Botanica SERBICA 42 (1): (2018) 139-146

Original Scientific Paper

Four neophytes new for the flora of Bosnia and Herzegovina

Đorđije Milanović[1]*, Semir Maslo[2] and Šemso Šarić[3]

1 University of Banja Luka, Faculty of Forestry, Stepe Stepanovića 75A, 78000 Banja Luka, Bosnia and Herzegovina

2 Primary School, Lundåkerskola, Södra Storgatan 45, 332 33 Gislaved, Sweden

3 JP ŠPD-ZDK d.o.o Zavidovići, Alije Izetbegovića 25, 72220 Zavidovići, Bosnia and Herzegovina

ABSTRACT: During systematic field research carried out in the wider Posavina region, Livanjsko polje, and the environs of Zavidovići (Bosnia and Herzegovina), the following four neophytes new for the flora of the country were recorded: *Hypericum majus*, *Juncus dudleyi*, *Symphyotrichum lanceolatum* and *Sisyrinchium montanum*. While the last two species have been previously recorded from the region (*Symphyotrichum lanceolatum* from Croatia, Serbia, Montenegro, and Slovenia; *Sisyrinchium montanum* from Croatia), *Hypericum majus* and *Juncus dudleyi* are here registered as new for the neophyte flora of the Balkan Peninsula.

Keywords: alien flora, Balkans, *Juncus dudleyi*, *Hypericum majus*, *Sisyrinchium montanum*, *Symphyotrichum lanceolatum*.

Received: 21 September 2017 Revision accepted: 12 December 2017

UDC: 497.15:581.95
DOI: 10.5281/zenodo.1173570

INTRODUCTION

The alien flora of Bosnia and Herzegovina (B&H) was not the subject of any comprehensive works during the 20th century. Only about 10 papers deal with several invasive allochtonous species in the country. Although some articles/chapters containing surveys of invasive alien plants (Redžić *et al.* 2008; Maslo 2016b), adventive weeds (Šumatić & Janjić 2006; Kovačević *et al.* 2008) and neophytes (Šilić & Abadžić 2000; Maslo 2014, 2015, 2016a, b) have been published in recent time, the list of alien plant species (including neophytes) present in B&H is not complete. Accordingly, the main objective of the present paper was to make a contribution to knowledge of the neophyte flora of Bosnia and Herzegovina, and of the Balkans as well.

MATERIALS AND METHODS

During the period 2014–2017, systematic field research was carried out in the degraded peatland of Jagme in Livanjsko polje, the lower Vrbas River valley, the wider area of the Tišina swamp near the town of Šamac, and around the villages of Maoča and Stipin Han in the vicinity of Zavidovići in central Bosnia and Herzegovina. Herbarium vouchers were collected and stored in the herbarium of the Faculty of Forestry, University of Banja Luka, as well as in that of the National Museum of Bosnia and Herzegovina (SARA). For each record, the name of the collector (leg.) and determiner (det.), precise locality name, date of collecting, decimal degree coordinates in WGS 84 projection, and a label of 10×10 km UTM squares are provided. The coordinates were determined using a Garmin GPS hand-held device in the field, while the position of new localities within B&H was mapped using ARCMap 10.0 software. The nomenclature mainly follows the Euro-Med checklist (Euro+Med 2006).

RESULTS AND DISCUSSION

***Hypericum majus* (A. Gray) Britton (Hypericaceae)** – new for B&H and the Balkan Peninsula (leg/det: Đ. Mi-

*correspondence: djordjije.milanovic@sf.unibl.org

lanović). Locality: Modruše - Velika livada in Livanjsko polje. Date of collection: 08.08.2015. Latitude/longitude: 43.816173° N / 16.916240° E. UTM: XJ55 (Fig. 1).

In Europe the species was recorded for the first time in Weiden, Germany, where it was probably introduced by the U.S. military during the Second World War (Merxmüller & Vollrath 1956). It has subsequently been recorded in only a few European countries: Germany (confirmed also by Nezadal 1984), France (Jonker 1960; Parent 2002; Ferrez 2003; André 2005), Belarus (Dubovik *et al.* 2012), and Italy (Alessandrini *et al.* 2017). This species belongs to the North American section *Brathys* (Mutis ex L. fil.) Choisy of the genus *Hypericum,* containing annual or perennial mostly glabrous herbs without black glands, bearing deciduous leaves with an articulated base or persistent ones with a base that is not articulated. Flowers 3-15 mm in diameter (comparatively smaller than in autochthonous European plants), with (4-)5 persistent sepals and petals, as well as persistent stamens usually in a continuous or interrupted ring, sometimes in five barely discernible fascicles, each of 1-2 stamens (Robson 2015), which distinguish it from most European sections of the genus (Robson 1968). In the European flora the section is represented by six species naturalised in damp places: *H. gymnanthum* Engelm. & A. Gray, *H. mutilum* L., *H. majus* (A. Gray) Britton, *H. canadense* L., *H. gentianoides* (L.) Britton (Robson 1968), and *H. boreale* (Britton) E. P. Bicknell (Dubovik *et al.* 2013). With the exception of *H. gentianoides*, which has reduced subulate to linear subulate appressed leaves, all of the mentioned species are morphologically very similar and were probably overlooked and possibly mistakenly identified in some European countries. Thus, the first record of *H. majus* from France was previously registered by mistake as *H. canadense* (Jonker 1959, 1960), while that from Italy was originally registered by mistake as *H. mutilum* (Alessandrini *et al.* 2017). In order to clarify diagnostic characteristics, an identification key is provided here. It mostly follows Adams (1973), with changes according to Robson (1968, 2015) and Mohlenbrock (2008).

