

**CONTRIBUTIONS TO THE KNOWLEDGE OF THE VEGETATION
ON THE MOLDOVA VECHÉ ISLET (CARAŞ-SEVERIN COUNTY)**

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Abstract: The paper presents the current characteristics of the psammophilous vegetation on the fixed and semi-fixed dunes in the north of the Moldova Veche islet. The stabilized dunes cover the biggest part of the northern area of the islet and are mainly populated by *Plantago arenaria*, displaying thus a monodominant aspect. The semi-stable dunes are lightly fixed with vegetation, mainly populated by *Festuca vaginata*, *Carex liparicarpus* and *Fumana procumbens*, have a reduced coverage and are formed on sands in the early stages of pedogenesis. In older bibliographical sources, *Plantago arenaria* is not mentioned on the islet. Most likely, this species appeared and spread massively on the dunes after the 1970s, behaving like a colonizing species. The proliferation of this species on the dunes was promoted by the grazing of feral horses. Most likely, the phytocoenoses containing *Plantago arenaria* replaced in time the plant associations *Brometum tectorum* and *Festucetum vaginatae*, which were widely spread in the northern part of the islet 50 years ago. The vegetation of the semi-fixed dunes has preserved its natural characteristics better and is not currently affected by the colonization with *Plantago arenaria*. This aspect can be associated with reduced disturbances of the habitat, grazing being reduced as a result of the poorly developed vegetation. Due to the similar composition in species, the semi-fixed dunes can be considered a stage of transition to stabilized dunes.

Key words: Iron Gates Natural Park, plant associations, habitats

Received: 27 April 2021 / Accepted: 27 September 2021

Introduction

The Moldova Veche islet is one of the big islands on the Romanian flow of the Danube, located between the localities Moldova Veche and Coronini (Caraş-Severin county), in an area where the Danube widens considerably (Fig. 1).

It is a protected natural area constituted according to GD no. 2151/2004 under the name of Ostrov-Moldova Veche Wetland, included in the Iron Gates Natural Park as an integral protection area and special avifauna protection area. From an administrative point of view, the islet belongs to the city of Moldova Nouă. The islet is one of the main tourist attractions in the Danube Gorge.

The surface of the protected area is 1627 ha, of which 345 ha represent the island proper while 1282 ha represent the water surface adjacent to the island down to a depth of 2 m. The climate on the islet is temperate-continental with sub-Mediterranean influences. Around the city of Moldova Noua, the annual average temperatures are 11.2°C while the annual average rainfall is 800-1000 mm/ year (Management Plan of the Iron Gates Natural Park).

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Fig. 1. Moldova Veche islet (Google Earth Pro)

The height of the island varies between 65 and 75 meters, except for a prehistoric mound in the south-western part of the island (Attila's mound in local toponymy) that rises up to 103 m (Morariu et al. 1973). The northern part of the island is mostly covered by sand dunes, populated with psammophilous vegetation, while the southern part is mostly occupied by lakes, among which there are land strips with palustrine vegetation, mesophilic meadows, bushes and arboreal vegetation typical to riverside coppices. Most of the wetlands are dammed. On the hill of the island, xerophilous grasslands and psammophilous vegetation predominate in areas with sandy substrate.

In the north-eastern part of the island there is a metal industrial bridge, about 600 m long, designed in the mid-1980s to transport tailings from the copper mines in the Moldova Nouă area to the island. This metal structure never worked for the purpose for which it was built.

The sand of the dunes comes mostly from the alluvial deposits of the Danube but also from the dredging activities that took place on the Danube, before the construction of the Iron Gates dam. The sand was shaped by winds in the form of dunes with a predominantly southeast-northwest direction. The height of the dunes in the northern part of the island is 9-10 meters, compared to the level of the Danube. On the mound located in the south-west of the island, the land is about 35 meters higher than the north of the island, the mound being populated mainly by steppe and psammophilous vegetation. An important population of *Colchicum arenarium* grows on the mound (Morariu et al. 1973).

Stony substrate and mixtures of sand and gravel appear on the dams and only on the island in the northern part. The islet was dammed in the mid-1980s, when the island was expected to become a repository for the tailings resulted from the Moldomin mining company. During this period, the metal bridge was built, which should have supported conveyor belts for the tailings. Due to the enormous risk of pollution of the Danube, the project was abandoned.

