

## ADDITION TO THE NEOPHYTIC FLORA OF THE CETINA RIVER REGION

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This work presents habitats of 22 neophytes within the Cetina River area. The neophytes – *Acer negundo* L., *Amaranthus albus* L., *A. blitoides* S. Watson, *Ambrosia artemisiifolia* L., *Artemisia verlotiorum* Lamotte, *Conyza bonariensis* (L.) Cronq., *C. canadensis* (L.) Cronq., *Eleusine indica* (L.) Gaertner, *Euphorbia maculata* L., *E. prostrata* Aiton, *Galinsoga parviflora* Cav., *Paspalum paspalodes* (Michx.) Scribn., *Tagetes minuta* L., *Xanthium spinosum* L., *X. strumarium* L. subsp. *italicum* (Moretti) D. Löve are mentioned for the first time for the researched area.

Data are given for new findings of neophytes previously recorded in the area investigated – *Amorpha fruticosa* L., *Aster squamatum* (Sprengel) Hieron., *Bidens subalternans* DC., *Conyza sumatrensis* (Retz.) E. Walker, *Datura inoxia* Mill., *Erigeron annuus* (L.) Pers., *Phytolacca americana* L.

**Key words:** neophytic flora, new localities, the Cetina River, Croatia

**Pandža, M. & Tafra, D.: Prilog neofitskoj flori područja rijeke Cetine (Dalmacija, Hrvatska). Nat. Croat., Vol. 17, No. 2., 91–112, 2008, Zagreb.**

U radu se navode nalazišta 22 neofita uz rijeku Cetinu. Neofiti – *Acer negundo* L., *Amaranthus albus* L., *A. blitoides* S. Watson, *Ambrosia artemisiifolia* L., *Artemisia verlotiorum* Lamotte, *Conyza bonariensis* (L.) Cronq., *C. canadensis* (L.) Cronq., *Eleusine indica* (L.) Gaertner, *Euphorbia maculata* L., *E. prostrata* Aiton, *Galinsoga parviflora* Cav., *Paspalum paspalodes* (Michx.) Scribn., *Tagetes minuta* L., *Xanthium spinosum* L., *X. strumarium* L. subsp. *italicum* (Moretti) D. Löve prvi put se navode za istraživano područje.

Za ranije zabilježene neofite – *Amorpha fruticosa* L., *Aster squamatum* (Sprengel) Hieron., *Bidens subalternans* DC., *Conyza sumatrensis* (Retz.) E. Walker, *Datura inoxia* Mill., *Erigeron annuus* (L.) Pers., *Phytolacca americana* L. navode se nova nalazišta na istraživanom području.

**Ključne riječi:** neofitska flora, nova nalazišta, rijeka Cetina, Hrvatska

## INTRODUCTION

Our intention was to make an analysis of species transferred by human activity (anthropochoria) from other phytogeographical regions and gradually established in anthropogenous, mainly weed and ruderal, vegetation. Development of anthropogenous flora is highly related to human activity. In the past, this region was exposed to a high level of emigration, resulting in abundance of neophyte species from both Americas (*americanoneophytes*; see TRINAJSTIĆ 1975, 1977).

Recently, neophytes have been intensively spreading along the coastal area of Croatia (SMITAL *et al.*, 1998; ILIJANIĆ *et al.*, 1991; TRINAJSTIĆ *et al.*, 1993; PANDŽA & STANČIĆ 1999; MILOVIĆ, 2001, 2004, MILOVIĆ & RANDIĆ, 2001; PANDŽA *et al.*, 2001; ŠILIC & ŠOLIĆ, 1999, 2002).

## METHODS

In the following review, taxa are stated in alphabetical order of genera. The nomenclature is in accordance with TUTIN *et al.* (1964–1980). Every finding is accompanied by a locality, a date and the habitat of the species. According to Gauss-Krüger the coordinates of the locality are presented (ex. 5637040E – 4812764N). Coordinates were determined by GPS (Garmin VISTA HCx). Both authors confirmed findings of all the neophytes. All locations are between Omiš and Trilj (Central Dalmatia).

## RESULTS

### *Acer negundo* L. (Aceraceae)

A species of North American origin (WALTERS, 1968: 239). Recorded for Šibenik (MILOVIĆ, 2002) and Janjina on the Pelješac peninsula (KOVAČIĆ *et al.*, 2000). In the town of Omiš it has been spontaneously spreading and growing in a large number of locations (56 37040 – 4812764; 5636946 – 4812688; 5637043 – 4812181; 5636799 – 4812611; May 13<sup>th</sup>, 2006). In Kaštil Slanica it grows in the vegetation near water; 5640792 – 4812426; Oct 28<sup>th</sup>, 2006. It has also been spotted on a deserted field and along the Ruda stream, tributary of the Cetina River; Sep 25<sup>th</sup>, 2005.

### *Amaranthus albus* L. (Amaranthaceae)

A species originating from America (*americanoneotophytes*). Recorded for the island of Svetac (ZI. PAVLETIĆ, 1978), the Palagruža islands (ZI. PAVLETIĆ, 1978a), Milna on the island of Brač (ŠTAMOL & MARKOVIĆ, 1985), the island of Hvar (TRINAJSTIĆ, 1993), the Krka River (MARKOVIĆ *et al.*, 1990, 1993), Lučica on the island of Kornat (PANDŽA & STANČIĆ, 1995), the island of Zlarin (PANDŽA, 1998), Betina on the island of Murter (PANDŽA, 1998b), Velike Vruje and Suha Punta on the island of Kornat, Njivice (Šibenik), Karlobag, Sv Filip i Jakov, Srima, Zaton, Raslina, Brodarica, the island of Žirje,

Primošten, Rogoznica, Trogir (PANDŽA *et al.*, 2001), Šibenik and its vicinity (MILOVIĆ, 2002), Makarska (ŠILIĆ & ŠOLIĆ, 2002), the island of St. Andrija (JASPRICA *et al.*, 2006).

