



## *Ranunculus aconitifolius* L. (Ranunculaceae), a taxon new for the flora of Serbia

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**ABSTRACT:** During extensive field investigations on Mt. Željina (central Serbia), *Ranunculus aconitifolius* L. (Ranunculaceae) was recorded for the first time in Serbia. This species inhabits waterlogged places near springs and streams and is most abundant within vegetation of the *Calthion palustris* alliance. All known habitats are situated in small areas below the mountain peaks Oglavlje and Ploška Čuka. This paper treats the taxonomic status of *R. aconitifolius* and presents data on its morphological characteristics, habitat preferences, and distribution in Serbia.

**KEYWORDS:** *Ranunculus aconitifolius*, first record, Mt. Željina, Serbia

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### INTRODUCTION

The genus *Ranunculus* L. comprises ca. 550-600 species with a cosmopolitan distribution on all continents except Antarctica (TAMURA 1995; WANG & GILBERT 2001; MABBERLEY 2008; ERST & SUKHORUKOV 2011). As the largest genus of the family Ranunculaceae Juss., it varies broadly in morphology, ecology, and life cycle and is represented mainly in sub-meridional to temperate zones of both hemispheres, as well as in high mountain systems (BALTIŠBERGER & HÖRANDL 2016).

According to GAJIĆ *et al.* (1992), 51 species from the genus *Ranunculus*, divided into two subgenera and ten sections, have been reported for Serbia. *Ranunculus* sect. *Aconitifolii* Tutin in Serbia was up to now represented by two taxa, viz., *Ranunculus platanifolius* L. and *R. montenegrinus* (Halácsy) Lindtner. Members of this section are characterised by fibrous roots, lobed basal leaves, white and caducous petals, pubescent receptacles, and veined subglobose achenes with a short curved beak (TUTIN & AKEROYD 1993). During extensive field research on Mt. Željina (central Serbia) conducted for the purpose of justifying its formal protection, the presence of *R. aconitifolius* L., an additional taxon from *Ranunculus* sect. *Aconitifolii*, was recorded for the first time for the flora of Serbia. The species is described, its taxonomic status evaluated, its habitat and characters that distinguish it from the similar, in Serbia more widespread, *R. platanifolius*, provided.

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### MATERIALS AND METHODS

Plant material of *R. aconitifolius* was collected on two occasions, four specimens during 2002 (on Mt. Željina, below the peak Pločka Čuka) and 11 specimens during 2013 (on Mt. Željina, below the Oglavlje peak). The voucher specimens of *R. aconitifolius* are deposited in the herbarium of the Institute of Botany and Botanical Garden "Jevremovac" of the University of Belgrade (BEOU) and in *Herbarium Moesiacum* of the University of Niš (HMN). The determination and morphological descriptions follow COOK *et al.* (1986), TUTIN & AKEROYD (1993), HROUDA (2002), BOJNANSKÝ & FARGAŠOVÁ (2007), and HESS *et al.* (2010). Nomenclature and synonyms are given according to Euro+Med PlantBase (HÖRANDL & RAAB-STRAUBE 2015) and Tela Botanica

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(<http://www.tela-botanica.org/>). The distribution of *R. aconitifolius* on the territory of Serbia is mapped on a 10×10 km MGRS grid system (LAMPINEN 2001).

## RESULTS AND DISCUSSION

*Ranunculus aconitifolius* L., Sp. Pl. 551, 1753.

**Syn.** – *Ranunculus caballeri* Losa & P. Monts., in *Anales Inst. Bot. Cavanilles* 10: 504, 1952; *Hecatonia aconitifolia* Schur, *Enum. Pl. Transsilv.* 13, 1866; *Ranula aconitifolia* Fourr., in *Ann. Soc. Linn. Lyon*, n.s. 16: 324, 1868.

**Description.** Perennial, (10) 20-60 (120) cm high. Rhizome short, with thick cylindrical roots, apically covered with fibrous debris. Stems terete, solitary, erect or ascending, glabrous. Basal leaves palmately 3-5 lobed, lobes serrate-dentate, middle one divided to the base; leaves (12) 30-70 (140) × (25) 45-160 (200) mm, glabrous or hairy on the nerves and margins, the upper ones sessile. Pedicels pubescent above, 1-3 times as long as subtending leaf. Flowers (10) 13-24 (26) mm in diameter, sepals reddish or purple beneath, glabrous. Petals 7-12 (13) mm, ovate, weakly obcordate, white. Honey-leaves 5, ovate, weakly obcordate. Achenes (2) 2.5-3.5 (5) mm, nearly rounded, slightly compressed, glabrous and indistinctly veined, yellowish green to yellowish brown, beak 0.3-1 mm, hooked. Flowering V-VIII.  $2n = 16$ .