1 Leaves linear, subulate, tightly appressed; inflorescence branched and mostly monochasial, branches fastigiate ..... *H. gentianoides*
1 Leaves flat, +/- patent; inflorescence not branched or branched and mostly dichasial, branches not fastigiate 2
2 Bracts foliaceous, resembling the foliage leaves ..... *H. boreale*
2 Bracts linear-setaceous, much more reduced than foliage leaves 3
3 Leaves ovate-triangular, rounded-oblong to short-elliptic 4
3 Leaves linear to lanceolate 5
4 Leaves (upper and middle especially) ovate-triangular, apex acute; stem simple or nearly so; capsule ovoid, 4-5 mm long ..... *H. gymnanthum*
4 Leaves rounded-oblong to short-elliptic, apex rounded; stem usually diffusely branched; capsule ellipsoid 2.5-3.5 mm long ..... *H. mutilum*
5 Upper leaves lanceolate, 5-7 veined at base ..... *H. majus*
5 Upper leaves linear, linear-oblong, 1-3 veined at base ..... *H. canadense*

Hypericum majus is a perennial or annual glabrous herb without black glands throughout. Stem 10-35 cm, four-ridged, unbranched or branched above (Fig. 2a). Leaves 15-40 mm, lanceolate to narrowly elliptic, (3–)5–7 veined, with acute apex. Sepals (4–)5–7 mm; petals golden-yellow, equal or slightly shorter than sepals, oblanceolate, 3.5–6 mm; stamens 12–21, obscurely five-fascicled. Capsules 5.5–7.5 mm, narrowly conical-ellipsoid, broadest in their proximal to middle region (Robson 1968, 2015) (Fig. 2b).

The species was found in drained and extremely degraded peatland of Jagme, alongside a seasonally dried secondary melioration channel in a habitat with ecological conditions very similar to those it prefers in its natural range of distribution. This locality is completely submerged from late autumn to mid-spring and quite dry during the summer. The species grows here together with *Carex rostrata, Carex vesicaria, Alisma plantago-aquatica, Juncus articulatus, Juncus conglomeratus, Agrostis stolonifera, Leersia oryzoides*, *Mentha aquatica*, and others.

***Symphyotrichum lanceolatum* (Willd.) G. L. Nesom (Asteraceae) (=*Aster lanceolatum* Willd)** - new for B&H (leg/det. Đ. Milanović). Locality 1: Kovačevića sprud near Maglajani in Lijevče polje. Date of collection: 15.10.2013. Latitude/Longitude: 44.950351/17.38236.; UTM: XK88 (leg/det. Đ. Milanović). Locality 2: Odmutsko polje near Šamac. Date of collection: 17.09.2017. Latitude/Longitude: 45.040434/18.516549. UTM: CQ09 (Fig. 1 & 2c).

The species is naturalised in many European countries (Euro+Med 2006) and has been previously recorded in the region of the Balkan Peninsula in Serbia (Obratov-Petković *et al.* 2009, 2016; Nešić *et al.* 2016; Radovanović *et al.* 2017), Croatia (Trinajstić *et al.* 2001; Csiky & Purger 2008; Rottensteiner 2015), Montenegro (Hadžiablahović 2010), and Slovenia (Jogan *et al.* 2001; Lešnik 2009). While in Croatia (Nikolić *et al.* 2014; Vuković *et al.* 2014), Montenegro (Stešević & Petrović 2010; Stešević & Caković 2013), and Slovenia (Zelnik 2012) it hasn't been recognised as an invasive species, in Serbia it shows an invasive character alongside large rivers (Obratov-Petković *et al.* 2009,

