INVASIVE AND POTENTIALLY INVASIVE PLANT SPECIES IN WETLANDS AREA OF BANAT

Carola, OTVES, Alina, NEACȘU, G.-G., ARSENE

Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timișoara
Calea Aradului, 119, 300645, Timișoara
otvescm@gmail.com

Abstract: Recent publication indicate a considerable proportion of adventive plants species included in the Romanian flora (ANASTASIU & NEGREAN, 2005, 2007, 2008, 2009, DIHORU, 2004, CULIȚĂ & OPREA, 2011 etc.). Concerning the west and south-west of Romania, the uneven importance of these species within the plant kingdom (by regions, the impact on economy and human health) and within the organization of biodiversity are both aspects partially tackled herein. We present a number of 82 adventive species signaled in the wetlands of Banat area (bibliographic synthesis, along with own data and observations): OPREA & OPREA, 1968, MORARIU & DANCIU, 1970, RACLARU & ALEXAN, 1972, MORARIU *et al*., 1973 (*in* manuscript COSTE, 2001); GRIGORE, 1971, TODOR *et al.*, 1971, ARVAT, 1977, GRIGORE & COSTE, 1977, PEIA, 1978, COSTE *et al*., 1999, ARSENE *et al.*, 2000; SÂRBU A. *et al.* (2007, *in* CULIȚĂ & OPREA, 2011), NEACȘU, 2008, NEACȘU *et al.*, 2010, 2011, 2012 etc., also specifying the chorology. We also discuss, from a biological and ecological standpoint, certain species that we deemed as having a major present impact or are a threat to the biodiversity and stability of these ecosystems: *Acorus calamus* L., *Paspalum paspalodes* (Michx.) Scribn., *Elodea canadensis* Michx., *E. nuttallii* (Planchon) St John, *Azolla filiculoides* Lam., *Vallisneria spiralis* L., *Mimulus guttatus* Fisch. ex DC., *Sicyos angulatus* L., *Juncus tenuis* Willd., *Cyperus difformis* L., *Amorpha fruticosa* L., *Asclepias syriaca* L. and *Reynoutia japonica* Houtt., with the mentioning of the habitats where these are present (DONIȚĂ *et al.*, 2005). The participation of adventive species in the aquatic and marsh plant structure of Banat, especially in the context of reducing wetlands in this area and including most of them in the Nature 2000 network, demands applied research on the management of non-native populations.

Key words: invasive plant species, potentially invasive plant species, wetlands, Banat

INTRODUCTION

The invasion of various species is one of the principal causes of the decline in biodiversity. There are numerous approaches, definitions, classifications and lists of invasive species. In recent years this subject can also be found in Romania in relevant specialized literature (DIHORU, 2004, ANASTASIU & NEGREAN, 2005, 2007, 2008, 2009 etc.).

According to DIHORU (2004), the status of invasive species is recurrently attributed to that species which has the capacity to multiply its numbers and to occupy new habitats to the detriment of other species, all due to a favoring ecological factor. These species prefer perturbed habitats, where the competition is low due to human intervention. ANASTASIU & NEGREAN (2007) clearly distinguish between invasive and potentially invasive species. Therefore, they deem an invasive species any alien species that threatens biological diversity by its introduction and spreading. The potentially invasive species could represent a threat to biological diversity.

There is a series of factors that facilitate the invasion of other species, among which most mentionable: climate changes, the degradation of natural habitats, quarantine practices, erroneous

horticultural or sylvan practices, the lack of natural competitors, transportation, commerce, tourism, inadequate legislation policies (ANASTASIU & NEGREAN, 2007).

According to DAISIE (Delivering Alien Invasive Species Inventories for Europe – *www.europe-aliens.org*.), in Europe there are 5789 alien plant species. Among these, the largest number, 3254, is found in Great Britain. Only a few species are mentioned in the Aland, Monaco and San Marino Islands. The study of invasive plants is coordinated by the group of experts ISSG (Invasive Species Specialist Group – *www.issg.org.).*

ANAČKOV *et al.*, 2013, discussing a list of 152 invasive neophytes from the Pannonia Plain introduced by accident (species of genus like *Amaranthus, Chenopodium, Oenothera, Ambrosia)* or deliberately (*Pinus nigra, Syringa vulgaris*), mentions that these infiltrate perturbed habitats, intervened upon by humans and semi-natural, but also that an important number of them (45) gravely threaten the biodiversity of natural habitats (*Robinia pseudacacia, Asclepias syriaca, Amorpha frutticosa, Acer negundo, Elodea Canadensis, Datura stramonium* etc).

Aquatic ecosystems, as well as those perturbed or wrongly managed, are most liable to be invaded by other species. HUSSNER, 2012, presents an overview of all alien aquatic plants from 46 European countries (reporting a number of 96 species). He draws attention to the ecologic and economic impact on aquatic ecosystems in European countries, by species *Elodea Canadensis* (reported in 41 countries), *E. nuttallii* (reported in 20 countries), *Azolla filiculoides* (reported in 25 countries), *Vallisneria spiralis*, (reported in 22 countries). In recent years, European countries have also reported problems with the rapid expansion of other species, such as *Eichhornia crassipes, Ludwigia sp., Hydrocotyle ranunculoides, Myriophyllum aquaticum*. The same author goes on to mention that the lasrgest number of alien aquatic plant species was signaled in Italy and France (34 species), followed by Germany with 27 species, Belgium and Hungary with 26 species, and Holland with 24 species.

SIMPSON & PROTS, 2012, estimate the distribution of invasive plants in the Ukranian Carpatian Mountains (utilizing APRS – Alien Plant Ranking System), under the impact of climate changes and human intervention, for 11 invasive species. Some of these spread rapidly in riparian habitats, raising serious problems. Take as example *Acer negundo*, a species that prevents the regeneration of willow and poplar communities, as well as *Impatiens glandulifera*, a species that tends to destabilize water banks due to the superficial radicular system, therefore modifying the abiotic conditions.

As a result of recently occurring introduction and change in field usage, biologic invaders raise problems in Hungary as well (TÖRÖK *et al.*, 2003). *Cobomba caroliniana* and *Elodea canadensis* are the common invasive aquatic plants. *Gymnocoronis spilanthoides* is a transformer aquatic plant. Flood areas and marshy fields are affected by the invasion of species such as *Amorphia fruticosa, Prumus serotina, Fraxinus pennsylvanica, Xanthium italicum, Impatiens glandulifera, I. parviflora, Vitis riparia, Rudbeckia laciniata*. Transformer species found in wetlands are as follows: *Fallopia japonica, Acer negundo, Echinocystis lobata, Humulus scandens* etc.

Referring to Romania and according to DAISIE, 700 species of invasive plants and animals have been identified, with the following distribution: 288 terrestrial plants, 14 marine, 70 aquatic, 247 mycophites, 67 invertebrate and 15 vertebrate. According to EUNIS (*European Nature Information System – http://eunis.eea.europa.eu/species.jsp*), 108 invasive plants have been

classified in Romania (99.1% of the total), among which: 0 marine, 6 inland surface water, 3 mires, bogs and fens, 11 grasslands, 4 woodland and forest, 7 inland sparsely vegetated, 18 arable land, gardens and parks, 67 industrial.

ANASTASIU & NEGREAN (2005 a, 2005 b, SÎRBU, 2004, *in* LAMBDON *et al*., 2008), have identified 435 alien species in Romanian flora (131 naturalized, 304 incidental) and 384 neophytes (113 naturalized, 271 incidental, 1 cover species). CULIȚĂ & OPREA (2011) specify that 671 adventive plant species have been inventoried in our country. From the same authors, 112 species meet the criteria for an invasive status, due to both spread capacity as well as the impact they have.

According to LAMBDON *et al.* (2008), there are 1567 genus in European adventive flora, 128 of which are considered representative. Among these, over 80 have species in the wetlands perimeter of Romania and the Banat region, a considerable number of genus having marsh and aquatic species (e.g. *Polygonum, Bidens, Carex, Cyperus, Iris, Juncus, Mentha, Ranunculus, Stachys, Rorippa, Salix, Populus*).

