Occurrence of *Eschscholzia californica* Cham. and *Lonicera japonica* Thunb. in Croatia

original scientific paper

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Sažetak

U srpnju 2013. u Hrvatskoj je po prvi put u prirodi otkriven kalifornijski mak (*Eschscholzia californica* Cham.), te je potvrđen jedini prethodni nalaz japanske kozlokrvine (*Lonicera japonica* Thunb.) iz 1996. Sjevernoamerička vrsta *Eschscholzia californica* pronađena je na ruderalnom staništu na poluotoku Pelješcu, a azijska *Lonicera japonica* unutar sastojina s lovorom (*Laurus nobilis*) u Župi dubrovačkoj. U radu su opisana njihova staništa.

Ključne riječi: *Eschscholzia californica*, invazivne vrste, južna Dalmacija, *Lonicera japonica*, prvi nalaz

Abstract

North-American plant species *Eschscholzia californica* Cham. was recorded outside cultivation for the first time in Croatia, in July 2013. The single earlier finding of Asian species *Lonicera japonica* Thunb. in Croatia, from 1996, was also confirmed. *Eschscholzia californica* was found on the ruderal site on the Pelješac peninsula, while *Lonicera japonica* grows within the *Laurus nobilis* stands in the Župa dubrovačka region. Their habitats are described in details.

Keywords*:* Croatia, *Eschscholzia californica*, first record, invasive species, *Lonicera japonica*

Introduction

During floristical investigations in South Croatia in July of 2013, *Eschscholzia californica* Cham. (Papaveraceae, California poppy) and *Lonicera japonica* Thunb. (Caprifoliaceae, Japanese honeysuckle) were found growing outside of cultivation, in the wild. In this paper, findings of these alochtonous species and description of their habitats are reported. Both taxa were found within the belt of the Mediterranean evergreen vegetation of the class *Quercetea ilicis* Braun-Blanquet 1947.

California poppy (*Eschscholzia californica*) is an annual or rarely perennial herb indigenous to North America (Cullen 2011). On natural habitats it grows at altitudes from the sea level up to 1990 m, in open, well-drained soils, on dunes, alluvial fans, river terraces and hillsides (Cook 1962). According to Flora Europaea (Mowat 1993), *E. californica* is reported from the Balearic Islands and France (including Corse), widely cultivated for ornament and locally naturalized in S.W. Europe, while it is a frequent casual elsewhere (Cullen 2011). According to Aghababian (2011), *E. californica* grows as cultivated or introduced plant from Macaronesia in the west to the Russian Federation to the east. The northern border of its European areal is found in Norway and Finland. California poppy is also reported from Austria (Fischer et al. 2008), Hungary (Kyrály 2009) and Slovenia (Frajman & Bačič 2011). In Italy, it is distributed in the provinces of Lombardia, Trentino-Alto Adige, Liguria, Marche and Sicilia (Rignanese 2011).

Japanese honeysuckle (*Lonicera japonica*) is a semi-evergreen climber native to Japan and China (Li 2011), and a well-known invasive plant in North America, Western Europe and North Africa. It is reported from Algeria, the Archipelago of the Azores, Balearic Islands, United Kingdom, Corse, Cyprus, France, Germany, Switzerland, Spain, Italy, Portugal, Sicily and Malta (Borowicz 1976; Anonymous 2006-2013), as well as from Slovenia and Greece (Jogan & Plazar 1998; Vladimirov et al. 2007). In these countries, it appears as: i) introduced and naturalized alien; ii) introduced and ad-

ventitious (casual) alien; or iii) cultivated plant. Japanese honeysuckle has been reported from Croatia as found in cultivation (Poljak et al. 2011; Tafra et al. 2012; cf. Nikolić (ed.) 2013) and a potential threat to the indigenous vegetation (Idžojtić & Zebec 2006). In a single occasion, in 1996, *L. japonica* was found growing outside of cultivation, in the vicinity of the town of Novigrad (Istria peninsula, N.W. Croatia), but there were no further information about its fate (Jogan & Plazar 1998).

Material and Methods

Intensive floristic surveys were conducted in July and August 2013 on the Pelješac peninsula and Župa dubrovačka (Dubrovnik-Neretva County, South Croatia), using the standard method described by Nikolić et al. (1998). Phytocoenological relevés were collected using the Braun-Blanquet (1964) approach. Herbarium specimens of *Eschscholzia californica* (Herbarium ID: ZAGR 33338) and *Lonicera japonica* (Herbarium ID: ZAGR 33337) are deposited in the Herbarium ZAGR of the Faculty of Agriculture, University of Zagreb (Bogdanović (ed.) 2013).

