



## *Eclipta prostrata* (L.) L. (Compositae), an adventive species new to the flora of Serbia

Ranko PERIĆ\* and Sara RILAK

Institute for Nature Conservation of Vojvodina Province, Radnička 20a, 21000 Novi Sad, Serbia

**ABSTRACT:** During field investigations of the wetland flora on Danubian islands in the vicinity of Pančevo (Serbia), we found the plant species *Eclipta prostrata* (Compositae). This adventive species with pantropical distribution has never before been recorded in Serbia. The present paper provides basic information about its morphological features, biology and habitat preferences, as well as some data on its coenology and the possible pathways of its introduction.

**KEYWORDS:** flora, chorology, neophytes, Serbia.

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### INTRODUCTION

There are several known species of the genus *Eclipta* L., which are native to warm-temperate regions of the globe, primarily in the New World (UMEMOTO & KOYAMA 2007). The only representative of this small genus in Europe is *E. prostrata* (L.) L. (TUTIN 1976). Since its initial records in Italy (VIEGI *et al.* 1974) and in Spain and Portugal (TUTIN 1976), *E. prostrata* continued to spread across Southern Europe. Due to its high dispersability and adaptability to changing environmental conditions, as well as to its pronounced ecotypic variability (LEE & MOODY 1989), *E. prostrata* recently has become a common weed species in disturbed wetland habitats across most of the Mediterranean area (TUTIN 1976; GREUTER 2006). During the last decade, this species has become naturalised in Greece (HAND 2009) and has also been recorded in Bulgaria (TZONEV 2007; PETROVA *et al.* 2013) and Montenegro (ČAKOVIĆ *et al.* 2014), anticipating its potential spread towards Serbia and other neighbouring parts of the Balkans.

In the course of a floristic survey of Danubian islands in the vicinity of Pančevo in Serbia, we found a few dozen individuals of the species *E. prostrata*, which is its first record for Serbia. The present paper provides basic information about this record, with some additional remarks on the habitat and pathway of introduction of the given species into Serbia.

### MATERIALS AND METHODS

Voucher herbarium specimens are stored in the Herbarium collection of the Institute for Nature Conservation of Vojvodina Province in Novi Sad (designated here as PZZP). The taxon's description follows VASSILCZENKO (1959), TUTIN (1976), STROTHER (2006) and CHEN & NICHOLAS-HIND (2011), with additional comments based on the authors' observations of the collected specimens. Nomenclature and synonyms of vascular plant taxa are given according to the Euro+Med Plantbase (GREUTER 2006). Author citations have complied with Rec 46A, Note 1 of the Code (MCNEILL *et al.* 2012). Data on the distribution in Serbia are mapped on a 10 × 10 km MGRS grid system (LAMPINEN 2001).

### RESULTS AND DISCUSSION

*Eclipta prostrata* (L.) L., *Mantissa Pl. Alt.* 286 (1771).  
**Syn.** *Verbesina prostrata* L., *Sp. Pl.* 902 (1753) [basionym]; *V. alba* L., *Sp. Pl.* 902 (1753); *Eclipta erecta* L., *Mantissa Pl. Alt.* 286 (1771), nom. illeg.; *E. alba* (L.) Hassk., *Pl. Jav. Rar.* 528 (1848); *E. marginata* Boiss., *Fl. Orient.* 3: 249 (1875); *Verbesina alba* subsp. *neapolitana* auct., des. inval.