In the Management Plan of the Iron Gates Natural Park, approved in 2013 by GD 1048/2013, the vegetation of the islet is described very briefly, the little information referring especially to the bird species existing here, as the area has a SPA status

(Special Protection Areas). The last in-depth study of the vegetation on the Moldova Veche islet dates back to 1973 (Morariu et al. 1973), with a detailed description of the plant associations on the island.

Compared to the situation presented by Morariu et al. (1973), the vegetation of the islet has undergone significant changes in the last 50 years, due to the natural dynamics, the arrangement of the dams, but also as a result of the feral horses that live on the island. In the 1970s, the Serbs from Moldova Veche raised horses on the islet, which they transported by ferry. After the ferry activity ended in the 1990s, the horses remained on the islet, turned feral and multiplied reaching about 100 individuals. The horses have been influencing the dynamics of the vegetation, both in terrestrial and aquatic ecosystems, on sand dunes, in meadows but also in areas with palustrine and aquatic vegetation. Previous research on the island (Bodescu 2013) reports situations with local populations of *Marsilea quadrifolia* negatively affected by the life of horses in the area of the islet lakes.

Material and methods

The field observations underlying this work were made between June and July 2020. The scientific names of the species are consistent with Euro+Med PlantBase (<https://www.emplantbase.org/home.html>) and with Flora Europaea (Tutin et al. 1964-1980, 1991), Sârbu et al. (2013). The phytocoenological surveys and their grouping in plant associations observe the methodological principles of the Braun-Blanquet school. The distribution of the plant species in the phytocoenological surveys within the main coenotaxonomic units was made according to Popescu et Sanda (1998) while the name of the plant associations and higher units was made according to Sanda et al. (2008). The belonging of the plant associations to the Natura 2000 types of habitats was made according to Gafta & Moutford et al. (2008) and Doniță et al. (2005).

The mapping of the vegetation was done by marking the boundaries of the main types of vegetation using a Garmin 64S GPS, in WGS 84 system, followed by the projection of coordinates on a Google Earth map.

The considerations regarding the dynamics of the vegetation on the sand dunes are presented in relation to the descriptions made by Morariu et al. about 50 years ago.

Results and discussion

Following the field study, several main types of vegetation were identified on the Moldova Veche islet:

1. Aquatic plant communities, in the wetlands (lakes, ponds, marshes) in the external part of the islet, connected to the Danube and the internal one, connected to the lakes (Order *Potamogetonetalia pectinati* Koch 1926), represented mainly by the associations *Myriophyllo-Potametum lucentis* Soó 1934, *Potamogetonetum graminei* Koch 1926, *Nymphoidetum peltatae* (Allorge 1922) Bellot 1951;

2. Palustrine vegetation on the lake banks (Alliances *Phragmition* W Koch. 1926 and *Magnocaricion* W Koch. 1926), represented mainly by the associations *Scirpo-Phragmitetum* W Koch. 1926, *Typhetum angustifoliae* Pignatti 1953, *Typhetum latifoliae* Lang 1973, *Schoenoplectetum lacustris* Chouharch 1924, *Caricetum ripariae* Knapp et Stoffer 1962, *Caricetum gracilis* Almquist 1929);

3. Mesophilic and meso-hygrophilous meadows, on sandy alluvial deposits, in the low floodable areas and towards the edge of the aquatic basins (Alliance *Agrostion*

stoloniferae Soó (1933) 1971, made up mostly of the plant associations *Agrostetum stoloniferae* (Ujvarosi 1941) Burduja et al. 1956 and *Poëtum pratensis* Răvărui et al. 1956);

4. The xero-mesophilic and xerophilous meadows of the alliance *Festucion valesiacae* Klika 1931, present in the higher areas of the island, especially on the mound. There are mainly represented by the plant associations *Chrysopogonetum grylli* Soó 1939, *Botriochloetum ischaemi* (Kristiansen 1937) Pop 1977, *Potentillo-Festucetum pseudodalmaticae* (Domin 1933) Majovsky 1954 and *Cynodonti-Poëtum angustifoliae* Rapaics ex Soó 1957 (with a higher degree of ruderalization).

5. Psammophilous vegetation on the sand dunes located in the north of the island, on dams and the south-west mound, represented mainly by the plant associations *Plantaginetum arenariae* (Buia et al., 1960) Popescu et Sanda 1987 and *Festucetum vaginatae* Rapaics ex Soó 1929 (Ord. *Festucetalia vaginatae* Soó 1957).