New localities:

– in ruderal vegetation on building material trash heaps; 5640131– 4812476; Oct 28<sup>th</sup>, 2006 and in a vegetable garden; 5645986 – 4811421; Oct 28<sup>th</sup>, 2006.

It grows individually in the above locations and has not yet been considered a dangerous weed.

### ***Amaranthus blitoides* S. Watson (*Amaranthaceae*)**

A species originating from North America (AKERROYD, 1993: 132). Recorded for the following locations: the island of Murter (PANDŽA, 1998b) and the Šibenik area – Solaris, Bilice, Dubrava, Perković (MILOVIĆ, 2002).

The new locality is along the Cetina River in ruderal vegetation on building material trash heaps; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006.

### ***Ambrosia artemisiifolia* L. (*Asteraceae*)**

A neophyte originating from North America (HANSEN, 1976: 142), (Fig. 1). It is quite rare in the coastal area and not considered a dangerous weed. Spotted in Milna on the island of Brač (ŠTAMOL & MARKOVIĆ, 1985), near the Krka River (MARKOVIĆ *et al.*, 1993), Makarska (ŠILIĆ & ŠOLIĆ, 1999). As for the Šibenik area, it has been found in Zaton, Vodice, Murter, Tisno, Solaris, Njivice (Šibenik), Zablacé, Perković, Siverić (PANDŽA *et al.*, 2001; MILOVIĆ, 2001; 2002).

The new locality is along the Cetina River, in ruderal vegetation around the bridge in Trilj; 5639750 – 4831390; Oct 29<sup>th</sup>, 2006.



**Fig. 1.** *Ambrosia artemisiifolia* L.

### *Amorpha fruticosa* L. (Fabaceae)

This species originates from Central and North America (BALL, 1968: 127) (Fig. 2). Recorded by S. HEĆIMOVIĆ (1982) for Lokrum, by REGULA-BEVILACQUA and LJ. ILIJANIĆ (1984) for Mljet, by TRINAJSTIĆ and ZI. PAVLETIĆ (1988) for Krapje Đol and by ŠILIĆ and ŠOLIĆ (2002) for the area around Radmanove mlinice.

The new localities:

- Ivanova Blato along the Cetina River; Sep 17<sup>th</sup>, 2005
- Omiš – ruderal vegetation in a populated area; 5637351 – 4813133; 5637377 – 4812945; May 13<sup>th</sup>, 2006; 5637975 – 4812397; May 14<sup>th</sup>, 2006
- Omiš – at the mouth of the Cetina River; 5636899 – 4812310; May 14<sup>th</sup>, 2006
- Omiš – along the road above the Plana tunnel; 5637518 – 4812893; May 14<sup>th</sup>, 2006
- Radmanove mlinice – in ruderal vegetation; 5642359 – 4811305; Sep 25<sup>th</sup>, 2005
- Omiš – along the road; 5637528 – 4812824; Oct 28<sup>th</sup>, 2006
- Kučići – along the road; 5637454 – 4813618; Oct 28<sup>th</sup>, 2006



Fig. 2. *Amorpha fruticosa* L.

- Omiš – by the yard of the Omial factory (Omiš); 5637448 – 4813615; Apr 30<sup>th</sup> 2007
- ruderal vegetation near the Cetina River; 5637819 – 4813216; Oct 28<sup>th</sup>, 2006
- shady slopes of the Omiška Dinara mountain; 5639325 – 4812902; Oct 28<sup>th</sup>, 2006
- ruderal vegetation on the building waste materials; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006
- Kaštil Slanica – in ruderal vegetation along the road; 5640792 – 4812426; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5650565 – 4810984; Oct 28<sup>th</sup>, 2006
- Blato upon Cetina River; 5649678 – 4816720; Oct 29<sup>th</sup>, 2006
- Čikotina lađa; 5641565 – 4822342; Oct 29<sup>th</sup>, 2006

It has spread over a broad area from Radmanove mlinice to the mouth of the Cetina River and being an allergen, presents a significant threat. Expansion of this species should be monitored with due care.

### *Artemisia verlotiorum* Lamotte (Asteraceae)

A neophyte originating from southwest China (TUTIN, 1976:180). Recorded for Poreč in Istria by MELZER (1969) and continental Croatia on the banks of the Sava River by MARKOVIĆ (1970). The first Mediterranean habitat of this species was found in the city of Split in ruderal vegetation (ILIJANIĆ *et al.*, 1991). Numerous locations have been noted by SMITAL *et al.* (1998). In central Croatia it is distributed in Zagreb and its surroundings, in the northern coastal area (Poreč, Rovinj, the village of Vranja, Opatija, Ičići, Matulji, Rijeka, Bakar, Crikvenica, Bribir and Novi Vinodolski; in central parts of the coast it is in Bilice near Šibenika, Split, Kaštel Sućurac, Dicmo, Podaca and Rogotin near Ploče). Also recorded for Zadar and numerous locations around Šibenik (PANDŽA *et al.*, 2001; MILOVIĆ, 2001, 2002).