**Description.** Annual, appressedly strigose-pilose, dull green plant, (6)20-60(100) cm high. *Stems* erect,

\*correspondence: ranko.peric@pzzp.rs

ascending or prostrate, more or less compressed, angled, longitudinally striated, oppositely branched from the base. *Leaves* plane, opposite, sessile or the lower shortly petiolate, leaf blade elliptical-lanceolate, oblong-lanceolate to oblong or oblong-ovate, (2-)4-13(-15) × (0.8)1-3 cm, narrowed at the base, remotely serrulate, teeth directed upwards, apex gradually acuminate. *Capitula* pedunculate, hemispherical, (2-)6-8(6) mm wide, usually one or two in leaf-axils, peduncle slender, (0-2)2-5 cm long. *Involucre* globose-campanulate, enlarging during fructification (up to 11 mm), consisting of up to 8 (10 in some of our specimens) herbaceous phyllaries arranged in two rows. Phyllaries c. 5-6 × 0.5-3 mm, oblong-ovate to oblong-lanceolate, acute, outer longer than inner, all with distinct longitudinal veins. *Receptacle* flat to slightly convex, covered with numerous greenish scales c. 2 mm long, scales setaceous, ciliate in the upper half. *Florets* white, outer ligulate, female, 2-seriate, half as long as the involucre or somewhat shorter, lamina 2.5-3 × c. 0.4 mm, slightly bifid or entire at the apex. Inner florets tubular, hermaphroditic, c. 1.5 mm, shortly 4(5)-lobed (in our specimens, the lobes are sparsely scabrid on the outside). *Achenes* prismatic, usually pale to dark brown, glabrous, 2-3 × 1-1.5 mm, trigonous to tetragonous or sometimes subterete, more or less laterally compressed, somewhat swollen in the upper half, distinctly angled, their surface smooth or inconstantly covered with blistering tubercles. *Pappi* of few persistent coroniform short bristles and setae. *Seeds* dark brown, minutely transversely wrinkled.  $2n = 22$  (STROTHER 2006). Flowering time: VI-IX (CHEN & NICHOLAS-HIND 2011). Pollination: entomophily (PETROVA *et al.* 2013). Seed dispersal: hydrochory, ornithochory (QUISUMBING 1923; UMEMOTO *et al.* 1998; ČAKOVIĆ *et al.* 2014). Type in London: Herb. Plukenet, s.n. (BM) (GRIERSON 1980: 212).

**Distribution.** This pantropical weed species is native to tropical and other warm-temperate areas of America and was introduced into Europe, Africa, Asia, Australia and the Pacific islands (STONE 1970; TUTIN 1976; GREUTER 2006; CHEN & NICHOLAS-HIND 2011). It was originally described from India [*"Habitat in India"*] (LINNAEUS 1771: 286). In Europe it has so far been recorded principally in countries bordering the Mediterranean and Black Seas: Portugal, Spain, France, Italy, Montenegro, Albania, Greece, Turkey, Cyprus, Bulgaria, Romania, Ukraine and Georgia, as well as in some other states, viz., Belgium, Armenia and Azerbaijan (GREUTER 2006; ČAKOVIĆ *et al.* 2014). Its seeds are easily transported by flowing water (QUISUMBING 1923) and water birds (TZONEV 2007).

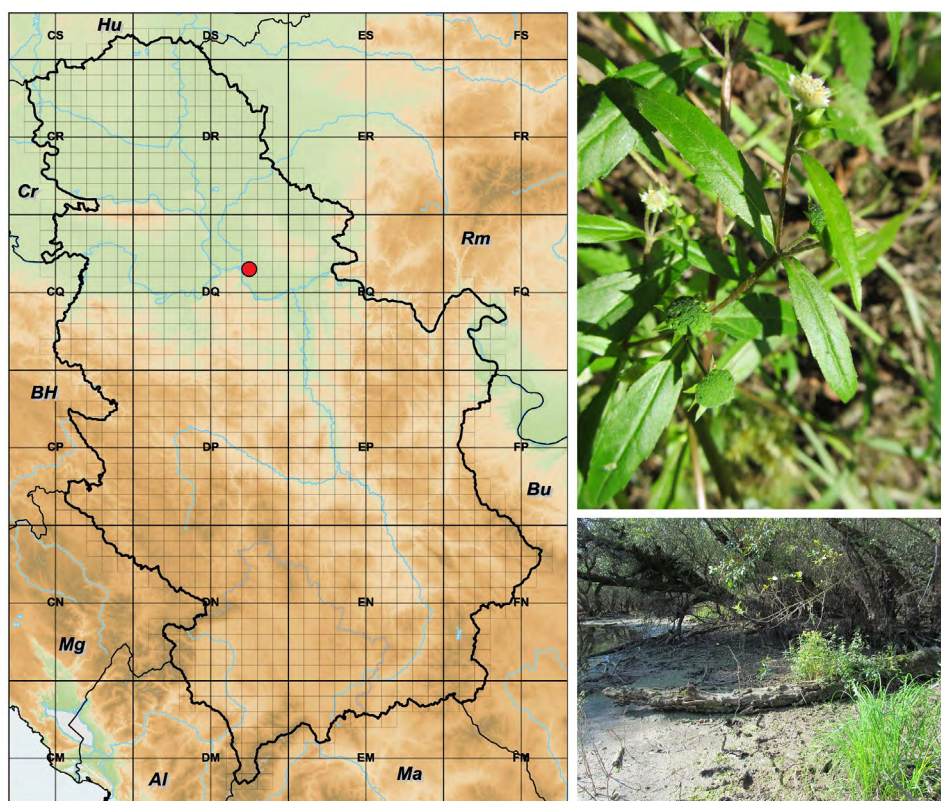
**Distribution in Serbia, pathway of introduction and invasive status.** Periodically flooded, almost bare grounds and mud puddles on the Danubian isle of Donja Ada near Pančevo are so far the only places where *E.*

