

CONSILIUL JUDEȚEAN TULCEA
INSTITUTUL DE CERCETĂRI ECO-MUZEALE „GAVRILĂ SIMION“

DELTA DUNĂRII VIII

**Studii și cercetări de științele naturii
și muzeologie**



Tulcea - 2020

DELTA DUNĂRII

VIII

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Studii și cercetări de științele naturii și muzeologie

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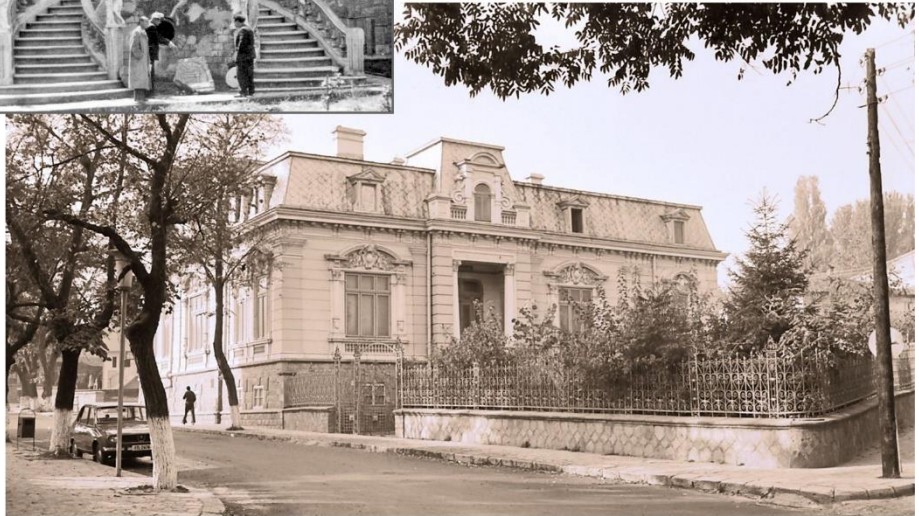
CUVÂNT ÎNAINTE

Simpozionul științific *Conservarea ariilor protejate – premisă a dezvoltării durabile*, inițiat în anul 2004, continuă seria de manifestări științifice organizate în perioada 1972-1984, în cadrul Secției de Științe ale naturii a Muzeului Deltei Dunării, și constituie un cadru de dezbateri și schimburi de experiență pentru factorii implicați în cercetarea, administrarea și luarea deciziilor ce privesc ariile naturale protejate, respectiv muzeografi, cercetători, custozi, reprezentanți ai ONG-urilor și ai autorităților administrației publice. Ediția a VI-a a acestui simpozion, desfășurată în 26-27 septembrie 2019, a fost dedicată aniversării a 55 de ani de la înființarea Secției de Științe ale Naturii, respectiv a Muzeului *Deltei Dunării*, eveniment la care au participat personalități din lumea academică, actuali și foști angajați ai muzeului, reprezentanți ai muzeelor de profil din București, Constanța, Focșani și ai administrației publice județene, colaboratori și sponsori care au fost alături de instituția muzeală de-a lungul timpului, cercetători invitați din Italia. Au fost momente emoționante generate nu numai de revederea colegilor sau a colaboratorilor și evocarea amintirilor referitoare la activitatea de pionerat desfășurată de sufletul acestei instituții, prof.dr. Gavrilă Simion, alături de specialiști și ceilalți angajați, ci și de imaginile document prezentate în expoziția retrospectivă, deschisă la Casa Avramide, locul unde s-a înființat instituția muzeală tulceană. Presentul volum reunește lucrările prezentate în cadrul simpozionului, ce fac referire, în cea mai mare parte, la Podișul Nord-dobrogean și Rezervația Biosferei Delta Dunării.

FOREWORD

The scientific symposium *Conservation of protected areas - premise of sustainable development*, initiated in 2004, continues the series of scientific events organized between 1972-1984, within the Department of Nature Sciences of the *Danube Delta's* Museum, and is a framework for debates and exchanges of experience for the factors involved in the research, administration and decision-making regarding the protected natural areas, respectively museographers, researchers, custodians, representatives of NGOs and public administration authorities. The 6th Edition of this symposium, held on 26-27th September 2019, was dedicated to the 55th Anniversary of the establishment of the Department of Nature Sciences, respectively the *Danube Delta's* Museum, an event attended by personalities from the academic world, current and former employees of the museum, representatives of the others museums from Bucharest, Constanța, Focșani and of the county public administration, collaborators and sponsors who have been with the museum institution over time, also guest researchers from Italy. There were emotional moments generated not only by the reunion of colleagues or collaborators and the evocation of memories related to the pioneering activity carried out by the soul of this institution, PhD Gavrilă Simion, along with specialists and other employees, but also by the document-images presented in the retrospective exhibition, opened at Casa Avramide, the place where the Tulcea museum institution was established. This volume brings together the papers presented at the symposium, which refer, for the most part, to the North Dobrogea Plateau and the Danube Delta Biosphere Reserve.

Editorii / Editors



Muzeul *Delta Dunării* își deschide porțile pentru public la 8 iulie 1964, după reorganizarea eterogenului Muzeu Raional Tulcea (înființat la 1 mai 1950 în actuala Casa Avramide). Noul muzeu tulcean, subordonat Sfatului Popular Raional Tulcea și Comitetului pentru Cultură și Artă, se detașa de celelalte muzee de profil din țară prin forma și originalitatea sa. Ideea de a înființa primul muzeu de științe ale naturii în Dobrogea a aparținut tânărului director al muzeului, Prof. Gavrilă Simion, „nenumit politic” la 20 martie 1955, ce a intuit potențialul inepuizabil al patrimoniului natural din Dobrogea și Delta Dunării pentru cercetarea științifică și, implicit, cunoașterea și dezvoltarea zonei. Prin intermediul biogrupelor, dioramelor și acvariului s-a prezentat ceea ce era caracteristic unei zone unice în Europa — Delta Dunării. Muzeul va funcționa sub această titulatură până în anul 1972, când avea să se înființeze secția muzeală de artă, noua denumire sub care a funcționat până în anul 2008 fiind **Muzeul de Științele Naturii „Delta Dunării”**.



Centrul Muzeal Ecoturistic Delta Dunării, realizat cu fonduri din bugetul local și din Programul PHARE CBC 2004-2006, continuă din februarie 2009 activitatea muzeografică, de cercetare științifică și de educație a Muzeului de Științele Naturii „Delta Dunării”. Organizat într-un imobil nou, cu un discurs muzeografic modern, Centrul s-a născut tot dintr-o inițiativă a vizionarului director Prof. univ. dr. Gavrilă Simion, prin care acesta intenționa realizarea unui „triunghi cultural” format din Muzeul de Etnografie și Artă Populară, Centrul Muzeal și Muzeul de Artă. Considerat unul dintre cele mai atractive obiective muzeale și turistice din zonă, Centrul Muzeal își îndeplinește cu succes misiunea de a informa și educa localnicii și turiștii asupra valorosului patrimoniu natural și socio-cultural al Rezervației Biosferei Delta Dunării, de a promova acest patrimoniu în țară și străinătate, de a crea o alternativă mai atractivă în procesul de educație despre mediu a tinerei generații, precum și de a găzdui diverse evenimente culturale și științifice.



Participanți la Simpozionul științific / Participants at Scientific symposium
(dr. Melania Stan – dir. adj. MNINGA, dr. Sorin Cristian Ailincăi – manager ICEM
Tulcea, prof. Elena Crăciun, dr. Dumitru Murariu – m.c. Academia Română,
prof. univ. dr. Ioan Opriș – Universitatea Valahia Târgoviște, dr. Mihai Gorgoi –
consilier superior MC, dr. Marian Tudor – dir. gen. INCDDD Tulcea)



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Elena MICU, Sonia-Elena PARPALĂ

Abstract

The project is financed through the Large Infrastructure Operational Programme, Priority Axis 4 – Protecting and restoring biodiversity, remediating contaminated soil and monitoring air quality.

Project duration: August 01, 2017 - July 31, 2020.

The beneficiary of the project is the Medio Pro NGO from Brașov in partnership with the Environmental Protection Agency Tulcea.

The total project value is 3,166,494.11 Ron/ 688,562.88 Euro.

The protected areas covered by this project are:

1. Natura 2000 Special Protection Area ROSPA0040 Dunărea Veche-Brațul Măcin, covering 19,011 ha, established by Government Decision 1284/ 2007 regarding the establishment of Special Protection Areas as part of the European ecological network Natura 2000 in Romania, as amended by Government Decision 971/ 2011.

2. Natura 2000 Site of Community Interest ROSCI0012 Brațul Măcin with an area of 10,433 ha established by Minister Order no. 1964/ 2007 regarding the establishment of Site of Community Interest as part of the European ecological network Natura 2000 in Romania, as amended by Minister Order 2387/ 2011.

3. Lacul Traian Nature Reserve with an area of 326 ha, established by Government Decision 2151/ 2004 on the establishment of protected natural area regime for new zones.

The target species in the project are: 108 birds species of Community interest, four amphibian and reptile species of Community interest, three mammalian species of Community interest and one mammalian species of National interest, 11 fish species of Community interest, one plant species of Community interest and one plant species of National interest, eight habitats of Community interest.

Keywords: *management, protected area, special protection area, species of Community interest, habitats*

Content

The project regarding the management plan development is addressed to the protected natural areas: ROSPA0040 Dunărea Veche-Brațul Măcin, ROSCI0012 Brațul Măcin and Traian Lake Nature Reserve, which have not a management structure. The project is implemented in partnership by the Medio Pro Association, from Cristian (Brașov County) and Tulcea Environmental Protection Agency (EPA/APM).

The protected areas covered by the project are:

ROSPA0040 Dunărea Veche – Brațul Măcin (19,011 ha)

This site (Figure 1) hosts important number of bird species protected at European level by the Birds Directive and the Bonn Convention, as well as nationally by O.U.G. no. 57/ 2007, respectively: 63 species listed in Annex 1 of the Birds Directive, 55 other migratory species, listed in the annexes to the Convention on Migratory Species (Bonn) and seven globally endangered species.

The site is important for nesting populations of: *Coracias garrulus*, *Falco vespertinus*, *Aythya nyroca*, *Accipiter brevipes*, *Anthus campestris*, *Lanius minor*, *Lanius collurio*, *Calandrella brachydactyla*. The site is important for migration of: *Pelecanus crispus*, *Accipiter brevipes*, *Branta ruficollis*, *Pelecanus onocrotalus* and *Phalacrocorax pygmaeus*. The site is important for wintering of *Phalacrocorax pygmaeus* and *Anser albifrons*.

ROSCI0012 Brațul Măcin (10,235 ha)

First of all, the site is of importance for the conservation of the habitat 92A0 *Salix alba* and *Populus alba* galleries which occupies approximately 19.41% of the site, respectively 4% of the surface of the habitat at national level. The site is also important for the conservation of the priority habitat **62C0* Ponto-sarmatic steppes**, occupying an area of about 4% from the national surface of the habitat.

At the same time, the site is important for the species of community interest *Marsilea quadrifolia* (pond clover), this species being cited by SĂVULESCU (1976) from the area of Iglița Lake. According to the specialized literature consulted, after 1976, the species was no longer found in the area of Iglița Lake.

The site represents the northern part of the migration corridor of plant species from the Balkan Peninsula to the northern Dobrogea and the Danube Delta. In addition, it is also an important migration route for certain species of fish, including sturgeons, as well as for birds, the territory of the site ROSCI0012 Brațul Măcin, being totally overlapped with ROSPA0040 Dunărea Veche-Brațul Măcin.



Figure 1. ROSPA0040 Dunărea Veche – Brațul Măcin
(source: EPA Tulcea Archive)

Fig. 1. ROSPA0040 Dunărea Veche-Brațul Măcin (sursa: arhiva APM Tulcea)

Traian Lake Nature Reserve (326 ha)

The Traian Lake (Figure 2) is of particular interest for ornithological studies, especially because it represents an important refuge for nesting, resting and feeding on rare bird species and because the area is less studied.

Following the study carried out by „Gavrila Simion” Eco-Museum Research Institute of Tulcea in the area of the Traian Lake, 102 identified species of birds, systematically grouped into 15 orders and 39 families. From the total species identified, 52 species are nesting. Regarding the phenological distribution of the ornithofauna from Traian Lake, 70 species are summer guests, 18 species are sedentary, seven species are winter guests and seven species are passage.

Of the 102 species of birds identified here, 64 are strictly protected species, 30 are protected species and only 12 are species of hunting interest, according to Law no. 103 from September 27, 1996. Following the observations made, seven very rare bird species that nest in this area were identified, which make it of international importance.



Figure 2. Traian Lake Nature Reserve (source: EPA Tulcea Archive)
Fig. 2. Rezervația naturală Lacul Traian (sursa: arhiva APM Tulcea)

The general objective of the project is the biodiversity conservation, public awareness and information on the importance of the natural values of the Special Protection Area ROSPA0040 Dunărea Veche-Brațul Măcin, Site of Community Interest ROSCI0012 Brațul Măcin and Lacul Traian Nature Reserve.

Also, **the specific objectives of this project** are:

1. Ensuring an efficient management of the species and habitats of the protected areas ROSCI0012 Brațul Măcin, ROSPA0040 Dunărea Veche-Brațul Măcin and the Lacul Traian Nature Reserve, through the elaboration and approval of the management plan.
2. Informing, raising awareness and consulting the population and stakeholders on the territory of the protected areas, in order to increase the efficiency of the management actions for the sites ROSCI0012 Brațul Măcin and ROSPA0040 Dunărea Veche-Brațul Măcin and respectively for the Lacul Traian Nature Reserve.

The main purpose of the project is the elaboration of the Integrated Management Plan and the concrete activities related to the conservation of

biodiversity, within the project, are: inventory, mapping, assessment of the impacts of threats and pressures, respectively assessment of the conservation status for the species and habitats of community interest for which conservation areas were declared protected natural areas ROSCI0012 Brațul Măcin, ROSPA0040 Dunărea Veche-Brațul Măcin and Lacul Traian Nature Reserve.

Also we purpose the information and awareness of the local community within the territorial area of the three protected natural areas and the stakeholders that carry out direct or related activities in the territory of the protected areas, because the conservation of biodiversity, respectively the minimization of the anthropic impact, are not possible without their information and involvement in applying effective management measures.

Within the three protected natural areas, studies were carried out for the following categories of habitats and species in the standard formular:

Habitats: **3130** Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/ or *Isoëto-Nanojuncetea*; **3270** Rivers with muddybanks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation, **62C0*** Ponto-Sarmatic steppe meadows; **6430** Hydrophilous tall herb fringe communities of plain and of the montane to alpine levels; **6510** Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*); **92A0** *Salix alba* and *Populus alba* galleries; **3140** Hard oligo-mesotrophic waters with benthic vegetation of *Chara* sp.; **6440** Aluvial meadows of river valleys of the *Cnidion dubii*.

Plants: *Marsilea quadrifolia*, *Echinops ritro* subsp. *ruthenicus*.

Amphibians and reptiles: *Bombina bombina*, *Triturus dobrogicus*, *Emys orbicularis* and *Testudo graeca*.

Mammals: *Lutra lutra*, *Spermophilus citellus*, *Mustela eversmannii* and *Meles meles*.

Fish: *Cobitis taenia*, *Misgurnus fossilis*, *Pelecus cultratus*, *Rhodeus sericeus amarus*, *Aspius aspius*, *Gobio kessleri*, *Alosa tanaica*, *Gymnocephalus schraetzer*, *Sabanejewia aurata*, *Zingel streber* and *Zingel zingel*.

Birds of community/ national interest: *Accipiter brevipes*, *Accipiter nisus*, *Acrocephalus melanopogon*, *Alcedo atthis*, *Anthus campestris*, *Clanga pomarina*, *Ardea purpurea*, *Aythya nyroca*, *Botaurus stellaris*, *Branta ruficollis*, *Bubo bubo*, *Burhinus oediconemus*, *Buteo buteo*, *Buteo rufinus*, *Calandrella brachydactyla*, *Caprimulgus europaeus*, *Charadrius alexandrinus*, *Chlidonias hybridus*, *Ciconia ciconia*, *Ciconia nigra*, *Circaetus gallicus*, *Circus aeruginosus*, *Circus cyaneus*, *Circus macrourus*, *Circus pygargus*, *Coracias garrulus*, *Dendrocopos syriacus*, *Dryocopus martius*, *Egretta garzetta*, *Emberiza hortulana*, *Falco vespertinus*, *Ficedula albicollis*, *Ficedula parva*, *Haliaeetus albicilla*, *Hieraaetus pennatus*, *Himantopus himantopus*, *Ixobrychus minutus*,

Lanius collurio, *Lanius minor*, *Larus melanocephalus*, *Larus minutus*, *Lullula arborea*, *Melanocorypha calandra*, *Milvus migrans*, *Nycticorax nycticorax*, *Oenanthe pleschanka*, *Pandion haliaëtus*, *Pelecanus onocrotalus*, *Pernis apivorus*, *Phalacrocorax pygmeus*, *Philomachus pugnax*, *Picus canus*, *Platalea leucorodia*, *Plegadis falcinellus*, *Porzana parva*, *Recurvirostra avosetta*, *Riparia riparia*, *Sterna albifrons*, *Sterna hirundo*, *Sylvia nisoria*, *Tringa glareola*.

The field research consisted in: inventory of species and habitats, mapping of species and habitats distribution, inventory and mapping the distribution of pressures and threats on species and habitats of community interest. For a more efficient visualization and analysis of the process of data collection in the field, respectively of the areas covered by the experts, the period in which the data collection activities was carried out was divided into four semesters. For the determination of plant and animal species, specialized determinants and reference works were used (CIOCÂRLAN, 2000; OLTEAN, 1994; PAPP, FĂNTĂNĂ, 2008; PETRESCU, 2007; POPOVICI *et alii*, 1984; PRODAN, 1935; SANDA, ARCUȘ, 1999; SĂVULESCU, 1976; TÖRÖK, 1998).

Following the completion of the data collection stage, the distribution maps of the species and habitats, the pressure and threat maps, the impact assessment, the conservation status of the species and habitats, as well as the establishment of management measures and monitoring protocols were prepared. In parallel with the collection of data from the field, the data collected were integrated into the geospatial database.

Results and discussion

1. Mammals. Within the ROSCI0012 Brațul Măcin, all the species recorded on the standard form were found, namely the European ground squirrel, *Spermophilus citellus* Eurasian otter, *Lutra lutra* steppe polecat, *Mustela eversmannii* and European badger *Meles meles*. The European ground squirrel identified in the steppe habitats within the site, located on the slopes, but also on the Danube dams. Corroborating the data collected for habitats with those collected for mammal species, it can be said that the poplar was found predominantly in the priority habitat 62C0* Ponto-Sarmatic steppe meadows.

The species *Mustela eversmannii* also identified in the field, at the same type of habitat, but according to the data we have at present, the potential distribution of this species is much narrower than that of the species *Spermophilus citellus*. In frame of the Traian Lake Nature Reserve, it was identified European ground squirrel *Spermophilus citellus*. As in ROSCI0012 Brațul Măcin, the species is present on the slopes covered by ponto-sarmatic steppe meadows. Eurasian otter *Lutra lutra*, was identified along the banks of the Brațul Măcin by plantar traces and by food debris.

The conservation status of the mammal species was evaluated as follows: unfavorable-inadequate for the glass species, unfavorable – bad for the European ground squirrel and favorable for the European badger *Meles meles*. Intensive grazing with sheep and stray dogs are the main threats to these species.

2. Amphibians and reptiles. Within the ROSCI0012 Brațul Măcin the red-bellied toad *Bombina bombina*, Danube crested newt *Triturus dobrogicus* were identified; the European pond turtle *Emys orbicularis* mainly, in the temporary aquatic habitats along the Brațul Măcin.

The spur-thighed tortoise *Testudo graeca* was identified in the dry habitats within the site. The status of conservation of the species was assessed as follows: favorable - good for *Testudo graeca*, favorable for the pond turtle and the red-bellied toad and unfavorable-unsuitable for the Danube crested newt.

3. Fish. Within the ROSCI0012 Brațul Măcin, all the species of ichthiofauna, indicated in the standard SCI formular were identified: grig *Cobitis taenia*, European weather loach *Misgurnus fossilis*, sabrefish *Pelecus cultratus*, European bitterling *Rhodeus sericeus amarus*, asp *Aspius aspius*, Kessler's gudgeon *Gobio kessleri*, Black Sea shad *Alosa tanaica*, striped ruffe *Gymnocephalus schraetzer*, golden loach *Sabanejewia aurata*, streber *Zingel streber*, and zingel *Zingel zingel*.

Due to the prohibition period, which lasted until June, the field activities were very difficult to achieve, but 17 data sampling stations were established, in which the diversity of ichthiofauna was evaluated under the conditions allowed by law. The conservation status of the fish species was assessed as follows: favorable for asp, bitterling and grig, and for the other eight species unfavorable.

4. Plants. Within the ROSCI0012 the Brațul Măcin has not been identified so far the species *Marsillea quadrifolia*, the last reports date from 1975. During the field stage, the potential habitats of the species were investigated, especially in the area where it was indicated in the standard form, respectively the area of Iglița Lake, but also the areas with shallow waters and slow flow regime along the Brațul Măcin. Considering the situation in the field, at the present moment we estimate the presence of species at the site level as being uncertain, but this is not the final decision, because the potential habitats of the species are to be investigated.

In the Traian Lake Nature Reserve was inventoried a well represented population of *Echinops ritro* subsp. *ruthenicus* in the steppe meadows, on the south side of the lake. However, we can say that the situation of the species is much better in the meadows outside the reserve, especially in the areas adjacent to the southern meadows in the reserve, in which the species are less affected by grazing but also by landslides. In the meadows of the reserve, the

species has a random distribution, but most individuals are located near the meadows outside the site, which probably also support the population of *Echinops ritro* subsp. *ruthenicus* from the reserve. The conservation status of the species was evaluated as unfavorable-inadequate.

5. Habitats

The habitats identified in ROSCI 0012 Brațul Măcin site:

- ✓ 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* sp.;
- ✓ 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* type vegetation;
- ✓ 3160 Natural dystrophic lakes and ponds;
- ✓ 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation;
- ✓ 3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p.vegetation;
- ✓ 62C0* Ponto-Sarmatic steppe meadows;
- ✓ 92A0 *Salix alba* and *Populus alba* galleries (Figure 3).



Figure 3. 92A0 *Salix alba* and *Populus alba* galleries (source: EPA Tulcea Archive)
Fig. 3. 92A0 Galerii de *Salix alba* și *Populus alba* (sursa: arhiva APM Tulcea)

The habitats identified within the Traian Lake Nature Reserve:

- 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* type vegetation;
- 3160 Natural dystrophic lakes and ponds;
- 62C0* Ponto-Sarmatic steppe meadows;
- R5305 Danubian vegetation with *Typha angustifolia* and *Typha latifolia*;
- R5309 Danubian vegetation with *Phragmites australis* and *Schoenoplectus lacustris*.

It had to note that there are differences between the habitats identified in the field and those found in the standard booking form. Thus, three of the habitats mentioned in the file were not found in the field (6430, 6510 and 6440), instead two new habitats (3150 and 3160) were identified. The Ponto-Sarmatic steppe meadows (62C0*) extend on the slopes of loess, on the plateaux used as permanent pastures and on the rocky promontories of the Brațul Măcin. The best-preserved portions were identified in the area of Piatra, on the cliff of the Brațul Măcin, but also in some grassland enclaves remaining among the arable crops between Turcoaia and Carcaliu. The state of conservation of habitats was evaluated as follows: unfavorable-inadequate for 3140 and 3130, unfavorable-bad for 62C0* and 92A0*, favorable conservation status for 3270, 3150 and 3160.

6. Birds. The bird species that were identified within the ROSPA0040 Dunărea Veche-Brațul Măcin, as well as on the territory of the Traian Lake Nature Reserve, revealed some differences from the standard formular of the nature reserve.

Species not identified in the Natura 2000 site ROSPA0040 Dunărea Veche-Brațul Măcin were: *Acrocephalus melanopogon*, *Branta ruficollis*, *Bubo bubo*, *Circus pygargus*, *Ficedula albicollis*, *Ficedula parva*, *Milvus migrans*, *Oenanthe pleschanka* and *Sterna albifrons*. Reasons for which they were not identified: fluctuations in the population densities of the source habitats (Măcin Mountains and the Danube Delta), irregular periods of passage, changing places of autumn wheat culture (for *Branta ruficollis* species).

Species of the birds not identified in the Traian Lake Nature Reserve were: *Troglodytes troglodytes*, *Alauda arvensis*, *Miliaria calandra*, *Oriolus oriolus*, *Calidris minutia*, *Charadrius dubius*, *Cygnus cygnus* and *Falco columbarius*. Reasons why they were not identified: lack of typical habitat and irregular periods of passage. The conservation status is favorable for all identified bird species, the habitats of these species being well represented as surface and in good conservation status point of view.

Based on the results of the biodiversity studies and following the assessment of the conservation status, appropriate conservation measures will be proposed which will be subject to public consultation and then included in the integrated management plan.

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LIFE4OAKFORESTS in Habitat 91AA*, Natural Park Vena del Gesso Romagnola (IT4070011), Italy

Proiectul LIFE4OAKFORESTS în Habitatul 91AA, Parcul Natural Vena del Gesso Romagnola (IT4070011), Italia*

Serena PETRONCINI, Massimiliano COSTA

Abstract

Life 16NAT/IT/000245 has the aim to generate conservation management tools for increasing structural and compositional biodiversity in Natura 2000 oak forests and is implemented in different members, regions and countries of Hungary and Italy. The coordinating beneficiary is Ente di gestione Parchi e Biodiversità Romagna (Italy) while the other beneficiaries are Bükk National Park (Hungary), Balaton Upland Park (Hungary), Duna-Ipoly National Park (Hungary), ETTE (Hungary), Centre for Ecological Research Hungarian Academy of Sciences and WWF Hungary. This project aims to:

- *identify which are the natural oak forests conditions that needs to be target for a nature conservation management. There are no primeval forests left in Hungary and Italy;*
- *increase biodiversity of EU priority oak forests such us habitat 91AA* (511 ha Italy) and 91G0*, 91H0*, 91I0* and 91M0 (1555 ha in Hungary), in National and Regional Parks in protected Natura 2000 sites;*
- *eradicate invasive species;*
- *demonstrate the best practices of oak forests nature conservation;*
- *management tools;*
- *increase public awarness about the importance of the forests';*
- *biodiversity.*

This project will focus on the reconstruction of natural forests conditions by collecting, examining papers and residual natural forests and by the examination of the nature conservation treatments carried out until now.

Elaboration of conservation forest management guideline, purchase oak forests for securing the biodiversity, effects of forest management and detection of the effects of treatments will be monitored according to a monitoring protocol. An intensive awareness activity will be carried out for stakeholders and general public.

Keywords: *LIFE4oakforests, old-growth forests, Natura 2000, oak forests, habitat 91AA*, biodiversity*

Introduction

Life4oakForests Life 16NAT/IT/000245 is an international project financed by EU and provides conservation management tools for increasing structural and compositional biodiversity in Natura 2000 network oak forests. The project

is implemented in different members, regions and countries of Hungary and Italy.

The coordinating beneficiary is Ente di Gestione Parchi e Biodiversità Romagna-MAR (Italy), while the other beneficiaries are Bükk National Park Directorate (Hungary), Balaton Upland Park Directorate (Hungary), Duna-ípoly National Park (Hungary), ETTE (Hungary), Centre for Ecological Research Hungarian Academy of Sciences and WWF Hungary.

The total budget of the project is of 7.980,586 Euros. The expected start date was the 1st July 2017 while the expected end date is the 31st December 2026.

Life4OaksForests aims:

- to identify the natural oak forests conditions and what should be the target of nature conservation management;
- to increase the biodiversity of EU priority oak forests such habitats 91AA*, 91G0*, 91H0*,91I0*, and 91M0 in the National Parks' managed protected Natura 2000 sites;
- to eradicate invasive species;
- to demonstrate the best practices of the oak forests nature conservation management tools. Especially to protect microhabitats for saproxylic insects and insectivorous birds. And address oak forests of the project areas to an evolutionary path of old-growth forest;
- to increase the public awareness about the importance of forests' biodiversity.

Life4oakforests is articulated in different actions:

Action A1: elaboration of ecological nature conservation oak forests management guideline based on scientific reference information on natural oak composition and structure (A1.1), direct observation and survey of old growth forests in Hungary, Italy and Europe (A1.3), examining conservation treatments carried out in Hungary and Italy (A1.4) and elaboration of a monitoring protocol (A1.2).

Action B1: purchase of land with oak forests for securing the biodiversity of the area (about 40 ha in Italy in habitat 91AA*).

Action C1: reconstruction of natural forests structure in the project areas (C1.1), reduction of game impact (C1.2), suppression of invasive species (C1.3), producing and replanting seedlings of the species characterizing the priority habitats (C1.4), ex-situ breeding of some saproxylics insects using LIFEeremita project results (C1.5), realization of ecotonal hedges around the purchased forests in Italy.

Action D1: Monitoring the effects of forests conservation management action and detection of the effect of treatments. The Economic and Social impact assessment.

Action E1: an intensive awareness-raising will be carried out for stakeholders and general public (E1.1). Collection, elaboration and publications about the developed management guideline and the results of their ecological nature conservation management according to the monitoring (E1.2), guidelines for the forests habitat development (for land users) on the potential oak habitats (E1.3) and ecosystem services for professionals (E1.4).

There will be intensive networking with the other projects and specialist working with forests' nature conservation (E1.5). An international conference will be organized to evaluate and share results and experience of the project (E1.6) and the involvement, awareness rising of stakeholders and decision makers (E.1.7).

Action E.2: Awareness-raising for general public, including films, games, booklets, brochures (E.2.1), the website (E.2.2), the notice boards at project sites (E.2.3), the media activities (E.2.4), a specific awareness campaign about numerous ecosystem services provided by natural forests in Italy (E.2.5), the Layman's report (E.2.6) (Project Life4Oakforests Handbook, 2017).

LIFE4oakforests in Italy

Life4oakforests in Italy is in the Regional Natural Park Vena del Gesso Romagnola (ZSC/ZPS IT4070011) IT, Region Emilia Romagna, province of Ravenna. The Regional Natural Park Vena del Gesso Romagnola has an extension of 6,000 ha (60Km²), an altitude between 100 and 515 m above sea level. The medium quote of the Gypsum steep slope is of 400 m. Gypsum is a salt, and it precipitated in coastal lagoons about 6 millions of years ago (during the Miocene Messinian geological period) during a long drought era, when the Adriatic sea dried up, being isolated from the Atlantic Ocean. The slopes run from East to West, facing South on one side and North on the other side: this causes a local warm and dry microclimate on one side and a cool and shady microclimate on the other side, generating in both the two slopes very different ecosystems (about 50 plants associations and 17 habitats in the Annex I of Directive 92/43/EEC). The area is unique for its vegetation, for the numerous caves and animal species: 1000 plant species are recorded, seven endemic plants, 22 species of ferns, 30 species of orchids and one IUCN endangered and the Eagle owl (*Bubo bubo*), the wolf (*Canis lupus*) and wild cat (*Felis silvestris*) are the most predators. Bats, with 19 species and eight species in the Annex II of the 92/43/EEC directive, are the most important group of animals. There are big wintering colonies, the largest with 18.000 individuals of Schreibers' Bat (*Miniopterus schreibersii*) and important breeding colonies,

including the very rare Mediterranean Horse-shoe Bat (*Rhinolophus euryale*). The two habitats involved in Life4oakforests are habitat 6210* (Seminatural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) with important orchid sites: 64.19 ha) and habitat 91AA* Eastern white oak forests (*Peucedano cervariae-Quercetum pubescentis*): 92.63 ha. Both of them are priority habitats.

The 6210* habitat is locally characterized by arid semi-natural meadows with *Bromus erectus* and *Brachypodium rupestre* of the alliance *Bromion erecti*, mixed with bush such as *Juniperus communis*, *Rosa canina*, *Crataegus monogyna* or by natural garrigue and dry meadows with *Helichrysum italicum* and *Bromus erectus* and many chamaephytes, on thin and rocky soils (clay, gypsum, sandstone). The 91AA* habitat is locally characterized by the association *Peucedano cervariae-Quercetum pubescentis*, with the species *Quercus pubescens* (dominant), *Fraxinus ornus*, *Ostrya carpinifolia*, *Sorbus domestica*, *Spartium junceum*, *Scabiosa columbaria*, *Silene nutans*, *Dorychnium hirsutum*, *Peucedanum cervaria*.

The project areas in the Gypsum Vein Regional Natural Park are five (Gesso, Monte Penzola, Riva di San Biagio, Monte Mauro (Figures 1-2), Carnè -Rontana) for a total surface of 511 ha in which are prevalently dominated by habitat 91AA*. The long tradition of forest management and the exploitation of the woods of the Vena del Gesso Park, as well as of the woods in most of Italy, generated forests with the following characteristics:

- Monoplane and even often monospecific;
- Poor presence of dead wood on the ground and standing dead trees (stump, snags and coarse woody debris);
- Absence of natural dynamism.

Life4oakforests will create new conservation management tools with the target to address in a long term, the forests of habitat 91AA* of Vena del Gesso Regional Natural Park towards an old-growth forest model. Old-growth forests have mainly the following characteristics: high quantity of plants and animal, biodiversity, high quantity of standing dead wood, lying deadwood, and spread woody debris, presence of many old and large trees often with cavities and decaying branches. In Italy it is very difficult to find old-growth forests in habitat 91AA*, due to the fact that this is a habitat that has been always exploited by humans. *Downy oaks* were commonly used as wooded pastures, particularly for pigs and cattle, and are still used in this way in many places of central and southern Italy, including Sicily and Sardinia. *Dead wood* and litter have been collected for centuries in the Downy oak woods. This with the millennial history of clear-cutting, burning and grazing may have significantly altered the soil formation processes and carbon accumulation.

Following the recent abandonment, many of the current Downy oak woods are developed on soils that had been cultivated for centuries (GUARINO, 2015). However in Italy there is a little patch of forest that has been candidate to old-growth forest of *Quercus pubescens* in habitat 91AA* and is in Bosco del Fanuso in the Natural Reserve “*Bosco della Ficuzza, Rocca Busambra, Bosco del cappeliere e Gorgo del Drago*” Special Protected Area ITA020007 located in Contrada Fanuso, Godrano (PA) (BADALAMENTI *et alii*, 2017).



Figure 1. Bosco autunnale a Monte Mauro (photo by Max Costa)
Fig. 1. Pădure pe versanții Monte Mauro

Methods

The conservation actions foreseen in the five project areas are the following: forest interventions to direct the structure of the forests towards a natural forest, protection against grazing of wild animals, suppression of exotic and invasive species, production and planting of seedlings species of habitat 91AA*, *ex-situ* breeding and repopulation of some saproxylic insects, to favour trees, shrubs and herbaceous specific composition of habitat 91AA*, to encourage un-even forest: diversification by age and tree size, vary the closure of the forest cover; to ensure a vertical diversity and a vertical density of the forest; to remove both shrub and arboreal alien species, such as *Pinus nigra* and other exotic species; to generate, maintain or open gaps large or small (up to a few hundred m²) controlling invasive species.

Release dead material on the ground and standing dead trees (snags and stumps) to improve micro-habitat and to encourage the spread of saproxylic insects, insectivorous birds and small rodents. Generate dying trees, ensuring a spatial distribution of various forms of dead and rotting wood. Keep large, old and decaying trees. The defence actions from over grazing of wild animals in the five projects areas consist in fencing some surface to ensure a better and effective regeneration of 91AA* habitat species. Areas where invasive and exotic species will be eliminated and replaced by native species and will be

fenced off. The project areas are infected by invasive alien species like *Ailanthus altissima* and *Robina pseudoacacia*. However for these two species no particular interventions will be done in Italy, these species being very aggressive and with a great potential of diffusion. No chemical products will be used and no mechanical precautions will be taken. The restoration of habitat 91AA* will be realized through a nursery production of herbaceous, arboreal and shrubby species of the habitat 91AA* that will be realized in the botanical garden Giardino Officinale of Casola Valsenio (RA) and a collection of seeds will be stored in the Germoplasm Bank of the University della Tuscia, in Viterbo, Italy. The seedlings will be planted and fenced to ensure a better and effective regeneration of 91AA * habitat species. The produced species will be used also for buffer zone at the edge of the forests (purchased land), as a protection from chemical agents of the surrounding crops. The breeding and repopulation of saproxylic insects such as Stag beetle (*Lucanus cervus*, classified as LC in the IUCN Red List), Great Capricorn beetle (*Cerambyx cerdo*, classified as LC in the IUCN Red List) and Hermit beetle (*Osmoderma eremita*, classified as NT in the IUCN Red List) will be carried on by Aquae Mundi NGO of Russi in the province of Ravenna. The three species are not extinct in the Gypsun Vein, but are rare. The intention is to collect some specimens in the Natural Park, reproduce them and repopulate the areas. For *Osmoderma eremita* results will be taken for LIFEeremita. The impact and effectivity of the conservation management actions are planned to be analysed with a monitoring protocol divided in three comprehensive modules:

A first module that covers the forests stands network survey (forest stand module) on the selected parts of the project areas. The network survey (500 points in Italy) is planned to be accomplished in a 40 x 40 m net. In all net points the survey of forest stand, shrub layer and deadwood will be carried out in a defined-sized circular plot. Following variables are intended to be measured in each circle: species diameter, social position and health status of the tree individuals; species and number of shrub layer individuals; diameter and length of lying deadwood. Circular plot survey amended by point relascope, light intensity and tree height measurements. The survey will be carried out before (baseline survey) and after the conservation management actions, and after the repeated conservation management actions.

The second module of the protocol focuses on the survey of certain selected conservation management actions. The monitoring primarily targets to survey the regeneration of tree and shrub species in selected artificial gaps, without the impact of large herbivores. Moreover, within the artificial gaps the decay phases of the created lying and standing dead wood and the regeneration of the artificially planted tree and shrub species saplings planned to be surveyed.

The third module is the zoological monitoring, covering the survey of Animal groups acknowledged as good indicators of forest stand structure. In Italy the zoological monitoring protocol will focus on Bats, saproxylics insects, Carabidae and Arachnidae specimens and is intended to be joined with the management action module. (Project Handbook, 2017)

Results

The expected results of Life4oak forests can be briefly summarized in the following lines:

- the natural oak forests condition is reconstructed as a standard for nature conservation management of oak forests;
- the ecological nature conservation oak forests management guideline elaborated and published with the result of its application by the project;
- 43.52 ha forests habitats in Hungary and 40 ha in Italy will be purchased;
- about 2,066 ha protected oak forests (1,555 ha in Hungary and 511 ha in Italy) managed according to the elaborated nature conservation management guideline in 24 project areas (19 in Hungary, 5 in Italy).

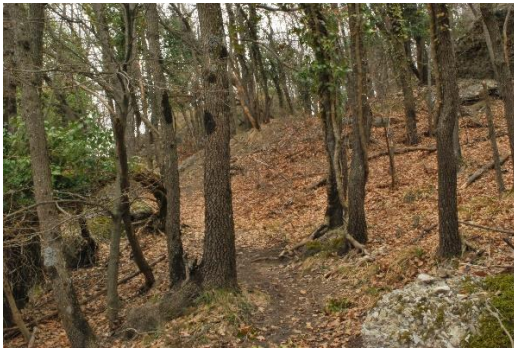
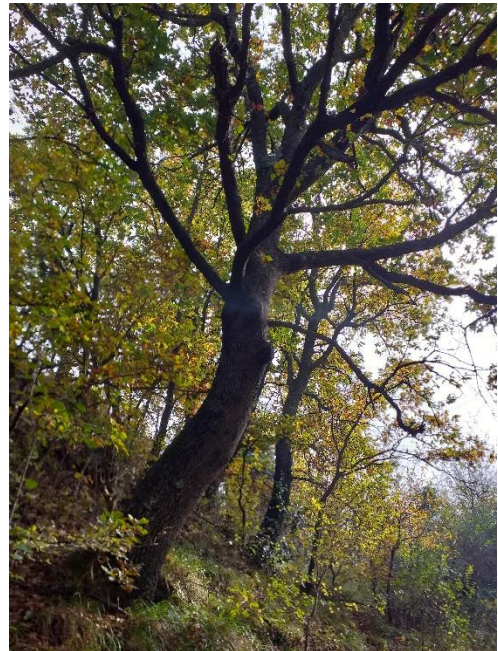


Figure 2. Downy oak forest on the southern slopes of Monte Mauro (photo by Max Costa)

Fig. 2. Pădure de stejar pufos pe versanții sudici ai Monte Mauro



As a result of this kind of management the forest structure will improved towards more natural one, lying and standing deadwood are present in all the areas. The biodiversity of the project areas are increased. About 95 ha forests fenced around to eliminate game's damage. The invasive tree species are eliminated, 50 ha in Hungary, 30 ha in Italy. Eleven presentations and field demonstrations held for stakeholders (working on concerned sites, forestry teachers and students).