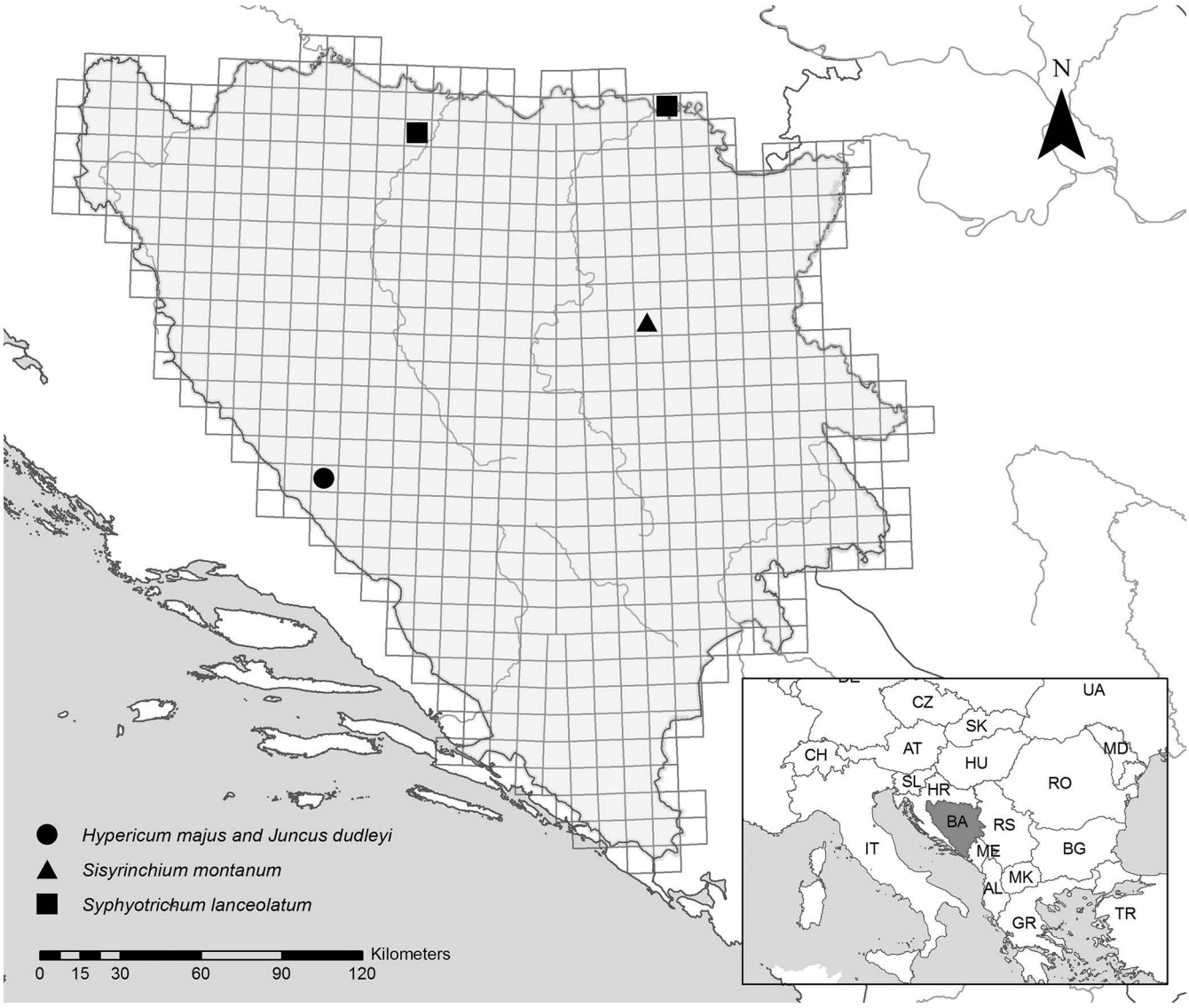

Fig. 1. Spatial distribution of new neophytes in Bosnia and Herzegovina (in saturated tint) displayed on UTM grid, 10×10 km.

2016; Nešić *et al.* 2016; Radovanović *et al.* 2017) and has been included in a preliminary list of strongly invasive plant invaders (Lazarević *et al.* 2012).

Symphyotrichum lanceolatum is a variable long-rhizomatous perennial with an erect glabrous or hairy stem measuring 30–150(–200) cm. Leaves linear-lanceolate to lanceolate-ovate, glabrous or sparsely scabrous on adaxial side, thin, with mucronate apices; cauline leaves with cuneate bases. Involucre campanulate to cylindric, 3–8 mm; involucral bracts in (3–)4–6 rows, linear to linear-lanceolate, sparsely ciliolate, with scarious margins, unequal to subequal. Inflorescence branches racemiform to more or less narrow paniculiform, often spreading; ray florets white, pinkish, or pale to dark purplish–blue, 3.2–10.1 mm in length (Brouillet *et al.* 2006). Disc florets have erect to sometimes more or less spreading yellow corollas (becoming purple at maturity), which distinguishes the species from the similar *S. lateriflorum* (L.) Á. Löve & D. Löve (disc florets with strongly reflexed whitish to cream corollas). The common invasive species of the genus *S. novi-belgii* (L.) G. L. Nesom, previously recorded from Balkan countries (Beck-Mannagetta *et al.* 1983; Arianoutsou *et al.* 2010; Stešević & Petrović 2010; Lazarević *et al.* 2012; Nikolić 2012; Petrova *et al.* 2013), has comparatively longer ((6–)10–19 mm) blue-violet or purple ray florets, and usually clasping, thick and firm cauline leaves, often with auriculate or rounded leaf bases (Brouillet *et al.* 2006). Finally, the comparatively lower (5–50(–70) cm), caespitose, and short rhizomatous species *S. tradescantii* (L.) G. L. Nesom, recorded from Serbia (Lazarević *et al.* 2012) and Croatia (Nikolić 2012), regularly has ascending inflorescence branches.