The species *R. aconitifolius* (Fig. 1) is closely related to *R. platanifolius*, differing in a few key characteristics:

- a:** Middle segment of basal leaf divided to the base; upper cauline leaves wide, serrate-dentate; pedicels pubescent above, 1-3 times as long as subtending leaf; stamens as long as carpels; carpels 2-3 mm long.....***R. aconitifolius***
- b:** Middle segment of basal leaf not divided to the base (connate 2,5-15 mm from the base); upper cauline leaves narrow, almost entire; pedicels glabrous or nearly glabrous above, 3-5 times as long as subtending leaf; stamens longer than carpels; carpels 3-4 mm long .....***R. platanifolius***

**Voucher specimens:** Mt. Željina (central Serbia): below Oglavlje peak [MGRS 34T DP81], 43°27' 57" N / 20°47'27" E, 1450 m, within vegetation of the *Calthion palustris* alliance, Leg/Det. Lazarević Predrag, 15. V 2013. (Voucher No. 17301, BEOU); Jezero, below Pločka Čuka peak [MGRS 34T DP81], 43°28' 27" N / 20°47'50" E, 1530 m, within vegetation of the *Calthion palustris* alliance, Leg/Det. Zlatković Bojan, 19. VIII 2002. (Voucher No. 13207, HMN).

**General Distribution.** Native to Central Europe (Austria, Czech Republic, France, Switzerland, Germany, Romania), extending to Spain, northern Italy, and the western part of the Balkan Peninsula (Croatia, Bosnia and Herzegovina, Montenegro). The nearest populations

were reported from Mt. Durmitor, Mt. Crna planina district of Kuči and Mt. Kom with Skrobotuša in Montenegro (ROHLENA 1942), as well as from "Leskovac near Han Pijesak" in Bosnia (LAKUŠIĆ 1987), but we are still awaiting herbarium data confirming those records. As an allochthonous species, it was recorded in Great Britain, Iceland, Norway, and Estonia? (COOK *et al.* 1986; TUTIN & AKEROYD 1993; HÖRANDL & RAAB-STRAUBE 2015). According to JALAS & SOUMINEN (1989), HOBOHM & BRUCHMANN (2011), and HOBOHM *et al.* (2014), it is a European endemic plant from wet habitats.

**Distribution in Serbia.** The only locality recorded so far in Serbia is on Mt. Željina, below the mountain peaks Oglavlje and Pločka Čuka (Fig. 1).

Since *R. aconitifolius* is listed in *Flora Principatus Serbiae* (PANČIĆ 1874), but missing in later literature sources, it can be concluded that this name actually refers to the more frequently occurring *R. platanifolius* (syn. *R. aconitifolius* subsp. *platanifolius*). That possibility was indicated for the first time in GAJIĆ (1970). According to HAYEK (1924) and HÖRANDL & RAAB-STRAUBE (2015), the presence of *R. aconitifolius* in Serbia is questionable, while it was omitted from some recent floristic literature treating the territory of Serbia (JALAS & SOUMINEN 1989; GAJIĆ *et al.* 1992). The closely related *R. platanifolius* is more widespread in mountainous and subalpine regions of Serbia (Beljanica, Suva Planina, Stara Planina, Babička Gora, Šar Planina, Prokletije), including Mt. Željina and the nearby Mt. Kopaonik in central Serbia (GAJIĆ *et al.* 1992). *Ranunculus aconitifolius* was erroneously reported within vegetation relevés from the Stara Planina Mountains in eastern Serbia (MIŠIĆ *et al.* 1978), where it was confused with *R. platanifolius*.