*prostrata* can be found in Serbia (Fig. 1), with less than 50 observed plants, so its present invasive status in Serbia can be estimated as „naturalised but not invasive“ (PYŠEK *et al.* 2012). The nearest known records of *E. prostrata* are from more than 360 km to the east, in the Danube valley between Nikopol and Cherkovitsa in northern Bulgaria (an approximation based on the UTM grid published by PETROVA *et al.* 2013). As is the case with many other marsh plants (VIVIAN-SMITH & STILES 1994; MUELLER & VAN DER VALK 2002; WONGSRIPHUEK *et al.* 2008; BROCHET *et al.* 2009, 2010; FIGUEROLA *et al.* 2010; REYNOLDS *et al.* 2015; GREEN 2016), *E. prostrata* also produces numerous seeds which are easily transported by migrating water birds. The Danube River with its adjacent area is known as one of the most important bird migration corridors in Europe (SOMMERWERK *et al.* 2009). In view of these facts, it is very feasible to postulate that waterbird-mediated dispersal was the pathway over which *E. prostrata* was introduced into Serbia.

**Voucher specimens: Banat: Pančevo-Veliko Selo: [MGRS 34T DQ76]** on the isle of Donja Ada, along the channel connecting the Danube and the Dana puddle, 44° 48' 21.01" N, 020° 37' 50.45" E, 71 m (Perić, R., Rilak, S. 22 Sept. 2016, PZZP).

**Habitat.** Common as a weed on riversides, flooded fields (e.g., rice fields) and abandoned ponds, mostly on heavy soils with a constant and abundant water supply (VASSILCZENKO 1959; KRANZ *et al.* 1977; CHEN & NICHOLAS-HIND 2011). Our specimens were collected on drying mudfields alongside the channel connecting the Danube and the Dana puddle. Geological and paedological substrates are represented by alluvial sand deposits (NEJGEBAUER *et al.* 1971; DIMITRIJEVIĆ *et al.* 1975). Vegetation is poorly developed and characterised by the presence of some pioneer species associated with the alliance *Bidention tripartitae* Nordhagen ex Klika et Hadač 1944. The following accompanying taxa were recorded: *Bidens frondosus* L., *Cyperus odoratus* L., *Lemna minor* L., *Lycopus europaeus* L., *Polygonum hydropiper* L., *Rorippa amphibia* (L.) Besser, *Salvinia natans* (L.) All. and *Solanum dulcamara* L.