Others results are: publishing of guidelines for the forest habitat development on the potential oak habitats (500 copies) and about ecosystem services in three languages (Hungarian, English and Italian); International conference organised to evaluate and share results and experience of the project; the general public's awareness raised towards the importance of Natura 2000 sites and nature conservation of oak forests by the project's webpage; 25 information signs; 5 minutes interactive movie; 300 copies of forest atlas; 500 copies and online materials for kids; information materials and regular media news. (Project Life4oakforests handbook, 2017)

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The Interreg ADRION Adriaticaves Project – Sustainable Management and Tourist Promotion of Natural and Archaeological Heritage in the Territory Managed by the Authority for Parks Management and Biodiversity – Romagna (Italy)

Proiectul Interreg ADRION Adriaticaves – gestionarea durabilă și promovarea turistică a patrimoniului natural și arheologic pe teritoriul gestionat de Autoritatea pentru Gestionarea Parcurilor și Biodiversitate – Romagna (Italia)

Veronica CHIARINI, Massimiliano COSTA,
Oscar ZANI, Jo DE WAELE

Abstract

The Adriaticaves project was born in the framework of the Interreg Project ADRION, which is a European transnational program investing in the promotion of cultural exchange, environmental sustainability and natural and cultural heritage protection in the Adriatic-Ionian Region. Seven partners are part of this project: the Majella National Park (Italy, lead partner), the Authority for Parks Management and Biodiversity – Romagna (Italy), Velebit Nature Park (Croatia), the Cantonal Public Institution for Protected Natural Areas (Bosnia and Herzegovina), Lipa Cave (Montenegro), the City of Čačak (Serbia) and the Shkodra Regional Council (Albania).

Adriaticaves is about karsts environment conservation through the promotion of sustainable tourism and the diffusion of “good practices” of cave management. Caves are fascinating and extremely delicate environments. Far from the surface, they appear like a “world apart” with their own fragile ecosystem. Their scientific importance is enormous from both a biological and a geological point of view. However, these environments are extremely fragile and any artificial modification introduced in their delicate equilibrium can seriously threaten and destroy these important heritages. This means that cave frequentation can seriously undermine the conservation of these natural environments. However, it is important to let people visit these places, allowing them to explore, discover their beauties and understanding their importance and their fragility. Indeed, opening a cave to the public can be a powerful tool for cave conservation, raising awareness towards these environments among the wide public, contributing to a correct scientific divulgation while improving knowledge and respect towards these environments. Adriaticaves project is focused in this direction: creating a network of caves, which have in common a series of best practices allowing for a sustainable management of these environments to promote a more sustainable tourism.

Keywords: *cave conservation, sustainable tourism, show caves, speleology, science and tourism, Interreg Project*

Introduction

Caves can be considered natural voids in the Earth's crust which can be potentially explored by humans. Cave formation can occur in any kind of rock and depends on several geological processes (e.g. wind, volcanism, tectonics, ice, water...) which are used for cave classification. However the most common factor leading to cave formation involves water action in soluble rocks like limestone, gypsum or halite or even in poorly soluble rocks such as quartzites (WRAY, SAURO, 2017).

Despite their geological origin, caves are relatively low energy environments characterised by permanent dark, rather stable temperatures and low availability of organic matter. However, they are strongly connected with the external environment and any environmental modification occurring at the surface is transferred to this underground world. These conditions altogether make cave environments particularly interesting for almost any scientific field. An example is provided by palaeoenvironment and palaeoclimate studies, which find excellent archives of information about past climate changes in cave speleothems (e.g. FAIRCHILD and BAKER, 2012), or by mineralogy, since in the cave environment unique conditions can be found, leading to the precipitation of rare mineral phases (e.g. HILL and FORTI, 1997). In addition, the importance of caves as karst aquifers must not be forgotten, providing huge quantities of pure fresh water and the deep interest hydrogeologists have in studying and preserving these environments. At the same time, biologists are deeply interested in these environments as well, since their unique environmental conditions lead to interesting adaptation strategies of the species inhabiting this underground world (e.g. CULVER and PIPAN, 2019). In recent times special attention has been given to bacterial colonies developing in caves, whose study can have strong impact for medical research but also for the understanding of the origin of life on our planet (BARTON and NORTHUP, 2007). Given the characteristics of stability and the "conservation" properties of these environments, caves can also be a source of information about past cultures, since they were often used as shelters or for ritual purposes. Thus, archaeologists and anthropologists as well find these places particularly interesting for the huge amount of information they can provide.

It is thus clear that cave environments can potentially provide huge amounts of information regarding several aspects of our past, while representing an actual ecosystem. However, caves can appear also as mysterious and amazing places able to attract cavers, explorers and tourists, thus assuming an economic value for local communities.

The characteristics described above, which are responsible for the huge interest in caves coming from different fields, make this habitat extremely fragile and sensitive to any introduced modification, especially the ones related to the

impact of human activities. Surface water and groundwater pollution, illegal dumping, vandalism, illegal animal trade and uncontrolled frequentation can seriously threaten cave environments, causing a huge loss in both the biological and geological heritage. But, even if it might seem contrasting with what exposed above, in some situations opening a cave to tourists can be a great opportunity for cave conservation. A conscious delineation of cave paths using proper materials, the training of cave guides about both scientific features and fragilities of the chosen cave, the control of people's access in terms of both maximum number and seasonal opening are all factors which can help a correct scientific divulgation among the public, thus raising awareness towards these poorly known environments.

The Adriaticaves Project is focused on this topic: the creation of a network of caves opened to the public adopting a sustainable approach for cave management. This project was born in the frame of the wider Interreg Project ADRION, which is a transnational program aiming to the promotion of cultural exchange, environmental sustainability and natural and cultural heritage conservation, involving countries of the Adriatic-Ionian Region. The Adriaticaves project started in 2018 and will be concluded in December 2020. It involves partners from both sides of the Adriatic Sea characterised by both environmental and cultural values but at different conservation status. The main objective of this project is to jointly raise the level of conservation of both natural (Natura 2000 sites) and cultural heritage and to identify sustainable development strategies, including major marketing operations, through the exchange of "best practices" of cave management and frequentation.

Materials and Methods

Seven partners are involved in the Adriaticaves Project (Figure 1): the Majella National Park (Abruzzo, Italy; project lead partner), the Authority for Parks Management and Biodiversity – Romagna (Emilia-Romagna, Italy), the Velebit Nature Reserve (Croatia), the City of Cačak District (Serbia), the Cantonal Public Institution for Protected Natural Areas (Bosnia and Herzegovina), the Shkodra Regional Council (Albania) and Lipa Cave (Montenegro).

Each partner has included in the project one or more caves located in its own territory. Both wild caves opened for tourist caving tours and show caves fully or partially equipped for tourist visits are part of the project.

In particular, considering the Authority for Parks Management and Biodiversity – Romagna, three caves formed in Messinian Gypsum outcrops have been included in the project (Figure 2): Tanaccia cave (a wild cave opened to the public for guided caving tourist visits); Re Tiberio Cave (a wild cave which has been equipped to be a show cave only for the first 60 m from the main

entrance, opened to the public for both guided tourists and guided caving tour visits) and Onferno Cave (a partially equipped show cave opened to the public for both guided tourists and guided caving tour visits).

The project is organized in 6 Work Packages (WP), each representing a main subject including several activities. Each partner is involved in each activity but some partners are actually responsible for the coordination of the different WPs.

The Project Work Packages are organised as follows:

- WP0: Preparation;
- WP1: Management (partner in charge: Majella National Park);
- WP2: Tourism Development and Sustainable Management Strategy (partner in charge: Authority for Parks Management and Biodiversity – Romagna);
- WP3: Cave Conservation through Natural and Cultural Heritage Protection (partner in charge: Authority for Parks Management and Biodiversity – Romagna);
- WP4: Pilot Projects (partner in charge: City of Cačak);
- WP5: Communication (partner in charge: Shkodra Regional Council).

WP2 and WP3 include several activities coordinated by the Authority for Parks Management and Biodiversity – Romagna through both its internal staff and collaboration with the University of Bologna (Biological, Geological and Environmental Sciences department).

WP2 is mainly focused on the production of informative material related to the project and the creation of a network of “speleo-guides” among the project partners. A “speleo-guide” is actually thought as an already trained caving guide from a technical point of view, further trained on biological, geological, archaeological and cave conservation issues. A specific training focused on these topics has been organised for all the partner’s caving guides involved in the Adriaticaves project. The definition of a more sustainable approach to cave frequentation and cave management will be valued on the market through the realization of local tour packages involving local travel agencies and taking into account the cave conservation strategies adopted and developed during this project.

WP3 is deeply connected with the previous WP and contains activities mainly focused on cave conservation through the development of specific monitoring strategies for each project cave, the set up of a monitoring system and the redaction of an Action Plan for habitat 8310 (“*Caves not open to the public*”), containing indications of the actions to be taken to protect and restore cave habitats. Cave monitoring (cave air CO₂, temperature, relative humidity, radon emission together with the reporting of rare faunal species (such as bats) frequenting these sites and/or rare plants located close to the cave entrances) will be performed during the whole duration of this project, in order to have enough data to understand basic cave dynamics and identify the best approach for the tourist visits according to the specific cave (e.g. number of people, areas of the cave that should not be visited, seasonality of cave visit according to the eventual presence of hibernating bats or breeding/nursery sites).

The actions planned in the Action Plan are then financed through the WP4 Pilot Projects, where each partner is given funds to improve the conservation status of both their wild caves and the ones opened to the public, together with actions related to the increasing of tourism sustainability in these environments (e.g. replacement of old halogen lamps with led lights and re-setting of show cave illumination systems to prevent the development of lampenflora, removal of material not suitable for cave environments in show caves, like wood...). In the territory managed by the Authority for Parks Management and Biodiversity – Romagna, archaeological researches aiming to improve the existing knowledge of local cave frequentation during the protohistory period and the preservation of cultural heritage, together with the realisation of some interventions to protect a “*lapis specularis*” Roman quarry and the replacement of an old illumination system with led lights in a local site are all actions planned and funded by Adriaticaves pilot projects.

WP5 is finally dedicated to communication of the defined sustainable approach with public activities, stakeholders and wide public.

Results and Discussion

The main expected result of this project represents the creation of a sort of quality brand “Adriaticaves” identifying all caves opened to the public (both wild and show caves) adopting “best practices” of cave management.

The main output of this project will be the realisation of a “Chart of Caves”, a document containing all the existing guidelines on cave frequentation, further implemented during the project, and indication of what has to be done in order to manage these environments in a sustainable way. This document will have to be signed by all the project partners in order to be identified by the quality brand “Adriaticaves”. At the moment this quality brand is restricted to the project partners but it is meant to be the starting point for its adoption at a European

international level, as a qualified and widely accepted brand of sustainable tourism in cave environments.

Minor, but not less important results are represented by the creation of a network linking together the “speleo-guides” of the project, trained to guide tourists in caves while providing correct scientific information, aware of the fragility of the environment they are working in, associated with the promotion of a more sustainable and slow tourism involving karst areas through the realisation of local tour packages gathered in a catalogue linking and promoting all project partners. At the local level we aim through this project to better understand cave dynamics through the monitoring system, in order to better manage a sustainable frequentation of our sites. In addition we are planning some intervention and archaeological investigation in order to improve the tourist offer linked to our karst areas, always giving the priority to environmental sustainability and protection of local heritage.

Conclusions

Caves are fascinating and mysterious sites that have always attracted the people’s curiosity. They are also extremely delicate ecosystems presenting unique features from both a geological and biological point of view and represent excellent natural laboratories for scientific research. However they are extremely fragile environments whose exploitation in terms of tourism attractions and/ or mere exploration can actually lead to their complete destruction. The ADRION-Adriaticaves project is a European Union Interreg project aiming to promote a sustainable management of caves through the realisation of several actions leading to the creation of a sort of quality brand.

A sustainable approach not only helps in cave habitat conservation, but also can have strong impact on the economy and development of local communities, aiming to raise awareness towards environment conservation. This will also increase the number of tourists sensitive to nature protection issues, allowing for the maintenance over the long term time scale of the local natural heritage. This project is also thought as a sort of starting point to promote and spread “best practices” of cave conservation of both show caves and wild caves visited through tourist caving tours at an international level through the creation of the quality brand “Adriaticaves”.

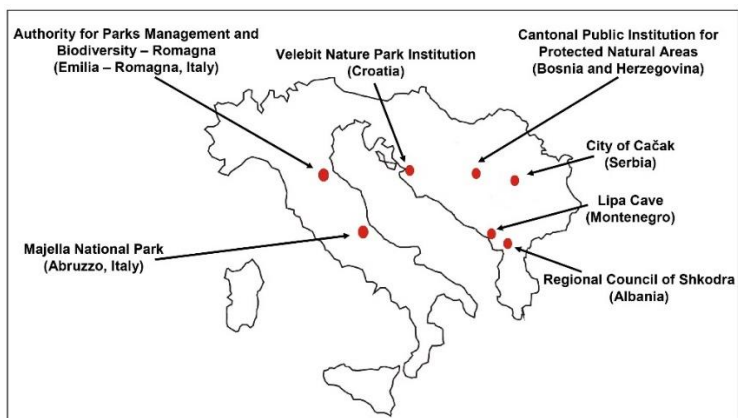


Figure 1. ADRION-Adriaticaves project partners
 Fig. 1. Partenerii proiectului ADRION-Adriaticaves

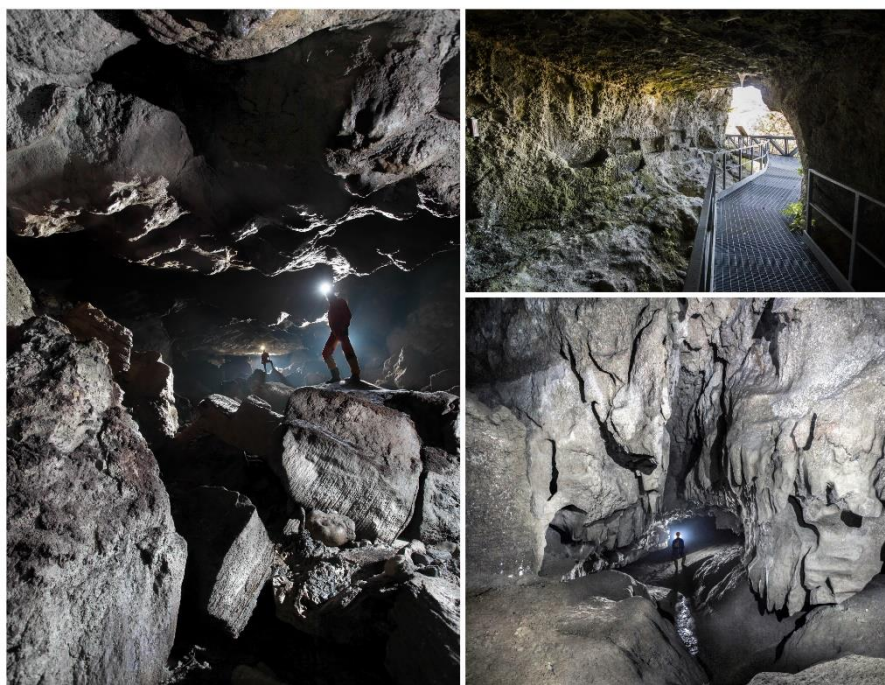


Figure 2. **Left:** Onferno Cave (Gemmano, RN); Photo by Francesco Grazioli
Upper right: Re Tiberio Cave (Borgo Rivola, RA); Photo by Piero Lucci
Lower right: Tanaccia Cave (Brisighella, RA); Photo by Piero Lucci
 Fig. 2. **Stânga:** Peștera Onferno; **dreapta sus:** Peștera Re Tiberio;
dreapta jos: Peștera Tanaccia

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The Natural Landscape as Part of the Local Identity

Case Study: Izvoarele Commune, Tulcea County

Peisajul natural ca parte a factorului identitar local
Studiu de caz: comuna Izvoarele, județul Tulcea

Andreea ACASANDRE, Raluca DUICĂ

Abstract

Izvoarele village is located in the centre of the Tulcea County, at the limit of two large protected areas: Măcin-Niculițel and the North Dobrogean Plateau. Among its distinct elements is the fact that the place shelters a unique compact community of Greek population, the only one living in the countryside in Romania. They represent an anthropological living museum, as they are a living proof of the multiculturalism in Dobrogea.

Their presence here is not arbitrary, as the people in the village all relate to the legend regarding the 13 families whom crossing these places in return from the north part of Danube towards Greece stopped here for a while. The reason is said to be that there was a newborn in the group, which caused them to stop for 40 days, and adding to that they discovered the fertility of the lands, especially the soil, which would allow them to establish a life there. As a result, the 13 families settled and formed the village at the base of Consul Hill.

Today, the Consul Hill represents a central element of the surrounding natural landscape, both at mezzo and local levels, being a major part of the local cultural landscape. Given this fact, the identity of Izvoarele is strongly related to this natural element which watches over it and its inhabitants.

Keywords: *community, rural identity, landscape, Greek minority*

Introduction

The Izvoarele village is situated in the central part of the Tulcea County. With a surface of 9751 ha (according to MDRAP, Territorial Observer – Village Data), the village is located in an area which represents the intersection of the higher plains and the Niculițel Hill, approximately 32 km distance from the county seat, the Municipality of Tulcea.

The village is unique in the county not only because of its natural elements, but also because of its specific population and lifestyle. This is what determines a third specific feature, unique in its value, the anthropogenic/built environment. The ethnologist Narcisa Știucă describes this community as “*the only compact community of Greeks in Romania, the only ones that live in the rural area.*” (ȘTIUCĂ, 2010).

Starting from three defining elements for the local identity, **the anthropogenic/ built heritage, the natural heritage and the cultural heritage**, this article focuses on how an ethnic group of small dimensions manages to maintain alive its traditions, customs and lifestyle. The article explores how the local identity of a small group of people can be maintained alive in a temporal frame such as the one of the 21st century.

This frame is found under various influences, which all have the capacity of adding great pressure on the local identity factor. The 21st century is characterized by a dominance of macro-tendencies such as *globalization*, in a geographic area eroded by multiple cultural influences. Basically, in the same compact geographic area you can find small ethnic groups such as: Megleno - Romanians, Aromanians, Ukrainians, Romany, Circassians, Russians and so on. While each one of these groups is searching for its own individuality, they all respect the life and traditions of their neighbours. Above all the things mentioned above, this space is under significant social, economic and demographic pressure. The population is old and the migration of the youth is increasing dramatically, reaching alarming levels. The main reason for this phenomenon is the general poverty of the Romanian rural areas and the lack of possibilities of finding a job and acquiring a decent lifestyle.

The lack of resources brings in front the problems of the anthropogenic and built environment, which is in an alarmingly degraded state in most parts of the village, shadowing the beauty and uniqueness of this place. It is because of this that the natural elements surrounding the Izvoarele village exist solitarily, detached from the social life of the villagers although they all form an exceptional background in front of which the everyday life of the Izvoarele population is unfolding.

Materials and Methods

This paper represents the result of a one-year interdisciplinary research in the Plateau of Northern Dobrogea. Thus among the methods used in this research can be found both methods specific to urban investigation and sociological research. Specialists from different domains visited the research area, using observation and interviews, as well as the analysis of official data provided by the City Hall. In addition, we analyzed the statistical data provided by the National Institute of Statistics in Bucharest.

Theoretical framework

The French sociologist Henri Mendras considers the rural area a *society of interaction*, stating that in such a community people know each other and relations are stronger and longer than the ones in the urban areas, most of them lasting from birth till death (MENDRAS, 1989, p. 132, *in* BĂDESCU, CUCU-OANCEA, ŞIŞEŞTEAN, 2009).

The survival of an ethnic group of small dimensions is difficult, especially in the 21st century, when the traditions and customs are eroded by globalization, when the cultural boundaries are diluted and the symbols of identity present less and less value. However, because of these strong forces of interaction from the rural areas we can all discuss today about the preservation of the tradition in these restricted areas. Louis Wirth (1938) spoke in the article "*Urbanism as a way of life*" about the impact of high densities of population on the social connections. Thus, as Wirth was saying, the social interactions have a tendency of being stronger if the community is smaller, like a rural one is ((WIRTH, 1938).

The rural environment has the capacity, through symbols and values, to preserve traditions and customs, offering them a physical frame for long-time existence, through exactly the lack of modernization which it is experiencing. Thus, exactly the one thing that represented the big rupture from the urbanized area (BERNEA, 1997; BĂDESCU, CUCU-OANCEA, ȘIȘEȘTEAN, 2009), the slow progress, is the one that offers today a sanctuary for local tradition. This phenomenon exists, at least for now, but its sustainability is debatable because the rural communities are in a vulnerable state, at the risk of disappearing both physically and symbolically, the migration of the youth taking with it all its defining elements.

Results and Discussions

The built heritage

According to the legend, the village was founded in 1828, all starting with 13 Greek families who left the village of Aspr - Acdere (Thessaloniki area) due to the Turkish persecution. Ethnologist Narcisa Știucă mentions that the Czarist Russians, great enemies of the Ottomans, had promised the Greeks "*protection and land exempt from taxes*" (ȘTIUCĂ, 2010). These families of Greeks were joined by seven Bulgarian families from Curuchioi, Varna area. The extended group went to the South of Basarabia where it tried to settle in the villages of Frecăței, Cișmechioi, Traianu Vechi, Pelini and Curcani (ȘTIUCĂ, 2010).

After a while, the group of Greeks and Bulgarians decided to go back home. There would be two possible reasons: some say they would have missed their home, others would say that the Russians did not live up to their promises. The group therefore left Basarabia and moved to Dobrogea. Legend has it that it was a late, cold autumn, and they camped somewhere in the shadow of Consul Hill.

One of the women was pregnant and giving birth, according to tradition, had to stay in that place for 40 days. Even today, the village elders remember that moment as the "40-day stop."

"The Greeks noticed that there were rich forests around, with good wood. They cut trees and sold them to merchants who were going to Tulcea, where

boats and ships were made. The Greeks got nice incomes from this, so they decided to stay there, even after the 40 days of childbed were completed” (Source: www.povestilemariinegre.ro, 2016).

The area is made up of three villages: Izvoarele, Alba and Iulia. The first name of the village of Izvoarele was Alibeichioi (Alibeykoy), which from Turkish would be translated as Ali-bei's village. The village of Alba was Accadana, and the village of Iulia was Cinili. Between 1924 and 1925, in the Dobrogea area the Turkish and Romanian names were replaced and a word game was created: **Regele Ferdinand (Alibichioi-Izvoarele) se încoronează (Dautcea-Încoronarea) cu Regina Maria (Ortachioi-Horia) la Alba (Accadâna-Alba) Iulia (Cinili)/ King Ferdinand (Alibichioi-Izvoarele) is crowned (Dautcea-Coronation) with Queen Marie (Ortachioi-Horia) in Alba (Accadâna-Alba) Iulia (Cinili)** (CORLEANĂ, 2007).

Izvoarele village, the largest of the three is a gathered village, crossed by a stream, tributary of the river Taița. The village spreads between two hills, Natura 2000 protected areas, the households being located to their base.

The street plot, with the national road DN22F that crosses the village, is organically developed in the central-eastern part of the village, and in the western area it is ordered, with relatively parallel streets. The plots are relatively small in size, but mainly rectangular in shape.

Alba village is located in a protected natural area – ROSPA 0073 Măcin-Niculițel and surrounded by ROSCI0201 Northern Dobrogean Plateau, it is bounded on the West side by the Alba river, and in the East by the Tilchilic river, the two waters joining in the south of the village. It is a small village with an organized street plot, developed to the east of DJ229, with parallel and perpendicular streets. The plots are generally rectangular in shape.

Iulia is a small village, made up of two bodies separated by the river Taița. The main body is crossed by DJ229 and has a rectangular street tram, while the second body, on the west side, has an organic street tram. The second body is at the eastern border with the protected natural area ROSPA 0073 Măcin-Niculițel and ROSCI0201 Nord Dobrogean Plateau. The plots are mainly rectangular in shape and large in size, so you can practice farming in the village.

Architecture

In the villages, the traditional houses (Photo 1) were preserved, made from local materials as they were conditioned by the geographical environment: wood and “*chirpici*”. The houses have porches, the wooden pillars of which are shaped by cutting and carving. The profiles of the windows, doors but also the decorative elements of the porch represent repetitions of stylized bird profiles (*Strategia de dezvoltare a Comunei Izvoarele*, 2011).

"Chirpici" is made by most of the inhabitants by grinding clay together with straw, which was put into patterns to form bricks and then dried in the sun. (*Atlasul Etnografic al României*, 1978)



Photo 1. Traditional houses from Izvoarele (source: Andreea Acasandre Archive)
Foto 1. Gospodăriile tradiționale din Izvoarele (sursa: Arhiva Andreea Acasandre)

The roof is short, with short mane, in three or four waters, thus being adapted to the climatic conditions in the area, where there are strong winds. (*Atlasul Etnografic al României*, 1978). Roofing materials are ceramic tiles or metal sheets (Photo 2).



Photo 2. Roof details (source: Raluca Duică Archive)
Foto 2. Detalii despre acoperiș (sursa: Arhiva Raluca Duică)

Residents

With a constantly declining population due to economic problems (which determines the rapid migration of the population to the big cities or abroad), the schools were closed in Alba and Iulia, the only one still functional being the one in Izvoarele.

"There are three schools, but two are no longer working ... Izvoarele secondary school is here in the village and we had two more, one in Alba and one in Iulia, but we don't have children anymore and even they are in a very advanced degree of wear and in need of rehabilitation. There is only one kindergarten here in the village of Izvoarele. We have buses that bring all the children here to Izvoarele. We have buses from the Ministry and we have a driver. Two trips in the morning, two trips in the evening and that's it." (Male, 60, Mayor of Izvoarele)

A visit to the only functional school helps us understand that this educational institution is among the few elements struggling to keep alive the local cultural heritage, even though the number of students is very small. *"The number of children is somewhere up to 160 children from kindergarten to the eighth grade. In my time there were 400. Now I have reached only 160. It is still good compared to other villages. Other villages have fewer children"* recalls the Mayor, who is also of Greek origin. The main peculiarity of the school in Izvoarele is that even though it's the only one remaining in operation, serving all three villages, there is an effort made to maintain the specific Greek traditions from one generation to another. Thus, entering this institution, we see on the right side the reception hall a closet in which are exposed some prizes won by students at various national and international competitions.

The natural heritage

The Izvoarele village is located in a very advantageous area, with a valuable natural environment and an increased accessibility related to the other rural and urban areas from the Tulcea County.

Thus, from the natural heritage perspective, the village has on its surface two of the largest natural reservations of this area: The Plateau of the Northern Dobrogea (Site Code: ROSCI0201) and Măcin-Niculițel (Site Code: ROSPA0073). In the south-western vicinity but without intersecting the territory of the village, is the Babadag Forest (Site Code: ROSPA0091) and in the proximity of the western limit of the village is the protected natural area of the Măcin Mountains (ROSCI0123).

As it can be observed, most of the protected natural areas are grouped in the south, west and north. The only protected natural area located in the eastern vicinity of the Izvoarele village is Deniz-Tepe and it is in ROSCI as well as in the ROSPA (ROSCI0067 and ROSPA0032).

Among those located on the territory of Izvoarele, the dominant from the north is Măcin-Niculițel (ROSPA0073), which occupies the north and north-western parts of the village. The surface of this natural protected area expands far beyond the limits of the village in the north and north-western directions. **The Natural Protected Area of the North Dobrogean Plateau (ROSCI0201)**, whose influence expands beyond the limits of the village towards south and south-west and north, is one of the dominants of the County, fostering a large variety of plants and animals. Basically, this village represents the area of intersection of various large natural areas which overlap and occupy a significant surface of the territory of the village.

This exceptional natural heritage offers a valuable diversity and represents a characteristic of the Izvoarele village. The northern protected natural areas “embrace” Alba, one of the components of the Izvoarele village, offering different perspectives all around it. Iulia, the third component of the Izvoarele village is situated in the southern part of the administrative territory, being surrounded by Natural Protected areas such as Măcin-Niculițel, The North Dobrogean Plateau and the Babadag Forest, all three of them framing it discreetly. Izvoarele is framed by Măcin-Niculițel, North Dobrogean Plateau and the Consul Hill (Photo 3).

This is an important landmark and the main touristic attraction of the area. It is also vividly present in the local memory of the population, being repeatedly mentioned by the locals.



Photo 3. The Consul Hill (source: Raluca Duică Archive)
Foto 3. Muntele Consul (sursa: Arhiva Raluca Duică)

The cultural heritage

One of the methods used to maintain the cultural identity is the participation in various national and international festivals dedicated to the Hellenic Community. The pupils from the primary school are still learning traditional Greek songs, customs, the village also having its own Folkloric ensemble that participates year by year in competitions and festivals organized in the various localities of Tulcea County.

However, the Mayor of the village sees it as essential for the communities, (this also being a project of the City Hall), the creation of a new Community Centre. This project is a priority for maintaining the cultural identity, since the inhabitants often organize festivals and meetings at the Community Centre. Even the school teacher mentioned that *"now the traditions of the village are organized at the Community Centre. Before each organized everything in its own, everyone was at home. Now we meet at the Community Centre and spend time together."* (Woman, 38 years old, teacher)

Within the village there are two churches, one on the new rite and one on the old rite (in the community there are still inhabitants on the old rite - most of the old ones), and the inhabitants observe some of the holidays on both the old and the new rites. One of the most complex celebrations of the Greek community in Izvoarele is January 6th-8th.

"What is specific to our locality is the feast of Saint John, Christmas on the old Rite. Whether we are in the church on a new or an old rite, everyone on the old rite keeps the traditions and customs during this period. It is on January 7th. Here, the Christmas on the old rite begins on the eve of the feast of Saint John with Drăgumanu, on January 6th." (Woman, 38 years old, teacher)

The teacher tells that the *Drăgumanu* celebration begins with a row of lads who go to the households and carol them, singing Greek songs. These carollers also look for grooms from throughout the year to "wet" them. The watering of the groom also happens on the same evening that the carolling takes place. *"They drag the poor grooms from well to well and soak them thoroughly. They hide, of course, and try not to be found knowing what awaits them. After that, after being bathed, the group invites them to party together."* (Woman, 38 years old, teacher)

On the second day, the bride's watering takes place. Thus, the Godmother comes to the bride's home, everyone dresses in local traditional costumes and the bride is sprinkled by the Godmother with the basil soaked in Holy Water.

"After the custom takes place at the bride's house, all the women descend into the centre of the village where the village round dance takes place. It is round dance within round dance ... it depends on how many women come to the round dance. The music resounds from the band brought by the City Hall. It's a big holiday and every year it is held. At least since I know myself ... there has been no year in which this did not happen." (Woman, 38 years old, teacher)

January 8th is the *Day of the Old Woman*. The symbol of the Old Woman is associated in the village with the midwife. The teacher mentions that even today there are old people in the village who come and help the young mothers in the care of the baby, in the first months after birth. Thus, the midwives of the year just ended are rewarded by the young mothers, at the Community Centre. They bring bread, chickens and pennies, and come *"to thank the midwife for help,"* says the teacher.

If at economic level the village has an acute lack of functional endowments to ensure its evolution, be it roads or other features necessary for progress, at cultural level, this community is grouped around the **local specific** and its survival is ensured, at least in this case, by the **Community Centre and the market in front of it**, places that have now become symbols of interaction (Photo 4).



Photo 4. The centre of the village where the Saint John round dance is held and the Building of the Community Centre (source: Raluca Duică Archive)

Foto 4. Centrul satului unde se desfășoară hora de Sfântul Ion și clădirea Centrului Comunitar (sursa: Arhiva Raluca Duică)

Local identity as the result of a three-layer heritage

The identity of Izvoarele commune is composed of the overlapping of the three types of elements: anthropic, natural and cultural, all having the same degree of importance.

Thus, the most important elements that define the identity are:

The Consul Hill is an important element at the mezzo-landscape, being not only the highest hill in the area, but also an intriguing element for the inhabitants, who dedicated legends but also explored it – through tourist routes and by cutting down trees.

The houses with Dobrogean specificity, as well as the Community Center along with the central market in Izvoarele, represents the anthropic elements that concentrate in them the local identity.

The presence of **Greeks** in this area it is explained both by historical facts, but also by legends related to the (quasi) natural landscape. The customs and traditions of the Greeks, maintained within the community, are a valuable element of their identity.

Conclusions

The population of Izvoarele represents in itself a valuable resource for the area, but together with the natural and built environment, they form a unique reality, which represent the soul and spirit of that specific place. A very important aspect of this research is the fact that the most imminent danger for this community is not the dilution of the traditions and customs that they have, but the physical disappearance of the community, caused by the global tendencies of the 21st century world.

The economic issues are the ones that most affect the cultural and built environment, leading the natural heritage to solitude and abandonment, vulnerability in front of irrational and unsustainable gestures such as deforestation and pollution.

Together, the built, cultural and natural heritages of Izvoarele, all of priceless value, can lead to sustainable development and, on the long term, a better quality of life for everybody.

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Important Species of Plants for Biodiversity Conservation in the North Dobrogean Plateau – Conservation Status

Specii de plante importante pentru conservarea biodiversității în Podișul Nord-dobrogean – Statut de conservare

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Abstract

*The changes induced by human activities in the last decades, in the North Dobrogean Plateau site (NDP), request the necessity to re-evaluate the conservation status of the flora and vegetation in this area. The NDP vegetation is part of the steppe unit, consisting of plants resistant to drought. In physical geography, a steppe is an eco-region, in the montage grasslands and shrub lands and temperate grasslands, savannas and shrub lands biomes, characterized by grassland plains without trees apart from those near rivers and lakes. Usually, steppes are characterized by a semi-arid or continental climate. Although these species of plants have developed mechanisms for efficient water management, they are vulnerable to climate change, which tends to increase the humidity deficit and the temperature gap. In addition to this global pressure, the NDP flora it is affected by other human activities, such as overgrazing, improper storage of waste, introduction of invasive species and change of land cover. The re-evaluation of the NDP flora is focused on a number of 74 species, of which seven are on the Annex II of the Habitat Directive (2236 *Campanula romanica*, 2079 *Moehringia jankae*, 2253 *Centaurea jankae*, 2327 *Himantoglossum caprinum*, 2125 *Potentilla emilii-popii*, 4067 *Echium russicum*, 4097 *Iris aphylla* subsp. *hungarica*). Four of them were identified in the NDP (*Campanula romanica*, *Moehringia jankae*, *Himantoglossum caprinum*, *Potentilla emilii-popii*). The other 67 are present on the National Red Lists or were the basis for the declaration of the nature reserves of the NDP. More than 70% of the species were identified in the field, for them were made the distribution maps, were estimated also the population size. The conservation status was established based on the population size, the pressures and threats. With the exception of two species (*Lunaria annua* and *Salvia aethiopsis*) the other species are represented by optimal populations and are in a favourable (FV) conservation status. In a hierarchy of pressure types the order is as follows: over-grazing, improper storage of waste, introduction of invasive species, change of land cover, the most important being the over-grazing.*

Keywords: *steppe vegetation, plant conservation status, Habitat Directive, pressures and threats, management measures*

Introduction

The word "steppe" means an environment consisting of wide temperate prairies, generally with hot dry summers and cold rainy winters. The steppes of the Northern hemisphere are located within continents, between 30° and 50° latitude. In the Southern hemisphere, this biome is less frequent and mostly be found in South America. The climate of the steppe is dry, with hot summers and freezing winters. [1]

As to its climate in Asia, Eastern steppes are very different from the Western ones. In the East, rains do not exceed 60 mm/ year, while Western steppes can receive up to 400 mm/ year. As to temperatures, the average temperature of Eastern Asian steppes is 25°C in summer and -15°C in winter, while in the West the average never exceeds 20°C in summer and 0°C in winter. The lack of trees is due not only to the climate, but also to the large herbivores' intense grazing and sometimes to man's deforestation. The steppe in the world is the temperate prairies are widespread in all continents. They are generally known as steppe but have other names as well, depending on the language of the geographical area where they are. European prairies (*puszta*) extend from Hungary to southern Russia and from there to Mongolia (steppe). In South-America, the steppe is in Peru and Bolivia (*puna*) and Argentina (*pampas*). In South-Africa and Australia, the steppe is called *veldt*, while the great expanses of grass of North America are simply called *prairies*. There are also subtropical steppes in central Spain, Turkey, Nepal and Texas, which are generally the result of destroyed forests. [2]

Eurasian Steppe. The largest temperate grassland in the world is the Eurasian steppe, extending from Hungary to China. It reaches almost one-fifth of the way around the Earth. The Eurasian steppe is so well known; the area is sometimes referred to as just The Steppe.

Other Steppes. The dry, short grass prairie of North America's Great Plains is also a steppe. The short grass prairie lies on the western edge of the Great Plains, in the rain shadow of the Rocky Mountains. It extends from the U.S. state of Texas in the south to the province of Saskatchewan, Canada, in the north. [3] The steppe is a biome with herbaceous vegetation. The Western steppes, which are more humid, are extremely rich in species. In the wet areas formed by melted snow, small trees and shrubs grow especially poplars and aspens, which sometimes cluster into small woods. Conversely, in Eastern steppes the vegetation is poorer and without trees. Everywhere the vegetation mainly consists of graminaceous plants, herbs that sometimes can be two meters tall as in the great Chinese "Grass Sea". Some species of pulse vegetables and composites also grow here. In the South-American steppe lives a very rare and exceptional plant: the Titanca (*Puya raimondii*), a typical plant of the *puna*, e.g. the Andean steppe of Peru and Bolivia. It grows 4,000 metres

above sea level and reaches 10 meters tall; it looks like a huge pineapple. It blooms and bears fruit only when old, generally when over one hundred years old. Threatened by breeding and farming, it is rarer than it used to be, and in many areas it seems to be actually disappearing. [2] Why North Dobrogean Plateau (NDP) is such an important area? NDP vegetation is part of the steppe unit (also present in Ukraine and Bulgaria) and of Steppic Bio-geographic Region that it is officially present at the European Union level only in Romania (X). Compared to the entire EU surface the Steppic Region represents less than 1%, more than enough reason to preserve the species and habitats of this region. The NDP represents the protected area with the largest surface of steppe grasslands in the entire Steppic Region within the Natura 2000 network (Figure 1). [4] Therefore, the identification, mapping and evaluation of the conservation status for the characteristic plant species are among the activities of the first importance in order to implement an effective management plan for this protected area.

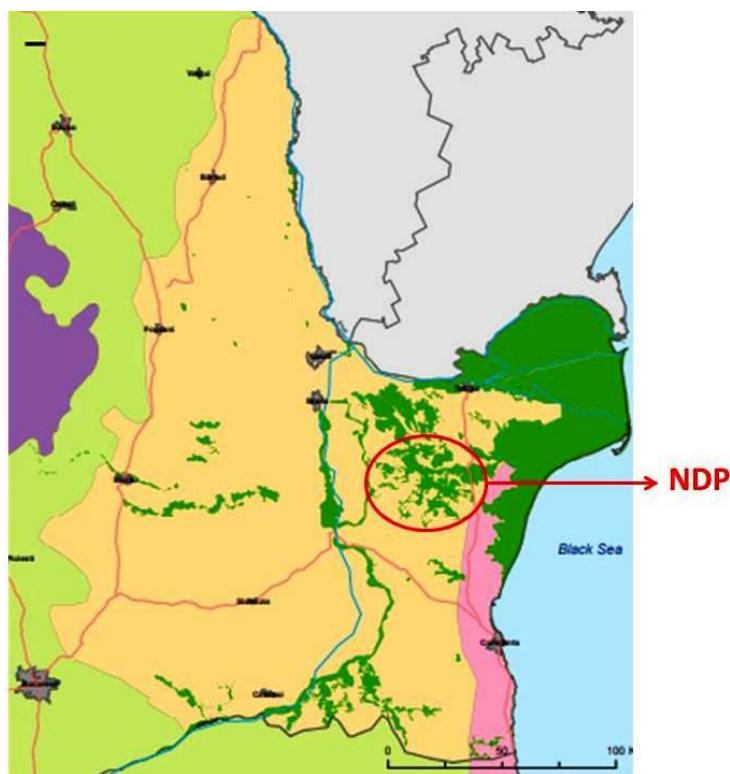


Figure 1. NDP in the bio-geographic “Steppe” region (source: ec.europa.eu)
Fig. 1. PND în regiunea bio-geografică „Stepa” (sursa: ec.europa.eu)

Materials and Methods

The study was conducted between March 2019 and June 2020, and is part of the project “Integrated Management of the North Dobrogean Plateau (MIPoNoDo)” – POIM, cod SMIS 116964. The financial support was provided from EU funds through Large Infrastructure Operational Programme (POIM 2014 – 2020)/ Priority Axis 4 – *Environmental protection by taking measures to preserve biodiversity, air quality monitoring and decontamination of historically contaminated sites*, Specific Objective 4.1 – *Operation for increasing the conservation status of biodiversity and rebuilding damaged ecosystems*.

