

## NEW PLANT COMMUNITY (*CARICETUM BUEKII* HEJNÝ ET KOPECKÝ IN KOPECKÝ ET HEJNÝ 1965) FROM CROATIA

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**Stančić, Z.:** New plant community (*Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965) from Croatia. *Nat. Croat.*, Vol. 17, No. 1., 15–26, 2008, Zagreb.

In this paper, the association *Caricetum buekii* is noted for the first time in Croatia. It has been established in wet habitats in the valleys of the Korana and Radonja rivers. Phytosociologically, it belongs to marshland vegetation of the class *Phragmito-Magnocaricetea*. The present paper also makes a contribution to the knowledge of the distribution of *Carex buekii* in Croatia. The species has been found at three new localities south of Karlovac: in Vukmanički Cerovec, Tušilović and Krnjak.

**Key words:** *Carex buekii*, distribution map, marshland vegetation, *Phragmito-Magnocaricetea*, *Magnocaricion elatae*, Croatia

**Stančić, Z.:** Nova biljna zajednica (*Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965) u Hrvatskoj. *Nat. Croat.*, Vol. 17, No. 1., 15–26, 2008, Zagreb.

U ovome radu je po prvi puta zabilježena asocijacija *Caricetum buekii* za Hrvatsku. Utvrđena je na vlažnim staništima u dolini rijeke Korane i Radonje. Fitocenološki pripada močvarnoj vegetaciji razreda *Phragmito-Magnocaricetea*. Ovim radom je također dat doprinos poznavanju rasprostranjenosti vrste *Carex buekii* u Hrvatskoj. Vrsta je ustanovljena na tri nova nalazišta južno od Karlovca: u Vukmaničkom Cerovcu, Tušiloviću i Krnjaku.

**Ključne riječi:** *Carex buekii*, karta rasprostranjenosti, močvarna vegetacija, *Phragmito-Magnocaricetea*, *Magnocaricion elatae*, Hrvatska

### INTRODUCTION

The species *Carex buekii* Wimm (syn. *C. banatica* Heuff.) has been established relatively recently for the flora of Croatia (ALEGRO & MARKOVIĆ, 1999). It was found in 1997 and 1998 in Gornje Prilišće and in Vukova Gorica, along the Kupa River near Karlovac.

According to floristic works (ASCHERSON, 1866; ASCHERSON & GRAEBNER, 1902–1904; HAYEK, 1932–1933; JOVANOVIĆ-DUNJIĆ, 1976; CHATER, 1980; SCHULTZE-MOTEL, 1980; PIGNATTI, 1982; ADLER *et al.*, 1994; MARTINČIĆ *et al.*, 1999; TIBOR, 2000) the species *Carex buekii* is distributed in Central and Southeast Europe and in western Asia, in the following countries: Poland, Czech Republic, Slovakia, Germany, Austria, Northern Italy, Slovenia, Hungary, Serbia, Bosnia and Herzegovina, Bulgaria, Romania, the Caucasus countries, Kazakhstan, Ukraine and Southern Russia. SCHULTZE-MOTEL (1980) states that the species is relatively rare in its distribution area and is occasionally even overlooked or confused with other species of the genus *Carex*.

In stream and river valleys, *Carex buekii* builds stands that are known in the phytosociological literature as the association *Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965. The community has been recorded in Germany (PHILIPPI, 1974; WALENTOWSKI *et al.*, 1992; POTT, 1995), Czech Republic (KOPECKÝ & HEJNÝ, 1965; HANÁKOVÁ & DUCHOSLAV, 2003), SLOVAKIA (HRIVNÁK, 2000; OŤAHELOVÁ *et al.*, 2001), Hungary (HRIVNÁK *et al.*, 2001; LÁJER, 2003) and Austria (ELLMAUER & MUCINA, 1993). So far, in botanic publications on marshland vegetation in Croatia (STANČIĆ, 2006, 2007; TRINAJSTIĆ, 2008), the association *Caricetum buekii* has not been mentioned.

In this paper the association *Caricetum buekii* is established for the first time in Croatia. Also, new localities of the *Carex buekii* species are noted.

## METHODS

Floristic and phytosociological field research was carried out during 2006 and 2007. The relevés were done according to the Zürich-Montpelier methodology (HORVAT, 1949; BRAUN-BLANQUET, 1964). The species composition of the association *Caricetum buekii* in Croatia is shown in the analytical table (Tab. 1). The features of the association are described in the text below. A list of relevé localities is presented in Appendix 1. A comparison of relevés from Croatia, Hungary, Slovakia and Czech Republic is given in the synoptic table (Tab. 2).

