

## *Salici-Myricarietum* MOOR 1958 (*Salicion eleagni*) in the vegetation of Croatia

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ABSTRACT: The paper is concerned with spreading of *Myricaria germanica* (L.) DESV. in the southwestern part of its distribution range, as well as the vegetation of river gravel banks belonging to the ass. *Salici-Myricarietum* MOOR 1958 in Northwestern Croatia. An analysis of the floristic composition of *Salici-Myricarietum* is provided and the succession of the vegetation on the dunes of the Drava River in the region of Varaždin in Northwestern Croatia is shown.

KEYWORDS: phytocoenology, vegetation, Croatia, *Salici-Myricarietum*, floristic composition, chorology

### Introduction

The great dynamic capability and power of the species *Myricaria germanica* (L.) DESV. to grow on bare gravel and sand banks (dunes) and to choke them with vegetation was already noticed by KERNER (1863). Also, the vegetation built by *M. germanica* on the shoals and banks of the Alpine rivers in the region of the Karawanken in Austria was studied by AICHINGER (1933) who described a special plant association, *Myricarieto-Epilobietum dodonaei*. Similar habitats were reported by KLIKA (1936) for the region of Western Carpathians and later for the region of the French Alps where the association *Myricarieto-Chondrilletum* was described by BRAUN-BLANQUET (cf. OBERDORFER 1957).

Lately, MOOR (1958) described another association - *Salici-Myricarietum*. This association can be found in the vegetation of Croatia, as well.

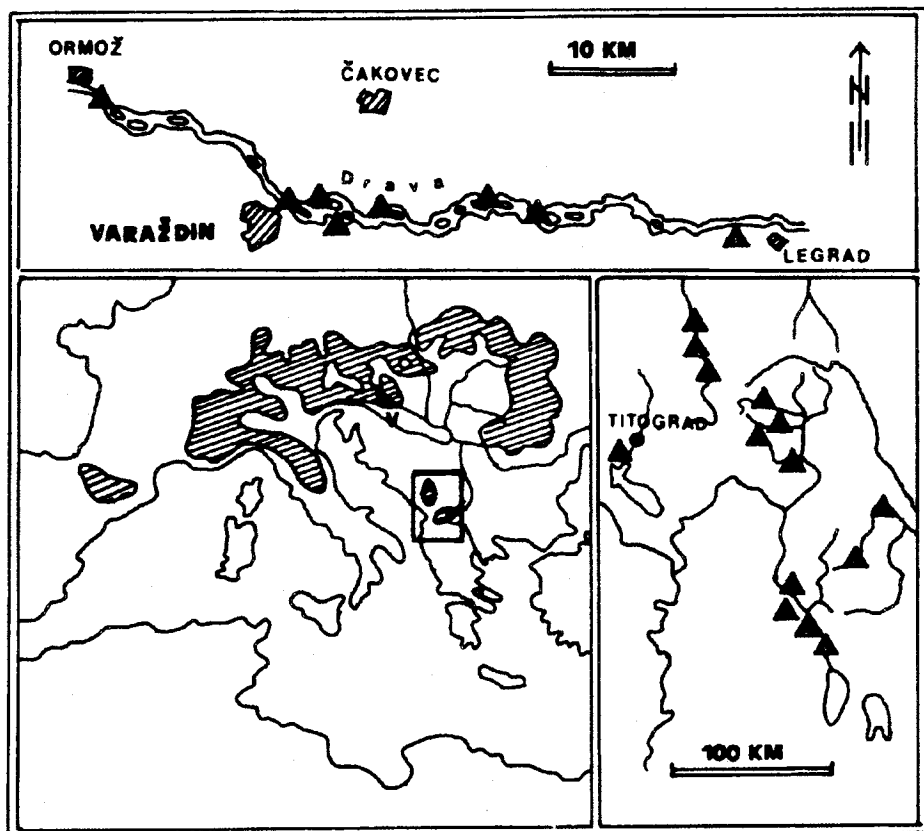


Fig. 1. Distribution of *Myricaria germanica* (L.) DESV. a - in C. Europe (according to MEUSEL et al. 1978, corr.), b - NW Croatia (orig.) and c - SW Balkan (after DŽEKOV 1957, EM 1967, LAKUŠIĆ et PAVLOVIĆ 1971, compil.)

