

PRELIMINARY STUDIES OF THE CHOROLOGY AND PHYTOSOCIOLOGY OF THE INVASIVE PLANTS FOUND ON THE COPANITA ISLAND IN THE DANUBE VALLEY, ROMANIA

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Abstract

*The intensive abiotic activity, but not only that, has brought about the invasion of allochthonous (non-native) species in the natural and semi-natural degraded ecosystems in our country. The invasive species influence the successional dynamics and the floristic composition of the plant communities, occupying increasingly more and more space. Biological invasion of the invasive plants is considered to be one of the most serious threats to biodiversity in alluvial and meadow vegetation. The effects of the invasive alien plants, on the flora and plant communities structure of the alluvial and meadow vegetation were investigated at Copănița Island in the Danube Valley. The researched territory is part of the ROSCI0045 Coridorul Jiului Protected Area. In order to control the introduction and expansion of invasive plants, as well as the anthropogenic impact of these species on biodiversity, a number of measures for the protection and proper management of invasive plants in riparian areas need to be defined and implemented. In the researched area, 22 invasive species were identified, for some of them new locations were established for Romania or Oltenia. Several species were identified for the first time in Oltenia or a second location was identified for Romania, such as the *Conyza sumatrensis*. It is found for the first time in Romania. The management is most effective when the invasion is detected early and comprehensive control measures are implemented quickly, any effect is thus limited. Therefore, early identification of the areas in which efforts should be concentrated (e.g. prevention, elimination and monitoring) is essential for cost-effective management. All the invasive species strongly affect biodiversity within natural habitats.*

Key words: *invasive plants, biodiversity, Copănița Island, Danube Valley*

INTRODUCTION

For as long as humans have travelled over and between land masses, species have been transported, deliberately or inadvertently, from their native ranges to new, previously unoccupied, areas (Manchester and Bullock, 2000). We can say that most of the invasive species were introduced in Romania in the first part of the

20th century, when trade, land and maritime transport developed.

The rapid development of trade, tourism, transport and human travel over the last century has dramatically increased the spread of invasive plant species, allowing them to cross natural geographic barriers (Wittenberg et al., 2001).

Neophyte invasion is considered the second greatest threat to plant diversity

after habitat loss due to human interference (Manchester and Bullock, 2000) and has increased in recent decades due to globalization and economic liberalization (Pimentel et al., 2001).

In the recent past, the rate and risk associated with alien species introductions have increased enormously because human population growth and human activities altering the environment have escalated rapidly (Pimentel et al., 2000).

The invasive species influence the successional dynamics and the floristic composition of the plant communities, occupying increasingly more and more space. Biological invasion of the invasive plants is considered to be one of the most serious threats to biodiversity in alluvial and meadow vegetation. Invasive species have a very high power of adaptation outside their natural distribution areas and the presence of very widespread dispersal potential, in new areas they have the ability to invade and dominate or overwhelm specific natives. These species influence biological diversity in ecosystems or natural or semi-natural habitats, representing an important factor in the change and dynamics of native biodiversity.

Invasive species can invade all types of ecosystems, their establishment and development can lead to the destruction of habitats and can also lead to species extinction and ecological, biological and functional changes at the level of the entire ecosystem.

For a correct management of the expansion and combating of invasive species, both those of plant and animal origin, complex studies are necessary regarding the ecology, morphology, anatomy, phenology, reproductive biology, physiology and phytochemistry, phytosociology and syndamics of the populations of these species. Following the research carried out in recent years, it was found that a large part of the invasive species cause significant damage to natural and semi-natural ecosystems, aquatic, practical, forest habitats and more,

also causing public health problems. This is closely interdependent with a complex of ecological factors that allow invasive species to become abundant and conquer new territories.

The paper presents a preliminary study on the species of invasive plants encountered in the summer of 2022 on Copănița island, an integral part of the Jiului Corridor protected area.

This island located in the Danube Valley, in the southern part of Romania, is of particular importance from the point of view of natural capital.

Located at the confluence of the Jiu and the Danube, this island is characterized by its special flora and fauna biodiversity. Several types of natural habitats have developed on this strip of land, very different, from aquatic to forest ones.

The island covers a relatively small area, but nevertheless the eco-pedo-climatic conditions here favor the development of a special vegetation with numerous rare plant species. Also on the island can be found a number of rare species of fauna, many species of birds and a special stud of wild horses.

MATERIALS AND METHODS

The researched territory is part of the ROSCI0045 Coridorul Jiului Protected Area. Copănița Island is an island found in the Danube Valley, near Bechet, Dolj County. It is located near the mouth of the Jiu River in the Danube (fig. 1).

