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THE FIRST RECORD OF NON-NATIVE *AMBROSIA TRIFIDA* L. (ASTERACEAE) IN MONTENEGRO

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Ambrosia trifida L., a plant species native to North America, has been recorded for the first time in the flora of Montenegro. The species was identified in four locations: near the major Montenegrin rivers Morača and Zeta, as well as at Lake Skadar. The aim of this paper is to report *A. trifida* as a new addition to the Montenegrin flora and to provide data on its main morphological characteristics, distribution, habitat types, and invasive status in Montenegro. Based on field observations, it can be concluded that all four established populations of *A. trifida* in Montenegro are self-sustaining and, from today's perspective, can be classified as naturalized. However, one population in the Skadar Lake area is particularly well-established and is transitioning to the status of an invasive species.

Key words: *Ambrosia trifida*; first record; habitat; Montenegro; non-native species

INTRODUCTION

Ambrosia trifida L. (giant ragweed) is native to North America, where it is recorded as a weedy species in many states (USDA and NRCS [1], OEPP/EPPO [2]). In North America, *A. trifida* tends to establish at latitudes between 45 ° and 30 ° north, likely due to strict photoperiodic constraints for flowering, which maximize its reproductive success [3].

According to Greuter [4], *A. trifida* has been registered as an alien species in more than 30 countries across the Mediterranean region. Within the territory of the former Yugoslavia, *A. trifida* has been documented in Serbia (Province of Vojvodina) [5] and Slovenia [6]. In other Balkan countries, the species has been reported in Bulgaria [7], while it has not been cited for Albania by Barina et al. [8]. However, according to OEPP/EPPO [2], the species is registered in Albania.

In the EPPO region, *A. trifida* was introduced at the end of the 19th century and has ex-

panded its range since the mid-1900s [9], [10]. As stated in the "Data sheets on pests recommended for regulation: *A. trifida* L." (OEPP/EPPO [2]): "Many of the occurrences of *A. trifida* in the EPPO region are considered casual populations." However, there are well-established populations in Western Europe, with particularly high densities in southwestern France [10].

Ambrosia trifida is the third non-native species of the genus *Ambrosia* L. recorded in the flora of Montenegro. Two other non-native species of this genus have previously been reported in Montenegro. *A. psilostachya* DC. was documented by Pulević [11], and *A. artemisiifolia* L. by Hadžiablahović [12] and Stešević & Petrović [13]. Since its first discovery, no additional data on *A. psilostachya* has been reported for Montenegro, while considerable information has been published on *A. artemisiifolia*, primarily concerning its distribution. This species holds an invasive status in Montenegro [14].

In addition to these non-native species of the genus *Ambrosia*, an autochthonous species, *A. maritima* L., has also been mentioned by several authors as occurring in the Eu-Mediterranean region of Montenegro [15].

MATERIAL AND METHODS

The data presented in this paper were collected in July 2019, August 2020, and August 2024. The morphological description of *A. trifida* was compiled using *Flora Europaea* (Hansen [16]) and Stoyanov et al. [7]. GPS coordinates were obtained through Google Earth (for the locality near the Morača River) and via a mobile phone (Google Maps app, iPhone 12 Pro) for all other localities. The coordinates are provided in decimal degrees.

Data related to the habitats where the species was found, as well as the assessment of the species' populations in different localities, were based on visual observations by the finder. The nomenclature follows the Euro+Med database [17], which is continuously updated (<http://www.europlusmed.org>).

For the habitat types where *A. trifida* was found, the habitats listed in Annex I of the European Directive 92/43/EEC (https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive_en) [18] were considered.

Study area

The study area includes the Zeta River, the Morača River, and Lake Skadar. The Morača and Zeta rivers are the main rivers within the Lake Skadar basin.

The Morača River is a major river in Montenegro, originating in the northern region within the Kolašin Municipality, beneath Mount Rzača. It flows southward for 99.5 km before emptying into Lake Skadar.