*Myricaria germanica* is a rare representative of the flora of Croatia. It is known only from the region of the banks of the River Drava (SCHLOSSER et VUKOTINOVIC 1869, PICHLER 1891), while the old reports of this species in the wider region of Zagreb (Samoborsko gorje) could not have been confirmed by subsequent research.

In the Drava River belt in Northwestern Croatia, *M. germanica* grows on shoals and gravel banks (or dunes) of the Drava River over a wider line of approximately 40 km from Ormož at the Slovenian border to Legrad in Croatia. The above area forms the southeastern limit of the Alpine part of the central European range of *M. germanica* (cf. MEUSEL et al. 1978).

In Balkan Peninsula, *M. germanica* occurs on the gravel and sand banks of rivers of southwestern Balkans, in the boundary region between Montenegro, Serbia, Kosovo, Albania and Macedonia (cf. KOŠANIN 1926, RECHINGER 1935, ČERNJAVSKI et al. 1949, DŽEKOV 1957, LAKUŠIĆ 1961, LAKUŠIĆ et PAVLOVIĆ 1971, EM 1967). According to LAKUŠIĆ et PAVLOVIĆ (1971), the Balkan populations of *M. germanica* should belong to the separate species, *M. ernesti-mayeri*, but all the characters analyzed of the above populations do not fall outside the limits of the variation range of *M. germanica*. *M. germanica* can be considered to represent a Glacial relict, especially because a number of other species of the relict character (e. g., *Equisetum hyemale* L., *Alnus incana* (L.) MOENCH, *Salix eleagnos* SCOP., *Epilobium dodonaei* VILL. and others, cf. TRINAJSTIĆ 1974) can be found in this part of the Balkan Peninsula.

The BORNMÜLLER (1925) report suggesting that *M. germanica* does not occur in the region of Demirkapija in Macedonia, have been confirmed by EM's (1967) studies. The distribution of *M. germanica* in the Balkan part of its Central European range is shown in Fig. 1, and the range reported by MEUSEL et al. (1978) has been corrected.

#### **Ass. *Salici-Myricarietum* MOOR 1958 in Croatia**

As mentioned in the introduction, on the basis of the analysis of the floristic composition, *M. germanica* forms only one association in Croatia, *Salici-Myricarietum* which grows on bank gravelly alluvial deposits. This association, as found by MOOR (1958), grows in the middle course of the Alpine rivers, and its distribution in Croatia is confined exclusively to the middle course of the Drava River. At the same time it represents the southeastern border of the range of *Salici-Myricarietum* in this part of Europe.

*Salici-Myricarietum* has been studied on the banks of the Drava River in the region of Varaždin and its floristic composition is shown in Tab. 1, made on the basis of 7 phytosociological relevés.

