NAT. CROAT. | VOL. 10 | No 4 | 259–275 | ZAGREB | December 31, 2001

ISSN 1330-0520
UDK 581.95(476.5)

original scientific paper / izvorni znanstveni rad

THE MOST RECENT STATE OF AFFAIRS IN THE DISTRIBUTION OF SOME NEOPHYTES IN CROATIA

MARIJA PANDŽA[1], JOSIP FRANJIĆ[2], IVO TRINAJSTIĆ[3], ŽELJKO ŠKVORC[2] & ZVJEZDANA STANČIĆ[4]

[1] Primary School, Murterski školji bb, HR-22243 Murter, Croatia

[2] Faculty of Forestry, University of Zagreb, Svetošimunska 25, P. O. Box 422, HR-10000 Zagreb, Croatia

[3] Dunjevac 2, HR-10000 Zagreb, Croatia

[4] Faculty of Science, Marulićev trg 20/2, HR-10000 Zagreb, Croatia

Pandža, M., Franjić, J., Trinajstić, I., Škvorc, Ž. & Stančić, Z.: The most recent state of affairs in the distribution of some neophytes in Croatia. Nat. Croat., Vol. 10, No. 4, 259–275, 2001, Zagreb.

During research into neophyte distribution in Croatia, a total of 332 new localities for 21 neophyte species has been discovered. The most numerous are new localities of *Bidens subalternans* (52), followed by *Impatiens glandulifera* (49), *Aster squamatus* (43), *Impatiens balfourii* (29), *Datura inoxia* (25), *Euphorbia prostrata* (11), *Galinsoga parviflora* (17), *Amaranthus albus* (14), *Galinsoga quadriradiata* (15), *Diplotaxis erucoides* (11), *Xanthium strumarium* ssp. *italicum* (9), *Phytolacca americana* (12), *Artemisia verlotiorum* (7), *Chamomilla suaveolens* (7), *Xanthium spinosum* (7), *Eleusine indica* (6), *Euphorbia maculata* (7), *Ambrosia artemisiifolia* (5), *Paspalum paspalodes* (3), *Euphorbia nutans* (2) and *Paspalum dilatatum* (1). The majority of the species investigated occur in all localities in a great number, only a few of them occurring individually.

Key words: neophytes, Croatia

Pandža, M., Franjić, J., Trinajstić, I., Škvorc, Ž. & Stančić, Z.: Dosadašnje stanje rasprostranjenosti nekih neofita u Hrvatskoj. Nat. Croat., Vol. 10, No. 4, 259–275, 2001, Zagreb.

Istraživanjem rasprostranjenosti neofita u Hrvatskoj ukupno je otkriveno 332 novih nalazišta za 21 neofitsku vrstu. Najviše novih nalazišta ima vrsta *Bidens subalternans* (52), zatim slijede *Impatiens glandulifera* (49), *Aster squamatus* (43), *Impatiens balfourii* (29), *Datura inoxia* (25), *Euphorbia prostrata* (11), *Galinsoga parviflora* (17), *Amaranthus albus* (14), *Galinsoga quadriradiata* (15), *Diplotaxis erucoides* (11), *Xanthium strumarium* ssp. *italicum* (9), *Phytolacca americana* (12), *Artemisia verlotiorum* (7), *Chamomilla suaveolens* (7), *Xanthium spinosum* (7), *Eleusine indica* (6), *Euphorbia maculata* (7), *Ambrosia artemisiifolia* (5), *Paspalum paspalodes* (3), *Euphorbia nutans* (2) i *Paspalum dilatatum* (1). Najveći broj istraživanih neofitskih vrsta pojavljuje se u velikoj množini na svim lokalitetima, a vrlo mali broj vrsta pojedinačno.

Ključne riječi: neofiti, Hrvatska

INTRODUCTION

Research into neophytes done so far was most frequently limited to the monitoring of one species or a small number of species only, and was often carried out in an incidental manner, so that today there is no comprehensive work in which the state of a greater number of neophytes in one locality can be seen. This work is an endeavour to analyse the species spread through the mediation of man (anthropochoriously) from other phytogeographical areas and that has become established in anthropogenic, primarily weed-ruderal, vegetation. Anthropogenic flora is strongly affected by human activity in general. In the 19th and 20th centuries, in Croatia and neighbouring countries, human migration was very pronounced and the plants from various parts of the world were brought into this region. For this reason, the region is very rich in neophytes, especially those originating from Asia (asiaticoneophytes) and North and South America (americanoneophytes, americano-neotophytes), (cf. TRINAJSTIĆ 1975; 1977).

Recently some neophytes have been spreading vigorously all over Croatia and there are many works dealing with their distribution as well as various indicators of the characters of their expansion in the coastal region (ILIJANIĆ *et al.*, 1991; FRANJIĆ, 1993; TRINAJSTIĆ *et al.*, 1993; PANDŽA & STANČIĆ, 1999). The dispersal of neophytes has been very vigorous in the last few years, and of some of them for decades, and during that time they have very often displaced the autochthonous vegetation. Most endangered are ruderal and weed vegetation, which are unable to resist such rapidly spreading neophytes. For instance, the ragweed (*Ambrosia artemisiifolia*) is so frequent in the lowlands of Croatia that it is displacing all autochthonous weed species, which simply have no response to its expansion and cannot compete with it. This species was very rare in the coastal region and on the islands, but in the last few years it began to spread considerably there, too. Therefore, on this occasion its distribution will be discussed in the Mediterranean region only, while for the inland part of Croatia, with the exception of mountainous and hilly regions, it can be said this species is very generally spread. A similar situation exists with respect to *Galinsoga parviflora*, which requires habitats of better quality and richer in nutritives than the ragweed, and which in the Mediterranean region also is a rarity. Its congenial species *G. quadriradiata* is even more demanding in respect to habitat, and it is rare not only in the Mediterranean region but in the Croatian hinterland, too. *Echinocystis lobata* and *Reynoutria japonica* are also species generally spread in inland Croatia while in the Mediterranean region they are very rare. *Datura inoxia* is spread equally in the inland and in the Mediterranean regions, although there are some indications that in the inland region it is spread anthropogenically from the Mediterranean region (cf. FRANJIĆ, 1993). Some species occur in the Mediterranean and sub-Mediterranean regions only, while in the inland region they do not exist at all, such as *Amaranthus albus*, *Aster squamatus*, *Bidens subalternans*, *Diplotaxis erucoides*, *Euphorbia prostrata*, *Paspalum dilatatum*, *P. paspalodes*, *Xanthium spinosum*, *X. strumarium* ssp. *italicum*. Most often these species originate from the warm regions of South America and the West Mediterranean, so it is not expected that they will spread in Croatia.

THE MOST RECENT STATE OF AFFAIRS IN THE DISTRIBUTION AND NEW LOCALITIES OF NEOPHYTES INVESTIGATED IN CROATIA

For greater accessibility in the survey, all researched neophyte species investigated are presented in alphabetic order, an indication being given of literature sources for their localities known so far. The distribution of some neophytes (*Ambrosia artemisiifolia* and *Galinsoga parviflora)* is shown for the Croatian littoral only, and not for the inland part of Croatia where it can be said that these species are generally spread and common. The localities of the species *Echinocystis lobata* and *Reynoutria japonica*, also investigated, are not presented either, because in the Croatian hinterland they are almost generally spread while in the littoral they are not known at all (*E. lobata*) or are very rare (*R. japonica*). A total of 332 new localities of 21 neophytic species has been discovered. The greatest number of new localities is for *Bidens subalternans* (52), then follow *Impatiens glandulifera* (49), *Aster squamatus* (43), *Impatiens balfourii* (29), *Datura inoxia* (25), *Euphorbia prostrata* (11), *Galinsoga parviflora* (17), *Amaranthus albus* (14), *Galinsoga quadriradiata* (15), *Diplotaxis erucoides* (11), *Xanthium strumarium* ssp. *italicum* (9), *Phytolacca americana* (12), *Artemisia verlotiorum* (7), *Chamomilla suaveolens* (7), *Xanthium spinosum* (7), *Eleusine indica* (6), *Euphorbia maculata* (7), *Ambrosia artemisiifolia* (5), *Paspalum paspalodes* (3), *Euphorbia nutans* (2) and *Paspalum dilatatum* (1). The majority of species occur in large numbers in all localities, while only few of them occur individually, which indicates the strong aggressiveness of the neophytes. Moreover, all species demonstrate a remarkable vitality, and damage or disease is rarely seen on them although some species are known to be carriers of certain diseases (cf. FRANJIĆ *et al.*, 1998). For every new habitat the date of discovery, the site and the UTM coordinates are given (cf. NIKOLIĆ *et al.*, 1998).