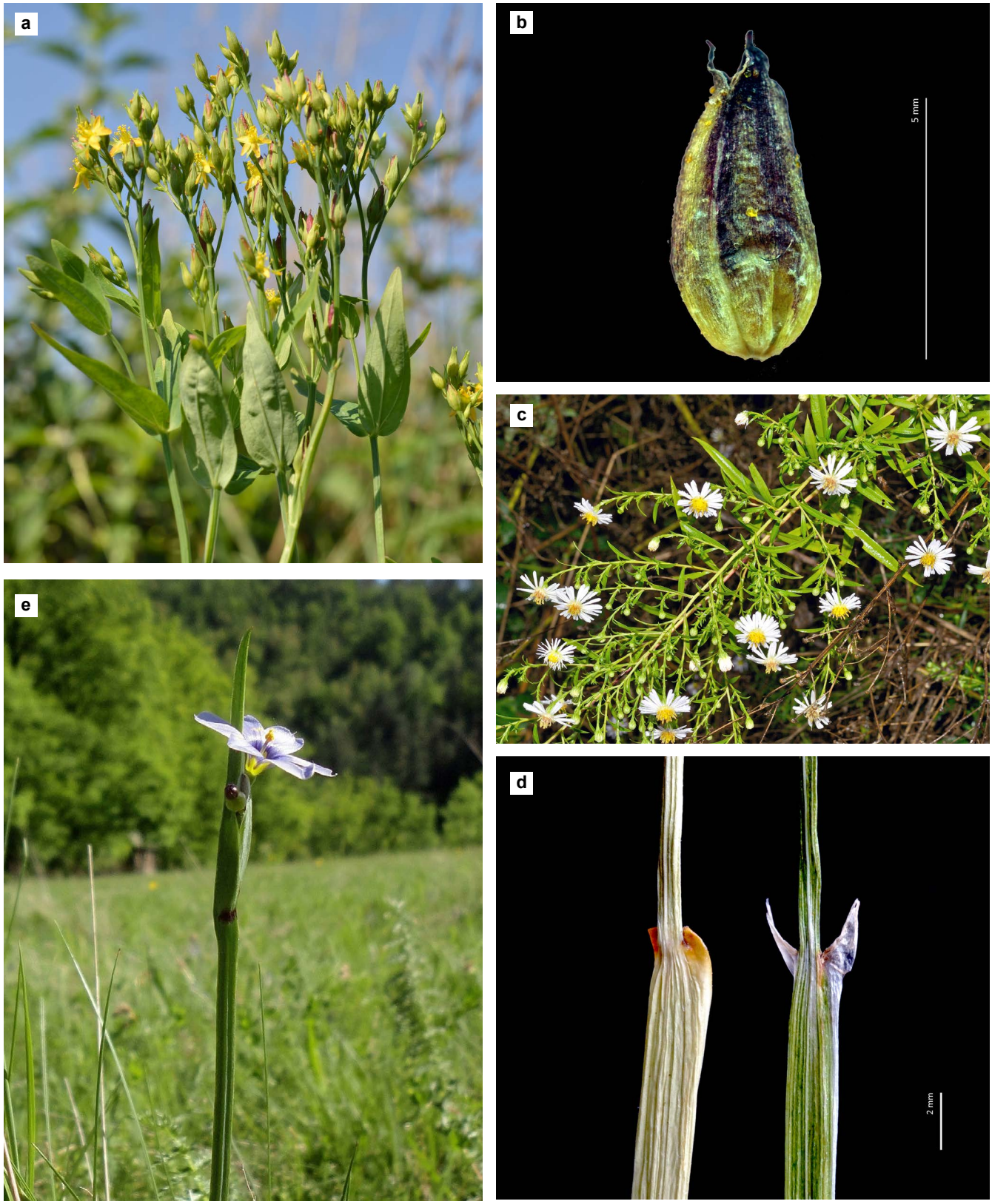

Fig. 2. a) *Hypericum majus* in Livanjsko polje; b) Capsule of *Hypericum majus* from Livanjsko polje; c) *Symphyotrichum lanceolatum* in Odmutsko polje near Šamac; d) Leaf auricles of *Juncus dudleyi* (left) and *Juncus tenuis* (right); e) *Sisyrinchium montanum* at Stipin han in the Krivaja valley.

At both recorded sites in northern Bosnia, the species *S. lanceolatum* inhabits ruderal habitats alongside roads and streets. The localities are situated in the regularly flooded area of large rivers (the Vrbas and Sava, respectively) at ruderal sites alongside roads intended for transport of gravel excavated from the river beds. These habitats are often overgrown by invasive species such as *Echinocystis lobata, Ambrosia artemisifolia, Bidens frondosa, Artemisia verlotiorum*, etc., which grow together with *S. lanceolatum* at the recorded localities.

***Juncus dudleyi* Wiegand (Juncaceae)** - new for B&H and the Balkan Peninsula (leg/det. Đ. Milanović). Locality: Modruše-Velika livada in Livanjsko polje. Date of collection: 06.06.2015. Latitude/longitude: 43.828990° N/16.910796° E. UTM: XJ55 (Fig. 1).