Tab. 1. Ass. *Salici-Myricarietum* MOOR 1958

Nr. Veget. Record.	1	2	3	4	5	6	7
Nr. Spec./Rec.:	11	8	10	23	11	13	18
Char. Ass.:							
<i>Myricaria germanica</i>	4.3	1.1	3.3	2.3	1.1	1.1	2.3
Char. All. <i>Salicion eleagni</i>							
Char. Order <i>Salicetalia purpureae</i>							
Char. Class <i>Salicetea purpureae</i>							
<i>Salix purpurea</i>	1.1	1.1	2.1	4.4	2.1	2.1	1.1
<i>Populus nigra</i> (juv.)	+	1.1	1.1	2.1	1.1	+	2.3
<i>Salix eleagnos</i>	.	2.1	+	2.1	1.1	+	3.3
<i>Calamagrostis epigejos</i> (loc.)	.	.	4.3	+	4.3	3.2	2.2
<i>Salix triandra</i>	.	.	.	.	.	.	1.1
<i>Salix daphnoides</i>	.	.	.	.	.	.	+
Comp.:							
<i>Solidago gigantea</i>	+2	.	1.1	2.3	3.3	2.1	1.1
<i>Taraxacum officinale</i> s.l.	.	.	+	+	1.1	+	.
<i>Alnus incana</i> (juv.)	+	.	.	+	.	1.1	.
<i>Ranunculus repens</i>	+	.	+	.	.	+	.
<i>Melilotus albus</i>	.	.	.	+	.	.	2.3
<i>Eupatorium cannabinum</i>	+	.	.	1.1	.	.	.
<i>Meniha aquatica</i>	.	.	1.1	.	+	.	.
<i>Stenactis annua</i>	.	.	.	+	.	+	.
<i>Vicia angustifolia</i>	.	+	.	+	.	.	.
<i>Petrorhagia saxifraga</i>	.	+	.	+	.	.	.
<i>Oenothera biennis</i>	.	.	.	+	.	.	+
<i>Tanacetum vulgare</i>	.	.	.	+	.	.	+
<i>Coryza canadensis</i>	.	.	.	+	.	.	+
<i>Poa compressa</i>	.	.	.	1.2	.	.	.
<i>Rubus caesius</i>	.	.	.	1.1	.	.	.
<i>Medicago lupulina</i>	.	.	.	1.1	.	.	.
<i>Lotus corniculatus</i>	+	.	.	.	.	.	.
<i>Plantago major</i>	+	.	.	.	.	.	.
<i>Ajuga reptans</i>	+	.	.	.	.	.	.
<i>Gratiola officinalis</i>	+	.	.	.	.	.	.
<i>Arenaria serpyllifolia</i>	.	+	.	.	.	.	.
<i>Herniaria glabra</i>	.	+	.	.	.	.	.
<i>Hypericum perforatum</i>	.	.	.	+	.	.	.
<i>Sedum acre</i>	.	.	.	+	.	.	.
<i>Galium mollugo</i>	.	.	.	+	.	.	.
<i>Poa annua</i>	.	.	.	.	.	+	.
<i>Trifolium repens</i>	.	.	.	.	.	+	.
<i>Achillea millefolium</i>	.	.	.	.	.	.	+
<i>Angelica silvestris</i>	.	.	.	.	.	.	+
<i>Plantago lanceolata</i>	.	.	.	.	.	.	+
<i>Daucus carota</i>	.	.	.	.	.	.	+
<i>Bidens tripartita</i>	.	.	.	.	.	.	+

## Analysis of floristic composition

*Salici-Myricarietum*, as it is known, represents a pioneer plant community with the open aspect and the low level of organisation. Being at least once a year under the direct influence of running waters, i. e. in the late spring and the early summer when the snow in the Alps melts and the water line of the Drava River rises, its floristic composition is partly composed of the permanent elements of the gravel bank vegetation and partly of a large number of accompanying and occasional elements disseminated along banks by wind or water.

For the characterization of the association, certainly the most important is the characteristic species of the association, *Myricaria germanica*, which predominates in some habitats.

The characteristic species of the alliance *Salicion eleagni* (order *Salicetalia purpureae* and of the class *Salicetea purpureae*) are well represented and very stable, which allows safe identification of the syntaxonomic status of *Salici-Myricarietum*. Among the species of the same group, *Calamagrostis epigejos* (L.) ROTH is also classified as differential or locally characteristic.

Accompanying plants are numerous. Out of 40 species indicated in the Table 1, as many as 33 species are accompanying plants, but only 4 species are represented in more than 50% of relevés, 9 species are represented in 2 relevés, and as many as 18 species in one relevé only. All this suggests the floristic instability of the association, which is a property of all pioneer plant associations.

