

Зборник Матице српске за природне науке / Proc. Nat. Sci, Matica Srpska Novi Sad,  
№ 122, 45—61, 2012

UDC 581.9(497.113 Novi Sad)  
DOI:10.2298/ZMSPN1222045D

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## SOME EXTINCT PLANT TAXA ON THE TERRITORY OF NOVI SAD AND THEIR VULNERABILITY STATUS IN VOJVODINA AND SERBIA

**ABSTRACT:** Natural habitats on the territory of Novi Sad are almost fully destroyed today, as well as their characteristic plant taxa. The reason for disappearance of natural habitats is the development of suburban communities, which is an irreversible process. Plant taxa, specific for wet, salty, and sandy ecosystems grew on those habitats twenty years ago and earlier. This paper presents the overview of 9 taxa (*Suaeda maritima* subsp. *maritima*, *Androsace elongata* subsp. *elongata*, *Cirsium boujartii* subsp. *boujartii*, *Aster sedifolius* subsp. *canus*, *Blackstonia perfoliata* subsp. *serotina*, *Plantago maritima* subsp. *maritima*, *Salvia nutans*, *Allium angulosum*, and *Typha schuttleworthii*). These taxa presented integral parts of autochthonous flora of Novi Sad. Since some of these taxa were found in the field 21 years ago and some even 93 years ago, they are extinct from the flora of Novi Sad.

**KEY WORDS:** extinction, flora, habitat, Novi Sad

### INTRODUCTION

The development of city quarters and communities, and increased human activity led to large and irreversible changes to the structure of the flora and fauna of urban and suburban areas. It resulted in disappearance or critical endangerment of the taxa, which formed the characteristic plant texture and were characterized by specific ecology of steppes, salty, and wet habitats before the process of urbanization.

Natural habitats are literally extinct and they are replaced by the vegetation dominated with synanthropic species of dense texture.

The territory of Novi Sad, especially its northwestern part, today's city quarters Detelinara and Novo Naselje, was characterized by habitats such as

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natural salty habitats, salty sands, fragments of steppes, and wet habitats in the past. Most of them have disappeared and some of the taxa characteristic to the above-mentioned habitats are extinct or became very rare.

This paper describes nine autochthonous taxa extinct from the flora of Novi Sad. Those plants are *Suaeda maritima* (L.) Dumort 1827 subsp. *pannonica* (G. Beck) Soó ex P. W. Ball 1964, *Androsace elongata* L. 1753 subsp. *elongata*, *Cirsium boujartii* (Pill. et Mitterp.) Schultz - B. 1856 subsp. *boujartii*, *Aster sedifolius* L. 1753 subsp. *canus* (W. et K.) Merxm. 1974, *Blackstonia perfoliata* (L.) Hudson 1762 subsp. *Serotina* (Koch ex Reichenb.) Vollman 1914, *Plantago maritima* L. 1753 subsp. *maritima*, *Salvia nutans* L. 1753, *Allium angulosum* L. 1753, and *Typha schuttletworthii* Koch et Sonder in Koch 1844.

*Suaeda maritima* subsp. *pannonica* is a Pannonian endemic plant (Boža, 1999), which grows in very salty and wet habitats and characterizes the alliance *Thero-Salicornion* Tx. 55 (Soó, 1970).

*Androsace elongata* subsp. *elongata* is subspecies characteristic for steppes and sandy habitats (Soó, 1970), belonging to Pontic floristic element (Stevanović, !). It belongs to alliance *Festucion rupicolae* Soó (29) 40 corr. Soó 64 (Soó, 1970).

*Cirsium boujartii* subsp. *boujartii* is a plant of ruderal habitats, distributed in Hungary (Csiky et al., 2005) and Romania (Butorač, 1999), and it is a member of the alliance *Onopordion* Br.-Bl. 26 (Soó, 1970). The habitats of this plant are destroyed by the spread of suburban communities.

*Aster sedifolius* subsp. *canus* is a plant growing in wet thickets, salty marshes (Soó, 1970). It belongs to Pontic-Pannonian floristic element (Stevanović, !) and is an edificator of the alliance *Festucion rupicolae* Soó (29) 40 corr. Soó 64 (Soó, 1970).

*Blackstonia perfoliata* subsp. *serotina* is a plant growing in wet, sandy and salty habitats (Soó, 1966), and belongs to Central-Eastern Mediterranean-Submediterranean-West Pontic-Pannonian floristic element (Budak, 1999) and it is an edificator of the alliance *Nanocyperion flavescens* W. Koch 26 (Soó, 1966).

*Plantago maritima* subsp. *maritima* grows in wet salty habitats characterizing the vegetation class *Festuco-Puccinellietea* Soó 68 (Soó, 1968). In a wider sense, it belongs to Euro-Asian floristic element (Stevanović, !).