The species belongs to the subgenus *Poiophylli* Buchenau and *Juncus tenuis* group (Brooks 2000), which contains several North American species naturalised in Europe, viz., *J. tenuis* Willd., *J. dudleyi* Wiegand, *J. dichotomus* Elliot, and *J. anthelatus* (Wiegand) R.E. Brooks & Whittem. According to Verloove & Lambinon (2011), all of the mentioned taxa are recognised as subspecies of *J. tenuis*. While the typical *J. tenuis* is naturalised everywhere in Europe and is recognised as an invasive species, others are considered as rare at the moment in several European countries [*J. dichotomus* (Italy, Belgium, Belarus, Ukraine, and Russia), *J. dudleyi* (Austria, Belgium, Germany, Great Britain, Slovakia, France, and the Netherlands), and *J. anthelatus* (France, Belgium, the Netherlands, Poland, and Great Britain) (Verloove 2010; Verloove & Lambinon 2011; Tihomirov 2013; Coporaal & Shaminée 2015; Kobierski & Rys 2015)] but probably often overlooked throughout. Since all of these species could also have been overlooked in the Balkans, an identification key is provided here (Brooks 2000; Hoste and Verloove 2016).

1 Leaf sheath auricles scarious to coriaceous (leathery), barely projecting beyond the point of insertion, much wider than long, 0.1–0.5 mm long, rounded at apex 2
1 Leaf sheath auricles hyaline (translucent), longer than wide, (1–) 2–6 mm long, usually acute toward apex (more rarely rounded) 3
2 Auricles scarious, whitish, opaque (neither rigid nor shiny). Tepals not or only slightly spreading in fruit ..... *J. dichotomus*
2 Auricles leathery and very rigid, yellowish to orange brownish, shiny.
Tepals spreading in fruit ..... *J. dudleyi*
3 Inflorescence tall, very diffusely branched, with widely spaced flowers. Plants usually measuring more than 70 cm. Capsules 2–2.5 (–3) mm long, nearly spherical, mostly less than ¾ of tepal length. Longest ultimate branches of the cymes 30–50 mm long ..... *J. anthelatus*
3 Inflorescence smaller, not diffusely branched, with congested flowers. Plants usually much smaller than 50 cm. Capsule mostly more than 3 mm long, only slightly shorter than tepals. Longest ultimate branches of the cymes 10–20 mm long..... *J. tenuis*

Juncus dudleyi can be easily distinguished from *J. tenuis* on the basis of its very rigid, yellowish to orange-brownish, and shiny leaf auricles, which are clearly wider than long (Fig. 2d). After strong degradation and melioration of the Jagme former peatland, the large degraded area was sown with a mixture of grass and clover seeds of unknown origin (Ritter-Studnička 1954). It can be assumed that some seeds of both *J. dudleyi* and *Hypericum majus* were admixed with the grass and clover seeds, established successfully, and found ecological conditions suitable for surviving until the present day. *Juncus dudleyi* grows here in fairly closed tall wet grasslands together with *J. conglomeratus, J. articulatus, J. inflexus, Phragmites australis, Calamagrostis epigejos, Poa trivialis* ssp. *sylvicola, Carex hirta*, etc.

***Sisyrinchium montanum* Greene (Iridaceae)** - new for B&H (leg/det: Š. Šarić/S. Maslo). Locality: Stipin han in the Krivaja valley. Date of collection: 18.02.2017. Latitude/longitude: 44.320278° N / 18.418889° E. UTM: BQ91 (Fig. 1 & 2e).

This species is native to North America and is currently known as an alien in Austria, Great Britain, the Czech Republic, France, Germany, Italy, Norway, Romania, Russia, Switzerland, and Ukraine (Euro+Med 2006), as well as in Croatia (Nikolić 2012), Belgium (Verloove 2016), and Sweden (Nordhag 1979). The status of the genus *Sisyrinchium* is still unclear, even within the flora of Croatia. According to the Flora Croatica Database (Nikolić 2012), the species recorded in the country under the name *S. angustifolium* Mill. (Pevalek 1915; Pavletić *et al.* 1980; Hulina 1998) belongs to *S. montanum* Greene. In contrast, other authors argue that only the species *S. bermudiana* L. occurs in Croatia (Britvec & Trinajstić 1999). It is important to note that almost all localities of these two species virtually overlap on the maps of distribution in FCD (Nikolić 2012), and *S. bermudiana* may have been confused with *S. montanum,* so the records need to be checked.

To identify this newly recorded species, we offer a key adjusted in accordance with the data of Ingram (1980), Chloewa & Henderson (2002), and Verloove (2016).

1 Flowers bright yellow ..... *S. californicum*
1 Flowers pale blue or violet-blue 2
2 Stem unbranched, with a single terminal inflorescence. Stem with a single node. Flowers violet-blue, 25-35 mm across. Pedicels erect in fruit, scarcely

exceeding the shorter spathe-valve. Outer spathe 36-76 mm long ..... *S. montanum*

2 Stem branched, each branch with a terminal inflorescence. Stem nodes usually 2-3. Flowers pale blue, 15-20 mm across. Pedicels arched to pendent in fruit, clearly exceeding the shorter spathe-valve. Outer spathe 18-38 mm long ..... *S. angustifolium*

Sisyrinchium montanum seems to be established in the area, where it can survive and reproduce both vegetatively and sexually (by means of seeds). Therefore, according to the definition of Richardson *et al.* (2000) and in view of its behaviour observed in the investigated area, this alien can be considered as a locally naturalised species in the vicinity of Zavidovići. The mode of introduction is unknown, possibly it was via garden waste, but the species is not a commonly cultivated ornamental plant in the area. Whatever the case, it is necessary to continue further research in order to determine the presence of this alien species in rural areas and natural habitats in other parts of Bosnia and Herzegovina.

