New localities of *Heracleum mantegazzianum* Sommier et Levier (Apiaceae) in Croatia and control measures taken

**Abstract**

**Background and Purpose:** The species *Heracleum mantegazzianum* (Apiaceae) originates from the Western Greater Caucasus (Russia, Georgia), but today it is widely distributed in Europe due to deliberate introductions as an ornamental plant and subsequent spontaneous spread. Therefore it is considered to be an invasive alien species. Its main negative impact concerns human health, as it produces phototoxic sap which causes skin burnings when exposed to UV light. In Croatia it was first recorded in 2009 near Žabnik (Međimurje County), but afterwards it has not been found on this locality again.

**Materials and Methods:** Floristic research in the Zagorje area was carried out during July and August 2014, using GPS Receiver to determine investigated localities.

**Results:** The species *Heracleum mantegazzianum* was recorded on 16th July 2014 in Gornja Šemnica (Radoboj, Krapina-Zagorje County), on two localities approximately 300 m apart. The localities were revisited on 1st August 2014. To control the spread of the species manual elimination of fructifying umbels was applied. On both localities floristic composition and general vegetation type were determined.

**Conclusion:** Monitoring of recorded sites and adjacent areas, control measures, and possible eradication of all individuals of *Heracleum mantegazzianum* should be conducted in the following years in order to control and possibly eradicate this invasive alien species.

**INTRODUCTION**

The species *Heracleum mantegazzianum* Sommier et Levier (Apiaceae) originates from the Western Greater Caucasus (Russia, Georgia), but today it is widely distributed in Europe. History of its spread dates back to the beginning of 19th century, when it was introduced to the Kew Botanic Gardens (London) and subsequently formed its first naturalized population in Cambridgeshire (1). Today, due to deliberate introductions as an ornamental plant and subsequent spontaneous spread, it is distributed in numerous western, northern and central European countries and is considered to be an invasive alien species (2, 3). It was shown that its dispersal on regional and continental level is human-mediated, while locally the species spread depends on its biological traits (4). While disturbed habitats are more easily invaded, it also invades semi-natural vegetation (5). Although it has different negative effects on the invaded...
habitats, such as outcompeting and replacing native vegetation, its main negative impact concerns human health, as it produces phototoxic sap which causes skin burnings when exposed to UV light (3).

The species is monocarpic perennial which can grow up to 5 m tall. Its ridged stem has purple blotches and pustulate bristles. Leaves are alternate, ternately or pinnately lobed and coarsely toothed. The inflorescences are compound umbels: there is one terminal and up to eight satellite umbels. Flowers are white or rarely pinkish, also outer radiate. Fruits are flattened and elliptical, narrowly winged, splitting into two mericarps, which have 3-5 elongated oil canals each (2, 6). One plant produces large number of seeds, establishing short-term persistent soil seed-bank (7). Furthermore, they are efficiently dispersed by water, wind and human-related factors (8).

In Croatia the species was first recorded in 2009 near Žabnik (Međimurje County; 9), but it has not been found on that locality afterwards. Regarding its presence in neighbouring countries, in Slovenia it was noted in Ljubljana and Maribor where it has spread from botanical gardens (10). In Bosnia and Herzegovina it was found in 2010 near Sarajevo, although it must have been present there since 2007 (11). In Hungary it was an ornamental plant but it escaped from many gardens and now it is considered potentially invasive (12).
MATERIAL AND METHODS

Floristic research in the Zagorje area was carried out during July and August 2014. Positions of the investigated localities were determined using Garmin GPSMAP 60CSx GPS Receiver. Species were determined using standard determination keys and iconographies (e.g. 13, 14). The nomenclature of the species follows Flora Croatica database (15). A distribution map was prepared using ESRI GIS ArcMap 10.1 software.

RESULTS AND DISCUSSION

The species Heracleum mantegazzianum was first recorded on 16th July 2014 in Gornja Šemnica (Radoboj, Krapina-Zagorje County), on two localities approximately 300 m apart. The localities were revisited on 1st August 2014. Croatian official map projection HTRS96/TM coordinates of the first locality are 456588 and 5113333, while the coordinates of the second locality are 456757 and 5113097 (Fig. 1). WGS84 projection coordinates of the same localities are 46° 9’ 30.1824” N, 15° 56’ 16.5012” E and 46° 9’ 22.5792” N, 15° 56’ 24.4572” E, respectively.