Included on the list of most aggressive invasive species, put together by IUNC (International Union from Nature Conservation – *http://www.iucn.org*), in the plant category, are the following: *Reynoutia japonica, Lythrum salicaria, Conyza canadensis, Ambrosia artemisiifolia, Acorus calamus, Alopecurus myosuroides, Oxalis stricta, Phytolaca americana, Eichhornia crassipes, Tamarix ramosissima.* With the exception of the latter two, all others are also found in the perimeter of wetlands in Banat. The study of invasive aquatic species is coordinated by ERNAIS (European Research Network on Aquatic Invasive Species – *www.zin.ru*).

MATERIAL AND METHODS

The area considered includes the Banat territory (Timiș and Caraș-Severin counties), as well as references to Arad county and the west of Mehedinți county (neighboring areas). We selected those species found in the Banat wetlands, extracted from the list of adventive species in the Romanian flora proposed by CULIȚĂ & OPREA (2011). The terminology follows the Flora Europaea system, the on-line edition. Each species is described in terms of chorology according to finds by various authors, completed by observations (not published elsewhere) and private research published between 2005 and 2011. We also mention particular aspects regarding the biology and ecology of a few species that evidently threaten the biodiversity of aquatic and marsh ecosystems.

RESULTS AND DISCUSSIONS

The following are presented adventive species reported in the area of wetlands in Banat. The chorological data are taken from various authors filled with our research, published or other unpublished yet.

1. *Acer negundo* L. - the interfluve Timiș - Bega, sporadic (GRIGORE, 1971), the Bega river, forest Balinț (VICOL, 1974).
2. *Acorus calamus* L. - CULIȚĂ & OPREA (2011): Banat (GRISELINI 1970, *in* POP E., 1930, HEUFFEL, 1858), Timiș Plain (BORBAS, 1884, *in* GRIGORE, 1987), Satchinez (OPREA & OPREA, 1968), meadow Begheiul (GRIGORE, 1971), mini-delta Nera (SÂRBU A. *et al.*, 2007), between the Mraconia Valley and Cazanele Mari (DIHORU *et al.*, 1968-1970), Mraconia Valley and Dubova Depression (DIHORU *et al.*, 1972, 1973). Additions: Uliuc, Timiș Valley (GRIGORE, 1967, *in* GRIGORE & COSTE, 1977).

3. *Agrostemma githago* L. - Banat (GRIGORE, 1971), Pișchia (FĂRCĂȘESCU, 2008).
4. *Alcea rosea* L. - Sânandrei (own research).
5. *Alopecurus myosuroides* Huds. - CULIȚĂ & OPREA (2011): Liebling (ȘERBĂNESCU & NYÁRÁDY s.a., *in* SĂVULESCU, 1972).
6. *Amaranthus albus* L. - CULIȚĂ & OPREA (2011): the interfluve Timiș - Bega, frequent (GRIGORE, 1971), Ostrovul Moldova Veche (MORARIU & DANCIU, 1970, MORARIU *et al*., 1973), Tri-Kule (ȘTEFUREAC *et al.*, 1971, MATACĂ 2003, 2005), Valley Mraconia (MATACĂ 2003, 2005), mini-delta Nera (SÂRBU A. *et al.*, 2007).
7. *Amaranthus blitoides* S. Watson - CULIȚĂ & OPREA (2011): the interfluve Timiș - Bega, frequent (GRIGORE, 1971), between Timiș, Pogoniș, Bârzava (ARVAT, 1977), Ostrovul Moldova Veche (MORARIU *et al.*, 1973), mini-delta Nera (SÂRBU A. *et al.*, 2007).
8. *Amaranthus blitum* L. - CULIȚĂ & OPREA (2011): between Timiș, Pogoniș, Bârzava (ARVAT, 1977), Ostrovul Moldova Veche (MORARIU & DANCIU, 1970, MORARIU *et al*., 1973), mini-delta Nera (SÂRBU A. *et al.*, 2007), between Valley Mraconia și Dubova Depression (DIHORU *et al.*, 1973), Cerna confluence with the Danube (leg. MORARIU & DANCIU, 1965). Additions: Pișchia (NEACȘU, 2008).
9. *Amaranthus crispus* (Lesp. et Thévenau) N. Terracc. - Liebling (MORARIU s.a., *in* SĂVULESCU, 1952: CULIȚĂ & OPREA (2011)), the interfluve Timiș - Bega, frequent (GRIGORE, 1971), between Timiș, Pogoniș, Bârzava (ARVAT, 1977).
10. *Amaranthus deflexus* L. - the interfluve Timiș - Bega, frequent (GRIGORE, 1971), between Timiș, Pogoniș, Bârzava (ARVAT, 1977).
11. *Amaranthus hybridus* L. - CULIȚĂ & OPREA (2011): in native area, on riverbanks (SAUER, 1967, *in* COSTEA *et al.*, 2004); Timișoara (BORZA, 1947 *in* OPREA, 2005).
12. *Amaranthus powellii* S. Watson - the interfluve Timiș - Bega, frequent (GRIGORE, 1971).
13. *Amaranthus retroflexus* L. - the interfluve Timiș - Bega, frequent (GRIGORE, 1971). CULIȚĂ & OPREA (2011): Ostrovul Moldova Veche (MORARIU *et al*., 1970, 1973), Tri-Kule (ȘTEFUREAC *et al.*, 1971), the Natural Park "Porțile de Fier" (MATACĂ, 2003). Additions: Pișchia, Sânandrei (NEACȘU, 2008).
14. *Amaranthus x theveneaui* Deg. et Thell. - Liebling (SORAN, 1954, *in* CULIȚĂ & OPREA (2011), the interfluve Timiș - Bega, frequent (GRIGORE, 1971), between Timiș, Pogoniș, Bârzava (ARVAT, 1977).
15. *Ambrosia artemisiifolia* L. - CULIȚĂ & OPREA (2011): Ostrovul Moldova Veche (MORARIU & DANCIU, 1970), between Mraconia Valley and Dubova Depression (DIHORU *et al.*, 1973), Tisovița Valley, Cazanele Mici (MATACĂ, 2003). Additions: Pișchia, Surduc (FĂRCĂȘESCU, 2008), Surduc, Pișchia, Liebling, Sânandrei (NEACȘU *et al.*, 2011, NEACȘU *et al.*, 2012).
16. *Amorpha fruticoasa* L. - CULIȚĂ & OPREA, 2011: frecquently invades damp places (Wittenberg, 2005), Timiș meadow (GRIGORE, 1971), Mureș meadow (SĂRĂȚEANU *et al*., 2008), Albina (SĂRĂȚEANU *et al*., 2010), mini-delta Nera (SÂRBU A. *et al.*, 2007), Ostrovul Moldova Veche (*Salicetum triandrae* Malcuit 1926 *amorphosum fruticosae* Borza 1954), Gurile Nera, Ostrovul Calinovăț, Crușovița Valley, Cazanele Mari (MATACĂ, 2003), Tri-Kule (ȘTEFUREAC *et al*., 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al.*, 1972, 1973), Eșelnița Valley, Mraconia Valley

(MATACĂ, 2003). Additions: along the Danube (TODOR *et al.*, 1971), common in the Danube meadow, sporadic in Nera meadow (RACLARU, ALEXAN, 1972), Reserve Pogăniș Meadow (COSTE *et al*., 1999).