Aim of the evaluation was the assessment of the conservation status of plant species and non-forest habitats for which were declared protected areas in the study area of the project.

The investigated area was relatively large (84,875 ha) and included:

a. *four Natura 2000 sites:*

- ROSCI0201 Podișul Nord Dobrogean
- ROSPA0091 Pădurea Babadag
- ROSPA0100 Stepa Casimcea
- ROSPA0040 Dunărea Veche – Brațul Măcin

b. *17 nature reserves of national interest* from the 22 presents in Dobrogea region (IV.49 Pădurea Babadag-Codru, IV.51 Muchiile Cernei-Iaila, IV.52 Beidaud, IV.53 Valea Mahomencea, IV.54 Dealul Ghiunghiurmez, IV.62 Valea Ostrovului, IV.63 Uspenia, IV.65 Casimcea, IV.66 Colțanii Mari, IV.67 Peceneaga, IV.68 Măgurele, IV.69 Războieni, 2.765 Dealul Bujorului, 2.766 Rezervația de liliac Valea Oilor, 2.767 Rezervația de liliac Fântâna Mare, 2.768 Vârful Secaru and 2.769 Korum Tarla).

c. *Five proposed reserves: one recognized locally ("La Monument"-Niculițel) and four nationally recognized (Dealul Izvorului, Arleanca, Dealul Lung, Coșarul Mare).*

The re-evaluation of steppe vegetation was focused on 74 species for which NDP component protected areas were. For these species were made the field visits in order to identify them. The following parameters were estimated for the species identified from the list of 74. Similar with Reporting Guide under Article 17 of the Habitats Directive [5] for each species was collected the following characteristics and parameters:

- Species scientific name
- EUNIS Species code
- Alternative species scientific name
- Population size
- Density per m²
- Habitat for the species

- Main pressures and threats
- Conservation status
- Conservation measures
- Future prospects
- Spatial distribution maps

To estimate the population size was used the quadrates method. This methodology delivers a complete survey and statistically robust estimates, the average values on surface unit being able to be extrapolate at species habitat level. Population size is the most important parameter for the inventory updated conservation status and robust monitoring data on population trends.

In order to assess the conservation status of species, firstly, we evaluated four parameters (range, population size, habitat for the species and future prospects) separately and secondly, we combined them into an overall assessment. After assessing each of these parameters, we establish the conservation status according to a format with four classes:

- *Favourable* (FV): habitat type or species can be expected to prosper without any change to existing management or policies.
- *Unfavourable-Inadequate* (U1): habitat type or species require a change in management or policy but there is no danger of extinction in the foreseeable future.
- *Unfavourable-Bad* (U2): habitat type or species is in serious danger of becoming extinct (at least regionally).
- *Unknown*: insufficient information available to allow an assessment. [6]

Results

The investigated species constitute a large list, some of this being species listed in Habitat Directive Annex II, IV and V, some are common and some are typical for steppe vegetation (Table 1). In the list are present one species of trees, four shrubs species and 69 herbaceous plants.

From the 74 investigated species, in the field there were identified only 63, of which the most common were the species typical for steppe vegetation like *Campanula romanica*, *Dianthus nardiformis*, *Thymus zygoides*, *Koeleria lobata*, *Asparagus verticillatus*, *Nectaroscordum siculum* subsp. *bulgaricum*, *Festuca callieri*, *Sempervivum ruthenicum*, or common species like *Muscari neglectum*, *Mercurialis ovata*, *Paeonia peregrina*, *Corydalis solida* (see Table 2 and Figure 2).

Table 1 List of species and subspecies investigated
Tabel 1 Lista speciilor și subsepeciilor investigate

1 <i>Achillea clypeolata</i>	25 <i>Echium russicum</i> *	50 <i>Orchis morio</i> **
2 <i>Achillea ochroleuca</i>	26 <i>Festuca callieri</i>	51 <i>Ormithogalum amphibolium</i>
3 <i>Agropyron cristatum</i> subsp. <i>brandzae</i>	27 <i>Fritillaria orientalis</i>	52 <i>Ormithogalum sibthorpii</i>
4 <i>Allium flavum</i> subsp. <i>tauricum</i>	28 <i>Gagea bulbifera</i>	53 <i>Paeonia peregrina</i>
5 <i>Allium flavum</i> ssp. <i>flavum</i>	29 <i>Gagea szovitzii</i>	54 <i>Paeonia tenuifolia</i>
6 <i>Allium guttatum</i>	30 <i>Galanthus plicatus</i>	55 <i>Paliurus spina-christi</i>
7 <i>Allium saxatile</i>	31 <i>Gallium verticillatum</i>	56 <i>Paronychia cephalotes</i>
8 <i>Anacamptis pyramidalis</i>	32 <i>Globularia bisnagarica</i>	57 <i>Pimpinella traium</i> ssp. <i>lithophila</i>
9 <i>Arenaria rigida</i>	33 <i>Goniolimon collinum</i>	58 <i>Piptatherum virescens</i>
10 <i>Asparagus verticillatus</i> **	34 <i>Gymnospermium altaicum</i>	59 <i>Platanthera chlorantha</i>
11 <i>Asphodeline lutea</i>	35 <i>Himantoglossum caprinum</i> *	60 <i>Potentilla emilii-popii</i> *
12 <i>Astragalus comiculatus</i>	36 <i>Iris aphylla</i> ssp. <i>hungarica</i> *	61 <i>Rosa turcica</i>
13 <i>Astragalus glaucus</i>	37 <i>Koeleria lobata</i>	62 <i>Rumex tuberosus</i>
14 <i>Asyneuma anthericoides</i>	38 <i>Lactuca viminea</i>	63 <i>Salvia aethiopsis</i>
15 <i>Campanula romanica</i> *	39 <i>Lathyrus pannonicus</i>	64 <i>Satureja coerulea</i>
16 <i>Celtis planchoniana</i>	40 <i>Limodorum abortivum</i>	65 <i>Scorzonera mollis</i>
17 <i>Centaurea jankae</i> *	41 <i>Lunaria annua</i> ssp. <i>pachyrrhiza</i>	66 <i>Scutellaria orientalis</i>
18 <i>Centaurea kanitziana</i>	42 <i>Mercurialis ovata - brei</i>	67 <i>Sempervivum ruthenicum</i>
19 <i>Cephalanthera rubra</i>	43 <i>Minuartia adenotricha</i>	68 <i>Silene compacta</i>
20 <i>Corydalis solida</i> **	44 <i>Moehringia jankae</i> *	69 <i>Spiraea crenata</i>
21 <i>Crocus chrysanthus</i>	45 <i>Muscari neglectum</i> **	70 <i>Spiraea hypericifolia</i>
22 <i>Crocus flavus</i>	46 <i>Myrrhoides nodosa</i>	71 <i>Stachys angustifolia</i>
23 <i>Dianthus nardiformis</i>	47 <i>Nectaroscordum siculum</i> ssp. <i>bulgaricum</i>	72 <i>Tanacetum millefolium</i>
24 <i>Echinops ritro</i> subsp. <i>ruthenicus</i>	48 <i>Neottia nidus-avis</i>	73 <i>Thymus zygoides</i>
* Natura 2000 species	49 <i>Ononis pusilla</i>	74 <i>Veratrum nigrum</i>

** **Common species**

Table 2. Identified species and number of the places
 Tabel 2. Speciile identificate și numărul de locuri

No.	EUNIS code	Specie name	Number of places where were identified
1	152841	<i>Achillea clypeolata</i>	20
2	154011	<i>Achillea ochroleuca</i>	7
3	191619	<i>Agropyron cristatum</i> subsp. <i>brandzae</i>	27
4	189274	<i>Allium flavum</i> subsp. <i>tauricum</i>	54
5	189279	<i>Allium guttatum</i>	10
6	188729	<i>Allium saxatile</i>	14
7	189443	<i>Anacamptis pyramidalis</i>	11
8	166063	<i>Arenaria rigida</i>	11
9	189155	<i>Asparagus verticillatus</i>	81
10	188662	<i>Asphodeline lutea</i>	20
11	170809	<i>Astragalus glaucus</i>	3
12	165320	<i>Asyneuma anthericoides</i>	1
13	165090	<i>Campanula romanica</i> *	370
14	155211	<i>Centaurea kanitziana</i>	15
15	189469	<i>Cephalanthera rubra</i>	2
16	175472	<i>Corydalis solida</i>	44
17	186411	<i>Crocus chrysanthus</i>	8
18	186422	<i>Crocus flavus</i>	20
19	166540	<i>Dianthus nardiformis</i>	122
20	154712	<i>Echinops ritro</i> subsp. <i>ruthenicus</i>	72
21	158124	<i>Festuca callieri</i>	54
22	188620	<i>Fritillaria orientalis</i>	11
23	188217	<i>Gagea bulbifera</i>	5
24	189035	<i>Gagea szovitzii</i>	25
25	185705	<i>Galanthus plicatus</i>	14
26	8239	<i>Globularia bisnagarica</i>	24
27	189938	<i>Himantoglossum hircinum</i> *(<i>caprinum</i>)	4
28	192830	<i>Koeleria lobata</i>	105
29	158124	<i>Lactuca viminea</i>	2

No.	EUNIS code	Specie name	Number of places where were identified
30	171817	<i>Lathyrus pannonicus</i>	4
31	189653	<i>Limodorum abortivum</i>	8
32	163959	<i>Lunaria annua</i> subsp. <i>pachyrhiza</i>	2
33	170023	<i>Mercurialis ovata</i>	37
34	166168	<i>Minuartia adenotricha</i>	2
35	165858	<i>Moehringia jankae</i> *	31
36	188976	<i>Minuartia adenotricha</i>	41
37	152168	<i>Myrrhoides nodosa</i>	15
38	188989	<i>Nectaroscordum siculum</i> subsp. <i>bulgaricum</i>	77
39	169902	<i>Ononis pusilla</i>	2
40	189762	<i>Orchis morio</i>	15
41	188175	<i>Ornithogalum amphibolum</i>	9
42	188506	<i>Ornithogalum sibthorpii</i>	12
43	175419	<i>Paeonia peregrina</i>	106
44	178042	<i>Paliurus spina-christi</i>	1
45	165869	<i>Paronychia cephalotes</i>	8
46	152090	<i>Pimpinella tragiium</i> subsp. <i>lithophila</i>	17
47	193250	<i>Piptatherum virescens</i>	8
48	189789	<i>Platanthera chlorantha</i>	18
49	179724	<i>Potentilla emilii-popii</i> *	22
50	189789	<i>Rosa turcica</i>	15
51	177467	<i>Rumex tuberosus</i>	6
52	173706	<i>Salvia aethiopsis</i>	10
53	173954	<i>Satureja coerulea</i>	4
54	161036	<i>Scorzonera mollis</i>	2
55	174855	<i>Scutellaria orientalis</i>	9
56	168360	<i>Sempervivum ruthenicum</i>	43
57	166283	<i>Silene compacta</i>	12
58	179504	<i>Spiraea crenata</i>	4
59	174368	<i>Stachys angustifolia</i>	13
60	160027	<i>Tanacetum millefolium</i>	30
61	174127	<i>Thymus zygoides</i>	118
62	188055	<i>Veratrum nigrum</i>	25

The not yet identified species were: *Astragalus corniculatus*, *Astragalus ponticus*, *Celtis planchoniana*, *Centaurea jankae**, *Echium russicum**, *Galium verticillatum*, *Gonolimon collinum*, *Gymnospermium altaicum*, *Iris aphylla* subsp. *hungarica*, *Neottia nidus-avis*, *Paeonia tenuifolia*, *Spiraea crenata*.

For the species present in Annex II of Habitats Directive (*Echium russicum*, *Iris aphylla* subsp. *hungarica*, and *Centaurea jankae*) that have not yet been identified, following explanations are possible: a) in European Checklist [6], *Pontechium maculatum* subsp. *maculatum* is resident name and *Echium russicum* is a synonym; b) the pedo-climatic conditions are not favourable for typical habitats for *Iris aphylla* subsp. *hungarica*, and *Centaurea jankae*. *Paeonia tenuifolia* is present outside of project area in proximity of Izvoarele village and *Gymnospermium altaicum* is present in Măcin Mountains National Park areas, adjacent to NDP.

The variability of the size of population is relatively high, starting at 0.25 individuals/ m² to 36 individuals/ m², and there is no direct correlation between the size of individuals and their spatial density.

To provide new information about *Astragalus corniculatus*, *Astragalus ponticus*, *Celtis planchoniana* and *Spiraea crenata* the study will continue in 2020. With the exception of two species (*Lunaria annua* and *Salvia aethiopsis*) the other species are represented by optimal populations and are in a favourable (FV) conservation status.

In a hierarchy of pressure types, the order is as follows: over-grazing, improper storage of waste, introduction of invasive species, change of land cover, the most important being the over-grazing. Most of the species have the typical habitat 62C0* Ponto-Sarmatic steppes, following by a mixed between 8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii and 62C0* Ponto-Sarmatic steppes (Table 3). The habitat 62C0* Ponto-Sarmatic steppes, is dominant in 12 natural reserves and 8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii in three. More of half of areas present in natural reserves is covered by 62C0* Ponto-Sarmatic steppes that it is in Unfavourable - Bad (U2) conserved status.

For the 62 species was made the spatial map. The maps are necessary for the monitoring system of the conservation status and for the geographical position of species populations. An example is the map for *Silene compacta*, present in Figure 3, species represented by one population situated in Secaru Peak.

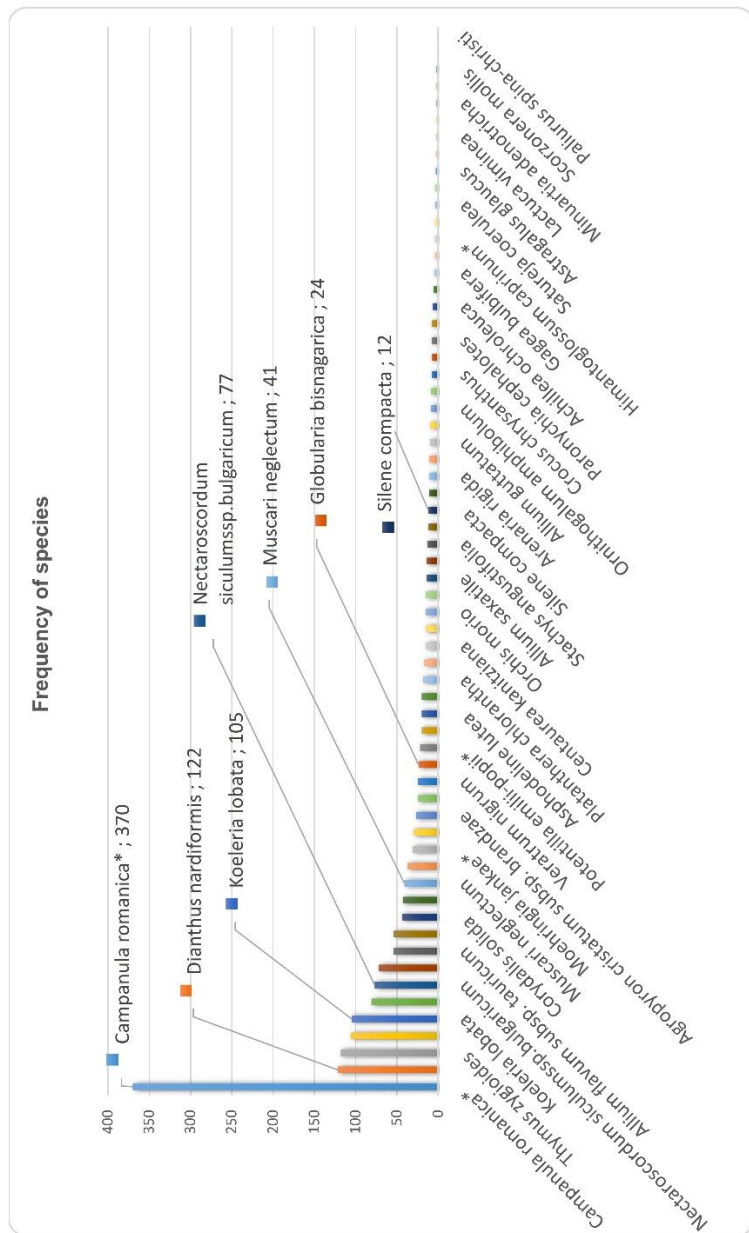


Figure 2. Frequency of the identified plant species in NDP
 Fig. 2. Frecvența speciilor de plante identificate în PND

Table 3. Typical species habitat

Tabel 3. Habitata tipice speciilor

No.	Species	Habitats
1	<i>Achillea clypeolata</i>	62C0* Ponto-Sarmatic steppes 8230 Siliceous rock with pioneer vegetation of the Sedo- Scleranthion or of the Sedo albi- Veronicion dillenii
2	<i>Achillea ochroleuca</i>	
3	<i>Allium guttatum</i>	
4	<i>Allium saxatile</i>	
5	<i>Arenaria rigida</i>	
6	<i>Celtis glabrata</i>	
7	<i>Ornithogalum amphibolum</i>	
8	<i>Piptatherum virescens</i>	
9	<i>Paliurus spina-christi</i>	
10	<i>Potentilla emilii-popii*</i>	
11	<i>Paronychia cephalotes</i>	
12	<i>Scorzonera mollis</i>	
13	<i>Silene compacta</i>	
14	<i>Thymus zygoides</i>	
15	<i>Agropyron cristatum</i>	62C0* Ponto-Sarmatic steppes
16	subsp. <i>brandzae</i>	
17	<i>Allium flavum</i> subsp. <i>tauricum</i>	
18	<i>Asphodeline lutea</i>	
19	<i>Astragalus corniculatus</i>	
20	<i>Astragalus glaucus</i>	
21	<i>Astragalus ponticus</i>	
22	<i>Asyneuma anthericoides</i>	
23	<i>Centaurea jankae</i>	
24	<i>Crocus chrysanthus</i>	
25	<i>Crocus flavus</i>	
26	<i>Echinops ruthenicus</i>	
27	<i>Echium russicum</i>	
28	<i>Festuca callieri</i>	
29	<i>Gagea bulbifera</i>	
30	<i>Gagea szovitsii</i>	
31	<i>Globularia bisnagarica</i>	
32	<i>Koelaria lobata</i>	
33	<i>Lathyrus pannonicus</i>	
34	<i>Ononis pusilla</i>	
35	<i>Orchis morio</i>	
36	<i>Paeonia tenuifolia</i>	
37	<i>Rumex tuberosus</i>	
38	<i>Salvia aethiopis</i>	
39	<i>Satureja coerulea</i>	
40	<i>Scutellaria orientalis</i>	
41	<i>Scutellaria orientalis</i>	
42	<i>Stachys angustifolia</i>	
	<i>Tanacetum millefolium</i>	

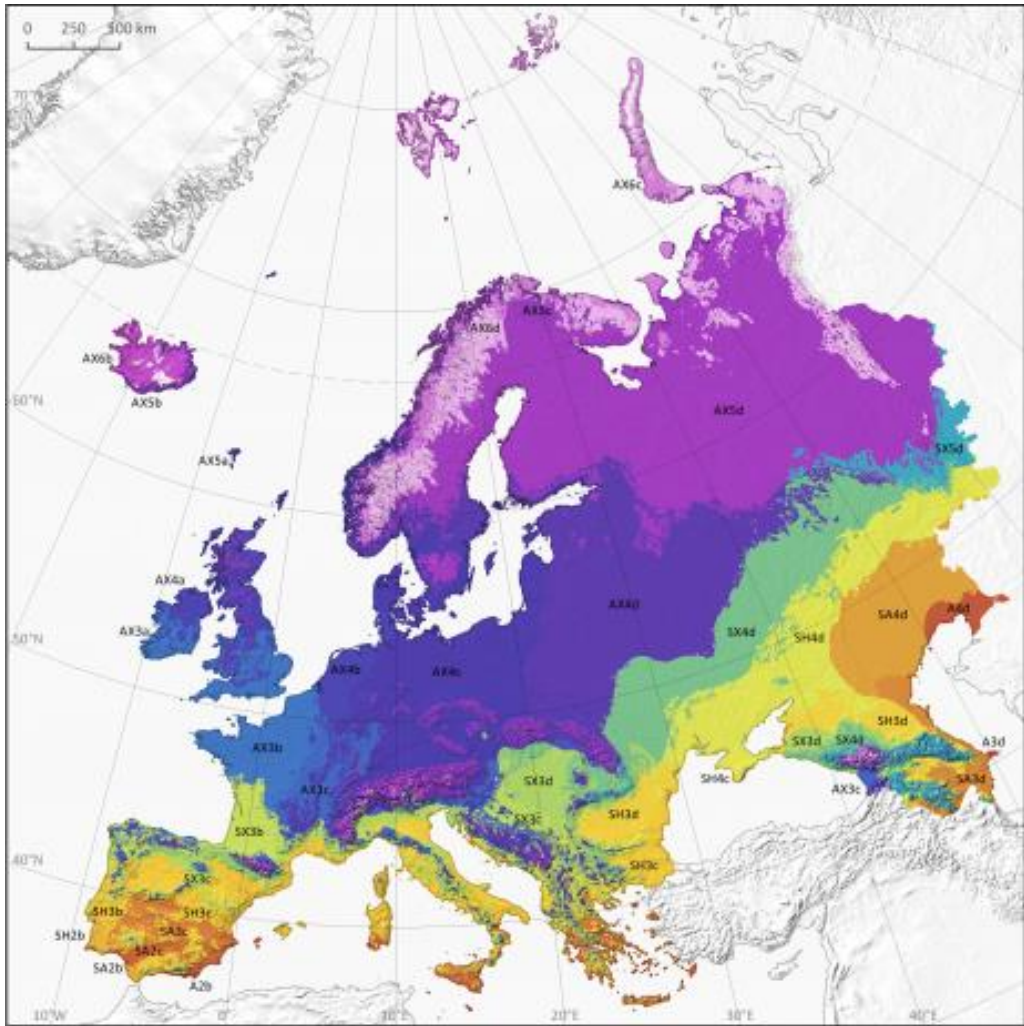
43	<i>Anacamptis pyramidalis</i>	62C0* Ponto-Sarmatic steppes 40C0 Ponto-Sarmatic deciduous thickets
44	<i>Fritillaria orientalis</i>	
45	<i>Himantoglossum hircinum</i>	
46	<i>(caprinum)*</i>	
47	<i>Iris aphylla</i> subsp. <i>hungarica</i>	
48	<i>Limodorum abortivum</i>	
49	<i>Ornithogalum sibthorpii</i>	
50	<i>Paeonia peregrina</i> <i>Rosa turcica</i>	
51	<i>Asparagus verticillatus</i>	8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii 40C0 Ponto-Sarmatic deciduous thickets
52	<i>Lactuca viminea</i>	
53	<i>Spiraea crenata</i>	
54	<i>Spiraea hypericifolia</i> (cultivated species)	
55	<i>Campanula romanica*</i>	8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii
56	<i>Centaurea kanitziana</i>	
57	<i>Dianthus nardiformis</i>	
58	<i>Galium verticillatum</i>	
59	<i>Gymnospermium altaicum</i>	
60	<i>Moehringia jankae*</i>	
61	<i>Pimpinella tragiium</i> subsp. <i>lithophila</i>	
61	<i>Sempervivum ruthenicum</i>	
62	<i>Cephalanthera rubra</i>	91X0 Dobrogean beech forests 91Y0 Dacian oak and hornbeam forests 40C0 Ponto-Sarmatic deciduous thickets
63	<i>Goniolimon collinum</i>	
64	<i>Lunaria annua</i> subsp. <i>pachyrhiza</i>	
65	<i>Minuartia adenotricha</i>	
66	<i>Myrrhoides nodosa</i>	
67	<i>Platanthera chlorantha</i>	
68	<i>Corydalis solida</i> subsp. <i>slivenensis</i>	91Y0 Dacian oak and hornbeam forests
69		
70	<i>Nectaroscordum siculum</i> subsp. <i>bulgaricum</i> <i>Veratrum nigrum</i>	
71	<i>Galanthus plicatus</i>	91X0 Dobrogean beech forests 91Y0 Dacian oak and hornbeam forests
72	<i>Mercurialis ovata</i>	
73	<i>Muscari neglectum</i>	
74	<i>Neottia nidus-avis</i>	



Figure 3. Spatial map of *Silene compacta*
 Fig. 3. Harta spațială pentru specia *Silene compacta*

Discussions

According to phyto-climatic units map (BOTTI, 2018), Romania, Ukraine and Bulgaria are part of 5H3c and 5H3d sub-humid units that means Romania from climatically point of view is not in semi-arid units typical of steppe (Figure 4). The assessment of plant list and vegetation studies elaborated by BRÂNDZĂ (1898), PETRESCU (2004, 2007) reveal that the Dobrogea area is part of steppic biome from the species composition point of view. Dobrogean vegetation list is very similar with the list of Russian steppe vegetation presented by BOONMAN and MIKHALEV (2005). Also, from a climatic point of view, Dobrogea belongs to a semi-arid climate, the multiannual precipitation falling in the range of 350-400 mm/ year. This discrepancy with the phyto-climatic map is explained by the fact that the surfaces covered with steppe vegetation and with a semi-arid climate are too small to be marked on the map whose resolution is too small to highlight these areas.



KEY TO PHYTOCLIMATIC UNITS

	Aridity		A - Arid				SA - Semi-arid				SH - Subhumid				SX - Subxeric				AX - Axeric																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
			2. Hot	3. Temp.	4. Cool	2. Hot	3. Temp.	4. Cool	2. Hot	3. Temp.	4. Cool	3. Temp.	4. Cool	5. Cold	6. Very cold	8. Temp.	4. Cool	5. Cold	6. Very cold	7. Nival																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Figure 4. Phyto-climatic Units Map (after BOTTI, 2018)
 Fig. 4. Harta unităților fito-climatice (după BOTTI, 2018)

Conclusions

From the pedo-climatic and vegetation structure point of view, the NDP area is part of the Steppic biome. The surface of NDP (84,875 ha) is a very small area in comparison with phyto-climatic units, one of the reason why it could not be mapped. The re-evaluation of steppe vegetation was focused on 74 species for which has been declared the NDP protected area. More than 80% of the species were identified in the field, for them were made the distribution maps, were estimated also the population size. With the exception of two species (*Lunaria annua* and *Salvia aethiopsis*) the other species are represented by optimal populations and are in a favourable (FV) conservation status.

Although the surface area covered by 62C0* Ponto-Sarmatic steppes habitat in Favourable (FV) conservation status is reduced, it is sufficient to host the populations of steppe typical species like *Festuca callieri* and *Thymus zygoides*. Populations of this species are abundant and in favourable conservation status. The species of community interest *Himantoglossum caprinum (hircinum)* is represented here by small populations.

The habitat 8230 Sedo-Scleranthion of the Sedo albi-Veronicion dillenii present at large scale in reserves like Vârful Secaru is in Favourable (FV) conservation status and host three important species of community interest: *Campanula romanica*, *Moehringia jankae* and *Potentilla emilii-popii*. The populations of these three species are also in favourable conservation status.

The data and information collected will be included in the integrated management plan of the NDP protected areas. There will be elaborated a realistical monitoring system of the conservation status of habitats and species based on this data and information. In the management plan, will be established the conservation measures and will be estimated the costs for their implementation. In the Gantt chart of the management plan will be found the timing of these measures. One of most important measures is to reduce the impact of animal grazing.

The alternative solutions that could reduce the overgrazing, because overgrazing is the most important pressure on the vegetation, are:

- a) Reducing the number of sheep, goats, cows and horses;
- b) Improving the quality of the meadows by sowing with native species and fertilizing with manure for grasslands outside NDP;
- c) Keeping the animals in the stable during the winter;
- d) Elimination of invasive wood species from grasslands.

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Important Species of Plants for Biodiversity Conservation in the North Dobrogean Plateau – Conservation Status

Specii de plante importante pentru conservarea biodiversității în Podișul Nord-dobrogean – Statut de conservare

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Abstract

*The changes induced by human activities in the last decades, in the North Dobrogean Plateau site (NDP), request the necessity to re-evaluate the conservation status of the flora and vegetation in this area. The NDP vegetation is part of the steppe unit, consisting of plants resistant to drought. In physical geography, a steppe is an eco-region, in the montage grasslands and shrub lands and temperate grasslands, savannas and shrub lands biomes, characterized by grassland plains without trees apart from those near rivers and lakes. Usually, steppes are characterized by a semi-arid or continental climate. Although these species of plants have developed mechanisms for efficient water management, they are vulnerable to climate change, which tends to increase the humidity deficit and the temperature gap. In addition to this global pressure, the NDP flora it is affected by other human activities, such as overgrazing, improper storage of waste, introduction of invasive species and change of land cover. The re-evaluation of the NDP flora is focused on a number of 74 species, of which seven are on the Annex II of the Habitat Directive (2236 *Campanula romanica*, 2079 *Moehringia jankae*, 2253 *Centaurea jankae*, 2327 *Himantoglossum caprinum*, 2125 *Potentilla emilii-popii*, 4067 *Echium russicum*, 4097 *Iris aphylla* subsp. *hungarica*). Four of them were identified in the NDP (*Campanula romanica*, *Moehringia jankae*, *Himantoglossum caprinum*, *Potentilla emilii-popii*). The other 67 are present on the National Red Lists or were the basis for the declaration of the nature reserves of the NDP. More than 70% of the species were identified in the field, for them were made the distribution maps, were estimated also the population size. The conservation status was established based on the population size, the pressures and threats. With the exception of two species (*Lunaria annua* and *Salvia aethiopsis*) the other species are represented by optimal populations and are in a favourable (FV) conservation status. In a hierarchy of pressure types the order is as follows: over-grazing, improper storage of waste, introduction of invasive species, change of land cover, the most important being the over-grazing.*

Keywords: *steppe vegetation, plant conservation status, Habitat Directive, pressures and threats, management measures*

Introduction

The word "steppe" means an environment consisting of wide temperate prairies, generally with hot dry summers and cold rainy winters. The steppes of the Northern hemisphere are located within continents, between 30° and 50° latitude. In the Southern hemisphere, this biome is less frequent and mostly be found in South America. The climate of the steppe is dry, with hot summers and freezing winters. [1]

As to its climate in Asia, Eastern steppes are very different from the Western ones. In the East, rains do not exceed 60 mm/ year, while Western steppes can receive up to 400 mm/ year. As to temperatures, the average temperature of Eastern Asian steppes is 25°C in summer and -15°C in winter, while in the West the average never exceeds 20°C in summer and 0°C in winter. The lack of trees is due not only to the climate, but also to the large herbivores' intense grazing and sometimes to man's deforestation. The steppe in the world is the temperate prairies are widespread in all continents. They are generally known as steppe but have other names as well, depending on the language of the geographical area where they are. European prairies (*puszta*) extend from Hungary to southern Russia and from there to Mongolia (steppe). In South-America, the steppe is in Peru and Bolivia (*puna*) and Argentina (*pampas*). In South-Africa and Australia, the steppe is called *veldt*, while the great expanses of grass of North America are simply called *prairies*. There are also subtropical steppes in central Spain, Turkey, Nepal and Texas, which are generally the result of destroyed forests. [2]

Eurasian Steppe. The largest temperate grassland in the world is the Eurasian steppe, extending from Hungary to China. It reaches almost one-fifth of the way around the Earth. The Eurasian steppe is so well known; the area is sometimes referred to as just The Steppe.

Other Steppes. The dry, short grass prairie of North America's Great Plains is also a steppe. The short grass prairie lies on the western edge of the Great Plains, in the rain shadow of the Rocky Mountains. It extends from the U.S. state of Texas in the south to the province of Saskatchewan, Canada, in the north. [3] The steppe is a biome with herbaceous vegetation. The Western steppes, which are more humid, are extremely rich in species. In the wet areas formed by melted snow, small trees and shrubs grow especially poplars and aspens, which sometimes cluster into small woods. Conversely, in Eastern steppes the vegetation is poorer and without trees. Everywhere the vegetation mainly consists of graminaceous plants, herbs that sometimes can be two meters tall as in the great Chinese "Grass Sea". Some species of pulse vegetables and composites also grow here. In the South-American steppe lives a very rare and exceptional plant: the Titanca (*Puya raimondii*), a typical plant of the *puna*, e.g. the Andean steppe of Peru and Bolivia. It grows 4,000 metres

above sea level and reaches 10 meters tall; it looks like a huge pineapple. It blooms and bears fruit only when old, generally when over one hundred years old. Threatened by breeding and farming, it is rarer than it used to be, and in many areas it seems to be actually disappearing. [2] Why North Dobrogean Plateau (NDP) is such an important area? NDP vegetation is part of the steppe unit (also present in Ukraine and Bulgaria) and of Steppic Bio-geographic Region that it is officially present at the European Union level only in Romania (X). Compared to the entire EU surface the Steppic Region represents less than 1%, more than enough reason to preserve the species and habitats of this region. The NDP represents the protected area with the largest surface of steppe grasslands in the entire Steppic Region within the Natura 2000 network (Figure 1). [4] Therefore, the identification, mapping and evaluation of the conservation status for the characteristic plant species are among the activities of the first importance in order to implement an effective management plan for this protected area.

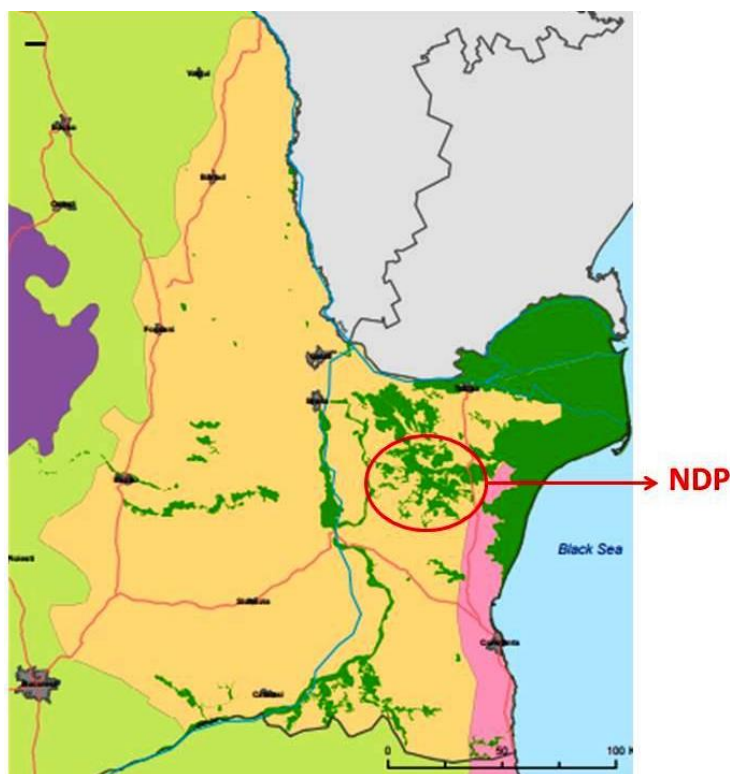


Figure 1. NDP in the bio-geographic “Steppe” region (source: ec.europa.eu)
Fig. 1. PND în regiunea bio-geografică „Stepa” (sursa: ec.europa.eu)

Materials and Methods

The study was conducted between March 2019 and June 2020, and is part of the project “Integrated Management of the North Dobrogean Plateau (MIPoNoDo)” – POIM, cod SMIS 116964. The financial support was provided from EU funds through Large Infrastructure Operational Programme (POIM 2014 – 2020)/ Priority Axis 4 – *Environmental protection by taking measures to preserve biodiversity, air quality monitoring and decontamination of historically contaminated sites*, Specific Objective 4.1 – *Operation for increasing the conservation status of biodiversity and rebuilding damaged ecosystems*.

Aim of the evaluation was the assessment of the conservation status of plant species and non-forest habitats for which were declared protected areas in the study area of the project.

The investigated area was relatively large (84,875 ha) and included:

- a. *four Natura 2000 sites*:
 - ROSCI0201 Podișul Nord Dobrogean
 - ROSPA0091 Pădurea Babadag
 - ROSPA0100 Stepa Casimcea
 - ROSPA0040 Dunărea Veche – Brațul Măcin
- b. *17 nature reserves of national interest* from the 22 presents in Dobrogea region (IV.49 Pădurea Babadag-Codru, IV.51 Muchiile Cernei-Iaila, IV.52 Beidaud, IV.53 Valea Mahomencea, IV.54 Dealul Ghiunghiurmez, IV.62 Valea Ostrovului, IV.63 Uspenia, IV.65 Casimcea, IV.66 Colțanii Mari, IV.67 Peceneaga, IV.68 Măgurele, IV.69 Războieni, 2.765 Dealul Bujorului, 2.766 Rezervația de liliac Valea Oilor, 2.767 Rezervația de liliac Fântâna Mare, 2.768 Vârful Secaru and 2.769 Korum Tarla).
- c. *Five proposed reserves*: one recognized locally (“La Monument”- Niculițel) and four nationally recognized (Dealul Izvorului, Arleanca, Dealul Lung, Coșarul Mare).

The re-evaluation of steppe vegetation was focused on 74 species for which NDP component protected areas were. For these species were made the field visits in order to identify them. The following parameters were estimated for the species identified from the list of 74. Similar with Reporting Guide under Article 17 of the Habitats Directive [5] for each species was collected the following characteristics and parameters:

- Species scientific name
- EUNIS Species code
- Alternative species scientific name
- Population size
- Density per m²
- Habitat for the species

- Main pressures and threats
- Conservation status
- Conservation measures
- Future prospects
- Spatial distribution maps

To estimate the population size was used the quadrates method. This methodology delivers a complete survey and statistically robust estimates, the average values on surface unit being able to be extrapolate at species habitat level. Population size is the most important parameter for the inventory updated conservation status and robust monitoring data on population trends.

In order to assess the conservation status of species, firstly, we evaluated four parameters (range, population size, habitat for the species and future prospects) separately and secondly, we combined them into an overall assessment. After assessing each of these parameters, we establish the conservation status according to a format with four classes:

- *Favourable* (FV): habitat type or species can be expected to prosper without any change to existing management or policies.
- *Unfavourable-Inadequate* (U1): habitat type or species require a change in management or policy but there is no danger of extinction in the foreseeable future.
- *Unfavourable-Bad* (U2): habitat type or species is in serious danger of becoming extinct (at least regionally).
- *Unknown*: insufficient information available to allow an assessment. [6]

Results

The investigated species constitute a large list, some of this being species listed in Habitat Directive Annex II, IV and V, some are common and some are typical for steppe vegetation (Table 1). In the list are present one species of trees, four shrubs species and 69 herbaceous plants.

From the 74 investigated species, in the field there were identified only 63, of which the most common were the species typical for steppe vegetation like *Campanula romanica*, *Dianthus nardiformis*, *Thymus zygoides*, *Koeleria lobata*, *Asparagus verticillatus*, *Nectaroscordum siculum* subsp. *bulgaricum*, *Festuca callieri*, *Sempervivum ruthenicum*, or common species like *Muscari neglectum*, *Mercurialis ovata*, *Paeonia peregrina*, *Corydalis solida* (see Table 2 and Figure 2).