*Salvia nutans* is a plant of loess heaths belonging to Pontic-Pannonian floristic element and it is considered a post-glacial, steppe relict (Soó, 1968). It characterizes the alliances *Festucion rupicolae* Soó, (29) 40, corr. Soó 64 and *Danthonio-Stipion stenophyllae* Soó, 47, corr. 71 (Soó, 1968).

*Allium angulosum* is a plant of occasionally flooded meadows characterizing the alliance *Molinion coeruleae* W. Koch 26 and belongs to Euro-Asian floristic element (Soó, 1973).

*Typha schuttletworthii* is a taxon of Middle-European floristic element characteristic for the alliance *Phragmition communis* W. Koch 26, emend. Soó 47 (Soó, 1973). In Serbia, ass. *Typhaetum schuttletworthii* B. Jovanović 82 (Jovanović, 1982) is recorded.

## MATERIAL AND METHODS

Nine floristically and phytogeographically important plants, extinct from the flora of Novi Sad, are presented in phylogenetic classification (T a k h t a - j a n, 1997) in this paper. For each plant, the following data are defined: general distribution and distribution in Serbia according to the *Red Book of Flora of Serbia I* (J o s i f o v i ć, M. ed. 1970-1976; D i k l i ć, N. ed. 1986; S t e v a n o v i ć, V. ed. 1999), and the distribution in Vojvodina based on literature data and personal field research. The distribution is presented on UTM maps 10x10 km. Floristic elements are presented according to Soó (S o ó, 1966, 1968, 1970, 1973), the *Red Book of Flora of Serbia I* (S t e v a n o v i ć, V. ed. 1999) and suggestions of the reviewer (Stevanović, !). The nomenclature is taken from the *Flora Europaea* (T u t i n et al., eds., 1968, 1972, 1976, 1980; T u t i n et al., eds., 1993).

For each presented taxon, the first and the last result in Novi Sad and its surroundings is given, as well as the type of the habitat and the category of endangerment in Serbia. Localities in Novi Sad are presented on the map of Novi Sad (Geoplan and Grad Novi Sad, 1995, proportion 1:10.000).

## RESULTS AND DISCUSSION

Fam.: Chenopodiaceae, Subfam.: Salsoloideae, Tribus: Suaeadeae  
*Suaeda maritima* (L.) D u m o r t 1827 subsp. *pannonica* (G. Beck) S o ó  
ex P. W. B a l l 1964

General distribution of this Pannonian endemic species (B o ž a, 1999) is eastern and central Europe (B a l l, A k e r o y d, 1993), Austria, Hungary, Moravia in the Czech Republic, Serbia, and Dobruja in Romania (S o ó, 1970). *Suaeda maritima* subsp. *pannonica* is a typical halophyte, which formed special, very dense alliances *Suaedetum pannonicae* Knežević, Boža 87 (K n e - ž e v i ć, B o ž a, 1987) near Melenci.3

In Serbia, it is present in northern, i.e. Pannonian part. Today, it can be stated with certainty that it grows only near Melenci, on the bank of the lake Rusanda, bog Okanj, as well as in Slano Kopovo near Novi Bečej, which is also its south border of its distribution in Serbia. It has disappeared from the localities south of Stari Bečej and near Sombor, while the data about the presence of this species near Senta and in Subotičko-Horgoška Sand are not certain.

Concerning its endangerment, it belongs to category of critically endangered taxa whose population is over 250 mature individual plants (B o ž a, 1999).

The only data about the presence of this species in Novi Sad is from 1974 without stating the precise locality (O b r a d o v i ć, B u d a k, 1974). This species is extinct from the territory of Novi Sad (Fig. 1. ●, 2.)