The names of plant communities and their syntaxonomic positions have mainly been adjusted with PHILIPPI (1974).

The nomenclature of plant species follows Flora Europaea (TUTIN *et al.*, 1964–1980, 1993).

## RESULTS AND DISCUSSION

### Association *Caricetum buekii* in Croatia

In the species composition of the association *Caricetum buekii*, a small number of species were detected. The total number of species noted in 10 relevés (Tab. 1) amounts to 24, averaging 5.1 species per relevé. The character and dominant species of the association is *Carex buekii*. Also rather frequent are: *Calystegia sepium*,

**Tab. 1.** Analytical table of the association *Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965 in Croatia.

Relevé number	1	2	3	4	5	6	7	8	9	10
Relevé area (m <sup>2</sup> )	16	25	25	25	25	25	25	25	25	25
Relevé shape	4x4	5x5	5x5	5x5	5x5	5x5	5x5	5x5	5x5	5x5
Cover total (%)	100	90	95	95	90	90	95	95	100	85
Altitude (m)	115	115	117	117	117	117	117	117	120	120
Management	–	–	burned	burned	burned	burned	burned	burned	burned	burned
Number of species	3	3	5	6	5	3	2	8	8	8
<b><i>Caricetum buekii</i></b>										
<i>Carex buekii</i>	5	5	5	5	5	5	5	5	5	5
<b><i>Phragmito-Magnocaricetea</i></b>										
<i>Mentha aquatica</i>	.	.	.	.	.	.	.	1	.	.
<i>Iris pseudacorus</i>	.	.	.	.	.	.	.	+	.	.
<i>Lycopus europaeus</i>	.	.	.	.	.	.	.	.	1	.
<b>Companions</b>										
<i>Calystegia sepium</i>	.	+	+	1	.	.	+	1	1	1
<i>Urtica dioica</i>	.	.	+	+	.	.	.	1	2	.
<i>Lythrum salicaria</i>	+	.	+	.	+	.	.	.	.	.
<i>Cirsium arvense</i>	.	.	+	.	.	.	.	.	+	1
<i>Equisetum palustre</i>	+	.	.	.	.	.	.	.	.	+
<i>Filipendula ulmaria</i>	.	+	.	.	.	1	.	.	.	.
<i>Galeopsis speciosa</i>	.	.	.	+	.	.	.	.	+	.
<i>Potentilla reptans</i>	.	.	.	.	+	+	.	.	.	.
<i>Equisetum arvense</i>	.	.	.	.	+	.	.	.	.	+
<i>Ranunculus repens</i>	.	.	.	+	.	.	.	.	.	.
<i>Myosotis scorpioides</i>	.	.	.	+	.	.	.	.	.	.
<i>Rumex crispus</i>	.	.	.	.	+	.	.	.	.	.
<i>Humulus lupulus</i>	.	.	.	.	.	.	.	1	.	.
<i>Angelica sylvestris</i>	.	.	.	.	.	.	.	+	.	.
<i>Solanum dulcamara</i>	.	.	.	.	.	.	.	+	.	.
<i>Epilobium hirsutum</i>	.	.	.	.	.	.	.	.	+	.
<i>Eupatorium cannabinum</i>	.	.	.	.	.	.	.	.	+	.
<i>Rubus caesius</i>	.	.	.	.	.	.	.	.	.	+
<i>Ambrosia artemisiifolia</i>	.	.	.	.	.	.	.	.	.	+
<i>Vicia cracca</i>	.	.	.	.	.	.	.	.	.	+

*Urtica dioica*, *Lythrum salicaria* and *Cirsium arvense*. Other species are represented with very low cover values or constancy, and some as single specimens.

Since the association belongs to marshland vegetation, the species composition features plants growing in wet habitats, such as *Lythrum salicaria*, *Equisetum palustre*, *Filipendula ulmaria*, *Mentha aquatica*, *Iris pseudacorus*, *Lycopus europaeus*. At some sites the stands of *Caricetum buekii* develop in the vicinity of cultivated land (relevé 10) or on the surface of abandoned ploughfields (relevé 9). In such areas weeds such as

**Tab. 2.** Synoptic table of the association *Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965 in Croatia, Hungary, Slovakia and Czech Republic: a) synoptic table in categories, b) synoptic table in absolute frequency values.