1. ***Amaranthus albus* L. (*Amaranthaceae*) –** originates from America (americano-neotophyte). In the Šibenik area, it has been reported for the Krka River area (MARKOVIĆ *et al.*, 1990; 1993), the island of Svetac (ZI. PAVLETIĆ, 1978), the island of Palagruža (ZI. PAVLETIĆ, 1978a), Milna on the island of Brač (ŠTAMOL & MARKOVIĆ, 1985), the island of Hvar (TRINAJSTIĆ, 1993), the island of Zlarin (PANDŽA, 1998), in Lučica on the island of Kornat (PANDŽA & STANČIĆ, 1995) and in Betina on the island of Murter (PANDŽA, 1998b). New localities are: Trogir (29. 10. 1999) along the road near the market (XJ01), Karlobag (29. 9. 1998) along the road next to the bus stop (WK03), Velike Vruje and Suha Punta on the island of Kornat (18. 7. 1996) in a trampled habitat between the houses and near the port (WJ24), Sv. Filip i Jakov (11. 9. 1998) in ruderal vegetation and in town's flower gardens (WJ36), the island of Žirje (2. 10. 1999) in Muna Cove and in the village (WJ53), Srima (30. 8. 2000) in a trampled habitat along the houses (WJ64), Zaton and Raslina (10. 9. 1998) along the road (WJ65), Rogoznica and Primošten (13. 10. 2000) in a trampled habitat along the houses (WJ72), Brodarica (15. 9. 1998) along the road (WJ73), Šibenik (10. 9. 1996) in Njivice along the track (WJ74). As it occurs on trampled sand soils and along roads in settlements, and individually, it does not yet constitute a danger.

2. ***Ambrosia artemisiifolia*** **L. (*Asteraceae*)** – is a neophyte originating from North America. In the littoral area it is a rare species and does not constitute a danger. For the Šibenik area along the Krka River it has been reported by MARKOVIĆ *et al*. (1993), and for Milna on the island of Brač by ŠTAMOL & MARKOVIĆ (1985). New localities are: Murter (17. 10. 1999) in ruderal vegetation on Luke and in flower gardens (WJ45), Pakoštane (11. 9. 1998) on the shore in ruderal vegetation and in a flower garden (WJ46), Tisno (29. 8. 2000) in the flower gardens near the port (WJ54), Vodice (14. 7. 1999) along parks in flower gardens (WJ64), Zaton near Šibenik (10. 9. 1998) in flower gardens and along the road in ruderal vegetation (WJ65).

3. ***Artemisia verlotiorum*** **Lamotte (*Asteraceae*) –** is asiaticoneophyte first reported by MELZER (1980) for Poreč in Istria. In the inland part of Croatia, the first localities of this species were discovered on the banks of the Sava River downstream of Ključ, near Rugvica and Podsused, as well as near the railway station of Podsused MARKOVIĆ (1970). In December of 1990, it was found in Split in ruderal vegetation (ILIJANIĆ *et al*., 1991). Numerous new localities of this species are reported by SMITAL *et al*. (1998). The new localities are: Zadar (15. 10. 2000) next to the bus station in ruderal vegetation (WJ18), the wider area of Murter and Betina (23. 7. 1995) in ruderal vegetation and in flower gardens (WJ45), Jezera on the island of Murter (9. 9. 2000) in the marina flower garden (WJ54), Oklaj (5. 11. 2000) along the road around Osmenovac pool and in ruderal vegetation in the settlement (WJ86), Unešić (7. 6. 1998) in ruderal vegetation in the settlement (WJ94), Drniš (5. 11. 2000) in ruderal vegetation around the bus station (WJ95).

4. ***Aster squamatus*** **(Sprengel) Hieron. (*Asteraceae*)** – originating from Central and South America, it was registered in Croatia for the first time in 1970 in the Neretva River valley near Ploče (cf. Hb I. TRINAJSTIĆ) and then by MELZER (1980) for Gradac. For the island of Mljet it was noted by REGULA-BEVILACQUA & JURKOVIĆ-BEVILACQUA (1980) and by REGULA-BEVILACQUA & ILIJANIĆ (1984). For the Krka River area it was reported by MARKOVIĆ *et al*. (1993), for Makarska by TRINAJSTIĆ *et al*. (1993), for Tarac (island of Kornat) by TRINAJSTIĆ (1996), for the wider area of Malostonski zaljev by JASPRICA & KOVAČIĆ (1997) and for the island of Zlarin by PANDŽA (1998). New localities are: Zaglav on the island of Dugi (7. 8. 1998) in flower gardens (WJ16), Zadar (29. 9. 1998) in ruderal vegetation (WJ18), Sukošan (2. 9. 1998) in settlements along the roads near the sea (WJ27), the island of Murter (autumn 1995) along the roads and in ruderal vegetation in Murter and Betina, the island of Tegina (WJ45), Pakoštane (11. 9. 1998) on the shore in ruderal vegetation (WJ46), the island of Žirje (3. 10. 1999) in Mikavica Cove as a part of ruderal vegetation (WJ53), Tribunj and Jezera (10. 9. 1998) in ruderal vegetation in the settlement (WJ54), Pirovac (29. 9. 1999) along the coast in the settlement (WJ55), Vodice and Srima (4. 10. 1996) by the sea around the marina and on many other places along the roads near the sea (WJ64), Raslina (10. 9. 1998) near the sea in settlement (WJ65), Rogoznica and Primošten (30. 7. 1997) in ruderal vegetation (WJ72), Brodarica and Grebaštica

(20. 10. 2000) in settlements in ruderal vegetation (WJ73), the hotel complex *Solaris* (autumn 1991) around hotels *Ivan* and *Andrija* (WJ74), Šibenik (26. 10. 1996) in Crnica, Njivice along the roads and at the railway station (WJ74), Bilice near Šibenik (25. 9. 1998) along the roads in the settlement (WJ74), Seget Vranjica (16. 10. 1999) near the sea (WJ81), Makarska and Tučepi (4. 9. 1998) in the town, in ruderal vegetation (confirmed, XH69), Ploče (30. 10. 1999) the swamp area near the port of Ploče, near the bus station, in the settlement on grass-plots and ruderal areas (XH96), Rogač on the island of Šolta (autumn 1999) in ruderal vegetation in the settlement (XJ00), Trogir and surrounding areas, the island of Čiovo (16. 10. 1999) in ruderal vegetation around the hotel (XJ01), Kaštel Štafilić (10. 1999) in ruderal vegetation in the settlement (XJ02), Split (28. 10. 1999) along the road and on lawns in the town (XJ11), Split-Solin (30. 7. 1997) along the roads (XJ12), Krilo Jesenice, Podstrana, Stobreč, Supetar Jesenice (16. 10. 1999) by the sea (XJ21), Dugi Rat and Omiš (17. 10. 1999) by the sea and in ruderal vegetation in settlements (XJ31), Mimice (17. 10. 1999) by the sea and in the settlement along the road (XJ41), Baška Voda, Promajna and Brela (17. 10. 1999) near the lawns and in ruderal vegetation (XJ50), Dubrovnik-Brgat (31. 10. 1999) in ruderal vegetation (BN62).