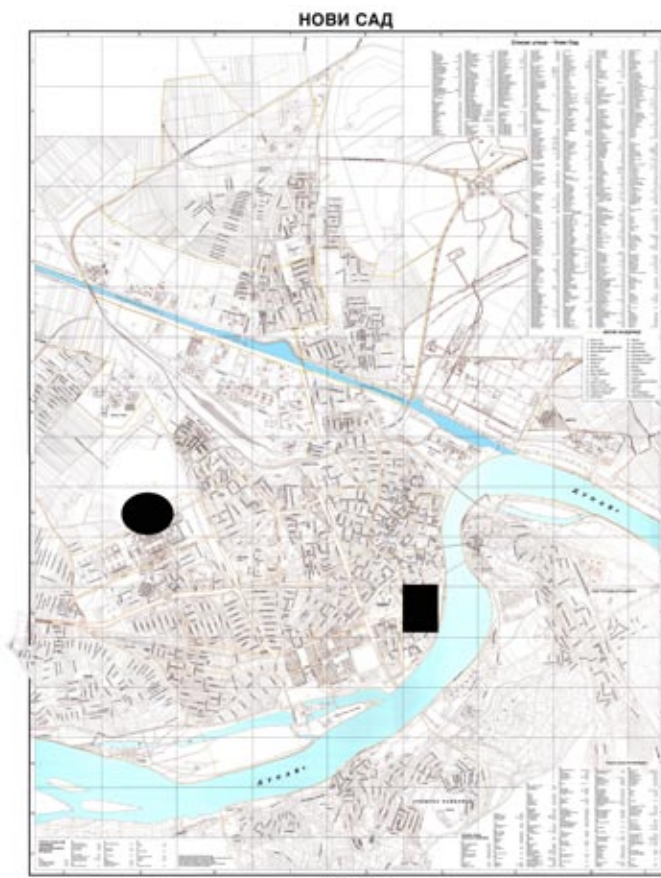


Fig. 1. – Localities at the territory of Novi Sad from which the species *Suaeda maritima* subsp. *pannonica* ● and *Androsace elongata* subsp. *elongata* ■ are extinct.

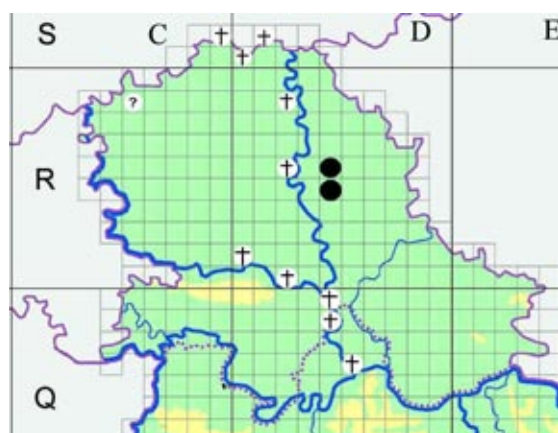


Fig. 2. – Distribution of *Suaeda maritima* subsp. *pannonica* in Vojvodina (B o ž a , 1999) corr.

Fam.: Primulaceae, Tribus: Androsaceae  
*Androsace elongata* L. 1753 subsp. *elongata*

This subspecies is characterized by Pontic type of distribution, with areal radiation towards middle Europe, where it populates relict steppes (Stevanović, !). However, one part of the areal in the Pannonian Plain is disjoint (S o ó, 1970). Its distribution covers the middle Europe, central and southern parts of Russia, Caucasus, and southern Siberia (Stevanović, !). In Europe, it grows from middle Germany, across Poland towards east to the Ural (F e r g u s o n, 1972).

It is a typical plant of steppes and is present on dry pastures, plain slopes, and in sandy and salty thickets (S o ó, 1970).

In Serbia, it grows in eastern and southeastern parts, from Vrška Čuka across Niš and Bela Palanka to Vranje (N i k o l i ć, 1972). In Novi Sad, it was present on the northern border of its distribution in Serbia.

The only locality on which this plant was present in Novi Sad are grasslands near the University where it was found only once in 1988 (B o ž a, B u d a k, 1990/91). *Androsace elongata* subsp. *elongata* is extinct f r o m the territory of Vojvodina (Fig. 1. ■, 3.).

Fig. 1. – Localities at the territory of Novi Sad from which *Suaeda maritima* subsp. *pannonica* ● and *Androsace elongata* subsp. *elongata* ■ are extinct

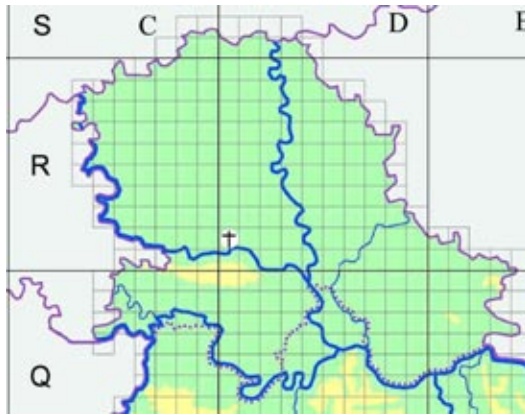


Fig. 3. – Distribution of *Androsace elongata* subsp. *elongata* in Vojvodina (B o ž a, B u d a k, 1990/91)

Fam.: Asteraceae, Subfam.: Cichorioideae, Tribus: Carduuseae  
*Cirsium boujartii* (Pill. et Mitterp.) S c h u l t z - B. 1856 subsp. *boujartii*

This subspecies grows only in Romania (W e r n e r, 1976) and Hungary (C s i k y et al., 2005) today. It belongs to Pannonian floristic element (B u t o r a c, 1999). For Serbia, it is recorded in Deliblato Sand in 1914 (W a g n e r, 1914) and near Novi Sad (J á v o r k a, 1925). The data for Novi Sad are later cited by O b r a d o v i ć (1966) and O b r a d o v i ć, B u t o r a c (1975). There are no data on this subspecies for Novi Sad after 1925.

