Scientific Papers. Series B, Horticulture. Vol. LXVIII, No. 1, 2024
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

NATURA 2000 HABITATS FROM OLTENIA AFFECTED BY INVASIVE AND POTENTIALLY INVASIVE SPECIES (II)

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Abstract

The present paper is a complex segment of a study aimed at Natura 2000 habitats that are affected by invasive and potentially invasive plants. In the first paper, the forest habitats that have registered changes following the impact of the exercise of this category of plants were presented, and in the present study, the practical Natura 2000 habitats that were affected to a lesser or greater extent by invasive and potential plant species are presented. invasive. These are: 6120 Xeric sand calcareous grasslands, 6240* Sub-pannonic steppic grasslands, 6260* Pannonic sand steppes and 62C0* Ponto-Sarmatic steppes. A summary analysis shows that all analyzed habitats are of community interest, which leads us to say that taking measures to reduce the impact exerted by this category of plants is strictly necessary. The most affected surfaces are those on the periphery of protected areas, where numerous spontaneous species are affected by various phytopathogenic agents and where the zoo-anthropogenic factor makes its presence felt.*

Key words*: grassland habitat, invasive plants, Natura 2000, Oltenia, Romania.*

INTRODUCTION

As compared to the protection of a species, the research and the conservation of natural habitats represent a priority (Noss, 1996; Cowling et al., 2004; Nicholson et al., 2009; Berg et al., 2014; Keith et al., 2015; Timis-Gansac et al., 2022; Georgescu et al., 2023; Georgescu & Luchian, 2023).

Numerous natural habitats that are included in Natura 2000 network of protected natural areas are located within Oltenia region. Some of them refer to grasslands, i.e. to these specific ecosystems, in which all phenomena are continuously subject to the influence of ecological factors.

When referring to Annex I of the Habitats Directive (92/43/EEC), it can be stated that, based on their distribution area, the grasslands under study belong to the following main categories: "Natural grasslands", distinguished by code 61 (for the habitat 6120* Xeric sand calcareous grasslands) and " Semi-natural dry grasslands and scrubland facies" (for habitats: 6240* Sub-pannonic steppic grasslands, 6260* Pannonic sand steppes and 62C0* Ponto-Sarmatic steppes).

The distribution of grasslands on the Romanian territory is uneven because of the great orographic and geobotanical variability (in reference to the mountain, subalpine and alpine regions) and because of the human influence exerted mainly in the plain and hilly regions (Pușcaru-Soroceanu et al., 1963). Out of more than 4 million ha of grasslands and hayfields, approximately half are formations of mesoxerophilous grasslands from hills and plains (about 29% of the total area) and xerophilous steppe grasslands from plains (about 13.5%) (Pușcaru-Soroceanu et al., 1963). Over time, the natural grasslands within Oltenia have been important for animal feeding, either through grazing or haying (Pavel, 1973). At the beginning of the 20th century, the breeding of domestic animals was not conducted on such a large scale as to induce significant damage to grasslands and to require improvement works. Subsequently and gradually, their irrational use, combined with the lack of proper measures, led to a decrease in the phyto-diversity and productivity of these places.

Scientific studies that mainly aimed at researching the grassland flora and vegetation within Oltenia were carried out over time (Buia & Popescu, 1952; Buia & Păun, 1960; Buia et al., 1961; Ciurchea, 1965; 1971; Cîrțu, 1971; 1976; Păun, 1966; Păun & Popescu, 1975; Popescu, 1979; 1981; 1992; 1996; Rădușoiu,

2005; 2006; Costache, 2011; Niculescu, 2015; 2020). Their main objective was to understand the floristic and vegetation diversity of these ecosystems. With the rapid development of invasive species, some areas occupied by grasslands have undergone obvious changes, this being especially true for those located in the plains and piedmont hills (Acatrinei et al., 2024).

The increases in climate changes extreme events might cause higher yield variability, lower harvestable yields, reductions/extensions in land use in some areas, introduction of new crop species and also changes in crop host and pathogens and pest's interaction, which will drive emergence of infectious diseases in both agricultural and non-managed ecosystems through multiple pathways (Durău et al., 2021; Paraschivu et al., 2022; Paraschivu et al., 2023; Sărățeanu et al., 2023; Velea et al., 2021).