The Zeta River originates from Vojnik Mountain and meanders through the Bjelopavlička Plain, passing through the municipalities of Nikšić and Danilovgrad. It flows eastward for 65 km before joining the Morača River north of Podgorica.

The Zeta River is the most significant tributary of the Morača River. In 2019, the Zeta River Valley was designated as a protected natural asset of national importance, classified as a "Nature Park."

Lake Skadar is the largest lake in the Balkan Peninsula, with a surface area that seasonally fluctuates between 370 km² and 530 km². Located in the western Balkans, the lake straddles the border between Montenegro and Albania. In Montenegro, Lake Skadar is protected as a National Park.

RESULTS

In Montenegro, several floristic-vegetation regions can be distinguished [19], each defined by different vegetation components: Macaronesian-Mediterranean, Middle European, Circumboreal, and Central South European Mountain. The Macaronesian-Mediterranean region in Montenegro consists of two subregions: Eu-Mediterranean and Sub-Mediterranean. To date, *A. trifida* has been recorded in the Sub-Mediterranean subregion, where a total of four populations have been documented (Figure 1).

Records:

Locality 1: Montenegro, Zeta Municipality (Golubovci), near the bridge in Vukovci village, along the Morača River (42.334133N; 19.208399E); altitude: 6 m; date: 15.07.2019; collector and identifier: S. Hadžiablahović.

Locality 2: Montenegro, Danilovgrad Municipality, near Donje Selo village, along the Zeta River (42.5464312N; 19.1542782E); altitude: 42 m; date: 20.09.2020; collector and identifier: H. Hadžiablahović.

Locality 3: Montenegro, Zeta Municipality (Golubovci), Bistrica, near the road (42.3041202N; 19.1458735E); Lake Skadar; altitude: 5 m; date: 11.09.2024; collector and identifier: H. Hadžiablahović.

Locality 4: Montenegro, Cetinje Municipality, Žabljačke livade, wet meadows (42.3031908N; 19.1621475E); Lake Skadar; altitude: 5 m; date: 17.09.2024; collector and identifier: H. Hadžiablahović.