6. Riverside coppice vegetation (Order *Salicetalia purpureae* Moor 1958, Al. *Salicion albae* Soó 1957) made up mostly of white poplar, black poplar, white willow (*Salici-Populetum* Meijer-Drees 1936), on the low banks of the islet but also on the edge of wetlands;

7. Thickets of *Hippophaë rhamnoides* (*Hippophaëtum rhamnoides* Borza 1931) on the low dunes, making the transition between sand dunes and wetlands;

8. Thickets of *Amorpha fruticosa* monodominant or mixed with other species, on the islet banks, at the base of dams and the edge of temporary or permanent waterholes (ponds, lakes);

9. Plantations of *Robinia pseudacacia*, especially on the north-eastern and north-western bank of the islet;

The distribution of the main types of vegetation in the islet area is displayed in Fig. 2.

Among types of ecosystems, the largest area is occupied by aquatic ecosystems, meadow forests (riverside coppices) and sand dunes.

Particular attention was paid to the sand dunes and specific vegetation, mainly for two reasons:

- the observed psammophilous vegetation is much changed compared to that described by Morariu et al. (1973);

- by updating the Moldova Nouă PUZ (General Urban Plan), there is desire to build some tourist facilities in the northern part of the island, on an area of about 50 ha. For this, the management regime of the land concerned must be changed in advance, from integral protection zone to sustainable development zone.

Regarding the sand dunes, two types were differentiated, depending on the degree of fixation of the dunes, the type of vegetation, the degree of sand cover and the degree of evolution of the sandy substrate:

- dunes stabilized with vegetation, with 70-90% coverage, populated mainly with *Plantago arenaria* (monodominant species), on psammoregosols with a more advanced degree of pedogenesis. They are widespread in the northern part of the islet;

- semi-stabilized dunes, poorly fixed with vegetation, with a 50-60% coverage, populated mainly with *Festuca vaginata*, *Carex liparicarpos* and *Fumana procumbens*, on sands in the early stages of pedogenesis.

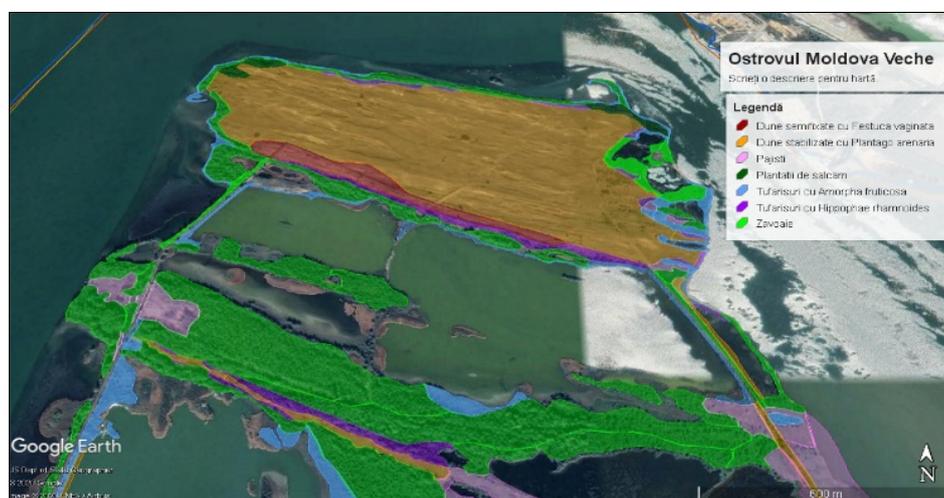


Fig. 2. Mapping of the main vegetation units on the Moldova Veche islet

Sand dunes stabilized with *Plantago arenaria*

These are sand dunes fixed mainly with *Plantago arenaria*, but exposed to the shaping action of the wind in the cold period of the year, due to the high degree of annual species (49.45%). This type of sand dunes occupies about 85% of the northern surface of the island (Fig. 2), but is also present on dams, on the southwestern mound of the island and in the higher areas between the lakes. After the aquatic and palustrine ecosystems, this is the most widespread type of habitat on the island, where it occupies about 70 ha, that is about 20% of the current surface of the island.