MATERIALS AND METHODS

Oltenia is located in the south-western part of Romania and it is characterized by a great variability related to climatic conditions, relief, and soil types. This variability determines the installation of a significantly diverse flora and vegetation.

From a geographical point of view, Oltenia includes the following regions: the Oltenia Plain, the Getic Piedmont, the Subcarpathian Depression, as well as the mountain, subalpine and alpine regions of the Southern Carpathians - the Parâng and Căpățânii Mountains (Figure 1).

The habitats under study are located within the Oltenia Plain and the Getic Piedmont, i.e. within those regions where zoo-anthropogenic activities are present on a large scale. It should be noted that the analyzed areas are either in the precincts of protected natural areas, or in other areas where research was carried out only from the floristic or vegetation point of view.

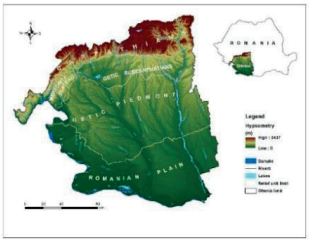

Figure 1. Map of Oltenia

For larger areas, the aerial photography technology used by means of drones is recommended, as it can provide valuable images concerning the areas occupied by the different natural habitats (Călina et al., 2020).

The interpretation of the habitats under study started from the information present in the work entitled "Manual de interpretare a habitatelor Natura 2000 din România (Romanian Manual for Interpretation of EU Habitats)" (Gafta & Mountford, 2008).

The identification of invasive species in certain areas and their rapid proliferation in a short time span has led us to pay close attention to these areas.

For each invasive or potentially invasive species, the population typology was specified by using a scale from 1-5 (1 - solitary organisms; 2 - rare populations, on surfaces < 10 m^2; 3 - rare populations, on surfaces >10 m^2; 4 - dense populations, on surfaces <10 m^2; 5 - dense populations, on surfaces >10 m^2). Furthermore, the introduction mode was also specified in each case.

The scientific names for the species mentioned in the paper are in accordance with POWO (2023).

RESULTS AND DISCUSSIONS

The study conducted for the present paper focuses on priority habitats.

The data gathered over time have highlighted some changes on certain areas occupied by these habitats and this is due to the presence of some invasive and potentially invasive species (Table 1). The comparative analysis of the data collected from surfaces where invasive species were identified and of those originating on surfaces where they are absent, highlights the decline of phytodiversity in the affected habitats.

In contrast to the forest habitats, in the case of the areas occupied by the grasslands included in the analyzed habitats, there can be noticed the presence of invasive and potentially invasive allogeneic species in greater numbers. Nevertheless, a favorable aspect is represented by the fact that few of them have dense populations (e.g. *Ambrosia artemisiifolia* L., *Ailanthus altissima* (Mill.) Swingle), the rest being under the form of solitary individuals or having rare populations (Table 1).

Table 1. Invasive and potentially invasive plants from the researched habitats

Scientific name	Population typology				Introduction mode
	Habitat 6120*	Habitat 6240*	Habitat 6260*	Habitat 62C0*	
Ambrosia artemisiifolia L.	4	2	1	2	accidental
Erigeron annuus (L.) Pers. subsp. *strigosus* (Muhl. ex Willd.) Wagenitz	2	2	3	1	accidental
Ailanthus altissima (Mill.) Swingle	1	3	4	2	accidental
Erigeron canadensis L.	3	1	2	1	accidental
Xanthium orientale L. subsp. *italicum* (Moretti) Greuter	2	1	2	1	accidental
Gleditsia triacanthos L.	1	2	2	1	accidental
Oxalis dillenii Jacq.	3	1	1	1	accidental
Robinia pseudoacacia L.	3	1	1	2	accidental
Lycium barbarum L.	1	2	1	1	ornamental
Acer negundo L.	1	1	1	1	accidental
Asclepias syriaca L.	1	-	2	1	accidental
Veronica persica Poir.	1	1	-	-	accidental
Abutilon theophrasti Medik.	1	1	1	-	accidental
Morus alba L.	1	1	1	2	accidental
Amorpha fruticosa L.	-	-	1	2	accidental
Amaranthus powellii S.Watson	1	1	-	1	accidental
Datura stramonium L.	1	-	-	-	accidental
Sorghum halepense (L.) Pers.	1	1	1	-	accidental
Elaeagnus angustifolia L.	-	1	-	2	accidental
Helianthus tuberosus L.	-	1	-	1	accidental
Phytolacca americana L.	1	1	1	2	accidental
Bassia scoparia (L.) A. J. Scott	2	1	-	1	accidental
Euphorbia maculata L.	1	1	2	-	accidental
Oxalis corniculata L.	1	1	1	1	accidental
Panicum capillare L.	1	1	1	-	accidental

Population typology: 1- solitary individuals; 2 - rare populations, on surfaces < 10 m^2; 3- rare populations, on surfaces > 10 m^2; 4-dense populations, on surfaces < 10 m^2; 5- dense populations, on surfaces > 10 m^2.