The list of the invasive plant species from Copănița Island, deliberately introduced in several ways, is based on a great lot of bibliographic sources, numerous herbarium data (Craiova), and the field observations of the author in the 2022 year.

In the appreciation of the species invasive status we took in consideration their chorology in Copănița Island, the occupied habitats and their capacity of reproduction and formation of stable populations, without the human intervention.

We have utilized the nomenclature after Tutin et al. (eds.) 1964-1980; Ciocârlan 2000, and Oprea 2005.



Figure 1. Copănița Island
(source: <https://www.google.ro/maps>)

RESULTS AND DISCUSSIONS

The effects of the invasive alien plants, on the flora and plant communities structure of the alluvial and meadow vegetation were investigated at Copănița Island in the Danube Valley.

In order to control the introduction and expansion of invasive plants, as well as the anthropogenic impact of these species on biodiversity, a number of measures for the protection and proper management of invasive plants in riparian areas need to be defined and implemented. In the researched area, 22 invasive species were identified, for some of them new locations were established for Romania or Oltenia.

Following studies on the inventory and conservation status of the Natura 2000 habitats on Copănița Island, a number of invasive species were identified.

This introduction of invasive plants on the island was done gradually, mainly by water, due to the intense navigation on this sector of the Danube, but also by other ways. An important factor in the spread and uncontrolled development of invasive species in this territory was the floods of April 2006. Some invasive species occupied quite large territories on the island due to their greater ability to compete with native plants and being able to penetrate natural aquatic habitats, of fresh water, of mesophilic and hygrophilic meadows, bushes and forests.

Invasive status. Taking into account their current distribution in this area, the state of the populations and the affected habitats, information about the 22 species identified are invasive, they can reproduce, without human intervention, and expand their range, both on anthropogenic habitats and the semi-natural or natural ones. Below is an alphabetical list of some invasive species identified and monitored during the aforementioned period:

Ailanthus altissima (Mill.) Swingle: neo; orig.: East Asia; intr. in Romania: orn; spread on Copănița Island: forest habitats; first mention in Romania: Fuss, 1866, from Transilvania (Sîrbu and Oprea, 2011);

Ambrosia artemisiifolia L. (*A. elatior* L.): neo; intr. in Romania: accidentally, anthropic factors; orig.: North America; spread on Copănița Island: in all herbaceous habitats, forest and schrub habitats, having an extremely high adaptive capacity; first mention in Romania: 1908, from Orșova, Mehedinti County;

Amorpha fruticosa L. (fig. 2): neo; intr. in Romania.: orn; orig.: North America; spread on Copănița Island: forest habitats and schrub habitats; first mention in Romania: Fătu, 1871, from Iași Botanical Garden (Sîrbu and Oprea, 2011);



Figure 2. *Amorpha fruticosa*
(photo M. Niculescu)

Artemisia annua L.: arh.; intr. in Romania: cultivated; orig.: C, SW Asia; spread on Copănița Island: herbaceous habitats; first mention in Romania: Guebhard, 1842-1848, from Moldavia;

Chenopodium ambosioides L.: neo; intr. in Romania: cultivated; orig.: Tropical America; spread on Copănița Island: herbaceous habitats and shrub habitats; first mention in Romania: Sigerus, 1791, from Transilvania - Axente Sever and Zlatna (Șirbu and Oprea, 2011);

Conyza canadensis (L.) Cronq. (*Erigeron canadensis* L.): neo; intr. in Romania: accidentally, anthropic factors; orig.: North America; spread on Copănița Island: herbaceous habitats and forest habitats; first mention in Romania: Nyárády, 1814, from Romania Carpathians (Șirbu and Oprea, 2011);

C. sumatrensis Retz. (fig. 4): neo; intr. in Romania: accidentally, anthropic factors orig.: North America; spread on Copănița Island: herbaceous habitats and shrub habitats; first mention: Anastasiu, 2010, from Constanța (Șirbu and Oprea, 2011);



Figure 3. *Conyza sumatrensis* (photo M. Niculescu)

Cyperus diformis L. (fig. 4): neo; intr. in Romania: accidentally, anthropic factors; orig.: Azores Islands; spread on Copănița Island: hygrophilic and meso-hygrophilic

habitat; first mention: Zahariadi, 1955 (Șirbu and Oprea, 2011);



Figure 4. *Cyperus diformis* (photo M. Niculescu)

Echinocloa colona (L.) Link., neo; intr. in Romania: accidentally, anthropic factors; orig.: North America; spread on Copănița Island: herbaceous habitats; first mention in Romania: Costea, 1996, from Bucharest (Șirbu and Oprea, 2011);