Country	Croatia		Hungary		Slovakia		Czech Republic		Taxa freq.
Source	STANČIĆ current paper		LÁJER (2003)		HRIVNÁK (2000)		HANÁKOVÁ & DUCHOSLAV (2003)		
Number of relevés	10		21		42		15		
Total number of species	24		57		89		80		
	a	b	a	b	a	b	a	b	
<i>Carex buekii</i>	V	10	V	21	V	42	V	15	88
<i>Urtica dioica</i>	II	4	I	3	IV	31	IV	12	50
<i>Calystegia sepium</i>	IV	7	I	4	IV	28	II	4	43
<i>Cirsium arvense</i>	II	3	.	.	III	19	II	5	27
<i>Lythrum salicaria</i>	II	3	III	10	I	8	I	2	23
<i>Lysimachia vulgaris</i>	.	.	III	11	I	8	I	1	20
<i>Phalaris arundinacea</i>	.	.	I	1	II	17	I	2	20
<i>Symphytum officinale</i>	.	.	.	.	II	12	III	8	20
<i>Filipendula ulmaria</i>	I	2	III	10	I	3	II	4	19
<i>Humulus lupulus</i>	I	1	.	.	II	13	I	2	16
<i>Galium aparine</i>	.	.	.	.	II	11	II	4	15
<i>Sanguisorba officinalis</i>	.	.	II	7	I	5	I	3	15
<i>Equisetum arvense</i>	I	2	.	.	I	8	II	4	14
<i>Equisetum palustre</i>	I	2	II	7	I	3	I	2	14
<i>Galium rivale</i>	.	.	.	.	II	14	.	.	14
<i>Lathyrus pratensis</i>	.	.	.	.	II	10	II	4	14
<i>Rubus caesius</i>	I	1	I	1	II	10	I	2	14
<i>Caltha palustris</i>	.	.	IV	13	.	.	.	.	13
<i>Scutellaria galericulata</i>	.	.	II	5	I	7	I	1	13
<i>Angelica sylvestris</i>	I	1	II	6	I	2	I	2	11
<i>Lycopus europaeus</i>	I	1	II	5	I	4	.	.	10
<i>Iris pseudacorus</i>	I	1	I	4	I	4	.	.	9
<i>Poa trivialis</i>	.	.	I	1	I	5	I	2	8
<i>Vicia cracca</i>	I	1	.	.	I	5	I	2	8
<i>Aegopodium podagraria</i>	.	.	I	4	I	2	I	1	7
<i>Alopecurus pratensis</i>	.	.	.	.	I	4	I	2	6
<i>Galeopsis</i> sp. (juv.)	.	.	.	.	.	.	II	6	6
<i>Galium palustre</i>	.	.	I	2	I	2	I	2	6
<i>Ranunculus repens</i>	I	1	.	.	I	3	I	2	6
<i>Stachys palustris</i>	.	.	I	3	I	3	.	.	6
<i>Achillea ptarmica</i>	.	.	II	5	.	.	.	.	5
<i>Cirsium palustre</i>	.	.	II	5	.	.	.	.	5
<i>Cirsium rivulare</i>	.	.	I	2	.	.	I	3	5
<i>Galeopsis speciosa</i>	I	2	.	.	I	3	.	.	5
<i>Geranium pratense</i>	.	.	.	.	.	.	II	5	5
<i>Polygonum bistorta</i>	.	.	I	4	.	.	I	1	5
<i>Carex hirta</i>	.	.	.	.	I	4	.	.	4
<i>Carex riparia</i>	.	.	I	4	.	.	.	.	4
<i>Galium uliginosum</i>	.	.	I	2	.	.	I	2	4