Understanding the rapid development of certain invasive and potentially invasive plant species, we believe that urgent measures are needed in order to reduce the impact exerted by these plants on grassland habitats, especially on those of community importance.

Habitat 6120* Xeric sand calcareous grasslands, is present on limited areas in Oltenia. It brings together fallow grasslands, which prefer dry places and soils rich in calcium.

In Oltenia, it is known both from Natura 2000 protected areas (e.g. "Coridorul Jiului"), as well as from other areas in the Danube floodplain (e.g. Pisculeț settlement - Dolj county or Izvoarele and Balta Verde settlements from Mehedinți county) (Sanda et al., 2001). The vegetation of this habitat, classified as *Molluginetum cervianae* Borza, 1963, is mentioned from the Jiu river floodplain, near the Tâmburești settlement. Because of the zoo-anthropogenic factor and the appearance of invasive species, *Hypertelis cerviana* (L.) Thulin is present only in isolated specimens (Figure 2), the surfaces where it forms compact phytocenoses being dominated by *Plantago indica* L. (Figure 3) and evolving towards the vegetation characteristic for the habitat 2130* [Fixed coastal dunes with herbaceous vegetation (grey dunes)].

Figure 2. Surfaces where *Hypertelis cerviana* is present

Figure 3. The current state of some areas where habitat 6120* was present - vernal aspect

6240* Sub-pannonic steppic grasslands are known from the Oltenia hills and from the Mehedinți Plateau. Within the "Coridorul Jiului" protected area, it is to be found in the northern part of the site, on dry, sunny areas. The presence of invasive species in the areas occupied by this habitat in Oltenia is explained by the affinity between humans and these places. A significant part of these areas represent former agricultural lands that have not been cultivated for many years, the current vegetation succeeding plant communities dominated by annual species.

This habitat is present on limited areas within the Danube and the Jiu floodplains. The phytodiversity decline in the grasslands occupied by the vegetation of this habitat is due to overgrazing by sheep. Thus, these areas experience the proliferation of ruderal species, whether native, not consumed by sheep, or invasive and potentially invasive alien species (e.g. *Ambrosia artemisiifolia* L., *Ailanthus altissima* (Mill.) Swingle (Figure 4), *Erigeron annuus* (L.) Pers. subsp. *strigosus* (Muhl. ex Willd.) Wagenitz).

Figure 4. *Ailanthus altissima* on surfaces occupied by habitat 6240* in the Danube floodplain

6260* Pannonic sand steppes represents a habitat with a greater spread on the continental sands located in the main river floodplains in Oltenia. It is found on flat lands with sandy dunes. The floristic composition of this habitat is characterized by the presence of numerous annual species. As a correspondent to the habitats in Romania, these surfaces are included in R6405 Ponto-Pannonian grasslands on unfixed continental dunes with *Bromus tectorum* (Doniță et al., 2005). It has a high conservative value (Popescu, 2005).

Although this habitat naturally recovers very easily, in some areas of the Jiu and the Danube floodplains, it also displays obvious changes in the floristic composition and structure. This fact is triggered by the practice of irrational grazing or by the simple transformation of these areas into agricultural land.

Among the invasive and potentially invasive alien species that exert a greater impact on the areas occupied by this habitat in Oltenia, there are to be noted: *Erigeron annuus* (L.) Pers. subsp. *strigosus* (Muhl. ex Willd.) Wagenitz, *Ailanthus altissima* (Mill.) Swingle, *Erigeron canadensis* L., *Xanthium orientale* L. subsp. *italicum* (Moretti) Greuter, *Gleditsia triacanthos* L., *Asclepias syriaca* L. (Figure 5).