Acknowledgements — Financial support for the field research was provided through two small grants. The research was carried out with the assistance of Udruga Dinarica in Livno and the Centre for the Environment in Banja Luka. The authors want to thank Vladimir Stupar, Davor Nikić, Ozren Žolja, and Mato Gotovac for technical and expert support during the field work, as well as Jessica Anderson for improving the English of this paper.

REFERENCES

Adams P. 1973. *Clusiaceae* of the Southeastern united States. *Journal of the Elisha Mitchell Scientific Society* **89**(1-2): 62–71.

Alessandrini A, Buono V, Longo D, Magni C, Manni QG & Nicolella G. 2017. *Acta Plantarum Notes 5 - Le raccolte di Acta Plantarum*. Araba Fenice, Boves.

André M. 2005. Contributions à la connaissance de la flore de la Haute-Saône et plus particulièrement des hydrophytes. *Les Nouvelles Archives de la Flore Jurassienne* **3**: 127–141.

Arianoutsou M, Bazos I, Delipetrou P & Kokkoris Y. 2010. The alien flora of Greece: taxonomy, life traits and habitat preferences. *Biological Invasions* **12**(10): 3525–3549.

Beck-Mannagetta G, Maly K & Bjelčić Ž. 1983. *Flora Bosnae et Hercegovinae, IV Sympetalae, Pars 4*. Zemaljski muzej Bosne i Hercegovine u Sarajevu, Prirodnjačko odjeljenje, Sarajevo.

Britvec M & Trinajstić I. 1999. New localities of the *Sisyrinchium bermudiana* L. (*Iridaceae*) species in Croatia. *Natura Croatica* **8**(1): 49–54.

Brooks RE. 2000. *Juncus* Linnaeus subg. *Poiophylli*. In: Flora of North America Editorial Committee (eds.), *Flora of North America North of Mexico, Vol.* **22**. *Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae*, pp. 217–225, Oxford University Press, New York. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=311002

Brouillet L, Semple JC, Allen GA, Chambers KL & Sundberg SD. 2006. *Symphyotrichum*. In: Flora of North America Editorial Committee (eds.), *Flora of North America North of Mexico, Vol.* **20**, pp. 465-531, Oxford University Press, New York. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=132022

Cholewa AF & Henderson DM. 2002. *Sisyrinchium*. In: Flora of North America Editorial Committee (eds), *Flora of North America North of Mexico, Vol.* **26,** pp. 351–371, Oxford University Press, New York. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=130515

Coporaal A & Schaminée J. 2015. *Juncus dudleyi* Wiegand, een nieuwe rus uit Amerika, en *Juncus* × *sallandiae* Corporaal & Schaminée hybr. nov., zijn hybride met *J. tenuis* Willd. *Gorteria* **37**: 52–63.

Csiky J & Purger D. 2008. Monitoring of plant species along the Drava river and in Baranja (Croatia). In: Purger JJ (ed.), *Biodiversity studies along the Drava river*, pp. 13–56, University of Pécs, Hungary.

Dubovik DV, Skuratovicz AN & Tretjakov DI. 2012. Инвазионные виды во флоре Беларуси. Материалы II-ой международной научно-практической конференции «Проблемы сохранения биологического разнообразия и использования биологических ресурсов». Национальная академия наук Беларуси, Институт экспериментальной ботаники им. В.Ф. Купревича, Научно-практический центр по биоресурсам, Центральный ботанический сад, Институт леса Минск, Беларусь, 22–26 октября 2012 г., 443–446.

Dubovik DV, Skuratovicz AN & Tretjakov DI. 2013. New for Belarus and Europe adventive species of plants. *Botanika (Issledovanya)* **42**: 3–28.

Euro+Med. 2006. Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity. http://ww2.bgbm.org/EuroPlusMed [Accessed July 5th 2014]

Ferrez Y. 2003. Contribution à la connaissance de la flore de Haute-Saône - Matériaux pour un inventaire de la flore vasculaire de Haute-Saône. *Les Nouvelles Archives de la Flore Jurassienne* **1**: 59–74.

Hadžiablahović S. 2010. The vascular flora of Ćemovsko polje (Montenegro). *Natura Montenegrina* **9**(1): 7–143.

Hoste I & Verloove F. 2016. *Juncus tenuis* subsp. *dichotomus*, lang miskend maar mogelijk sinds kort inburgerend in België. *Dumortiera* **108**: 22–29.

Hulina N. 1998. New localities for and distribution of some rare plant species in Croatia. *Acta Botanica Croatica* **55-56**: 41–51.