<i>Impatiens glandulifera</i>	.	.	.	.	I	2	I	2	4
<i>Juncus effusus</i>	.	.	I	2	.	.	I	2	4
<i>Scirpus sylvaticus</i>	.	.	I	1	I	1	I	2	4
<i>Veratrum album</i>	.	.	I	4	.	.	.	.	4
<i>Agrostis stolonifera</i>	.	.	.	.	I	3	.	.	3
<i>Anthriscus sylvestris</i>	.	.	.	.	I	3	.	.	3
<i>Aristolochia clematitis</i>	.	.	.	.	I	3	.	.	3
<i>Betonica officinalis</i>	.	.	I	1	I	1	I	1	3
<i>Carex vesicaria</i>	.	.	I	2	I	1	.	.	3
<i>Deschampsia cespitosa</i>	.	.	I	1	.	.	I	2	3
<i>Elymus caninus</i>	.	.	.	.	I	2	I	1	3
<i>Elymus repens</i>	.	.	.	.	I	3	.	.	3
<i>Galium album</i>	.	.	.	.	I	3	.	.	3
<i>Glechoma hederacea</i>	.	.	.	.	I	1	I	2	3
<i>Impatiens parviflora</i>	.	.	.	.	I	2	I	1	3
<i>Lysimachia nummularia</i>	.	.	.	.	.	.	I	3	3
<i>Peucedanum palustre</i>	.	.	I	3	.	.	.	.	3
<i>Poa palustris</i>	.	.	.	.	I	2	I	1	3
<i>Potentilla reptans</i>	I	2	.	.	I	1	.	.	3
<i>Rubus hirtus</i>	.	.	.	.	I	3	.	.	3
<i>Selinum carvifolia</i>	.	.	I	2	.	.	I	1	3
<i>Solidago gigantea</i>	.	.	I	3	.	.	.	.	3
<i>Thalictrum flavum</i>	.	.	I	3	.	.	.	.	3
<i>Arrhenatherum elatius</i>	.	.	.	.	I	1	I	1	2
<i>Artemisia vulgaris</i>	.	.	.	.	I	2	.	.	2
<i>Betula pendula</i>	.	.	.	.	.	.	I	2	2
<i>Carduus crispus</i>	.	.	.	.	I	1	I	1	2
<i>Carex brizoides</i>	.	.	I	1	.	.	I	1	2
<i>Carex vulpina</i>	.	.	I	1	I	1	.	.	2
<i>Cirsium oleraceum</i>	.	.	I	1	.	.	I	1	2
<i>Cucubalus baccifer</i>	.	.	.	.	I	2	.	.	2
<i>Dactylis glomerata</i>	.	.	.	.	I	1	I	1	2
<i>Epilobium hirsutum</i>	I	1	.	.	I	1	.	.	2
<i>Eupatorium cannabinum</i>	I	1	.	.	I	1	.	.	2
<i>Fallopia dumetorum</i>	.	.	.	.	.	.	I	2	2
<i>Festuca pratensis</i> s. l.	.	.	.	.	I	2	.	.	2
<i>Fraxinus excelsior</i> (juv.)	.	.	.	.	.	.	I	2	2
<i>Galium rubioides</i>	.	.	I	2	.	.	.	.	2
<i>Galium verum</i>	.	.	.	.	I	1	I	1	2
<i>Heracleum sphondylium</i>	.	.	.	.	.	.	I	2	2
<i>Hypericum tetrapterum</i>	.	.	I	2	.	.	.	.	2
<i>Lamium purpureum</i>	.	.	.	.	I	2	.	.	2
<i>Mentha longifolia</i>	.	.	.	.	I	2	.	.	2
<i>Myosotis palustris</i>	.	.	I	2	.	.	.	.	2
<i>Oxalis acetosella</i>	.	.	I	1	.	.	I	1	2
<i>Poa pratensis</i>	.	.	.	.	I	1	I	1	2
<i>Potentilla anserina</i>	.	.	I	1	I	1	.	.	2
<i>Ranunculus ficaria</i>	.	.	.	.	I	1	I	1	2
<i>Rubus idaeus</i>	.	.	.	.	I	2	.	.	2
<i>Scrophularia nodosa</i>	.	.	.	.	I	2	.	.	2

<i>Silene flos-cuculi</i>	.	.	I	1	I	1	.	.	2
<i>Solanum dulcamara</i>	I	1	.	.	I	1	.	.	2
<i>Stellaria aquatica</i>	.	.	.	.	I	2	.	.	2
<i>Stellaria palustris</i>	.	.	I	1	.	.	I	1	2
<i>Thalictrum lucidum</i>	.	.	.	.	I	2	.	.	2
<i>Typha latifolia</i>	.	.	.	.	I	2	.	.	2

Species in only one relevé

**Croatia:** *Ambrosia artemisiifolia*, *Mentha aquatica*, *Myosotis scorpioides*, *Rumex crispus*.

**Hungary:** *Carex paniculata*, *Doronicum austriacum*, *Epilobium parviflorum*, *Galeopsis pubescens*, *Gentiana pneumonanthe*, *Juncus conglomeratus*, *Molinia arundinacea*, *Pimpinella major*, *Ranunculus lanuginosus*, *Salix aurita*, *Stellaria graminea*, *Valeriana dioica*.

**Slovakia:** *Agrostis capillaris*, *Bidens tripartita*, *Calamagrostis epigejos*, *Chaerophyllum aromaticum*, *Cirsium canum*, *C. vulgare*, *Convolvulus arvensis*, *Equisetum hyemale*, *Euphorbia esula*, *Geum urbanum*, *Impatiens noli-tangere*, *Linaria vulgaris*, *Matricaria perforata*, *Mimulus guttatus*, *Myosotis* sp., *Pseudolysimachion longifolium*, *Ranunculus acris*, *R. sceleratus*, *Rorippa sylvestris*, *Saponaria officinalis*, *Taraxacum* sect. *ruderalia*, *Torilis japonica*.