17. *Armoracia rusticana* P. Gaertn., B. Mey. et Scherb. - the interfluve Timiș - Bega, frequent (GRIGORE, 1971), insula Ada-Kaleh island (RAȚIU, 1968, *in* CULIȚĂ & OPREA (2011)).
18. *Artemisia annua* L. - the interfluve Timiș - Bega (GRIGORE, 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al.*, 1972, *in* CULIȚĂ & OPREA (2011).
19. *Asclepias syriaca* L. - CULIȚĂ & OPREA (2011): mini-delta Nera (SÂRBU A. *et al*., 2007), between Mraconia Valley and Dubova Depression (Dihoru *et al*., 1972). Additions: Surduc, Pișchia (NEACȘU, 2008), Satchinez (cercetări proprii). The species is mentioned in Arad County, along the Mureș river (DRĂGULESCU, 2003, *in* CULIȚĂ & OPREA (2011)).
20. *Aster lanceolatus* Willd. - CULIȚĂ & OPREA (2011): Banat (MORARIU *et al*., 1969), MORARIU & DANCIU 1970 (Ostrovul Moldova Veche).
21. *Aster novae-angliae* L. - between Timiș-Pogoniș-Bârzava (ARVAT, 1977).
22. *Aster x salignus* Willd. - CULIȚĂ & OPREA (2011): Liebling (MORARIU & NYÁRÁDY, *in* SĂVULESCU, 1964).
23. *Atriplex hortensis* L. - CULIȚĂ & OPREA (2011): Banat (HEUFFEL, 1858), Timișoara, near Bega (MORARIU s.a., *in* SĂVULESCU, 1952).
24. *Azolla filiculoides* Lam. - CULIȚĂ & OPREA (2011): Porțile de Fier, Orșova (LIȚESCU *et al*., 2003, 2005). *A. caroliniana* Willd.: gurile Nera, Balta Nera (MATACĂ, 2003, LIȚESCU *et al.*, 2005)
25. *Bidens frondosa* L. - mini-delta Nera (SÂRBU A. *et al*., 2007, *in* CULIȚĂ & OPREA (2011))
26. *Bidens vulgata* E. L. Greene - CULIȚĂ & OPREA (2011): Ostrovul Moldova Veche (MORARIU *et al*., 1969), Timiș meadow (VICOL, 1970), Insula Ada-Kaleh (MORARIU *et al*., 1969, VICOL, 1970), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972), Tri-Kule (ȘTEFUREAC *et al*., 1971). Additions: Timiș confluence with the brook Nădrag, on the right shore and downstream (VICOL, 1974).
27. *Brassica nigra* (L.) W. D. J. Koch - Banat (BORZA, 1947, *in* CULIȚĂ & OPREA (2011))
28. *Chamomilla suaveolens* (Pursh) Rydb. - the interfluve Timiș - Bega, frequent (GRIGORE, 1971).
29. *Chenopodium ambrosioides* L. - CULIȚĂ & OPREA (2011): mini-delta Nera (SÂRBU A. *et al*., 2007), Timiș meadow (VICOL, 1970, 1974), Porțile de Fier (MORARIU, 1966), Ada-Kaleh (ȚOPA, 1972), Orșova, Grațca Valley (MORARIU, 1966).
30. *Chenopodium botrys* L. - CULIȚĂ & OPREA (2011): Porțile de Fier (KANITZ, 1879-1881, BRÂNDZĂ, 1879-1883), Ostrovul Moldova Veche (DOMIN, 1932, *in* MATACĂ, 2003; MORARIU & DANCIU, 1970), Ada-Kaleh (PRODAN, *in* SĂVULESCU, 1952), Țesna Valley (RESMERIȚĂ, 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972, 1973), Tri-Kule (ȘTEFUREAC *et al*., 1971), Cazanele Mari (MATACĂ, 2002), Eșelnița Valley (CSŰRÖS *et al.*, 1976), Jidoștița Valley, Bahna Velley, Vodița Valley, Slătinicul Mare Valley (MATACĂ, 2003).
31. *Conyza canadensis* (L.) Cronq. - CULIȚĂ & OPREA (2011): mini-delta Nera (SÂRBU A. *et al*., 2007), the interfluve Timiș - Bega, frequent (GRIGORE, 1971), Țesna Valley (RESMERIȚĂ, 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al*.,

1972, 1973), Tri-Kule, Cazanele Mari, Cazanele Mici, Mraconia Valley, Eşelnița Valley, Dunube meadow, Cerna meadow, Ada-Kaleh, Bahna Valley, Jidoștița Valley, Divici Valley (ROMAN, 1974, MATACĂ, 2003). Pișchia, Sânandrei (NEACȘU, 2008).

32. *Coriandrum sativum* L. - the interfluve Timiș - Bega, sporadic (CĂLINESCU, 1942, GRIGORE, 1971, *in* CULIȚĂ & OPREA (2011)).
33. *Cuscuta campestris* Yunck. -CULIȚĂ & OPREA (2011): Sânandrei, Liebling (BUIA, 1938-1939), the interfluve Timiș - Bega, frequent (GRIGORE, 1971), Ostrovul Moldova Veche (MORARIU *et al*., 1973), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972, 1973), Mraconia Valley (MATACĂ, 2003).
34. *Cyperus difformis* L. - Timișoara (ZAHARIADI, 1955). Additions: sporadic, marshy places - Timișoara, Otelec (GRIGORE, 1971).
35. *Datura stramonium* L. - CULIȚĂ & OPREA (2011): mini-delta Nera (SÂRBU A. *et al*., 2007), Satchinez (OPREA & OPREA, 1968), the interfluve Timiș - Bega, frequent (GRIGORE, 1971), Sânandrei (NEACȘU, 2008), Tri-Kule (ȘTEFUREAC *et al*., 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al.*, 1972, 1973), Ada-Kaleh (ROMAN, 1974, MATACĂ, 2005). Additions: Nature Reserve - Valea Mare-Moldova Nouă (GRIGORE & COSTE, 1977).
36. *Dianthus barbatus* L. subsp. *barbatus* - the interfluve Timiș - Bega (GRIGORE, 1971).
37. *Echinocystis lobata* (Michx) Torr. et A. Gray - CULIȚĂ & OPREA (2011): Timiș meadow (VICOL, 1970), Porțile de Fier (ANASTASIU, 2005). Additions: frequent in Timiș meadow, overgrown with willows and alder trees nearby (VICOL, 1974), often in Nera meadow (PEIA, 1978).
38. *Elodea canadensis* Michx. - CULIȚĂ & OPREA (2011): Gurile Nera, Ostrovul Calinovăț (Matacă, 2003), mini-delta Nera (SÂRBU A. *et* al., 2007).
39. *Elodea nuttallii* (Planch.) H.St John - Porțile de Fier I și II (LIȚESCU *et al.*, 2003, *in* CULIȚĂ & OPREA (2011)).
40. *Erigeron annuus* (L.) Pers. - CULIȚĂ & OPREA (2011): mini-delta Nera (SÂRBU A. *et al*., 2007), Ostrovul Moldova Veche (MORARIU *et al.*, 1970), between Timiș-Pogoniș-Bârzava (ARVAT, 1977), Liebling (NYÁRÁDY, 1964), Tri-Kule (ȘTEFUREAC *et al*., 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972). Additions: left shore of Timiș river, at Găvojdia, on the right shore of Timiș river, to Criciova, on the right shore of Timiș river, near Tincova, Timiș Valley, near Piatra Scrisă (ARSENE *et al.*, 2000), Surduc, Pișchia (NEACȘU, 2008).
41. *Eriochloa villosa* (Thunb.) Kunth - Pișchia (FĂRCĂȘESCU *et al*., 2008).
42. *Eruca vesicaria* (L.) Cav. - between Timiș-Pogoniș-Bârzava (ARVAT, 1977).
43. *Fimbristylis bisumbellata* (Forssk.) Bubani - CULIȚĂ & OPREA (2011): gurile Nera (SÂRBU A., 2003, *in* OPREA, 2005), mini-delta Nera (SÂRBU A. *et al*., 2007).
44. *Galinsoga parviflora* Cav. - Timiș meadow (VICOL, 1970), the interfluve Timiș-Bega (GRIGORE, 1971). CULIȚĂ & OPREA (2011): Nera meadow, at Naidăș (BORZA, 1942), Ostrovul Moldova Veche (MORARIU *et al*., 1973), Mureș meadow (BORZA, 1942), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972, 1973), Eșelnița Valley, Ada-Kaleh (ROMAN, 1974, MATACĂ, 2003). Additions: Nature Reserve Valea Mare-Moldova Nouă (GRIGORE & COSTE, 1977), Surduc (NEACȘU, 2008).