*C. boujartii* subsp. *boujartii* has disappeared from Deliblato Sand and from the territory of Novi Sad, which was its only locality in Serbia, so it is extinct from the flora of Serbia (B u t o r a c, 1999). On the aforementioned localities, it was present also on the southwestern border of its areal (Fig. 4. ●, 5.)

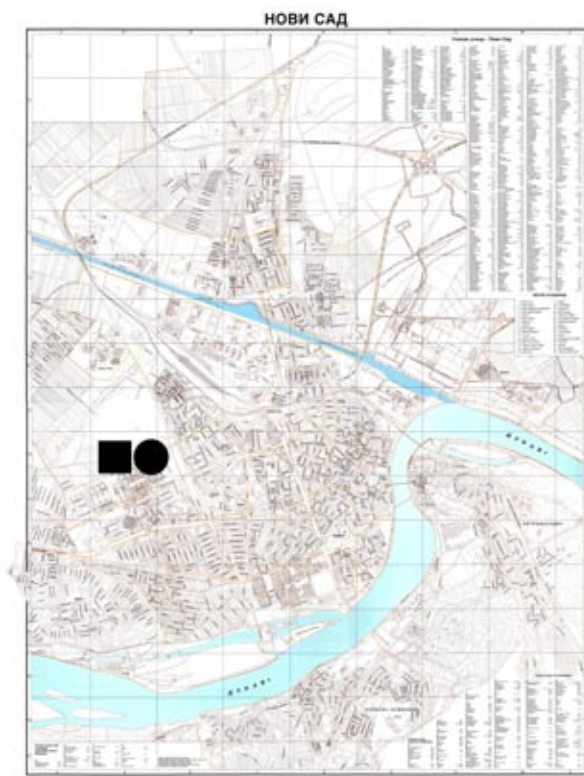


Fig. 4. – Localities at the territory of Novi Sad from which *Cirsium boujartii* subsp. *boujartii* ● and *Aster sedifolius* subsp. *canus* ■ are extinct

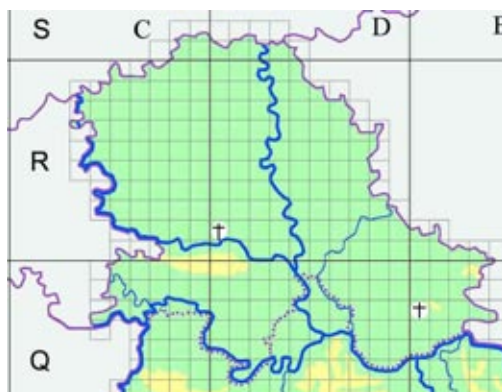


Fig. 5. – Distribution of *Cirsium boujartii* subsp. *boujartii* in Vojvodina (B u t o r a c, 1999)

Fam.: Asteraceae, Subfam.: Asteriodeae, Tribus: Astereae  
*Aster sedifolius* L. 1753 subsp. *canus* (Waldst. et Kit.) M e r x m. 1974

The general distribution of this taxon covers Austria, Hungary, Romania, Serbia and Bulgaria (G a j i ć, 1975). The subspecies belongs to Pannonian-Pontic floristic element (Stevanović, !).

According to Gajić, in Serbia, this plant grows only in Vojvodina, where it is often found on salty habitats (G a j i ć, 1975). According to our research, this taxon is present on salty habitats along large rivers.

For the territory of Novi Sad, it was firstly recorded by Tatar in 1939 (T a t á r, 1939). There are no later data for the territory of Novi Sad. The taxon is found near Novi Sad (Veternik, Futog) in 1974 (O b r a d o v i ć, B u d a k, 1974). However, the aforementioned habitats were destroyed by the process of urbanization and this subspecies were not recorded there in the last 30 years.

This taxon is endangered (Fig. 4. ■, 6.) in Serbia (Vojvodina) today.

Fig. 4. – Localities at the territory of Novi Sad from which *Cirsium boujartii* subsp. *boujartii* ● and *Aster sedifolius* subsp. *canus* ■ are extinct

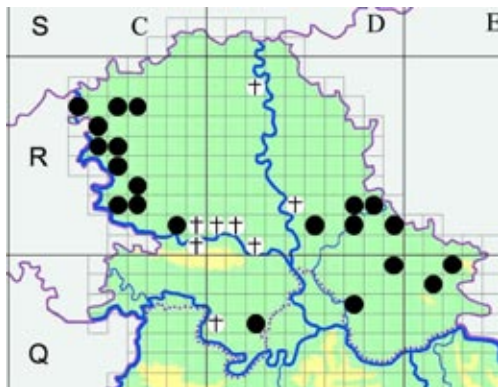


Fig. 6. – Distribution of *Aster sedifolius* subsp. *canus* in Vojvodina (B r d a r, 2000) corr.