5. ***Bidens subalternans* DC. (*Asteraceae*)** – originates from warm regions of South America. This is a species of markedly thermophilic character the migration of which is, therefore, limited to warmer parts of Europe. It spreads epizoocornally. For Croatia, it was noted for the first time in 1956 in Trsat (Rijeka) and Opatija as *B. bipinnata* L. (cf. TRINAJSTIĆ, 1975a). Under the name of *B. bipinnata*, many localities of this neophyte were published (TRINAJSTIĆ, 1978; 1979a; 1987; 1993a; ILIJANIĆ & HEĆIMOVIĆ, 1983; ILIJANIĆ *et al.*, 1991; MARKOVIĆ *et al.*, 1990; 1993). The first locality of *B. subalternans* in the Croatian flora was reported by MELZER (1987) for Senj and Bale near Pula, and shortly afterwards for several localities in the northern Adriatic littoral by MELZER & BREGANT (1989). TRINAJSTIĆ (1993a) made a revision of all localities of *B. bipinnata* published until that date and concluded that all the published localities referred in fact to *B. subalternans.* The new localities are: Karlobag (9. 1998) along the roads and in ruderal vegetation in the settlement (WK03), Starigrad Paklenica (29. 9. 1998) along the roads (WK30), Zadar (29. 9. 1998) along the roads in ruderal vegetation (WJ18), Sukošan (29. 9. 1998) on neglected areas in the settlement (WJ27), Biograd, Sv. Filip i Jakov, Turanj and Sv. Petar (11. 9. 1998) along the road (WJ36), Veli Vinik near Murter (23. 7. 1997) on cultivated land (WJ45), Pakoštane and Drage (11. 9. 1998) along the roads and flower gardens (WJ46), the island of Žirje (2. 10. 1999) in Muna village (WJ53), Tribunj (11. 9. 1998) along the roads (WJ54), Pirovac, Makirina and Kapela (11. 9. 1998) on neglected areas and along the roads (WJ55), Zablaće, Vodice and Srima (4. 10. 1996) in ruderal vegetation in settlements (WJ64), Zaton and Raslina (10. 9. 1998) along the roads and near the houses (WJ65), Rogoznica, Podorljak, Primošten, Bila, Podorljak, Špardići (30. 7. 1997) along the roads (WJ72), Marina (9. 1998) along the road in ruderal vegetation (WJ80), Brodarica, Crveni brig, Jadrtovac and Grebaštica (15. 9. 1998) along the roads and in ruderal vegetation (WJ73), Šibenik and Bilice (9. 1984.) in yards

and along roads (WJ74), Skradinski buk (5. 10. 1996) along the road (WJ75), Konjevrate (5. 11. 2000) along the road (WJ84), Oklaj, Suknovci-Promina (5. 11. 1999) in ruderal vegetation and along the roads (WJ86), Drniš (5. 11. 2000) along the road (WJ95), Trogir (16. 10. 1999) above Medena hotel (XJ01), Split (4. 9. 1998) in ruderal vegetation in the town (XJ11), Supetar Jesenice (16. 10. 1999) by the sea (XJ21), Omiš and Dugi Rat (4. 9. 1998) on neglected areas in settlements (XJ31), Mimice (17. 10. 1999) along the roads (XJ41), Brela (9. 1996) in ruderal vegetation (XJ50), Podgora (5. 9. 1998) ruderal area and along the roads (XH69), Ploče (10. 1999) in parks and along the roads in the settlement (XH96), Neum and Klek (30. 10. 1999) along the roads, in ruderal vegetation in the settlement (YH25), Slano (31. 10. 1999) ruderal vegetation along the roads in settlement (YH34), Slano (summer 2000) in the settlement (YH34), Zaton near Dubrovnik (summer 2000) in ruderal vegetation (BN53). Over time it has become so spread that today in some countries it constitutes a dangerous weed, like *Ambrosia artemisiifolia* or *Galinsoga parviflora* in the inland part of Croatia.

6. ***Chamomilla suaveolens* (Pursh) Rydb. (*Asteraceae*)** – was registered for the territory of Croatia first by MARKOVIĆ & LUKAČ (1993) who supplied the data on the distribution and habitats of this neophyte in Croatia. The main area of its distribution is north-west Croatia (Gorski kotar and Lika). In this work, 67 new localities are given. The new localities are: Žutnica (5. 8. 1999) around the railway station (WM61), Sv. Matej near Gornja Stubica (30. 7. 1999) along the road (WL79), Nova Ves (27. 7. 1999) in a trampled habitat along the road (WH93), Levanjska Varoš, Musić, Majar and Slobodna Vlast (8. 1996) in ruderal vegetation (BR72).

7. ***Datura inoxia* Miller *(Solanaceae)*** – was noted for the first time for the Croatian flora at Sućurađ on the island of Šipan by M. HEĆIMOVIĆ (1981), and was later found in many localities (S. HEĆIMOVIĆ, 1982; ŠTAMOL & MARKOVIĆ, 1985; TRINAJSTIĆ & ZI. PAVLETIĆ, 1990; FRANJIĆ, 1993; PANDŽA & ZI. PAVLETIĆ, 1996; PANDŽA & STANČIĆ, 1995; FRANJIĆ & TRINAJSTIĆ, 1996; FRANJIĆ & PANDŽA, 1996; HULINA, 1998; PANDŽA, 1998; PANDŽA & STANČIĆ, 1999). The new localities are: Rijeka (4. 8. 2001) in ruderal vegetation (VL52), Zlatar Bistrica (2. 8. 1999) in a flower garden (WM80), Karlovec Ludbreški (1. 8. 1999) in a flower garden (XM22), Slapno near Ozalj (spring 1999) in ruderal vegetation near the settlement (WL35), Škrinjari (summer 1999) by a house (XL18), Levanjska Varoš and Slobodna Vlast (8. 1998) in ruderal vegetation and growing in settlements (BR72), Sv. Ivan Žabno (8. 1999) in ruderal vegetation in the settlement (XL28), Rabac and Labin (29. 6. 2000) in a flower garden (VK39), Jablanac (8. 2000) around the *Ablana* hotel (VK95), Sveti Juraj (8. 1999) on more ruderal areas in the settlement (VK97), Preko – the island of Ugljan (21. 5. 1999) in ruderal vegetation near the sea (WJ08), Sukošan (15. 10. 2000) in ruderal vegetation in the settlement (WJ27), Betina (24. 10. 2000) in ruderal vegetation (WJ45), Jezera (9. 9. 2000) in court--yards and on abandoned land (WJ54), Primošten and Šparadići (13. 10. 2000) in an olive-grove and in flower gardens (WJ72), Crveni brig, Brodarica and Žaborić (20. 10. 2000) in the garden on abandoned land (WJ73), Rogač – the island of

Šolta (7. 2000) in ruderal vegetation (XJ00), Omiš (8. 1999) in ruderal vegetation in the settlement (XJ31), Vinkovci (13. 8. 2001) along the road (CR21), Lug (22. 7. 2001) along the road (CR26). It spreads along roads, in courtyards, gardens and in ruderal vegetation as an ergasiophygophyte.

8. ***Diplotaxis erucoides* (L.) DC. (*Brassicaceae*).** This West Mediterranean species was reported for the first time for the Croatian flora near Šibenik by ZI. PAVLETIĆ (1987). Afterwards it was reported by ZI. PAVLETIĆ & PANDŽA (1994) for Srima, Vodice, Tribunj, Pirovac, Tisno, Murter, Jezera, Brodarica, Krapanj, Rogoznica, Trogir and in the Šibenik hinterland for Bilice, Vrpolje, Danilo Biranj and Danilo Gornje, Perković, Lozovac and Stankovci. For the Krka River area it was reported by MARKOVIĆ *et al*. (1993), and for the island of Kaprije by FRANJIĆ & PANDŽA (1996). New localities are: Stubalj, Zaton near Šibenik and Raslina (5. 1997) in ruderal vegetation (WJ65), Primošten and Šparadići (27. 4. 1996) on uncared for areas and along the road (WJ72), Grebaštica, Žaborić and Crveni brig (13. 10. 2000) on uncared for areas, gardens and in courtyards (WJ73), Južna Dubrava (16. 8. 1997) in a garden (WJ74), Lozovac (5. 10. 1996) in gardens (WJ75), between Žitnić and Drniš (5. 11. 2000) on a rubbish-heap (WJ95).