45. *Gleditsia triacanthos* L. - CULIȚĂ & OPREA (2011): Moldova Veche (TODOR *et al.*, 1971), Eșelnița Valley, it flows into the Danube (CSŰRÖS *et al.*, 1968), Insula Ada-Kaleh, Vârciorova (ROMAN, 1974). Additions: Timișoara (GRIGORE, 1971).
46. *Glycyrrhiza glabra* L. - supports different humidity levels. In Banat, was reported var. *glandulifera* (BORZA, 1947, *in* CULIȚĂ & OPREA (2011):), without localization. Additions: Nature Reserve Lunca Pogănișului (COSTE *et al.*, 1999).
47. *Helianthus tuberosus* L. - CULIȚĂ & OPREA (2011): Comorișteț Valley (BORZA, 1942), in the Timiș river meadow (GRIGORE, 1971), Ada-Kaleh (RAȚIU, 1968). Additions: Găvojdia, left shore of Timiș (ARSENE *et al.*, 2000).
48. *Hemerocallis lilioasphodelus* L. - Banat (PRODAN, 1939, *in* CULIȚĂ & OPREA (2011).
49. *Humulus scandens* (Lour.) Merr.- CULIȚĂ & OPREA (2011): Timiș meadow (VICOL, 1970, *in* NEGREAN, 1987), Dunube Meadow, at Porțile de Fier, Ada-Kaleh (ROMAN, 1974).
50. *Impatiens glandulifera* Royle - Timiș meadow (VICOL, 1970).
51. *Iva xanthifolia* Nutt. - Timiș county, rare (GRIGORE 1971).
52. *Juglans regia* L. - CULIȚĂ & OPREA (2011): Banat, seedlings isolated (GHIȘA, 1941, *in* CĂLINESCU, 1941), at Cazane (BORZA, 1931), Mraconia Valley (CĂLINESCU & IANA, 1964), Cazanele Mari, Tri-Kule (ȘTEFUREAC *et al*., 1971), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972, 1973), Cerna Valley (BUNESCU, 1945), Vodița Valley (ROMAN, 1974), Ostrovul Moldova Veche (MATACĂ, 2003). Additions: Herculane (Lit. KITAIBEL, 1802, SCHWARZOTT, 1831, HEUFFEL, 1858, HAZSLINZSKY, 1872, DEGEN, 1901, POPESCU & SAMOILĂ, 1962), Râul Mare (BORZA, 1938, NYÁRÁDY, 1958), Cerna Valley, Gura Zlata (FEKETE & BLATTNY, 1913): *in* manuscript COSTE, 2001. Nature Reserve Valea Mare-Moldova Nouă (GRIGORE & COSTE, 1977), Sânandrei (NEACȘU, 2008).
53. *Juncus tenuis* Willd. - CULIȚĂ & OPREA (2011): Ada-Kaleh (RAȚIU, 1968), Eșelnița Valley (RESMERIȚĂ *et al*., 1971). Additions: in the meadows, in Banat, without localization (VICOL, 1974), Radimna Valley, Micoș Valley (Lit. RACLARU, ALEXAN, 1972). Surduc, Pișchia (NEACȘU, 2008), Liebling (NEACȘU *et al.*, 2010).
54. *Kochia scoparia* (L.) Schrad. - CULIȚĂ & OPREA (2011): Banat (BORZA, 1947), the Dunube Gorge (ȘTEFUREAC *et al*., 1971), Eșelnița Valley (CSŰRÖS *et al*., 1968), Tri-Kule (ȘTEFUREAC *et al*., 1971), Ada-Kaleh (DOMIN, 1932).
55. *Lupinus polyphyllus* Lindl. - in Banat, sporadic, moderately moist soils (GRIGORE, 1971).
56. *Mentha x piperita* L. - Banat (CULIȚĂ & OPREA, 2011), Nera Valley (HEUFFEL, 1858, BORZA, 1947, *in* CULIȚĂ & OPREA (2011)).
57. *Mentha x spicata* L. - CULIȚĂ & OPREA (2011): Banat, without localization (GUȘULEAC s.a., *in* SĂVULESCU, 1961).
58. *Mimulus guttatus* DC. - in damp places on the shore of rivers, streams, ditches, shallow (BORZA, 1933, FERN, 1997, *in* CULIȚĂ & OPREA, 2011). Banat (ARVAT, 1977). TOKARSKA-GUZIK & DAJDOK (2007), *in* CULIȚĂ & OPREA, 2011 considered this species charactheristic for association *Sparganio-Glycerietum fluitantis* Koch 1926, in Poland.
59. *Morus alba* L. - Timiș meadow (GRIGORE, 1971, VICOL, 1974). CULIȚĂ & OPREA (2011): between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1973), Tri-Kule (ȘTEFUREAC *et a*l., 1971), Ostrovul Moldova Veche (MORARIU & DANCIU, 1970,

MORARIU *et a*l., 1973), Cazanele Mari, Cazanele Mici, Eşelniţa Valley, spilling Eşelniţa into the Danube (MATACĂ, 2003), mini-delta Nera (SÂRBU A. *et al*., 2007). Additions: along the Nera (COSTE, 1974), Nature Reserve Valea Mare – Moldova Nouă (GRIGORE & COSTE, 1977).

60. *Morus nigra* L. - common on wet soils; CULIŢĂ & OPREA (2011): Banat (HEUFFEL, 1858), Ada-Kaleh (ROMAN, 1974). Sânandrei (NEACŞU, 2008).
61. *Oenothera biennis* L . - CULIŢĂ & OPREA (2011): frequent on rivers shore in Banat (ROCHEL, 1828, *in* BORZA, 1942), Ostrovul Moldova Veche (MORARIU & DANCIU, 1970), mini-delta Nera (SÂRBU A. *et al*., 2007), between Mraconia Valley and Dubova Depression (DIHORU *et al*., 1972), Tri-Kule (ŞTEFUREAC *et al*., 1971), Ostrovul Moldova Veche (MORARIU & DANCIU, 1970), Cazanele Mari (ŞTEFĂNESCU & SANDA, 11970), mini-delta Nera (SÂRBU A. *et al*., 2007). Additions: Timiş meadow (VICOL, 1974), on the rivers (GRIGORE, 1971). Herculane (DEGEN, 1901), Cerna Valley (POPESCU & SAMOILĂ, 1972): *in* manuscript COSTE, 2001.
62. *Oxalis corniculata* L. - the interfluve Timiş-Pogoniş-Bârzava (ARVAT, 1977).
63. *Oxalis stricta* L. - between Timiş, Pogoniş, Bârzava (ARVAT, 1977). CULIŢĂ & OPREA (2011): Eşelniţa Valley (CSŰRÖS *et al*., 1968), between Mraconia Valley and Cazanele Mari (ROMAN, 1974, DIHORU *et al*., 1968-1970). Additions: Surduc (NEACŞU, 2008).
64. *Paspalum paspalodes* (Michx.) Scribn. - CULIŢĂ & OPREA (2011): gurile Nera (SÂRBU A., 2003), OPREA, 2005, SÂRBU A. *et al.*, 2007, Ostrovul Moldova Veche (ANASTASIU *et al.*, 2005, ANASTASIU & NEGREAN, 2007).
65. *Phytolaca americana* L. - CULIŢĂ & OPREA (2011): Banat (BORZA, 1947, ŢOPA, 1947), between Timiş, Pogoniş, Bârzava (ARVAT, 1977, *in* OPREA, 2005), Liebling (SORAN, 1954, *in* OPREA, 2005). Additions: Herculane (Lit. SCHWARZOTT, 1831, *in* BOŞCAIU, 1971). Surduc (NEACŞU, 2008).
66. *Polygonum orientale* L. - land well supplied with water, ruderal weet in moist (FERN, 1997, *in* CULIŢĂ & OPREA (2011)); Timişoara (GRIGORE, 1971)
67. *Portulaca grandiflora* Hook. - Liebling (SORAN, 1954, *in* OPREA, 2005: CULIŢĂ & OPREA (2011)).
68. *Portulaca oleracea* L. - Nera and Dunube meadow (COSTE, 1974). Pişchia, Sânandrei (NEACŞU, 2008).
69. *Prunus cerasifera* Ehrh. - mini-delta Nera (SÂRBU A. *et al*, 2007, *in* CULIŢĂ & OPREA (2011)).
70. *Prunus serotina* Ehrh. - prefers not excessive moist soils; in our country appears in the wild west and requires close monitoring due to the invasive nature Hungary, Poland (CULIŢĂ & OPREA (2011).
71. *Reynoutia japonica* Houtt. - species with broad ecological amplitude, grows well on wetlands. Rare in Banat (CULIŢĂ & OPREA (2011). Additions: Timiş meadow, at Coştei (VICOL, 1974), Banat (BOŞCAIU, 1971). Sânandrei, 2011 (own research).
72. *Robinia pseudacacia* L. - the interfluve Timiş - Bega, frequent (GRIGORE, 1971), Ostrovul Moldova Veche (MATACĂ 2003, 2005, *in* CULIŢĂ & OPREA (2011)). Additions: Banat (ROCHEL, 1928, *in* VICOL, 1974), Nature Reserve Lunca Pogănişului (COSTE *et al.*, 1999),