Fam.: Gentianaceae, Tribus: Gentianeae  
*Blackstonia perfoliata* (L.) H u d s o n 1762 subsp. *serotina* (Koch ex Reichenb.) V o l l m a n 1914

General distribution of this species covers the Mediterranean area (J o v a n o v i ć - D u n j i ć, 1973) and it belongs to central-eastern Mediterranean-Sub-Mediterranean-West Pontic-Pannonian floristic element (B u d a k, 1999). In Europe, it grows in southern and central parts, in the north to Netherlands (T u t i n, 1972). It populates muddy habitats, swamps, rarely salty marshes and sandy plains (S o ó, 1966).

Its distribution in Serbia covers Bačka, Banat and western Serbia near Ljubovija (B u d a k, 1999; T o m o v i ć et al., 2009).

The first data for Novi Sad and its surroundings were recorded by Z o r k ó c z y (1896), K u p c s o k (1915) and P r o d á n (1916), later J a n j a -

t o v i ć et al. (1980) and O b r a d o v i ć (1981). For the last time it was found on salty habitats near Novi Sad in 1985.

It has disappeared from the surroundings of Novi Sad; it is very rare in Vojvodina and belongs to the group of endangered taxa (T o m o v i ć et al., 2009). (Fig. 7. ●, 8.)

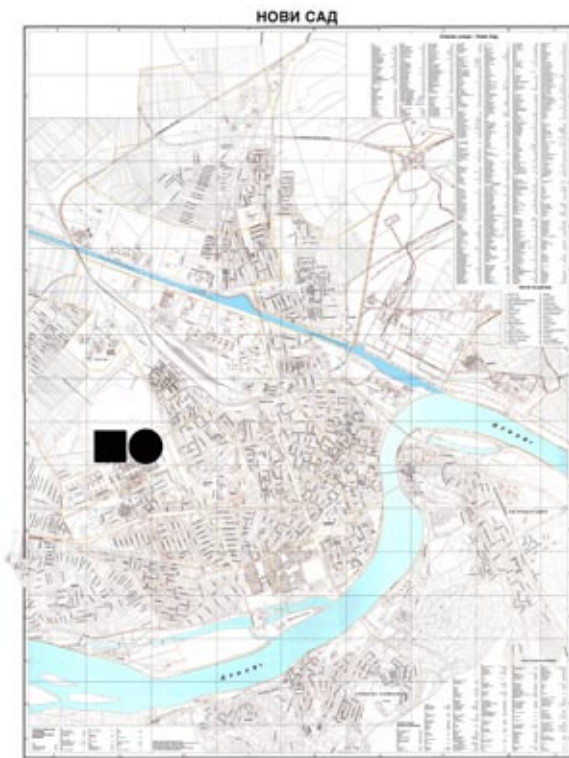


Fig. 7. – Localities at the territory of Novi Sad from which *Blackstonia perfoliata* subsp. *serotina* ● and *Plantago maritima* subsp. *maritima* ■ are extinct

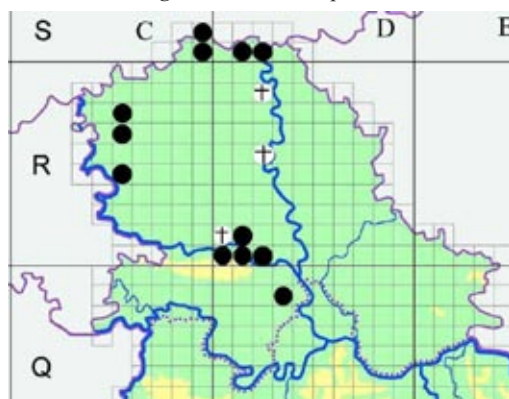


Fig. 8. – Distribution of *Blackstonia perfoliata* subsp. *serotina* in Vojvodina



Fam.: Plantaginaceae

*Plantago maritima* L. 1753 subsp. *maritima*

*P. maritima* represents the aggregate that is constituted of proportionally large number of subspecies distributed in different parts of the northern hemisphere. The populations from Serbia (Vojvodina) belong to typical subspecies *maritima*. General distribution *P. maritima* subsp. *maritima* covers almost entire Europe, towards the East to Middle Asia and Mongolia; it is also present in North and South America (Jan k o v i ć, G a j i ć, 1974). In wider sense, it belongs to Euro-Asian floristic element (Stevanović, !).