The new localities:

- Omiš – ruderal vegetation in the populated area; 5637041– 4812131; May 14<sup>th</sup>, 2006
- Omiš – in a flower garden in front of the Red Cross building; 5637043 – 4812181; May 14<sup>th</sup>, 2006
- Ivanovo Blato upon Cetina – ruderal vegetation near the river; Sep 17<sup>th</sup>, 2005
- Trilj – ruderal vegetation in a populated area; 5639779 – 4831369; Sep 25<sup>th</sup>, 2005
- along the Ruda stream, Cetina tributary; Sep 25<sup>th</sup>, 2005
- Omiš – in ruderal vegetation around the Galeb factory; 5637110 – 4812173; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation near Cetina River; 5637819 – 4813216; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5650591 – 4810874; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road near the Cetina River; 5650565 – 4810984; Oct 28<sup>th</sup>, 2006

- Blato upon Cetina; 5649678 – 4816720; Oct 29<sup>th</sup>, 2006
- Trilj – ruderal vegetation around the bridge over the Cetina; 5639750 – 4831390; Oct 29<sup>th</sup>, 2006
- Trilj – by the Cetina River; 5639528 – 4831250; Oct 29<sup>th</sup>, 2006
- Trilj – in a deserted garden; 5640053 – 4831825; Oct 29<sup>th</sup>, 2006
- Trilj – in ruderal vegetation along the road; 5640150 – 4832071; Oct 29<sup>th</sup>, 2006

### ***Aster squamatus* (Sprengel) Hieron. (Asteraceae)**

A species of Central and South American origins (YEO, 1976:115). First found in Croatia in the Neretva valley near Ploče in 1970 and in Gradac by Melzer in 1971 (see TRINAJSTIĆ *et al.*, 1993). Recorded for the island of Mljet (REGULA-BEVILACQUA & JURKOVIĆ-BEVILACQUA, 1980; REGULA-BEVILACQUA & ILIJANIĆ, 1984), along the Krka River (MARKOVIĆ *et al.*, 1993), Makarska (TRINAJSTIĆ *et al.*, 1993), Tarac on the island of Kornat (TRINAJSTIĆ, 1996), in the area of Malostonski Bay (JASPRICA & KOVAČIĆ, 1997), on the island of Zlarin (PANDŽA, 1998). On a large number of locations along the coastline and on the islands from Zadar to Dubrovnik (PANDŽA *et al.*, 2001; MILOVIĆ 2001, 2002). Also recorded for Omiš in ruderal vegetation near the sea on October 17<sup>th</sup>, 1999 (PANŽA *et al.*, 2001.)

The new localities:

- Omiš – in ruderal vegetation around the bus station; 5636940 – 4812576; Sep 17<sup>th</sup>, 2005
- in ruderal vegetation along the canal; 5638262 – 4814811; Sep 25<sup>th</sup>, 2005
- Omiš – in a high-school park; 5637368 – 4812398; Oct 28<sup>th</sup>, 2006
- Kučići – ruderal vegetation around the bridge; 5637454 – 4813618; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road near the Cetina River; 5637819 – 4813216; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation on the building waste materials along the road; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006
- in a yard; 5647291 – 4814397; Oct 29<sup>th</sup>, 2006

It has spread over anthropogenous habitats in ruderal vegetation in populated areas and by the roads.

### ***Bidens subalternans* DC. (Asteraceae)**

A neophyte originating from warm climates of South America (TUTIN, 1976: 140). Due to its thermophylic character its spread is limited to warm parts of Europe. It has spread by epizoochoria. It was found for the first time in Croatia in Trsat (Rijeka) and Opatija as *Bidens bipinnata* L. (TRINAJSTIĆ, 1975a). Also recorded for a number of locations as such (TRINAJSTIĆ, 1978; 1979a; 1987; 1993a; ILIJANIĆ & HEĆIMOVIĆ, 1983; ILIJANIĆ *et al.*, 1991; MARKOVIĆ *et al.*, 1990, 1993). The *Bidens subalternans* species was recorded in Senj and Bale (near Pula) for the first time in Croatian flora by MELZER

(1987). All the published materials referring to *Bidens bipinnata* species were revised by TRINAJSTIĆ (1993a). It was concluded that all the recorded findings belong to the *Bidens subalternans* species. Also recorded in the vicinity of Makarska and near Omiš (TRINAJSTIĆ *et al.*, 1993; PANDŽA *et al.*, 2001) and on many other locations along the coastline and on the islands (PANDŽA & ZI. PAVLETIĆ, 1996; PANDŽA, 1998; 1998a, 1998b, 2002, 2003; PANDŽA *et al.*, 2001; MILOVIĆ 2001; 2002).

The new localities:

- Omiš – in a flower garden in front of the Red Cross building; 5637043 – 4812181; May 14<sup>th</sup>, 2006
- Radmanove mlinice; in ruderal vegetation; 5642359 – 4811305; Sep 25<sup>th</sup>, 2005
- on a deserted field near the Ruda stream; Sep 25<sup>th</sup>, 2005
- Omiš – in ruderal vegetation above the Stjepan Radić square; Oct 28<sup>th</sup>, 2006
- Omiš – on the town beach; Oct 28<sup>th</sup>, 2006
- along the road by the Galeb factory (Omiš); 5637110 – 4812173; Oct 28<sup>th</sup>, 2006
- by the yard of the Omial factory (Omiš); 5637448 – 4813615; Oct 28<sup>th</sup>, 2006
- along the road; 5637528 – 4812824; Oct 28<sup>th</sup>, 2006
- ruderal vegetation on building waste materials; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006
- on a meadow by the Cetina River; 5642974 – 4811699; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5644527 – 4811251; Oct 28<sup>th</sup>, 2006
- along the road; 5645964 – 4811517; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5648156 – 4810983; 5650591 – 4810874; 5651042 – 4811221; 5651458 – 4811287; Oct 28<sup>th</sup>, 2006
- Kostanje – on building waste materials along the road; 5649095 – 4812203; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5637064 – 4814092; 5638262 – 4814811; Oct 29<sup>th</sup>, 2006
- Gata – in a deserted orchard; 5639559 – 4814593; Oct 29<sup>th</sup>, 2006
- Čišla – in a deserted garden; 5641151 – 4814396; Oct 29<sup>th</sup>, 2006
- Ostrvica – in ruderal vegetation along the road; 5642238 – 4813972; Oct 29<sup>th</sup>, 2006
- along the road; 5644220 – 4813517; Oct 29<sup>th</sup>, 2006
- Blato upon Cetina – on cultivated soil; 5649254 – 4817051; Oct 29<sup>th</sup>, 2006
- Trnbusi – along the road; 5644561 – 4818447; Oct 29<sup>th</sup>, 2006
- on the building waste materials along the road; 5647421 – 4817208; 5648898 – 4814819; Oct 29<sup>th</sup>, 2006
- Kostanje – in ruderal vegetation along the road; 5648829 – 4813131; Oct 29<sup>th</sup>, 2006
- Podgrađe – in ruderal vegetation; 5651025 – 4811891; Oct 29<sup>th</sup>, 2006.

***Conyza bonariensis* (L.) Cronq. (Asteraceae)**

A species originating from tropical parts of America (MARTINČIĆ *et al.*, 1999). Croatian locations from the literature as well as new habitats from his researches are recorded by MILOVIĆ (2004).

The new localities:

- Kučići – along the road; Sep 25<sup>th</sup>, 2005
- Omiš – in ruderal vegetation on the town beach; in ruderal vegetation along the road; 5648156 – 4810983; 5650591- 4810874; Oct 28<sup>th</sup>, 2006
- Kaštil Slanica- in ruderal vegetation along the road; 5640792 – 4812426; Oct 28<sup>th</sup>, 2006.
- on a meadow by the Cetina River; 5642974 – 48 11699; Oct 28<sup>th</sup>, 2006
- Trilj – ruderal vegetation in the populated area; 5639779 – 4831369; Oct 29<sup>th</sup>, 2006
- Trilj – on the walk along the Cetina River bank; 5639650 – 4831385; Oct 29<sup>th</sup>, 2006.

***Conyza canadensis* (L.) Cronq. (Asteraceae)**

A neophyte originating from North America (CRONQUIST, 1976). All the herbarium samples of this species from the Croatian herbarium (ZA) and the Ivo and Marija Horvat herbarium (ZAHO) have been published by MILOVIĆ (2004). MILOVIĆ (2004) has produced a list of Croatian locations recorded in the literature and new locations from his research work.

The new localities:

- Omiš – in a high-school park and in ruderal vegetation around the Galeb factory; 5637110 – 4812173; Oct 28<sup>th</sup>, 2006
- Podgrađe – in ruderal vegetation along the road; 5650207 – 4811968; Oct 29<sup>th</sup>, 2006
- Podgrađe – along the road; 5651025 – 4811891; Oct 29<sup>th</sup>, 2006
- Ostrvica – in ruderal vegetation along the road; 5642238 – 4813972; Oct 29<sup>th</sup>, 2006
- Svinišća – along the road; 5645086 – 4811314; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road near the Cetina River; 5650565 – 4810984; Oct 28<sup>th</sup>, 2006
- on building waste materials; 5651763 – 4811349; Oct 28<sup>th</sup>, 2006
- in a yard; 5647291 – 4814397; Oct 29<sup>th</sup>, 2006
- Trilj – ruderal vegetation around the bridge over the Cetina River; 5639750 – 4831390; Oct 29<sup>th</sup>, 2006

***Conyza sumatrensis* (Retz.) E. Walker. (Asteraceae)**

A neophyte originating from tropical America (PIGNATTI, 1982). Recently recorded by MILOVIĆ (2004) in a large number of locations along the east coast of the Adriatic Sea. Recorded in the above mentioned work for Omiš and Radmanove mlinice.



The new localities:

- Omiš – in ruderal vegetation along the road; 5636940 – 4812576; Sep 17<sup>th</sup>, 2005; in ruderal vegetation on the town beach; Oct 28<sup>th</sup>, 2006
- Dobra voda – along the road; Sep 25<sup>th</sup>, 2005
- Kučići – along the road and in cultivated fields; Sep 25<sup>th</sup>, 2005
- in ruderal vegetation along the road; 5637064 – 4814092; 5638262 – 4814811; Oct 29<sup>th</sup>, 2006
- Gata – in a deserted orchard; 5639559 – 4814593; Oct 29<sup>th</sup>, 2006
- Čišla – in a deserted garden; 5641151 – 4814396; Oct 29<sup>th</sup>, 2006
- Kaštil Slanica- in ruderal vegetation along the road; 5640792 – 4812426; Oct 28<sup>th</sup>, 2006
- ruderal vegetation near the Cetina River; 5637819 – 4813216; Oct 28<sup>th</sup>, 2006
- along the road; 5642125 – 4811887; Oct 28<sup>th</sup>, 2006
- on a meadow near the Cetina River; 5642974 – 4811699; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5644922 – 4811294; 5644527 – 4811251; Oct 28<sup>th</sup>, 2006
- Svinišća – along the road; 5645086 – 4811314; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5645986 – 4811421; 5645959 – 4811914; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5651042 – 4811221; 5651458 – 4811287; Oct 28<sup>th</sup>, 2006
- Kostanje – on building waste materials along the road; 5649095 – 4812203; Oct 28<sup>th</sup>, 2006
- Blato upon Cetina; 5649678 – 4816720; 5649254 – 4817051; Oct 29<sup>th</sup>, 2006
- Trilj – ruderal vegetation in the populated area; 5639779 – 4831369; Oct 29<sup>th</sup>, 2006
- Trilj – on a lawn near the Cetina River; 5639706 – 4831339; Oct 29<sup>th</sup>, 2006
- Trilj – in ruderal vegetation along the road; 5640150 – 4832071; Oct 29<sup>th</sup>, 2006
- Čikotina lađa; 5641565 – 4822342; Oct 29<sup>th</sup>, 2006