Table 1 List of species and subspecies investigated
Table 1 Lista speciilor și subspeciilor investigate

1 <i>Achillea clypeolata</i>	25 <i>Echium russicum</i> *	50 <i>Orchis morio</i> **
2 <i>Achillea ochroleuca</i>	26 <i>Festuca callieri</i>	51 <i>Ornithogalum amphibolium</i>
3 <i>Agropyron cristatum</i> subsp. <i>brandzae</i>	27 <i>Fritillaria orientalis</i>	52 <i>Ornithogalum sibthorpii</i>
4 <i>Allium flavum</i> subsp. <i>tauricum</i>	28 <i>Gagea bulbifera</i>	53 <i>Paeonia peregrina</i>
5 <i>Allium flavum</i> ssp. <i>flavum</i>	29 <i>Gagea szovitzii</i>	54 <i>Paeonia tenuifolia</i>
6 <i>Allium guttatum</i>	30 <i>Galanthus plicatus</i>	55 <i>Paliurus spina-christi</i>
7 <i>Allium saxatile</i>	31 <i>Galium verticillatum</i>	56 <i>Paronychia cephalotes</i>
8 <i>Anacamptis pyramidalis</i>	32 <i>Globularia bisnagaica</i>	57 <i>Pimpinella traquium</i> ssp. <i>lithophila</i>
9 <i>Arenaria rigida</i>	33 <i>Goniolimon collinum</i>	58 <i>Piptatherum virescens</i>
10 <i>Asparagus verticillatus</i> **	34 <i>Gymnospermium altaicum</i>	59 <i>Platanthera chlorantha</i>
11 <i>Asphodeline lutea</i>	35 <i>Himantoglossum caprinum</i> *	60 <i>Potentilla emilii-popii</i> *
12 <i>Astragalus comiculatus</i>	36 <i>Iris aphylla</i> ssp. <i>hungarica</i> *	61 <i>Rosa turcica</i>
13 <i>Astragalus glaucus</i>	37 <i>Koeleria lobata</i>	62 <i>Rumex tuberosus</i>
14 <i>Asyneuma anthericoides</i>	38 <i>Lactuca viminea</i>	63 <i>Salvia aethiopsis</i>
15 <i>Campanula romanica</i> *	39 <i>Lathyrus pannonicus</i>	64 <i>Satureia coerulea</i>
16 <i>Celtis planchoniana</i>	40 <i>Limodorum abortivum</i>	65 <i>Scorzonera mollis</i>
17 <i>Centaurea jankae</i> *	41 <i>Lunaria annua</i> ssp. <i>pachyrhiza</i>	66 <i>Scutellaria orientalis</i>
18 <i>Centaurea kanitziana</i>	42 <i>Mercurialis ovata</i> - <i>brei</i>	67 <i>Sempervivum ruthenicum</i>
19 <i>Cephalanthera rubra</i>	43 <i>Minuartia adenotricha</i>	68 <i>Silene compacta</i>
20 <i>Corydalis solida</i> **	44 <i>Moehringia jankae</i> *	69 <i>Spiraea crenata</i>
21 <i>Crocus chrysanthus</i>	45 <i>Muscari neglectum</i> **	70 <i>Spiraea hypericifolia</i>
22 <i>Crocus flavus</i>	46 <i>Myrrhoides nodosa</i>	71 <i>Stachys angustifolia</i>
23 <i>Dianthus nardiformis</i>	47 <i>Nectaroscordum siculum</i> ssp. <i>bulganicum</i>	72 <i>Tanacetum millefolium</i>
24 <i>Echinops ritro</i> subsp. <i>ruthenicus</i>	48 <i>Neottia nidus-avis</i>	73 <i>Thymus zygoides</i>
* Natura 2000 species	49 <i>Ononis pusilla</i>	74 <i>Veratrum nigrum</i>
** Common species		

Table 2. Identified species and number of the places

Tabel 2. Speciile identificate și numărul de locuri

No.	EUNIS code	Specie name	Number of places where were identified
1	152841	<i>Achillea clypeolata</i>	20
2	154011	<i>Achillea ochroleuca</i>	7
3	191619	<i>Agropyron cristatum</i> subsp. <i>brandzae</i>	27
4	189274	<i>Allium flavum</i> subsp. <i>tauricum</i>	54
5	189279	<i>Allium guttatum</i>	10
6	188729	<i>Allium saxatile</i>	14
7	189443	<i>Anacamptis pyramidalis</i>	11
8	166063	<i>Arenaria rigida</i>	11
9	189155	<i>Asparagus verticillatus</i>	81
10	188662	<i>Asphodeline lutea</i>	20
11	170809	<i>Astragalus glaucus</i>	3
12	165320	<i>Asyneuma anthericoides</i>	1
13	165090	<i>Campanula romanica</i> *	370
14	155211	<i>Centaurea kanitziana</i>	15
15	189469	<i>Cephalanthera rubra</i>	2
16	175472	<i>Corydalis solida</i>	44
17	186411	<i>Crocus chrysanthus</i>	8
18	186422	<i>Crocus flavus</i>	20
19	166540	<i>Dianthus nardiformis</i>	122
20	154712	<i>Echinops ritro</i> subsp. <i>ruthenicus</i>	72
21	158124	<i>Festuca callieri</i>	54
22	188620	<i>Fritillaria orientalis</i>	11
23	188217	<i>Gagea bulbifera</i>	5
24	189035	<i>Gagea szovitzii</i>	25
25	185705	<i>Galanthus plicatus</i>	14
26	8239	<i>Globularia bisnagarica</i>	24
27	189938	<i>Himantoglossum hircinum</i> *(<i>caprinum</i>)	4
28	192830	<i>Koeleria lobata</i>	105
29	158124	<i>Lactuca viminea</i>	2

No.	EUNIS code	Specie name	Number of places where were identified
30	171817	<i>Lathyrus pannonicus</i>	4
31	189653	<i>Limodorum abortivum</i>	8
32	163959	<i>Lunaria annua</i> subsp. <i>pachyrhiza</i>	2
33	170023	<i>Mercurialis ovata</i>	37
34	166168	<i>Minuartia adenotricha</i>	2
35	165858	<i>Moehringia jankae</i> *	31
36	188976	<i>Minuartia adenotricha</i>	41
37	152168	<i>Myrrhoides nodosa</i>	15
38	188989	<i>Nectaroscordum siculum</i> subsp. <i>bulgaricum</i>	77
39	169902	<i>Ononis pusilla</i>	2
40	189762	<i>Orchis morio</i>	15
41	188175	<i>Ornithogalum amphibolum</i>	9
42	188506	<i>Ornithogalum sibthorpii</i>	12
43	175419	<i>Paeonia peregrina</i>	106
44	178042	<i>Paliurus spina-christi</i>	1
45	165869	<i>Paronychia cephalotes</i>	8
46	152090	<i>Pimpinella tragium</i> subsp. <i>lithophila</i>	17
47	193250	<i>Piptatherum virescens</i>	8
48	189789	<i>Platanthera chlorantha</i>	18
49	179724	<i>Potentilla emilii-popii</i> *	22
50	189789	<i>Rosa turcica</i>	15
51	177467	<i>Rumex tuberosus</i>	6
52	173706	<i>Salvia aethiopsis</i>	10
53	173954	<i>Satureja coerulea</i>	4
54	161036	<i>Scorzonera mollis</i>	2
55	174855	<i>Scutellaria orientalis</i>	9
56	168360	<i>Sempervivum ruthenicum</i>	43
57	166283	<i>Silene compacta</i>	12
58	179504	<i>Spiraea crenata</i>	4
59	174368	<i>Stachys angustifolia</i>	13
60	160027	<i>Tanacetum millefolium</i>	30
61	174127	<i>Thymus zygoides</i>	118
62	188055	<i>Veratrum nigrum</i>	25

The not yet identified species were: *Astragalus corniculatus*, *Astragalus ponticus*, *Celtis planchoniana*, *Centaurea jankae**, *Echium russicum**, *Galium verticillatum*, *Goniolimon collinum*, *Gymnospermium altaicum*, *Iris aphylla* subsp. *hungarica*, *Neottia nidus-avis*, *Paeonia tenuifolia*, *Spiraea crenata*.

For the species present in Annex II of Habitats Directive (*Echium russicum*, *Iris aphylla* subsp. *hungarica*, and *Centaurea jankae*) that have not yet been identified, following explanations are possible: a) in European Checklist [6], *Pontechium maculatum* subsp. *maculatum* is resident name and *Echium russicum* is a synonym; b) the pedo-climatic conditions are not favourable for typical habitats for *Iris aphylla* subsp. *hungarica*, and *Centaurea jankae*. *Paeonia tenuifolia* is present outside of project area in proximity of Izvoarele village and *Gymnospermium altaicum* is present in Măcin Mountains National Park areas, adjacent to NDP.

The variability of the size of population is relatively high, starting at 0.25 individuals/ m² to 36 individuals/ m², and there is no direct correlation between the size of individuals and their spatial density.

To provide new information about *Astragalus corniculatus*, *Astragalus ponticus*, *Celtis planchoniana* and *Spiraea crenata* the study will continue in 2020. With the exception of two species (*Lunaria annua* and *Salvia aethiopsis*) the other species are represented by optimal populations and are in a favourable (FV) conservation status.

In a hierarchy of pressure types, the order is as follows: over-grazing, improper storage of waste, introduction of invasive species, change of land cover, the most important being the over-grazing. Most of the species have the typical habitat 62C0* Ponto-Sarmatic steppes, following by a mixed between 8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii and 62C0* Ponto-Sarmatic steppes (Table 3). The habitat 62C0* Ponto-Sarmatic steppes, is dominant in 12 natural reserves and 8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii in three. More of half of areas present in natural reserves is covered by 62C0* Ponto-Sarmatic steppes that it is in Unfavourable - Bad (U2) conserved status.

For the 62 species was made the spatial map. The maps are necessary for the monitoring system of the conservation status and for the geographical position of species populations. An example is the map for *Silene compacta*, present in Figure 3, species represented by one population situated in Secaru Peak.

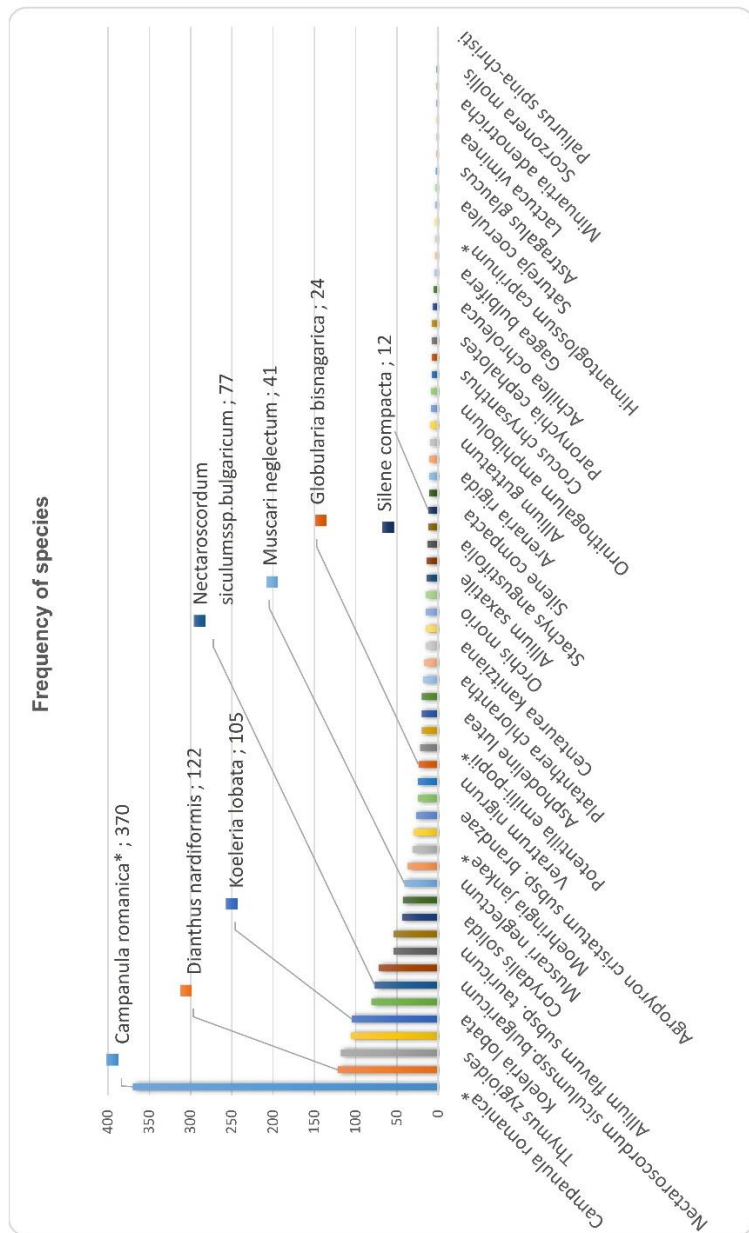


Figure 2. Frequency of the identified plant species in NDP
 Fig. 2. Frecvența speciilor de plante identificate în PND

Table 3. Typical species habitat

Tabel 3. Habitate tipice speciilor

No.	Species	Habitats
1	<i>Achillea clypeolata</i>	62C0* Ponto-Sarmatic steppes 8230 Siliceous rock with pioneer vegetation of the Sedo- Scleranthion or of the Sedo albi- Veronicion dillenii
2	<i>Achillea ochroleuca</i>	
3	<i>Allium guttatum</i>	
4	<i>Allium saxatile</i>	
5	<i>Arenaria rigida</i>	
6	<i>Celtis glabrata</i>	
7	<i>Ornithogalum amphibolum</i>	
8	<i>Piptatherum virescens</i>	
9	<i>Paliurus spina-christi</i>	
10	<i>Potentilla emilii-popii*</i>	
11	<i>Paronychia cephalotes</i>	
12	<i>Scorzonera mollis</i>	
13	<i>Silene compacta</i>	
14	<i>Thymus zygioides</i>	
15	<i>Agropyron cristatum</i>	62C0* Ponto-Sarmatic steppes
16	subsp. <i>brandzae</i>	
17	<i>Allium flavum</i> subsp. <i>tauricum</i>	
18	<i>Asphodeline lutea</i>	
19	<i>Astragalus corniculatus</i>	
20	<i>Astragalus glaucus</i>	
21	<i>Astragalus ponticus</i>	
22	<i>Asyneuma anthericoides</i>	
23	<i>Centaurea jankae</i>	
24	<i>Crocus chrysanthus</i>	
25	<i>Crocus flavus</i>	
26	<i>Echinops ruthenicus</i>	
27	<i>Echium russicum</i>	
28	<i>Festuca callieri</i>	
29	<i>Gagea bulbifera</i>	
30	<i>Gagea szovitsii</i>	
31	<i>Globularia bisnagarica</i>	
32	<i>Koelaria lobata</i>	
33	<i>Lathyrus pannonicus</i>	
34	<i>Ononis pusilla</i>	
35	<i>Orchis morio</i>	
36	<i>Paeonia tenuifolia</i>	
37	<i>Rumex tuberosus</i>	
38	<i>Salvia aethiopis</i>	
39	<i>Satureja coerulea</i>	
40	<i>Scutellaria orientalis</i>	
41	<i>Scutellaria orientalis</i>	
42	<i>Stachys angustifolia</i>	
	<i>Tanacetum millefolium</i>	

43	<i>Anacamptis pyramidalis</i>	62C0* Ponto-Sarmatic steppes 40C0 Ponto-Sarmatic deciduous thickets
44	<i>Fritillaria orientalis</i>	
45	<i>Himantoglossum hircinum</i>	
46	(<i>caprinum</i>)*	
47	<i>Iris aphylla</i> subsp. <i>hungarica</i>	
48	<i>Limodorum abortivum</i>	
49	<i>Ornithogalum sibthorpii</i>	
50	<i>Paeonia peregrina</i> <i>Rosa turcica</i>	
51	<i>Asparagus verticillatus</i>	8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii 40C0 Ponto-Sarmatic deciduous thickets
52	<i>Lactuca viminea</i>	
53	<i>Spiraea crenata</i>	
54	<i>Spiraea hypericifolia</i> (cultivated species)	
55	<i>Campanula romanica</i> *	8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii
56	<i>Centaurea kanitziana</i>	
57	<i>Dianthus nardiformis</i>	
58	<i>Galium verticillatum</i>	
59	<i>Gymnospermium altaicum</i>	
60	<i>Moehringia jankae</i> *	
61	<i>Pimpinella tragiium</i> subsp. <i>lithophila</i>	
61	<i>Sempervivum ruthenicum</i>	
62	<i>Cephalanthera rubra</i>	91X0 Dobrogean beech forests 91Y0 Dacian oak and hornbeam forests 40C0 Ponto-Sarmatic deciduous thickets
63	<i>Goniolimon collinum</i>	
64	<i>Lunaria annua</i> subsp. <i>pachyrhiza</i>	
65	<i>Minuartia adenotricha</i>	
66	<i>Myrrhoides nodosa</i>	
67	<i>Platanthera chlorantha</i>	
68	<i>Corydalis solida</i> subsp. <i>slivenensis</i>	91Y0 Dacian oak and hornbeam forests
69		
70	<i>Nectaroscordum siculum</i> subsp. <i>bulgaricum</i> <i>Veratrum nigrum</i>	
71	<i>Galanthus plicatus</i>	91X0 Dobrogean beech forests 91Y0 Dacian oak and hornbeam forests
72	<i>Mercurialis ovata</i>	
73	<i>Muscari neglectum</i>	
74	<i>Neottia nidus-avis</i>	



Figure 3. Spatial map of *Silene compacta*
 Fig. 3. Harta spațială pentru specia *Silene compacta*

Discussions

According to phyto-climatic units map (BOTTI, 2018), Romania, Ukraine and Bulgaria are part of 5H3c and 5H3d sub-humid units that means Romania from climatically point of view is not in semi-arid units typical of steppe (Figure 4). The assessment of plant list and vegetation studies elaborated by BRÂNDZĂ (1898), PETRESCU (2004, 2007) reveal that the Dobrogea area is part of steppic biome from the species composition point of view. Dobrogean vegetation list is very similar with the list of Russian steppe vegetation presented by BOONMAN and MIKHALEV (2005). Also, from a climatic point of view, Dobrogea belongs to a semi-arid climate, the multiannual precipitation falling in the range of 350-400 mm/ year. This discrepancy with the phyto-climatic map is explained by the fact that the surfaces covered with steppe vegetation and with a semi-arid climate are too small to be marked on the map whose resolution is too small to highlight these areas.

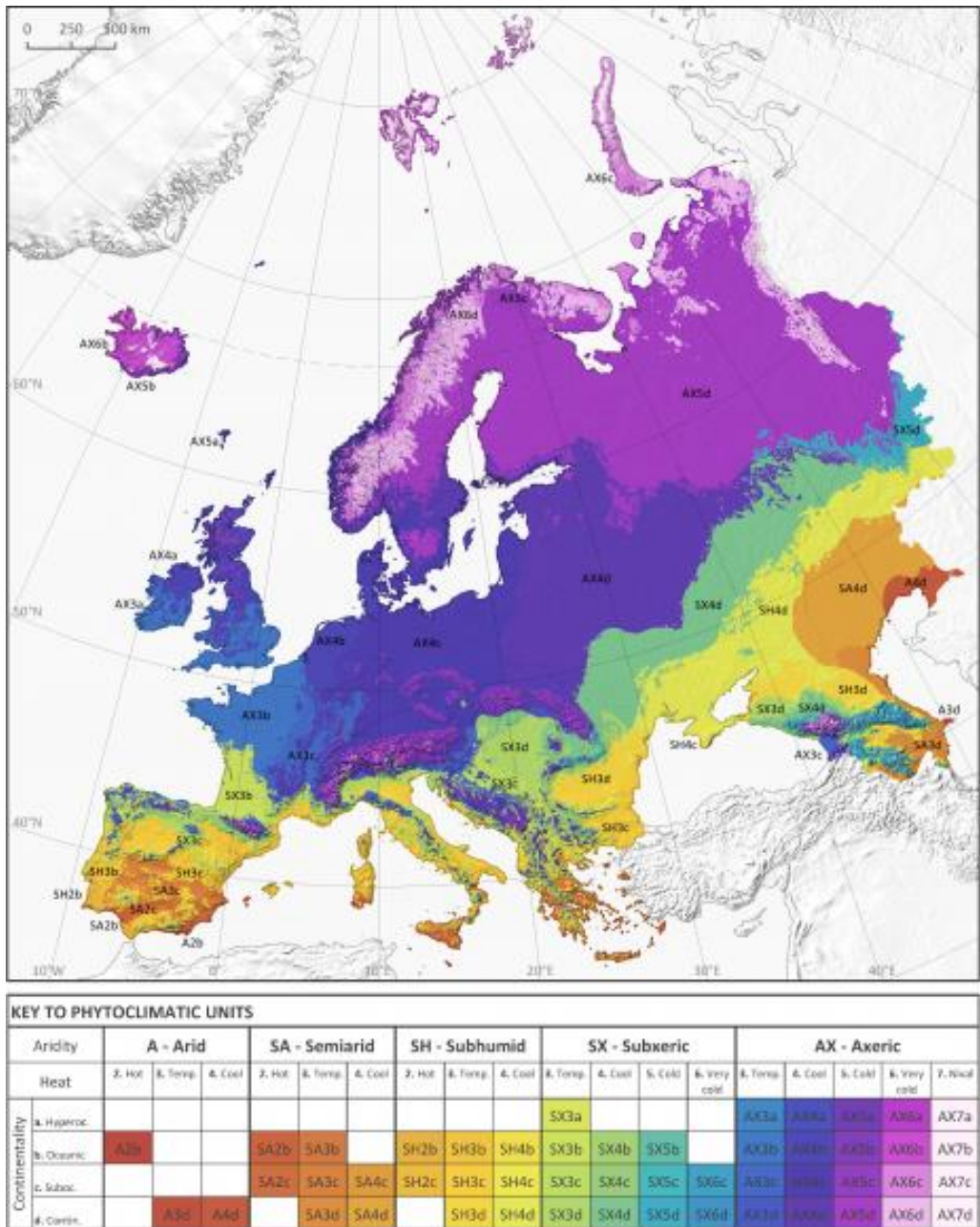


Figure 4. Phyto-climatic Units Map (after BOTTI, 2018)
 Fig. 4. Harta unităților fito-climatice (după BOTTI, 2018)

Conclusions

From the pedo-climatic and vegetation structure point of view, the NDP area is part of the Steppic biome. The surface of NDP (84,875 ha) is a very small area in comparison with phyto-climatic units, one of the reason why it could not be mapped. The re-evaluation of steppe vegetation was focused on 74 species for which has been declared the NDP protected area. More than 80% of the species were identified in the field, for them were made the distribution maps, were estimated also the population size. With the exception of two species (*Lunaria annua* and *Salvia aethiopsis*) the other species are represented by optimal populations and are in a favourable (FV) conservation status.

Although the surface area covered by 62C0* Ponto-Sarmatic steppes habitat in Favourable (FV) conservation status is reduced, it is sufficient to host the populations of steppe typical species like *Festuca callieri* and *Thymus zygoides*. Populations of this species are abundant and in favourable conservation status. The species of community interest *Himantoglossum caprinum (hircinum)* is represented here by small populations.

The habitat 8230 Sedo-Scleranthion of the Sedo albi-Veronicion dillenii present at large scale in reserves like Vârful Secaru is in Favourable (FV) conservation status and host three important species of community interest: *Campanula romanica*, *Moehringia jankae* and *Potentilla emilii-popii*. The populations of these three species are also in favourable conservation status.

The data and information collected will be included in the integrated management plan of the NDP protected areas. There will be elaborated a realistical monitoring system of the conservation status of habitats and species based on this data and information. In the management plan, will be established the conservation measures and will be estimated the costs for their implementation. In the Gantt chart of the management plan will be found the timing of these measures. One of most important measures is to reduce the impact of animal grazing.

The alternative solutions that could reduce the overgrazing, because overgrazing is the most important pressure on the vegetation, are:

- a) Reducing the number of sheep, goats, cows and horses;
- b) Improving the quality of the meadows by sowing with native species and fertilizing with manure for grasslands outside NDP;
- c) Keeping the animals in the stable during the winter;
- d) Elimination of invasive wood species from grasslands.

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Assessment of Phytodiversity and Productivity of Steppic Grasslands from ROSCI0201 Podișul Nord-Dobrogean

Evaluarea fitodiversității și productivității pajiștilor stepice din ROSCI0201 Podișul Nord-Dobrogean

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Abstract

The natural habitat of community interest 62C0 Ponto-Sarmatic steppes allows the preservation in ROSCI0201 Podișul Nord-Dobrogean protected area of several rare species in danger of becoming extinct due to anthropogenic pressures in particular. In order to recommend effective management measures for biodiversity conservation, it was necessary to investigate the past and current level of degradation of the herbaceous layer of these steppe grasslands and the main factors of anthropogenic impact. Prior to conducting field research activity in 2019, two reference works were studied regarding the phytocoenosis of the steppe grasslands from Babadag Plateau (1970) and Casimcei Plateau (1975) as an integral part of the Podișul Nord-Dobrogean protected area, the information being used to evaluate the productivity of the grasslands for that period. Generally speaking, the productivity of plant associations from Festucion rupicolae alliance is higher than that of plant associations from Pimpinello-Thymion zygioidi alliance and the grasslands of Babadag, closer to the Black Sea and the Danube Delta, are more valuable than those from Casimcei Plateau, located west of the sea shore in a drier climate. From the synthesis of the 152 surveys of 62C0* Ponto-Sarmatic steppes habitat, carried out in 2019, a list of 350 plant species was compiled, of which 44 species belong to Poaceae Family, 23 species belong to Fabaceae and 283 species to other families. Of these plants, 24 species are rare with protection status, eight are native expansive species and nine are alien plant species with different characteristics regarding their invasive potential. The pastoral value of the herbaceous layer is considered poor (23.5), the grass production is 2.72 t/ ha useful plant biomass which allows a rather low optimal stocking rate, of only 0.23 Livestock Unit (LU)/ ha for a 185-day grazing season. Compared to the average productivity of the grasslands of Babadag and Casimcea from 45-50 years ago, the pastoral value decreased by 0.15% per year, the production of useful grass and the stocking rate (optimal loading of livestock) by 0.5% per year, mainly due to the permanent overgrazing. The current stocking rate for pastures from the 20 localities of the studied area is 1.06 LU/ ha, exceeding 4.6 times the optimal load evaluated on the basis of floristic plot and 3.1 times the projected load recommended by the plans developed for grazing. For these reasons, in order to preserve biodiversity and landscapes, we propose to regulate grazing in*

terms of optimum stocking rate and grazing duration, as well as to expand the cultivation of forage plants in arable land.

Keywords: *steppe grasslands, phytodiversity, pastoral value, forage production, stocking rate*

Introduction

One of the first objectives taken into consideration when establishing a protected area is the conservation of biodiversity. The main factor influencing permanent grasslands is man and his livestock, respectively the anthropo-zoogenic factor.

Overgrazing or under stocking until abandonment of grazing are the main causes of degradation of grassland biodiversity in the temperate area. Establishing the right stocking rate is very important in order to maintain an optimal balance between grass production and the number of livestock per hectare in the grazing season (REDFEARN, BIDWELL, 2003).

To begin with, it is necessary to know the productivity (production and forage quality) of the herbaceous layer from the studied permanent grassland. The method of determining by mowing in protected premises and establishing the degree of grass consumption is the most accurate, but also the most difficult to implement, sometimes impossible. For this reason, a new method of evaluating the productivity of the grasslands based on floristic surveys has been used (MARUȘCA, 2019; MARUȘCA *et alii*, 2019).

By this simpler and easy to apply method, sufficiently accurate results can be obtained in order to assess the productivity of grassland, namely the pastoral value, the useful grass production on the basis of which the stocking rate expressed in livestock unit (LU) per hectare is calculated. This method can be applied for both older and more recent vegetation studies, in order to analyse the dynamics of the economic and productive potential.

Materials and Methods

In order to evaluate the productivity of the grasslands, two synthesis papers on the vegetation of the Babadag Plateau (DIHORU, DONIȚĂ, 1970) and Casimcei Plateau (HOREANU, 1974) as component parts of the Podișul Nord-Dobrogean (PND) were studied. The data was needed to evaluate the productivity dynamics for the last 45-50 years.

Between May-September 2019, the team that studied in the field the non-forest habitats in the PND, more specifically the natural habitat of community interest 62C0* Ponto-Sarmatic steppes, targeting the steppe grasslands, drew up 152 floristic surveys. The studies were carried out within the project "Integrated management of the Podișul Nord-Dobrogean (MIPoNoDo), SMIS code 116964". In order to investigate in more detail the current level of

degradation of the herbaceous layer, special attention was paid to the hollows on the ground due to the overgrazing and to the fixed or movable stones from the surface of the ground.

The appreciation of the participation (P) of the plant species in the grass layer was made directly in percentages according to the KLAPP-ELLENBERG method (MARUȘCA, 2019), in order to facilitate synthesis and subsequent calculations. Likewise, in order to evaluate the productivity of the grasslands, the species were organized into large economic groups: grasses, legumes and other families.

For each species the presence (K) was indicated as number and percentage of total surveys, participation (P) in percentages, forage value index (F) after KOVACS (1979), PĂCURAR, ROTAR (2014) and MARUȘCA (2016) and finally the useful green mass index (M) after MARUȘCA (2019).

After the floristic list has been drawn up with the component species of the herbaceous layer and their participation in the useful green mass, the next step is the application of some formulas for determining the pastoral value (PV), namely:

$$Pv = \sum P (\%) \times F/9$$

Where:

Pv = pastoral value indicator (0-100)

P = participation of species in the herbaceous layer (%)

F = foraging value index

Having available the synthetic tables with the participation (%) of the species it was possible to calculate the pastoral value based on the forage quality indices (F).

For the floristic survey using the percentage participation of the species, for each species we noted the forage quality index (F), which can have values ranging from 0 to 9, 0 for all plants without forage value or with indices 1 (toxic plants), 2 (plants that depreciate the quality of the products) and 3 (harmful to herbaceous layer), followed by the rest of the indices from 4 to 9, meaning the forage value:

Foraging value indices (F)

1 = toxic for livestock or humans;

2 = plants that depreciate the quality of the products;

3 = harmful to herbaceous layer;

4 = poor in forage value (ballast species);

- 5 = mediocre in forage value (former F1);
- 6 = average in forage value (former F2);
- 7 = good in forage value (former F3);
- 8 = very good in forage value (former F4);
- 9 = excellent in forage value (former F).

After determining the pastoral value indicator, by dividing by 9 the score obtained after multiplying $P \times F$, the quality of grassland is evaluated as follows:

- 0-5 – degraded grassland
- 5-15 – very poor
- 15-25 – poor
- 25-40 – mediocre
- 40-60 – average
- 60-80 – good
- 80-100 – very good.

As in the field there are some difficulties regarding the fencing and guarding of the test surfaces, a new method of indirect determination of the grass production is proposed. The method is based on the floristic surveys and production indices of the green mass for forage species (M) components of the herbaceous layer (Table 1).

The equation for determining the average index for forage green mass production (IM) of permanent grassland phytocoenosis:

$$IM = \frac{4 \times P(\%) \text{ind. } 4 + 5 \times P(\%) \text{ind. } 5 \dots \dots + 9 \times P(\%) \text{ind. } 9}{100}$$

Where: 4 ... 9 = indices (marks) of appreciation for forage species
 P(%) = species participation in the herbaceous layer
 ind. = individual (plant species)

Table 1. Production indices for forage species and estimation of useful production per hectare of unfertilized permanent grassland (MARUȘCA, 2019)

Tabel 1. Indici de producție pentru speciile de furaje și estimarea producției utile pe hectar a păștilor permanente nefertilizate (MARUȘCA, 2019)

Average indices of green mass production for forage species (M)	Transformation coefficients into green mass production (GM)	Green mass production estimate (GM) (t/ ha)	Production value appreciation
0,1-0,5 0,5-1,0	x 1,8 x 1,9	0,2-0,9 1,0-1,9	Very poor
1,0-1,5 1,5-2,0	x 2,0 x 2,1	2,0-3,0 3,2-4,2	Poor
2,0-2,5 2,5-3,0	x 2,2 x 2,3	4,4-5,5 5,8-6,9	Poor-Average
3,0-3,5 3,5-4,0	x 2,4 x 2,5	7,2-8,4 8,8-10,0	Average
4,0-4,5 4,5-5,0	x 2,6 x 2,7	10,4-11,7 12,2-13,5	Average-Good
5,0-5,5 5,5-6,0	x 2,8 x 2,9	14,0-15,4 16,0-17,4	Good
6,0-6,5 6,5-7,0	x 3,0 x 3,1	18,0-19,5 20,2-21,7	Good-V. good
7,0-7,5 7,5-8,0	x 3,2 x 3,3	22,4-24,0 24,8-26,4	Very good
8,0-8,5 8,5-9,0	x 3,4 x 3,5	27,2-28,9 29,8-31,5	Excellent

After calculating the IM for the plant association by multiplying with the coefficients given in Table 5, we can estimate the production of green mass usable by animals, in tonnes per hectare.

By this simple method of appreciating the production of green mass (grass) that can be used by animals based on the phytocoenosis floristic plot, an essential contribution is made to establishing the optimal grazing capacity for permanent grassland.

This model has been further improved by introducing transformation coefficients (1.8 to 3.5) which multiplied by production indices (M) gives us the useful grass production (GM t/ ha) (MARUȘCA, 2019).

The required green mass for livestock unit (LU) during the vegetation period is about 12 tonnes, which results from multiplying the feed for 65 kg/ LU with the optimal 185-day grazing season.

The optimum stocking rate (in hectares) is calculated by dividing the production per hectare of a permanent grassland (GM t/ ha) to the required 12 t/ LU/ season.

For the evaluation of the stocking rate of grassland during the grazing season, a new scale of assessment is proposed:

Value	Grassland evaluation
0,01-0,20	Degr. = degraded
0,21-0,40	Vp = very poor
0,41-0,60	P = poor
0,61-0,80	Med. = mediocre
0,80-1,20	Av. = average
1,20-1,60	G = good
1,61-2,00	Vg = very good
Over 2,00	Exc. = excellent

For the final evaluation we also used statistical data offered by the Directorate for Agriculture of Tulcea County. The data regarding the livestock and grassland areas was used to calculate the current stocking rate for the 20 localities included in the Podișul Nord-Dobrogean protected area.

The determination of plant species and habitat types and the evaluation of the initial productivity of the studied grasslands was done according to *** 1952-1976; PUȘCARU-SOROCEANU *et alii*, 1963; ANGHEL *et alii*, 1971; HOREANU, 1974, 1975; ȚUCRA *et alii*, 1987; CRISTEA *et alii*, 2004; SÂRBU *et alii*, 2004; DONIȚĂ *et alii*, 2005; CIOCÂRLAN, 2009; SAMFIRA *et alii*, 2011; SÂRBU *et alii*, 2013.

Results and Discussions

Before beginning the field observations, in 2019, on the vegetation of the steppe grasslands of the Podișul Nord-Dobrogean, were assessed the productivity of the associations belonging to the *Festucion rupicolae* and *Pimpinello-Thymion zygoidi* alliances from the Babadag Plateau and Casimcea Plateau. The evaluation was based on the data gathered from the literature.

Thus, the evaluation of the productivity of the steppe grasslands in the Babadag Plateau highlighted a pastoral value of 32 (mediocre), a forage production of 4.47 t/ ha (poor) and a stocking rate of 0.37 LU/ ha (very poor). (Table 2).

Table 2. Productivity evaluation of steppe grasslands in the Babadag Plateau (after DIHORU & DONIȚĂ, 1970)

Tabel 2. Evaluarea productivității pajiștilor stepice din Podișul Babadag (după DIHORU, DONIȚĂ, 1970)

Phytocoenosis	Pastoral value (PV)	Forage production (GM t/ ha)	Optimal loading (LU/ ha)
Al. <i>Festucion rupicola</i>	33,0	4,97	0,41
<i>As. Stipo (ucrainicae)-Festucetum valesiaca</i>	33	4,42	0,37
<i>As. Crysopogonetum grylli dobrogicum</i>	15	2,08	0,17
<i>As. Medicagini-Festucetum valesiaca</i>	55	8,80	0,75
<i>As. Cynodonti-Poëtum angustifoliae</i>	45	12,91	1,08
<i>As. Elytrigetum intermediae</i>	45	9,35	0,78
<i>As. Trigonello (gladiatae)-Orlayetum</i>	14	1,20	0,10
<i>As. Bombicilaeno-Botriochloetum ischaemi</i>	8	0,68	0,06
<i>As. Poëtum bulbosae</i>	42	1,62	0,14
<i>As. Artemisietum austriaca</i>	25	1,77	0,15
<i>As. Agropyretum pectiniformae</i>	48	6,88	0,57
Al. <i>Pimpinello-Thymion</i>	28,3	2,78	0,23
<i>As. Agropyro-Thymetum zygoidi</i>	29	2,76	0,23
<i>As. Koelerio-Artemisietum lerchiana</i>	28	1,14	0,10
<i>As. Festucetum callierii</i>	28	4,44	0,37
Average value for phytocoenosis	31,9	4,47	0,37

There are very big differences between plant associations in terms of productivity, as suggested by the indicators used. *Cynodonti-Poëtum angustifoliae* association and *Elytrigetum intermediae* association are considered the most valuable while *Bombicilaeno-Botriochloetum ischaemi* association, *Trigonello (gladiatae)-Orlayetum* association and *Koelerio-Artemisietum lerchiana* association have the lowest value.

Generally speaking, *Festucion rupicola* alliance is more valuable than *Pimpinello-Thymion zygoidi* alliance in terms of productivity.

In the Casimcei Plateau, grassland productivity is lower than in the Babadag Plateau, due to the distance from the sea who generates climatic conditions with lower humidity (Table 3).

Table 3. Productivity evaluation of the steppe grasslands in the Casimcea Plateau (after HOREANU, 1974)

Tabel 3. Evaluarea productivității pajiștilor stepice din Podișul Casimcei (după HOREANU, 1974)

Phytocoenosis	Pastoral value (PV)	Forage production (GM t/ha)	Optimal loading (LU/ha)
Al. <i>Festucion rupicolae</i>	20,8	3,00	0,25
<i>As. Festucetum valesiacaе dobrogicum</i>	27	2,96	0,25
<i>As. Stipetum capillatae dobrogicum</i>	15	1,50	0,13
<i>As. Chrysopogonetum gryllii dobrogicum</i>	29	9,80	0,82
<i>As. Chrysanthemetum millefoliati</i>	11	1,06	0,09
<i>As. Agropyretum pectiniformae</i>	48	4,34	0,36
<i>As. Botriochloetum ischaemi dobrogicum</i>	15	1,35	0,11
<i>As. Artemisio (austriacaе) Poëtum (bulbosae) dobrogicum</i>	16	0,88	0,07
<i>As. Elytrigetum intermediae</i>	37	11,52	0,96
<i>As. Xero-Calamgrostetum epigei</i>	7	1,04	0,09
<i>As. Ceratocarpetum arenarii</i>	5	0,36	0,03
<i>As. Elymetum asperi</i>	18	1,54	0,13
Al. <i>Pimpinello-Thymion zygioidi</i>	13,3	1,00	0,08
<i>As. Koelerio (degeni)-Thymetum (zygioidis)</i>	18	1,39	0,12
<i>As. Sclerantho-Festucetum callieri</i>	20	1,46	0,12
<i>As. Sedo (hillebrandtii)-Polytrichetum (piliferi)</i>	2	0,14	0,01
Average value for phytocoenosis	19,2	2,62	0,22

The most valuable associations in terms of productivity are *Elytrigetum intermediae* and *Chrysopogonetum gryllii dobrogicum* and the lowest are those from Al. *Pimpinello-Thymion zygioidi* located on rocky grounds.

On average, the associations from Al. *Festucion rupicolae* have a pastoral value of 21, a useful forage production of 3 t/ ha, which allows an optimum loading of 0.25 UVM/ ha, for 185 days grazing period.

152 floristic surveys were made in several trips on the field, between May and September 2019 in the Podișul Nord-Dobrogean area (Figure 1). The

results of field observations on the steppe grassland vegetation are presented in Table 4.