The stabilized dunes are mainly populated by the plant association *Plantaginietum arenariae* (Buia et al. 1960) Popescu et Sanda 1987 and fall into the priority habitat type 6260 * - Pannonian steppes on sands (Doniță et al. 2005). An important role in fixing the dunes is also held by the layer of terricolous mosses that cover considerable surfaces of the sand dunes (*Polytrichum piliferum*, *Tortula* sp.).

The dunes with *Plantago arenaria* generally have a 70-90% coverage and a monodominant aspect (Figs. 3-4), the edifying species having high abundance-dominance indices (AD3-5) compared to the other species of the association. The plant species with high constancy are mostly psammophilous and optionally psammophilous, belonging to the order *Festucetalia vaginatae* Soó 1957, mainly to the alliances *Bassio laniflorae-Bromion tectorum* (Soó 1957) Borhidi 1996 and *Festucion vaginatae* Soó 1929 (Table 1). High constancy has been observed in several steppe species of the alliance *Festucion valesiacae* Klika 1931 (*Astragalus onobrychis*, *Bromus squarrosus*, *Verbascum banaticum*) and of the class *Festuco-Brometea* Br.-Bl. and R. Tüxen in Br.-Bl. 1949 (*Anthemis ruthenica*, *Cynodon dactylon*, *Medicago falcata*), whose development is favored by the aridity of the dunes and the advanced degree of sand pedogenesis.

The proportion between perennial species – hemicryptophytes, geophytes, chamaephytes and phanerophytes (50.55%), and annual and biennial species – therophytes and hemi-therophytes (49.45%) is almost equal, slightly in favor of perennial species (Fig. 5). However, the annual species are dominant in terms of abundance-dominance.



Figs. 3-4. Stabilized dunes with *Plantago arenaria* on the Moldova Veche islet

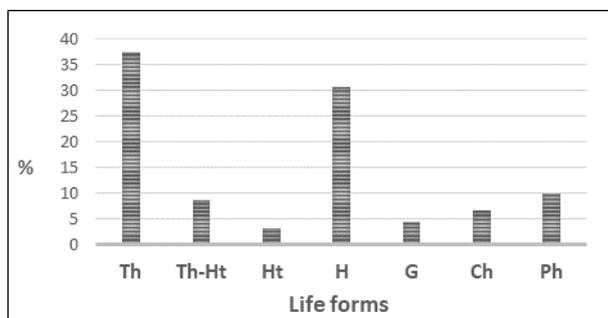


Fig. 5. Spectrum of life forms on the stabilized dunes with *Plantago arenaria*

In the work “*Vegetation of the river island Moldova Veche*” (Morariu et al., 1973), the phytocoenoses with *Plantago arenaria* are not mentioned and *Plantago arenaria* is not among the species inventoried on the island by the authors. Most likely, this species appeared on the islet and spread massively on the surface of the dunes after the 1970s, behaving like a colonizing species (Pysek et al. 2004, Rejmánek 1995). The colonizing plants are native plants that, in certain circumstances, manage to occupy considerable areas in disturbed ecosystems, with a behavior similar to invasive species. In the case of *Plantago arenaria*, its massive spread on the dunes on the islet over the last 50 years has most likely been favored by the grazing of feral horses on the islet and the annual life cycle of the plant. Over time, the species has proliferated to the detriment of the good and medium fodder plants (*Festuca vaginata*, *Cynodon dactylon*, *Bromus tectorum*, etc.) giving the stabilized dune vegetation a monodominant appearance. On the other hand, the good fodder species registered a strong decline in time, at present *Festuca vaginata* being poorly represented quantitatively on this type of dunes.

Most likely the phytocoenoses with *Plantago arenaria* replaced in time the phytocoenoses of the associations *Brometum tectorum* Bojko 1934 and *Festucetum vaginatae* Rapaics ex Soó 1929, types of phytocoenoses that Morariu et al. (1973) present as widespread on the sands in the northern part of the island. In support of this hypothesis come the similarities that exist in the floristic composition of the three plant associations belonging to the order *Festucetalia vaginatae* Soó 1957.

Plantago arenaria phytocoenoses are widespread on both continental and marine sands. In the coastal area of the Black Sea, *Plantago arenaria* is present on stabilized

dunes, but especially in the ruderalized areas of the beaches of Sulina, Sf. Gheorghe and Cap Midia (Făgăraş 2013). We believe that this psammophilous species proliferates and can become dominant in disturbed ecosystems (through overgrazing, excessive walking), as it happens on the stabilized dunes of the islet, influenced by the long-term grazing of feral horses.