In view of its ecology and the mechanisms of dispersal of its seeds, we can expect that *E. prostrata* will be found in Serbia in the near future in appropriate habitats along the Danube and its tributaries, especially downstream from Pančevo, in preserved riparian areas known as migratory bird stopover habitats, e.g., Labudovo okno and nearby wetlands (PUZOVIĆ *et al.* 2009). Together with other plant species such as *Paspalum distichum* L. (BLAŽENČIĆ *et al.* 2000), *Elodea nuttallii* (Planch.) H. St. John (STEVANOVIĆ *et al.* 2003), *Cyperus odoratus* L. [„*C. strigosus sensu Stevanović*“, non L.] (STEVANOVIĆ *et al.* 2005; VERLOOVE 2014) and *Sporobolus indicus* (L.) R. Br. (PERIĆ *et al.* 2013), *E. prostrata* belongs to a group



**Fig. 1.** *Eclipta prostrata* (L.) L. in Serbia. Left: known distribution of *E. prostrata* in Serbia (red circle: new record); upper right: specimen of *E. prostrata* from Donja Ada; bottom right: typical habitat of the species on the isle of Donja Ada.

of adventive species originally from warm-temperate regions of the world that were first found in Serbia almost exclusively along the Danube downstream from Belgrade. These facts emphasise the significance of the Danube as part of the Southern Invasive Corridor (one of Europe's four most important routes for invasive species) in the spreading of adventive and invasive species from the Black Sea area and suggest that recent introductions of the aforementioned tropical or subtropical species into more continental areas like Serbia can possibly be attributed to the effects of global warming (CSAGOLY 2008).

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## REFERENCES

- BLAŽENČIĆ J, LAKUŠIĆ D & BLAŽENČIĆ Ž. 2000. A new data about *Paspalum paspalodes* (Michx) Scribner (*Poaceae*, *Panicoideae*) - a new "dangerous" weed species in Serbia (FR Yugoslavia). *Ekologija (Beograd)* **35**(1): 73-86.
- BROCHET AL, GUILLEMAIN M, FRITZ H, GAUTHIER-CLERC M & GREEN AJ. 2009. The role of migratory ducks in the long-distance dispersal of native plants and the spread of exotic plants in Europe. *Ecography* **32**: 919-928.
- BROCHET AL, GUILLEMAIN M, FRITZ H, GAUTHIER-CLERC M & GREEN AJ. 2010. Plant dispersal by teal (*Anas crecca*) in the Camargue: duck guts are more important than their feet. *Freshwater Biology* **55**: 1262-1273.
- ČAKOVIĆ D, STEŠEVIĆ D, VUKSANOVIĆ S & TAN K. 2014. *Colchicum cupanii* Guss. subsp. *glossophyllum* (Heldr.) Rouy, *Datura innoxia* Mill. and *Eclipta prostrata* (L.) L., new floristic records in Montenegro and western Balkan. *Acta Botanica Croatica* **73**(1): 255-265.
- CHEN JS & NICHOLAS-HIND DJ. 2011. *Eclipta* Linnaeus, Tribe Heliantheae. In: WU ZY, RAVEN PH & HONG DY (eds.), *Flora of China* **20-21**, p. 869. Science Press & Missouri Botanical Garden Press, Beijing-St. Louis.
- CSAGOLY P. 2008. Invasion of the Danube. *Danube Watch (Wien)* **3-4**: 17-21.
- DIMITRIJEVIĆ M, KARAMATA S, SIKOŠEK B & VESELINOVIĆ D. 1975. *Osnovna geološka karta SFRJ 1:100000, list Pančevo L 34-114*. Savezni geološki zavod, Beograd.
- FIGUEROLA J, CHARALAMBIDOU I, SANTAMARÍA L & GREEN AJ. 2010. Internal dispersal of seeds by waterfowl: effect of seed size on gut passage time and germination patterns. *Naturwissenschaften* **97**: 555-565.
- GREEN AJ. 2016. The importance of waterbirds as an overlooked pathway of invasion for alien species. *Diversity and Distributions* **22**: 239-247.
- GREUTER W. 2006+. Compositae (pro parte majore). In: GREUTER W & RAAB-STRAUBE E (eds.), *Compositae. Euro+Med Plantbase-the information resource for Euro-Mediterranean plant diversity*. [Continuously updated at <http://ww2.bgbm.org/EuroPlusMed/>].
- GRIERSON AJC. 1980. Compositae. In: DASSANAYAKE MD & FOSBERG FR (eds.), *A Revised Handbook to the Flora of*

