

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 IInd 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

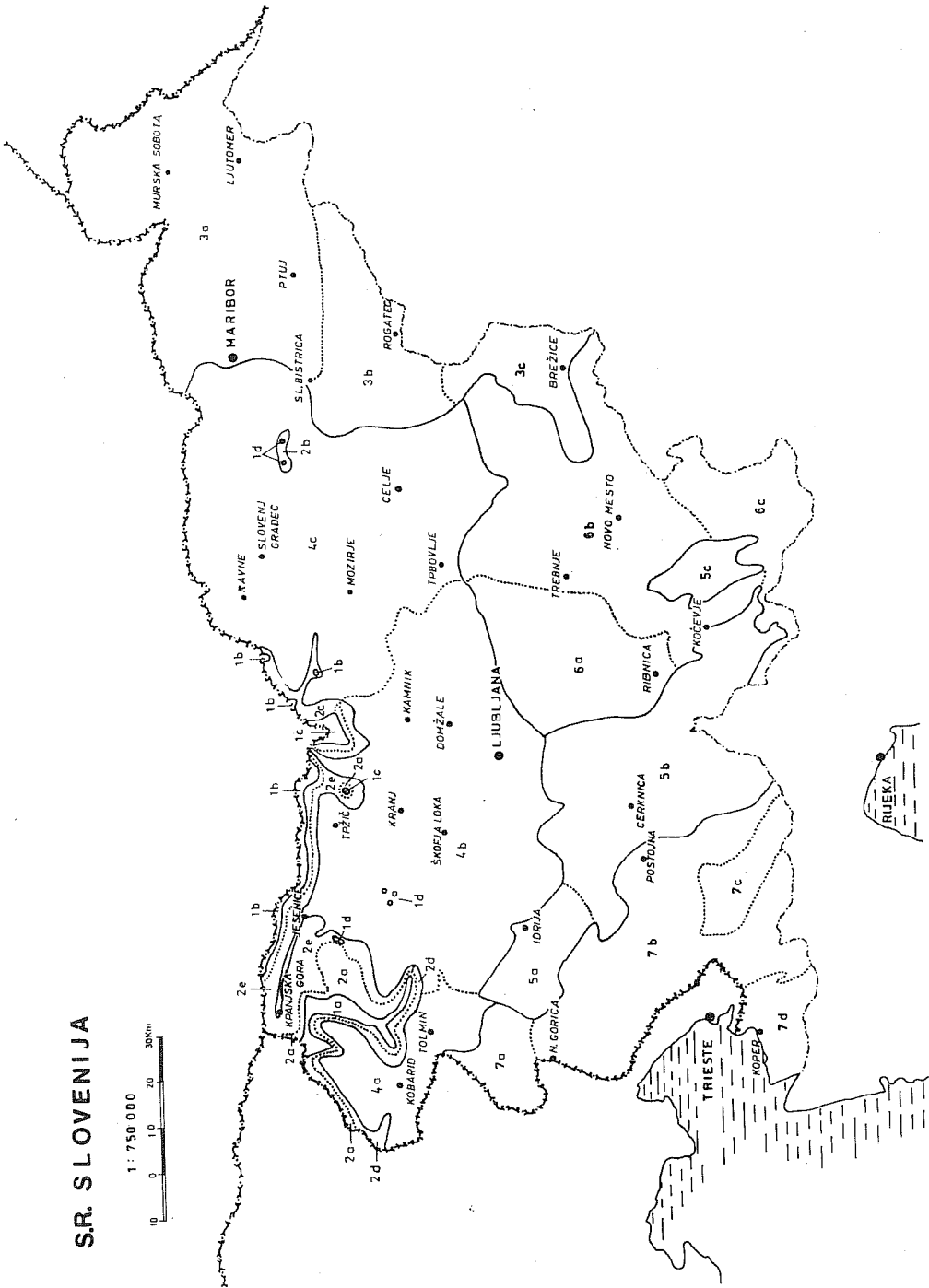
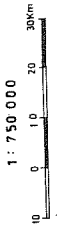


FIG. 1 - Phytogeographic division of Slovenia.

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 transsilvanicum

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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