9. ***Eleusine indica* (L.) Gaertner (*Poaceae*)** – is an adventive species spread all over the world. For the Croatian flora, it was reported for the first time in the autumn of 1955 for the Kaldanija area near Umag (HODAK, 1960) as a part of ruderal vegetation. Afterwards, it was also reported for other localities (cf. MARKOVIĆ & HULINA, 1970; TOPIĆ & ŠEGULJA, 1978; IVKOVIĆ, 1982; LOVRIĆ & RAC, 1987; TOPIĆ & KUSULJA, 1987; DUBRAVEC *et al*., 1989; HULINA, 1989; ILIJANIĆ, 1989; JOGAN, 1990; ILIJANIĆ *et al*., 1991; VREŠ, 1996). The new localities are: Kunjevci (summer 1999) by a hunter's lodge (CR21), Sukošan (15. 10. 2000) on moist trodden land along the court-yard fence in the area of Ždralovac (WJ27), Rogoznica (13. 10. 2000) on a swampy trodden area by St. Ivan chapel (WJ72), Šibenik (15. 9. 1998) along the road near the railway station (WJ74), Trogir (9. 1999) on a stile near the market by the sea (XJ01), Split (29. 10. 1999) along the pavement near the Marjan hotel (XJ11).

10. ***Euphorbia maculata* L. (*Euphorbiaceae*)** – originates from North America and was first reported in the Croatian littoral for the Šibenik area by VISIANI (1826). Afterwards, this species was discovered in the wider area of Rijeka (THELLUNG, 1917; JAVORKA, 1925), and the same localities were also confirmed by ILIJANIĆ (1957), then in Karlovac, along the railway lines Zagreb-Novska (via Sisak), Zagreb-Vinkovci, Vinkovci-Brčko, Osijek-Voćin, Vinkovci-Banova Jaruga, and in the Zagreb Botanical Garden. For Hvar it was reported by TRINAJSTIĆ (1993), and for Makarska by TRINAJSTIĆ *et al*. (1993a). The new localities are: Rabac (29. 6. 2000) along the road (VK39), the island of Žirje (3. 10. 1999) in Tratinska cove (WJ53), Jezera (15. 10. 1999) in cracks in walls and on stiles in the Lovišća auto-camp (WJ54), Vodice and Srima (14. 8. 2000) in ruderal vegetation and along the roads (WJ64), Brodarica and Grebaštica (15. 9. 1998) in ruderal vegetation and along the road (WJ73).

11. ***Euphorbia nutans*** **Lag. (*Euphorbiaceae*)** was first discovered in the inland part of Croatia near Zagreb by GOSPODARIĆ (1955). ILIJANIĆ (1957) reports it for Ozalj, then along the railway lines Zagreb-Vinkovci, Osijek-Beli Manastir, Osijek-Donji Miholjac, Virovitica-Banova Jaruga, Karlovac-Zagreb. For Korčula, it was reported first by Keller (cf. TRINAJSTIĆ, 1985). The new localities are: Murter (27. 8. 2000) in flower gardens in Hramina (WJ45), Grebaštica (20. 10. 2000) in gardens near the road, on fields, along the road near the restaurant »Stari Šibenik« and in a flower garden in the »Maslina« restaurant (WJ73).

12. ***Euphorbia prostrata*** **Aiton (*Euphorbiaceae*)** – is a neophyte originating from North America. For Croatia it is reported for the first time by ČARNI & JOGAN (1998) for the island of Lošinj and then by MILOVIĆ & RANDIĆ (2001) for Škrljevo and Rijeka as well as numerous localities from Dalmatia. It may be assumed that this species had been noted in other localities but because of its strong resemblance to the species *E. chamaesyce* it was probably taken for that species, so a revision of all so far published works connected with the distribution of *E. chamaesyce* is necessary. The new localities are: Karlobag (20. 9. 1998) along the road in the settlement (WK03), Sukošan (15. 10. 2000) along the road at the bus stop (WJ27), Sv. Filip i Jakov (11. 9. 1998) in a flower garden near the sea (WJ36), Murter (11. 6. 2000) in cracks in stones near the Luke (WJ45), the island of Žirje (2. 10. 1999) in the settlement of Muna (WJ53), Vodice and Srima (14. 8. 2000), very commonly along the edges of the roads (WJ64), Podgora (4. 9. 1998) along the road in the settlement (XH69), Rogoznica (15. 9. 1998) along the roads in settlements (WJ72), Grebaštica (20. 10. 2000) along the road (WJ73), Suknovci-Promina (9. 8. 1997) along the court-yard (WJ86).

13. ***Galinsoga parviflora*** **Cav. (*Asteraceae*)** – is a South American neophyte. This is a very frequent weed in the lowlands of inland Croatia (gardens, fields, flower gardens, potato fields, corn fields and the like), so it can be said to be generally spread in the inland region. In the Makarska area it was reported by TRINAJSTIĆ *et al*. (1993a) and in the Šibenik area for the Krka River it was reported by MARKOVIĆ *et al.* (1993). In the Croatian littoral *G. parviflora* is very rare, so only the new localities for this area are presented. The new localities are: Pazin (8. 1999) in ruderal vegetation in the town (VL11), Brest (8. 1999) in flower gardens (VL23), Rijeka and surroundings (5. 1996) in flower gardens (VL51, VL52), Crikvenica (22. 7. 2000) in flower gardens (VL70), Pula (16. 6. 1997) in flower gardens (VK06), Rabac (29. 6. 2000) in a flower garden (VK39), Rab (22. 7. 2000) in flower gardens in the settlement (VK85), Jablanac (22. 7. 2000) in flower gardens (VK95), Sv. Juraj and Kalić (14. 8. 2000) in flower gardens (VK97), Senj (16. 8. 2000) in flower gardens (VK98), Zadar (15. 10. 2000) in a flower garden (WJ18), Murter (29. 11. 1998) in a flower garden on Hramina (WJ45), Vodice (14. 7. 1999) in flower gardens near the marina (WJ64), Šibenik (16. 6. 1998) in a garden in Crnica (WJ74), Unešić (7. 6. 1998) in gardens (WJ94), Hvar (25. 9. 2000) in flower gardens (XH18).

14. ***Galinsoga quadriradiata*** **Ruiz et Pavon (*Asteraceae*)** – was brought to Europe from South America (Peru) at the end of the 18th century (1794) to the botanical

gardens of Madrid and Paris. Thence it was spread all over the Europe during the Napoleonic wars, and in the 20th century it became common throughout the world. For Croatia, it was reported first by TRINAJSTIĆ (1974a), and afterwards it was reported for many localities (cf. TRINAJSTIĆ, 1975a, 1978; 1984; TRINAJSTIĆ *et al*., 1993). *G. quadriradiata* is an urbanophile species which according to recent knowledge spreads in the vicinity of bus and railway stations, along parking areas, in popular resorts and similar sites with a high turnover of people (cf. TRINAJSTIĆ, 1974a; 1974b; 1975a; 1978; 1984; IVKOVIĆ, 1979; IVKOVIĆ & ČAPAKOVIĆ, 1979; 1981; TRINAJSTIĆ *et al*., 1993; FRANJIĆ *et al*., 1999). The new localities are: Tikveš (15. 5. 1999) in ruderal vegetation (CR36), Monjoroš (20. 7. 2001) in ruderal vegetation (CR37), Putkovec and Žutnica near Krapina (5. 8. 1999) in the vegetable crops and along the field road (WM61), Trakošćan (3. 8. 1999) in the vegetable crops (WM72), Vukanci (4. 8. 1999) along the farm (WM80), Žarovnica north of Ivanec (3. 8. 1999) in maize crops (WM82), Zagreb – the wider city area (20. 6. 2000) on cultivated areas (flower gardens and similar) (WL67, WL77, WL86, WL87), Sv. Matej near Gornja Stubica (30. 7. 1999) along the road (WL89), Jertovec (31. 7. 1999) in a maize field and a garden (WL99), Lipovljani (summer 1999) in flower gardens (XL42), Tikveš (6. 1999) in the park around the castle (CR35), Jezerane (6. 1999) in flower gardens (WK19), Sukošan (15. 10. 2000) in a flower garden in front of the »Veseljak« restaurant (WJ27), Dubrovnik (7. 2000) in flower gardens (BN62).