**Czech Republic:** *Achillea millefolium*, *Alliaria petiolata*, *Bromus erectus*, *B. inermis*, *Cardamine pratensis*, *Carex cespitosa*, *Centaurea jacea*, *Chaerophyllum bulbosum*, *Colchicum autumnale*, *Cruciata glabra*, *Equisetum fluviatile*, *Festuca rubra*, *Galium boreale*, *Geranium palustre*, *Glyceria maxima*, *Holcus lanatus*, *Lamium album*, *L. maculatum*, *Mentha* sp. (juv.), *Oxalis stricta*, *Polygonum amphibium*, *Ranunculus auricomus*, *Rumex acetosa*, *Tanacetum vulgare*, *Veronica chamaedrys*, *Vicia sepium*.

*Cirsium arvense*, *Equisetum arvense* and *Ambrosia artemisiifolia* have been recorded. During the field work it was also observed that the stands of the association spread to wet meadows featuring species of the order *Molinietalia* W. Koch 1926.

In the comparison of the species composition of *Caricetum buekii* from Croatia, Hungary (LÁJER, 2003), Slovakia (HRIVNÁK, 2000), and the Czech Republic (HANÁ-



Fig. 1. Association *Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965 in habitat in Vukmanički Cerovec on 16/06/2006 (relevé 1).





**Fig. 2.** Association *Caricetum buekii* Hejný et Kopecký in Kopecký et Hejný 1965 in habitat in Tušilović on 01/05/2007 (relevé 3).

KOVÁ & DUCHOSLAV, 2003) in the synoptic table (Tab. 2) a great similarity is revealed between them. The synoptic table is compiled of 88 relevés, in which 159 plant taxa were recorded. In the floristic composition of the community, from all four countries 8 common species appear (Tab. 2) and they are: *Carex buekii*, *Urtica dioica*, *Calystegia sepium*, *Lythrum salicaria*, *Filipendula ulmaria*, *Equisetum palustre*, *Rubus caesius*, and *Angelica sylvestris*. Also, substantial agreement has been noticed regarding the constancy of the other frequent species.

The association's physiognomy is influenced by domination of the species *Carex buekii*. Stands have a dark green colour (Fig. 1, 2). During the inflorescence period of *Carex buekii*, in the second half of April and beginning of May, vegetation height is around 80–90 cm, and it reaches its maximal height of 120 cm and more in June. Cover values of the investigated stands range between 85% and 100%. During the cold seasons, the community is in its inactive phase, i.e. above-ground plant parts die down. It has been observed that the occasional burning of the dry above-ground remains of plants during winter and early spring has a beneficial effect on the community. That is, the ashes provide nutrients. In burning, the woody plants get eliminated, thus the overgrowing of the surface by bushes is stopped, while fire is harmless for the underground plant parts. Furthermore, the burned-down stands get richer in plant species, and more densely developed, than the stands in which there is no such effect.

In Croatia, the association *Caricetum buekii* has been recorded in the Korana and Radonja river valleys, in relatively moist habitats, at altitudes in the range of 115–120 m. Flood water has not been observed in the plots investigated. In the literature, there are various data on moisture in the habitat. For example, KOPECKÝ & HEJNÝ

(1965), who described the association first, write that it develops in habitats near the river banks, on somewhat elevated sites that regularly get flooded during substantial spring and summer floods. SCHULTZE-MOTEL (1980) states that the species *Carex buekii* develops in variably moist habitats, on loamy and sandy soils rich in nutrients and poor in calcium carbonate. ALEGRO & MARKOVIĆ (1999) note that *Carex buekii* grows in moist habitats, on sandy alluvial sediments along the Kupa river bank in Croatia, which are flooded for about one third of the year. HRIVNÁK *et al.* (2001) record the association *Caricetum buekii* in the inundation area of the Ipel' river in Slovakia and Hungary, but in habitats without direct flooding. According to KOPECKÝ & HEJNÝ (1965) the species *Carex buekii* develops roots to a depth of 3 m, which could explain different moisture levels at the soil surface.