Nature Reserve Valea Mare-Moldova Nouă (GRIGORE & COSTE, 1977), Nădrag Valley, Jdioara (ARSENE *et al.*, 2000), Pișchia, Liebling (NEACȘU, 2008).

73. *Rudbeckia laciniata* L. - Timiș Valley (VICOL, 1974), subspontaneous in Banat, along the rivers, meadows, bushes (CIOCÂRLAN, 2000), Surduc (NEACȘU, 2008).
74. *Sicyos angulatus* L. - CULIȚĂ & OPREA (2011): Timiș meadows (VICOL, 1970),on the Bârzava river (GOGA, 1980).
75. *Solidago canadensis* L. - CULIȚĂ & OPREA (2011): meadows in Banat (ȚOPA, 1962), mini-delta Nera (SÂRBU A. *et al.*, 2007).
76. *Solidago gigantea* Aiton - CULIȚĂ & OPREA (2011): Banat (MORARIU & NYÁRÁDY, *in* SĂVULESCU, 1964).
77. *Sorghum halepense* (L.) Pers. - This species was first mentioned in Banat by HEUFFEL (1858); the interfluve Timiș - Bega (GRIGORE, 1971), mini-delta Nera (SÂRBU A. *et al.*, 2007, *in* CULIȚĂ & OPREA (2011)), Liebling (NEACȘU, 2008).
78. *Trifolium hybridum* L. - wet grassy meadows (GRIGORE, 1971). Additions: Râul Mare (Lit. NYÁRÁDY, 1958), Moldova Veche-Pojejena, in wet meadows (Lit. TODOR *et al.*, 1971), Nature Reserve Lunca Pogănișului (COSTE *et al*., 1999), Satchinez Nature Reserve (COSTE *et al*., 1998, 1999), Poiana Ruscăi Mountains: Povergina, meadow brook near village Bichigi, meadow brook to Răchita (COSTE *et al*., 1996): *in* manuscript COSTE, 2001.
79. *Vallisneria spiralis* L. - Banat (HEUFFEL, 1858, *in* CULIȚĂ & OPREA (2011)), Bega Moartă, at Ghiroda (GRIGORE, 1971). Additions: in a pool to Honorici and at Coștei (VICOL, 1974).
80. *Veronica peregrina* L. - Ostrovul Moldova Veche (MORARIU, 1963, *in* CULIȚĂ & OPREA (2011)).
81. *Veronica persica* Poir. - the interfluve Timiș - Bega, frequent (GRIGORE, 1971), Liebling (NEACȘU, 2008).
82. *Xanthium spinosum* L. - the interfluve Timiș - Bega, frequent (GRIGORE, 1971), Pișchia (NEACȘU, 2008).

In Arad county, are reported the following species: *Amaranthus blitum* L., *Amaranthus crispus* (Lesp. et Thévenau) N. Terracc., *Amaranthus retroflexus* L., *Ambrosia artemisiifolia* L., *Amorpha fruticoasa* L., *Armoracia rusticana* P. Gaertn., B. Mey. et Scherb., *Asclepias syriaca* L., *Conyza canadensis* (L.) Cronq., *Cuscuta campestris* Yunck., *Datura stramonium* L., *Echinocystis lobata* (Michx) Torr. et A. Gray, ca invazivă, *Impatiens glandulifera* Royle, *Oenothera biennis* L., *Prunus cerasifera* Ehrh., *Reynoutia japonica* Houtt., *Robinia pseudacacia* L., ca invazivă, *Rudbeckia laciniata* L., *Veronica persica* Poir. (CULIȚĂ & OPREA, 2011, by different authors).

Hereinafter, we present certain aspects regarding chorology, biology and ecology of a few species that threaten aquatic and marsh ecosystems, referencing Romania and the Banat region, based on the existing data from specialized publications and private observations.

Acorus calamus L. - originating from South-East Asia (CIOCÂRLAN, 2009). Cultivated from ancient times in India for medicinal purposes and as seasoning. Prevalent across most of Europe, where it was introduced in 1557 (MATTHIOLI, 1565, *in* CULIȚĂ & OPREA, 2011). Mentioned for the first time in Banat by GRISELINI, *in* 1780. Later signaled by HEUFFEL (1858) and BORZA, 1947 (*in* CULIȚĂ & OPREA, 2011). In Romania it grows sporadically on the banks of still or mild running

waters, rush-beds, marsh grasslands, from plain regions to common oak levels (SÂRBU *et al.*, 2013). It is an illustrative species for the association *Acoretum calamii* Eggler. In Banat, there are many mentions of it (see chronology list above). The species is also present in the Satchinez Marsh rezervation flora in Timiş county (OPREA & OPREA 1968, ARSENE *et al.*, 2005). Within the same habitat, it is also encountered in the floristic composition of the association *Phragmitetum australis.* Upon further field work in the fall of 2011, we reaffirm the presence of the species within the reservation perimeter.

Paspalum paspalodes (michx.) Scribn. - species of tropical origin (CIOCÂRLAN, 2009). Introduced incidentally in Europe at the end of the XIXth century. Signaled for the first time in Romania in the Danube Delta, Letea forest, by ROMAN (1992, *in* CULIŢĂ & OPREA, 2011). It vegetates on beach sands, in marsh areas, salty soils (ANASTASIU, 2009). It propagates vegetatively, through rhizome fragmentation and/or through stolon, developing very dense populations that eliminate the reed and rush associations. It raises problems in rice crops. It also blocks irrigation canals. It cannot be eliminated through fire, as the rhizomes are resistant to fire. Careful prevention methods are recommended against the invasion of this species, as control measures are inefficient, and chemical measures have their own risks. In Romania, it can be considered a species with a high invasive potential for wetland habitats (CULIŢĂ & OPREA, 2011). In Banat the species is signaled in a few wetland habitats by SÂRBU A. (2003), OPREA (2005), SÂRBU A. *et al.* (2007), ANASTASIU *et al.* (2005), ANASTASIU & NEGREAN (2007, *in* CULIŢĂ & OPREA, 2011).