The accompanying species observed on the dunes with *Plantago arenaria* are represented by a mixture of psammophilous, steppe and ruderal species. Steppic and ruderal species are numerous in phytocoenoses with *Plantago arenaria*, but have low abundance-dominance values (Table 1). Their development on dunes is favored by the low mobility of these dunes (at least during the vegetation period), by the aridity of the dunes and by the more advanced pedogenetic process.

On the dunes with *Plantago arenaria* there are some invasive and potentially invasive plant species, both woody and herbaceous – *Robinia pseudoacacia*, *Ailanthus altissima*, *Amorpha fruticosa*, *Elaeagnus angustifolia*, *Morus alba*, *Coryza canadensis*, *Erigeron annuus*, *Ambrosia artemisiifolia*, *Asclepias syriaca*, *Artemisia annua*, *Amaranthus albus*, *Xanthium orientale* subsp. *italicum*, *Xanthium spinosum* (Table 1). The invasive species have a fairly high share (13.54%) of the total species within the plant association (96 species), which can be interpreted as a disturbance of the dune habitat, most likely due to grazing.

The conservation status of the stabilized dunes is inadequate due to grazing, which has determined over time the monodominant appearance of the vegetation.

Sand dunes semi-stabilized with *Festuca vaginata*, *Carex liparicarpos* and *Fumana procumbens*

They are located in the northern part of the island, near the first row of lakes, between the western and eastern dams (Fig. 2), close to the information panel of National Forest Administration Romsilva – the Iron Gates National Park Administration. This type of dunes is also present on the hill in the southwestern part of the islet, especially on the southern and western slopes that are more eroded.

They are semi-fixed dunes, with a high degree of mobility, with poorly developed vegetation, on which the presence of *Festuca vaginata*, *Carex liparicarpos* and *Fumana procumbens* species can be noticed (Figs. 6-7). The substrate consists of sand and sand mixed with gravel near the dams. The coverage of the substrate with vegetation is low, between 50 and 60%.

The characteristic species on these dunes is *Festuca vaginata* (AD1-2) which builds the plant association *Festucetum vaginatae* Rapaics ex Soó 1929, together with the co-dominant species *Carex liparicarpos* (AD 1-3) and *Fumana procumbens* (AD 1-2). This type of vegetation is included in the priority habitat 6260 * – Pannonian steppes on sands (Doniță et al. 2005). The plant species present on semi-fixed dunes are few (43 species) compared to those on fixed dunes and have low abundance-dominance indices (Table 2).

Alongside the edifying plants, the following species have a high constancy within the association: *Bromus tectorum*, *Thymus pulegioides*, *Acinos arvensis*, *Cynodon dactylon*, *Plantago arenaria*, *Petrorhagia saxifraga*, *Astragalus onobrychis*, *Alyssum desertorum*, *Silene conica*, *Onosma arenaria*, *Polygonum arenarium*, *Koeleria glauca*, *Tribulus terrestris*, *Teucrium chamaedrys*, *Sedum urvillei*, *Euphorbia seguieriana* (Table 2). The psammophilous species from the order *Festucetalia vaginatae* Soó 1957 are well

represented in the floristic composition of the association, but also steppe species from the order *Festucetalia valesiaca* Br.-Bl. et R. Tüxen ex Br.-Bl. 1949 as well as those of the class *Festuco-Brometea* Br.-Bl. et R. Tüxen in Br.-Bl. 1949.



Figs. 6-7. Semi-stabilized dunes on the Moldova Veche islet

The floristic composition of the semi-fixed dunes on the islet is quite different from that of the Pannonian dunes with *Festuca vaginata* and *Corynephorus canescens* (association *Festuco vaginatae-Corynephorum* Soó in Aszód 1935) described by Karácsonyi in 1979 on the sandy lands in the northwest of the country (Nirului Plain). Their composition is rather similar to that of fixed dunes, being probably a stage of transition to stabilized dunes. Their degree of ruderalization is lower, probably due to less grazing, in the conditions of a poor and discontinuous vegetation.