It is present in larger part of Europe, from the North of Scandinavia and Baltic and Atlantic coastline, to Spain, northern Italy and Pannonian Plain in the South. It is absent from the Balkan peninsula except in several localities on the Adriatic coastline (Stevanović, !). *Plantago maritima* subsp. *maritima* grows on salty localities with the largest concentration of salt, as well as on muddy, salty habitats (S o ó, 1968).

In Serbia, it grows only in certain parts of the Pannonian region in Bačka and Banat. The first data for the territory of Novi Sad is from 1915 (K u p c - s o k, 1915); for the last time it was recorded on salty habitats together with *Blackstonia perfoliata* subsp. *Serotina* in 1985. In this locality, it was present on one of the southern borders of distribution in Serbia.

*Plantago maritima* subsp. *maritima* belongs to the category of endangered or vulnerable species in Serbia, which has disappeared from the territory of Novi Sad (Novo Naselje) (Fig. 7. ■, 9.)

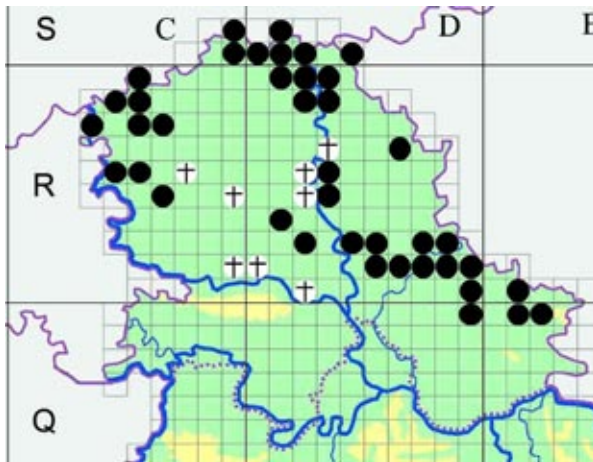


Fig. – 9. Distribution of *Plantago maritima* subsp. *maritima* in Vojvodina (A p r o, 2001) corr.

Fam.: Lamiaceae, Subfam.: Nepetoideae, Tribus: Salvieae  
*Salvia nutans* L. 1753

General distribution of this species covers the Pannonian and Vlaška plains, Dobruja, Bessarabia, Crimea and steppes in Ukraine to the northern Sub-Caucasus (B u d a k, 1999). It belongs to Pontic-Pannonian floristic element. In the Pannonian Plain, it is considered a postglacial steppe relict (S o ó, 1968). It grows on loess plains and steppes (S o ó, 1968).

In Serbia, it was present only in Vojvodina (D i k l i ć, 1974), in Bačka and Srem. The first data for the territory of Novi Sad were recorded by Zorkóczy (Z o r k ó c z y, 1896) on the localities between Novi Sad and Futog. Kupcsok (K u p c s o k, 1915) stated that it grows between Novi Sad and Kisač. These are the only data for the territory of Novi Sad.

*Salvia nutans* is extinct from the flora of Novi Sad where it was on the southern border of its distribution in Serbia. In the *Red Book of Flora of Serbia – I*, it was described as an extinct taxon (B u d a k, 1999). (Fig. 10. ●, 11.)



Fig. 10. – Localities at the territory of Novi Sad from which the species *Salvia nutans* ● and *Allium angulosum* ■ are extinct

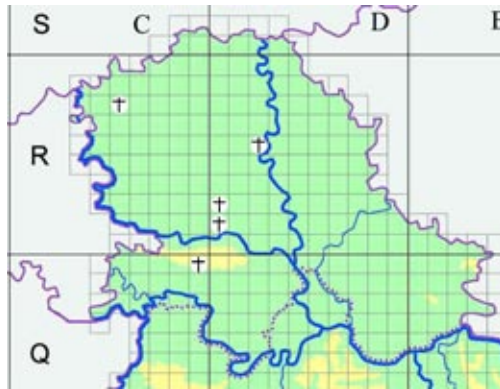


Fig. 11. – Distribution of *Salvia nutans* in Vojvodina (B u d a k, 1999)

Fam. Alliaceae, Subfam.: Alliaoideae, Tribus: Allieae  
*Allium angulosum* L. 1753

General distribution of *Allium angulosum* covers middle and southern Europe from eastern France and northern Italy across Poland in the east (S t e a r n, 1980), across the Balkan Peninsula and the European part of the Russia to Siberia (Б ъ л е в, А с е н о в, 1964). It belongs to Euro-Asian floristic element (S o ó, 1973). It grows on muddy plains and swamps on wet hay meadows, sandy marshes, and flooded meadows (S o ó, 1973).

It grows in Vojvodina, Mačva and Šumadija as well as on two localities in eastern, i.e. southeastern Serbia (A n a č k o v, 2003; 2009).