### ***Datura inoxia* Mill. (Solanaceae)**

Recorded for the first time in Croatian flora for Suđurađ on the island of Šipan (M. HEČIMOVIĆ, 1981), and later on the islet of Bobara (S. HEČIMOVIĆ, 1982), the islands of Brač (ŠTAMOL & MARKOVIĆ, 1985; ZI. PAVLETIĆ & TRINAJSTIĆ, 1990), Murter (FRANJIĆ, 1993; PANDŽA & ZI. PAVLETIĆ, 1996), Kornat (PANDŽA & STANČIĆ, 1995), Kaprije (FRANJIĆ & PANDŽA, 1996), ZLARIN (PANDŽA, 1998), Vis (FRANJIĆ & TRINAJSTIĆ, 1996) and for the continental parts of Croatia by FRANJIĆ (1993), FRANJIĆ & TRINAJSTIĆ (1996), HULINA (1998).

During the 1994–2000 period, it was found in a number of locations along the east Adriatic coast (PANDŽA & STANČIĆ, 1999; PANDŽA *et al.*, 2001; MILOVIĆ, 2002). In August 1999, it was found in ruderal vegetation of the town of Omiš (PANDŽA *et al.*, 2001).

The new locality is in Kostanje – in a flower garden and on a trash heap; 5648829 – 48 13131; Sep 17<sup>th</sup>, 2005.

It has spread over yards, flower gardens, gardens and ruderal surfaces – *ergasiophyte* (TRINAJSTIĆ, 1975) (Fig. 3).

### *Eleusine indica* (L.) Gaertn. (*Poaceae*)

This adventive species originates from southwest Asia and is widespread in the warm climates of the world (VREŠ, 1996). First recordings in the Croatian flora were made in autumn 1955 in Kaldanija near Umag (HODAK, 1960), in ruderal vegetation. Later it was found in the continental region (Zagreb and its vicinity, Dugo selo, Lipik, Vukovar, Baranja) and along the coastline (Rijeka, Poreč, Sukošane, Šibenik, Rogoznica, Trogir, Kaštel Gomilica, Split, Makarska, delta of the Neretva, Dubrovnik), (MARKOVIĆ & HULINA, 1970; TOPIĆ & ŠEGULJA, 1978; IVKOVIĆ, 1982; TOPIĆ & KUSULJA, 1987, 1989; LOVRIĆ & RAC, 1987; DUBRAVEC *et al.*, 1989; HULINA, 1989; ILIJANIĆ, 1989; JOGAN, 1990; ILIJANIĆ *et al.*, 1991; VREŠ 1996; ČARNI & JOGAN, 1998; ŠILIĆ & ŠOLIĆ, 1999; MILOVIĆ, 2001, 2002; PANDŽA *et al.*, 2001).

A new locality is in Omiš, in a high-school yard in ruderal vegetation on a trodden surface; 5637368 – 4812398; Oct 28<sup>th</sup>, 2006.

### *Erigeron annuus* (L.) Pers. (*Asteraceae*)

A neophyte originating from North America (HALLIDAY, 1976: 117). Recorded for the island of Murter (PANDŽA, 1998b), Šibenik and Perković (MILOVIĆ, 2002), along the Cetina River and the village of Svinišće (ŠILIĆ & ŠOLIĆ, 1999).



Fig. 3. *Datura inoxia* Mill.

The new localities:

- Ivanova Blato upon Cetina; Sep 17<sup>th</sup>, 2005
- Kostanje; Sep 17<sup>th</sup>, 2005
- Radmanove mlinice; in ruderal vegetation; 5642359 – 4811305; Sep 25<sup>th</sup>, 2005
- Trilj – in ruderal vegetation in populated area; 5640053 – 4831825; Sep 25<sup>th</sup>, 2005
- on a deserted field near the Ruda stream; Sep 25<sup>th</sup>, 2005
- Kaštil Slanica – in ruderal vegetation along the road; 5640792 – 4812426; Oct 28<sup>th</sup>, 2006
- on a meadow by the Cetina River; 5642974 – 4811699; Oct 28<sup>th</sup>, 2006
- along the road; 5644922 – 4811294; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road; 5645986 – 4811421; 5648156 – 4810983; 5650591 – 4810874; 5650565 – 4810984; 5651042 – 4811221; Oct 28<sup>th</sup>, 2006
- Kostanje – on building waste materials; 5649095 – 4812203; Oct 28<sup>th</sup>, 2006
- Gata – in a deserted orchard; 5639559 – 4814593; Oct 29<sup>th</sup>, 2006
- Blato upon Cetina – on cultivated soil; 5649254 – 4817051; Oct 29<sup>th</sup>, 2006
- Ugljane – along the road; 5642580 – 4826750; Oct 29<sup>th</sup>, 2006
- Trilj – on a meadow near the Cetina River; 5639706 – 4831339; Oct 29<sup>th</sup>, 2006
- Trilj – on a path along the Cetina River bank; 5639650 – 4831385; Oct 29<sup>th</sup>, 2006
- Čikotina lađa – in a flower garden; 5641649 – 4822287; Oct 29<sup>th</sup>, 2006
- Srijani – in ruderal vegetation around the Health Center; 5641389 – 4821976; Oct 29<sup>th</sup>, 2006
- Trnbusi – on a meadow along the road; 5646871 – 4817397; Oct 29<sup>th</sup>, 2006
- Podgrađe – in ruderal vegetation along the road; 5650207 – 4811968; Oct 29<sup>th</sup>, 2006