Figure 1. *Eschscholzia californica* Cham. (photo N. Jasprica)

Figure 2. Habitat with *Eschscholzia californica* Cham. in the Bay of Sutvid on the Pelješac peninsula (photo N. Jasprica)

Figure 3. *Lonicera japonica* Thunb. (photo N. Jasprica)

Figure 4. *Lonicera japonica* Thunb. within the stands of *Laurus nobilis* L. in the Župa dubrovačka region (photo N. Jasprica)

Results and discussion

Eschscholzia californica was found on sunny and sandy grounds in the Bay of Sutvid on the northern coast of central part of the Pelješac peninsula (South Croatia), on July 13, 2013 (Figs. 1, 2). The Gauss-Krüger coordinates are: X=5702063, Y=4755756 (FCD Id 17004). It grows along the narrow pathway between macchia (the *Myrto-Quercetum ilicis* (Horvatić 1963) Trinajstić 1985 association) and the salt marsh vegetation (the *Puccinellio festuciformis-Sarcocornietum fruticosae* (Braun-Blanquet 1928) J.M. Géhu 1976 association). Population is very small, occupying only 3-4 m^2. The

floral composition was as follows (plot size 25 m^2, vascular plant cover 50%, number of taxa in the relevé 21, July 13, 2013, N. Jasprica): *Elymus pycnanthus* (Godr.) Melderis (1); *Avena sterilis* L. (1); *Brachypodium retusum* (Pers.) P.Beauv. (1); *Sorghum halepense* (L.) Pers. (+), *Opuntia ficus-indica* (L.) Miller (+); *Parietaria judaica* L. (+); *Crithmum maritimum* L. (+); *Rubus ulmifolius* Schott (+); *Eschscholzia californica* Cham. (+); *Inula crithmoides* L. (+); *Lagurus ovatus* L. (+); *Allium commutatum* Guss. (+); *Dactylis glomerata* L. ssp. *hispanica* (Roth) Nyman (+); *Crucianella latifolia* L. (+); *Bupleurum veronense* Turra (+); *Teucrium polium* L. (+); *Reichardia picroides* (L.) Roth (+); *Portulaca oleracea* L. (+); *Piptatherum miliaceum* (L.) Coss. (+); *Elymus repens* (L.) Gould (+); and *Halimione portulacoides* (L.) Aellen (+).

California poppy is not invasive in the neighboring countries, e.g. in Slovenia, where could be occasionally naturalized (Frajman & Bačič 2011) and it is expected to occur along roads, highways, and other disturbed areas. However, Leger & Rice (2003), comparing size and fecundity of 20 native and invasive *E. californica* populations, found indications for a genetic shift in traits towards rapid growth and reproduction in different environments, and thus for an evolutionary context of loss of traits.

In our study, *Lonicera japonica* (Fig. 3) was found within the vegetation of *Quercion ilicis* Braun-Blanquet (1931) 1936 alliance near the Bay of Beterina in the village of Mlini (Župa dubrovačka, South Croatia), on August 9, 2013. The Gauss-Krüger coordinates are: X=5763831, Y=4724306 (FCD Id 17006). It grows within the laurel (*Laurus nobilis*) stands at 3-4 m a.s.l. (Fig. 4), where several individuals with good vitality were found. The floral composition was as follows (plot size 50 m^2, slope 5-10°, aspect S, vascular plant cover 100%, vegetation height of 3 m, number of taxa in the relevé 18, August 9, 2013): *Laurus nobilis* L. (4); *Hedera helix* L. (2); *Rubus ulmifolius* Schott (2); *Spartium junceum* L. (1); *Smilax aspera* L. (1); *Lonicera japonica* Thunb. (+); *Piptatherum miliaceum* (L.) Coss. (+); *Daucus carota* L. ssp. *major* (Vis.) Arcang. (+); *Rubia peregrina* L. (+); *Asparagus acutifolius* L. (+); *Dactylis glomerata* L. ssp. *hispanica* (Roth) Nyman (+); *Pistacia terebinthus* L. (+); *Brachypodium sylvaticum* (Huds.) P.Beauv. (+); *Araujia sericifera* Brot. (+); *Robinia pseudoacacia* L. (+); *Celtis australis* L. (+); *Sorbus domestica* L. (+); *Fraxinus ornus* L. (+); and *Prunus* sp. (+). The whole area in focus was affected by fire in 2007. This vegetation has some floristic similarities with the laurel associations indicated for the Adriatic sector in Italy (cf. Allegrezza et al. 2006; cf. Gianguzzi et al. 2010).