On the first locality the species was growing by the road, in the ruderal vegetation of the order Onopordetalia acanthii Br.-Bl. et R. Tx. ex Klika et Hadač 1944 (National Habitat Classification: I.1.4. Ruderal communities of continental region) mixed with ruderal vegetation of the class Galio-Urticetea Passarge ex Köpeczy 1969 (National Habitat Classification I.1.5. Nitrophilous, shady ruderal vegetation; 16) with species: Achillea millefolium, Agrimonia eupatoria, Ajuga reptans, Arrhenatherum elatius, Artemisia vulgaris, Calystegia sepium, Campanula trachelium, Centaurea jacea, Chenopodium album, Cichorium intybus, Cirsium arvense, Cirsium vulgare, Clematis vitalba, Convolvulus arvensis, Corncob sanguinea, Dactylis glomerata, Daucus carota, Dipsacus fullonum, Equisetum telmateia, Erigeron annuus, Eupatorium cannabinum, Festuca pratensis, Galeopsis speciosa, Galium mollugo, Geranium columbinum, Holcus lanatus, Hypericum perforatum, Lactuca serriola, Lamium maculatum, Lolium multiflorum, Mentha longifolia, Mentha pulegium, Pastinaca sativa, Picris hieracioides, Plantago lanceolata, Plantago major, Polygonum aviculare, Potentilla reptans, Pulicaria dysenterica, Rumex acetosa, Rumex crispus, Siliene latifolia ssp. alba, Sinapis arvensis, Solidago gigantea, Sonchus sp., Stachys palustris, Symphytum officinale, Tanacetum vulgare, Taraxacum officinale, Torilis japonica, Urtica dioica, Valeriana officinalis, Verbena officinalis, Vicia cracca. In this locality, on the area of cca 200 m², 10 fructifying individuals and cca 30 young individuals of Heracleum mantegazzianum were counted. The landowner informed us that the site is mowed at least once a year, although the narrow part of the land by the road is more regularly maintained by mowing through the maintenance of public roads. This would explain the fact that in the exact vicinity of the road no fructifying plants were found and the fact that the plants on the remaining part of the site grew up to 3 m.

On the second locality (see Fig. 1) the species was present in hygrophilous herbaceous vegetation of the alliance Calthion R. Tx. 1936 (National Habitat Classification C.2.2.3. Hygrophilous herbaceous vegetation; 16) with species: Agrimonia eupatoria, Agrostis stolonifera, Ajuga reptans, Arrhenatherum elatius, Calystegia sepium, Carex hirta, Carex otrubae, Cerasitum sp., Cirsium arvense, Coronilla varia, Dactylis glomerata, Dipsacus fullonum, Elymus repens, Equisetum palustre, Equisetum telmateia, Eupatorium cannabinum, Galium mollugo, Geranium columbinum, Holcus lanatus, Juncus articulatus, Juncus inflexus, Lathyrus pratensis, Linaria vulgaris, Lysimachia nummularia, Lythrum salicaria, Potentilla reptans, Pulicaria dysenterica, Ranunculus acris, Rubus caesius, Scirpus sylvaticus, Senecio erraticus ssp. barbareifolius, Stachys palustris, Urtica dioica, Vicia cracca. Invaded area in this locality was smaller than the first one, encompassing cca 10 m², with six fructifying individuals and just few young individuals. Height of the fructifying plants (up to 2 m) on this site would suggest that it is also maintained by regular mowing.

Taking into consideration that an individual plant needs three to five years to flower, population on these sites must have been present here at least since 2011. On the Street View of Google Earth application of the first locality, which was taken in September 2011, young leaf rosettes can be observed, confirming the presence of the species.

The exact introduction pathway of the species is not known, but we presume that unintentional introduction occurred, since to our knowledge the species is not used as ornamental plant in Croatia, nor it would be legally allowed to import or introduce it.

During the second field visit of the localities (i.e. in August) control measures were taken in order to disable the dispersal of seeds and the consequent spread of the species. As the species produces exceptionally high number of seeds (7), control measures in both localities included manual elimination of all fructifying umbels and their safe disposal. Fructifying umbels were put in trash bags, which were then sealed tightly and stored for several months before they were disposed in the garbage.

In addition to monitoring of recorded sites and adjacent areas, control measures, including possible eradication of all individuals, should be conducted during the following years. Furthermore, in the next few years more detailed vegetation study is planned.

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