The ratio between annual species (41.86%) and perennials (58.14%) is in favor of perennials (Fig. 8). However, perennial species do not ensure the stability of these dunes, having low AD values. The vegetation is poor developed on this type of dunes, due to the early stages of pedogenesis, to the high dune mobility and low sand trophicity.

Compared to stabilized dunes, the percentage of psammophilic species is higher on semi-fixed dunes while the percentage of steppic, ruderal and invasive species is lower (Fig. 9). The low share of invasive species can be associated with lower habitat disturbances, horses grazing being reduced due to poorly developed vegetation. The vegetation of the semi-fixed dunes has preserved its natural characteristics better and is not currently affected by the colonization with *Plantago arenaria*. However, the extension of this species in the area of semi-fixed dunes cannot be ruled out in the long run, with the evolution of the sandy substrate.

The conservation value of the semi-fixed dunes is high. Among the species observed on the semi-fixed dunes in the northern part of the island, *Silene borysthena* is endangered nationally (Dihoru & Negrean 2009). The endangered species *Colchicum arenarium*, mentioned since 1973 by Morariu et al., grows on the semi-fixed dunes in the southwestern mound of the islet.

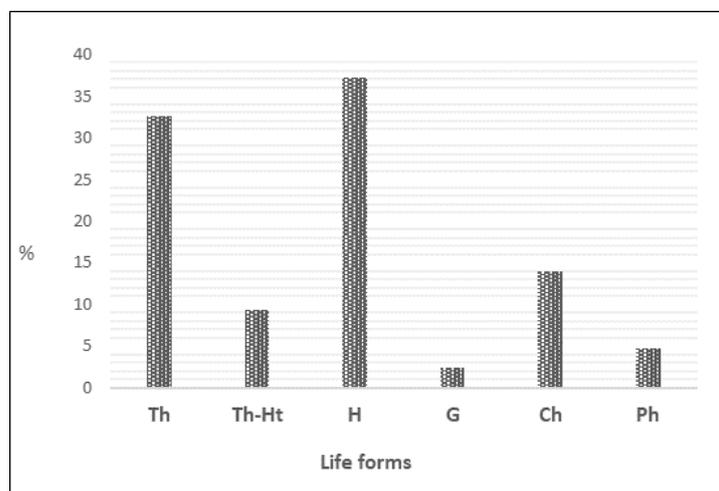


Fig. 8. Life forms on the semi-fixed dunes

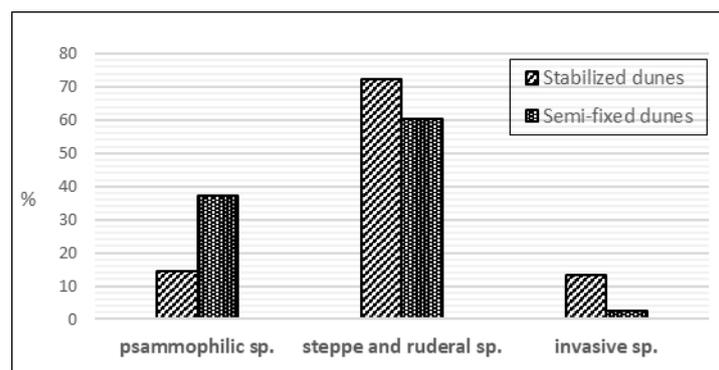


Fig. 9. The comparative percentage of some categories of species between stabilized and semi-fixed dunes

Conclusions

On the Moldova Veche islet, the sand dunes are present especially in the northern part of the island, on dunes and on the mound in the southwestern part of the island.

Depending on their vegetation cover, on edifying species and the degree of evolution of the substrate, two types of sand dunes were differentiated: those stabilized mainly with *Plantago arenaria*, with medium to high coverage, on psammoregosols with an advanced state of pedogenesis and semi-stabilized dunes, with low coverage, on sands in early stages of pedogenesis, edified mainly by *Festuca vaginata*, *Carex liparicarpos* and *Fumana procumbens*.

The dunes with *Plantago arenaria* cover most of the northern part of the islet. Specific to stabilized and ruderalized sands, *Plantago arenaria* has spread massively on the surface of the dunes over the last 50 years, in an ecosystem strongly disturbed by the grazing of feral horses. As it is a species resistant to trampling, devoid of fodder value,

with a good ability to spread through seeds, it came to colonize most of the sand dunes on the island and to give the dune vegetation a monodominant appearance.