In this paper, the association *Caricetum buekii* is, in accordance with PHILIPPI (1974), included in the alliance *Magnocaricion* W. Koch 1926, of the order *Phragmitetalia* W. Koch 1926 and the class *Phragmito-Magnocaricetea* Klika in Klika *et Novák* 1941. The reasons for accepting the syntaxonomic division by PHILIPPI (1974) are features of habitats situated in river valleys which are in contact with other marshland communities of the *Magnocaricion* alliance. However, in the literature the association is assigned to various higher syntaxonomic categories. For example, KOPECKÝ & HEJNÝ (1965) classified the association into the alliance *Phalaridion arundinaceae* Kopecký 1961, within the order *Nasturtio-Glycerietalia* Pignatti 1953 and the class *Phragmito-Magnocaricetea*. Later, KOPECKÝ (1969) arranged *Caricetum buekii* to sub-alliance *Filipendulenion* (Lohmeyer in Oberd. *et al.* 1967) Balátová-Tuláčková 1978. In recent literature HEJNÝ (1995) was again assigned *Caricetum buekii* to *Phalaridion arundinaceae*. In Austria, ELLMAUER & MUCINA (1993) put the association *Caricetum buekii* into the vegetation of canal, stream and river edges, within the sub-alliance *Filipenduleion*, which belongs to the vegetation of wet meadows of the alliance *Calthion* R. Tx. 1937 em. Bal.-Tul. 1978, order *Molinietalia* W. Koch 1926 and class *Molinio-Arrhenatheretea* R. Tx. 1937 em. R. Tx. 1970. Obviously, further syntaxonomical research into the association is necessary, and with data collected over the whole distribution area and in relation to all related communities of wet habitats.

Apart from growing as a part of the *Caricetum buekii* association, *Carex buekii* grows in other wet habitat types as well. KOPECKÝ & HEJNÝ (1965) record the species growing beneath the woody species of the genus *Salix* and *Alnus*, where, due to shade, it develops with less vitality. ALEGRO & MARKOVIĆ (1999) also note *Carex buekii* in the composition of shrubs and woods along river banks, but without clear determination of the syntaxonomic affiliation of the stands.

From the standpoint of nature conservation, the association *Caricetum buekii* can be considered potentially endangered for the following reasons: due to the small number of as-yet known localities in Croatia, wetlands generally are exposed to the overgrowth of shrub and woody species, the construction of roads and other facilities leads to the fragmentation and extinction of habitats, and artificially regulated water flows in river valleys decrease the amount of moisture in the habitat. For the preservation of this kind of vegetation it is necessary to maintain the water regime in the habitat, provide occasional mowing during the vegetation period, and burning of the dry remains of plants during winter or early spring.



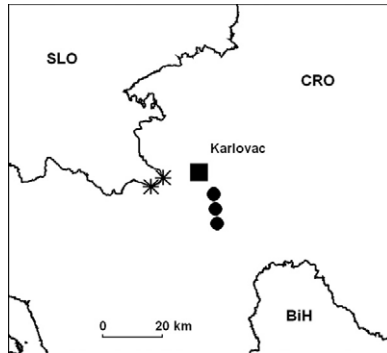


Fig. 3. Distribution map of *Carex buekii* in Croatia. Asterisks indicate formerly known localities, while full circles show new ones.

However, just for comparison, the association *Caricetum buekii* is on the Red List of plant communities in Germany (RENNWALD, 2000). Besides, the species *Carex buekii* has been included on the list of the Red Book of Vascular Flora of Croatia (NIKOLIĆ & TOPIĆ, 2005) as nearly threatened.

### Distribution of the species *Carex buekii* in Croatia

So far, the species *Carex buekii* has been known in Croatia from two localities only (ALEGRO & MARKOVIĆ, 1999), and three new localities are indicated in this paper (Fig. 3).

Old localities in Croatia:

- Gornje Prilišće, April 1997, May 1998
- Vukova Gorica, April 1997, May 1998

New localities in Croatia:

- Vukmanički Cerovec, 16/06/2006, 01/05/2007
- Tušilović, 01/05/2007
- Krnjak, 01/05/2007.

All these localities are situated within the broad surroundings of Karlovac, in Central Croatia. The discovery of new localities indicates that this species grows in the above area, composing stable populations, and that new localities are expected to be found in the course of future detailed investigations.