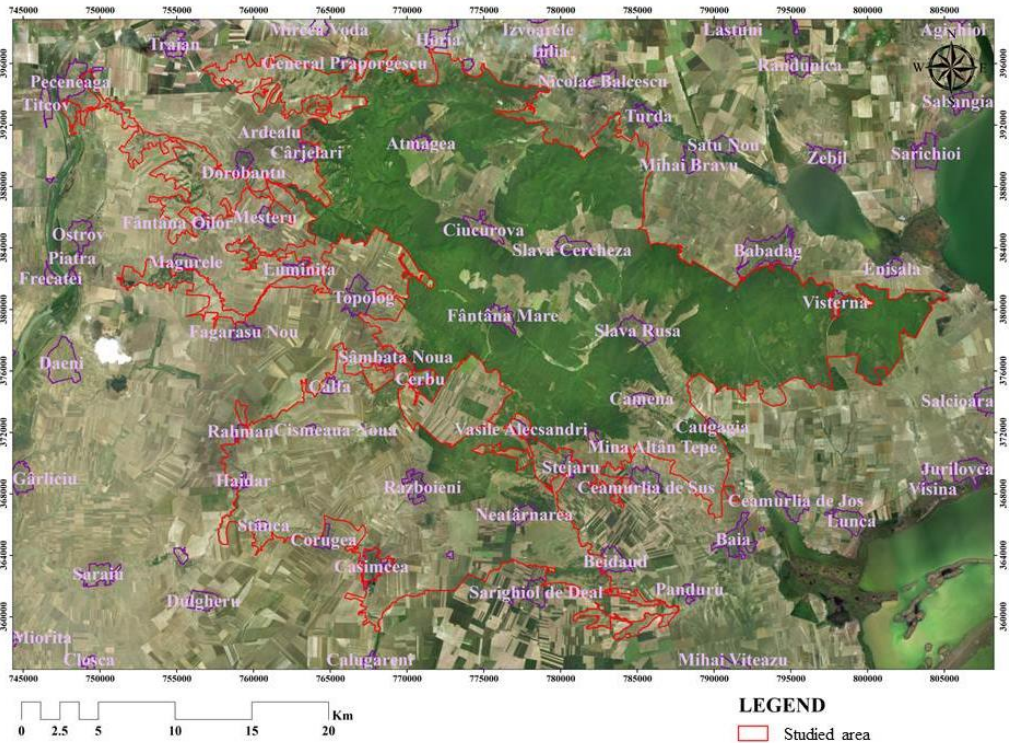


Figure 1. Studied area in ROSCI0201 Podișul Nord-Dobrogean
 Fig. 1. Zona studiată în ROSCI0201 Podișul Nord-Dobrogean

From the very beginning there can be noticed a very low average degree of coverage-participation of grassy vegetation, of only 81%, with soil hollows of 14.1% and mobile stones or rocks on 4.9% of the surface.

Following the 152 surveys performed, there were found 350 species, 57 subspecies, 202 genera and 57 families: (AMA = 2 species, ANA 1, API 14, ARI 1, ASC 3, AST 64, BET 1, BOR 8, BRA 14, CAE 1, CAM 2, CAP 2, CAR 16, CHE 4, CON 3, COR 1, CRA 3, CYP 2, DIP 4, ELA 1, EUP 7, FAB 23, FAG 1, GEN 1, GER 2, HYP 2, IRI 2, JUN 1, LAM 27, LIL 4, LIN 1, MAL 3, MOR 2, OLE 2, ORC 1, PAE 1, PLA 2, POA 44, POL 3, POR 1, PRI 1, RAN 7, RES 1, RHA 1, ROS 21, RUB 9, RUT 1, SCR 12, SM 1, SOL 1, TIL 1, ULM 1, URT 1, VAL 1, VER 1, VIO 3, ZYG 2 species), demonstrating exceptional phytodiversity on a fairly small surface.

Table 4. Synthesis of floristic surveys for 62C0* Ponto-Sarmatic steppes natural habitat from ROSC10201 Podișul Nord-Dobrogean, average productivity and optimal stocking rate for May-September 2019

Tabel 4. Sinteza releveelor floristice pentru habitatul 62C0* Stepe Ponto-Sarmatice din ROSC10201 Podișul Nord-Dobrogean, productivitatea medie și încărcarea optimă cu animale la pășunat pentru perioada mai-septembrie 2019

SPECIES	Presence (K) in 152 plots		Average participation (P) in habitat	Value index	
	nr.	%	%	F**	M***
1	2	3	4	5	6
VEGETATION COVER	x	81,0	x	x	x
TOTAL HOLLOW	x	19,0	x	x	x
From wich: soil	x	14,1	x	x	x
stones	x	4,9	x	x	x
Poaceae (P %)			61,1		
<i>Festuca valesiaca</i>	142	93,4	25,19	5	3
<i>Bothriochloa ischaemum</i>	133	87,5	20,26	3	0
<i>Stipa capillata</i>	48	31,6	2,98	3	0
<i>Cynodon dactylon</i>	41	27,0	2,62	6	2
<i>Chrysopogon gryllus</i>	31	20,4	3,75	4	7
<i>Poa bulbosa</i>	31	20,4	0,90	6	1
<i>Melica ciliata</i> subsp. <i>ciliata</i>	16	10,5	0,03	4	2
<i>Bromus tectorum</i>	15	9,9	0,39	5	2
<i>Dactylis glomerata</i> subsp. <i>glomerata</i>	15	9,9	0,03	9	8
<i>Poa angustifolia</i>	15	9,9	0,57	7	5
<i>Elymus repens</i>	14	9,2	1,19	3	0
<i>Koeleria splendens</i>	12	7,9	0,19	5	3
<i>Agropyron cristatum</i> subsp. <i>pectinatum</i>	11	7,2	0,38	7	5
<i>Setaria pumila</i>	9	5,9	0,02	4	1
<i>Bromus squarrosus</i>	8	5,3	0,02	3	0
<i>Bromus riparius</i>	8	5,3	0,03	3	0
<i>Agrostis stolonifera</i> subsp. <i>stolonifera</i>	7	4,6	0,02	7	6
<i>Festuca callieri</i> *	7	0,5	0,89	5	2
<i>Taeniatherum caput-medusae</i>	7	4,6	0,69	3	0
<i>Bromus hordeaceus</i>	6	3,9	0,11	5	5
<i>Bromus inermis</i>	6	3,9	0,01	8	8
<i>Calamagrostis epigeios</i>	6	3,0	0,01	3	0
<i>Brachypodium sylvaticum</i>	4	2,6	0,01	5	7
<i>Hordeum murinum</i> subsp. <i>murinum</i>	4	2,6	0,05	5	3
<i>Elymus hispidus</i> subsp. <i>hispidus</i>	4	2,6	0,01	3	0
<i>Lolium perenne</i>	4	2,6	0,01	9	8
<i>Piptatherum virescens</i>	4	2,6	0,01	3	0
<i>Phleum phleoides</i>	4	2,6	0,01	6	4
<i>Phleum pratense</i>	4	2,6	0,01	9	8

1	2	3	4	5	6
<i>Stipa ucrainica</i>	4	2,6	0,28	3	0
<i>Apera spica-venti</i> subsp. <i>spica-venti</i>	3	2,0	0,01	5	6
<i>Sorghum halepense</i>	3	2,0	0,01	3	0
<i>Tragus racemosus</i>	3	2,0	0,01	3	0
<i>Digitaria ischaemum</i>	2	1,3	0,01	3	0
<i>Agropyron ponticum</i>	1	0,7	0,01	3	0
<i>Aegilops cylindrica</i>	1	0,7	0,01	5	3
<i>Alopecurus pratensis</i>	1	0,7	0,01	8	7
<i>Brachypodium pinnatum</i>	1	0,7	0,01	5	7
<i>Cleistogenes serotina</i>	1	0,7	0,01	3	0
<i>Festuca pratensis</i>	1	0,7	0,01	9	8
<i>Koeleria lobata</i> *	1	0,7	0,23	5	3
<i>Setaria viridis</i>	1	0,7	0,01	4	4
<i>Stipa tirsia</i>	1	0,7	0,08	3	0
Fabaceae (P%)			0,7		
<i>Medicago falcata</i>	24	15,8	0,15	7	6
<i>Lotus corniculatus</i>	16	10,5	0,10	8	6
<i>Trifolium arvense</i>	10	6,6	0,04	4	2
<i>Coronilla varia</i>	9	5,9	0,03	1	0
<i>Astragalus onobrychis</i>	7	4,6	0,11	5	4
<i>Medicago lupulina</i>	5	3,3	0,02	8	3
<i>Onobrychis viciifolia</i>	5	3,3	0,04	8	8
<i>Trifolium campestre</i>	5	3,3	0,04	7	2
<i>Lathyrus tuberosus</i>	5	3,3	0,01	3	0
<i>Astragalus glaucus</i> *	3	2,0	0,07	5	4
<i>Lathyrus pratensis</i>	2	1,3	0,01	7	6
<i>Medicago minima</i>	2	1,3	0,02	7	1
<i>Astragalus glycyphyllos</i>	1	0,7	0,01	5	6
<i>Astragalus cicer</i>	1	0,7	0,01	5	4
<i>Coronilla scorpioides</i>	1	0,7	0,01	1	0
<i>Lathyrus sphaericus</i>	1	0,7	0,01	6	1
<i>Melilotus officinalis</i>	1	0,7	0,01	6	7
<i>Trifolium alpestre</i>	1	0,7	0,01	6	3
<i>Trifolium diffusum</i>	1	0,7	0,01	3	0
<i>Trifolium scabrum</i>	1	0,7	0,01	6	4
<i>Vicia cracca</i>	1	0,7	0,01	7	6
<i>Vicia villosa</i>	1	0,7	0,01	6	6
Other families (P%)			19,2		
<i>Achillea coarctata</i>	31	20,4	0,35	6	3
<i>Achillea collina</i>	3	2,0	0,01	6	5
<i>Achillea leptophylla</i>	6	3,9	0,01	3	0
<i>Achillea nobilis</i> subsp. <i>neilreichii</i>	6	3,9	0,01	3	0
<i>Achillea pannonica</i>	27	17,8	0,57	6	5
<i>Achillea setacea</i>	11	7,2	0,08	6	3
<i>Acinus arvensis</i> subsp. <i>arvensis</i>	6	3,9	0,01	3	0
<i>Adonis vernalis</i>	14	9,2	0,14	1	0

1	2	3	4	5	6
<i>Agrimonia eupatoria</i> subsp. <i>eupatoria</i>	26	17,1	0,08	3	0
<i>Ailanthus altissima</i>	5	3,3	0,04	3	0
<i>Ajuga chamaepytis</i> subsp. <i>chamaepytis</i>	8	5,3	0,05	3	0
<i>Ajuga laxmannii</i>	5	3,3	0,01	4	2
<i>Allium flavum</i> subsp. <i>flavum</i>	13	8,6	0,02	2	0
<i>Allium rotundum</i> subsp. <i>rotundum</i>	11	7,2	0,02	2	0
<i>Allium paniculatum</i>	3	2,0	0,01	2	0
<i>Althaea cannabina</i> subsp. <i>cannabina</i>	3	2,0	0,01	3	0
<i>Alyssum alyssoides</i>	8	5,3	0,03	3	0
<i>Alyssum hirsutum</i>	5	3,3	0,01	3	0
<i>Amaranthus albus</i>	4	2,6	0,01	3	0
<i>Anthemis ruthenica</i>	10	6,6	0,02	3	0
<i>Anthemis tinctoria</i> subsp. <i>tinctoria</i>	3	2,0	0,01	3	0
<i>Arabis turrita</i>	3	2,0	0,01	3	0
<i>Artemisia austriaca</i>	87	57,2	3,30	2	0
<i>Artemisia absinthium</i>	4	2,6	0,01	2	0
<i>Asparagus tenuifolius</i>	4	2,6	0,01	3	0
<i>Asparagus verticillatus</i> *	6	3,9	0,01	3	0
<i>Asperula cynanchica</i>	19	12,5	0,13	3	0
<i>Asperula tenella</i>	17	11,2	0,03	3	0
<i>Atriplex littoralis</i>	3	2,0	0,01	3	0
<i>Ballota nigra</i> subsp. <i>nigra</i>	7	4,6	0,01	3	0
<i>Berteroa incana</i>	11	7,2	0,04	3	0
<i>Lithospermum purpureocaeruleum</i>	3	2,0	0,01	3	0
<i>Bupleurum falcatum</i> subsp. <i>falcatum</i>	3	2,0	0,01	3	0
<i>Carduus acanthoides</i>	9	5,9	0,02	2	0
<i>Carduus nutans</i>	8	5,3	0,03	2	0
<i>Carduus thoermeri</i>	19	12,5	0,04	2	0
<i>Carex humilis</i>	3	2,0	0,03	4	1
<i>Carlina biebersteinii</i> subsp. <i>brevibracteata</i>	4	2,6	0,01	3	0
<i>Carthamus lanatus</i>	7	4,6	0,02	3	0
<i>Carpinus orientalis</i> juv.	4	2,6	0,04	3	0
<i>Centaurea biebersteinii</i>	10	6,8	0,01	3	0
<i>Centaurea diffusa</i>	32	21,1	0,15	4	4
<i>Centaurea rutifolia</i> subsp. <i>jurineifolia</i>	5	9,3	0,01	3	0
<i>Centaurea solstitialis</i>	4	2,6	0,01	2	0
<i>Centaurea gracilentia</i> *	11	7,2	0,02	3	0
<i>Cephalaria transylvanica</i>	6	3,9	0,01	3	0
<i>Chenopodium album</i>	3	2,0	0,01	3	0
<i>Chondrilla juncea</i>	66	43,4	0,30	3	0
<i>Cichorium intybus</i>	36	23,7	0,15	5	6
<i>Cirsium arvense</i>	3	2,0	0,01	3	0
<i>Cirsium vulgare</i>	4	2,6	0,01	3	0
<i>Consolida regalis</i> subsp. <i>regalis</i>	10	6,8	0,03	3	0

1	2	3	4	5	6
<i>Convolvulus arvensis</i>	19	12,5	0,07	7	6
<i>Convolvulus cantabricus</i>	14	9,2	0,32	3	0
<i>Convolvulus lineatus</i>	3	3,3	0,01	3	0
<i>Cotinus coggygria</i> juv.	5	3,3	0,01	3	0
<i>Crataegus monogyna</i> subsp. <i>monogyna</i> juv.	42	27,6	0,89	3	0
<i>Crepis foetida</i> subsp. <i>rheoadifolia</i>	8	5,3	0,02	3	0
<i>Cruciata pedemontana</i>	5	3,3	0,09	3	0
<i>Daucus carota</i> subsp. <i>carota</i>	18	11,8	0,10	6	5
<i>Dianthus nardiformis</i> *	20	13,2	0,43	3	0
<i>Dianthus giganteus</i> subsp. <i>giganteus</i>	7	4,6	0,01	3	0
<i>Digitalis lanata</i>	10	6,6	0,02	3	0
<i>Echinops ritro</i> subsp. <i>ruthenicus</i> *	8	5,3	0,04	3	0
<i>Echium italicum</i>	7	4,6	0,02	3	0
<i>Echium vulgare</i>	11	7,2	0,03	4	3
<i>Elaeagnus angustifolia</i>	3	2,0	0,01	3	0
<i>Erodium cicutarium</i>	11	7,2	0,05	3	0
<i>Erigeron annuus</i> subsp. <i>annuus</i>	3	2,0	0,01	3	0
<i>Conyza canadensis</i>	3	2,0	0,01	3	0
<i>Eryngium campestre</i>	101	66,4	0,84	3	0
<i>Erysimum diffusum</i>	6	3,9	0,01	3	0
<i>Erysimum cuspidatum</i>	6	3,9	0,01	3	0
<i>Euphorbia agraria</i>	3	2,0	0,01	1	0
<i>Euphorbia glareosa</i> subsp. <i>dobrogensis</i>	3	2,0	0,01	1	0
<i>Euphorbia glareosa</i> subsp. <i>glareosa</i>	3	2,0	0,08	1	0
<i>Euphorbia seguieriana</i>	22	14,5	0,97	1	0
<i>Euphorbia virgata</i> subsp. <i>virgata</i>	3	2,0	0,01	1	0
<i>Filipendula vulgaris</i>	8	5,3	0,01	5	4
<i>Fragaria viridis</i> subsp. <i>viridis</i>	21	13,8	0,18	4	1
<i>Fraxinus ornus</i> juv.	4	2,6	0,01	3	0
<i>Galium humifusum</i>	39	25,7	0,20	5	2
<i>Galium octonarium</i>	5	3,3	0,01	3	0
<i>Galium verum</i>	19	12,5	0,05	5	4
<i>Geranium sanguineum</i>	4	2,6	0,01	3	0
<i>Haplophyllum suaveolens</i>	3	2,0	0,02	3	0
<i>Heliotropium europaeum</i>	3	2,0	0,01	3	0
<i>Herniaria glabra</i>	16	10,5	0,15	3	0
<i>Hieracium bauhini</i>	9	5,9	0,03	3	0
<i>Hieracium pilosella</i>	6	3,9	0,05	4	1
<i>Hypericum elegans</i>	11	7,2	0,02	3	0
<i>Hypericum perforatum</i>	8	5,3	0,02	1	0
<i>Inula hirta</i>	7	4,6	0,01	3	0
<i>Inula oculus-christi</i>	10	6,06	0,12	3	0
<i>Juncus inflexus</i>	4	2,6	0,01	3	0
<i>Linaria genistifolia</i>	14	9,2	0,02	3	0

1	2	3	4	5	6
<i>Linaria vulgaris</i>	5	3,3	0,01	3	0
<i>Linum austriacum</i>	3	2,0	0,01	3	0
<i>Lychnis coronaria</i>	5	3,3	0,01	3	0
<i>Marrubium peregrinum</i>	27	17,8	0,35	3	0
<i>Nigella arvensis</i>	4	2,6	0,01	3	0
<i>Odontites serotina</i>	4	2,6	0,01	3	0
<i>Onosma visianii</i>	3	2,0	0,01	3	0
<i>Origanum vulgare</i>	7	4,6	0,01	4	4
<i>Orlaya grandiflora</i>	6	3,9	0,01	3	0
<i>Paeonia peregrina*</i>	9	5,9	0,01	3	0
<i>Phlomis tuberosa</i>	3	2,0	0,01	3	0
<i>Pimpinella tragium</i> subsp. <i>lithophila*</i>	4	2,6	0,06	3	0
<i>Plantago argentea</i>	5	3,3	0,03	5	2
<i>Plantago lanceolata</i>	35	23,0	0,41	6	1
<i>Portulaca oleracea</i>	3	2,0	0,01	3	0
<i>Potentilla argentea</i> subsp. <i>argentea</i>	49	32,2	0,47	4	2
<i>Potentilla pedata</i>	10	6,6	0,04	4	2
<i>Potentilla recta</i> subsp. <i>recta</i>	7	4,6	0,08	3	0
<i>Prunus cerasifera</i> juv.	3	2,0	0,01	3	0
<i>Prunus spinosa</i> subsp. <i>spinosa</i> juv.	4	2,6	0,01	3	0
<i>Prunella vulgaris</i>	3	2,0	0,01	4	2
<i>Pyrus pyraeaster</i> juv.	8	5,3	0,02	3	0
<i>Reseda lutea</i>	7	4,6	0,03	3	0
<i>Rosa canina</i> sensu lato	9	5,9	0,02	3	0
<i>Rosa gallica</i>	5	3,3	0,01	3	0
<i>Rosa pimpinellifolia</i>	7	4,6	0,01	3	0
<i>Rubus caesius</i>	5	3,3	0,05	3	0
<i>Rumex acetosa</i>	4	2,6	0,01	4	5
<i>Salvia nemorosa</i> subsp. <i>nemorosa</i>	5	3,3	0,01	3	0
<i>Salvia nutans</i>	4	2,6	0,03	4	2
<i>Salvia verticillata</i>	5	3,3	0,01	3	0
<i>Sambucus ebulus</i>	7	4,6	0,01	3	0
<i>Sanguisorba minor</i>	40	26,3	0,33	3	0
<i>Scabiosa ochroleuca</i>	6	3,9	0,03	4	4
<i>Scabiosa argentea</i>	5	3,3	0,01	3	0
<i>Scleranthus annuus</i> subsp. <i>annuus</i>	8	5,3	0,02	3	0
<i>Scleranthus perennis</i> subsp. <i>perennis</i>	7	4,6	0,04	3	0
<i>Sedum urvillei</i> subsp. <i>hillebrandtii</i>	18	11,8	0,34	3	0
<i>Seseli tortuosum</i>	5	3,3	0,01	3	0
<i>Stachys angustifolia*</i>	6	3,9	0,04	3	0
<i>Stachys recta</i>	9	5,9	0,02	3	0
<i>Stachys germanica</i>	6	3,9	0,01	3	0
<i>Tanacetum millefolium*</i>	3	2,0	0,01	3	0
<i>Taraxacum serotinum</i>	27	17,8	0,10	5	2
<i>Teucrium chamaedrys</i>	58	38,2	0,88	3	0
<i>Teucrium polium</i> subsp. <i>capitatum</i>	71	46,7	0,62	3	0

1	2	3	4	5	6
<i>Thalictrum minus</i> subsp. <i>minus</i>	6	3,9	0,01	3	0
<i>Thymus pannonicus</i> subsp. <i>pannonicus</i>	80	52,6	1,94	4	2
<i>Thymus zygioides</i> *	26	17,1	0,67	4	1
<i>Torilis arvensis</i> subsp. <i>arvensis</i>	6	3,9	0,01	3	0
<i>Urtica dioica</i> subsp. <i>dioica</i>	6	3,3	0,01	5	7
<i>Verbascum banaticum</i>	21	13,8	0,04	3	0
<i>Verbascum phlomooides</i>	12	7,9	0,04	1	0
<i>Verbascum speciosum</i>	10	6,6	0,02	3	0
<i>Verbascum thapsus</i>	3	2,0	0,01	3	0
<i>Veronica austriaca</i> subsp. <i>austriaca</i>	3	2,0	0,01	3	0
<i>Vinca herbacea</i>	5	3,3	0,01	3	0
<i>Vincetoxicum hirundinaria</i> subsp. <i>hirundinaria</i>	8	5,3	0,02	3	0
<i>Xanthium spinosum</i>	14	9,2	0,03	3	0
<i>Xanthium strumarium</i>	4	2,6	0,01	2	0
<i>Xeranthemum annuum</i>	26	17,1	0,10	3	0

Species present in two plots, (1,3% presence, 0,01% participation on average, generally with indexes 1 – toxic plants, 2 – plants that depreciates the quality of the products, 3 – harmful to herbaceous layer, all of them without foraging value): *Adonis flammea*, *Ajuga salicifolia*, *Allium saxatile**, *Alyssum desertorum*, *Amaranthus retroflexus*, *Anagallis arvensis*, *Anchusa azurea*, *Anthericum ramosum*, *Aster linosyris*, *Calamintha einseleana*, *Campanula romanica**, *Centaurea scabiosa* subsp. *scabiosa*, *Chenopodium schraderianum*, *Clematis vitalba*, *Clinopodium vulgare*, *Cornus mas* juv., *Cynanchum acutum*, *Delphinium fissum*, *Diplotaxis muralis*, *Euphorbia cyparissias*, *Falcaria sioides*, *Galium dasypodum*, *Galium rubioides*, *Gypsophila glomerata*, *Gleditsia triacanthos* juv., *Helichrysum arenarium* subsp. *arenarium*, *Herniaria hirsuta*, *Inula germanica*, *Iris suaveolens*, *Marrubium vulgare*, *Matricaria chamomilla*, *Onopordum acanthium*, *Polygonum aviculare*, *Quercus pubescens* juv., *Salvia aethiopis**, *Sanguisorba officinalis*, *Sambucus nigra*, *Satureja coerulea**, *Sempervivum ruthenicum**, *Sideritis montana* subsp. *montana*, *Silene compacta**, *Sinapis arvensis*, *Stachys annua*, *Tanacetum corymbosum*, *Tragopogon dubius*, *Tribulus terrestris*. *Valerianella locusta*, *Veronica spicata*, *Viola tricolor*.

Species in just one plot (0,7% presence, "+" participation, in general with index 1 – toxic plants, 2 – plants that depreciates the quality of the products, 3 – harmful to herbaceous layer, all of them without foraging value): *Achillea clypeolata**, *Allium flavescens*, *Allium fuscum* subsp. *fuscum*, *Allium flavum* subsp. *tauricum**, *Allium guttatum**, *Alyssum caliacrae*, *Alyssum strigosum*, *Alyssum saxatile*, *Althaea pallida*, *Anthemis arvensis*, *Anthriscus sylvestris*, *Aristolochia clematitis*, *Artemisia annua*, *Artemisia pontica*, *Aster oleifolius*, *Campanula bononiensis*, *Carex halleriana*, *Centaurea gracilentia*, *Centaurea orientalis*, *Centaureum erythraea* subsp. *erythraea*, *Cerastium brachypetalum*, *Crepis sancta*, *Daucus broteri*, *Daucus guttatus* subsp. *zahariadii*, *Datura stramonium*, *Dianthus membranaceus*, *Dianthus pseudarmeria*, *Dianthus pallens*, *Echinops sphaerocephalus*, *Fagopyrum convolvulus*, *Galium flavescens*, *Glechoma hirsuta*, *Hieracium echinoides*, *Inula britannica*, *Inula ensifolia*, *Iris variegata*, *Jurinea dobrogensis*, *Lappula squarrosa*, *Lactuca serriola*, *Lathyrus collinus*, *Lavatera thuringiaca*, *Leontodon asper*, *Leontodon hispidus*, *Ligustrum vulgare*, *Lycopsis arvensis*, *Mercurialis perennis*, *Morus alba* juv., *Morus nigra* juv., *Muscari tenuiflorum*,

<i>Nectaroscordum siculum</i> subsp. <i>bulgaricum</i> *, <i>Onopordum tauricum</i> , <i>Orchis morio</i> , <i>Paliurus spina-christi</i> *, <i>Hieracium pilosella</i> , <i>Polygonatum odoratum</i> , <i>Potentilla heptaphylla</i> , <i>Prunus tenella</i> , <i>Pyrus elaeagrifolia</i> juv., <i>Rapistum perenne</i> , <i>Rorippa sylvestris</i> , <i>Rubus canescens</i> , <i>Salsola kali</i> subsp. <i>ruthenica</i> , <i>Scrophularia nodosa</i> , <i>Scorzonera austriaca</i> , <i>Sedum maximum</i> , <i>Senecio vernalis</i> , <i>Seseli annuum</i> , <i>Seseli pallasii</i> , <i>Silene alba</i> subsp. <i>latifolia</i> , <i>Silene dichotoma</i> subsp. <i>dichotoma</i> , <i>Silene otites</i> subsp. <i>otites</i> , <i>Sorbus torminalis</i> , <i>Tilia tomentosa</i> juv., <i>Tordylium maximum</i> , <i>Ulmus minor</i> juv., <i>Verbena officinalis</i> , <i>Veronica paniculata</i> , <i>Viola hirta</i> , <i>Viola jordani</i> .	
Pastoral value (PV)	23,50
Quality index	Poor
Useful green mass average index (M)	1,36
Useful green mass (GM t/ ha)	2,72
Optimum stocking rate for 185 days grazing period (LU/ha)	0,23

*) - rare, protected species

F** - foraging value index

M*** - useful green mass index

The Poaceae Family includes 44 species, Fabaceae Family 23 species and other families 283 species. We identified 24 protected plant species plants, marked with an asterisk in the synthetic habitat survey.

Due to overgrazing and other causes according to the present legislation (***) 2019), eight species of native expansive plants are mentioned in the PND: *Botriochloa ischaemum*, *Calamagrostis epigeios*, *Asperula cynanchica*, *Carduus nutans*, *Cirsium vulgare*, *Crataegus monogyna*, *Eryngium campestre* and *Prunus spinosa*.

There are also nine species of adventitious and invasive plants for the flora of Romania (SÎRBU, OPREA, 2011): *Ailanthus altissima*, *Amaranthus retroflexus*, *Eleagnus angustifolia*, *Datura stramonium*, *Morus alba*, *Morus nigra*, *Prunus cerasifera*, *Sorghum halepense* and *Xanthium spinosum*.

Another important aspect from an economic point of view, the steppe grasslands of the PND of the year 2019 does not differ much in composition from those of Babadag and Casimcei plateaux described 40 years ago. Thus, the pastoral value (PV) of 23.5 is considered poor, as well as the useful grass production (GM) of only 2.72 t/ ha and the optimum stocking rate of only 0.23 LU/ ha.

The results allowed us to make a comparison between the current state of productivity and what was happening about 45-50 years ago (Table 5).

Table 5. Comparative synthesis of the productivity dynamics of steppe grasslands from the Podișul Nord-Dobrogean site

Tabel 5. Sinteza comparativă a dinamicii productivității pajiștilor stepice din situl Podișul Nord Dobrogean

Plateau	Pastoral value (PV)	Forage production (GM t/ha)	Optimal loading (LU/ha)
Babadag (1970)	31,9	4,47	0,37
Casimcea (1975)	19,2	2,62	0,22
Difference B - C; +, -	+ 12,7	+ 1,85	+ 0,15
% B - C	166	170	170
Average B + C	25,6	3,55	0,30
Average NDP(2019)	23,5	2,72	0,23
Difference NDP - BC; +, -	- 2,1	- 0,83	- 0,07
% NDP - BC	92	77	77
Rate of degradation in 45-50 years (%/ year)	0,15	0,5	0,5

From this comparison, we notice a rate of decrease of the pastoral value by 0.15% per year and of the production and the optimum-stocking rate by 0.5% per year from the first productivity assessments.

To establish the stocking rate per hectare, we have registered the number of livestock and grassland surfaces from 2018, data made available by CAD Tulcea (Table 6).

Table 6. The number of livestock expressed in livestock units (LU) and the stocking rate of grasslands in the Podișul Nord-Dobrogean site in 2018

Tabel 6. Efectivele de animale exprimate în unități vită mare (UVM) și încărcarea cu animale a pajiștilor din situl Podișul Nord-Dobrogean în 2018

Nr. crt.	Locality (TAU)	Cows	Sheep	Goats	Horses	TOTAL (LU)	Grasslands (ha)	UVM/ha	
								Real	Projected
1	Babadag	235	58	73	-	366	465	0,79	0,29
2	Baia	392	2.006	680	62	3.140	2.168	1,45	0,56
3	Beidaud	821	463	536	-	1.820	2.408	0,76	0,32
4	Casimcea	985	2.884	392	199	4.460	3.744	1,19	0,56
5	Ceamurlia de Jos	215	598	260	-	1073	580	1,85	0,41
6	Cerna	35	3.620	665	-	4.320	3.149	1,37	0,64
7	Ciucurova	31	368	154	38	591	565	1,05	0,32
8	Dorobanțu	68	1.288	868	-	2.224	2.624	0,85	0,22
9	Dăeni	195	647	115	108	1.060	1.152	0,92	0,34
10	Horia	33	280	189	-	502	1.124	0,45	0,22

Nr. crt.	Locality (TAU)	Cows	Sheep	Goats	Horses	TOTAL (LU)	Grasslands (ha)	UVM/ha	
								Real	Projected
11	Izvoarele	113	568	326	-	1.007	1.099	0,92	0,16
12	Jurilovca	134	592	253	-	979	2.101	0,47	0,39
13	Mihai Bravu	267	572	393	-	1.232	1.105	1,11	0,43
14	Nalbant	63	317	138	-	518	1.321	0,39	0,37
15	Ostrov	134	706	34	-	874	590	1,48	0,29
16	Peceneaga	45	647	168	148	1.008	338	2,98	0,25
17	Sarichioi	52	114	21	-	187	504	0,37	0,34
18	Slava Cercheză	34	350	70	7	461	441	1,05	0,23
19	Stejaru	387	1.148	343	20	1898	663	2,86	0,23
20	Topolog	812	1.371	904	476	3.563	3.295	1,08	0,29
TOTAL		5.051	18.597	6.582	1.053	31.283	29.430	1,06	0,34

From this data it turns out that in the 20 localities in our area of study, there is a total of over 31.3 thousand LU, out of which more than 90% are sheep and goats that graze all year round, except for the winter days with a snow layer. The livestock grazes on 29.4 thousand hectares of permanent grassland.

To complete the datasets, we analysed the pastoral arrangements made between 2005 and 2019 for all 20 localities. We found data on the projected optimal stocking rate, in accordance with the current productivity of the grasslands.

The analysis of the pastoral arrangements shows that the stocking rate on pastures is above the productive potential of the grasslands in all TAUs (Territorial Administrative Units) when compared to the one evaluated on scientific basis in 2019, respectively from 1.5-2 times in the Sarichioi, Nalbant and Horia villages, up to 12-13 times the carrying capacity in Peceneaga and Stejaru villages.

The average value for the 20 TAUs is 1.06 LU/ ha, exceeding 4.6 times the optimal load (0.23 LU/ ha) evaluated using the floristic surveys and even 3.1 times the projected one (0.34 LU/ ha) in the pastoral arrangements already approved by the village councils.

Surprisingly, the designers of the pastoral arrangements for the most crowded pastures with animals from the Podișul Nord-Dobrogean, respectively the Peceneaga and Stejaru villages, set an optimum of 0.23-0.25 LU/ ha, exactly as our assessments.

Preliminary conclusions

The vegetation of the steppe grasslands from the Podișul Nord-Dobrogean site are in a very advanced state of vegetative and productive degradation due to overgrazing, especially by sheep and goats, this issue being the main factor of degradation of the biodiversity, environment and pastoral economy.

Interdisciplinary research and studies that evaluate the vegetation diversity and productivity of the permanent grasslands, with the assessment based on floristic surveys and determination of the optimum carrying capacity and stocking rates, are an essential scientific support for the elaboration of the management plans for the protected areas.

Establishing the optimal stocking rate and grazing period on the existing grasslands for each of the 20 TAUs in the Podișul Nord-Dobrogean site, as well as the production of forages on arable land, are the main prospective actions to reduce the current anthropogenic pressure in order to preserve biodiversity, environment and landscapes.

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Research on the Participation of Protected Species from the Steppe Grasslands of the ROSCI0201 Podișul Nord-Dobrogean, According to Some Characteristics of the Soil

*Cercetări privind participarea unor specii protejate
din pajiștile stepice ale ROSCI0201 Podișul Nord-Dobrogean,
în relație cu unele caracteristici ale solului*

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Abstract

Researches on ecological conditions for protected plant species from grassland need, also, an appropriate evaluation of physical and chemical characteristics of the soil. Within the project "Integrated management of the Podișul Nord-Dobrogean (MiPoNoDo), SMIS code 116964" we studied the permanent grasslands hosted by natural habitat of community interest 62C0 Ponto-Sarmatic steppes. To achieve this goal, we analyzed 67 floristic surveys, from each studied location being collected soil samples from a depth of 0-10 cm, using a soil corer with a diameter of 25 mm. In the floristic surveys, we identified nine protected species, of which *Thymus zygioides* in 13 locations, *Dianthus nardiformis* in 10 locations and *Festuca callieri* in four locations. *Echinops ruthenicus*, *Astragalus glaucus*, *Pimpinella tragium*, *Scorzonera mollis*, *Salvia aethiopsis* and *Tanacetum millefolium* were identified in less than four locations. In soil samples, we determined the percentage of soil content in skeleton, pH, carbonates, humus content, phosphorus (P) and potassium (K). For the first two most widespread protected species, we prepared eco-diagrams according to the HUND method (1966). The dependency of the presence and participation of the species *Dianthus nardiformis* is medium on soil skeleton content, indifferent on soil pH, medium to high on humus content and total nitrogen (N), very small to medium on P and small to large on K. For *Thymus zygioides* the dependency on soil skeleton is very high, indifferent on soil pH with a tendency towards neutral to weak alkaline, indifferent on carbonates, medium to very high on humus content and total N, very small to small on P and small to large on K. The species *Festuca callieri* prefers and indicates soils with a high content of skeleton, lacking carbonates and poor in fertilizing elements (N, P, K). Thus, the rare species from the steppe grasslands vegetal layer can be used as indicators for the physical and agrochemical characteristics of the soil, an important tool for biodiversity conservation and proper management of this habitat.*

Keywords: *steppe grasslands, protected plant species, agrochemical soil characteristics*

Introduction

One of the main objectives of ROSCI0201 Podișul Nord Dobrogean, protected area of community importance, is to preserve several rare plant species identified in 62C0 * Ponto-Sarmatic steppe habitat.

In order to achieve this goal, in addition to the anthropogenic pressure represented mainly by overgrazing, it is necessary to study the environmental conditions, from which of first importance are soil physical and chemical characteristics, these elements being able to influence the presence and participation of the protected plant species in vegetation structure.

Since the bibliographic review did not reveal the existence of such approaches at national level, the present study was elaborated with the purpose of deepening the study of the soil-plant relationship from the steppe grasslands.

Materials and Methods

In the field trips from June and July 2019, in addition to the 67 floristic surveys on the 100 sqm (10 m x 10 m) sample area, on the two diagonals of the sample square, soil samples were taken with a soil corer with the diameter of 25 mm at a depth of 10 cm.

Soil samples were analyzed by the National Institute for Research-Development for Pedology, Agro-chemistry and Environmental Protection (ICPA) - Bucharest according to the following methods:

- **pH in aqueous suspension** 1:2,5; SR 7184-13:2001, PTL 04;
- **Carbonates:** gas volumetric method; STAS 7184/ 16-80; PTL 43;
- **Humus:** wet oxidation STAS 7184/ 21-82; PTL 12;
- **P_{AL}:** extractable phosphorus in ammonium acetate-lactates; STAS 7184/ 19-82; PTL 19;
- **K_{AL}:** extractable potassium in ammonium acetate-lactates; STAS 7184/ 18-80; PTL 22.

Classes for soil skeletal content
(2-25 mm)

Naming	Limits (%)
Not necessary	absent
Very low	0,1 - 3,0
Low	3,1 - 7,0
Average	7,1 - 15,0
High	15,1 - 35,0
Very high	> 35,0

The assessment of the physical components, respectively the soil skeleton (2-25 mm), was done after the expert opinion and the following agrochemical components according to the standardized methodology (FLOREA *et alii*, 1987).

Based on the floristic survey and on the main physical and agrochemical characteristics of the

soil, it was possible to produce diagrams using the HUND method (MARUȘCA, 1982; MARUȘCA *et alii*, 2010).

The plant species were determined using the classification proposed by Ciocârlan (2009).

Soil reaction (pH) and percentage content classes (carbonates, humus, N, P and K) are shown at the bottom of each diagram (Figures 2-3).

Initially, the method highlighted the relative presence of a species in the vegetation layer of grassland depending on the agrochemical characteristics of the soil.

Subsequently, the HUND method (1966) was improved by LAUER (1974) and MARUȘCA (1982), introducing in addition the relative participation of plant species according to the same agrochemical characteristics of the soil.

Specifically for this improved method, for each agrochemical factor taken into consideration should be registered all presences and participation of a certain plant species from the vegetal layer. This results in a series of data on the presence and participation of the species, linked to the respective factor.

For the next phase, the largest number regarding the presence in vegetal layer for a plant species it is equalized to 100, the rest of the species from the same floristic survey have to follow proposed method in order to rank the plant species response towards the selected agrochemical factor.

In order to quantify the participation of plant species towards a specific agrochemical factor the same concept is used, respectively the highest value of the participation of a species it is equalized to 100, value against which the lower values of the plant species from the same floristic survey are reported.

The result is a diagram expressing the relative dependency of the presence and participation of a species in the vegetal layer against some physical or agrochemical components of the soil.

Results and Discussions

From the analytical results of the 67 soil samples that accompany the 67 floristic surveys (Figure 1), we notice a quite large variation of the physical and agrochemical values of the soil (Table 1).

Thus, the soil skeleton content (2-25 mm) reaches values from 0 up to almost 50% of the weight of some soil samples.

The soil reaction (pH) is from moderately acidic (5.33) to weak alkaline (8.32) passing through all three classes of values.