- Ceylon 1, pp. 111-278, Smithsonian Institution and The National Science Foundation-Amerind Publishing Co., Washington D.C.-New Delhi.
- HAND R. 2009. Supplementary notes to the flora of Cyprus VI. *Willdenowia* **39**: 301-325.
- KRANZ J, SCHMUTTERER H & KOCH W (eds.). 1977. *Diseases, pests and weeds in tropical crops*. Verlag Paul Parey, Berlin.
- 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>].
- LEE HK & MOODY K. 1989. Ecotypic differentiation of *Eclipta prostrata* (L.) L. from the Philippines. In: ANONYMOUS (ed.), *Proceedings, No. 1, 12th Asian-Pacific Weed Science Society Conference Taipei*, Taiwan, pp. 171-176. Asian-Pacific Weed Science Society.
- LINNAEUS C. 1771. *Mantissa Plantarum Altera generum editionis VI. et specierum editionis II. Impensis Direct. Laurentii Salvii, Holmiae*.
- MCNEILL J, BARRIE FR, BUCK WR, DEMOULIN V, GREUTER W, HAWKSWORTH DL, HERENDEEN PS, KNAPP S, MARHOLD K, PRADO J, PRUD'HOMME VAN REINE WF, SMITH GF, WIERSEMA JH & TURLAND NJ (eds.). 2011. *International Code of Nomenclature for algae, fungi and plants (Melbourne Code), adopted by the Eighteenth International Congress, Melbourne, Australia, July 2011*. *Regnum Vegetabile* **154**: 1-208.
- MUELLER MH & VAN DER VALK AG. 2002. The potential role of ducks in wetland seed dispersal. *Wetlands* **22**: 170-178.
- NEJGEBAUER V, ŽIVKOVIĆ B, TANASIJEVIĆ MĐ & MILJKOVIĆ N. 1971. *Pedološka karta Vojvodine 1: 50 000*. Institut za poljoprivredna istraživanja, Novi Sad.
- PERIĆ R, PANJKOVIĆ B, ŠKONDRIĆ S & STOJŠIĆ V. 2013. *Sporobolus indicus* (L.) R.Br. (Gramineae), a new adventive species in the flora of Serbia. *Archives of Biological Sciences* **65**(4): 1511-1514.
- PETROVA A, VLADIMIROV V & GEORGIEV V. 2013. *Invasive alien species of vascular plants in Bulgaria*. Bulgarian Academy of Sciences, Sofia.
- PUZOVIĆ S, SEKULIĆ G, STOJNIĆ N, GRUBAČ B & TUCAKOV M. 2009. *Značajna područja za ptice u Srbiji*. Ministarstvo životne sredine i prostornog planiranja, Zavod za zaštitu prirode Srbije, Pokrajinski sekretarijat za zaštitu životne sredine i održivi razvoj. Beograd-Novı Sad.
- PYŠEK P, DANIHELKA J, SÁDLO J, CHRTEK JJR, CHYTRÝ M, JAROŠÍK V, KAPLAN Z, KRAHULEC F, MORAVCOVÁ L, PERGL J, ŠTAJEROVÁ K & TICHÝ L. 2012. Catalogue of alien plants of the Czech Republic (2nd edition): checklist update, taxonomic diversity and invasion patterns. *Preslia* **84**: 155-255.
- QUISUMBING E. 1923. General characters of some Philippine weed seeds. *Philippine Agricultural Review* **16**: 298-351.
- REYNOLDS C, MIRANDA NA & CUMMING GS. 2015. The role of waterbirds in the dispersal of aquatic alien and invasive species. *Diversity and Distributions* **21**: 744-754.
- SOMMERWERK N, HEIN T, SCHNEIDER-JAKOBY M, BAUMGARTNER C, OSTOJIC A, PAUNOVIĆ M, BLOESCH J, SIBER R & TÖCKNER K. 2009. The Danube River basin. In: TÖCKNER K, ROBINSON TC & UEHLINGER U (eds.), *Rivers of Europe*, pp. 59-112, Academic Press, London-Burlington-San Diego.