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## REFERENCES

- ADLER, W., K. OSWALD & R. FISCHER, 1994: Exkursionsflora von Österreich. Verlag Eugen Ulmer, Stuttgart-Wien.
- ALEGRO, A. L. & LJ. MARKOVIĆ, 1999: *Carex buekii* Wimm. (*Cyperaceae*) in the flora of Croatia. Nat. Croat. 8 (2), 101–107.
- ASCHERSON, P., 1866: Über die geographische Verbreitung der *Carex buekii* Wimm. Österr. Bot. Z. 16, 105–109.
- ASCHERSON, P. & P. GRAEBNER, 1902–1904: Synopsis der mitteleuropäischen Flora II/2. Verlag von Wilhelm Engelmann, Leipzig.
- BRAUN-BLANQUET, J., 1964: Pflanzensoziologie. 3th ed., Springer Verlag, Wien-New York.
- CHATER, A. O., 1980: *Carex* L. In: TUTIN, T. G., V. H. HEYWOOD, N. A. BURGESS, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds.), Flora Europaea, Vol. 5. Cambridge University Press, Cambridge, p. 290–323.
- ELLMAUER, T. & L. MUCINA, 1993: *Molinio-Arrhenatheretea*. In: MUCINA, L., G. GRABHERR & T. ELLMAUER (eds.), Die Pflanzengesellschaften Österreichs. Teil 1. Anthropogene Vegetation. Gustav Fischer Verlag, Jena-Stuttgart-New York, p. 297–401.
- HANÁKOVÁ, P. & M. DUCHOSLAV, 2003: Vegetace rákosin a vysokých ostřic (tř. *Phragmito-Magnocaricetea*) nivy Moravy v Hornomoravském úvalu II. vegetace ř. *Oenanthetalia aquaticae* a *Nasturtio-Glycerietalia*. Čas. Slez. Muz. Opava (A) 52, 75–87.
- HAYEK, A., 1932–1933: Prodrromus florae peninsulae Balcanicae. Vol. 3. Verlags des Repertorium, Dahlem bei Berlin, p. 3.
- HEJNÝ, S., 1995: *Phragmito-Magnocaricetea*. In: MORAVEC, J. (ed.), Rostlinná společenstva České republiky a jejich ohrožení (2. vydání). Severočeskou přírodou, příloha 1995, Litoměřice, p. 39–49.
- HORVAT, I., 1949: Nauka o biljnim zajednicama. Nakladni zavod Hrvatske, Zagreb.
- HRIVNÁK, R., 2000: *Caricetum melanostachyae* Balázs 1943 a *Caricetum buekii* Hejný et Kopecký 1965 na strednom Slovensku. Bull. Slov. Bot. Spoločn., Bratislava 22, 215–227.
- HRIVNÁK, R., H. OŤAHELOVA, M. VALACHOVIČ, A. CVACHOVÁ & P. BALÁZS, 2001: Aquatic and marsh plant communities of an inundation area of the Ipeľ River (rkm 96–119). Kitaibelia 6 (2), 267–279.
- JOVANOVIĆ-DUNJIĆ, R., 1976: *Carex* L. In: JOSIFOVIĆ, M. (ed.), Flora SR Srbije. Vol. 8. Srpska akademija nauka i umetnosti, Odeljenje prirodoslovno-matematičkih nauka, Beograd, p. 182–258.
- KOPECKÝ, K. & S. HEJNÝ, 1965: Allgemeine Charakteristik der Pflanzengesellschaften des *Phalaridion arundinaceae* – Verbandes. Preslia 37, 53–78.
- KOPECKÝ, K., 1969: Razšíření a druhové složení porostu *Carex buekii* Wimm. na horním a středním toku Oravy v západních Karpatech. Zpr. Čs. Bot. Společ., Praha 4, 9–15.
- LÁJER, K., 2003: A *Caricetum buekii*, *Caricetum cespitosae*, *Caricetum paniceo-nigrae*, *Cirsietum rivularis* és *Sagittario-Sparganietum emersi* hazai előfordulásáról. Kitaibelia 8, 35–42.
- MARTINČIČ, A., T. WRABER, N. JOGAN, V. RAVNIK, A. PODOBNIK, B. TURK & B. VREŠ, 1999: Mala flora Slovenije. Tehniška založba Slovenije, Ljubljana.
- NIKOLIĆ, T. & J. TOPIĆ (eds.), 2005: Crvena knjiga vaskularne flore Republike Hrvatske: kategorije EX, RE, CR, EN i VU. Državni zavod za zaštitu prirode, Ministarstvo kulture, Zagreb.
- OŤAHELOVÁ, H., R. HRIVNÁK & M. VALACHOVIČ, 2001: *Phragmito-Magnocaricetea*. In: HÁBEROVÁ, I., M. HÁJEK, R. HRIVNÁK, I. JAROLÍMEK, H. OŤAHELOVÁ, R. ŠOLTÉS, M. VALACHOVIČ & M.