**Habitat.** *Ranunculus aconitifolius* generally occupies moist to wet places, springs, streamlets, brook banks, wet meadows, etc., usually in mountain and subalpine zones (COOK *et al.* 1986; HOFFMANN *et al.* 2010). The ecological conditions it prefers are localities with vegetation of the alliances *Calthion palustris* Tx. 1937, *Adenostylion* Luquet 1926, *Salicion herbaceae* Br.-Bl. in Br.-Bl. et Jenny 1926, *Magnocaricion elatae* Koch 1926, and *Alnion incanae* Pawłowski *et al.* 1928, as well as wet places within *Fagus* and *Abies* forests, etc. (HUBER 1988; HOBOHM *et al.* 2014). HUBER (1988) noted that *R. aconitifolius* is typically accompanied by *Caltha palustris*, *Filipendula ulmaria*, and *Juncus effusus*; and sometimes by *Carex paniculata*, *Crepis paludosa*, *Dactylorhiza maculata*, and *Veronica beccabunga*.

In Serbia, *R. aconitifolius* occupies places near mountain springs, streams, and water flushes within the zone of *Fagus* forests below the highest Željina mountain peaks. It prefers partly shady or open places within vegetation of the *Calthion palustris* alliance (Fig. 1), rarely other vegetation. The most abundant populations are

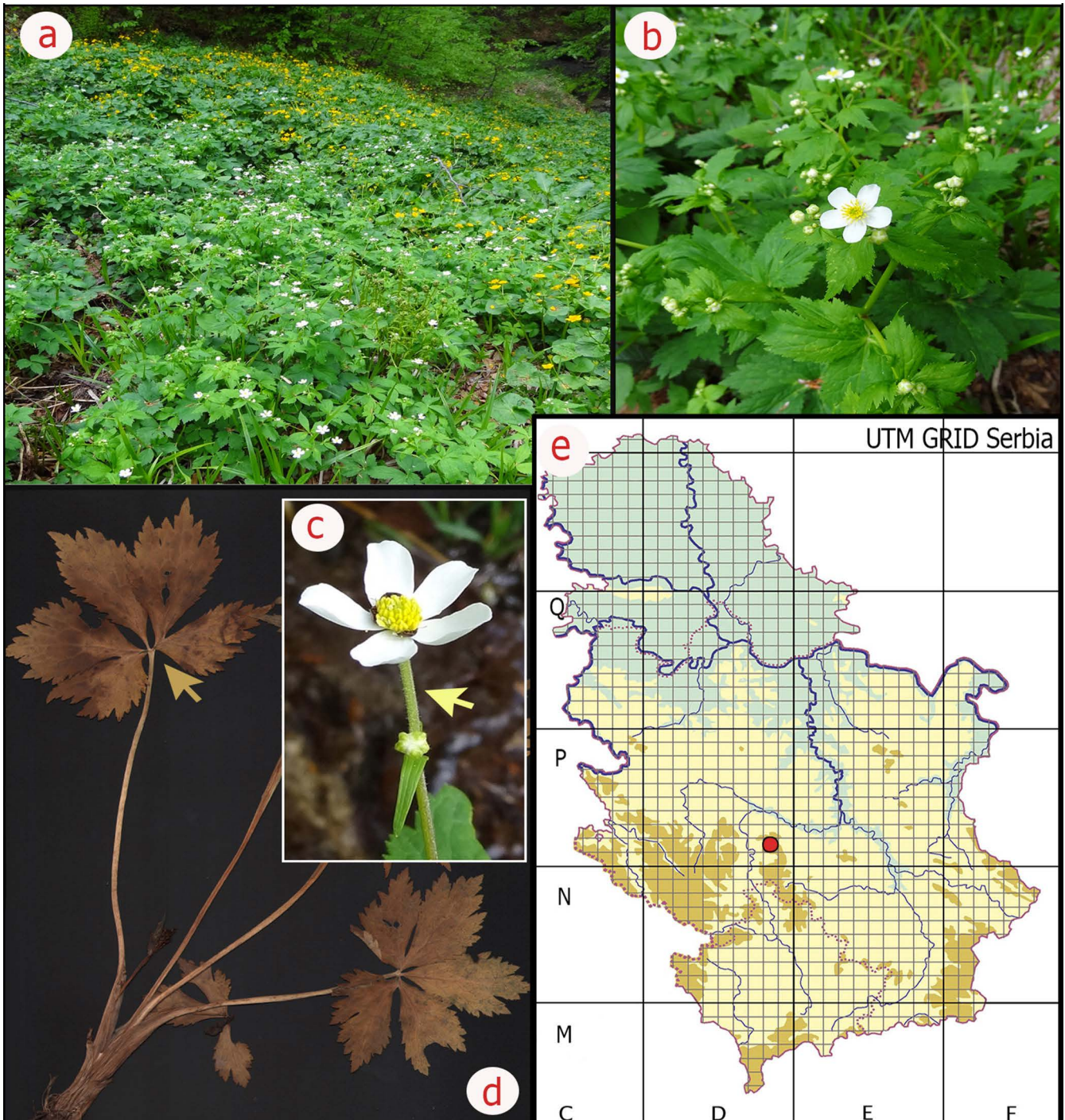


Fig. 1. a - *Ranunculus aconitifolius*, typical habitat; b - general appearance of the species; c - pubescent pedicels (marked with an arrow); d - middle segment of basal leaf divided to the base (marked with an arrow); e - UTM map of *R. aconitifolius* distribution in Serbia.