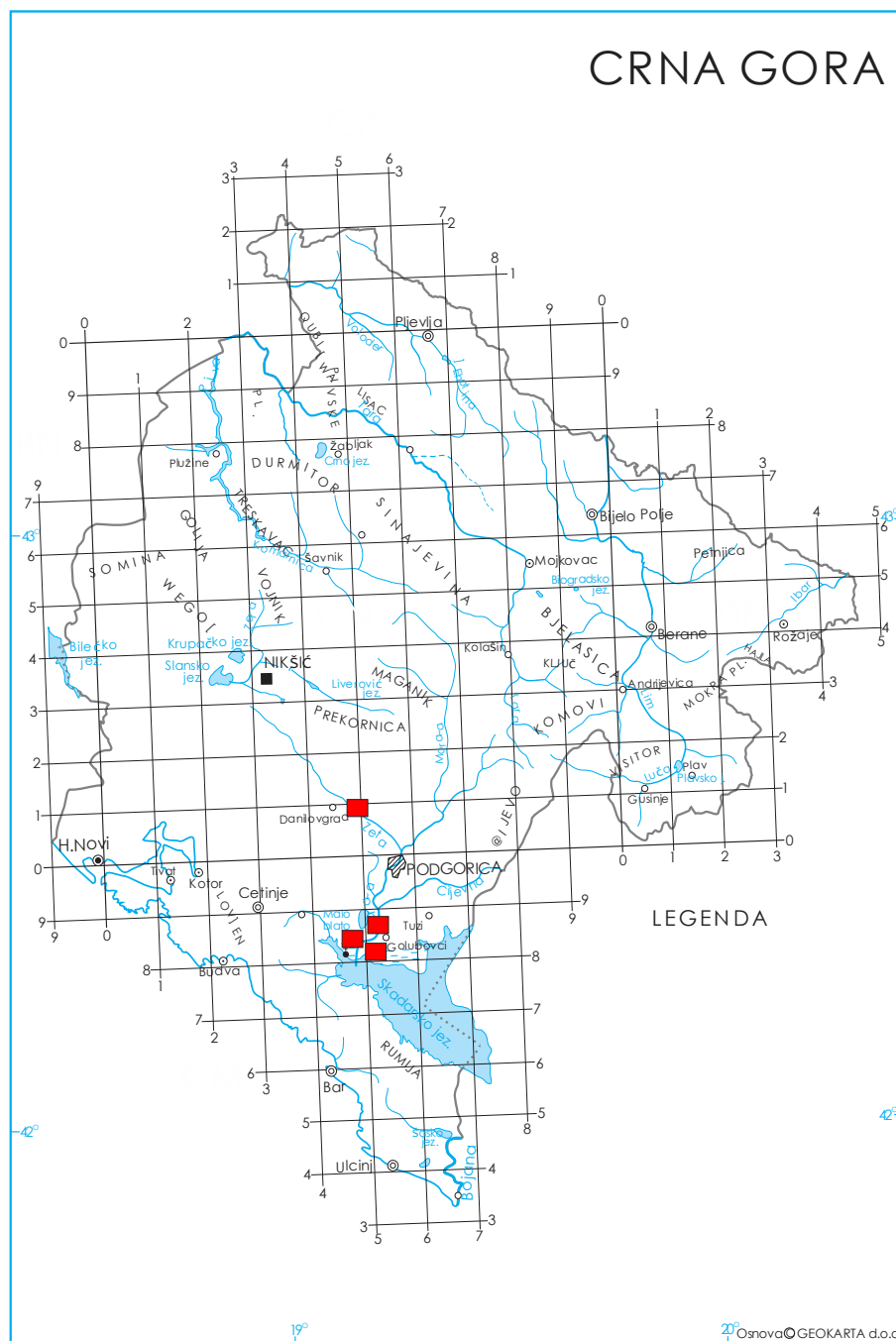


Figure 1. Records of *Ambrosia trifida* in Montenegro

Morphological description

Ambrosia trifida L., *Sp. Pl.* 2: 987 (1753).
— Annual, 0.5–2(4) m tall. Stems sturdy, patent-hirsute or hispid, up to 3 cm in diameter, with white pith. Leaves 5–25 cm long and 5–20 cm wide, palmately 3- to 5-lobed or entire, each with a pointed tip; petiolate, opposite, scabrid, with serrate margins.

Capitula unisexual: male heads numerous, hemispherical, drooping, arranged in erect terminal

racemes, with 5–20 florets; corolla tube cream or opaque yellow, 1–2 mm long, glabrous, often with 5(6) longitudinal dark lines; involucre cup-shaped, 2–3 mm in diameter, fused, with 1–3 dark nerves and erose margins. Female heads form groups in the axils of the uppermost leaves, each 1-flowered; florets without petals; involucre 6–10 mm long in fruit, many-ribbed, with each rib ending in a short spine; crown-shaped at the top. Achenes 4–6 mm long, 1-seeded, smooth, dark brown; pappus absent.

Flowering: VII–IX; fruiting: IX–X.