- ZALIBEROVÁ, Rastlinné spoločenstvá Slovenska: 3. vegetácia mokradí. Veda, Vydavateľstvo SAV, Bratislava, p. 51–274.
- PHILIPPI, G., 1974: Klasse *Phragmitetea* Tx. et Prsg. 42. In: OBERDORFER, E. (ed.), 1998: Süd-deutsche Pflanzengesellschaften. Teil I. Fels- und Mauergesellschaften, alpine Fluren, Wasser-, Verlandungs- und Moorgesellschaften. 4th ed. Gustav Fischer Verlag, Jena-Stuttgart-Lübeck-Ulm, p. 119–165.
- PIGNATTI, S., 1982: Flora d' Italia. Vol. 3. Edagricole, Bologna.
- POTT, R., 1995: Die Pflanzengesellschaften Deutschlands. 2nd ed. UTB Ulmer, Stuttgart.
- RENNWALD, E. (ed.), 2000: Verzeichnis und Rote Liste der Pflanzengesellschaften Deutschlands. Schriftenr. Vegetationsk. 35, 1–800.
- SCHULTZE-MOTEL, W., 1980: *Carex buekii*. In: HEGI, A. Illustrierte Flora von Mitteleuropa. Band 2, Teil 1. 3th ed. Verlag Paul Parey, Berlin-Hamburg, p. 166–167.
- STANČIĆ, Z., 2006: Marshland vegetation of the class *Phragmiti-Magnocaricetea* in Croatia. In: PEŠIĆ, V. & S. HADŽIABLAHOVIĆ (eds.), Proceedings of the Symposium, II International Symposium of Ecologists of Montenegro. Kotor, 20.-24.09.2006.
- STANČIĆ, Z., 2007: Marshland vegetation of the class *Phragmito-Magnocaricetea* in Croatia. Biologia, Bratislava 62 (3), 297-314.
- TIBOR, S., 2000: A magyarországi edényes flóra határozója. Nemzeti Tankönyvkiadó, Budapest.
- TRINAJSTIĆ, I., 2008: Biljne zajednice Republike Hrvatske. Akademija šumarskih znanosti, Zagreb.
- TUTIN, T. G., V. H. HEYWOOD, N. A. BURGES, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds.), 1964–1980: Flora Europaea 1-5, Cambridge University Press, Cambridge.
- TUTIN, T. G., N. A. BURGES, A. O. CHATER, J. R. EDMONDSON, V. H. HEYWOOD, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds.), 1993: Flora Europaea 1. 2nd ed. Cambridge University Press, Cambridge.
- WALENTOWSKI, H., B. RAAB, W. A. ZAHLMEISTER, 1992: Vorläufige Rote Liste der in Bayern nachgewiesenen oder zu erwartenden Pflanzengesellschaften. Ber. Bayer. Bot. Ges. Beih. 7, 1-170.

## Appendix

The list of relevé localities:

**Relevé 1:** Vukmanički Cerovec; Gauß-Krüger coordinates: 5547829, 5030727; date: 16/06/2006; **relevé 2:** Vukmanički Cerovec; 5547810, 5030736; 01/05/2007; **relevé 3:** Tušilović; 5548122, 5026626; 01/05/2007; **relevé 4:** Tušilović; 5548203, 5026715; 01/05/2007; **relevé 5:** Tušilović; 5548204, 5026818; 01/05/2007; **relevé 6:** Tušilović; 5548201, 5026813; 01/05/2007; **relevé 7:** Tušilović; 5548244, 5026920; 01/05/2007; **relevé 8:** Tušilović; 5548171, 5026617; 01/05/2007; **relevé 9:** Tušilović; 5548164, 5026454; 01/05/2007; **relevé 10:** Krnjak; 5548274, 5022225; 01/05/2007.

## S A Ž E T A K

Nova biljna zajednica (*Caricetum buekii* Hejny et Kopecký in Kopecký et Hejny 1965) u Hrvatskoj

Z. Stančić

Asocijacija *Caricetum buekii* Hejny et Kopecký in Kopecký et Hejny 1965 je u ovome radu zabilježena po prvi puta za Hrvatsku. U flornom sastavu, pored karakteristične i dominantne vrste (*Carex buekii*), razvija se relativno mali broj biljnih vrsta i s malim pokrovnim vrijedostima. Asocijacija je uvrštena u močvarnu vegetaciju visokih šaševa sveze *Magnocaricion elatae*, reda *Phragmitetalia* i rzededa *Phragmito-Magnocaricetea*.

Vrsta *Carex buekii* dosad je u Hrvatskoj zabilježena na samo dva lokaliteta (Gornje Prilišće i Vukova Gorica). Tijekom 2006. i 2007. pronađena su još tri nova nalazišta na vlažnim staništima u dolini rijeke Korane i Radonje (Vukmanički Cerovec, Tušilović i Krnjak).

Zbog malog broja poznatih lokaliteta, prestanka košnje, zaraštavanja staništa drvenastim vrstama, te negativnog djelovanja regulacije vodenih tokova koja dovodi do promjene vodnog režima, vrsta *Carex buekii* i pripadajuća asocijacija *Caricetum buekii* mogu se smatrati potencijalno ugroženima.