recorded in habitats with dominance of *Caltha palustris* s.l., together with *Juncus effusus*, *Scirpus sylvaticus*, *Ranunculus repens*, *Jacobaea subalpina*, *Aegopodium podagraria*, *Geum rivale*, *Carex remota*, etc. The species is less abundant on moderately wet forest edges. Some specimens are scattered individually near streams and other wet places. The entire currently known population

in Serbia is estimated to contain less than 500 individuals, but it probably is somewhat larger. No direct threatening factors have been observed to date.

Further research on *R. aconitifolius* is required in order to elucidate its chorology, ecology, potential threats to its existence, and the need for its conservation in Serbia.

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## REFERENCES

- BALTISBERGER M & HÖRANDL E. 2016. Karyotype evolution supports the molecular phylogeny in the genus *Ranunculus* (Ranunculaceae). *Perspectives in Plant Ecology, Evolution and Systematics* **18**: 1-14.
- BOJNANSKÝ V & FARGAŠOVÁ A. 2007. *Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region*. Springer Science & Business Media.
- COOK CDK, GRAU J & LÓPEZ GONZÁLEZ G. 1986. *Ranunculus* L. In: CASTROVIEJO S, LAÍN Z, LÓPEZ GONZÁLEZ G, MONTSERRAT P, MUÑOZ GARMENDIA F, PAIVA J & VILLAR L (eds.), *Plantas vasculares de la Península Ibérica e Islas Baleares, Vol. 1. Lycopodiaceae-Papaveraceae*, pp. 279-371, Real Jardín Botánico, CSIC.
- ERST A & SUKHORUKOV A. 2011. Records of *Ranunculus longicaulis* and *R. pseudohirculus* (Ranunculaceae) from Nepal. *Taiwania* **56**(3): 218-222.
- GAJIĆ M. 1970. Rod *Ranunculus* L. In: JOSIFOVIĆ M (ed.), *Flora SR Srbije* **1**, pp. 254-301, Srpska akademija nauka i umetnosti, odeljenje prirodno-matematičkih nauka, Beograd.
- GAJIĆ M, DIKLIĆ N & JANKOVIĆ M. 1992. Rod *Ranunculus* L. In: SARIĆ M (ed.), *Flora Srbije* **1**, pp. 340-399, Srpska akademija nauka i umetnosti, odeljenje prirodno-matematičkih nauka, Beograd.
- HAYEK A. 1924. Prodrumus Florae peninsulae Balcanicae 1. *Repertorium Novarum Specierum Regni Vegetabilis* **30**(1): 1-352.
- HESS HE, LANDOLT E, MÜLLER-HIRZEL R & BALTISBERGER M. 2010. *Bestimmungsschlüssel zur Flora der Schweiz und angrenzender Gebiete*. Springer-Verlag.
- HOBOHM C & BRUCHMANN I. 2011. Are there endemic vascular plants in wet habitats of Europe? *Transylvanian Review of Systematical and Ecological Research* **12**: 1-14.
- HOBOHM C, VANDERPLANK SE, JANIŠOVÁ M, TANG CQ, PILS G, WERGER MAJ, TUCKER CM, CLARK VR, BARKER NP, KEPING M, MOREIRA-MUÑOZ A, DEPPE U, FRANCILOLO SE, HUANG J, JANSEN J, OHSAWA M, NOROOZI J, DE SEQUEIR MP, BRUCHMAN I, YANG W & YANG Y. 2014. Part IV: Endemism in Vascular Plants, Chapter 8: Synthesis. In: HOBOHM C (ed.), *Endemism in Vascular Plants. Plant and Vegetation Vol. 9*, pp. 311-321, Springer, Dordrecht.
- HOFFMANN MH, VON HAGEN KB, HÖRANDL E, RÖSER M & TKACH NV. 2010. Sources of the arctic flora: Origins of arctic species in *Ranunculus* and related genera. *International Journal of Plant Sciences* **171**(1): 90-106.