Echinocystis lobata (Michx.) Torr. et A. Gray: neo; intr. in Romania: cultivated in the botanical gardens; orig.: North America (southern Canada); spread on Copănița Island: forest and shrub habitats; first mention in Romania: Moesz, 1904, from Dârște, Brașov County (Șirbu and Oprea, 2011);

Eclipta prostrata (L.) L. (*E. alba* (L.) Hassk.) (fig. 5): neo; intr. in Romania: accidentally, anthropic factors; orig.: Tropical and subtropical America (Tutin, in Tutin et al. 1976) or Asia from Iran (Vassilczenko, 1999/1959; Stone, 1970, Prostko 2004) (Șirbu and Oprea, 2011); spread on Copănița Island: forest and herbaceous habitats; first mention in Romania: 1994-1996, Șirbu A., from The Small Island of Brăila, Brăila County (Șirbu and Oprea, 2011);

Erigeron annuus (L.) Pers. (*Aster annuus* L., *Stenactis annua* (L.) Ness.). neo; intr. in Romania: accidentally, cultivated or anthropic factors; orig.: North America; spread on Copănița Island: forest, shrub and herbaceous habitats;

first mention in România: 1866, Schur from Transilvania and Crișana (Sîrbu and Oprea, 2011);



Figure 5. *Eclipta prostrata*
(photo M. Niculescu)

Fraxinus pensylvanica Marshall (*F. pensylvanica* var. *lanceolata* (Borkh.) Sarg.; *F. lanceolata* Borkh.; *F. pubescens* Lam.): arh.; intr. in Romania: orn, forest; orig.: North America; spread on Copănița Island: forest habitats; first mention in România: 1910-1915, cultivated in Bazoș Park, Timiș County (Marcus, 1958);

Kochia scoparia (L.) Shrad. (*Bassia scoparia* (L.) A. J. Scott., *Chenopodium scoparia* L.): arh.; intr. in Romania: orn., grown in the garden; orig.: Asia; spread on Copănița Island: herbaceous habitat; first mention: Edel, 1835-1853; Czihak, 1836, 1841, Moldavia (Kanitz, 1979-1881);

Morus alba L.: arh.; intr. in Romania: orn., alim.; orig.: Asia (China); spread on Copănița Island: forest habitats; first mention in Romania: 16th century, the Turks of the Ottoman Empire (Bordeianu et al., 1963);

Oenothera glazioviana Micheli (*O. erythrosepala* Borbás; *O. lamarkiana* auct. non., Ser.): neo; intr. in Romania: orn.; orig.: North America; spread on Copănița Island: herbaceous and shrub habitats; first mention in Romania: Morariu, 1957, Cluj-Napoca (Sîrbu and Oprea, 2011);

Panicum capillare L. (fig. 6): neo; intr. in Romania: orn, fodd; orig.: North America; spread on Copănița Island: herbaceous habitats; first mention in Romania: 1983, Socola, Iași County;

Panicum miliaceum L.: arh.; intr. in Romania: alim, fodd; orig.: Asia; spread on

Copănița Island: herbaceous habitats; first mention in România cultivated species from the Neolithic period (Cârciumaru et al. 2005);

Phytolacca americana L. (*Ph. decandra* L.): neo; intr.: orn, alim., orig.: North America; spread on Copănița Island: forest habitats; first mention: Sestini, 1780, from Forești, Cluj County (Pop, 1930);



Figure 6. ***Panicum capillare***
(photo M. Niculescu)

Sicyos angulatus L.: neo; intr. in Romania: orn.; orig.: North America; spread on Copănița Island: forest habitats; first mention in Romania: 1816, Baumgarten, Transilvania (Sîrbu and Oprea, 2011);

Symphotrichum lanceolatum Willd. (*Aster lanceolatum* (Willd.) G. L. Nesom) (fig. 7): neo; intr. in Romania: orn., orig.: North America; spread on Copănița Island: herbaceous, shrub, aluvial forest habitats; first mention in Romania: Soó, 1940, Transilvania (Borza, 1947);



Figure 7. ***Symphotrichum lanceolatum***
(photo M. Niculescu)

Xanthium orientale L. ssp. ***italicum*** (Moretti) Greuter: neo; intr. in Romania: accidentally, anthropic factors; orig.: America?; spread on Copănița Island: herbaceous habitats; first mention in Romania: 1884, Borbas, Timiș County (Grigore, 1987);

Invasive species in the researched territory affect the physiognomy, floristic composition, structure and state of conservation of the Natura 2000 habitats, in the close interdependence of human activity, and at the same time with the existence of eco-pedo-climatic conditions in the continuation of the change and of course either through continuous introduction. theirs in the area, namely the throwing of waste with seeds or vegetative organs on the Danube, the transport and spreading of these seeds through the navigation system, the intensive practice of fishing, the practice of tourism, economic activity, etc.