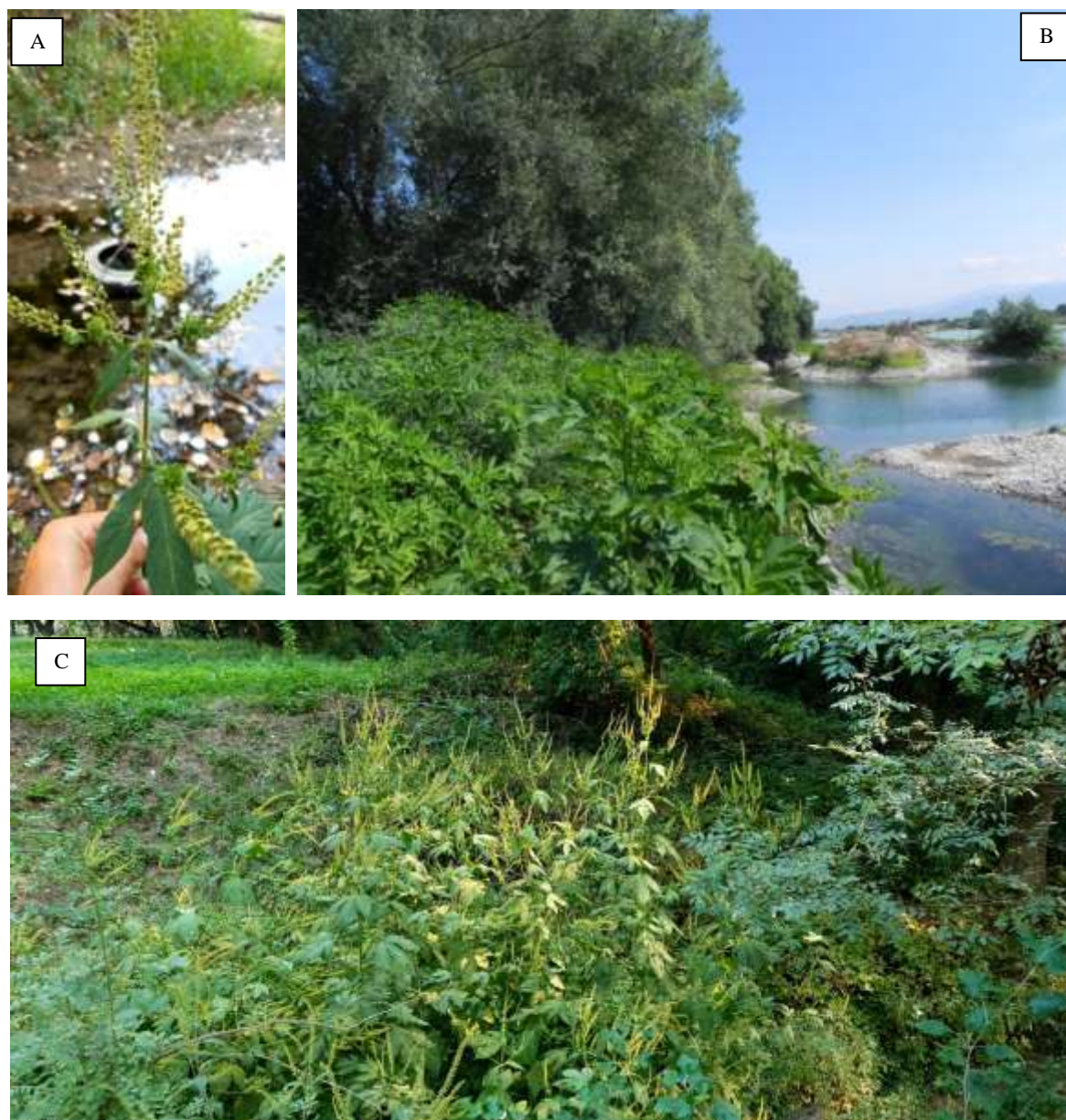


Figure 2. *Ambrosia trifida* - whole plant (A); habitats of *A. trifida* close to Morača River (B) and Zeta River (C)
(Photographs by H. Hadžiablahović (A, C) and S. Hadžiablahović (B))

DISCUSSION

A. trifida grows in its natural habitat in North America, where it originally inhabited river valleys, floodplains, drainage channels, moist disturbed open sites, and similar environments [7]. Later, with the globalization of world production and seed trade, the species was introduced and naturalized in many countries within the temperate zones of Europe and Asia, gradually becoming a dangerous invasive alien species [7]. According to Follak et al. [9], *A. trifida* spreads slowly, and its current distribution in central and eastern Europe (CEE) consists of relatively few and mostly isolated localities.

Habitats and populations in Montenegro

In Montenegro, the species has been found on rich alluvial soils within the Zeta River system and on sandy and gravelly alluvial habitats along the Morača River. The climate and soil conditions are similar to those in which *A. trifida* grows in its natural habitat in North America.