- HÖRANDL E & RAAB-STRAUBE E. 2015. *Ranunculaceae*. In: Euro+Med Plantbase-the information resource for EuroMediterranean plant diversity. Published on the Internet <http://ww2.bgbm.org/EuroPlusMed/>
- HROUDA L. 2002. *Ranunculaceae* Juss. – pryskyřníkovité. In: KUBÁT K, CHRTEK J JUN, KAPLAN Z, KIRSCHNER J & ŠTĚPÁNEK J (eds), *Klíčky květeně České republiky*, pp. 108-128, Academia, Praha.
- HUBER W. 1988. *Natürliche Bastardisierung zwischen weissblühenden "Ranunculus"-Arten in den Alpen*. Veröffentlichungen des Geobotanischen Institutes der Eidgenössische Technische Hochschule Zürich, Band **100**.
- JALAS J & SUOMINEN J (eds.). 1989. *Atlas Florae Europaeae* **8**. The Committee for Mapping the Flora of Europe and Societas Biologica Fennica Vanamo, Helsinki.
- LAKUŠIĆ R, MIŠIĆ LJ & GOLJIĆ S. 1987. *Ranunculetum serbici* Lakušić, Mišić & Golić Assoc. nova. *Bilten Društva ekologa BiH. Ekološke monografije* **4**: 117-121.
- LAMPINEN R. 2001. Universal Transverse Mercator (UTM) and Military Grid Reference System (MGRS). Downloadable from <http://www.luomus.fi/english/botany/afe/map/utm.htm>
- MABBERLEY DJ. 2008. *Mabberley's Plant-Book: A Portable Dictionary of Plants, their Classification and Uses* (3<sup>rd</sup> edition). Cambridge University Press, Cambridge.
- MIŠIĆ V, JOVANOVIĆ-DUNJIĆ R, POPOVIĆ M, BORISAVLJEVIĆ LJ, ANTIĆ M, DINIĆ A, DANON J & BLAŽENČIĆ Ž. 1978. *Biljne zajednice i staništa Stare planine*. Posebna izdanja **511**, Odeljenje prirodno-matematičkih nauka **49**, Srpska akademija nauka i umetnosti, Beograd.
- PANČIĆ J. 1874. *Flora Kneževine Srbije*. Državna štamparija, Beograd.
- ROHLENA J. 1942. Conspectus florae Montenegrinae. *Preslia* **20-21**: 1-506.
- TAMURA M. 1995. *Angiospermae* Ordnung *Ranunculales*. Fam. *Ranunculaceae*. II. Systematic part. In: HIEPKO P (ed.), *Natürliche Pflanzenfamilien*, 2<sup>nd</sup> edition, pp. 223-519, Duncker & Humblot, Berlin, Germany.
- TUTIN TG & AKEROYD JR. 1993. *Ranunculus* L. In: TUTIN TG, BURGESS NA, CHATER AO, EDMONDSON JR, HEYWOOD VH, MOORE DM, VALENTINE DH, WALTERS SM & WEBB DA (eds.), *Flora Europaea, Vol. 1, Psilotaceae to Platanaceae*, 2<sup>nd</sup> edition, pp. 269-286, Cambridge University Press, Cambridge, New York, Melbourne.
- WANG WT & GILBERT MG. 2001. *Ranunculus*. In: WU ZY & RAVEN PH (eds.), *Flora of China, Vol. 6*, pp. 391-431, Science Press, Missouri Botanical Garden Press.

## Botanica SERBICA



## REZIME

## *Ranunculus aconitifolius* L. (Ranunculaceae), nova vrsta za floru Srbije

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**T**okom terenskih istraživanja planine Željin (C Srbija) u svrhu njene formalne zaštite, po prvi put za floru Srbije potvrđeno je prisustvo vrste *Ranunculus aconitifolius* L. (Ranunculaceae). *R. aconitifolius* naseljava vodom zasićena staništa pored izvora i planinskih potoka, sa najvećom brojnošću unutar vegetacije sveze *Calthion palustris*. Sva do sada zabeležena staništa ove vrste nalaze se unutar manjeg područja ispod planinskih vrhova Oglavlje i Pločka čuka.

**KLJUČNE REČI:** *Ranunculus aconitifolius*, prvi zapis, planina Željin, Srbija