The vegetation of the semi-fixed dunes has preserved its natural characteristics better and is not currently affected by the colonization with *Plantago arenaria*. This aspect can be associated with the lower degree of habitat disturbance, grazing being reduced as a result of the poorly developed and discontinuous vegetation. Due to the similar floristic composition, the semi-fixed dunes can be considered a stage of transition to stabilized dunes.

Both types of dunes belong to the priority habitat 6260* – Pannonian steppes on sands, with high conservation value. The conservation status of the stabilized dunes is inadequate due to grazing, which over time has determined the monodominant appearance and ruderalization of vegetation.

Knowing the current situation of psammophilous vegetation on the Moldova Veche islet may be of interest to the administration of the Iron Gates Natural Park, to update the park management plan, but also to the local administration of Moldova Nouă which intends to develop tourist attractions on the island through the new Zonal Urban Plan.

Acknowledgements. This work was supported by the projects “Adequate management of invasive species in Romania, in conformity with the EU regulation 1143/2014 regarding the prevention and management of the introduction and spread of invasive alien species” of University of Bucharest and “Supplementation of the knowledge of biodiversity through the implementation of the monitoring system for the conservation status of species and habitats of European interest in Romania and reporting based on article 17 of the Habitats Directive 92/43/CEE” of Institute of Biology Bucharest – Romanian Academy.

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Table 1. The plant community *Plantaginetum arenariae* (Buia et al. 1960) Popescu et Sanda 1987

Relevés	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	K
Area (m ²)	100	100	100	100	100	100	100	100	100	100	
Cover (%)	70	70	80	80	80	90	90	80	70	80	
Number of taxa	19	22	23	25	23	26	22	23	23	29	
Bassio laniflorae-Bromion tectorum											
<i>Plantago arenaria</i>	4	4	4	3	4	5	5	4	3	4	V
<i>Bromus tectorum</i>	+		1	2		1	+	1	+	1	IV
<i>Bassia laniflora</i>			+			+	+				II
<i>Polygonum arenarium</i>			+			+			+		II
Festucion vaginatae et Festucetalia vaginatae											
<i>Euphorbia seguieriana</i>		+	1	+		+			1	1	III
<i>Centaurea arenaria</i> subsp. <i>borysthena</i>		+		+			+		+	+	III
<i>Alyssum desertorum</i>			+			+		+	+	+	III
<i>Onosma arenaria</i>			+			+			+	+	II
<i>Carex liparicarpus</i>		1			1	+				+	II

<i>Silene conica</i>	+				+	+				II
<i>Festuca vaginata</i>		+		1						I
<i>Koeleria glauca</i>							+		+	I
<i>Salsola kali</i> subsp. <i>ruthenica</i>						+		+		I
<i>Tragopogon floccosus</i>						+				I
Festucion valesiacae et Festucetalia valesiacae										
<i>Astragalus onobrychis</i>	+		+		+	+			+	III
<i>Bromus squarrosus</i>		+		+		+	+		1	III
<i>Verbascum banaticum</i>		+		1		+		1	+	III
<i>Medicago minima</i>			+			+		+		II
<i>Eryngium campestre</i>			+		+	+			+	II
<i>Chondrilla juncea</i>					+	+			+	II
<i>Vincetoxicum hirsutinaria</i>					+	+			+	II
<i>Petrorhagia saxifraga</i>				+	+					II
<i>Erysimum diffusum</i>	+						+	+		II
<i>Taraxacum serotinum</i>	+		+							I
<i>Potentilla cinerea</i>						+		+		I
<i>Thymus pannonicus</i>				+					+	I
<i>Centaurea stoebe</i> subsp. <i>australis</i>			+						+	I
<i>Linaria genistifolia</i>					+		+			I
<i>Chrysopogon gryllus</i>		+							+	I
<i>Minuartia glomerata</i>				+					+	I
<i>Sedum urvillei</i>	+			+						I
<i>Sedum hispanicum</i>				1	+					I
<i>Lotus corniculatus</i>					+			+		I
<i>Allium flavum</i>			+							I
<i>Vicia lathyroides</i>									+	I
<i>Achillea setacea</i>	+									I
<i>Poa bulbosa</i>						+				I
Festuco-Brometea										
<i>Cynodon dactylon</i>	1	+		1	1			1	2	III
<i>Medicago falcata</i>		+	1				+		1	III
<i>Anthemis ruthenica</i>	+	1		+		+		+		III
<i>Thymus pulegioides</i>	1			+	1			+		II
<i>Teucrium chamaedrys</i>	+			1	+		+			II
<i>Anchusa officinalis</i>			+	1		+			1	II
<i>Acinos arvensis</i>	+	+			+				+	II
<i>Arenaria serpyllifolia</i>		+					+	+		II
<i>Stachys atherocalyx</i>		+	+					+		II
<i>Alyssum alyssoides</i>									+	I
<i>Trifolium campestre</i>						+			+	I
<i>Crepis foetida</i> subsp. <i>rhoeadifolia</i>	+			+						I
<i>Galium verum</i>					+				+	I
<i>Cerastium semidecandrum</i>		+						+		I
<i>Asparagus officinalis</i>							+	+		I
<i>Bromus hordeaceus</i>						1		+		I
<i>Echium vulgare</i>	+				+					I
<i>Carduus nutans</i>				+					+	I
<i>Medicago minima</i>			1							I
<i>Achillea collina</i>									+	I
<i>Rosa canina</i>							+			I
<i>Thalictrum minus</i>					+					I
<i>Berteroa incana</i>									+	I
<i>Euphorbia cyparissias</i>				+						I
<i>Hypericum perforatum</i>						+				I
<i>Ononis spinosa</i>					+					I