Ingram R. 1980. *Sisyrinchium* L. In: Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM & Webb DA (eds.), *Flora Europaea Vol.* **5**, pp. 86–87, Cambridge University Press, Cambridge.

Jogan N, Bačić T, Frajman B, Leskovar I, Naglič D, Podobnik A, Rozman B, Strgulc-Krajšek S & Trčak B. 2001. *Gradivo za Atlas flore Slovenije*. Center za kartografijo favne in flore, Miklavž na Dravskem polju

Jonker FP. 1959. *Hypericum canadense* in Europe. *Acta Botanica Neerlandica* **8**: 185–186.

Jonker FP. 1960. *Hypericum canadense* in Europe: an addition. *Acta Botanica Neerlandica* **9**: 343.

Kobierski P & Ryś R. 2015. *Juncus anthelatus* - nowy, obcy gatunek we florze Polski. *Chrońmy Przyrodę Ojczystą* **71**(1): 61–67.

Kovačević Z, Šumatić N, Kojić M, Petrović D & Herceg N. 2008. Adventivna korovska flora Bosne i Hercegovine. *Acta Herbologica* **17**(1): 89–93.

Lazarević P, Stojanović V, Jelić I, Perić R, Krsteski B, Ajtić R, Sekulić N, Branković S, Sekulić G & Bjedov V. 2012. Preliminarni spisak invazivnih vrsta u Republici Srbiji sa opštim mjerama kontrole i suzbijanja kao potpora budućim zakonskim aktima. *Zaštita Prirode* **62**(1): 5–31.

Lešnik M. 2009. Nove plevelne vrste v Sloveniji - ocena dinamike prehoda iz ruderalnih v plevelne združbe njiv in trajnih nasadov. *Zbornik predavanj in referatov 9. slovenskog posvetovanja o varstvu rastlin z mednarodno udeležbo*, Nova Gorica, 4–5. marec 2009, pp. 299–308.

Maslo S. 2014. Alien flora of Hutovo blato natural park (South Bosnia and Herzegovina). *Herbologia* **14**(1): 1–13.

Maslo S. 2015. Alien flora of the city of Mostar (Bosnia and Herzegovina). *Herbologia* **15**(2): 1–16.

Maslo S. 2016a. Contribution to the flora of Bosnia and Herzegovina (New neophytes in the flora of Bosnia and Herzegovina). *Glasnik Zemaljskog muzeja Bosne i Hercegovine (PN) NS* **36**(1): 43–61.

Maslo S. 2016b. Preliminary list of invasive alien plant species (IAS) in Bosnia and Herzegovina. *Herbologia* **16**(1): 1–14.

Merxmüller H & Vollrath H. 1956. Ein amerikanisches *Hypericum* als Neubürger in Europa. *Berichte der Bayerischen Botanischen Gesellschaft* **31**: 130–131.

Mohlenbrock MH. 2008. *Aquatic and standing water plants of the Central Midwest, Acanthaceae to Myricaceae - water willows to wax myrtles*. Southern Illinois University.

Nešić M, Obratov-Petković D, Skočajić D, Bjedov I, Đukić M & Đunusijević-Bojović D. 2016. Allelopathic potential of the invasive species *Aster lanceolatus* Willd. *Periodicum Biologorum* **118**(1): 1–7.

Nezadal W. 1984. Wiederfund von *Illecebrum verticillatum* zusammen mit *Radiola linoides, Juncus capitatus* und *Hypericum majus* bei Grafenwöhr/Opf. *Berichte der Bayerischen Botanischen Gesellschaft* **55**: 67–71.

Nikolić T (ed.). 2012. Flora Croatica Database. Department of Biology, Faculty of Science, University of Zagreb. http://hirc.botanic.hr/fcd [Accessed November 13th 2016]

Nikolić T, Mitić B & Boršić I. 2014. *Flora Hrvatske - invazivne biljke*. Sveučilište u Zagrebu, Zagreb.

Nordhag Y. 1979. *Sisyrinchium montanum* in Bohuslan, Sweden. *Svensk Botanisk Tidskrift* **73**(1): 39–40.

Obratov-Petković D, Bjedov I, Nešić M, Belanović S, Đunusijević-Bojović D & Skočajić D. 2016. Impact of Invasive *Aster lanceolatus* populations on soil and flora in urban sites. *Polish Journal of Ecology* **64**(2): 289–295.

Obratov-Petković D, Bjedov I, Radulović S, Skočajić D, Đunusijević-Bojović D & Đukić M. 2009. Ekologija i rasprostranjenje invazivne vrste *Aster lanceolatus* Willd. na vlažnim staništima Beograda. *Glasnik Šumarskog Fakulteta, Beograd* **100**: 159–178.

Parent GH. 2002. Etudes écologiques et chorologiques sur la flore Lorraine. Note 26: Quelques taxons nouveaux ou meconnus de Lorraine française. Donnees rassemblees de 1993 a 2005. *Archives des Sciences Naturelles, Physiques et Mathématiques* **46**: 5–40.