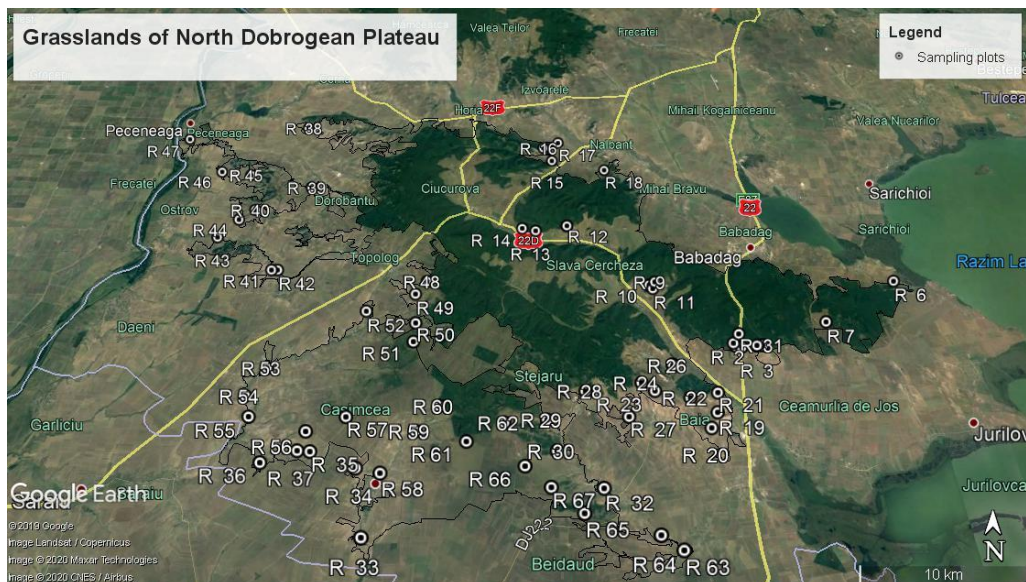


Figure 1. Distribution of floristic surveys from June-July 2019 in ROSCI0201 Podișul Nord-Dobrogean

Fig. 1. Distribuția releveelor floristice efectuate în perioada iunie-iulie 2019, în ROSCI0201 Podișul Nord-Dobrogean

The carbon content (%) reaches values from 0 up to 34.1 %, very high respectively, humus (%) from low (1.66%) to very high (15.87), total N from medium (0.141%) to very high (0.708%), PAL (mg / kg) from 4 (very low) to 137 (very high) and KAL from 110 (low) to 696 (very high).

The average values regarding the physical characteristics of the soil for the 67 sample stations located in 62C0* Ponto-Sarmatic steppe habitat are medium (6.9%) for the soil skeleton content. The agrochemical parameters have the following average values: neutral for pH (7.06), medium content of carbonates (5.4%), medium content of humus (6.4%), high content for total N (0.338%), low for PAL (14.9 mg/ kg) and high for KAL (238 mg/ kg), which shows that we have a pretty good soil trophic levels except the phosphorus content.

Table 1. Physical and agrochemical analysis of the soils from surveys from 62C0* habitat with protected plant species in the Podișul Nord-Dobrogean

Tabel 1. Analiza fizică și agrochimică a solurilor din stațiunile cu habitat 62C0* și specii de plante protejate din Podișul Nord-Dobrogean

Specification (nr. surveys)	Values	Participation in vegetal layer %	Skeleton content (2-25 mm) %	pH	Carbonates %	Humus %	Total N %	P _{AL} mg/ kg	K _{AL} mg/ kg
62C0* Habitat (67 surveys)	minimum	x	0,0	5,33	0,0	1,66	0,141	4	110
	maximum	x	49,9	8,32	34,1	15,87	0,708	137	696
	average	x	6,9	7,06	5,4	6,40	0,338	14,9	238
<i>Festuca callieri</i> (4 surveys)	minimum	+	5,2	5,91	0,0	4,29	0,240	10	141
	maximum	20	49,9	6,60	0,0	7,87	0,443	18	256
	average	10,8	23,7	6,27	0,0	6,14	0,336	13,5	187
	Dif** +, -	x	+ 16,8	- 0,76	- 5,4	- 0,26	- 0,002	- 1,4	- 41
	%	x	343	89	0	96	99	91	83
<i>Dianthus nardiformis</i> (10 surveys)	minimum	+	4,2	5,73	0,0	5,01	0,240	5	128
	maximum	8	49,9	7,80	1,1	7,87	0,443	27	256
	average	4,8	21,0	6,59	0,2	6,10	0,327	12,0	169
	Dif** +, -	x	+ 14,1	- 0,44	- 5,2	- 0,30	- 0,011	- 2,9	- 69
	%	x	304	94	4	95	97	81	71
<i>Thymus zygoides</i> (13 surveys)	minimum	1	2,7	5,73	0,0	4,29	0,185	7	120
	maximum	15	39,8	8,06	33,1	13,27	0,557	18	256
	average	5,8	12,5	6,96	5,5	7,04	0,353	10,4	188
	Dif** +, -	x	+ 5,6	- 0,07	+ 0,1	+ 0,64	+0,011	- 4,5	- 50
	%	x	181	99	102	110	104	70	79

- 62 C0* - Ponto-Sarmatic steppe habitat type

- Differences** towards 62C0* average value

In the 67 floristic surveys of 62C0* habitat type, the following nine protected plant species (see Annex), in the order of their presence, were encountered:

Thymus zygoides (5,8% participation in the vegetal layer) in 13 surveys; *Dianthus nardiformis* (4,8% participation) in 10 surveys; *Festuca callieri* (8,3% participation) in four surveys; *Echinops ruthenicus* (1,5% participation) in three surveys; *Astragalus glaucus* (5% participation) in two surveys; *Pimpinella tragium* (5 % participation) in two surveys and in only one survey *Scorzonera mollis* (2% participation), *Salvia aethiopis* and *Tanacetum millefolium* (5% participation).

The data presented in Table 1 show that *Festuca callieri* prefers carbonate-free soils with a high soil skeleton content, moderately acidic reaction and lower content in fertilizing elements.

The species *Dianthus nardiformis* also prefers soils poor in carbonates and fertilizing elements but richer in the soil skeleton content.

Thymus zygoides prefers moderately acidic to neutral soils, richer in humus and nitrogen, poor in P and K and with a lower soil skeleton content.

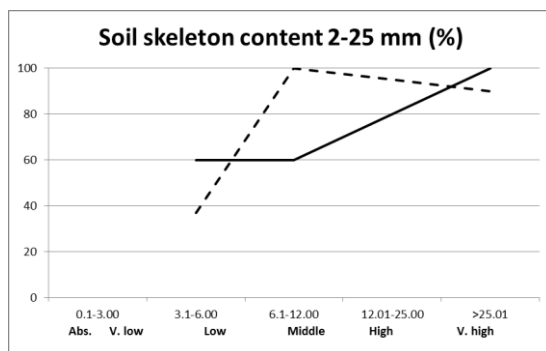
A more detailed analysis of the dependency regarding the presence and participation towards the physical and agrochemical characteristics, for the first two species in order of their presence (*Dianthus nardiformis* and *Thymus zygoides*), is shown in figures 2 and 3.

Thus, the species *Dianthus nardiformis* has the highest presence on soils with a very high skeletal content and the *Thymus zygoides* species on a medium content. Regarding participation in the vegetal layer, *Dianthus nardiformis* was more abundant on soils with medium skeleton content and *Thymus zygoides* on the soil with a very high skeleton content.

Considering the dependency of the presence and participation towards the main characteristics of the soil, the species *Dianthus nardiformis* is almost indifferent to pH of the soil, prefers a medium content in carbonates, from medium to high in humus and total N, from very small to medium in P content and from small up to high in K.

Compared to the same agrochemical characteristics of the soil, the species *Thymus zygoides* is equally indifferent to pH with some tendency towards neutral-weak alkaline, indifferent to carbonates on soils with a medium to very high content in humus, from medium to high in total N content, from very low to low in P and from low up to high in K content.

The results regarding the dependency of the two species on the physical and agrochemical characteristics of the soil emphasize the importance of this approach for the appropriate evaluation of the factors that influence the diversity of the vegetal layers.



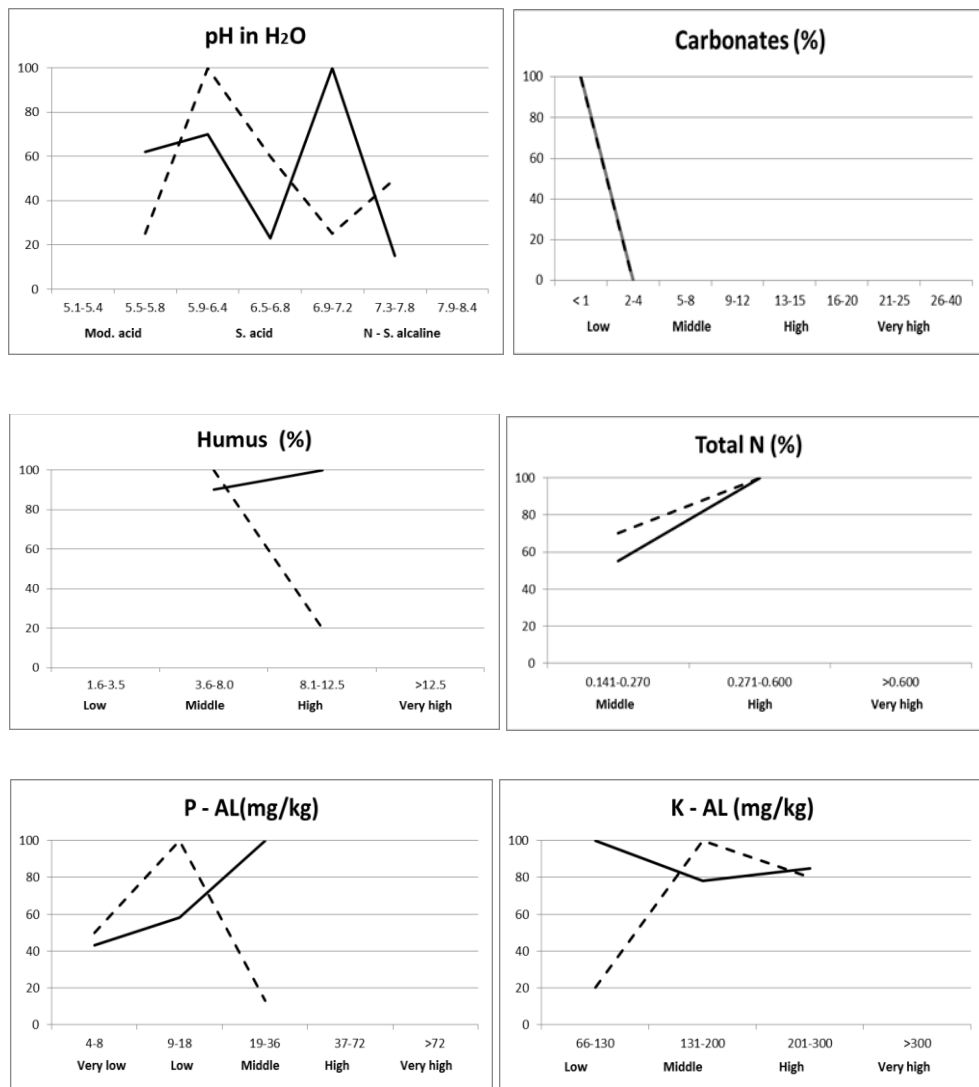
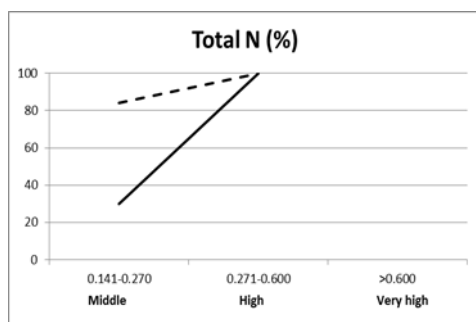
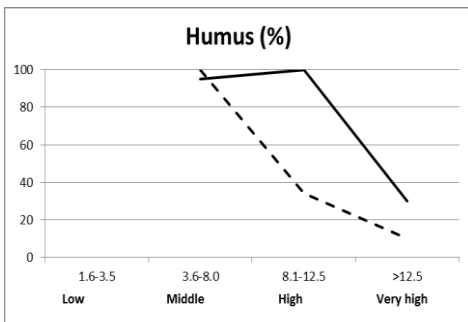
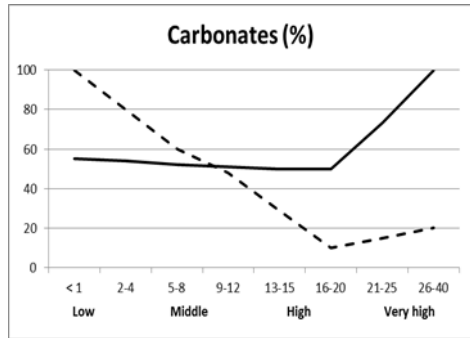
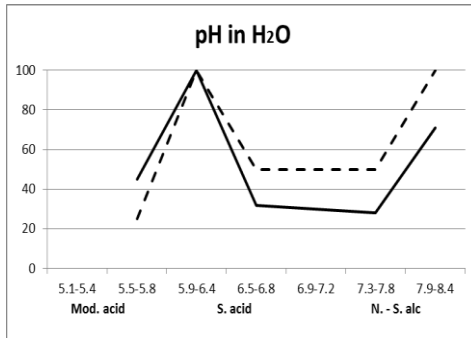
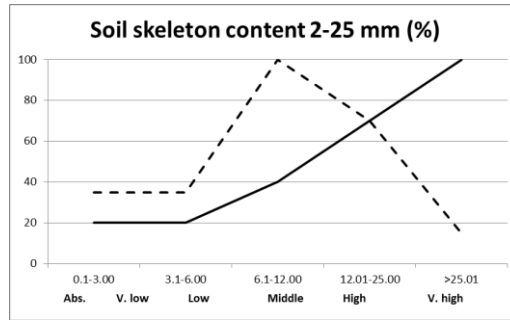


Figure 2. Dependency of presence (- - - %) and participation (----- %) of the species *Dianthus nardiformis* (present in 10 surveys) on the physical and agrochemical characteristics of the soil

Fig. 2. Dependența prezenței (- - - %) și participării (----- %) speciei *Dianthus nardiformis* (prezentă în 10 relevee) față de caracteristicile fizice și agrochimice ale solului



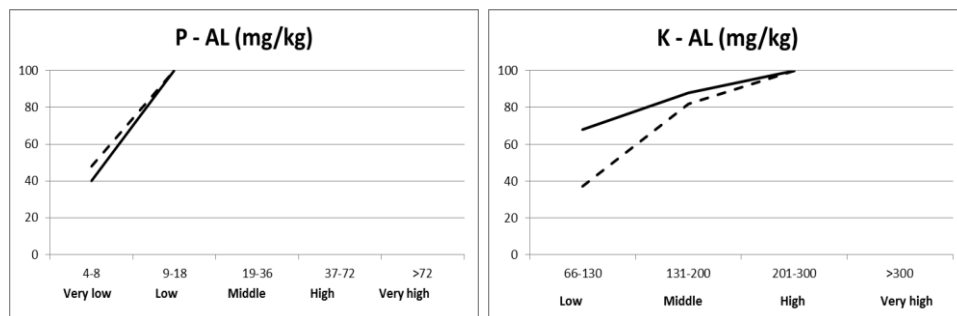


Figure 3. Dependency of presence (- - - %) and participation (— %) of the species *Thymus zygioides* (present in 13 surveys) on the physical and agrochemical characteristics of the soil

Fig. 3. Dependența prezenței (- - - %) și participării (— %) speciei *Thymus zygioides* (prezentă în 13 relevee) față de caracteristicile fizice și agrochimice ale solului

Conclusions

In addition to intensive grazing, the protected plant species characteristic to the natural habitat of community interest 62C0* Ponto-sarmatic steppes from ROSCI0201 Podișul Nord Dobrogean are strongly influenced by the physical and agrochemical characteristics of the soil.

The species *Dianthus nardiformis* prefers skeletal soils with low carbonate and phosphorus content.

The species *Thymus zygioides* prefers neutral to low alkaline soils, rich in humus and very poor in phosphorus.

The species *Festuca callieri* grows on soils with a high content of skeleton, lacking carbonates and poor in fertilizing elements.

Plants, especially rare species are true "phytometers" for the main physical and agrochemical characteristics of the soil.

Annex – Selection of protected plant species from Podișul Nord Dobrogean

Dianthus nardiformis

Thymus zygoides



Festuca callieri

Echinops ritro
subsp. *ruthenicus*



Pimpinella tragium
subsp. *litophila*

Astragalus glaucus



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**Muchiile Cernei-Iaila Nature Reserve
(Tulcea County, Romania)
a New Site for *Krascheninnikovia ceratoides* in Europe**

*Rezervația naturală Muchiile Cernei-Iaila
(jud. Tulcea, România)
un nou site pentru *Krascheninnikovia ceratoides* în Europa*

Mihai PETRESCU

Abstract

Besides the previous inventories, within the Muchiile Cernei-Iaila Nature Reserve, in 2017-2018, there were identified three priority community interest habitats and the very rare threatened species *Krascheninnikovia ceratoides*. Most of the 10 plant communities framed in these habitats are endangered (four coenotaxa), followed by rare (two coenotaxa), vulnerable or frequent (one coenotaxon) ones. The ruderal species invasive tendency is low for most plant communities. Exceptions are the medium disturbed coenotaxa (*Agropyro-Thymetum zygoidi*, *Paeonio peregrinae-Carpinetum orientalis*, *Agropyro cristati-Krascheninnikovietum ceratoidis*), or those with a high perturbation due to ruderal species (*Artemisio austriacae-Poëtum bulbosae*). The richest in threatened species is considered *Agropyro-Thymetum zygoidi* (seven species), followed by *Medicagini minimae-Festucetum valesiacae* (five species), *Botriochloetum ischaemi* (three species), *Agropyro cristati-Krascheninnikovietum ceratoidis* and *Galio dasypodi-Quercetum pubescentis* (two species), respectively *Thymio pannonic-Chrysopogonetum grylli* (one species). Most of the threatened species are endangered locally, at least within the respective plant communities. *Krascheninnikovia ceratoides* is considered a relict of the „cold mammoth-steppe”, this reserve being a new location and the only one in Dobrogea confirmed by recent inventories. Similar to the phytocenoses inventoried by the author in Alfambra/ Spain, also in Dobrogea *Krascheninnikovia ceratoides* plant communities are present in the disturbed/ ruderal areas of steppe meadows. In Dobrogea these plant communities are located in more continental microclimates than the general cold (continental) steppe macroclimate of the region. In Alfambra/ Spain *Krascheninnikovia ceratoides* occurs in a warm (Mediterranean) steppe, with a more continental influence than the overall Mediterranean climate of Spain. As probably Spain was colonised by *Krascheninnikovia ceratoides* through a preglacial migration through the *Stipa capillata* steppes of the Danube valley, some of the oldest

populations from this natural corridor could be these phytocoenoses from Muchiile Cernei-Iaila Nature Reserve. In this reserve our proper studies frame *Krascheninnikovia ceratoides* as an endangered species, while in the Alfambra area it could be estimated as „vulnerable”. Still, in both regions, this rare species should be protected through adequate management measures, within its habitats.

Keywords: *Muchiile Cernei-Iaila Nature Reserve new site, Krascheninnikovia ceratoides, relict of the „cold mammoth-steppe”, Dobrogea/ Romania, Alfambra/ Spain*

Introduction

In this paper are presented preliminary own data, updated in 2017-2018, on habitats and species of higher plants of community or national interest, following the inventories presented in previous works (*Danube Delta IV, V*). The main aim of this study is to present unedited data on *Krascheninnikovia ceratoides* plant communities, for which this reserve is a new site, also in comparison with other phytocoenosis dominated by this species in Aragon-Spain, where it was also observed by the author. The methodology used in field studies for the expeditious, preliminary inventory of habitats and species of conservation interest is presented also. On this basis, the conservation status of habitats/ species in relation to the intensity of anthropogenic disturbances was also preliminarily estimated.

Materials and methods

The complex landscape of the Muchiile Cernei-Iaila Nature Reserve (1,891.00 ha), framed within the site of community interest Podișul Nord Dobrogean, includes one of the largest steppe and wooded steppe areas in Dobrogea, the vegetation mosaic consisting of three major habitat types, all of which are priority ones, of community interest:

- **Ponto-Sarmatic steppes** (62C0*/ 34.92), found on almost all forms of relief, especially in the west of the reserve. Eastwards the steppe meadows appear mainly on peaks, southern slopes or on shallow soils. In areas with humidity higher than average, the steppes intertwine with wooded steppe vistas, or appear only in the clearings of compact forests;
- **Sub-Mediterranean and wooded steppe forests** (91AA*/ 71.73723, 71.73724) consist of more or less compact forests, all of which are located on slopes with different exposures, but predominantly northern ones, less on the peaks, or on the southern frame of the hills;

- **Continental wooded steppe forests** (9110*/ 41.7A221) form isolated clusters of continental forest-steppe forests, which occupy mainly the upper part of some northern slopes.

In Spain, which is the extreme western location in Europe of this species, it was observed by the author in the Aragon region, Teruel province, at Alfambra, where two plots were inventoried. In this Spanish province, the species is quoted in two sites, respectively Zaragoza, where it is located at about 200-300 m (similar with the coenotaxa from Dobrogea) in the meso-Mediterranean layer, respectively in Alfambra, in the supra-Mediterranean layer, at 1000-1200 m.

The on-site research consisted in observations on itineraries and inventories generally in 100 square meters plots, according to the Braun-Blanquet method. The identification and framing of the plant species, coenotaxa and habitats are based on PHYSIS database, the EUR 27 and 28 versions of the *Interpretation Manual of the European Union Habitats* (***) 2007, (***) 2013) and other papers or field guides (BLAMEY, GREY-WILSON, 1998; CIOCĂRLAN, 2009; DEVILLIERS *et alii*, 1996; DIHORU, DONIȚĂ, 1970; HOREANU, 1976a; HOREANU, 1976b; IVAN, 1979; OLTEAN *et alii*, 1994; PETRESCU 2007; PRODAN, 1934-1935; PRODAN, 1935-1936; PRODAN, 1938-1939; SANDA, ARCUȘ, 1999; SANDA *et alii*, 2008; SĂVULESCU *et alii*, 1952-1976; SÂRBU *et alii*, 2013).

The preliminary assessment of the importance and conservation status of threatened species or habitats/ coenotaxa was made by using a scale, as shown in Table 1.

Table1. The correspondence between the dominance, habitat frequency and the threat categories for species and habitats/ coenotaxa

Tabel 1. Corespondența dintre dominanță, frecvența habitatului și categoriile de amenințare pentru specii și habitate/ coenotaxa

Dominance indices (species)	Threat category	Habitat frequency in the studied area (% of the route)
– <5 individuals/ plot, with negligible dominance	critically endangered	-
+ – ≤ 1 % dominance	endangered	+ – ≤ 1 %
1 – 1-10 % dominance	vulnerable	I – 1-10 %
2 – 10-25 % dominance	rare	II – 10-25 %
3 – 25-50 % dominance	sporadic	III – 25-50 %
4 – 50-75 % dominance	frequent	IV – 50-75 %
5 – 75-100 % dominance	very frequent	V – 75-100 %

The field data were collected in plots according to the Braun-Blanquet methodology. The preliminary assessment of the importance and conservation status of threatened species or habitats/ coenotaxa, as a basis for the evaluation of the conservation priorities, was based upon their framing into several local threat

categories, within the analyzed coenotaxa (for the species), by using the scale presented in Table 1. For the species the first three gradations correspond to the IUCN threat categories (endangered, vulnerable, rare), to which the “*critically endangered*” category was added. For the next three gradations that correspond to the “*not threatened*” IUCN category, the following frequency categories were used: sporadic, frequent and very frequent. A correspondence was also set between these categories and the Braun-Blanquet scale for the assessment of the dominance within the plots. For the preliminary assessment of the habitat threat categories an adapted form of the previous scale was used, based on the estimation of the percentage limits in the research route within which the habitat/coenotaxa was noticed. If a species or habitat is framed into a high threat category (endangered, vulnerable) its local conservation status can be considered low, closer to an unfavorable status and vice versa. In the case of habitats/ plant communities, the higher is their threatened species number, the better can be considered their conservation value and status, taking into account that these taxa, sensitive to human activities, are in general considered as environment indicators.

Wherever data allowed also the conservation status of the plant communities/ habitats induced by the intensity of human activities was assessed. A simple scale which estimates a high, medium, low or null level of disturbance was used, taking into account the dominance indices and the number of ruderal and/ or non-native species identified in the plots located in plant communities, in the studied habitats. Within the species list, for each plant community the ruderal species are underlined, while the non-native ones are mentioned in the description of the respective coenotaxa.

Within each shrub or herbaceous plant community the presence of at least one ruderal/ non-native species with a certain dominance index corresponds to a level of disturbance, respectively: r – very low; + – low, 1 – medium; 2-5 – high. If the number of recorded ruderal or non-native species is equal or exceeds 50% of the total number of species, even if these kind of taxa have low dominance indices, (like for example + - low), there can be considered that the respective plant community has a level of disturbance that corresponds to the next higher level (such as in this case 1- medium).

For the oak forests, if the oak species proportion is: higher or equal to 2 (20%) – low disturbance; between (or equal to) 1(10%) and 2 (20%) – medium disturbance; no oaks – high disturbance. The highest disturbance level in the canopy or shrub/ grasses layer is considered representative for the overall plant community.

Results and Discussions

Nearly all the area of Muchiile Cernei-Iaila Nature Reserve is covered in habitats of community importance, typical for the Stepic Bioregion, as described below.

62C0* Ponto-Sarmatic steppes**34.92 Ponto-Sarmatic steppes**

Medicagini minimae-Festucetum valesiaca Wagner 1941 can be estimated as a vulnerable cenotaxa in the reserve. In this association were observed five rare taxa, threatened on a national scale, which can be considered endangered, at least at the level of this plant community. The low degree of ruderal species invasive trend is indicated by the reduced abundance-dominance indices of the five such species.

Plot MF1-12-04-18

Key species: *Festuca valesiaca* (3), *Medicago minima* (+).

Threatened species: *Koeleria lobata* (+), *Pimpinella tragium* subsp. *lithophila* (+), *Potentilla bornmuelleri* (+), *Thymus zygioides* (+).

Other species: *Astragalus vesicarius* subsp. *pseudoglaucus* (+), *Cichorium intybus* (+), *Dichanthium ischaemum* (1), *Erophila verna* (+), *Euphorbia agraria* (+), *Euphorbia glareosa* (+), *Helichrysum arenarium* (+), *Marrubium vulgare* (+), *Plantago lanceolata* (+), *Poa bulbosa* (1), *Sanguisorba minor* (+), *Teucrium chamaedrys* (+), *Teucrium polium* subsp. *capitatum* (+).

Plot MF2-12-04-18

Key species: *Festuca valesiaca* (3).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (±).

Other species: *Astragalus vesicarius* subsp. *pseudoglaucus* (+), *Cichorium intybus* (+), *Crataegus monogyna* (+), *Dichanthium ischaemum* (1), *Helichrysum arenarium* (+), *Potentilla argentea* (+), *Sanguisorba minor* (+), *Stipa capillata* (+), *Teucrium chamaedrys* (+), *Thymus pannonicus* (+), *Verbascum phoeniceum* (+).

Botriochloetum (Andropogonetum) ischaemi Pop 1977, a frequent coenotaxa, is the most common in the reserve, especially in its west side, where it occurs on deep to shallow soils. In the plots four threatened species were identified, of which *Pimpinella tragium* subsp. *lithophila*, *Satureja coerulea*, *Tanacetum millefolium* are rare at national level, and *Krascheninnikovia ceratoides* (*Ceratoides latens*) is considered insufficiently known (OLTEAN *et alii*, 1994), respectively very rare (CIOCÂRLAN, 2009). The latter species shows a certain fidelity to this association, similar to the situation in Transylvania (KOVÁCS, 2011). Within the association, the first two taxa are estimated to be locally endangered, while the third species is considered between endangered and vulnerable. A low level of ruderalization is indicated by predominantly low abundance-dominance indices of 14 such species.

Plot Bi1-13-11-17

Key species: *Dichanthium ischaemum* (4).

Threatened species: *Krascheninnikovia ceratoides* (1).

Other species: *Agropyron cristatum* (+), *Convolvulus cantabricus* (+), *Cynodon dactylon* (+), *Eryngium campestre* (+), *Euphorbia glareosa* (+), *Linum austriacum* (+), *Stipa capillata* (+), *Thymus pannonicus* (+).

Plot Bi1-4-10-18

Key species: *Dichanthium ischaemum* (4).

Threatened species: *Pimpinella tragi* subsp. *lithophila* (+), *Satureja caerulea* (+).

Other species: *Agrimonia eupatoria* (+), *Artemisia austriaca* (+), *Chrysopogon gryllus* (1), *Cichorium intybus* (+), *Eryngium campestre* (+), *Euphorbia glareosa* (+), *Festuca valesiaca* (1), *Fragaria viridis* (+), *Marrubium peregrinum* (+), *Stachys recta* (+), *Stipa capillata* (+), *Teucrium chamaedrys* (+), *Teucrium polium* subsp. *capitatum* (+), *Thalictrum minus* (+).

Plot Bi2-12-04-18

Key species: *Dichanthium ischaemum* (4).

Threatened species: *Krascheninnikovia ceratoides* (1).

Other species: *Achillea setacea* (+), *Erodium cicutarium* (+), *Eryngium campestre* (+), *Euphorbia glareosa* (+), *Galium aparine* (+), *Lamium amplexicaule* (+), *Marrubium peregrinum* (1), *Ranunculus oxyspermus* (+), *Thlaspi perfoliatum* (+), *Viola arvensis* (+).

Plot Bi3-12-04-18

Key species: *Dichanthium ischaemum* (4).

Threatened species: *Tanacetum millefolium* (+).

Other species: *Crataegus monogyna* (+), *Euphorbia agraria* (+), *Euphorbia glareosa* (+), *Euphorbia seguieriana* (+), *Lamium amplexicaule* (+), *Marrubium peregrinum* (+), *Orlaya grandiflora* (+), *Teucrium chamaedrys* (+), *Thlaspi perfoliatum* (+), *Thymus pannonicus* (+).

Plot Bi4-12-04-18

Key species: *Dichanthium ischaemum* (5).

Threatened species: *Krascheninnikovia ceratoides* (1), *Tanacetum millefolium* (+).

Other species: *Achillea setacea* (+), *Ajuga chamaepytis* (+), *Agropyron cristatum* (+), *Falcaria vulgaris* (+), *Lamium amplexicaule* (+), *Marrubium vulgare* (+), *Orlaya grandiflora* (+), *Thymus pannonicus* (+), *Thlaspi perfoliatum* (+).

Artemisio austriacae-Poëtum bulbosae Pop 1970 can be estimated as an endangered plant community in the reserve. No nationally threatened taxa were observed in this association. The high degree of ruderalization is indicated by significant abundance-dominance indices (+ - 3) of the five indicator species.

Plot AP1-4-10-18:

Key species: *Artemisia austriaca* (3), *Poa bulbosa* (1).

Other species: *Achillea setacea* (1), *Agrimonia eupatoria* (+), *Carduus thoermeri* (+), *Carthamus lanatus* (+), *Chrysopogon gryllus* (+), *Eryngium campestre* (+), *Festuca valesiaca* (1), *Fragaria viridis* (+), *Melica ciliata* (+), *Phlomis tuberosa* (+), *Plantago lanceolata* (+), *Potentilla argentea* (+), *Quercus pubescens* (1), *Stipa capillata* (+), *Teucrium chamaedrys* (+).

Thymio pannonici-Chrysopogonetum grylli Doniță et al. 1992 plant community is considered endangered, only one rare threatened species being identified, estimated as endangered within the respective phytocoenosis. There can be deduced a low disturbance due to presence of three ruderal species with a reduced dominance.

Plot TCg1-4-10-18:

Key species: *Chrysopogon gryllus* (3).

Threatened species: *Thymus zygioides* (+).

Other species: *Allium rotundum* (+), *Asperula tenella* (+), *Bromus tectorum* (+), *Dichanthium ischaemum* (2), *Euphorbia glareosa* (+), *Euphorbia seguieriana* (+), *Eryngium campestre* (+), *Sanguisorba minor* (+), *Teucrium polium* subsp. *capitatum* (+).

Plot TCg2-4-10-18:

Key species: *Chrysopogon gryllus* (4).

Other species: *Agrimonia eupatoria* (+), *Carpinus orientalis* (+), *Clinopodium vulgare* (+), *Dichanthium ischaemum* (1), *Euphorbia glareosa* (+), *Origanum vulgare* (+), *Quercus pubescens* (+), *Teucrium chamaedrys* (+), *Teucrium polium* subsp. *capitatum* (+).

Stipetum capillatae (Hueck 1931) Krausch 1961 plant community is an endangered coenotaxa that occurs on restricted areas, low grazed. In these phytocoenoses there was observed only one rare threatened taxa *Pimpinella tragi* subsp. *lithophila*, endangered within the plant community. A low level of the ruderal species invasive tendencies was observed, as shown by the reduced dominance indices of four such species.

Plot Sc1-4-10-18:

Key species: *Stipa capillata* (3).

Threatened species: *Pimpinella tragi* subsp. *lithophila* (+).

Other species: *Cephalaria uralensis* (+), *Chondrilla juncea* (+), *Cichorium intybus* (+), *Chrysopogon gryllus* (+), *Dichanthium ischaemum* (1), *Festuca valesiaca* (1), *Fragaria viridis* (+), *Galium humifusum* (+), *Marrubium peregrinum* (+), *Pimpinella tragi* subsp. *lithophila*, *Reseda lutea* (+), *Stachys recta* (+), *Teucrium polium* subsp. *capitatum* (+), *Thalictrum minus* (+).

Agropyro cristati-Krascheninnikovietum ceratoidis J. A. Kovács 2011 is an endangered cenotaxon, found in small areas, medium grazed. The

phytocoenoses, dominated by the very rare threatened species *Krascheninnikovia ceratoides*, are extremely rare in the reserve, where the species can be considered critically endangered. Another threatened species at the national level is *Salvia aethiopsis*, critically endangered in these phytocoenoses. The degree of ruderalization is medium, attested by the abundance-dominance indices (+-1) of the nine such species. This is similar to the situations in Transilvania (KOVÁCS, 2011) and Spain (TENORIO *et alii*, 2000), where the association appears especially in the disturbed steppes.

The phytocoenoses dominated by *Krascheninnikovia ceratoides* in the reserve have been included, at least temporarily, in the only coenotaxa dominated by this species, described so far in Romania, the association *Agropyro cristati-Krascheninnikovietum ceratoidis* J. A. Kovács 2011, recently described from Transilvania (KOVÁCS, 2011), similar to those in Dobrogea.

The inclusion of this association in the *Artemisio-Kochion* alliance indicates the framing of these phytocoenoses from Dobrogea within the habitat 34.92 Ponto-Sarmatic steppes, within which are located the small clusters of *Krascheninnikovia ceratoides*, most of the plots being of 50 square meters, unlike the plots for other plant communities, due to the very restricted areas where *Agropyro cristati-Krascheninnikovietum ceratoidis* occurs. Some differences in the inventory of species compared to the surveys in Transilvania attest to the fact that the Dobrogean phytocoenosis could possibly be considered regional variants.

Krascheninnikovia ceratoides is a relict species, which could attest to the existence also in Dobrogea of the “mammoth cold steppe” mentioned for Transilvania (KOVÁCS 2011). Similar to the phytocoenoses in Transilvania, it is very probable that *Krascheninnikovia ceratoides* has been continuously maintained in Dobrogea, at least in the area of the Muchiile Cernei-laila Nature Reserve, since the beginning of the Holocene. This could attest to the continuous existence of steppe meadow habitats until now, being unlikely its survival in a forest environment, in the shade of trees, being a heliophil species. This nature reserve is a new recorded site in Romania, and consequently in Europe, for *Krascheninnikovia ceratoides*.

Krascheninnikovia ceratoides could be considered to be located in the Muchiile Cernei-laila nature reserve in its only site in Dobrogea, if its presence is not confirmed in other areas of the province. Thus, the only area from which it was cited (BRÂNDZĂ, 1898; GRECESCU, 1898; PRODAN, 1934-1935) in the past (1898-1935), quotations also used within later works (NEGREAN, 2012), is located between Satu Nou (Ienikioi) and Mircea-Vodă (Akpunar), Constanța County. In that site the species was not found by the author in 2018. In later references it is quoted from Dobrogea in a single work (BORZA, 1947-1949) but without indicating the locality/ location, after which in subsequent works

(CIOCĂRLAN, 2009; KOVÁCS, 2011; SÂRBU *et alii*, 2013; SĂVULESCU, 1952-1976) the species is mentioned only from Transilvania. Given this limited location, possibly in a single Dobrogean site, it can be considered that the species *Krascheninnikovia ceratoides* is more exposed to extinction in Dobrogea than other taxa inventoried in this study, which are also found in other sites in the region.

Plot AKr1-12-04-18

Key species: *Agropyron cristatum* (+), *Krascheninnikovia ceratoides* (3).

Threatened species: *Krascheninnikovia ceratoides* (3).

Other species: *Achillea setacea* (+), *Agrimonia eupatoria* (+), *Dichanthium ischaemum* (1), *Erodium cicutarium* (+), *Euphorbia glareosa* (+), *Galium aparine* (+), *Lamium amplexicaule* (+), *Sanguisorba minor* (+), *Stellaria media* (1), *Thlaspi perfoliatum* (+), *Viola arvensis* (+).

Plot AKr2-12-04-18

Key species: *Krascheninnikovia ceratoides* (4).

Threatened species: *Krascheninnikovia ceratoides* (4), *Salvia aethiopsis* (r).

Other species: *Agrimonia eupatoria* (+), *Artemisia austriaca* (+), *Dichanthium ischaemum* (2), *Eryngium campestre* (+), *Fragaria viridis* (+), *Galium aparine* (+), *Lamium amplexicaule* (+), *Stellaria media* (+), *Teucrium chamaedrys* (+), *Thlaspi perfoliatum* (+), *Veronica chamaedrys* (+), *Viola arvensis* (+).

Plot AKr3-12-04-18

Key species: *Krascheninnikovia ceratoides* (3).

Threatened species: *Krascheninnikovia ceratoides* (3).

Other species: *Achillea setacea* (+), *Agrimonia eupatoria* (+), *Artemisia austriaca* (+), *Dichanthium ischaemum* (2), *Galium aparine* (+), *Lamium amplexicaule* (+), *Marrubium vulgare* (1), *Orlaya grandiflora* (+), *Salvia nemorosa* (+), *Stellaria media* (+), *Xeranthemum annuum* (+).

34.9211 Western Pontic thyme steppes

***Agropyro-Thymetum zygioidi* Dihoru (1969) 1970**, a coenotaxa assessed as rare within the site, is the richest in threatened species. The seven threatened taxa are framed within the “rare” category at the national level, but within this plant community they are mostly endangered, except the dominant *Thymus zygioides* and the vulnerable *Koeleria lobata*. There was recorded a medium level of disturbance due to grazing, as indicated by the dominance indices of the four ruderal species.

Plot AT1-12-04-18:

Key species: *Agropyron ponticum* (1), *Thymus zygioides* (3).

Threatened species: *Euphorbia glareosa* subsp. *dobrogeensis* (+), *Koeleria lobata* (1), *Pimpinella tragium* subsp. *lithophila* (+), *Potentilla bornmuelleri* (+), *Thymus zygioides* (3).

Other species: *Astragalus vesicarius* subsp. *pseudoglaucus* (+), *Cichorium intybus* (+), *Dichanthium ischaemum* (+), *Erophila verna* (+), *Poa bulbosa* (1), *Reseda lutea* (+), *Sanguisorba minor* (+), *Scorzonera austriaca* (+), *Scleranthus perennis* (+), *Sedum urvillei* subsp. *hillebrandtii* (+), *Teucrium polium* subsp. *capitatum* (+).

Plot AT1-4-10-18:

Key species: *Thymus zygioides* (3).

Threatened species: *Koeleria lobata* (1), *Pimpinella tragium* subsp. *lithophila* (+), *Satureja caerulea* (+), *Scutellaria orientalis* (±), *Thymus zygioides* (3).

Other species: *Cleistogenes bulgarica* (+), *Dichanthium ischaemum* (+), *Leontodon crispus* (+), *Medicago falcata* (+), *Poa bulbosa* (+), *Reseda lutea* (+), *Sideritis montana* (+), *Stipa capillata* (+), *Teucrium chamaedrys* (+), *Teucrium polium* subsp. *capitatum* (+).

91AA* Eastern white oak woods

41.73723 Moesian *Paeonia peregrina* – white oak woods

Paeonio peregrinae-Carpinetum orientalis Doniță 1970 can be considered between rare and sporadic, being the most widespread type of forest in the reserve. No nationally threatened species have been identified. The specific composition of the grass layer can be considered representative of the natural status of this cenotaxa, in which only one ruderal species has been identified. However, the small proportion of *Quercus pubescens* in some surveys plots indicates a partial derivation, respectively a medium level of disturbance due to anthropogenic activities.

Plot PC1-4-10-18:

Key species: *Carpinus orientalis* (3), *Quercus pubescens* (2).