Elodea canadensis Michx. - originating from North America (CIOCÂRLAN, 2009). It arrived in Europe in the XIXth century. In Romania it arrived incidentally, via the Danube, from Hungary. The species is classified as invasive. It grows sporadically in still or mild flowing waters, ponds, canals and lakes from the steppes to the oak forests (SÂRBU *et al.*, 2013). It frequently formes monospecific phytocenosis (of the association *Elodeetum canadensis* Pign. 1959). In moderate density conditions, it oxygenates the waters and ensures food source and refuge for fish populations. Excessive development determines water clogging and the disruptance of economic activities. Control is achieved mecanically, chemically and biologically (through the introduction of phytophagous fish and pathogen fungi (HOLM *et al.*, 1997, *in* CULIŢĂ & OPREA, 2011). In Banat the species is mentioned by MATACĂ (2003), SÂRBU A. *et* al. (2007, *in* CULIŢĂ & OPREA, 2011). Habitats in Romania where it is present: R2206 Danube communities with *Potamogeton perfoliatus, P. gramineus, P. lucens, Elodea canadensis* and *Najas marina* (DONIŢĂ *et al.*, 2005).

E. nuttallii (Planchon) St. John - originating from North America (CIOCÂRLAN, 2009). Introduced in Europe in 1939 for aquatic cultures (CIOCÂRLAN *et al.*, 1997, *in* CULIŢĂ & OPREA, 2011). In Romania it was found in the Danube Delta in 1992 (ANASTASIU & NEGREAN, 2007), where it forms specific associations with the hornwort (*Ceratophyllo demersi-Elodeetum nuttallii* CIOCÂRLAN *et al.*, 1997). Locally, it tends to replace *E. canandensis* Michx. (CIOCÂRLAN, 2011). It is frequent in still or mild flowing waters, lakes, canals, ponds or eutrophication waters, from the steppes to the oak forests (SÂRBU *et al.*, 2013). It eliminates the species *Potamogeton, Myriophyllum spicatum, Ceratophyllum demersum, Marsilea quadrifolia*. It is avoided by aquatic phytophagous insescts to the dtriment of other aquatic macrophytes (ERHARD *et al*., 2007). It is difficult to apply biological and chemical control measures and even prohibited in certain habitats;

the recommended method is mechanical and through fires (ANASTASIU & NEGREAN, 2007). In Banat, it is signaled by LIȚESCU *et al.* (2005, *in* CULIȚĂ & OPREA, 2011).

Azolla filiculoides Lam. - originally from North America (CIOCÂRLAN, 2009). Introduced in the botanical gardens of Europe in 1872. In Romania, it was signaled in the Danube Delta by PALLIS, in 1916 (*in* CULIȚĂ & OPREA, 2011). CIOCÂRLAN (2000, 2009), SÂRBU *et al.* (2013) synonymize *A. filiculoides* Lam. with *A. caroliniana* Willd. In the R.P.R. flora, the two species are considered distinct (their discriminating characteristics presented), with the mention that only *A. caroliniana* Willd. is found in herbariums. It grows well in rivers, lakes, pools, marshes and canals. The species spreads quickly, vegetatively, through organ fragments or discharge from aquaria into still or running waters. It threatens associations of *Trapa natans, Salvinia natans, Marsilea quadrifolia, Ceratophyllum demersum, Myriophyllum spicatum* (ANASTASIU & NEGREAN, 2007). According to SÂRBU *et al.* (2013), it is a rare species in the Romanian flora. In the Banat region species *A. caroliniana* Willd. is signaled (MATACĂ, 2003, LIȚESCU *et al.*, 2005, *in* CULIȚĂ & OPREA, 2011). It lives symbiotically with nitrogen bonding bacteria *Anabaena azollae;* because of this it is used as green fertilizer on rice crops. In still waters, it is necessary to physically remove the plants, through mechanical methods and incineration. Chemical control in aquatic ecosystems is not recommended, due to the negative effects it could have on the biocenosis. Habitats in Romania where it is present: R 2203 danubian communities with *Salvinia natans, Marsilea quadrifolia, Azolla caroliniana* and *A. filiculoides* (DONIȚĂ *et al.* 2005) and R2206 danubian communities with *Potamogeton perfoliatus, P. gramineus, P. lucens, Elodea canadensis* and *marine Najas* (DONIȚĂ *et al.*, 2005).

Vallisneria spiralis L. - originated from tropical regions (CIOCÂRLAN, 2009). Introduced in Europe as an ornamental plant and as fodder. It was first mentioned in Banat by HEUFFEL (1858 "*in aquis stagnantibus planitiei*. Jul. Aug. KITAIBEL.-ROCHEL"). Even though it is not mentioned as an adventive species in *European Flora*, Romanian specialized publications indicate that it is in fact adventive for this area (CIOCÂRLAN, 2000, 2009, SÂRBU *et al.*, 2013). It was also signaled in Banat by GRIGORE (1971), VICOL (1974). It multiplies vegetatively, through stolons or the accidental tear-off of the plant. It grows in shallow, still or mild running waters, from the plains to hilly areas (SÂRBU *et al.*, 2013). It edifies the association *Potameto-Vallisnerietm* Br.-Bl. 1931; also included in the structure of the association *Elodeetum canadensis* Pign. 1959 (ȘTEFAN *et al*., 2006, *in* CULIȚĂ & OPREA, 2011). It contributes to water filtration, constitutes food source and shelter for fish. Excessive development leads to the elimination of other species and encumbers fishing. Habitats in Romania where it is present: R2206 Danubian communities with *Potamogeton perfoliatus, P. gramineus, P. lucens, Elodea canadensis* and *marine Najas* (DONIȚĂ *et al.*, 2005).

Mimulus guttatus Fisch. ex DC. - originating from North America (CIOCÂRLAN, 2009). Introduced in Europe between 1824 and 1853 as an ornamental plant (TOKARSKA-GUZIK & DAJDOK, 2007, *in* CULIȚĂ & OPREA, 2011). In Romania it was first signaled by PORCIUS, in 1885 (CULIȚĂ & OPREA, 2011). In Banat it is quoted by ARVAT (1977). It grows in damp places, on the banks of rivers, streams, ditches. It multiplies vegetatively.

Sicyos angulatus L. - originated from North America (CIOCÂRLAN, 2009). Introduced in Europe as a decorative plant in the XIXth century (BAILEY, 1947, *in* CULIȚĂ & OPREA, 2011). Today it is out of controlled crops and still expanding. The species is first mentioned, in Romania, by BAUMGARTEN, in 1816 (*in* CULIȚĂ & OPREA, 2011) and HEUFFEL, 1858, in Transylvania,

respectively Banat. According to SÂRBU *et al.* (2013), a rare species in Romanian flora. In Banat, it was signaled in the Timiș alluvial plain (VICOL, 1970) and on the banks of Bârzava River (GOGA, 1980, *in* CULIȚĂ & OPREA, 2011). It grows well on river banks, near marshes, along roads and on raw lands. Sometimes a weed in agricultural crops. Dissemination is achieved by water, through the aid of animals (the hispid fruit cling to their fur), due to agriculture machinery or at harvest.

Juncus tenuis Willd. - originally from North America (CIOCÂRLAN, 2009). Introduced in Europe, through France, in 1820 (PARROT, 1958, *in* CULIȚĂ & OPREA, 2011). The species is first mentioned in Romania in 1913, by LENGYEL (ATANASIU & NEGREAN, 2009). To the chronological data above we also add Surduc, Pișchia, Liebling as locations where we have encountered it (NEACȘU, 2008, NEACȘU *et al*., 2010). It multiplies through rhizomes or seeds. Frequent in mesophyll or mezzo-hydrophilic plains, nitrophile bracken, forests and shrubbery in alluvial plains. From hilly regions to spruce levels (SÂRBU *et al.*, 2013). It represents the association *Juncetum tenuis* Schwiekerath 1944. Habitats in Romania where it is present: R3713 Anthropic meadows of *Juncus tenuis* and *Trifolium repens* (Doniță *et al.*, 2005).