Tribulo-Eragrostion minoris							
<i>Tribulus terrestris</i>			+		+	+	II
<i>Tragus racemosus</i>	+			+			I
<i>Portulaca oleracea</i>		+					I
Chenopodietalia albi							
<i>Xanthium italicum</i>					+	1	II
<i>Setaria viridis</i>			+		+		I
<i>Senecio vernalis</i>					+	+	I
<i>Artemisia annua</i>		+			+		I
<i>Conyza canadensis</i>		+	+				I
<i>Erodium cicutarium</i>					+		I
<i>Amaranthus albus</i>	+		+				I
<i>Sisymbrium orientale</i>	+						I
<i>Camelina microcarpa</i>						+	I
<i>Silene latifolia</i> subsp. <i>alba</i>							I
<i>Chenopodium album</i>			+				I
<i>Xanthium spinosum</i>					+		I
Other species							
<i>Oenothera parviflora</i>	+	+	+	+			II
<i>Hippophae rhamnoides</i>				1		+	I
<i>Papaver rhoeas</i>						+	I
<i>Robinia pseudacacia</i>			1			1	I
<i>Ailanthus altissima</i>			+		+		I
<i>Elaeagnus angustifolia</i>							I
<i>Prunus mahaleb</i>		+					I
<i>Amorpha fruticosa</i>		+					I
<i>Populus alba</i>					1		I
<i>Morus alba</i>						1	I
<i>Crataegus monogyna</i>						+	I
<i>Vulpia myuros</i>					+		I
<i>Scleranthus annuus</i>			+				I
<i>Aristolochia clematitis</i>		+					I
<i>Plantago lanceolata</i>				+			I
<i>Asclepias syriaca</i>					+		I
<i>Erigeron annuus</i>							I
<i>Ambrosia artemisiifolia</i>			+				I

Table 2. The plant community *Festucetum vaginatae* Rapaics ex Soó 1929

Relevés	R1	R2	R3	R4	R5	R6	R7	K
Area (m ²)	100	100	100	100	100	100	100	
Cover (%)	50	50	50	60	50	60	50	
Number of taxa	17	14	15	19	17	18	18	
Festucion vaginatae et Festucetalia vaginatae								
<i>Festuca vaginata</i>	2	1	2	2	2	1	2	V
<i>Carex liparicarpos</i>	1	3	1	1	2	2	+	V
<i>Fumana procumbens</i>		1	2	2	1	2	2	V
<i>Alyssum desertorum</i>	+			+	+			III
<i>Silene conica</i>			+		+	+		III
<i>Onosma arenaria</i>			+		+		+	III
<i>Koeleria glauca</i>	+		+	+				III
<i>Euphorbia seguieriana</i>			+		+		+	III
<i>Silene borysthena</i>		+				+		II
<i>Centaurea arenaria</i> subsp. <i>borysthena</i>					+	+		II
<i>Tragopogon floccosus</i>				+				I
<i>Salsola kali</i> subsp. <i>ruthenica</i>	+							I