It is rare in Vojvodina. The first data for Novi Sad is from 1980 (J a n j a - t o v i ć et. al., 1980) from sandy and salty habitats, where it could not be found later. It has disappeared from the territory of Novi Sad, Novo Naselje city quarter. Most probably, it belongs to the category of vulnerable species because of the vulnerability and appearance of invasive weeds on the habitats. (Fig. 10. ■, 12.)

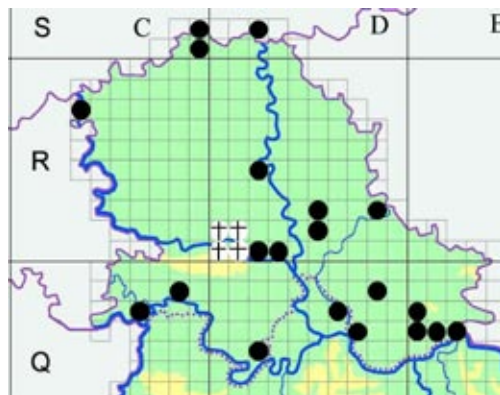


Fig. 12. – Distribution of *Allium angulosum* in Vojvodina (A n a č k o v, 2003; 2009) corr.

Fam: Typhaceae

*Typha schuttleworthii* Koch et Sonder in Koch 1844

General distribution of this plant covers southern and eastern parts of middle Europe, from eastern France and northern Italy (C o o k, 1980), to Balkan Peninsula (J o v a n o v i ć, 1986), the Alps and the Carpathian Mountains (S o ó, 1973). It belongs to middle European floristic element (S o ó, 1973). This species grows in fresh waters and on muddy habitats (S o ó, 1973).

For Serbia, there are very few data; it is recorded in eastern (T o m o v i ć et. al., 2009), southeastern, southwestern and central Serbia as well as in Novi Sad. It was recorded in Novi Sad by Fritsch in 1909 for the first time (R a n đ e l o v i ć, 1999), and later Javorka (J á v o r k a, 1925) whose data were cited by O b r a d o v i ć, 1966; O b r a d o v i ć, B u t o r a c, 1975; J o v a n o v i ć 1986.

*Typha schuttleworthii* has disappeared from the flora of Novi Sad and Vojvodina, where it grew in swamp vegetation. In the *Red Book of Flora of Serbia 1*, it is stated as critically endangered (R a n đ e l o v i ć, 1999), i.e. endangered species (T o m o v i ć et. al., 2009). (Fig. 13, 14.)

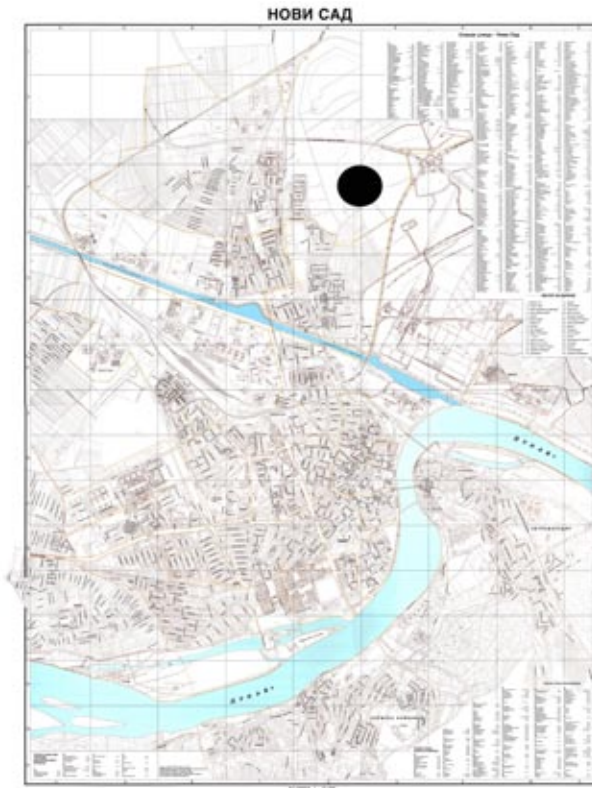


Fig. 13. – Locality at the territory of Novi Sad from which the species *Typha schuttleworthii* ● is extinct

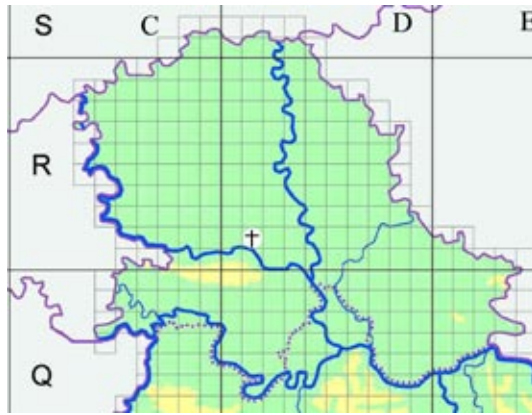


Fig. 14. – Distribution of *Typha schuttleworthii* in Vojvodina (Randelović, 1999)

## CONCLUSION

This paper describes 9 autochthonous taxa, which disappeared from the flora of Novi Sad.