At Locality 1 along the Morača River, *A. trifida* occurs on sandy-gravelly alluvial habitats along the river, growing in a habitat dominated by *Salix alba* (*Salicetum albae-fragilis* community). This habitat is listed in Annex I of the EU Habitats Directive (Council Directive 92/43/EEC) and can be classified as "91E0 Alluvial forests with *Alnus*

glutinosa and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*), "a priority habitat type (*) under the Directive. This finding is located a few kilometers from the mouth of the Morača River into Lake Skadar. The population here consists of only about 15 specimens, with further expansion or occupation of space expected.

At Locality 2 along the Zeta River, *A. trifida* grows on eutric brown soil over lake sediments (vertic eutric cambisol) along the river, within a plant community dominated by *Fraxinus angustifolia* Vahl, with significant participation from *Ulmus glabra* Huds. and *Quercus robur* L. This habitat is listed in Annex I of the EU Habitats Directive (Council Directive 92/43/EEC) and can be classified as "91F0 Riparian mixed forests of *Quercus robur*, *Ulmus laevis*, and *Ulmus minor*, *Fraxinus excelsior*, or *Fraxinus angustifolia* along great rivers (*Ulmion minoris*)". The population at this site consists of approximately 15–20 specimens, with further expansion or occupation of space expected.

At Locality 3 in the Lake Skadar area, *A. trifida* grows on alluvial sandy soils near a road. Here, the species occurs singly or in small clusters of 2–3 specimens over an area of 2–3 m². Further expansion or occupation of space is expected. This area is submerged for most of the year, except during the summer period (from late July to mid-October).

At Locality 4 in the Lake Skadar area, *A. trifida* grows on alluvial sandy soils within a plant community dominated by the invasive species *Xanthium orientale* L. subsp. *italicum* (Moretti) Greuter. The population size here consists of approximately 200 specimens scattered across an area of about 2 km². The population is thinned out, but further expansion or occupation of space is expected. Like Locality 3, this area is submerged for most of the year, except during the summer period (from late July to mid-October).

Alien status in Montenegro

Based on the concept that classifies species according to the stages they reach along the introduction-naturalization-invasion continuum (IN-IC)—describing how species progress in the invasion process by overcoming geographical, environmental, and biotic barriers [20–24] provided a more detailed explanation of the terms "Casual", "Naturalized" and "Invasive" to describe the invasive status of alien species.

All four established populations of *A. trifida* in Montenegro form self-sustaining populations

over several life cycles without direct human intervention, and their persistence does not depend on the ongoing input of propagules. In this context, we consider that *A. trifida* in Montenegro, from the current perspective, can be classified as naturalized. However, one population, located in the wet meadows of Žabljačke livade in the Lake Skadar area, is particularly well-established and appears to be transitioning to the status of an invasive species.

Given that the territory of southern Montenegro has been evaluated as suitable for the species' southward expansion, it is crucial to monitor its spread and establish control programs aimed at reducing seed production and eradicating the species from Montenegro. Otherwise, in the near future, it is likely that the species' invasive status will transform from naturalized to invasive across the entire country.

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ПРВ ПОДАТОК ЗА АЛОХТОНИОТ ВИД *AMBROSIA TRIFIDA* L. (ASTERACEAE) ВО ЦРНА ГОРА

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Алохтониот вид *Ambrosia trifida* L., кој потекнува од Северна Америка, првпат е забележан во флората на Црна Гора. Тој е регистриран на четири локалитети во близина на големите црногорски реки Морача и Зета, како и во околината на Скадарско Езеро. Во трудот се наведуваат податоци за најзначајните морфолошки карактеристики на овој вид, неговата дистрибуција, типовите живеалишта и неговиот инвазивен статус во Црна Гора. Врз основа на теренските набљудувања, може да се заклучи дека сите четири воспоставени популации на *A. trifida* во Црна Гора се самоодржливи, така што популацијата од околината на Скадарско Езеро има статус на инвазивен вид.

Клучни зборови: *Ambrosia trifida*; прв рекорд; живеалишта; Црна Гора; алохтон вид