Pavletić Z, Trinajstić I & Šugar I. 1980. The growth of the species *Sisyrinchium angustifolium* Miller in Croatia. *Acta Botanica Croatica* **39**: 171–174.

Petrova A, Vladimirov V & Georgiev V. 2013. *Invasive alien species of vascular plants in Bulgaria*. Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia.

Pevalek I. 1915. *Sisyrinchium angustifolium* u Hrvatskoj. *Prirodoslovna Istraživanja Hrvatske i Slavonije* **7**: 1–2.

Radovanović N, Kuzmanović N, Vukojičić S, Lakušić D & Jovanović S. 2017. Floristic diversity, composition and invasibility of riparian habitats with *Amorpha fruticosa:* A case study from Belgrade (Southeast Europe). *Urban Forestry & Urban Greening* **24**: 101–108.

Redžić S, Barudanović S & Radović M (eds.). 2008. *Bosnia and Herzegovina –Land of Diversity. Overview and status of Biological and Landscape Diversity in Bosnia and Herzegovina*. Federal Ministry of Environment and Tourism, Sarajevo.

Richardson DM, Pyšek P, Rejmanek M, Barbour MG, Panetta FD & West J. 2000. Naturalization and invasion of alien plants: concepts and definitions. *Diversity and Distributions* **6**: 93–107.

Ritter-Studnička H. 1954. Flora i vegetacija livada kraških polja Bosne i Hercegovine. *Godišnjak Biološkog Instituta u Sarajevu* **7**(1-2): 25–109.

Robson NKB. 1968. *Hypericum* L. In: Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH,

Walters SM & Webb DA (eds.), *Flora Europaea Vol.* **2** - *Rosaceae to Umbelliferae*, pp. 261–269, Cambridge University Press, Cambridge.

Robson NKB. 2015. *Hypericum* L. In: Flora of North America Editorial Committee (eds.), *Flora of North America Vol.* **6**, pp. 71–105, Oxford University Press, New York. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=116180

Rottensteiner WK. 2015. Notizen zur "Flora von Istrien", Teil I. *Joannea Botanik* **12**: 93–195.

Stešević D & Caković D. 2013. Contribution to the alien flora of Montenegro and Supplementum to the Preliminary list of plant invaders. *Biologica Nyssana* **4**(1–2): 1–7.

Stešević D & Petrović D. 2010. Preliminary list of plant invaders in Montenegro. *Biologica Nyssana* **1**(1–2): 35–42.

Šilić Č & Abadžić S. 2000. Contribution to the knowledge of the neophytic flora of Bosnia and Herzegovina. *Herbologia* **1**(1): 29–40.

Šumatić N & Janjić N. 2006. Adventivne biljke u Bosni i Hercegovini. *Acta Herbologica* **15**(1): 9–14.

Tihomirov VN. 2013. *Juncus dichotomus* (*Juncaceae*) vo flore vostočnoй Evropы. *Botaničeskiй Žurnal* **98**(6): 767–771.

Trinajstić I, Franjić J & Škvorc Ž. 2001. Floristička analiza as. *Impatienti-Solidaginetum* M. Moor 1958 (*Calystegion sepii*) u Međimurju. *Agronomski Glasnik* **6**: 305–313.

Verloove F. 2010. *Juncus dichotomus* (*Juncaceae*) in northwestern Italy, a xenophyte new to Europe. *Willdenowia* **40**: 173–178.

Verloove F. 2016. *Sisyrinchium* L. In: *Manual of the Alien Plants of Belgium*. Botanic Garden of Meise, Belgium. http://alienplantsbelgium.be/ [Accessed November 13th 2016]

Verloove F & Lambinon J. 2011. The non-native vascular flora of Belgium: new combinations and a new variety. *New Journal of Botany* **1**(1): 38–42.

Vuković N, Miletić M, Milović M & Jelaska SD. 2014. Grime's CSR strategies of the invasive plants in Croatia. *Periodicum Biologorum* **116**(3): 323–329.

Zelnik I. 2012. The presence of invasive alien plant species in different habitats: case study from Slovenia. *Acta Biologica Slovenica* **55**(2): 25–38.

Botanica SERBICA

REZIME

Četiri neofite nove za floru Bosne i Hercegovine

Đorđije Milanović, Semir Maslo i Šemso Šarić

Tokom sistematskih istraživanja vaskularne flore u širem području Posavine, Livanjskom polju i okolini Zavidovića (Bosna i Hercegovina) potvrđeno je prisustvo četiri neofite nove za floru ove države: *Hypericum majus*, *Juncus dudleyi*, *Symphyotrichum lanceolatum* i *Sisyrinchium montanum*. Dok su posljednje dvije već zabilježene u zemljama jugoistočne Evrope (*Symphyotrichum lanceolatum* iz Hrvatske, Srbije, Crne Gore i Slovenije; *Sisyrinchium montanum* iz Hrvatske), *Hypericum majus* i *Juncus dudleyi* predstavljaju novitete za floru Balkanskog poluostrva.

Ključne reči: alohtona flora, Balkansko poluostrvo, *Juncus dudleyi*, *Hypericum majus*, *Sisyrinchium montanum*, *Symphyotrichum lanceolatum*