### *Euphorbia maculata* L. (*Euphorbiaceae*)

A neophyte originating from North America (SMITH & TUTIN, 1968:216), (Fig. 4). In the Croatian coastal area recorded for Šibenik by VISIANI (1826). ILIJANIĆ (1957) recorded quite a few findings of the species in the plains of the Croatian mainland, from Karlovac in the west to Okučani in the east. Also recorded for the island of Hvar (TRINAJSTIĆ, 1993), Makarska – in parks and plantations of S<sup>t</sup> Frances monastery (TRINAJSTIĆ *et al.*, 1993), as well as for several localities in Istra and Kvarner (ČARNI, 1996; ČARNI & JOGAN, 1998). For Rabac, the island of Žirje, Jezera on the island of Murter, Vodice, Srma, Raslina, Jadrija, Lozovac, Šibenik, Brodarica, Jadrovac, Perković, Primošten and Grebaštica it was recorded by PANDŽA *et al.* (2001) and MILOVIĆ (2001).

The new localities:

- in ruderal vegetation along the road near the Cetina River; 5650551 – 4810927; Oct 28<sup>th</sup>, 2006
- along the road; 5644220 – 4813517; 5647291 – 4814397; Oct 29<sup>th</sup>, 2006



Fig. 4. *Euphorbia maculata* L.

- along the road margins some 100 m in length; 5648298 – 4814721; Oct 29<sup>th</sup>, 2006
- Nova sela – on trampled ground around houses; 5643239 – 4821097; Oct 29<sup>th</sup>, 2006
- Trilj – on the path along the Cetina River bank; 5639592 – 4831174; Oct 29<sup>th</sup>, 2006

#### ***Euphorbia prostrata* Aiton (*Euphorbiaceae*)**

A neophyte originating from North America (SMITH & TUTIN, 1968: 216). First recordings in Croatian flora for Mali Lošinj (ČARNI & JOGAN, 1998). After that, found in a large number of locations – Rijeka, Zadar, Šibenik and its surroundings, Trogir, Split, Makarska (MILOVIĆ & RANDIĆ, 2001), Karlobag, Sukošan, Sv Filip i Jakov, Murter, the island of Žirje, Vodice, Srma, Grebaštica, Rogoznica, Suknovci, Podgora (PANDŽA *et al.*, 2001).

The new localities:

- Omiš – along the road; Sep 25<sup>th</sup>, 2005
- in ruderal vegetation near the Cetina River; Sep 25<sup>th</sup>, 2005
- Radmanove mlinice – along the road; Sep 25<sup>th</sup>, 2005
- Omiš – ruderal vegetation in a high-school park; 5637368 – 4812398; Oct 28<sup>th</sup>, 2006
- Omiš – ruderal vegetation around the bridge over the Cetina River; Oct 28<sup>th</sup>, 2006
- along the road; 5637528 – 4812824; Oct 28<sup>th</sup>, 2006
- shady slopes of the Omiška Dinara mountain; 5639325 – 4812902; Oct 28<sup>th</sup>, 2006

- ruderal vegetation on the building waste materials; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006
  - Omiš – in ruderal vegetation around the bus station; 5636912 – 4812564; Oct 29<sup>th</sup>, 2006
  - Gata – in a deserted orchard; 5639559 – 4814593; Oct 29<sup>th</sup>, 2006
  - Trilj – on a path along the Cetina River bank; 5639650 – 4831385; Oct 29<sup>th</sup>, 2006
- Grows on anthropogenous habitats by roads, walls, canals, bridges, along the pavement cracks.

### ***Galinsoga parviflora* Cav. (Asteraceae)**

A South American neophyte (TUTIN, 1976: 144). Occurs frequently in Croatian lowlands (gardens, fields, flower gardens, potatoe fields, corn fields). Rarely found in the coastal area, by the Krka River (MARKOVIĆ *et al.*, 1993), Makarska (TRINAJSTIĆ *et al.*, 1993), Pazin, Brest, Rijeka, Crikvenica, Pula, Rabac, Rab, Jablanac, St. Juraj and Kalić, Senj, Zadar, Unešić, Murter, Vodice, Šibenik, Knin, Krapanj, Grebaštica, Perković, Kistanje and Knin (MILOVIĆ, 2001, 2002; PANDŽA *et al.*, 2001).