Distribution of Japanese honeysuckle in Slovenia is linked to the Submediterranean planar part of the country, while it is naturalized in several damp and shady, or ruderal sites (Jogan & Plazar 1998). This ornamental, but highly invasive species has established itself in several scattered coastal and ruderal habitats in Greece (Vladimirov et al. 2007).

In the communities previously mentioned, beside *Eschscholzia californica* and *Lonicera japonica*, several (potentially) invasive alochtonous plants were noted: *Opuntia ficus-indica*, *Robinia pseudoacacia* and *Araujia sericifera*. It seems that these habitats are suitable for colonization of the newcomers. In this regard, presence and spreading of *Opuntia ficus-indica* could not be ignored, particularly on the Pelješac peninsula. That long-known invasive Mexican species, which occurs in rocky and stony substrates, became quite frequent in the Thermo-Mediterranean shrub formations with *Euphorbia dendroides* L. (the *Oleo sylvestris-Euphorbietum dendroidis* Trinajstić 1973 association) near the town of Orebić (Jasprica 2011). A fast-growing South-American vine *Araujia sericifera*, which can cover a tree canopy in two or three years, has just recently been noted for Croatia in Župa dubrovačka region, but only from the ruderal sites along the roads (Cunjak & Borovečki-Voska 2013). Highly invasive *Robinia pseudoacacia* from the S.E. United States, is naturalized in Europe, including Croatia, for centuries now. In Župa dubrovačka region is widespread, particularly on the flysch ground.

In summary, findings of the plant-newcomers contribute to the floristic and vegetation richness of Croatia, as well as to the knowledge of the chorology and ecology of the target-species: in this case, of *Eschscholzia californica* and *Lonicera japonica* in South Europe. However, it also emphasizes the possible further spreading of the invasive taxa to the suitable habitats, a process that could be potentially dangerous to Croatian indigenous flora, vegetation and habitats in the whole. Using proposals for Croatian standards and criteria for treating alien flora (Mitić et al. 2008), potential invasion status for both species can be estimated as 2.1.1. or 2.1.2.