*Suaeda maritima* subsp. *Pannonica* is a Pannonian endemic plant, characterizing the alliance *Thero-Salicornion* Tx. 55. In Serbia, it is considered as a much-endangered taxon. The only data regarding this plant for Novi Sad is from 1974.

*Androsace elongata* subsp. *elongata* belongs to Pontic floristic element in the alliance *Festucion rupicolae* Soó (29) 40 corr. Soó 64. It was found in Novi Sad only once in 1988. It has disappeared from the flora of Vojvodina.

*Cirsium boujartii* subsp. *boujartii* belongs to Pannonian floristic element, and it is distributed in Romania and Hungary. It creates groups of the alliance *Onopordion* Br.-Bl. 26. The only data for Novi Sad is from 1925. It is extinct from the flora of Serbia.

*Aster sedifolius* subsp. *canus* is a taxon of Pannonian-Pontic floristic element and it is an edicator of the alliance *Festucion rupicolae* Soó (29) 40 corr. Soó 64. It was recorded for the first time at the territory of Novi Sad in 1939 and it was found in 1974 for the last time. Today it is an endangered taxon in Serbia (Vojvodina).

*Blackstonia perfoliata* subsp. *serotina* is of Central-Eastern Mediterranean-Sub-Mediterranean-Western Pontic-Pannonian floristic element, and it is an edicator of the alliance *Nanocyperion flavescens* W. Koch 26. The first data for Novi Sad were from 1896, 1915, and 1916, and in 1985, it was found for the last time. In Vojvodina, it is rare and belongs to the group of endangered taxa.

*Plantago maritima* subsp. *maritima* characterizes the vegetation of the class *Festuco-Puccinellietea* Soó 68, and in wider sense, it belongs to Euro-Asian floristic element. The first data for Novi Sad were from 1915, and for the last

time it was recorded in 1985. It grows only in Bačka and Banat. In Serbia, it belongs to the group of endangered or vulnerable subspecies.

*Salvia nutans* belongs to Pontic-Pannonian floristic element and steppe, postglacial relicts. It is the characteristic species of the alliance *Festucion rupicolae* Soó (29) 40 corr. Soó 64 и *Danthonio-Stipion stenophyllae* Soó 47. corr. 71. The only data for Novi Sad and its territory were from 1896 and 1915. This species is extinct from the flora of Serbia.

*Allium angulosum* is the species from the alliance *Molinion coeruleae* W. Koch 26 and belongs to Euro-Asian floristic element. The first data for Novi Sad were from 1980, where it could not be found later. In Serbia, it belongs to vulnerable species.

*Typha schutteworthii* is middle European floristic element and is characteristic for the alliance *Phragmition communis* W. Koch. 26 emend. Soó 47. The first data for Novi Sad were from 1909, and the last data were from 1925. In Serbia, it is an endangered species.

Abbreviation: corr. – corrected map of distribution

(Stevanović, !) additions and suggestions of Professor Vladimir Stevanović, PhD, corresponding member of SASA

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## НЕКИ ИШЧЕЗЛИ БИЉНИ ТАКСОНИ СА ПОДРУЧЈА НОВОГ САДА И ЊИХОВ СТАТУС УГРОЖЕНОСТИ У ВОЈВОДИНИ И СРБИЈИ

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### Резиме

На територији града Новог Сада данас су скоро потпуно уништена природна станишта, као и биљни таксони који су их карактерисали. Разлог нестанка природних станишта је ширење приградских насеља, што је незаустављив процес. На тим стаништима су пре двадесет и више година расли биљни таксони специфични за влажне, слатинске и пешчарске екосистеме. У овом раду је приказано девет таксона (*Suaeda maritima* subsp. *maritima*, *Androsace elongata* subsp. *elongata*, *Cirsium boujartii* subsp. *boujartii*, *Aster sedifolius* subsp. *canus*, *Blackstonia perfoliata* subsp. *serotina*, *Plantago maritima* subsp. *maritima*, *Salvia nutans*, *Allium angulosum* и *Typha schutteworthii*), који су у прошлости чинили саставни део аутохтоне флоре Новог Сада. Будући да ови таксони нису нађени на терену дуж од 21 године, а неки чак 93 године, нестали су из флоре околине Новог Сада.

КЉУЧНЕ РЕЧИ: флора, ишчезавање, Нови Сад, станиште

### ACKNOWLEDGMENT

This work was supported by Ministry of Science and Technological Development of the Republic of Serbia, which has financed this research within the research project No. 173030.