The new localities:

- Trilj – on a path along the Cetina River bank; 5639592 – 4831174; Sep 25<sup>th</sup>, 2005
- in ruderal vegetation along the road; 5645959 – 4811914; Oct 28<sup>th</sup>, 2006
- in ruderal vegetation along the road near the Cetina River; 5650565 – 4810984; Oct 28<sup>th</sup>, 2006
- Trilj – ruderal vegetation around the bridge over the Cetina River; 5639750 – 4831390; Oct 29<sup>th</sup>, 2006
- Trilj – in a meadow by the Cetina River; 5639706 – 4831339; Sep 25<sup>th</sup>, 2005
- Čikotina lađa – in a flower garden and a vegetable garden; 5641649 – 4822287; Oct 29<sup>th</sup>, 2006.
- Srijani – in ruderal vegetation around the Health Center; 5641389 – 4821976; Oct 29<sup>th</sup>, 2006

### ***Paspalum paspalodes* (Michx.) Scribn. (Poaceae)**

An adventive species of neotropical origins (Fig. 5). First recordings in Croatia in the Neretva valley, between Metković and Opuzen, Metković and Gabela in 1947 in swamp vegetation (HORVATIĆ, 1949). Also recorded for Korčula (TRINAJSTIĆ, 1985), along the Krka River (MARKOVIĆ *et al.*, 1990, 1993), Split, Kaštel Sućurac and Kaštel Gomilica (ILIJANIĆ *et al.*, 1991), Makarska (TRINAJSTIĆ *et al.*, 1993), Betina, Pakoštane, Biograd (PANDŽA *et al.*, 2001), Jadrtovac and Vrpolje (MILOVIĆ, 2001, 2002).

The new localities:

- Ivanovo Blato on the Cetina; Sep 17<sup>th</sup>, 2005
- Omiš – in ruderal vegetation along the road; 5636940 – 4812576; Sep 17<sup>th</sup>, 2005
- ruderal vegetation on the building waste materials along the road; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006.



Fig. 5. *Paspalum paspalodes* (Michx.) Scribn.

### *Phytolacca americana* L. (Phytolaccaceae)

A neophyte originating from the USA (WEBB & AKEROYD, 1993: 134) (Fig. 6). Recorded for the islands of Šipan (M. HEĆIMOVIĆ, 1981); Lokrum (S. HEĆIMOVIĆ, 1982), Korčula (TRINAJSTIĆ, 1985), Kaprije (FRANJIĆ & PANDŽA, 1996), Hvar (TRINAJSTIĆ, 1993), Zlarin (PANDŽA, 1998), Murter (PANDŽA, 1998b), Žirje (PANDŽA, 2003), along the Krka River (MARKOVIĆ *et al.*, 1993), near Omiš (RADIĆ, 1976), Makarska (ŠILIĆ & ŠOLIĆ, 1999) in Nova Ves, Čalinac, Đurđevački peski, Dilj-Čardak, Klokočevik, Trnava, Osijek, Bilje, Zadar and Brgat-Dubrovnik (PANDŽA *et al.*, 2001).

The new location is in Omiš in a high-school park (5637110 – 4812173) and around the Galeb factory; 5637110 – 4812173; Sep 25<sup>th</sup>, 2005.

### *Tagetes minuta* L. (Asteraceae)

A neophyte originating from South America (HANSEN, 1976:144), (Fig. 7). First recordings for Croatian flora were made some seventy years ago (HAYEK, 1928-1931:618) as *Tagetes glandulifera* Schrk. During the last thirty years, it was found in



Fig. 6. *Phytolacca americana* L.

many locations along the Adriatic coast (ŠILIC, 1973; TRINAJSTIĆ, 1971, 1974, 1985; S. HEĆIMOVIĆ, 1982; M. & S. HEĆIMOVIĆ 1987; ZI. PAVLETIĆ, 1987; ILIJANIĆ *et al.*, 1991; TRINAJSTIĆ *et al.*, 1993; JASPRICA & KOVAČIĆ, 1997a; ČARNI & JOGAN, 1998; ŠILIC & ŠOLIĆ 1999; MILOVIĆ, 2001, 2002). In the area of Biokovo, found in St. Križ near Zagvozd (ZI. PAVLETIĆ, 1987) in Makarska, Baškovići, Velo Brdo, Drvenik and Podgora (TRINAJSTIĆ *et al.*, 1993).

The new localities:

- ruderal vegetation on building waste materials along the road; 5640131 – 4812476; 5651458 – 4811287; 5651763 – 4811349; Oct 28<sup>th</sup>, 2006
- Gata – in a deserted orchard; 5639559 – 4814593; Oct 29<sup>th</sup>, 2006
- Podgrađe – in ruderal vegetation in a canal along the road; 5651025 – 4811891; Oct 29<sup>th</sup>, 2006.

#### ***Xanthium spinosum* L. (Asteraceae)**

A South American neophyte (LÖVE, 1976: 143). Recorded for the islands of Vis and Molat (DOMAC, 1955, 1963), Šipan (M. HEĆIMOVIĆ, 1981), Lastovo and Korčula



Fig. 7. *Tagetes minuta* L.

(TRINAJSTIĆ, 1979, 1985), Brač (ŠTAMOL & MARKOVIĆ, 1985), Hvar (TRINAJSTIĆ, 1993), Kornat (Opat, Koromašna, Ropotnica) (PANDŽA & STANČIĆ, 1995), along the Krka River (MARKOVIĆ *et al.*, 1993), Murter (PANDŽA, 1998b), Šibenik and its surroundings (MILOVIĆ, 2002); Zadar, Pakoštane, the villages of Lukar, Suknovci and Oklaj, Unešić, Šibenik (PANDŽA *et al.*, 2001).

New locality in Gata, along the road in ruderal vegetation; Sep 17<sup>th</sup>, 2005.