15. ***Impatiens balfourii*** **Hooker (*Balsaminaceae*) –** is a neophyte originating from Asia (Himalayas). As a wild species it was first reported in Croatia for Istria by PERICIN (1992). Shortly after, it was reported in Krapinske Toplice and Kraljevec near Budinšćina in Hrvatsko Zagorje, and in Zelengaj and Jelenovac in Zagreb by ILIJANIĆ *et al*. (1994). On the island of Murter, it was reported in flower gardens and along courtyard fences (cf. PANDŽA, 1998). New localities are: Novo Topolje (29. 8. 2001.) along the road (BR80), Košenine near Mala Gora (29. 7. 1999) along shrubs at the entrance to the quarry (WM51), Očura (3. 8. 1999) along the road (WM71), Donji Lipovec, Ladislavec and Lobor (31. 7. 1999) along the road in a ditch (WM80), Jelovec (2. 8. 1999) along the fence (WM90), Čalinec (28. 7. 1999) along the road (WM92), Nova Ves (27. 7. 1999) along the road (WM93), Visoko near Kalnik (31. 7. 1999) in a ditch along the road (XM00), Podevčevo and Moždenec (1. 8. 1999) along the fence (XM01), Črešnjevo selo (2.8. 1999) along the fence (XM02), Ćurilovec, Leskovec and Varaždinske Toplice (1. 8. 1999) along the road in ruderal vegetation (XM11), Gornja Poljana (1. 8. 1999) between the road and court-yard (XM12), Mali Bukovac (1. 8. 1999) along the fence (XM32), Virje (7. 1999) in ruderal vegetation along the road (XM50), Križevci-Komin (7. 1999) along the road and streamlets (XL19, XL29), the wider Zagreb area (7. 1998) in ruderal vegetation (WL67, WL77, WL86, WL87), Borovec--Vrapče (30. 7. 1999) along the road (WL77), Donja Stubica (30. 7. 1999) in a ditch along the road (WL79), Komin, Bosna, Gornje Orašje and Bedenica (31. 7. 1999) in a ditch along the road (WL99), Levanjska Varoš and Musić (8. 1999) in flower gardens (BR72).

16. ***Impatiens glandulifera*** **Royle (*Balsaminaceae*) –** grows spontaneously in the region of the West Himalayas and Eastern India. It was brought to Europe as a decorative garden species and it spread from there to natural habitats. Nowadays, this species is a widely spread neophyte in Europe, growing in natural habitats on river banks and near flooded forests. For the Croatian flora, it was first reported in 1968 along the edge of willows on the Sava River banks near Podsused, in the wider Zagreb area (MARKOVIĆ, 1970). Later, it was found in many new localities (TRINAJSTIĆ, 1974; MARKOVIĆ, 1979; 1984; LUKAČ, 1989; TRINAJSTIĆ & FRANJIĆ, 1994; 1995). Its habitats are usually in areas with the humid and cold climate of north-west Croatia where the greatest number of localities was registered. Outside this area, it was also found in Osijek, which is its most eastern known habitat in Croatia. The new localities are: Zelenjak near Klanjec (29. 7. 1999) along the road (WM50), Pregrada, Kostel near Pregrada and Lastine near Hum na Sutli (29. 7. 1999) along the road (WM51), Gašparići near Krapinske Toplice (29. 7. 1999) along the road (WM60), Valentinovo near Krapinske Toplice, Đurmanec and Žutnica (29. 7. 1999) along the road (WM61), Sutinske Toplice (4. 8. 1999) along the road (WM70), Očura (6. 1999) along the streamlet (WM71), Mače (28. 7. 1999) between the road and forest (WM80), Šumec near Lepoglava, Lepoglava-Ivanec (28. 7. 1999) along the road (WM81), Klenovnik, Zloganje, Jerovec and Slivarsko (6. 1999) along the streamlet and along the road in the vicinity of the settlement (WM82), Lovrećan, along the Drava river and Cestica-Ormož (27. 7. 1999) along the road (WM83), Butkovec-Breznički Hum (31. 7. 1999) along the road (WM90), Gornje Podrute and Kraljevec (2. 8. 1999) in crops along the fence and in a ditch between the road and railway (WM91), Petrijanec and Vinica (27. 7. 1999) along the ditch (WM93), Kračevac, Paka (7. 1999) along the streamlet and in ruderal vegetation along the road (XM00), Podrute, Gornje Makonjišće and Presečno (1. 8. 1999) cultivated in the garden, and in a ditch (XM01), Sv. Martin na Muri, Lapšina, Jalšovec (7. 1999) in ruderal vegetation and along the streamlets and the Mura river (XM05), Mali Bukovec (1. 8. 1999) in front of a house in a flower garden (XM32), Goričan-Letenye (8. 1998) along the Mura river (XM33), Gračec (8. 1998) in ruderal vegetation (XL08), Haganj (8. 1998) in ruderal vegetation in the settlement and along the streamlets (XL28), Jurovski Brod (7. 1999) in ruderal vegetation in the settlement (WL25), Ozalj (7. 1999) in ruderal vegetation and along the Kupa river (WL35), Gornje Pokuplje (7. 1999) along the Kupa River (WL44), Bregana-Brežice (7. 1999) along the Sava River (WL57), between Hum-Lug and Zabok, Strmec Stubički and between Pila and Stubičke Toplice (29. 7. 1999) along the road (WL79), Bedenica, Bosna and Gornje Orešje (31. 7. 1999) in a court-yard, cultivated and along the road (WL99), Vinkovci (7. 1999) in ruderal vegetation and along the railway (CR21).

17. ***Paspalum dilatatum*** **Poiret (*Poaceae*) –** is a grass originating from South America. It was first found in Croatia in the Šibenik area and reported by ILIJANIĆ (1989) in the *Solaris* hotel complex. For the Split area (Kman) and Kaštel Sućurac it was reported by ILIJANIĆ *et al*. (1991). The new locality is Podgora (4. 9. 1998) by the side of vegetable plantations in the settlement (XH69).

18. ***Paspalum paspalodes* (Michx.) Schriber (*Poaceae*).** This adventive species of neotropical origin was first found in Croatia in 1947 in the Neretva River valley between Metković and Opuzen, and Metković and Gabela (HORVATIĆ, 1949) as a part of wetland vegetation. For Korčula, it was reported by TRINAJSTIĆ (1985), and for the Krka River area by MARKOVIĆ *et al*. (1990, 1993). In Split, it was found in October of 1990 near a petrol station on Kman as well as in Kaštel Sućurac and Kaštel Gomilica in a moist ruderal habitat (ILIJANIĆ *et al*., 1991). The new localities are: Biograd (15. 10. 2000) on moist grass by the sea (WJ36), Betina (10. 1996) in a sandy moist area near the sea (WJ45), Pakoštane (11. 9. 1998) along the road in a settlement in ruderal vegetation (WJ46).

19. ***Phytolacca americana* L. (*Phytolaccaceae*)** originates from North America. In Croatia, it was reported in a large number of localities. Thus, it was reported by M. HEĆIMOVIĆ (1981) and S. HEĆIMOVIĆ (1982) for the islands of Šipan and Lokrum, for Korčula and Hvar by TRINAJSTIĆ (1985, 1993), along the Krka River by MARKOVIĆ *et al*. (1993), for the island of Kaprije by FRANJIĆ & PANDŽA (1996) and for the islands of Zlarin and Murter by PANDŽA (1998, 1998b). New localities are: Čalinec (28. 7. 1999) along the road (WM92), Nova Ves (27. 7. 1999) along the road (WM93), Repaš (1994) along the forest road (XM61), Đurđevački peski (12. 2000) around the hunters' house and a white pine stand (*Pinus strobus*, XL79), Dilj-Čardak (21. 8. 2001) along the road (BR62), Klokočevik (29. 8. 2001) along the road (BR71), Trnava (29. 8. 2001) along the road (BR81), Osijek and Bilje (1. 1999) along the Drava river on both sides of the river (CR14, CR24), Zadar (15. 10. 2000) in ruderal vegetation (WJ18), the island of Žirje (21. 6.1997) along the road in the settlement (WJ53), Dubrovnik-Brgat (31. 10. 1999) in ruderal vegetation (BN62).

20. ***Xanthium spinosum* L. *(Asteraceae)*** – is a South American neophyte which in Croatia was reported first by Domac for the islands of Vis and Molat (DOMAC 1955, 1963), then for the islands of Lastovo, Korčula and Hvar by TRINAJSTIĆ (1979, 1985, 1993), for Šipan island by M. HEĆIMOVIĆ (1981), for the island of Brač by ŠTAMOL & MARKOVIĆ (1985), for the area along the Krka River by MARKOVIĆ *et al*. (1993), and for the islands of Kornati by PANDŽA & STANČIĆ (1995) and Murter (PANDŽA 1998b). The new localities are: Zadar (29. 9. 1998) along the cemetary (WJ18), Pakoštane (11. 9. 1998) along the roads in settlement (WJ46), Šibenik (9. 1995) in ruderal vegetation (WJ74), Lukar, Suknovci and Oklaj (20. 6. 1999) in ruderal vegetation (WJ86), Unešić (7. 6. 1998) along the road (WJ94).