Cyperus difformis L. - originated from the Azore Islands (CIOCÂRLAN, 2009). Considered indigenous species in some European countries. ZAHARIADI (1955, *in* CULIȚĂ & OPREA, 2011) signaled the species in Timișoara. He also mentions that it was introduced to us through seed imports, along with rice cultivation. Today it grows sporadically in marshes, mires, rice crops, from plains to oak forest regions (SÂRBU *et al.*, 2013). ANGHEL *et al*. (1962, *in* CULIȚĂ & OPREA, 2011) said that the species was present in all rice crops in the country, where it could invade and compromise the cultures.

Amorpha fruticosa L. - originated from North America (CIOCÂRLAN, 2009). It was introduced in England, in 1724, for ornamental and anti-erosion purposes (CULIȚĂ & OPREA, 2011). In Romania it was introduced to botanical gardens, first in Iași (FĂTU, 1871, *in* CULIȚĂ & OPREA, 2011). One of the most discussed invasive species. It multiplies rapidly due to a high sprouting capacity and seeds disseminated by water, or through the aid of animals or the wind. It frequently invades riverbanks. There are many sightings of the species in Banat (see above chronology). We have observed the species invasion on the bank of Subuleasa canal (outskirts of Timișoara), in 2010, with negative effects on the marsh vegetation. Part of the association *Amorphetum fruticosae* Morariu 1969. The invasion is especially dangerous as it compromises reforestation of the alluvial plains areas (DIHORU, 2004). Control measures are mechanical, first through close cutting and then setting fire, or chemical. If developing under controlled conditions, the species is economically important. It can be cultivated for ornamental purposes, in parks and gardens. It protects soil, mountainsides, embankments and riverbanks against erosion. Also worth mentioning is the nitrogen it contributes to the soil, as it belongs to the *Fabaceae* family. Some authors recommend the species as a biological pest measure (it produces amorphigen, a substance toxic to many insects).

Asclepias syriaca L. - originated from North America (CIOCÂRLAN, 2009). Introduced in Europe in 1629 (BAGI, 2008, *in* CULIȚĂ & OPREA, 2011). First mentioned in Romania by CZIHACH, in 1836 (CULIȚĂ & OPREA, 2011). It favors anthropic habitats, with man-introduced vegetation, untended crops and alluvial plains. Sometimes it is found as a weed growing in cultures. In Hungary it is considered an invasive weed (BAGI, 2008, *in* CULIȚĂ & OPREA, 2011). In Banat it is signaled by SÂRBU A. *et al*. (2007). We have identified the species on the banks of

Surduc River (with a few specimens in bloom), in 2007. In the Satchinez Marsh reservation, in the fall of 2011, we found a considerable population, with healthy individuals, bearing fruit, in an open space, near a canal, from where we estimate it will spread due to the fragility of the habitat.

Reynoutia japonica Houtt. - originated from East Asia (CIOCÂRLAN, 2009). Introduced in Europe in 1825 (ANASTASIU & NEGREAN, 2007), as an ornamental plant. Mentioned as sub-spontaneous species in the Romanian flora, by PAUCĂ (1940, *in* CULIȚĂ & OPREA, 2011). Rare in Banat (CULIȚĂ & OPREA, 2011). Today the species has over 100 chronological mentions in Romania. Despite all this, it is not yet sufficiently studied. CULIȚĂ & OPREA (2011) state that following the conclusions drawn from specimens collected for study, the species has sometimes been confused with *R. x bohemica*. One of the most aggressive invasive plants (according to IUCN). It grows on the banks of rivers and streams. It has a high regenerative capacity, multiplies rapidly, and prevents the development of other species, exhausting soil resources with negative effects on the invaded habitat biodiversity (CULIȚĂ & OPREA 2011, according to various authors). Despite their limitations, setting fire and chemical and biological methods are an option as control measures (CULIȚĂ & OPREA, 2007). We have identified the species, in 2010, within the perimeter of Sânandrei Lake. At that time, there was no apparent issue of invasion, the species having been only signaled, but since then the habitat has been perturbed by draining, which would favor the species settling in here as well.

CONCLUSIONS

1. According to private research and bibliographic data available, there is a number of 82 invasive or potentially invasive adventive plant species in the wetlands of Banat. A region-wide chronology is presented for each.
2. The species *Acorus calamus* L., *Paspalum paspalodes* (Michx.) Scribn., *Elodea canadensis* Michx., *E. nuttallii* (Planchon) St John, *Azolla filiculoides* Lam., *Vallisneria spiralis* L., *Mimulus guttatus* Fisch. ex DC., *Sicyos angulatus* L., *Juncus tenuis* Willd., *Cyperus difformis* L., *Amorpha fruticosa* L., *Asclepias syriaca* L. and *Reynoutia japonica* Houtt. have been looked at more closely as they are among the main causes of the decline in aquatic and marsh biodiversity.
3. We consider further research is needed on the presence and expansion of invasive and potentially invasive plants in the wetlands of Banat, in order to augment our knowledge of plant invasion in these ecosystems and to establish concrete management measures.

BIBLIOGRAPHY:

1. ANAČKOV, G., RAT, M., RADAK, B., IGIĆ, R., VUKOV, D., RUĆANDO, M., KRISTIVOJEVIĆ, M., RADULOVIĆ, S., CVIJANOVIĆ, D., MILIĆ, D., PANJKOVIĆ, B., SZABADOS, K., PERIĆ, R., KIŠ, A., STOJŠIĆ, V., BOŽA, P., 2013 – *Alien invasive neophytes of the suotheastern part of the Pannonian Plain – Central European Journal of Biology*, 8 (10): 1032-1047
2. ANASTASIU, P., NEGREAN, G., 2005 a – *Alien plants in Romania (I)*, Analele Universității AL.I. Cuza, Iași, seria a II-a, Biologie vegetală, 51: 87-96.
3. ANASTASIU, P., NEGREAN, G., 2005 b, *Alien plants in Constanța and south Constanța (Agigea) harbours*, Simpozion științific, Facultatea de Biologie, Iași, p. 33.
4. ANASTASIU, P., NEGREAN, G., 2007 – *Invadatori vegetali în România*, Ed. Universității din București.