Conyza sumatrensis a species identified for the second time in Romania, it is new for Oltenia, the species being cited only from Dobrogea in the town of Constanța, this being the second resort.

Echinocloa colona like the previous species, is a species identified for the second time in Romania, it is new for Oltenia, the species being cited only from the Bucharest train station. Thus, Copănița

Island is the second settlement in the country for this species.

Eclipta prostrata was not cited from Oltenia, in Romania being cited only from the counties: Brăila, Constanța and Tulcea, also from the Danube Valley. Copănița Island is a new resort for this species where it is quite common, but the species is certainly widespread in other localities in the Danube basin.

Sicyos angulatus and *Echinocystis lobata* are found throughout the Danube Valley, especially in forest habitats, especially in the 92A0 - *Salix alba* and *Populus alba* galleries, Natura 2000 habitat. They are particularly aggressive species, they develop quickly, they occupy very large areas, they suffocate the seedlings and they are two extremely rare species that are difficult to combat, especially *Sicyos angulatus*, due to their fruit spikes.

Symphotrichum lanceolatum is a fairly aggressive species in the researched territory, it invades the alluvial vegetation, especially the 92A0 - *Salix alba* and *Populus alba* galleries, Natura 2000 habitat, and has a negative impact on the floristic composition of the phytocoenoses that build the alluvial or meadow plant communities of the Danube valley. This species is cited for the first time from Oltenia.

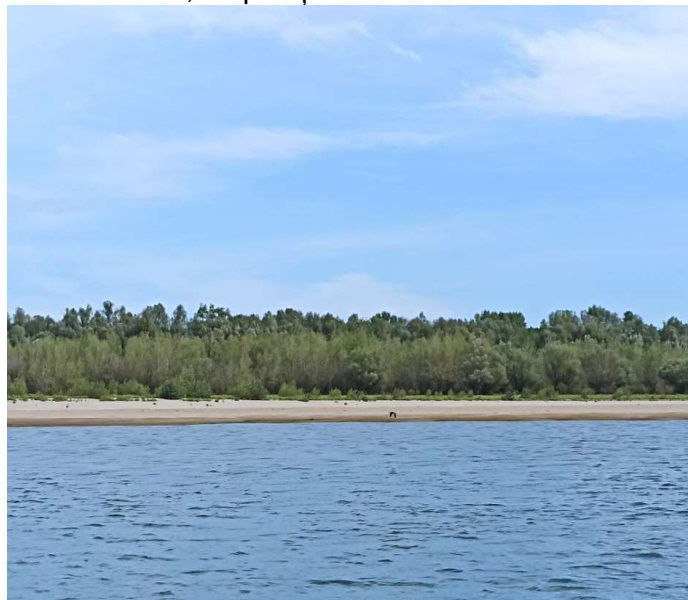


Figure 7. Copănița Island (photo: M. Niculescu)

Abbreviations: **arh**-archaeophyte; **neo**-neophyte; **orig.**: origin; **intr.**: introduced (**orn**-ornamental, **alim**-alimentary, **fodd**-fodder);

CONCLUSIONS.

In the researched area, 22 invasive species were identified, for some of them new locations were established for Romania or Oltenia. Several species were identified for the first time in Oltenia or a second location was identified for Romania, such as the *Conyza sumatrensis* or *Echinocloa colona*.

The management is most effective when the invasion is detected early and comprehensive control measures are implemented quickly, any effect is thus limited. Therefore, early identification of the areas in which efforts should be concentrated (e.g. prevention, elimination and monitoring) is essential for cost-effective management. All the invasive species strongly affect biodiversity within natural habitats.

This study, is a preliminary study, the researches that will continue to consider the importance of this island, its geographical position and all the eco-pedo-climatic conditions in the continuation of the change. At the same time, the importance of the inventory and monitoring of invasive species within the researched territory, which is an integral part of an important protected area in Romania, is of particular importance and can represent a useful support in the rational management of immigration and biological invasion in our country, and especially in the protected areas in whose negative impact on protected species and habitats is special.

ACKNOWLEDGEMENTS

The present study was carried out within the project POIM:150549, "Revision of the Management Plan of the Protected Natural Areas ROSCI0045 Jiului Corridor, ROSPA0023 Jiu-Danube Confluence, ROSPA0010 Bistreț and the Drănic Fossil

Site-2391 and Zăval Forest-IV.33 nature reserves"

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