Other species:

- trees: *Fraxinus ornus* (+);
- shrubs/ lianas: *Cornus mas* (1), *Crataegus monogyna* (+);
- grasses/ undershrubs: *Agrimonia eupatoria* (+), *Asperula tenella* (+), *Brachypodium sylvaticum* (1), *Fragaria viridis* (+), *Teucrium chamaedrys* (+).

Plot PC1-12-04-18:

Key species: *Carpinus orientalis* (3), *Quercus pubescens* (1).

Other species:

- shrubs/ lianas: *Cornus mas* (1), *Crataegus monogyna* (+), *Evonymus verrucosus* (+);
- grasses/ undershrubs: *Adonis vernalis* (+), *Brachypodium sylvaticum* (+), *Festuca valesiaca* (+), *Filipendula vulgaris* (+), *Fragaria viridis* (+), *Marrubium vulgare* (+), *Polygonatum latifolium* (+), *Teucrium chamaedrys* (+), *Thalictrum minus* (+), *Vinca herbacea* (+), *Viola odorata* (+).

41.73724 Moesian *Galium dasypodium* – white oak woods

***Galio dasypodi-Quercetum pubescentis* Doniță 1970** plant community can be considered rare in the reserve, where it appears more in the form of steppe vistas. Only two rare threatened species were identified, endangered in these phytocenoses. The specific composition of the grass layer can be considered as low disturbed with eight ruderal species. The tree layer is non-derived, but often with low coverage, being estimated a low level of disturbance due to human activities.

Plot GQ1-4-10-18:

Key species: *Quercus pubescens* (4).

Threatened species: *Asparagus verticillatus* (+).

Other species:

- trees: *Fraxinus ornus* (1);
- shrubs/ lianas: *Crataegus monogyna* (+);
- grasses/ undershrubs: *Agrimonia eupatoria* (+), *Asperula tenella* (+), *Brachypodium sylvaticum* (1), *Dichanthium ischaemum* (+), *Galium aparine* (+), *Melica ciliata* (+), *Stipa capillata* (+), *Teucrium polium* subsp. *capitatum* (+).

Plot GQ2-12-04-18:

Key species: *Quercus pubescens* (3).

Threatened species: *Tanacetum millefolium* (+).

Other species:

- shrubs/ lianas: *Crataegus monogyna* (+);
- grasses/ undershrubs: *Achillea setacea* (+), *Artemisia austriaca* (+), *Erodium cicutarium* (+), *Festuca valesiaca* (1), *Filipendula vulgaris* (+), *Fragaria viridis* (+), *Galium aparine* (+), *Lamium amplexicaule* (+), *Lithospermum arvense* (+), *Poa bulbosa* (+), *Ranunculus illyricus* (+), *Stellaria media* (+), *Teucrium chamaedrys* (+), *Thlaspi perfoliatum* (+), *Viola odorata* (+).

Plot GQ1-12-04-18:

Key species: *Quercus pubescens* (3).

Other species:

- trees: *Acer campestre* (+), *Fraxinus ornus* (1);
- shrubs/ lianas: *Cornus mas* (1), *Crataegus monogyna* (+);
- grasses/ undershrubs: *Agrimonia eupatoria* (+), *Artemisia absinthium* (+), *Dichanthium ischaemum* (+), *Evonymus verrucosus* (+), *Euphorbia glareosa* (+), *Fragaria viridis* (+), *Marrubium vulgare* (+), *Phlomis tuberosa* (+), *Poa angustifolia* (1), *Salvia nemorosa* (+), *Stipa capillata* (+), *Viola suavis* (+).

9110* Euro-Siberian stepic woods with *Quercus* spp.**41.7A221 Pontic *Acer tataricum-Quercus pedunculiflora* oak woods**

***Viola suavis-Quercetum pedunculiflorae* Donita 1970** can be considered an endangered association in the reserve, where it appears

completely isolated. No endangered species have been identified. The specific composition of the grass layer can be considered poorly ruderalised, four indicator species being found, with low coverage. The tree layer is non-derived, being estimated a low general level of disturbance due to anthropogenic activities.

Plot VQ1-12-04-18:

Key species: *Quercus pedunculiflora* (4).

Other species:

- shrubs/ lianas: *Crataegus monogyna* (1);
- grasses/ undershrubs: *Agrimonia eupatoria* (+), *Dactylis polygama* (+), *Fragaria viridis* (+), *Geum urbanum* (+), *Lamium purpureum* (+), *Scilla bifolia* (+), *Stellaria media* (+), *Urtica dioica* (+), *Veronica hederifolia* (+), *Viola odorata* (+).

Krascheninnikovia ceratoides phytocoenoses from Alfambra, Spain

Krascheninnikovia ceratoides* phytocoenoses** from Spain are framed into the *Salsolo-Peganion* alliance, that represents a regressive stage of the Mediterranean thickets known as matorrales, being an ubiquitous taxon that occurs several alliances like *Rosmarino-Ericion*, *Gypsophilion*, but mostly *Salsolo-Peganion* (TENORIO *et alii*, 2000), so at least a part of these phytocoenoses could be framed into the habitat of community importance **1430 Halo-nitrophilous scrubs (Pegano-Salsoletea)** and its correspondent **15.72 Mediterranean halo-nitrophilous scrubs (Salsolo-Peganelalia)** – according to the EUR 28 version of the *Interpretation Manual of the European Union Habitats* () 2013). In Dobrogea ***Krascheninnikovia ceratoides*** was only recorded in the *Festucion valesiacae* and *Artemisio-Kochion* alliances, both framed into the habitat **62C0* Ponto-Sarmatic steppes (34.92 Ponto-Sarmatic steppes)**.

In Spain, maybe because of this ubiquitous character, in the previously mentioned reference (TENORIO *et alii*, 2000), the phytocoenoses dominated by *Krascheninnikovia ceratoides* are not framed in any proper plant community, like the ones identified in Romania that belong to the ***Agropyro cristati-Krascheninnikovietum ceratoidis* J. A. Kovács 2011**. Still it is important to underline that the key species *Agropyron cristatum* of this plant community was also identified within one of the plots from Spain, presented below. In this situation, the two plots recorded by the author from the surroundings of the Alfambra castle, Aragon (Spain), will be just mentioned as ***Krascheninnikovia ceratoides* phytocoenoses**, as no proper plant community denomination was identified in the references on its phytosociology (TENORIO *et alii*, 2000), or anywhere else on the web. These two plots, of 100 square meters each, were inventoried in March 2019, when only a few perennials were visible, mostly in a

vegetative stage, the samples being very poor in species, but this is a general characteristic of the *Krascheninnikovia ceratoides* phytocoenoses, both in Spain and in Dobrogea, Romania. Thus, the number of species per plot is framed between five and eight for the phytocoenoses analyzed in Spain, on plots of 100 square meters area, while in Dobrogea the smaller plots, of 50 square meters, have 12-14 species. The first plot is characteristic for deep terra rossa soils on slopes, while the second is typical for dryer conditions, as it occurs on rocky summits of the hills, being even poorer in species.

A low to medium disturbance can be estimated from the presence of three ruderal species, with coverage of (+-1). *Krascheninnikovia ceratoides* is the only threatened taxon that was identified so far, considered vulnerable in Aragon (Spain). Within the analyzed phytocoenosis it can be considered sporadic, as it is dominant, while in the Alfambra area it can be preliminarily assessed as vulnerable.

1430 Halo-nitrophilous scrubs (Pegano-Salsoletea)

15.72 Mediterranean halo-nitrophilous scrubs (Salso-Peganelalia)

Krascheninnikovia ceratoides phytocoenoses from Alfambra recorded in two plots have only one threatened species *Krascheninnikovia ceratoides*, dominant within the plant community. A medium level of disturbance is indicated by four ruderal taxa, with a significant variation of abundance-dominance indices.

Plot Kr1-2-03-19:

Key species: *Krascheninnikovia ceratoides* (3).

Threatened species: *Krascheninnikovia ceratoides* (3).

Other species: *Agropyron cristatum* (1), *Diplotaxis muralis* (+), *Poa bulbosa* (1), *Salsola vermiculata* (+), *Sedum sediforme* (+), *Stipa parviflora* (+), *Veronica hederifolia* (+).

Plot Kr2-2-03-19:

Key species: *Krascheninnikovia ceratoides* (3).

Threatened species: *Krascheninnikovia ceratoides* (3).

Other species: *Artemisia herba-alba* (+), *Diplotaxis muralis* (+), *Heliotropium europaeum* (+), *Stipa parviflora* (+).

Comparative analysis

In Spain the species is quoted (DOMINGUEZ *et alii*, 2001) as small populations, especially in the clearings of shrubby vegetation, close to cultivated areas, which indicate ruderal conditions, like in the plant communities from Romania. Similar to the phytocoenoses described in Transilvania, also in Dobrogea these are present in the disturbed areas of steppe meadows, usually grazed, including many ruderal species in the specific composition. The analysis of the ruderal species participation within the coenotaxa from Muchiile Cernei-Iaila Nature

Reserve indicates a medium level of disturbance due to human activities, shepherding, trampling, etc., similar to ones from the Transylvania – Romania, while in Spain, at Alfambra, within a typical continental climate, grazing is prohibited, but the soil erosion is active on the steep soils, where the species also occur on barren rocky soils (DOMINGUEZ *et alii*, 2001), unlike Dobrogea.

In Dobrogea *Krascheninnikovia ceratoides* plant communities are located in more continental microclimates than the general steppe macroclimate of the area, being found only on chernozem steppe soils formed on loess, only on the northern slopes of the hills from Muchiile Cernei-Iaila Nature Reserve, in the lower half, towards a large depression, but on all microrelief exposures, not only southern ones as in Transylvania. Even though in Spain, in general this species occurs at the foothill of gentle slopes and within the valley bottom (DOMINGUEZ *et alii*, 2001), in Alfambra-Spain, the *Krascheninnikovia ceratoides* plant communities seem to be better adapted to the general macroclimate than in Romania, still with more continental/ steppic influences than the overall Mediterranean climate of Spain. Thus, it was observed on all exposures of the slopes, and also of plateaux and valleys, on deep to shallow soils. In Spain the species is considered nitrophyllous and halophyllous, similar to the locations within Central Asia (TENORIO *et alii*, 2000). In Dobrogea it occurs on chernozems on loess, so in this case *Krascheninnikovia ceratoides* cannot be considered nitrophyllous nor halophyllous.

This is considered a Mediterranean-Turanian taxa, or Eurasiatic, with a wide range of distribution centered in the Irano-Turanian region, from where it expands eastwards to Mongolia and Northern America, while to the west it has an insular distribution in Russia, in south east Europe, mainly in the Danube Bassin on loess, like in Romania (Dobrogea, Transylvania), Hungary, Austria reaching Spain and Morocco (TENORIO *et alii*, 2000). The latest two regions were probably colonised through a preglacial migration during the Messinian dry period through the *Stipa capillata* steppes of the Danube valley (JUARISTI, 2003). Taking into account this theory, one of the oldest populations from the Danube valley could be represented by these *Krascheninnikovia ceratoides* phytocoenoses within Muchiile Cernei-Iaila Nature Reserve. Indeed, this site is located at the eastern end of the Danube valley. Still, the distribution area of some saharo-sindian taxa, usually associated with *Krascheninnikovia ceratoides*, like *Stipa tenacissima*, *Artemisia herba-alba*, underlines also the possibility of a south-Mediterranean migration (TENORIO *et alii*, 2000). It is important to notice that *Agropyron cristatum*, a continental species, is associated with *Krascheninnikovia ceratoides* in Dobrogea and Transylvania, but also in the proper plots recorded in Alfambra, which could confirm the theory of a north Mediterranean migration of both species. In this respect it should be taken into account the European distribution of *Agropyron cristatum*.

Dobrogea is considered to have been the refuge of forest species during the last Ice Age (PAȘCOVSCHI, 1967), but it could have been also a refuge for some continental species like *Krascheninnikovia ceratoides*. In this respect some authors (TENORIO *et alii*, 2000) consider that *Krascheninnikovia ceratoides* was spread after the last glaciations from the Mediterranean refuge. It could have spread maybe also from the Dobrogea refuge, probably the northernmost area of the East Mediterranean refuge. Even nowadays, at least the southern seacoast of the Romanian Dobrogea, is considered the Euxinic province of the Mediterranean region (CIOCĂRLAN, 2009).

In the recorded plots in Alfambra-Spain, *Krascheninnikovia ceratoides* is one of the typical steppe species that form a part of the plant communities' inventories, similar to the situation from Dobrogea. The difference is that in Dobrogea the species are mainly characteristic for the cold (continental) steppe, while in Alfambra some taxa confer a distinctive aspect of warm (Mediterranean) steppe. It is considered a Tertiary relict taxa classified as vulnerable in the latest area, according to some references (*Catalogo de especies amenazadas de Aragon – Flora*), but other studies rank it into the not threatened IUCN category (DOMINGUEZ *et alii*, 2001). Within our proper studies in Alfambra, within the two plots *Krascheninnikovia ceratoides* was recorded with a dominance index of 3, which could frame preliminarily it into the "sporadic" category within these phytocoenoses. Still from only two plots this cannot be extrapolated to the whole Alfambra area, where the author estimates it as „vulnerable”, as these populations were observed on the hill around the medieval castle, but also on several valleys southwards of Alfambra village, There, this species can be dominant in some plant communities, respectively codominant or rare in other phytocoenoses.

In the Romanian Dobrogea, while at the country level it is considered insufficiently known (OLTEAN *et alii*, 1994), respectively very rare (CIOCĂRLAN, 2009), the present paper rank it as endangered at the level of the nature reserve, where it was observed with dominance indices of 1-4 within the plots, which could frame it into the vulnerable to frequent within the analyzed phytocoenoses. But the plant communities where *Krascheninnikovia ceratoides* is dominant or codominant are very restricted, so at the level of the nature reserve the species could be considered critically endangered, like also in Dobrogea region, where this is the only site confirmed by recent inventories.

Conclusions

At the site level, three habitats of community interest were identified, all priority ones, respectively: **62C0* Ponto-Sarmatic steppes**, **91AA* Eastern white oak woods** and **91I0* Euro-Siberian steppe woods with *Quercus* spp.** Of the 10 associations observed, most are endangered (four cenotaxa),

followed by rare (two cenotaxa), vulnerable or frequent syntaxons (one cenotaxon). The degree of ruderalization is low for most associations. Exceptions are the medium disturbed cenotaxa (*Agropyro-Thymetum zygoidi*, *Paeonio peregrinae-Carpinetum orientalis*, *Agropyro cristati-Krascheninnikovietum ceratoidis*), or those with a high level of ruderalization (*Artemisio austriacae-Poëtum bulbosae*).

The richest in endangered species is considered the association *Agropyro-Thymetum zygoidi* (seven species), followed by *Medicagini minimaefestucetum valesiacae* (five species), *Botriochloetum ischaemi* (three species), *Agropyro cristati-Krascheninnikovietum ceratoidis* and *Galio dasypodi-Quercetum pubescentis* (two species), respectively *Thymio pannonicichrysopogonetum grylli* (one species). Most nationally threatened species are endangered locally, at least in the associations that contain them. They are followed by sporadic/ frequent species within the respective phytocenosis, dominant within the plant communities, such as *Thymus zygoides* and *Krascheninnikovia ceratoides*, respectively by those critically endangered like *Salvia aethiopsis*.

Krascheninnikovia ceratoides is a relict species, which could attest to the existence also in Dobrogea of the “mammoth cold steppe”. Muchiile Cernei-laila reserve is a new recorded site in Romania, and consequently in Europe, for *Krascheninnikovia ceratoides*. It is also the only site from Dobrogea confirmed by recent inventories.

Similar to the phytocenoses described in Transylvania and Alfambra, also in Dobrogea *Krascheninnikovia ceratoides* plant communities are present in the disturbed/ ruderal areas of steppe meadows. In Dobrogea these plant communities are located in more continental microclimates than the general cold (continental) steppe macroclimate of the region. In Alfambra *Krascheninnikovia ceratoides* occurs in a warm (Mediterranean) steppe, with a more continental climate than the overall Mediterranean climate of Spain. As probably Spain was colonised by *Krascheninnikovia ceratoides* through a preglacial migration through the *Stipa capillata* steppes of the Danube valley, some of the oldest populations from this natural corridor could be these phytocenosis from Muchiile Cernei-laila Nature Reserve. While in the Muchiile Cernei-laila area our proper studies frame *Krascheninnikovia ceratoides* as an endangered species, in the Alfambra area it could be estimated as „vulnerable”, so less threatened. Still, in both regions, this rare relictar species should be protected through adequate management measures, together with the habitats where it occurs.

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Habitats of Community Interest from the Danube Delta Biosphere Reserve and Associated Natura 2000 Sites (SCI, SPA) Inventoried between 2014-2018

Habitat de interes comunitar din Rezervația Biosferei Delta Dunării și siturile Natura 2000 asociate (SCI, SPA) inventariate în perioada 2014-2018

Mihai PETRESCU

Abstract

The present work is a result of the research theme “Research on flora and avifauna species, habitats and landscapes of conservative interest in the Natura 2000 sites in Dobrogea”, where there will be presented the aspects regarding the flora, vegetation and habitats of conservation importance within the Danube Delta Biosphere Reserve (D.D.B.R.) and the overlapping Natura 2000 sites (SCI, SPA). Taking into account that the frequency of the habitats and species within the studied areas was estimated according to their percentages observed within the research itineraries, respectively (for the threatened species) their coverage within the plots, their threat categories (endangered, vulnerable, rare, etc.) has only a preliminary character.

According to their estimated frequency within the studied site, most of the habitats could be considered endangered (13 habitats), followed by vulnerable (eight habitats), sporadic (three habitats) and rare (two habitats) ones. The assessed conservation status ranks from undisturbed (13 habitats), low disturbed (nine habitats), highly disturbed (two habitats) to medium disturbed (one habitat).

The number of threatened species is the highest within the loess/ rocky steppes (62C0 – 17 species), sand steppes (6260* – 12 species), sand beaches (1210 – nine species) and salt marshes and steppes (1530 – seven species). The rest of the habitats have between 0 and 5 threatened species.*

This outstanding natural heritage requires adequate management measures. Among the 25 habitats studied within proper research, six are priority ones for conservation overall the European Union. Within the Danube Delta Natura 2000 sites and overlapping sites, according to proper preliminary studies and criteria, most of these (14 habitats) should have a high priority within conservation measures, while seven habitats could be of secondary priority, followed by four habitats with a low priority.

Keywords: *D.D.B.R., habitats of community interest, threatened, endangered, vulnerable, sporadic, rare, disturbed, priority*

Introduction

The present work is a result of the research theme “Research on flora and avifauna species, habitats and landscapes of conservative interest in the Natura 2000 sites in Dobrogea”, where there will be presented the aspects regarding the flora, vegetation and habitats of conservation importance within the Danube Delta Biosphere Reserve (D.D.B.R.) and the following Natura 2000 sites, wholly or partially overlapping with it (SCI, SPA): ROSCI0065 Delta Dunării, ROSPA0031 Delta Dunării and Complexul Razim-Sinoie, ROSPA0009 Beștepe-Mahmudia, as well as neighboring sites (ROSPA0052 Lacul Beibugeac). The ROSCI0066 Delta Dunării-Zona marină and ROSPA0076 Marea Neagră have not been studied, being beyond ICEM Tulcea’s scientific competence, as these include marine habitats and species, studied by other institutions (I.N.C.D.M. „Gr. Antipa” Constanta etc.).

From the ecological point of view, Dobrogea region (that includes Tulcea and Constanța counties) represents the most important region of Romania, as here the largest surface of protected areas/ Natura 2000 sites occurs at the national level. It also represents the most important natural area in the European Union for the conservation of most species and habitats of community interest from the Steppic and Pontic bioregions.

In this context, even though numerous studies were conducted in Tulcea County, they were mainly focused on the Danube Delta area, for the remaining area the existing data being less detailed and/ or updated. For this particular reason the “*Gavrilă Simion*” Eco-Museum Research Institute of Tulcea (I.C.E.M.) initiated an overall and updated assessment of the natural heritage of this region within the Natura 2000 ecological network.

Within this work, there will be presented the plant species, vegetation and habitats from the Danube Delta Biosphere Reserve, but also from the Danube Delta Natura 2000 sites (SCI, SPA) as follows: ROSCI0065 Delta Dunării, ROSPA0031 Delta Dunării și Complexul Razim-Sinoie, ROSPA0009 Beștepe-Mahmudia, ROSPA0052 Lacul Beibugeac. Wherever possible there will be indicated the names of the places where the species, plant communities and/ or habitats were identified, or at least the territorial administrative unit (TAU) on whose territories they were identified.

Besides the scientific importance of this research, which can be used as a basis for the clarification, particularization and updating of the data regarding the presence occurrence, conservation status of some protected species and habitats, another goal is facilitating national and European funds at the level of each territorial administrative unit of the county. This could be achieved using the results of the research partially presented in this paper, for the: management on

a scientific basis of the natural heritage within the areas under the jurisdiction of the local authorities, both inside and outside protected areas; the drafting of the chapters regarding the natural heritage of each TAU within the financial applications; the procurement of clearings, etc.

Methods and Materials

The on-site research consisted in observations on itineraries and inventories generally in 100 square meters plots, according to the Braun-Blanquet method. The coenotaxa with an area below 100 square meters were considered plant community fragments, therefore they were not recorded in plots. Only in few situations, for forest habitats with high trees, of 200 square meters plots were used, in order to properly include all main key species. In the plots the species dominance is assessed according to the Braun-Blanquet scale. Within a certain plant community the dominance of the species identified outside the plots only and the sites where they are located are underlined in the text. The flora inventory is presented in the lists of species mentioned for each coenotaxon in the habitat description. For each species, between brackets, the variation limits of the dominance are mentioned, followed by the site where they were identified. For each plant community in a certain habitat first the most important species for conservation, represented by the key, respectively the threatened taxa there are presented. The remaining species, for the forests and thickets are grouped in vegetation layers that correspond to the main groups of biological forms (trees, shrubs/ lianas, grasses, etc.). The identification and framing of the plant species, coenotaxa and habitats are based on PHYSIS database and other papers or field guides (CIOCÂRLAN, 2009; DEVILLIERS *et alii*, 1996; DIHORU, DONIȚĂ, 1970; DONIȚĂ *et alii*, 2005, HOREANU, 1976b; IVAN, 1979; OLTEAN *et alii*, 1994; PETRESCU, 2007; PRODAN, 1934-1935; PRODAN, 1935-1936; PRODAN, 1938-1939; SANDA, ARCUȘ, 1999; SANDA *et alii*, 2008; SĂVULESCU *et alii*, 1952-1976; SÂRBU *et alii*, 2007).

The scientific names of the threatened taxa was maintained as it is listed in the National Red List (OLTEAN *et alii*, 1994) in order to avoid any confusion, even though the denomination of all the other species corresponds mainly to other more recent references (CIOCÂRLAN, 2009). The framing of the taxa was made according to the conservation importance. Thus taxa were framed to the subspecies level only where it was necessary to distinguish between infrataxa with or without conservation importance (ex. *Corydalis solida* subsp. *slivenensis* versus *Corydalis solida* subsp. *solida*), only in the case of the threatened taxa. The threatened species where the subspecies is not mentioned were mentioned in this form in order to correspond with the scientific denomination listed in the national red list (OLTEAN *et alii*, 1994).

For the key species the subspecies was mentioned only where the plant community denomination specifies the respective subspecies scientific name, in order to justify the proper framing of the studied phytocoenoses; like *Sedo hillebrandtii-Polytrichetum piliferi*, in which case it was necessary to separate *Sedum urvillei* subsp. *hillebrandtii* by *Sedum urvillei* subsp. *urvillei*. The other taxa, with no particular conservation value, were framed only to the species level, being mentioned in their *sensu lato* form, except the exceptional situations in which it was necessary to make a distinction between a native and an alien species (ex. *Cannabis sativa* subsp. *spontanea* versus *Cannabis sativa* subsp. *sativa*), significant for the conservation status of a certain plant community. Similar situations, where some subspecies that are important for conservation are mentioned, while the other taxa are only framed at the species level can also be quoted from the references mentioned previously (SANDA, VICOL, ȘTEFĂNUȚ, 2008).

The correspondence with the community interest habitats follows the descriptions in the EUR 27 version of the *Interpretation Manual of the European Union Habitats* (EUROPEAN COMMISSION-DG ENVIRONMENT, 2007). The preliminary assessment of the importance and conservation status of threatened species or habitats/coenotaxa, as a basis for the evaluation of the conservation priorities, was made by using a scale, as follows. For the species the first three gradations correspond to the IUCN threat categories (endangered, vulnerable, rare), to which the “*critically endangered*” category was added. For the next three gradations, that correspond to the IUCN category “*not threatened*”, the following frequency categories were used: sporadic, frequent, very frequent. A correspondence was also set between these categories and the Braun-Blanquet scale for the assessment of the dominance within the plots. For the preliminary evaluation of the habitat threat categories an adapted form of the previous scale was used, based on the estimation of the percentage limits in the research route within which the habitat/ coenotaxa was noticed (Table 1).

The conservation status was preliminary assessed by threat categories. Thus, the higher threat categories correspond to a lower conservation status, closer to an unfavourable level. Also the higher the number of threatened species, the better the conservation status can be considered. Taking into account if the habitat is a priority one not, combined with its threat category/ estimated area the habitat urgency for the intervention with adequate management measures was ranked, in decreasing order in three categories: high priority, priority, secondary priority.

Wherever data allowed also the conservation status of the plant communities/ habitats induced by the intensity of human activities was assessed. A simple scale which estimates a high, medium and low or null level of disturbance was used, taking into account the dominance indices and the number of ruderal and/or non-native species identified in the plots located in plant communities, in the studied habitats.

Table 1. The correspondence between the dominance, habitat frequency and the threat categories for species and habitats/ coenotaxa
Tabel 1. Corespondența dintre dominanță, frecvența habitatului și categoriile de amenințare pentru specii și habitate/ cenotaxoni

Dominance indices (specii)	Threat category	Habitat frequency in the studied area (% of the route)
– <5 individuals/ plot, with negligible dominance	critically endangered	-
+ – ≤ 1 % dominance	endangered	+ – ≤ 1 %
1 – 1-10 % dominance	vulnerable	I – 1-10 %
2 – 10-25 % dominance	rare	II – 10-25 %
3 – 25-50 % dominance	sporadic	III – 25-50 %
4 – 50-75 % dominance	frequent	IV – 50-75 %
5 – 75-100 % dominance	very frequent	V – 75-100 %

Within each plant community the presence of at least one ruderal/non-native species with a certain dominance index corresponds to a level of disturbance, i.e.: r – very low; + – low, 1 – medium; 2-5 – high. Additionally, for oak forests that are usually represented by more or less derived phytocoenoses, if the oak species proportion is: higher or equal to 2 (20%) – low disturbance; between (or equal to) 1 (10%) and 2 (20%) – medium disturbance; no oaks – high disturbance. The highest disturbance level in the canopy or shrub/grasses layer is considered representative for the overall plant community. Within the species list for each plant community the ruderal species are underlined, while the non-native ones are mentioned in the description of the respective coenotaxa.

HABITATS MENTIONED WITHIN THE DANUBE DELTA SCI THAT WERE NOT STUDIED WITHIN PROPER RESEARCH

The habitats mentioned in the initial documents that were used for the Danube Delta SCI (Formularul standard Natura 2000 – ROSCI0065), were not all studied within proper research, for different reasons. The habitats 1110 and 3140 overrun the frame of the present research, while the habitats 6120*, 6420, 6440, 6510 were not identified within proper inventories, as they most probably do not occur within the D.D.B.R. or Danube Delta SCI and SPA. This is explainable as when the initial documents for this SCI were elaborated the available data about this habitats were scarce, but nowadays the existing

information allows and requires the readjustment of these habitat lists. The 6410 habitat, even though is confirmed in some works (SANDA, ARCUŞ, 1999) within this studied area, was not observed within proper research so far.

1110 Sandbanks which are slightly covered by sea water all the time, was not studied as it overruns the frame of the present research, being mainly found within the Danube Delta-Marine zone SCI, studied by institutions specialized in marine research.

3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (PAL.CLASS.: (22.12 or 22.15) x 22.44)), represented in the Danube Delta by the subtype **22.44 Chandalier algae submerged carpets** has as algae as key species, so it outruns the frame of the present research, focused on higher plants and habitats dominated by these.

6120 * Xeric sand calcareous grasslands (PAL.CLASS.: 34.12)

This habitat that corresponds to the subtype **34.12 Middle European pioneer calcareous sand swards** occurs, according to the PHYSIS database, in Western Europe and Western and Northern Central Europe, locally to Lithuania and Belarus. Thus its range does not include nor Romania nor the Danube Delta region. Also the alliances *Koelerion glaucae* and *Sileno conicae-Cerastion semidecandri*, or their synonyms (MUCINA *et alii*, 2016) are not present in the Danube Delta, at least according to synthesis works about this region (SANDA, ARCUŞ, 1999). Some of the key species of the 6120 habitat, like *Carex ligerica*, *Euphorbia seguieriana*, *Helichrysum arenarium*, *Koeleria glauca* could indicate similarities with the plant communities typical for the sandy steppes that occur in the Danube Delta, framed within the subtype **34.A21 Western Pontic sand steppes** and within the corresponding *Festucetalia vaginatae* order. Within this order there are included numerous plant communities mentioned from the Danube Delta and its adjacent areas from the Dobrogea Plateau (SANDA, ARCUŞ, 1999), which were also identified and described within proper research presented in this work, that are obviously included in the **6260* Pannonic sand steppes**. In conclusion the sandy steppes of the Danube Delta and the associated sites are framed obviously within the **6260* Pannonic sand steppes** (PAL.CLASS.: 34.A1, 34.A2), where the West Pontic basin, that includes the Danube Delta Biosphere Reserve and its associated sites, is explicitly mentioned, unlike for the 6120 habitat whose range does not include this region.

Probably due to a confusion between the two community interest habitats **6120* Xeric sand calcareous grasslands** (PAL.CLASS.: 34.12)-**34.12 Middle European pioneer calcareous sand swards**, respectively the **6260***

Pannonic sand steppes (PAL. CLASS.: 34.A1, 34.A2)-**34.A21 Western Pontic sand steppes**, the first habitat was included on the list of the D.D.B.R. habitats, while the second is missing. This confusion should be urgently revised, in order to replace the habitat **6120*** with **6260*** on the official list of the D.D.B.R. habitats of community interest, or to mention both provisory until accurate research will clarify this problem. On the other hand the priority habitat **6260*** occur without any doubt in the D.D.B.R. and associated sites, including, on a phytocoenological basis, all the sand steppes of this area, so that is unlike that some of these steppes could be framed into the 6120* habitat. In this respect the presence of the **6260*** habitat within the D.D.B.R. and associated sites should be officially admitted, in order to include this priority habitat within management plans, or to readjust the management measures elaborated for the 6120* habitat to the 6260*, taking into account that they are similar.

6410 *Molinia* meadows on calcareous, peaty or clayey-siltladen soils (*Molinion caeruleae*) (PAL.CLASS.: 37.31)

This habitat, framed into the subtype **37.31 Purple moorgrass meadows and related communities**, including plant communities from the alliance *Molinion caeruleae* is represented within the D.D.B.R. by the coenotaxa ***Vicio biennis-Molinietum euxinae* Dihoru et Negrean 1976**, according to synthesis works (SANDA, ARCUŞ, 1999). Quoted from Letea Forest, this one was not observed so far within proper inventories, so it should be a priority in the future field research.

6420 Mediterranean tall humid herb grasslands of the *Molinio-Holoschoenion* (PAL.CLASS.: 37.4)

This habitat presence into the D.D.B.R. and associated sites is doubtful, even if the coasts of the Black Sea are mentioned in its description. Even if within the subtype **37.4 Mediterranean tall humid grasslands**, that corresponds to the *Molinio-Holoschoenion* alliance, the Danube Delta and adjacent Dobrogea regions are mentioned, the *Molinio-Holoschoenion* alliance is described only from the Western Mediterranean, where it includes seasonally flooded meadows on subsaline soils (MUCINA *et alii*, 2016). *Molinio-Holoschoenion* alliance or its synonyms (MUCINA *et alii*, 2016) or plant communities framed within it were also not found within synthesis works about the vegetation of Dobrogea and the Danube Delta (SANDA, ARCUŞ, 1999). Taking into account some of the key species like first of all *Agrostis stolonifera*, then other taxa that can be co-dominant within these type of meadows (dominant within other habitats of community interest in which they were framed within the present work 1530* (*Juncus maritimus*), 7230 (*Schoenus nigricans*) 6260* (*Scirpus holoschoenus*) and also *Tetragolobus maritimus*, *Orchis*

laxiflora (*Orchis laxiflora* subsp. *elegans*), this habitat could be represented in the D.D.B.R. by plant communities from the *Agrostion stoloniferae* alliance (SANDA, ARCUȘ, 1989), but this alliance is not mentioned within this 6420 habitat, nor within other community interest habitats. Representative for this alliance would be first of all the coenotaxa *Agrostetum stoloniferae* (Ujvarosi 1941) Burduja et al. 1956 that occur in the D.D.B.R. (SANDA, ARCUȘ, 1999). From this alliance, within proper research, there was identified so far the coenotaxa *Poëtum sylvicolae* Buia et al. 1959, presented below, but this fact does not ascertain the presence of the 6240 habitat within the D.D.B.R. and associated sites.

Another possibility is that this 6420 habitat was confused with the **7230 Alkaline fens** (PAL.CLASS.: 54.2) habitat of community interest, that occur without any doubt within the D.D.B.R.. Thus, it was recorded within the Corbu Beach at least, presented within the present work, framed within the subtype **54.217 Pontic dunal black sedge fens**, described within the PHYSIS database, represented by the coenotaxa ***Orchido-Schoenetum nigricans Oberd.1957***. This was also quoted from nearby areas, southwards of the Corbu Beach (Năvodari), or within the proper D.D.B.R., from Sărăturile levee and Sfiștofca (SANDA, ARCUȘ, 1999). In this second situation, if finally it will be officially admitted that the 6420 does not exist within the D.D.B.R., it could be replaced by the 7230 habitat within management measures that could be revised adequately, or adapted, as these are similar habitats.

In conclusion the Danube Delta Biosphere Reserve Administration (D.D.B.R.A) should have as a priority to clarify if this habitat or other doubtful/ similar community interest habitats really occur within the D.D.B.R. and associated sites, in order to officially revise the list of the habitats of community interest, respectively to take measures for their conservation and to report them adequately to the European Commission.

***Poëtum sylvicolae* Buia et al. 1959** can be estimated so far as being endangered within the Tulcea's territory (TDV), where the only ruderal species observed in the plot is *Xanthium italicum* that corresponds to a low disturbance level from this point of view.

Key species: *Poa sylvicola* (5; TDV).

Other species: *Althaea officinalis* (+; TDV), *Cynodon dactylon* (1; TDV), *Phragmites australis* (+; TDV), *Rumex palustris* (+; TDV), *Senecio paludosus* (+; TDV), *Xanthium italicum* (+; TDV).

6440 Alluvial meadows of river valleys of the *Cnidion dubii*
(PAL.CLASS.: 37.23)

According to proper studies, this habitat does not occur within the

D.D.B.R. and associated sites, for several reasons. The corresponding habitat **37.23 Subcontinental riverine meadows** includes alluvial meadows from subcontinental climate regions of Central Europe, of which north-eastern Croatia is the closest area to the Danube Delta, still separated by hundreds of kilometers; the *Cnidion dubii* (syn. *Deschampsion caespitosae*) alliance, and the plant communities mentioned within it (*Violo-Cnidetium*, *Oenanthe lachenalii-Molinietum*, *Lathyro palustris-Gratioletum*, *Gratiolo-Caricetum praecosis-suzae*, *Cnidio-Violetum pumilae*, *Cnidio-Violetum elatioris*, *Juncetum atrati*) were not identified within proper research and are not quoted within synthesis works (SANDA, ARCUŞ, 1999) about the D.D.B.R. and associated sites; the habitat 6440 is not mentioned within synthesis works about the habitats of Romania (DONIŢĂ *et alii*, 2005). In conclusion the D.D.B.R.A should have as a priority to clarify if this habitat or other doubtful/ similar community interest habitats really occur within the D.D.B.R. and associated sites, in order to officially revise the list of the habitats of community interest, respectively to take measures for their conservation and to report them adequately to the European Commission.

6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (PAL.CLASS.: 38.2)

According to proper studies, this habitat does not occur within the D.D.B.R. and associated sites, for several reasons. The corresponding habitat **38.2 Lowland and collinar hay meadows**, is characteristic of the Euro-Siberian zone, that includes the Danube Delta. However, the mentioned alliances *Arrhenatherion elatioris*, *Brachypodio-Centaureion nemoralis*, *Festucion pratensis* are not quoted (nor their synonyms or their component coenotaxa) within synthesis works (SANDA, ARCUŞ, 1999) about the D.D.B.R. and associated sites. Still the habitat 6510 is mentioned within synthesis works about the habitats of Romania (DONIŢĂ *et alii*, 2005). No phytocoenological arguments are presented for this framing that was probably done on the basis of key species only. Without the adequate use of the phytocoenological classification, this framing based only on key species can be misleading, as the same key species may occur in several habitats. Within the Annex 3 (DONIŢĂ *et alii*, 2005) within the 6150 habitat there it mentioned the subtype **R3715 Danubio-Pannonic *Agrostis stolonifera* meadows**, that is also mentioned from Dobrogea, that includes the Danube Delta. The same subtype is not mentioned anymore within the 6150 in the same reference, page 171. Still, the *Agrostis stolonifera* meadows also found within the Danube Delta, framed into the coenotaxa *Agrostetum stoloniferae* (Ujvarosi 1941) Burduja *et al.* 1956, that occur in the D.D.B.R. (SANDA, ARCUŞ, 1999), can be framed into the only subtype dominated by *Agrostis stolonifera* described in the PHYSIS database,

respectively **37.2422 Creeping bent flood swards**, but the 37.2422 code does not correspond to the 38.2 code typical for this habitat.

In conclusion, the D.D.B.R.A should have as a priority to clarify if this habitat or other doubtful/ similar community interest habitats really occur within the D.D.B.R. and associated sites, in order to officially revise the list of the habitats of community interest, respectively to take measures for their conservation and to report them adequately to the European Commission.

HABITATS IDENTIFIED WITHIN THE DANUBE DELTA BIOSPHERE RESERVE AND ASSOCIATED NATURA 2000 SITES, STUDIED WITHIN PROPER RESEARCH

Most of the habitats mentioned in the initial documents that were used for the Danube Delta SCI (Formularul standard Natura 2000 – ROSCI0065) were also confirmed and studied more or less in detail within our own investigations. Still, within proper research three new community interest habitats were identified within the D.D.B.R. and associated Natura 2000 sites habitat, that are not mentioned in the Danube Delta SCI: **2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)** (PAL.CLASS.: 16.212), **6260* Pannonic sand steppes** (PAL.CLASS.: 34.A1, 34.A2), **7230 Alkaline fens** (PAL.CLASS.: 54.2). This is explainable as when the initial documents for this SCI were elaborated the available data about these habitats were scarce, but nowadays the existing information allows and requires the readjustment of these habitat lists.

1150* Coastal lagoons (PAL.CLASS.: 21)

21 Coastal lagoons

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 9072 ha and a conservation status of B level.

The habitat subtypes that occur within this habitat, that extend on reduced areas in comparison with the open waters devoid of vegetation (higher plant coenotaxa), can be considered overall as mostly rare (sometimes from endangered to frequent), and mainly undisturbed, with isolated situations medium or low disturbance, first of all due to alien taxa (*Vallisneria spiralis*) and less to ruderal species. These subtypes were recorded mainly within the: Razim Lagoon-Grădiștea Island, the reed beds framed between the Razim Lagoon open waters and the Babadag Lake (Sarichioi TAU); Golovița Lagoon, between Cape Doloșman and Jurilovca (Jurilovca TAU), Tuzla Lake (Săcele TAU).

Polypogon monspeliensis was the only rare threatened species identified within this habitat as endangered.

It should be mentioned that, within this habitat, Sinoe lagoon can be considered as framed into the subtype **21.1 Sea-connected lagoons**, but the habitats within this lagoon were not yet studied within the present research.

21.2 Isolated lagoons

In the studied area, this habitat includes several other **habitat subtypes** as follows:

22.43 Rooted floating vegetation

This habitat subtype framed within the isolated lagoons subtype can be considered as between endangered and rare, and also undisturbed to medium disturbed, due to alien species (*Vallisneria spiralis*). It was recorded from the Razim Lagoon-Grădiștea Island (Sarichioi TAU), as well as within the Golovița Lagoon, between Cape Doloșman and Jurilovca (Jurilovca TAU).