5. ANASTASIU, P., NEGREAN, G., 2008 – *New alien plants to Romania*, Analele Universității din Craiova. Sria Agricultură, Montanologie, Cadastru, 38/B: 1-10.
6. ANASTASIU, P., NEGREAN, G., 2009 – *Neophytes in Romania*, in Neobiota din România, Presa Universitară Clujeană, pp. 66-97.
7. ANASTASIU, P., NEGREAN, G., BAŞNOU, C., SÂRBU, C., OPREA, A., 2007 – *A preliminary study on the neophytess of wetlands in Romania*, in RABITSCH, W., F. ESSL & F. KLINGENSTEIN (Eds.): Biological Invasions from Ecology to Conservation. Neobiota 7 (2007): 181-192.
8. ARSENE, G.-G., CHELU, A., SAMFIRA, I., PĂTRUȚ, D., DANCEA, L., HORABLAGA, M., FAUR, F., 2000 – *Biodiversitatea specifică şi tipologia pajiştilor permanente din regiunea colinară şi montană a Banatului*, Raport de cercetare pe anul 2000.
9. ARSENE, G.-G., FAUR, F.-M., NEACŞU, A.-G., ANDREIS, C., COSTE, I., ARSENE, A.-M., 2005 – *The flora, the vegetation and the habitats of the Satchinez natural reserve (Timiş dep.)*, Annals of West University of Timişoara, ser. Biology, XIII, Timişoara, pp.1-20, ISSN 1453 – 7680.
10. ARVAT, N., 1977 – *Flora şi vegetaţia dintre râurile Timiş, Pogoniş şi Bârzava*, Teză de doctorat, Iaşi.
11. BOȘCAIU, N., 1971 – *Flora și vegetația munților Țarcu, Godeanu și Cernei*, Ed. Academiei R.S.R., București.
12. BOȘCAIU, N., 1966 – *Vegetaţia acvatică şi palustră din împrejurimile oraşului Lugoj*, Universitatea „Babeş-Bolyai" Cluj. Grădina botanică, Contribuţii botanice II, Cluj-Napoca, pp. 69-80.
13. BURESCU, P., 2003 – *Flora şi vegetaţia zonelor umede din nord-vestul României*, Ed. Academiei Române, Bucureşti.
14. CIOCÂRLAN, 2000 – *Flora ilustrată a României. Pteridophyta et Spermatophyta*, Ed. Ceres, Bucureşti.
15. CIOCÂRLAN, 2009 – *Flora ilustrată a României. Pteridophyta et Spermatophyta*, Ed. Ceres, Bucureşti.
16. COSTE, I., 1974 – *Flora şi vegetaţia Munţilor Locvei*. Teză de doctorat. Cluj.
17. COSTE, I., ARSENE, G.-G., PĂTRUȚ, D., CHELU, A.-L., BOBOICIOV, S., 1999 – *Stabilirea și caracterizarea unităților de vegetație și a tipurilor de biotop din sud-vestul României (Banat)*, Raport de cercetare pe anul 1999.
18. CULIȚĂ, S., OPREA, A., 2011 – *Plante adventive în flora României*, Ed. "Ion Ionescu de la Brad", Iași.
19. DIHORU, Gh., 2004 – *Invasive plants in Romania's flora*, Analele Universității din Craiova, 9 (45), 73-83.
20. DONIȚĂ, N., POPESCU, A., PAUCĂ-COMĂNESCU, M., MIHĂILESCU, S., BIRIȘ, I.-A., 2005 – *Habitatele din România*, Ed. Tehnică Silvică, București.
21. ERFMEIER, A., BOHNKE, M., BRUELHEIDE, H., 2011 – *Secondary invasion of Acer negundo: the role of phenotypic responses versus local adaptation*, Biological Invasions, 13:1599-1614
22. FĂRCĂȘESCU, 2008 – *Cercetări privind studiul florei segetale și gradul de îmburuienare la principalele culturi din județul Timiș.* Teză de doctorat. U.S.A.M.V.B.Timișoara, Facultatea de Horticultură și Silvicultură.
23. FĂRCĂȘESCU, A.-M., ARSENE, G.-G., NEACȘU, A.-G., 2008 – *Eriochloa villosa (Thunb.) Khunt – a new invasive weed in Romania*, Journal of Plant Diseases and Protection, Special Issues, XXI, Eugen Ulmer KG, Stuttgart, pp. 333-334, ISSN 1861-4051
24. GRIGORE, S., 1971 – *Flora şi vegetaţia din interfluviul Timiş-Bega*, Teză de doctorat, Institutul Agronomic „Ion Ionescu de la Brad", Iaşi.

25. GRIGORE, S., COSTE, I., 1977 – *Contribuţii la studiul vegetaţiei xerofile de stâncării din Cheile Caraşului şi Cheile Gârliştei*, Tibiscus, Şt. nat., 35-49, Timişoara.
26. GRISELINI, F., 1984 – *Încercare de istorie politică şi naturală a Banatului Timişoarei*, Ed. Facla, Timişoara.
27. HEUFFEL, I., 1858 – *Enumeratio plantarum in Banatu Temesiensi spontane crescentium et frecquantius cultorum*, Vindobonas.
28. HUSSNER, A., 2012 – *Alien aquatic plant species in European countries*, Weed Research, 52: 297-306
29. LAMBDON, P.W., PYŠEK, P., BASNOU, C., HEJDA, M., ARIANOUTSOU, M., ESSL, F., JAROŠI, V., PERGL, J., WINTER, M., ANASTASIU, P., ANDRIOPOULOS, P., BAZOS, I., BRUNDU, G., CELESTI-GRAPOW, L., CHASSOT, PH., DELIPETROU, P., JOSEFSSON, M., KARK, S., KLOTZ, S., KOKKORIS, Y., KÜHN, I., MARCHANTE, H., PERGLOVÁ, I., PINO, J., VILÀ, M., ZIKO, A., ROY, D., HULME, P.E., 2008 – *Alien flora of Europe: species diversity, temporal trends, geographical patterns and research needs*. Preslia 80: 101-149.
30. NEACŞU, A., ARSENE, G.-G., 2011 – *Remarks on the evolution tends of aquatic and paludicolous vegetation in the main accumulation lakes in Timis county*, Research Journal of Agricultural Science, 43 (2), pp. 211-217, ISSN 2066-1843
31. NEACŞU, A., ARSENE, G.-G., ARSENE, A., STROIA, C., FAUR, F., TABUC, C., 2010 – *The influence on flora and vegetation of the water quality in Liebling accumulation lake*, Journal of Horticulture, Forestry and Biotechnology, vol. 14 (3), 95-98, ISSN 2066-1797
32. NEACŞU, A., ARSENE, G.-G., STROIA, C., LAŢO, A., CRISTA, F., 2012 – *Changes in Banat's humid areas flora and vegetation under the influence of proximities,* 47 th Croatian and 7 th International Symposium on Agriculture, Opathija, Croaţia, pp. 98-101
33. NEACŞU, A., 2008 – *Cercetări asupra biodiversităţii florei şi vegetaţiei unor lacuri de acumulare din judeţul Timiş.* Teză de doctorat. U.S.A.M.V.B. Timişoara, Facultatea de Agricultură.
34. PEDASHENKO, H., APOSTOLOVAA, I., VASSILEV, K., 2012 – *Amorpha fruticosa invasibility of different habitats in lower Danube*, Phytologia Balcanica, 18 (3): 285-291
35. PEIA, P., 1978 – *Aspecte din vegetaţia din Cheile Minişului*, Contrib. bot., 235-250, Cluj.
36. RACLARU, P., ALEXAN, M., 1972 – *Flora Defileului Dunării Baziaş-Pojejena*, An. Univ. Bucureşti, s. biol. veg., XXI, Bucureşti.
37. SÂRBU, I., ŞTEFAN, N., OPREA, A., 2013 – *Plante vasculare din flora României. Determinator ilustrat de teren*, Ed. Victor B Victor, Bucureşti.
38. SIMPSON, M., PROTS, B., - 2012 – *Predicting the distribution of invasive plants in the Ukrainian Carpathians under climatic change and intensification of anthropogenic disturbances: implications for biodiversity conservation*, Environmental Conservation 40 (2): 167-181.
39. SÎRBU, C., 2004 – *The alien flora of Moldavia (Romania)*, Lucrări ştiinţifice Universitatea Agronomică din Iaşi, Seria Agricultură, 47.
40. SORAN, V., 1956 – *Câteva asociaţii de plante acvatice şi palustre din Banat,* Studii şi cercetări de biologie, 1-4, Ed. Academiei R.P.R., Cluj, pp.107-124.
41. TODOR, I., GERGELY, I., BÂRCĂ, C., 1971 – *Contribuţii la cunoaşterea florei şi vegetaţiei din zona Defileului Dunării între oraşul Moldova Veche şi comuna Pojejena, judeţul Caraş-Severin*, Contrib. bot., IV, 203-256, Cluj.
42. TÖRÖK, K., BOTTA-DUKÁT, Z., DANCZA, I., NÉMETH, I., KISS, J., MIHÁLY, B., MAGYAR, D., 2003 – *Invasion gateways and corridors in the Carpathian Basin: biological invasions in Hungary*, Biological Invasions 5: 349-356

43. VICOL, E.C., 1970 – *Bidens frondosus L. în flora României*, Stud. şi cercet. biol., Bot., 22,4, 207-301, Bucureşti.
44. VICOL, E.C., 1974 – *Flora şi vegetaţia Piemontului Lugojului*, Teza de doctorat, Cluj-Napoca.
45. *** 1952-1976 (SĂVULESCU, T. red.), *Flora R.S.R.* (I-XIII), Ed. Academiei R.S.R., Bucureşti.
46. http://easin.jrc.ec.europa.eu
47. http://eunis.eea.europa.eu/species.jsp
48. http://www.iucn.org
49. http://www.rbge.org.uk/databases
50. www.europe-aliens.org
51. www.issg.org
52. www.zin.ru