- STEVANOVIĆ V, ŠINŽAR-SEKULIĆ J & STEVANOVIĆ B. 2003. On the distribution and ecology of macrophytic flora and vegetation in the river Danube reservoir between Žilovo islet and the mouth of the Nera tributary (river- km 1090 and 1075). *Large rivers* **14**(3-4): 283-295.
- STEVANOVIĆ V, TAN K, TOMAŠEVIĆ M & UOTILA P. 2005. The occurrence of *Cyperus strigosus* (Cyperaceae) in Serbia and Montenegro. *Phytologia Balcanica* **11**(2): 137-138.
- STONE BC. 1970. The Flora of Guam. A Manual for the identification of the vascular plants of the island. *Micronesica* **6**: 1-657.
- STROTHER JL. 2006. *Eclipta* L. In: FLORA OF NORTH AMERICA EDITORIAL COMMITTEE (eds.), *Flora of North America: North of Mexico 21: Magnoliophyta: Asteridae, part 8: Asteraceae, part 3*, pp. 128-129. Oxford University Press, Oxford-New York.
- TUTIN TG. 1976. *Eclipta* L. In: TUTIN TG, HEYWOOD VH, BURGESS NA, MOORE DM, VALENTINE DH, WALTERS SM & WEBB DA (eds.), *Flora Europaea 5*, p. 141, Cambridge University Press, Cambridge-London-New York-Melbourne.
- TZONEV R. 2007. *Eclipta prostrata* (Asteraceae): a new alien species for the Bulgarian flora. *Phytologia Balcanica* **13**(1): 79-80.
- UMEMOTO S, KOBAYASHI H, UEKI K & ITO M. 1998. Correct names of Japanese *Eclipta*. *Journal of Weed Science and Technology* **43**(3): 244-248.
- UMEMOTO S & KOYAMA H. 2007. A new species of *Eclipta* (Compositae: Heliantheae) and its allies in eastern Asia. *Thai Forest Bulletin (Botany)* **35**: 108-118.
- VASSILCZENKO IT. 1959. *Eclipta* L. In: SHISHKIN BK (ed.), *Flora of the U.S.S.R.* **25**, pp. 537-538. Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad. [Translated from Russian, Smithsonian Institution Libraries, Washington D.C., 1999]
- VERLOOVE F. 2014. A conspectus of *Cyperus* s.l. (Cyperaceae) in Europe (incl. Azores, Madeira and Canary Islands) with emphasis on non-native naturalized species. *Webbia* **69**(2): 179-223.
- VIEGI L, RENZONI CELA G & GARBARİ F. 1974. Flora esotica d'Italia. *Lavori Società Italiana Biogeografia* **4**: 125-220.
- VIVIAN-SMITH G & STILES EW. 1994. Dispersal of salt marsh seeds in the feet and feathers of waterfowl. *Wetlands* **14**: 316-319.
- WONGSRIPHUEK C, DUGGER BD & BARTUSZEVIĆ AM. 2008. Dispersal of wetland plant seeds by mallards: influence of gut passage on recovery, retention and germination. *Wetlands* **28**: 290-299.

## Botanica SERBICA



## REZIME

***Eclipta prostrata* (L.) L. (Compositae), nova adventivna vrsta u Srbiji**

Ranko PERIĆ i Sara RILAK

Prilikom terenskih istraživanja močvarne flore na dunavskim adama u okolini Pančeva (Srbija) pronašli smo biljnu vrstu *Eclipta prostrata* (Compositae). Ova adventivna vrsta pantropskog rasprostranjenja dosada nije bila zabeležena u Srbiji. U članku su date osnovne informacije o morfološkim osobinama ove vrste, njenoj biologiji, osobinama staništa, kao i neki podaci o cenološkim osobinama i mogućim načinima njene introdukcije.

**KLJUČNE REČI:** flora, horologija, neofite, Srbija.