***Xanthium strumarium* L. subsp. *italicum* (Moretti) D. Löve (Asteraceae)**

A neophyte originating from North and South America (LÖVE, 1976: 143), (Fig. 8). Recorded for the islands of Mljet (REGULA-BEVILACQUA & ILJANIĆ, 1984), Korčula (TRINAJSTIĆ, 1985), Koločep (M. & S. HEĆIMOVIĆ, 1987), along the Krka River (MARKOVIĆ, *et al.*, 1993), the area around the Malostonski Bay and Pelješac (JASPRICA & KOVAČIĆ, 1997, 1997a), Šibenik and its surroundings (Jadrija, Zablaće, Perković) (MILOVIĆ, 2002), Posedarje, Murter, Oklaj, Brodarica, Marina near Trogir, Solin, Jesenice, Dugi Rat and Baška voda (PANDŽA *et al.*, 2001).





Fig. 8. *Xanthium strumarium* L. subsp. *italicum* (Moretti) D. Löve

The new localities:

- Omiš – on the town beach; 5637015 – 4812055; May 14<sup>th</sup>, 2006
- Omiš (Sinaj) – ruderal vegetation in the populated area; 5637975 – 4812397; May 14<sup>th</sup>, 2006
  - ruderal vegetation near the Cetina River; 5637819 – 4813216; Oct 28<sup>th</sup>, 2006
  - ruderal vegetation on building waste materials along the road; 5640131 – 4812476; Oct 28<sup>th</sup>, 2006
  - in ruderal vegetation along the road near the Cetina River; 5650565 – 4810984; Oct 28<sup>th</sup>, 2006
- Čišla – in a deserted garden; 5641151 – 4814396; Oct 29<sup>th</sup>, 2006
- Trilj – in ruderal vegetation along the road; 5640150 – 4832071; Sep 25<sup>th</sup>, 2005
- on a deserted field near the Ruda stream; Sep 25<sup>th</sup>, 2005.

## DISCUSSION

The species *Ambrosia artemisiifolia* recorded in Trilj near the bridge over the Cetina River, grows in ruderal vegetation on a small area and is not yet considered a dangerous weed. Nearby residents however are aware of its presence as well as its strong allergenic features.

*Amorpha fruticosa*, another allergenic species, covers large areas along the Cetina River banks from Radmanove mlinice to the river mouth. It has also been spreading over ruderal areas in the town of Omiš (spotted around the Omial factory and the new residential quarter called Sinaj). Also spotted upstream from Radmanove mlinice. Its spreading in this region will require particular attention in the future.

The species *Artemisia verlotiorum* grows on anthropogenous habitats. It spreads quite fast due to underground vine propagation.

The species *Bidens subalternans* has a distinctly thermophylic character. Recorded for quite a number of locations on ruderal habitats (along roads, within populated areas, on embankments, on building material waste heaps, in gardens, flower gardens). It has already spread over such a wide area that it endangers cultivated species, somewhat like *Ambrosia artemisiifolia* or *Galinsoga parviflora* in the continental parts of Croatia. Also noticed on piles of building material waste.

The species *Galinsoga parviflora* appears quite frequently in the continental regions of Croatia. In contrast, within the area along the Cetina River, only isolated populations were noticed. Recorded for Trilj and Čikotina lađa in gardens and flower gardens, each population abundant in quantity of individual plants.

Species of the *Conyza* genus have been spotted in abundant populations in a large number of locations, creating areas of dangerous weed. These species grow on ruderal surfaces, along roads and paths, on building material waste heaps, around residential quarters, in gardens...

The species *Conyza sumatrensis* is exceptionally distinctive for its quantity and shows a tendency to spread, assisted by favourable climate conditions (a mild winter enables its continuing existence). Other species were recorded individually or in small groups and are not regarded as dangerous weeds so far.

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## SAŽETAK

### Prilog neofitskoj flori područja rijeke Cetine

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U radu se navode 22 neofitske vrste u porječju rijeke Cetine: *Acer negundo*, *Amaranthus albus*, *A. blitoides*, *Ambrosia artemisiifolia*, *Amorpha fruticosa*, *Artemisia verlotiorum*, *Aster squamatum*, *Bidens subalternans*, *Conyza bonariensis*, *C. canadensis*, *C. sumatrensis*, *Datura innoxia*, *Eleusine indica*, *Erigeron annuus*, *Euphorbia macalata*, *E. prostrata*, *Galinsoga parviflora*, *Paspalum paspalodes*, *Phytolacca americana*, *Tagetes minuta*, *Xanthium spinosum* i *X. strumarium* subsp. *italicum*.

Posebnu pozornost zaslužuju vrste *Ambrosia artemisiifolia* i *Amorpha fruticosa*, pelud obiju vrsta je jaki alergen. Dok je vrsta *Ambrosia artemisiifolia* zabilježena u ruderalnoj vegetaciji uz most na Cetini u Trilju, vrsta *Amorpha fruticosa* obrasta velike površine uz Cetinu od Radmanovih mlinica do ušća Cetine u more.

U velikoj množini pojavljuju se vrste *Artemisia verlotiorum*, *Aster squamatum*, *Bidens subalternans*, *Conyza bonariensis*, *C. canadensis*, *C. sumatrensis* i *Erigeron annuus*.

Vrste štira – *Amaranthus albus* i *A. blitoides* javljaju se pojedinačno, pa zasada ne predstavljaju opasan korov. Vrsta *Artemisia verlotiorum* raste na antropogenim staništima. Njezino brzo širenje uvjetovano je razmnožavanjem podzemnim vriježama.

Vrsta *Aster squamatum* osobito je brojna na staništima u blizini mora i bočatih voda dok je *Bidens subalternans* obilno nazočan na ruderalnim staništima (uz ceste i putove, po naseljima, na odbačenom građevinskom otpadu, u vrtovima i cvjetnjacima, zapuštenim površinama).