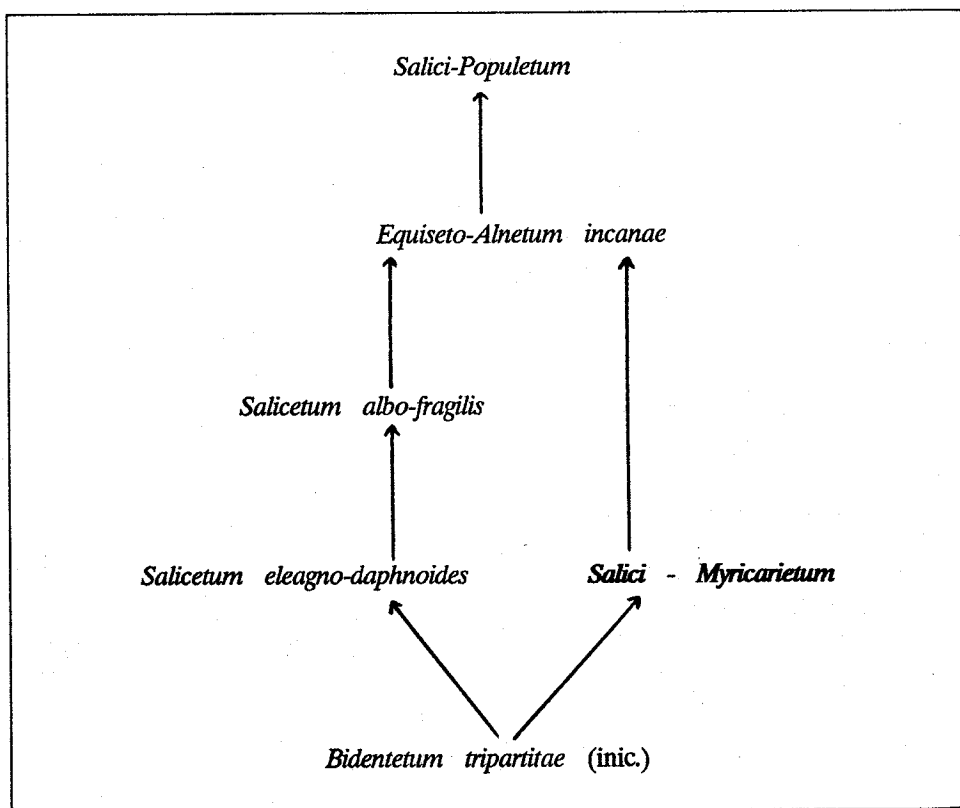
In the territory studied, *Salici-Myricarietum* is syndynamically well connected with the related association of *Salicetum eleagno-daphnoides*, as also can be noted from the floristic composition of the associations in the region.

## Succession of vegetation on gravel banks

As mentioned above, the Drava River in its middle course in the wider region of Varaždin by force of its streams carries and displaces significant amounts of mineral detritate of varying texture. Thus, temporary or permanent banks are formed emerging from water when its level is low. Such gravel banks are rapidly covered by the fragmentarily developed *Bidentium tripartitae* that includes also young bush-like willow trees and provided that favorable conditions continue over a longer period, causes the appearance and the development of *Salici-Myricarietum* or *Salicetum eleagno-daphnoides*.

During further succession process, *Salicetum eleagno-daphnoides* passes into ass. *Salicetum albo-fragilis*, and *Salici-Myricarietum* into *Equiseto-Alnetum incanae*. After appearance of *Alnus incana* in special habitats of *Salicetum eleagno-daphnoides*, this association is succeeded by *Equiseto-Alnetum incanae*. Both these succession steps are conditioned by sedimentation of fine particles of sand and mud accelerated especially by the vegetation cover which slows down water streams and ties together the accumulated sedimentary material. Once the alluvial soil is developed, the succession direction goes towards the development of *Salici-Populetum*, and this forest association represents the terminal phase of the succession on gravel banks in the wider region of Varaždin (cf. TRINAJSTIC 1969). The syndynamic relations indicated are shown in Tab. 2.

Tab. 2. Succession of the vegetation of gravel banks of the River Drava in Northwestern Croatia



## Sažetak

### As. *Salici-Myricarietum* MOOR 1958 (*Salicion oleagni*) u vegetaciji Hrvatske

U radu se iznose podaci o rasprostranjenosti vrste *Myricaria germanica* (L.) DESV. u jugoistočnom dijelu njena areala u Europi (sjeverozapadna Hrvatska, jugozapadni Balkan), te vegetacija riječnih sprudova u sjeverozapadnoj Hrvatskoj. Ta vegetacija pripada asocijaciji *Salici-Myricarietum*. Analiziran je florni sastav as. *Salici-Myricarietum* iz šireg područja Varaždina i prikazana sukcesija vegetacije na sprudovima rijeke Drave u sjeverozapadnoj Hrvatskoj.

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