carici albae-Piceetum



WESTERN DINARIC SECTOR  
NORTHWESTERN DINARIC SUBSECTOR

5 a) District of Trnovski gozd (Trnovo wood)

Isopyro-Fagetum  
(incl. Aceri-Fagetum dinaricum)  
Neckero-Abietetum  
Piceetum subalpinum dinaricum

Fagetum altimontanum dinaricum  
Fagetum subalpinum dinaricum  
Pinetum mugo croaticum  
Edriantho-Caricetum humilis  
Abieti-Fagetum praealpino-dinaricum  
Luzulo albidae-Piceetum  
Carlino-Caricetum humilis

*Sesleria autumnalis*  
*Anemone trifolia*  
*Primula carniolica*  
*Primula x venusta* (*Primula auricula* x  
*P. carniolica*)  
*Hladnikia pastinacifolia*

5 b) Snežnik-Risnjak District

Isopyro-Fagetum  
(incl. Aceri-Fagetum dinaricum)  
Neckero-Abietetum  
Piceetum subalpinum dinaricum  
Fagetum altimontanum dinaricum  
Fagetum subalpinum dinaricum  
Pinetum mugo croaticum  
Abieti-Fagetum dinaricum  
Abieti-Piceetum dinaricum  
Piceetum montanum dinaricum

*Aremonia agrimonoides*  
*Omphalodes verna*  
*Calamintha grandiflora*  
*Allium victorialis*

5 c) Rog District

Isopyro-Fagetum  
(incl. Aceri-Fagetum dinaricum)  
Neckero-Abietetum  
Piceetum subalpinum dinaricum  
Abieti-Fagetum dinaricum

*Dentaria trifolia*  
*Dentaria polyphyllus*  
*Acer obtusatum*

PREDINARIC SUBSECTOR

6 a) Western Dolenjsko (Lower Carniola) District

Carpinetum praedinaricum  
Fagetum submontanum praedinaricum  
Lamio orvalae-Fagetum praedinaricum  
var. geogr. *Dentaria digitata*  
Asperulo-Carpinetum

*Dentaria digitata*  
*Omphalodes verna*  
*Ruscus hypoglossum*

6 b) Eastern Dolenjsko (Lower Carniola) District

Carpinetum praedinaricum  
Fagetum submontanum praedinaricum  
var. geogr. *Acer obtusatum*  
Lamio orvalae-Fagetum praedinaricum  
var. geogr. *Dentaria polyphyllus*  
Fagetum altimontanum praedinaricum  
Vaccinio myrtilli-Carpinetum praedinaricum  
Melampyro-Quercetum praedinaricum  
Ostryo-Fagetum var. geogr. *Acer obtusatum*  
Querco-Luzulo-Fagetum var. geogr.  
*Epimedium alpinum*  
Epimedio-Galio-Abietetum

*Dentaria polyphyllus*  
*Acer obtusatum*  
*Epimedium alpinum*

6 c) Bela Krajina District

Carpinetum praedinaricum

*Pinus nigra*

Fagetum submontanum praedinaricum  
 var. geogr. Acer obtusatum  
 Vaccinio myrtilli-Carpinetum praedinaricum  
 Ostryo-Fagetum var. geogr. Acer obtusatum  
 Quercu-Luzulo-Fagetum var. geogr.  
 Epimedium alpinum  
 Seslerio-Fagetum  
 Carpino-Fraxinetum  
 Carpino-Abietetum

*Sesleria autumnalis*  
*Carpinus orientalis*

MEDITERRANEAN REGION  
 ADRIATIC PROVINCE  
 NORTHERN COAST SECTOR

7 a) District of Goriška Brda

Ornithogalo pyrenaici-Carpinetum  
 Ostryo-Quercetum pubescentis  
 Seslerio-Fagetum  
 Seslerio-Ostryetum  
 Carici-Centaureetum rupestre  
 Danthonio-Scorzoneretum villosae  
 Fagetum submontanum submediterraneum  
 Lamio orvalae-Fagetum praealpinum (fragments)  
 Quercu-Luzulo-Fagetum var. geogr.  
 Ruscus aculeatus  
 Carici umbrosae-Quercetum petraeae  
 var. geogr. *Sesleria autumnalis*

*Knautia drymeia* subsp. *drymeia*  
*Scorzonera villosa*

7 b) Kras (Karst) and Vipava valley District

Ornithogalo pyrenaici-Carpinetum  
 Ostryo-Quercetum  
 Seslerio-Fagetum  
 Seslerio-Ostryetum  
 Carici-Centaureetum rupestre  
 Danthonio-Scorzoneretum villosae  
 Quercu-Castanetum submediterraneum

*Gladiolus illyricus*  
*Peucedanum coriaceum* subsp. *pospicbalii*  
*Crocus variegatus*  
*Fritillaria tenella*  
*Scorzonera villosa*

7 c) Brkini District

Quercu-Luzulo-Fagetum var. geogr.  
 Calamintha grandiflora  
 Melampyro-Quercetum submediterraneum

*Calamintha grandiflora*  
*Orobancha nana*

7 d) District of Koper and Šavrinska brda

Ostryo-Quercetum ilicis (fragment)  
 Quercu-Carpinetum orientalis (fragments)  
 Seslerio-Quercetum pubescentis  
 Seslerio-Quercetum petraeae  
 Molinio litoralis-Quercetum pubescentis

*Asparagus acutifolius*  
*Cistus salvifolius*  
*Osyris alba*  
*Quercus ilex*  
*Spartium junceum*  
*Scorzonera villosa*  
*Ononis antiquorum*  
*Coronilla emeroides*  
*Genista silvestris*

The present contribution is dedicated to considerations on the phytogeographic division of Slovenia and it constitutes an attempt at further elucidation of certain phytogeographic problems which to some extent remain unsolved and whose final solution will require further study also in the future.

The detailed phytogeographic division as included is based on the theses put forward by I. Trinajstić (1978, 1980, 1986) who in our opinion has presented the most detailed phytogeographic division of Yugoslavia accepted also within the framework of the inter-republican and the inter-provincial project, the "Vegetation Map of Yugoslavia". For the territory of Slovenia we of course contributed essential supplements to his views and added the phytogeographic division as such.

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