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Literature

- **Aghababian, M. (2011):** Papaveroideae. – In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. (http://ww2.bgbm.org/EuroPlusMed) [accessed August 13, 2013].
- **Allegrezza, M., Biondi, E., Felici, S. (2006):** A phytosociological analysis of the vegetation of the central sector of the Adriatic aspect of the Italian peninsula. Hacquetia 5(2): 5-45.
- **Anonymous (2006-2013):** Euro+Med PlantBase - the information resource for Euro-Mediterranean plant diversity. (http://ww2.bgbm.org/EuroPlusMed) [accessed August 13, 2013].
- **Bogdanović, S. (ed.) (2013):** Virtual Herbarium ZAGR. University of Zagreb, Faculty of Agriculture. (http://herbarium.agr.hr) [accessed September 5, 2013].
- **Borowicz, K. (1976):** *Lonicera* L. In: Tutin, T.G., Heywood, V.H., Burges, N.A., Moore, D.M., Valentine, D.H., Walters, S.M., Webb, D.A. (eds.) Flora Europaea 4. Cambridge University Press, Cambridge, 46-48.
- **Braun-Blanquet, J. (1964):** Pflanzensoziologie. Grundzüge der Vegetationskunde. 3. New York, USA. Springer-Verlag.
- **Cook, S.A. (1962):** Genetic system, variation, and adaptation in *Eschscholzia californica*. Evolution 16: 278-299.
- **Cullen, J. (2011):** *Eschscholzia* Chamisso. In: Cullen, J., Knees, S., Cubey, H.S. The European Garden Flora - Flowering Plants, 2. Cambridge University Press, Cambridge, 533-534.
- **Cunjak, Z., Borovečki-Voska, Lj. (2013):** *Araujia sericifera* Brot. (Asclepidiaceae), nova alohtona vrsta u hrvatskoj flori. Glasnik Hrvatskog botaničkog društva 1(1): 5.
- **Fischer, M.A., Oswald, K., Adler, W. (2008):** Exkursionsflora für Österreich, Liechtenstein und Südtirol. Dritte Auflage. Biologiezentrum der Oberösterreichischen Landesmuseen, Linz. 1-1392.
- **Frajman, B., Bačič, T. (2011):** Contributions to the knowledge of the flora of Slovenia and adjacent regions: taxonomic revision and distributional patterns of ten selected species. Phyton (Horn, Austria) 50(2): 231-262.
- **Gianguzzi, L., D'Amico, A., Romano, S. (2010):** Phytosociological remarks on residual woodlands of *Laurus nobilis* in Sicily. Lazaroa 31: 67-84.
- **Idžojtić, M., Zebec, M. (2006):** Rasprostranjenost pajasena (*Ailanthus altissima* /Mill./ Swinge) i širenje invazivnih drvenastih neofita u Hrvatskoj. (Distribution of the Tree of Heaven (*Ailanthus altissima* (Mill.) Swingle) and Spreading of Invasive Woody Alien Species in Croatia). Glasnik za šumske pokuse, Special edition, 5: 315-323.
- **Jasprica, N. (2011):** Vegetation outline and NATURA 2000 habitats of the Pelješac peninsula, South Croatia. In: Bulić, Z. (ed.) Proceedings of the Conference "Nature Protection in XXI Century", Žabljak, Montenegro, September 20-23, 2011, Podgorica. Zavod za zaštitu prirode Crne Gore, 443-450.
- **Jogan, N., Plazar**, **J.** (1998): *Lonicera japonica* Thunb. - nova naturalizirana vrsta slovenske flore. Annales, Series Historia Naturalis 13: 125-128.
- **Kyrály, G. (ed.) (2009):** Új magyar füvészkönyv: Magyarorszá g hajtásos növényei. Határozókulcsok. Aggteleki Nemzeti Park Igazgatóság, Jósvafő, 616.
- **Leger, E.A., Rice, K.J. (2003):** Invasive California poppies (*Eschscholzia californica* Cham.) grow larger than native individuals under reduced competition. Ecology Letters 6: 257-264.
- **Li, D.Z. (2011):** *Lonicera japonica* Thunberg. In: Cullen, J., Knees, S., Cubey, H.S. (eds.) The European Garden Flora - Flowering Plants, vol. 5. Cambridge University Press, Cambridge, 346.
- **Mitić, B., Boršić, I., Dujmović, I., Bogdanović, S., Milović, M., Cigić, P., Rešetnik, I., Nikolić, T. (2008):** Alien flora of Croatia: proposals for standards in terminology, criteria and related

database. Natura Croatica 17(2): 73–90.

- **Mowat, A.B. (1993):** *Eschscholzia* Cham. In: Tutin, T.G., Burges, N.A., Chater, A.O., Edmondson, J.R., Heywood, V.H., Moore, D.M., Valentine, D.H., Walters, S.M., Webb, D.A. (eds.) Flora Europaea 1 (Second Edition). Cambridge University Press, Cambridge, 302.
- **Nikolić, T., Bukovec, D., Šopf, J., Jelaska, S.D. (1998):** Kartiranje flore Hrvatske: Mogućnosti i standardi. Natura Croatica 7 (Suppl. 1): 1-62.
- **Nikolić, T. (ed.) (2013):** Flora Croatica Database. (http://hirc.botanic.hr/fcd). Sveučilište u Zagrebu, Prirodoslovno-matematički fakultet, Botanički zavod s botaničkim vrtom, Zagreb [accessed August 13, 2013]
- **Poljak, I., Idžojtić, M., Zebec, M. (2011):** Dendroflora Zoološkog vrta grada Zagreba. Šumarski list 135 (5-6): 269-279.
- **Rignanese, L. (2011):** *Eschscholzia californica* Cham. in Nees. In: Flora Italiana.
- (http://luirig.altervista.org/flora/taxa/floraspecie.php?genere=Eschscholzia). [accessed August 8, 2013].
- **Tafra, D., Pandža, M., Milović, M. (2012):** Vascular flora of the town of Omiš. Natura Croatica 21(2): 301-334.
- **Vladimirov, V., Dane, F., Stevanović, V., Tan, K. (2007):** New floristic records in the Balkans, 6. Phytologia Balcanica 13(3): 433-455.