21. ***Xanthium strumarium* L. ssp. *italicum* (Moretti) D. Löve *(Asteraceae)*** was first reported in Croatia for the island of Mljet by REGULA-BEVILACQUA & ILIJANIĆ (1984), then for Koločep by M. HEĆIMOVIĆ & S. HEĆIMOVIĆ (1987), for the area along the Krka River by MARKOVIĆ *et al*. (1993), for the wider area of Malostonski zaljev by JASPRICA & KOVAČIĆ (1997) and for the Pelješac peninsula by JASPRICA & KOVAČIĆ (1997a). The new localities are: Posedarje (29. 9. 1998) in ruderal vegetation in the settlement (WJ28), Murter (6. 10. 1997) in ruderal vegež along the road (WJ54), Brodarica (20. 10. 2000) a fence in ruderal vegetation (WJ73), Marina (4. 9. 1998) in ruderal vegetation by the sea (WJ80), Oklaj (5. 11.

2000) around Osmanovac pool (WJ86), Solin (9. 2000) in ruderal vegetation (XJ22), Baška Voda (4. 9. 1998) in ruderal vegetation by the sea (XJ50), Jesenice (4. 9. 1998) in ruderal vegetation (XJ21), Dugi Rat (4. 9. 1998) along the factory (XJ31).

DISCUSSION AND CONCLUSION

In the past research into neophytes in Croatia was most frequently reduced to monitoring a few or one species only. Very often such research was carried out in an incidental manner and so today there is no comprehensive work in which the status of a large number of neophytes in one locality could be seen. For this reason, in this work an effort was made to present the actual state of affairs of the distribution of the most frequent neophytes in Croatia. Moreover, this work is an attempt to make an analysis of the species spread by a man (anthropochorously) from other phytogeographical regions and settled in the anthropogenic vegetation, primarily in weed-ruderal vegetation. Because of the very pronounced migrations in Croatia and neighbouring countries in the 19th and the 20th centuries, plants from various parts of the world were brought into this region, which is therefore very rich in neophytes.

Neophytes have been spreading intensively in the last few years and some of them during the recent decades, very often replacing indigenous vegetation. The most endangered kinds of vegetation are ruderal plants and weeds, which are unable to resist such a rapid spread of neophytes. For instance, *Ambrosia artemisiifolia* and *Galinsoga parviflora* are so frequent in the lowlands of Croatia that they have displaced all the indigenous weed species, which simply have no response to their expansion and cannot compete. These very species in the littoral region and on the islands present a real rarity, although during the latest research in their distribution a considerable expansion in both the Mediterranean and Submediterranean regions has been noted. *G. quadriradiata* is somewhat more demanding in respect to its habitat, and consequently it was rather rare not only in the Mediterranean region but in the inland part of Croatia, too. Today, this species is spreading relatively fast and it is a frequent weed in tilled fields, nurseries and flower gardens. It should be noted that *G. quadriaradiate* began to appear first in places with vigorous movement and turnover of people and goods (stations, ports, resorts), but nowadays it is spreading in large numbers and often constitutes the dominant weed in gardens and nurseries. *Echinocystis lobata* and *Reynoutria japonica* in the inland part of Croatia also constitute widely spread species. *E. lobata* most often spreads hydrochorously and can be found along almost all streams and rivers in the lowlands of Croatia where with its abundance it covers the indigenous vegetation. *R. japonica* is ergasiophygophyte which spreads around abandoned structures, graveyards, streams, railway lines and the like. This species is cultivated as a decorative plant so it may be expected to spread in the Mediterranean part of Croatia much faster than *E. lobata*, which spreads spontaneously by way of hydrochoria in the Sava and Drava River basins and practically cannot be transferred to the Adriatic catchment area in a natural way. *Datura inoxia* which is ergasiophigophyte, as is *R. japonica*, is distributed

equally in the inland and Mediterranean areas, although there are indications that it has been brought to the inland part of Croatia from the Mediterranean area by man (cf. FRANJIĆ, 1993). The above mentioned species spread on agricultural and forest lands under field crops and they constitute the principal weeds, which may cause many problems and expensive damage (cf. FRANJIĆ *et al.*, 1998; TRINAJSTIĆ & FRANJIĆ, 1994; TRINAJSTIĆ *et al.*, 1991, 1993). Other species investigated occur in habitats that are not farm lands (on waste dumps, along railway lines, coasts, roads, etc.), yet when they grow in great number they can enter the crops and someday may be expected to become a very dangerous weed. It is also important to say that neophytes are often carriers of various diseases (viruses) and that, therefore, they should be looked upon with a certain amount of cautiousness.

During the research of neophyte distribution in Croatia, a total of 332 new localities for 21 neophyte species was discovered. Most new localities belong to *Bidens subalternans* (52), then come *Impatiens glandulifera* (49), *Aster squamatus* (43), *Impatiens balfourii* (29), *Datura inoxia* (25), *Euphorbia prostrata* (11), *Galinsoga parviflora* (17), *Amaranthus albus* (14), *Galinsoga quadriradiata* (15), *Diplotaxis erucoides* (11), *Xanthium strumarium* ssp. *italicum* (9), *Phytolacca americana* (12), *Artemisia verlotiorum* (7), *Chamomilla suaveolens* (7), *Xanthium spinosum* (7), *Eleusine indica* (6), *Euphorbia maculata* (7), *Ambrosia artemisiifolia* (5), *Paspalum paspalodes* (3), *Euphorbia nutans* (2) and *Paspalum dilatatum* (1). The majority of the species investigated in all localities occur in great numbers, and only few of them occur individually, which indicates the strong aggressiveness of the neophytes, which by their numerousness are displacing the indigenous vegetation.

Received April 6, 2001

REFERENCES

DOMAC, R., 1955: Flora otoka Visa. Acta Pharm. Jugosl. **5**, 3–42.

DOMAC, R., 1963: Flora otoka Molata. Acta Bot. Croat. **22**, 83–98.

DUBRAVEC, K., N. PLAVŠIĆ-GOJKOVIĆ & M. BRITVEC, 1989: Nova nalazišta adventivne vrste *Eleusine indica* Gaertn. u Hrvatskoj. Fragm. Herbol. Jugosl. **18**(1), 95–97.

ČARNI, A. & N. JOGAN, 1998: Vegetation of thermophilic trampled habitats in the bay of Kvarner. Nat. Croat. **7**(1), 45–58.

FRANJIĆ, J., 1993: Nova nalazišta vrste *Datura inoxia* Miller (*Solanaceae*) u Hrvatskoj. Acta Bot. Croat. **52**, 97–100.

FRANJIĆ, J. & M. PANDŽA, 1996: Flora otoka Kaprija. Ekološke monografije **7**, 161–179.

FRANJIĆ, J. & I. TRINAJSTIĆ, 1996: Sadašnje stanje rasprostranjenosti vrste *Datura inoxia* Miller (*Solanaceae*) u Hrvatskoj. Fragm. Phytom. Herbol. **24**(2), 5–9.

FRANJIĆ, J., I. TRINAJSTIĆ & Ž. ŠKVORC, 1998: Prilog poznavanju nekih neofita u Hrvatskoj. Fragm. Phytom. Herbol. **26**(1–2), 5–17.

GOSPODARIĆ, LJ., 1955: Prilog poznavanju flore i vegetacije rijeke Save između Zagreba i Šćitarjeva. Diplomski rad – PMF. Zagreb.

HEĆIMOVIĆ, M., 1981: Prikaz i analiza flore otoka Šipana. Acta Bot. Croat. **40**, 205–227.

HEĆIMOVIĆ, M. & S. HEĆIMOVIĆ, 1987: Flora otoka Koločepa. Acta Bot. Croat. **46**, 189–205.

HEĆIMOVIĆ, S., 1982: Flora otoka Lokruma, Bobare i Mrkana. Acta Bot. Croat. **41**, 155–170.