Figure 5. Surfaces within the habitat 6260* from Oltenia, which are affected by invasive alien species (*Ailanthus altissima* and *Erigeron annuus* subsp. *strigosus*)

The habitat 62C0* Ponto-Sarmatic steppes is found in several areas of Oltenia. It is also mentioned from the precincts of certain Natura 2000 protected areas (e.g. Silvostepa Olteniei). From the coverage viewpoint, this habitat has a good representation, occupying the second place after the forests of turkey oak and Hungarian oak with *Festuca heterophylla* in the weedy layer.

On certain areas, the conservation value of this habitat is very high due to the presence of vascular species of sozological importance: *Ziziphora capitata* L., *Sternbergia colchiciflora* Waldst. et Kit., *Salvia aethiopis* L., *Crucianella angustifolia* L., *Convolvulus cantabricus*, *Lathyrus sphaericus* M. Bieb., etc. The surfaces occupied by the vegetation of this habitat are used in most cases as pastures and they are found on flat, fertile, dry lands, either on chernozems or on alluvial soils (Sanda et al., 2008) (Figure 6).

Figure 6. Physiognomy of the areas occupied by the 62C0* habitat within Oltenia

In some locations with Oltenia, the vegetation of this habitat is affected either by invasive native species (e.g. *Lepidium draba* L.), or by alien species: *Ambrosia artemisiifolia* L., *Ailanthus altissima* (Mill.) Swingle, *Robinia pseudoacacia* L., *Morus alba* L., *Amorpha fruticosa* L., *Elaeagnus angustifolia* L., *Phytolacca americana* L., as well as by other taxa that are present as solitary individuals.

CONCLUSIONS

The comparative analysis of the four habitats presented above, by taking into account the presence of invasive and potentially invasive allogeneic species, highlights the fact that this category of plants has poor populations in the investigated areas. There are few cases in which these plants have a greater spread, with rich populations (e.g. *Ambrosia artemisiifolia* in habitat 6120*). However, if we take into account the fact that the analyzed habitats are of community importance and the invasive alien species in these habitats are in a fairly large percentage, compared to those identified in Romania (between 15-20% of the total), we can say that the need to protect these habitats is acute.

Table 1. Invasive and potentially invasive plants from the researched habitats

Scientific name	Population typology				Introduction mode
	Habitat 6120*	Habitat 6240*	Habitat 6260*	Habitat 62C0*	
Ambrosia artemisiifolia L.	4	2	1	2	accidental
Erigeron annuus (L.) Pers. subsp. *strigosus* (Muhl. ex Willd.) Wagenitz	2	2	3	1	accidental
Ailanthus altissima (Mill.) Swingle	1	3	4	2	accidental
Erigeron canadensis L.	3	1	2	1	accidental
Xanthium orientale L. subsp. *italicum* (Moretti) Greuter	2	1	2	1	accidental
Gleditsia triacanthos L.	1	2	2	1	accidental
Oxalis dillenii Jacq.	3	1	1	1	accidental
Robinia pseudoacacia L.	3	1	1	2	accidental
Lycium barbarum L.	1	2	1	1	ornamental
Acer negundo L.	1	1	1	1	accidental
Asclepias syriaca L.	1	-	2	1	accidental
Veronica persica Poir.	1	1	-	-	accidental
Abutilon theophrasti Medik.	1	1	1	-	accidental
Morus alba L.	1	1	1	2	accidental
Amorpha fruticosa L.	-	-	1	2	accidental
Amaranthus powellii S.Watson	1	1	-	1	accidental
Datura stramonium L.	1	-	-	-	accidental
Sorghum halepense (L.) Pers.	1	1	1	-	accidental
Elaeagnus angustifolia L.	-	1	-	2	accidental
Helianthus tuberosus L.	-	1	-	1	accidental
Phytolacca americana L.	1	1	1	2	accidental
Bassia scoparia (L.) A. J. Scott	2	1	-	1	accidental
Euphorbia maculata L.	1	1	2	-	accidental
Oxalis corniculata L.	1	1	1	1	accidental
Panicum capillare L.	1	1	1	-	accidental

Population typology: 1- solitary individuals; 2 - rare populations, on surfaces < 10 m^2; 3- rare populations, on surfaces > 10 m^2; 4-dense populations, on surfaces < 10 m^2; 5- dense populations, on surfaces > 10 m^2.

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