HODAK, N., 1960: Nalazište tropske vrste *Eleusine indica* Gaertn. u flori Jugoslavije. Acta Bot. Croat. **18–19**, 65–67.

HORVATIĆ, S., 1949: *Paspalum distichum* L. ssp. *paspalodes* (Michx.) Thell. na području donje Neretve. Acta Bot. Croat. **12–13**, 231–238.

HULINA, N., 1989: Flora in the Turopolje region. Period. Biol. **91**(1), 163–164.

HULINA, N., 1998: Nova nalazišta i rasprostranjenost nekih rijetkih biljnih vrsta u flori Hrvatske. Acta Bot. Croat. **55/56**: 41–51.

ILIJANIĆ, LJ., 1957: Nova nalazišta dviju adventivnih mlječika (*Euphorbia maculata* L. i *E. nutans* Lag.) u Hrvatskoj. Acta Bot. Croat. **16**, 105–108.

ILIJANIĆ, LJ., 1989: Die Stadt Split, neuer Fundort von *Eleusine indica* (L.) Gaertner (*Poaceae*). Bios (Thessaloniki) 117.

ILIJANIĆ, LJ. & S. HEĆIMOVIĆ, 1983: Nova nalazišta adventivne vrste *Bidens bipinnata* L. u istočnojadranskom primorju. Acta Bot. Croat. **42**, 123–126.

ILIJANIĆ, LJ., M. RADIĆ & Ž. ROKOV, 1991: Prilog adventivnoj flori Splita i okolice. Acta Bot. Croat. **50**, 59–65.

ILIJANIĆ, LJ., LJ. MARKOVIĆ & Z. STANČIĆ, 1994: *Impatiens balfourii* Hooker fil. u Hrvatskoj. Acta Bot. Croat. **53**, 115–119.

IVKOVIĆ, O., 1979: *Lepidium virginicum* L. (*Caparidales*, *Brassicaceae*) i *Galinsoga ciliata* (Raf.) Blake (*Asterales*, *Asteraceae*) – novi podaci o rasprostranjenju u SR Srbiji. Biosistematika **5**(2): 151–154.

IVKOVIĆ, O., 1982: Novi nalazi adventivne vrste *Eleusine indica* (L.) Gaertn. 1788 (*Poales*, *Poaceae*) u Jugoslaviji. Zbornik Prir. Nauk. Mat. Srp. (Novi Sad) **63**, 77–81.

IVKOVIĆ, O. & J. ČAPAKOVIĆ, 1979: Novi podaci za adventivnu floru SAP Vojvodine. Drugi kongres ekologa Jugoslavije 549–554.

IVKOVIĆ, O. & J. ČAPAKOVIĆ, 1981: Prilog poznavanju rasprostiranja nekih adventivnih biljaka u SAP Vojvodini. Biosistematika **7**(2): 137–147.

JASPRICA, N. & S. KOVAČIĆ, 1997: Flora šire okolice Malostonskog zaljeva. Zbornik Dubrovačkog primorja i otoka **6**, 241–262.

JASPRICA, N. & S. KOVAČIĆ, 1997a: Vascular Flora of the central part of Pelješac peninsula. Nat. Croat. **6**(4): 381–407.

JAVORKA, S., 1925: Magyar Flora. Budapest.

JOGAN, N., 1990: Prispevek k poznavanju razširjenosti trav v Sloveniji. Biol. Vestn. **38**(2), 27–38.

LOVRIĆ, A. Ž. & M. RAC, 1897: Fitocenološka analiza vegetacije Biokovskog područja. Morske i kopnene biocenoze. Acta Biokovica **4**, 97–142.

LUKAČ, G., 1989: Nova nalazišta vrste *Impatiens glandulifera* Royle u Hrvatskoj. Acta Bot. Croat. **48**, 165–168.

MARKOVIĆ, LJ., 1970: Prilozi neofitskoj flori savskih obala u Hrvatskoj. Acta Bot. Croat. **29**, 203–211.

MARKOVIĆ, LJ., 1979: Neofiti kao šumski korovi u poplavnim područjima kontinentalne Hrvatske. Zbornik radova I. Jugoslavensko savjetovanje o suzbijanju korova u šumarstvu, 21–29. Sarajevo.

MARKOVIĆ, LJ., 1984: Zur Verbreitung und Vergesellschaftung von *Impatiens glandulifera* in Kroatien. Acta Bot Slov Acad Sci Slovaceae Ser A Suppl 1, 209–215

MARKOVIĆ, LJ. & N. HULINA, 1970: *Eleusine indica* (L.) Gaertn. u širem području Zagreba. Acta Bot. Croat. **29**, 213–215.

MARKOVIĆ, LJ. & G. LUKAČ, 1993: Verbreitung und Standorte von *Chamomilla suaveolens* in Kroatien. Nat. Croat. **2**(1), 89–98.

MARKOVIĆ, LJ., LJ. ILIJANIĆ, G. LUKAČ & V. HRŠAK, 1990: Pregled istraživanja biljnog pokrova na području Nacionalnog parka Krka. Ekološke monografije **2**, 449–470.

MARKOVIĆ, LJ., LJ. ILIJANIĆ, G. LUKAČ & V. HRŠAK, 1993: Kvalitativni sastav flore papratnjača i sjemenjača Nacionalnog parka Krka. Botanički zavod Prirodoslovno-matematičkog fakulteta Sveučilišta u Zagrebu. Zagreb.

MELZER, H., 1969: Beiträge zur Flora von Kärnten. Verh. Zool.-Bot. Ges. Wien **108/109**, 127–137.

MELZER, H., 1980: Neues zur Flora von Kärnten, Norditalien und Salzburg. Carinthia II **170**, 261–269.

MELZER, H., 1987: Beiträge zur Flora von Frial-Julisch Venetien (Italien) und Slowenien (Jugoslawien). Linzer. Biol. Beitr. **19**(2), 377–388.

MELZER, H. & E. BREGANT, 1989: Neues zur Flora von Frial-Julisch Venetien, Slowenien und Kroatien. Gortania **11**, 161–176.

MILOVIĆ, M. & M. RANDIĆ, 2001: New localities of *Euphorbia prostrata* Aiton (= *Chamaesyce prostrata* (Aiton) Small) in Croatia. Nat. Croat. **10**(2), 89–95.

NIKOLIĆ, T., D. BUKOVEC, J. ŠOPF & S. D. JELASKA, 1998: Kartiranje flore Hrvatske, mogućnosti i standardi. Nat. Croat. **7** Suppl. 1, 1–62.

PANDŽA, M., 1998: Flora of the island of Zlarin. Nat. Croat. **7**(1), 59–78.

PANDŽA, M., 1998a: Flora of the islands of Krapanj and Prvić. Nat. Croat. **7**(4), 321–339.

PANDŽA, M., 1998b: Flora of the island of Murter (central Adriatic). Acta. Bot. Croat. **57**, 99–122.

PANDŽA, M. & ZI. PAVLETIĆ, 1996: Značajne biljke hrvatske flore na otoku Murteru. Ekološke monografije **7**, 199–204.

PANDŽA, M. & Z. STANČIĆ, 1995: Contribution of the flora of the Kornati islands (Croatia). Nat. Croat. **4**(3), 133–142.

PANDŽA. M. & Z. STANČIĆ, 1999: New localities of *Datura inoxia* Miller and *Solanum elaeagnifolium* Cav. (*Solanaceae*) in Croatia. Nat. Croat. **8**(2), 117–124.

PAVLETIĆ, ZI., 1978: Vaskularna flora otoka Sveca. Acta Bot. Croat. **37**, 215–224.

PAVLETIĆ, ZI., 1978a: Pregled i analiza flore Palagruških otoka. Biosistematika **4**(1), 39–47.

PAVLETIĆ, ZI., 1987: *Diplotaxis erucoides* (L.) DC., nova adventivna vrsta u flori Hrvatske. Glas. Prir. Muz. Beograd Serija B **12**, 16–18.

PAVLETIĆ, ZI. & M. PANDŽA, 1994: *Diplotaxis erucoides* (L.) DC. (*Brassicaceae*) u Hrvatskoj flori. Fragm. Phytom. Herbol. **22**(1–2), 25–28.

PAVLETIĆ, ZI. & I. TRINAJSTIĆ, 1990: *Datura inoxia* Miller (*Solanaceae*) u flori Hrvatske. Fragm. Herbol. Jugosl. **19**(2), 133–138.

PERICIN, C., 1992: Floristischer Beitrag aus Istrien, einem Übergangsgebiet zwischen den Alpen und den Dinariden. Bauhinia **10**, 53–58.

REGULA-BEVILACQUA, LJ. & B. JURKOVIĆ-BEVILACQUA, 1980: Prilog flori otoka Mljeta. Acta. Bot. Croat. **39**, 175–184.

REGULA-BEVILACQUA, LJ. & LJ. ILIJANIĆ, 1984: Analyse der Flora der Insel Mljet. Acta Bot. Croat. **43**, 119–142.

SMITAL, A., LJ. MARKOVIĆ, & M. RUŠČIĆ, 1998: O širenju vrste *Artemisia verlotiorum* Lamotte u Hrvatskoj. Acta Bot. Croat. **55–56**, 53–63.

ŠTAMOL, V. & LJ. MARKOVIĆ, 1985: Prilog flori otoka Brača. Acta Bot. Croat. **44**, 99–106.

THELLUNG, A., 1917: *Euphorbia-Hypericifoliae*. In: ASCHERSON, P. & P. GRAEBNER: Syn. Mitteleurop. Fl. **7**, 423–480.

TOPIĆ, J. & B. KUSULJA, 1987: Učestalost vrste *Eleusine indica* (L.) Gaertn. u Slavoniji. Zbornik sažetaka priopćenja trećeg kongresa biologa Hrvatske, Zagreb, p. 111.

TOPIĆ, J. & B. KUSULJA, 1989: Frequency and abundance of the species *Eleusine indica* (L.) Gaertn. in the Slavonia and Baranja regions. Period. Biol. **91**(1), 174.

TOPIĆ, J. & N. ŠEGULJA, 1978: Novo nalazište vrste *Eleusine indica* (L.) Gaertn. u Hrvatskoj. Acta Bot. Croat. **37**, 229–230.

TRINAJSTIĆ, I., 1974: Ein neuer Fundort von *Impatiens glandulifera* Royle in Kroatien. Fragm. Herbol. Jugosl. **40**, 1–6.

TRINAJSTIĆ, I., 1974a: *Galinsoga ciliata* (Rafin.) Blake in der Ruderal-Flora Kroatiens. Fragm. Herbol. Jugosl. **47**, 1–10.

TRINAJSTIĆ, I., 1974b: *Galinsoga ciliata* (Rafin.) Blake newcomer in the Flora of Serbia (Yugoslavia). Fragm. Herbol. Jugosl. **47**, 142–149.

TRINAJSTIĆ, I., 1975: Kronološka klasifikacija antropohora s osvrtom na helenopaleofite jadranskog primorja Jugoslavije. Biosistematika **1**(1), 79–85.

TRINAJSTIĆ, I., 1975a: *Bidens bipinnata* L. – nova adventivna vrsta u flori Hrvatske. Acta. Bot. Croat. **34**, 171–173.

TRINAJSTIĆ, I., 1977: Cronological classification of the Antropochors. Fragm. Herbol. Jugosl. **2**, 27–31.

TRINAJSTIĆ, I., 1978: Nova nalazišta vrste *Bidens bipinnata* L. u Hrvatskoj. Fragm. Herbol. Jugosl. **5**(96–105), 5–7.

TRINAJSTIĆ, I., 1979: Pregled flore otoka Lastova. Acta Bot. Croat. **38**, 167–186.

TRINAJSTIĆ, I., 1979a: Još jedno novo nalazište vrste *Bidens bipinnata* L. u Hrvatskoj. Fragm. Herbol. Jugosl. **8**(126–135), 5–6.

TRINAJSTIĆ, I., 1984: Novi podaci o rasprostranjenosti adventivne vrste *Galinsoga ciliata* (Rafin.) Blake u Jugoslaviji. Fragm. Herbol. Jugosl. **13**(2), 63–66.

TRINAJSTIĆ, I., 1985: Flora otočne skupine Korčule. Acta Bot Croat **44**, 107–130.

TRINAJSTIĆ, I., 1987: *Bidens bipinnata* L. (*Asteraceae*) – nova pridošlica u flori Crne Gore (Jugoslavija). Biosistematika **12**(1), 35–37.

TRINAJSTIĆ, I., 1993: Vaskularna flora otoka Hvara. Acta Bot. Croat. **52**, 113–143.

TRINAJSTIĆ, I., 1993a: *Bidens subalternans* DC. u neofitskoj flori Hrvatske. Acta Bot. Croat. **52**, 107–112.

TRINAJSTIĆ, I., 1996: Pregled flore Kornatskog otočja. Ekološke monografije **7**, 161–179.

TRINAJSTIĆ, I. & J. FRANJIĆ, 1994: Prilog poznavanju rasprostranjenosti vrste *Impatiens glandulifera* Royle (*Balsaminaceae*) u Hrvatskoj. Fragm. Phytom. Herbol. **22**(1–2), 21–24.

TRINAJSTIĆ, I. & J. FRANJIĆ, 1995: Ass. *Impatienti-Solidaginetum* M. Moor 1958 (*Calystegion sepium*) u vegetaciji Republike Hrvatske. Fragm. Phytom. Herbol. **23**(1), 25–30.

TRINAJSTIĆ, I., J. FRANJIĆ & D. KAJBA, 1991: Prilog poznavanju rasprostranjenosti vrste *Echinocystis lobata* (Michx.) Torr. & Gray u Hrvatskoj. Fragm. Herbol. **20**(1–2), 69–74.

TRINAJSTIĆ, I., J. FRANJIĆ & D. KAJBA, 1993: Dosadašnje stanje rasprostranjenosti vrste *Galinsoga quadriadiata* Ruiz et Pavon (*Asteraceae*) u Hrvatskoj. Fragm. Phytom. Herbol. **21**(2), 117–121.

TRINAJSTIĆ, I., ZI. PAVLETIĆ, J. FRANJIĆ & Z. LIBER, 1993: Prilog poznavanju neofitske flore makarskog primorja (Dalmacija, Hrvatska). Fragm. Phytom. Herbol. **21**(1), 57–62.

VISIANI, R., 1826: Stirpium dalmaticarum specimen. Patavii.

VREŠ, B., 1996: New localities of the species *Eleusine indica* (L.) Gaertn. (*Poaceae*) in Croatia and Slovenia. Nat. Croat. **5**(2), 155–160.

SAŽETAK

Dosadašnje stanje rasprostranjenosti nekih neofita u Hrvatskoj

M. Pandža, J. Franjić, I. Trinajstić, Ž. Škvorc & Z. Stančić

Na čitavom području Republike Hrvatske obavljeno je istraživanje neofita te su određena staništa i utvrđene UTM koordinate.

Istraživanjima rasprostranjenosti neofita u Hrvatskoj ukupno je otkriveno 332 novih nalazišta za 21 neofitsku vrstu. Najviše novih nalazišta ima vrsta *Bidens subalternans* (52), zatim slijede *Impatiens glandulifera* (49), *Aster squamatus* (43), *Impatiens balfourii* (29), *Datura inoxia* (25), *Euphorbia prostrata* (11), *Galinsoga parviflora* (17), *Amaranthus albus* (14), *Galinsoga quadriradiata* (15), *Diplotaxis erucoides* (11), *Xanthium strumarium* ssp. *italicum* (9), *Phytolacca americana* (12), *Artemisia verlotiorum* (7), *Chamomilla suaveolens* (7), *Xanthium spinosum* (7), *Eleusine indica* (6), *Euphorbia maculata* (7), *Ambrosia artemisiifolia* (5), *Paspalum paspalodes* (3), *Euphorbia nutans* (2) i *Paspalum dilatatum* (1). Također se daje osvrt na opću rasprostranjenost vrsta *Reynoutria japonica* Hout. i *Echinocystis lobata* (Michx.) Torr. & Gray.

Najveći broj istraživanih neofitskih vrsta pojavljuje se u velikoj množini na svim lokalitetima, a vrlo mali broj vrsta pojedinačno, što ukazuje na veliku agresivnost neofita koji svojom brojnošću potiskuju autohtonu vegetaciju.