Potamogetonum perfoliati Koch 1926 em. Passarge 1964 was observed as vulnerable and undisturbed in the area of the Grădiștea Island (GRD), Sarichioi TAU, and also towards the entrance in the channel that links the Razim Lagoon with the Babadag Lake. The plant community is formed usually by very sparse individuals of *Potamogeton perfoliatus*, being monodominant.

Key species: *Potamogeton perfoliatus* (+-1; GRD).

Potamogetonum perfoliati Koch 1926 em. Passarge 1964, a rare and undisturbed association within the Golovița Lagoon, between Cape Doloșman and Jurilovca (GDJ), Jurilovca TAU, is usually monodominant and formed by very sparse individuals of *Potamogeton perfoliatus*.

Key species: *Potamogeton perfoliatus* (+-1; GDJ).

Overall this plant community can be assessed as framed between vulnerable and rare, undisturbed, in the area of the Razim Lagoon-Grădiștea Island (Sarichioi TAU), as well as within the Golovița Lagoon between Cape Doloșman and Jurilovca (Jurilovca TAU).

Myriophyllo-Potametum lucentis Soó 1934 is a plant community in which there were framed, at least provisionally the phytocoenoses dominated by *Myriophyllum spicatum* and *Vallisneria spiralis* that occur in the ponds and channels within the reed beds adjacent to the Golovița Lagoon, between Cape Doloșman and Jurilovca (GDJ), even if *Potamogeton lucens* was not observed in the plots. These can be framed into the subassociation **vallisnerietosum V. Karpati 1963**, as described in synthesis works on the vegetation of Dobrogea and the Danube Delta (SANDA, ARCUȘ, 1999). In the studied areas it can be considered as endangered and highly disturbed, due to the dominant alien species *Vallisneria spiralis*.

Key species: *Myriophyllum spicatum* (2; GDJ), *Vallisneria spiralis* (2; GDJ).

Other species: *Phragmites australis* (+; GDJ), *Potamogeton perfoliatus* (+; GDJ).

22.41 Free-floating vegetation

This habitat subtype is framed into the habitat of community importance **3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation**, being observed within the reed beds adjacent to the Golovița Lagoon, between Cape Doloșman and Jurilovca (Jurilovca TAU), where it could be preliminary estimated as rare, also medium disturbed due to the co-dominant alien species *Vallisneria spiralis*.

***Ceratophyllum demersi* Hild.1956** was registered as rare and medium disturbed between Cape Doloșman and Jurilovca (GDJ), Jurilovca TAU.

Key species: *Ceratophyllum demersum* (2; GDJ).

Other species: *Myriophyllum spicatum* (1; GDJ), *Vallisneria spiralis* (1; GDJ).

22.4313 Fringed waterlily carpets

The habitat subtype is endangered and undisturbed within the Razim Lagoon, near the Grădiștea Island (Sarichioi TAU).

***Nymphoidetum peltatae* (Allorge 1922) Bellot 1951** was inventoried as endangered and undisturbed in the shallow waters of the Razim Lagoon, near the Grădiștea Island (GRD), Sarichioi TAU.

Key species: *Nymphoides peltata* (4; GRD).

Other species: *Ceratophyllum demersum* (+; GRD), *Schoenoplectus lacustris* (+; GRD).

***Nymphoidetum peltatae* (Allorge 1922) Bellot 1951**, an endangered and undisturbed association, was recorded in the area of the Grădiștea Island (GRD), Sarichioi TAU.

Key species: *Nymphoides peltata* (5; GRD).

Other species: *Phragmites australis* (+; GRD), *Potamogeton perfoliatus* (+; GRD).

44.1621 Lower Danube willow galleries

***Salicetum albae* Issler 1924 s.l.**, framed within the habitat of community importance **92A0 *Salix alba* and *Populus alba* galleries**, is considered an endangered plant community in the the reed beds adjacent to the Golovița Lagoon, between Cape Doloșman and Jurilovca (GDJ), Jurilovca TAU. There can be estimated a low level of non-native plant invasive tendencies (*Vallisneria spiralis*).

Key species: *Salix alba* (5; GDJ).

Other species:

- grasses/ undershrubs: *Calystegia sepium* (+; GDJ), *Phragmites australis* (1; GDJ), *Vallisneria spiralis* (+; GDJ).

53.1111 Freshwater [Phragmites] beds

This habitat subtype is mainly rare, sometimes frequent and mostly undisturbed, rarely low disturbed. It was recorded from: the Razim Lagoon-Grădiștea Island, Sarichioi TAU; the reed beds framed between the Razim Lagoon open waters and the Babadag Lake (Sarichioi TAU); Golovița Lagoon, between Cape Doloșman and Jurilovca (Jurilovca TAU). Even though widespread in the Danube Delta, *Trapa natans* was recorded as critically endangered within this habitat.

Scirpo-Phragmitetum W. Koch 1926 was observed as a rare and undisturbed plant community in the Razim Lagoon-Grădiștea Island (GRD), Sarichioi TAU, nearly monodominant.

Key species: *Phragmites australis* (4; GRD),

Other species: *Nympoides peltata* (+; GRD)

Scirpo-Phragmitetum W. Koch 1926 can be considered a frequent and undisturbed association in the vast reed beds framed between the Razim Lagoon open waters and the Babadag Lake (RB), Sarichioi TAU.

Key species: *Phragmites australis* (5; RB).

Threatened species: *Trapa natans* (r; RB).

Other species: *Calystegia sepium* (+; RB), *Lythrum salicaria* (+; RB), *Lycopus europaeus* (+; RB), *Pulicaria dysenterica* (+; RB), *Myriophyllum spicatum* (+; RB), *Najas marina* (+; RB), *Typha angustifolia* (+; RB).

Scirpo-Phragmitetum W. Koch 1926 can be considered a rare association within the Golovița Lagoon, between Cape Doloșman and Jurilovca (GDJ), Jurilovca TAU. A low disturbance is indicated by the presence of the ruderal species *Tanacetum vulgare*.

Key species: *Phragmites australis* (5; GDJ).

Other species: *Calystegia sepium* (+; GDJ), *Lythrum salicaria* (+; GDJ), *Lycopus europaeus* (+; GDJ), *Tanacetum vulgare* (+; GDJ).

53.1122 Dry halophile Phragmites beds

Astero tripolii-Phragmitetum humilis Krisch (1972) 1974 was identified as rare and undisturbed in the brackish waters of the Tuzla Lake (STZ), Săcele TAU. *Polypogon monspeliensis* was the only rare threatened species identified, endangered within the plots.

Key species: *Phragmites australis* subsp. *australis* var. *humilis* (4; STZ).

Threatened species: *Polypogon monspeliensis* (+; STZ).

Other species: *Elymus elongatus* (+; STZ), *Apera spica-venti* (1; STZ), *Atriplex prostrata* (1; STZ), *Bolboschoenus maritimus* (1; STZ), *Juncus gerardi* (+; STZ), *Suaeda maritima* (+; STZ).

1210 Annual vegetation of drift lines (PAL.CLASS.: 17.2)

17.2 Shingle beach drift lines

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of B level.

The habitat is endangered and low disturbed, sometimes medium disturbed, mainly due to ruderal species, being less affected by alien taxa. The conservation importance of the habitat is enhanced by nine threatened species (*Artemisia tschernieviana*, *Crambe maritima*, *Convolvulus persicus*, *Eryngium maritimum*, *Ephedra distachya*, *Crambe maritima*, *Leymus racemosus* subsp. *sabulosus*, *Petasites spurius*, *Plantago coronopus*) these being framed between endangered and sporadic, at least within the plots. It was identified at the Sulina beach (Sulina TAU), Portița (Jurilovca TAU), between C.A. Rosetti and Cardon (C.A. Rosetti TAU).

17.22 Euro-Siberian shingle beach drift lines

Within this subtype there were identified several plant communities, as follows:

***Argusietum (Tournefortietum) sibiricae* Popescu et Sanda 1975**, an endangered plant community within the Sulina TAU's territory, where it was observed at the Sulina beach (SPL), Sulina TAU. There it is characterized by a low disturbance level, induced by one ruderal species. One rare threatened species, *Eryngium maritimum* is endangered, at least within the plots.

Key species: *Argusia sibirica* (2; SPL).

Threatened species: *Eryngium maritimum* (+; SPL).

Other species: *Lactuca tatarica* (+; SPL), *Salsola soda* (+; SPL), *Xanthium italicum* (1; SPL).

***Crambetum maritimae* (I. Șerbănescu 1970) Popescu et al. 1980** was found on the coastal sands of Portița (POR), Jurilovca TAU, where it occupies reduced areas, being framed as endangered. In its composition, four threatened species are included in the "rare" category at the national level, of which *Crambe maritima* and *Leymus racemosus* subsp. *sabulosus* are also considered vulnerable. Within the studied phytocoenoses these four species are mainly endangered, except the vulnerable *Leymus racemosus* subsp. *sabulosus* and the dominant key species. The two ruderal species, with significant coverage

(+/-1) indicate a medium disturbance, due to grazing and probably tourism activities on the beach adjacent to the resort.

Key species: *Crambe maritima* (3; POR).

Threatened species: *Crambe maritima* (3; POR), *Eryngium maritimum* (±; POR), *Leymus racemosus* subsp. *sabulosus* (1; POR), *Plantago coronopus* (±; POR).

Other species: *Bromus tectorum* (1; POR), *Centaurea arenaria* (+; POR), *Erodium cicutarium* (±; POR), *Glaucium flavum* (r; POR), *Gypsophila perfoliata* (±; POR), *Lactuca tatarica* (+; POR), *Lepidium perfoliatum* (r; POR), *Medicago lupulina* (r; POR), *Secale sylvestre* (+; POR).

***Convolvuletum persici* (Borza1931 n.n.) Sanda et al. 1998** is an endangered plant community that was noticed between C.A. Rosetti and Cardon (RC), in the surroundings of Cardon village (C.A. Rosetti TAU). There it can be considered as low disturbed as indicated by the non-native *Robinia pseudoacacia*. The dominant key species is also a rare threatened species, both at the national level and within the plant communities.

Key species: *Convolvulus persicus* (2; RC).

Threatened species: *Convolvulus persicus* (2; RC).

Other species: *Carex colchica* (+; RC), *Centaurea arenaria* (+; RC), *Cynodon dactylon* (+; RC), *Euphorbia seguieriana* (1; RC), *Polygonum arenarium* (+; RC), *Robinia pseudoacacia* (+; RC), *Scabiosa argentea* (+; RC).

***Convolvuletum persici* (Borza1931 n.n.) Sanda et al. 1998**, an endangered association within the Plaja (Beach) Sulina (SPL). It can be considered low disturbed as indicated by one ruderal species. Besides the key species another rare threatened species at the national level is *Eryngium maritimum*, endangered within the plots.

Key species: *Convolvulus persicus* (2; SPL).

Threatened species: *Convolvulus persicus* (2; SPL), *Eryngium maritimum* (+; SPL).

Other species: *Salsola soda* (+; SPL), *Xanthium italicum* (+; SPL).

***Convolvuletum persici* (Borza1931 n.n.) Sanda et al. 1998** can be considered as endangered within the Plaja (Beach) Sulina (SPL). It can be considered medium disturbed as indicated by two alien species with a significant coverage (*Conyza canadensis*, *Elaeagnus angustifolia*). Besides the key species, other rare threatened species at the national level are *Ephedra distachya* and *Petasites spurius*, endangered within the plots.

Key species: *Convolvulus persicus* (2; SPL).

Threatened species: *Convolvulus persicus* (2; SPL), *Ephedra distachya* (+; SPL), *Petasites spurius* (+; SPL).

Other species: *Centaurea arenaria* (+; SPL), *Conyza canadensis* (+; SPL), *Cynodon dactylon* (+; SPL), *Elaeagnus angustifolia* (1; SPL), *Euphorbia seguieriana* (+; SPL).

Overall this plant community is endangered and low disturbed (sometimes medium disturbed) mainly due to alien species and less to ruderal ones. Four threatened species were recorded (*Convolvulus persicus*, *Ephedra distachya*, *Eryngium maritimum*, *Petasites spurius*), the first one being rare while the other are endangered within the plots.

***Atripliceto hastatae-Cakiletum euxinae* Sanda et al. 1999** can be considered as endangered within the northernmost part of the Chituc levee (CN). It can be considered as low disturbed as indicated by one ruderal species. Two rare and vulnerable threatened species at the national level, *Artemisia tschernieviana* and *Crambe maritima*, are framed between endangered and vulnerable within this phytocoenosis.

Key species: *Cakile maritima* subsp. *euxina* (3; CN).

Threatened species: *Artemisia tschernieviana* (+; CN), *Crambe maritima* (1; CN).

Other species: *Lactuca tatarica* (+; CN), *Phragmites australis* subsp. *australis* var. *humilis* (+; CN), *Xanthium italicum* (+; CN).

1310 *Salicornia* and other annuals colonising mud and sand (PAL.CLASS.: 15.1)

15.1 Annual salt pioneer swards

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of B level.

The habitat was mostly observed as endangered, but also vulnerable and sporadic in some cases. A natural status of conservation was observed within most of the plant communities, except the low disturbed *Suaedo-Bassietum hirsutae* (Br.-Bl. 1928) Țopa 1939. Most of the seven threatened species at the national level are endangered at least within the plots (*Crambe maritima*, *Eryngium maritimum*, *Convolvulus persicus*, *Halocnemum strobilaceum*, *Leymus racemosus* subsp. *sabulosus*, *Limonium meyeri*), *Euphorbia peplis* being critically endangered. It was recorded from: seashores that belong to the Murighiol and Jurilovca communes (Portița), Sulina (Sulina TAU), Caraorman (Crișan TAU), Cășla Vădanei (Sfântu Gheorghe TAU), Agighiol Lake (Valea Nucarilor TAU), Sarichioi TAU, Portița (Jurilovca TAU), Cășla Vădanei (Sfântu Gheorghe TAU), between Letea, C.A. Rosetti and Cardon (C.A. Rosetti TAU), Sarinasuf (Murighiol TAU), Histria-Saele levee (Istria TAU), Plaja (Beach) Corbu (Corbu TAU).

15.11521 Western Pontic glasswort-seablite-saltwort swards

As an overall assessment this habitat subtype/ plant community can be considered vulnerable, sometimes endangered, along the seashores that belong to the Murighiol and Jurilovca TAUs (Portița), to the Sulina TAU, as well as on the Sahalin Islands (Sfântu Gheorghe TAU). It can be considered as mainly undisturbed, in some cases medium disturbed, due to the alien species. This coenotaxon is particularly rich in threatened species (*Leymus racemosus* subsp. *sabulosus*, *Crambe maritima*, *Eryngium maritimum*, *Euphorbia pepelis*, *Convolvulus persicus*), with even four such taxa per plot. These are mostly endangered within the coenotaxa, except the critically endangered *Euphorbia pepelis* and *Convolvulus persicus*, whose populations are very rare, even if locally the latest can become dominant.

Salsoletum sodae Slavnic 1948 was identified especially between the vegetation-free stretch of beach and the low dunes partly fixed by the cenotaxon *Elymetum gigantei*. In the composition of the association only *Leymus racemosus* subsp. *sabulosus*, a vulnerable and rare species, is threatened on a national scale, being endangered in the plant community. Within both the coastal area and the whole territory of the Murighiol TAU, the coenotaxon can be considered as endangered.

Salsoletum sodae Slavnic 1948 was found as vulnerable, in the Portița area (POR), on wet sands. It has a reduced coverage, with four threatened species, three of the "vulnerable and rare" and one from the "rare" categories at the national level, but mostly endangered within the plant community, except the critically endangered *Euphorbia pepelis*.

Key species: *Salsola soda* (2; POR).

Threatened species: *Crambe maritima* (+; POR), *Eryngium maritimum* (+; POR), *Euphorbia pepelis* (r; POR), *Leymus racemosus* subsp. *sabulosus* (+; POR).

Other species: *Cakile maritima* subsp. *euxina* (r; POR), *Gypsophila perfoliata* (r; POR), *Lactuca tatarica* (1; POR), *Polygonum maritimum* (r; POR).

Salsoletum sodae Slavnic 1948 was found as vulnerable, within Plaja (Beach) Sulina (SPL), Sulina TAU. It has a reduced coverage, with three threatened species, one "vulnerable and rare" and two from the "rare" category at the national level, all endangered within the plant community. It is a medium disturbed plant community, where the non-native *Amorpha fruticosa* has a significant coverage, higher than the one of the only ruderal taxon that was identified.

Key species: *Salsola soda* (2; SPL).

Threatened species: *Convolvulus persicus* (+; SPL), *Eryngium maritimum* (+; SPL), *Leymus racemosus* subsp. *sabulosus* (+; SPL).

Other species: *Amorpha fruticosa* (1; SPL), *Xanthium italicum* (+; SPL).

***Salsoletum sodae* Slavnic 1948**, is a vulnerable and undisturbed coenotaxon recorded from the Sahalin Islands (IS), Sfântu Gheorghe TAU. It has a reduced coverage, with one "vulnerable and rare" threatened species, endangered within the plant community.

Key species: *Salsola soda* (2; IS).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; IS).

Other species: *Argusia sibirica* (+; IS), *Cakile maritima* (+; IS).

15.115211 Western Pontic glasswort swards

This habitat subtype/ coenotaxa was identified as endangered to sporadic within Sulina (Sulina TAU), Caraorman (Crișan TAU), Câșla Vădanei (Sfântu Gheorghe TAU), Agighiol Lake (Valea Nucarilor TAU, Sarichioi TAU, Portița (Jurilovca TAU), with a single threatened species, *Leymus racemosus* subsp. *sabulosus*, endangered within the coenotaxon. It can be considered as being in its natural status, as no ruderal/ alien species were observed.

***Salicornietum prostratae* Soó (1947) 1964**, a vulnerable plant community within the Sulina pastureland (SPS) area is typical for a natural status, especially due to its specific biotope extreme conditions, that prevent the occurrence of ruderal/ alien taxa.

Key species: *Salicornia europaea* (4; SPS).

Other species: *Aster tripolium* (+; SPS), *Argusia sibirica* (+; SPS), *Juncus maritimus* (+; SPS), *Puccinellia limosa* (+; SPS), *Spergularia media* (+; SPS), *Suaeda maritima* (+; SPS).

***Salicornietum prostratae* Soó (1947) 1964**, a sporadic coenotaxa, is represented by phytocoenoses that occupy relatively extensive areas to the east and north of the village of Caraorman (CON), Crișan TAU, characteristic for the salty soils.

Key species: *Salicornia europaea* (3; CON).

Other species: *Aster tripolium* (+; CON), *Bassia hirsuta* (1; CON), *Cynodon dactylon* (+; CON), *Puccinellia distans* subsp. *limosa* (+; CON), *Spergularia marina* (+; CON).

***Salicornietum prostratae* Soó (1927) 1964**, is a rare and undisturbed plant community in the Câșla Vădanei (GCV) area, between the Tătaru Canal and the seashore.

Key species: *Salicornia europaea* (4; GCV).

Other species: *Bassia hirsuta* (1; GCV), *Juncus littoralis* (+; GCV), *Puccinellia limosa* (+; GCV), *Spergularia media* (+; GCV), *Suaeda maritima* (+; GCV).

***Salicornietum prostratae* Soó (1927) 1964** is vulnerable and undisturbed on the Sahalin islands (IS). The only threatened, vulnerable and

rare species identified in the cenotaxon is *Leymus racemosus* subsp. *sabulosus*, endangered within the coenotaxa.

Key species: *Salicornia europaea* (4; GCV).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; IS).

Other species: *Aster tripolium* (+; IS), *Bassia hirsuta* (1; GCV), *Halimione pedunculata* (+; IS), *Juncus littoralis* (+; GCV), *Puccinellia limosa* (+; GCV), *Spergularia media* (+; IS), *Suaeda maritima* (+; IS).

***Salicornietum prostratae* Soó (1927) 1964**, typical for the halophile soils from the northern part of the Agighiol Lake, can be considered as endangered in the studied area (LA), the specific low diversity being a consequence of the extreme conditions in which it develops.

Key species: *Salicornia europaea* (4; LA).

Other species: *Halimione pedunculata* (+; LA), *Puccinellia limosa* (+; LA), *Spergularia media* (+; LA).

***Salicornietum prostratae* Sanda, Popescu 1999**, described as endangered from the Razim Lagoon shore, at Sarichoi (SA), can be considered representative for this coenotaxa, as no ruderal/ alien species were recorded.

Key species: *Salicornia europaea* (3; SA)

Other species: *Aster tripolium* (+; SA), *Bassia hirsuta* (+; SA), *Bolboschoenus maritimus* (1; SA), *Halimione verrucifera* (\pm ; SA), *Phragmites australis* subsp. *australis* var. *humilis* (+; SA), *Suaeda maritima* (+; SA).

***Salicornietum prostratae* Sanda, Popescu 1999** can be considered a vulnerable plant community within the Portița seashore (POR), Jurilovca TAU, where it has a representative aspect, as no alien/ ruderal species were identified.

Key species: *Salicornia europaea* (4; POR).

Other species: *Artemisia santonica* (+; POR), *Aster tripolium* (+; POR), *Halimione pedunculata* (+; POR), *Juncus littoralis* (+; POR), *Spergularia media* (+; POR).

15.115212 Western Pontic seablite swards

The subtype/ plant community was studied at Cășla Vădanei (Sfântu Gheorghe TAU), between Letea, C.A. Rosetti and Cardon (C.A. Rosetti TAU), Sarinasuf (Murighiol TAU), Histria-Saele levee (Istria TAU), being mostly observed as a vulnerable coenotaxa, sometimes as sporadic. Only two threatened species were recorded, *Halocnemum strobilaceum* and *Limonium meyeri*, both endangered within the coenotaxon. The absence of ruderal/ alien species shows a natural conservation status, sometimes low disturbed.

***Suaedetum maritimae* Soó 1927** forms narrow strips in the transition zone between the coenotaxon *Salicornietum prostratae* and *Juncetum littoralis*,

at Câșla Vădanei (GCV), where it occurs as vulnerable, being composed of very few halophilic species, being in its natural status.

Key species: *Suaeda maritima* (3; GCV).

Other species: *Bassia hirsuta* (1; GCV), *Puccinellia limosa* (+; GCV), *Salicornia europaea* (+; GCV).

***Suaedetum maritimae* Soó 1927**, observed within the Sulina pastureland area (SPS) as a vulnerable plant community, being devoid of ruderal/ alien species, is representative for a natural status.

Key species: *Suaeda maritima* (2; SPS).

Other species: *Aster tripolium* subsp. *pannonicus* (+; SPS), *Juncus maritimus* (+; SPS), *Puccinellia distans* subsp. *limosa* (+; SPS), *Spergularia media* (+; SPS), *Salicornia europaea* (1; SPS), *Tamarix ramosissima* (+; SPS).

***Suaedetum maritimae* Soó 1927**, recorded from the the Plaja (Beach) Sulina (SPL) as a vulnerable plant community, is low disturbed, as indicated by one ruderal species.

Key species: *Suaeda maritima* (2; SPL).

Other species: *Argusia sibirica* (+; SPL), *Atriplex prostrata* (+; SPL), *Phragmites australis* subsp. *australis* var. *humilis* (+; SPL), *Tamarix ramosissima* (+; SPL), *Xanthium italicum* (+; SPL).

***Suaedetum maritimae* Soó 1927** was recorded as sporadic, between C.A. Rosetti and Cardon (RC), being also observed between Letea and C.A. Rosetti, where they form narrow strips, several kilometers long, in areas with negative relief. Within this association was noted the presence of the threatened species *Limonium meyeri*, endangered within the plots, at least.

Key species: *Suaeda maritima* (3; RC).

Threatened species: *Limonium meyeri* (+; RC).

Other species: *Aeluropus littoralis* (1; RC), *Cynodon dactylon* (2; RC), *Halimione pedunculata* (+; RC), *Juncus gerardi* (+; RC), *Juncus littoralis* (+; RC), *Salicornia europaea* (1; RC), *Spergularia media* (1; RC).

***Suaedetum maritimae* Soó 1927** was recorded only in the Sarinasuf (SR) area, on the territory of Murighiol TAU, in conditions of maximum salinity, compared to most of the other associations. Here it can be provisionally classified as rare. *Halocnemum strobilaceum* is the only rare species included in the Red List of Higher Plants of Romania, endangered within the plant community.

Key species: *Salicornia europaea* (+; SR), *Suaeda maritima* (3; SR).

Threatened species: *Halocnemum strobilaceum* (+; SR).

Other species: *Aeluropus littoralis* (+; SR), *Halimione verrucifera* (+; SR), *Puccinellia limosa* (+; SR), *Spergularia media* (+; SR).

***Suaedetum maritimae* Soó 1927** plant community, identified as vulnerable at Histria (H)-Saele levee (Istria TAU) has a low level of disturbance,

indicated by the ruderal species *Cynanchum acutum*, with a reduced dominance.

Key species: *Suaeda maritima* (4; H).

Other species: *Artemisia santonica* (+; H), *Atriplex prostrata* (+; H), *Bolboschoenus maritimus* (+; H), *Cynanchum acutum* (+; H), *Elymus elongatus* (+; H), *Halimione verrucifera* (+; H), *Puccinellia limosa* (+; H).

15.145 Western Pontic *Bassia hirsuta* communities

This subtype is endangered and low disturbed, but still threatened by developments in the last location, being recorded from the Sulina beach (Sulina TAU) and Plaja (Beach) Corbu (Corbu TAU).

***Suaedo-Bassietum hirsutae* (Br.-Bl. 1928) Topa 1939** was observed as a pioneer vegetation endangered within the Sulina beach (SPL), a low disturbance being obvious, taking into account the presence of one ruderal and one non-native (*Conyza canadensis*) species, both with a reduced dominance.

Key species: *Bassia hirsuta* (2; SPL).

Other species: *Althaea officinalis* (+; SPL), *Atriplex prostrata* (r; SPL), *Conyza canadensis* (+; SPL), *Corispermum nitidum* (+; SPL), *Cynodon dactylon* (+; SPL), *Gypsophila perfoliata* (+; SPL), *Phragmites australis* (+; SPL), *Salicornia europaea* (+; SPL), *Solanum dulcamara* (+; SPL), *Xanthium italicum* (+; SPL).

***Suaedo-Bassietum hirsutae* (Br.-Bl. 1928) Topa 1939** is an endangered association within the Corbu Beach (CRB), Corbu TAU, a low disturbance being indicated by ruderal taxa, with a reduced dominance. Still the main threat for this subtype/ plant community is the probable extension of constructions/ developments.

Key species: *Bassia hirsuta* (2; CRB), *Suaeda maritima* (+; CRB).

Other species: *Aster tripolium* (+; CRB), *Artemisia santonica* (+; CRB), *Phragmites australis* subsp. *australis* var. *humilis* (+; CRB), *Salicornia europaea* (1; CRB), *Xanthium italicum* (+; CRB).

1410 Mediterranean salt meadows (*Juncetalia maritimi*) (PAL.CLASS.: 15.5)

15.5 Mediterranean salt meadows

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4,536 ha and a conservation status of A level.

This habitat was recorded as endangered and undisturbed to low disturbed, due to the presence of the alien species *Elaeagnus angustifolia*. This habitat was registered so far from the area towards the Sulina beach (Sulina TAU) and northwards of the Caraorman village (Crișan TAU), but it was

preliminary observed also near Sfântu Gheorghe. The dominant species, *Plantago coronopus* is also a threatened species at the national level.

15.5 Mediterranean salt meadows

***Plantaginetum coronopi* R. Tüxen 1937**, an endangered plant community within the Sulina beach (SPL), shows a low level of alien species invasive trend, these being only represented by *Elaeagnus angustifolia*. The dominant *Plantago coronopus* is also considered rare threatened taxon at the national level.

Key species: *Plantago coronopus* (2; SPL).

Threatened species: *Plantago coronopus* (2; SPL).

Other species: *Apera spica-venti* (+; SPL), *Cynodon dactylon* (1; SPL), *Gypsophila perfoliata* (+; SPL), *Elaeagnus angustifolia* (+; SPL), *Juncus littoralis* (+; SPL), *Plantago arenaria* (±; SPL), *Linum austriacum* (+; SPL), *Tamarix ramosissima* (+; SPL).

***Plantaginetum coronopi* R. Tüxen 1937** was studied northwards of the Caraorman village (CON), on sandy salinized soils, where it occurs on a restricted area, being framed as endangered and undisturbed.

Key species: *Plantago coronopus* (3; CON).

Threatened species: *Plantago coronopus* (3; CON).

Other species: *Aster tripolium* (r; CON), *Cynodon dactylon* (1; CON), *Juncus littoralis* (+; CON), *Puccinellia distans* subsp. *limosa* (+; CON), *Salicornia europaea* (+; CON), *Spergularia media* (+; CON).

1530* Pannonic salt-steppes and salt-marshes (PAL.CLASS.: 15.A1, 15.A2)

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4,536 ha and a conservation status of B level.

This habitat was mainly recorded as vulnerable, closely followed by the endangered and rare categories, being observed as sporadic only in isolated cases. In most of the analyzed situations, this habitat is in its natural status or low disturbed, and less medium disturbed, mainly due to ruderal species invasive trends. The situations where alien species were noticed are isolated. The locations where this habitat was recorded are: Portița, Dealul Călugăru-lancina Nature Reserve (Jurilovca TAU), Plopu, Beibugeac Lake, Sărăturii Lake, Sarinasuf, coastal dunes strips, Periteașca (Murighiol TAU), Ghiolul Cotului, Japșa Eraclia-Enisala (Sarichioi TAU), Agighiol Lake (Valea Nucarilor TAU), Sulina pastureland, Sulina beach (Sulina TAU), Sahalin islands, Tătaru Channel towards the seashore (Sfântu Gheorghe TAU), Danube floodplain (Beștepe, Mahmudia, Grindu, Topraichioi Lake (Mihai Bravu TAU), Pardina

TAU, Ceamurlia Lake (Ceamurlia de Jos TAU), Plaja (Beach) Corbu (Corbu TAU). The most important species from this habitat is *Centaurea pontica*, endemic within Romania, a species of community interest, critically endangered by the tourism developments and roads within the Sulina territory. Other six threatened species at the national level enhance the conservation value of this habitat, like *Plantago coronopus*, *Samolus valerandi*, *Leymus racemosus* subsp. *sabulosus*, *Hymenolobus procumbens* (endangered within the plots), *Polypogon monspeliensis* (endangered-sporadic within the plots), *Halocnemum strobilaceum* (endangered-vulnerable within the plots).

15.A2 Ponto-Sarmatic salt steppes and saltmarshes

***Puccinellio-Salicornietum* Popescu et al. 1987** is described as vulnerable in the Portița area (POR), where it develops on wet salinized sands, being considered in its natural status.

Key species: *Salicornia europaea* (3; POR), *Puccinellia distans* (2; POR).

Other species: *Aeluropus littoralis* (1; POR), *Artemisia santonica* (r; POR), *Bassia hirsuta* (+; POR), *Halimione pedunculata* (1; POR), *Puccinellia convoluta* (+; POR), *Spergularia media* (1; POR).

***Puccinellio-Salicornietum* Popescu et al. 1987**, characteristic for soils with a high salt concentration, occurs as rare near the Beibugeac Lake (LB), Murighiol TAU, where it can be considered as endangered, being in its natural status.

Key species: *Salicornia europaea* (2; LB), *Puccinellia limosa* (1; LB).

Other species: *Aeluropus littoralis* (+; LB), *Aster tripolium* (+; LB), *Halimione pedunculata* (+; LB), *Halimione verrucifera* (+; LB), *Spergularia media* (+; LB), *Suaeda maritima* (1; LB).

***Puccinellio-Salicornietum* Popescu et al. 1987**, rare within the Sărăturii Lake (LS) Murighiol TAU, which frequently dries out completely, here having a natural status.

Key species: *Salicornia europaea* (3; LS), *Puccinellia limosa* (+; LS).

Other species: *Aster tripolium* (1; LS), *Phragmites australis* subsp. *australis* var. *humilis* (+; LS), *Spergularia media* (+; LS).

***Puccinellio-Salicornietum* Popescu et al. 1987** is endangered in the halophile meadows south of the Plopu village (PLS), Murighiol TAU, being considered in its natural status.

Key species: *Salicornia europaea* (3; PLS), *Puccinellia limosa* (1; PLS).

Other species: *Artemisia santonica* (+; PLS), *Aster tripolium* (+; PLS), *Bassia hirsuta* (+; PLS), *Halimione verrucifera* (r; PLS), *Juncus gerardi* (+; PLS), *Phragmites australis* subsp. *australis* var. *humilis* (+; PLS), *Suaeda maritima* (2; PLS).

Puccinellio-Salicornietum Popescu et al. 1987, described as vulnerable from the Tuzla Lake saltmarshes (STZ), Săcele TAU, can be considered representative for this coenotaxa, as no ruderal/ alien species were recorded.

Key species: *Salicornia europaea* (2; STZ), *Puccinellia limosa* (1; STZ).

Other species: *Aeluropus littoralis* (+; STZ), *Elymus elongatus* (+; STZ), *Spergularia media* (+; STZ).

Puccinellio-Salicornietum Popescu et al. 1987, vulnerable along the road towards the proper beach in the halophile meadows framed westwards by the Dobrogea Plateau, Plaja (Beach) Vadu (VDC) (Corbu TAU), can be considered in its natural status.

Key species: *Salicornia europaea* (3; VDC), *Puccinellia limosa* (1; VDC).

Other species: *Leymus elongatus* (+; VDC), *Artemisia santonica* (+; VDC), *Halimione pedunculata* (+; VDC), *Halimione verrucifera* (+; VDC), *Spergularia media* (+; VDC), *Suaeda maritima* (+; VDC).

Puccinellio-Salicornietum Popescu et al. 1987 is rare and undisturbed in the halophile meadows along the road between Periprava and C.A.Rosetti (PR), C.A.Rosetti TAU, outside the Pădurea Letea strictly protected area. There it was analyzed in the location where a massive soil salinization advance from the former fish farm abandoned ponds, towards the Letea Forest. This plot is adjacent to the declining pure stands of *Fraxinus pallisae*, of which numerous trees are already dead. It is also less than 100 m from the plot that belongs to the coenotaxon ***Asparago pseudoscaberi-Quercetum pedunculiflorae Popescu et al. 1997*** that was placed close to the concrete fountain, next to the Periprava-Rosetti road.

Key species: *Salicornia europaea* (2; PR), *Puccinellia limosa* (+; PR).

Other species: *Aeluropus littoralis* (1; PR), *Aster tripolium* (1; PR), *Suaeda maritima* (1; PR).

Puccinellio-Salicornietum Popescu et al. 1987 is endangered and undisturbed within Plaja (Beach) Corbu (CRB), Corbu TAU. Still it is threatened by the probable extension of constructions/ developments.

Key species: *Salicornia europaea* (5; CRB), *Puccinellia limosa* (+; CRB).

Other species: *Aster tripolium* (+; CRB), *Bassia hirsuta* (+; CRB), *Phragmites australis* subsp. *australis* var. *humilis* (+; CRB).

This plant community can be considered in its natural status, mostly rare, but still vulnerable in many situations, being identified at Portița (Jurilovca TAU), Beibugeac Lake and Sărăturii Lake (Murighiol TAU), Tuzla Lake saltmarshes (Săcele TAU), Plaja (Beach) Vadu, Plaja (Beach) Corbu (Corbu TAU).

Polypogonetum monspeliensis Morariu 1957 has an obvious conservative value, being dominated by the rare threatened species *Polypogon monspeliensis*. The association is sporadic and undisturbed within the plots, as

well as due to the very small areas observed at Ghiolul Cotului (GCO), Sarichioi TAU, where it can be assessed as endangered.

Key species: *Polypogon monspeliensis* (3; GCO).

Threatened species: *Polypogon monspeliensis* (3; GCO).

Other species: *Aeluropus littoralis* (+; GCO), *Aster tripolium* (+; GCO), *Atriplex prostrata* (+; GCO), *Bolboschoenus maritimus* (1; GCO), *Phragmites australis* (2; GCO).

***Polypogonietum monspeliensis* Morariu 1957** is an endangered and low disturbed coenotaxa, due to ruderal species. It was recorded within the area of the Ceamurlia Lake (LC), Ceamurlia de Jos TAU, where the key threatened species, *Polypogon monspeliensis*, is assessed as rare.

Key species: *Polypogon monspeliensis* (2; LC).

Threatened species: *Polypogon monspeliensis* (2; LC).

Other species: *Alisma plantago-aquatica* (+; LC), *Lolium perenne* (+; LC), *Ononis spinosa* (+; LC), *Phragmites australis* subsp. *australis* var. *humilis* (+; LC), *Puccinellia limosa* (+; LC), *Trifolium fragiferum* (1; LC), *Xanthium italicum* (+; LC).

The plant community is considered endangered and in its natural status, being observed at Ghiolul Cotului (Sarichioi TAU), respectively at the Ceamurlia Lake (Ceamurlia de Jos TAU).

15.A2143 Western Ponto-Caspian saltmarsh grass swards

This habitat subtype/ association is framed between endangered and vulnerable and from undisturbed to low disturbed, with no threatened species identified so far. It was recorded from Ghiolul Cotului (Sarichioi TAU) and Plaja (Beach) Vadu (Corbu TAU).

***Aeluropetum littoralis* Prodan 1939** occurs on reduced areas, as vulnerable, at Ghiolul Cotului (GCO), Sarichioi TAU, where it has an undisturbed status.

Key species: *Aeluropus littoralis* (3; GCO).

Other species: *Bolboschoenus maritimus* (+; GCO), *Aster tripolium* (+; GCO), *Phragmites australis* (+; GCO), *Salicornia herbacea* (+; GCO), *Spergularia media* (+; GCO), *Suaeda maritima* (+; GCO).

***Aeluropetum littoralis* Prodan 1939** occurs on reduced areas, as endangered, at Plaja (Beach) Vadu (Corbu TAU), where it can be considered low disturbed, with only one ruderal species with a low coverage.

Key species: *Aeluropus littoralis* (5; VDC).

Other species: *Bolboschoenus maritimus* (1; VDC), *Cynanchum acutum* (+; VDC), *Juncus littoralis* (1; VDC).

15.A211 Western Pontic saline steppes

The habitat subtype/ plant community, mainly observed as rare, and less as vulnerable and endangered, was studied at Plopu, Sărăturii Lake, Beibugeac Lake (Murighiol TAU), Agighiol Lake (Valea Nucarilor TAU), Ghiolul Cotului (Sarichioi TAU), Tuzla Lake (Săcele TAU), Plaja (Beach) Vadu (Corbu TAU). It can be assessed overall as low disturbed, due to ruderal species presence, and less in its natural status, or medium disturbed. Only in one situation alien species were observed, at Sarichioi, but with a low presence.

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993** may be classified as rare within the halophile meadows south of Plopu (PLS). These phytocoenoses occur on the higher microrelief and saline soils compared to those dominated by *Salicornia europaea* or *Suaeda maritima*.

Key species: *Artemisia santonica* (4; PLS).

Other species: *Aeluropus litoralis* (+; PLS), *Aster tripolium* (+; PLS), *Juncus gerardi* (+; PLS), *Puccinellia limosa* (1; PLS), *Salicornia europaea* (+; PLS), *Spergularia media* (+; PLS).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993**, rare around the Sărăturii Lake (LS), has no ruderal/ alien species, being undisturbed from this point of view.

Key species: *Artemisia santonica* (4; LS).

Other species: *Lotus tenuis* (+; LS), *Puccinellia limosa* (1; LS), *Salicornia europaea* (+; LS), *Trifolium fragiferum* (+; LS).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993**, rare within the Beibugeac Lake (LB), shows a medium disturbance, due to the presence of three indicator species like *Arenaria serpyllifolia*, *Bromus hordeaceus*, *Senecio vernalis*.

Key species: *Artemisia santonica* (3; LB).

Other species: *Achillea setacea* (+; LB), *Agropyron elongatum* (+; LB), *Arenaria serpyllifolia* (+; LB), *Bromus hordeaceus* (1; LB), *Medicago minima* (+; LB), *Puccinellia limosa* (1; LB), *Senecio vernalis* (+; LB).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993** has been inventoried as vulnerable, on reduced areas, which occupy the saline soils of Ghiolul Cotului (GCO), Sarichioi TAU.

Key species: *Artemisia santonica* (2; GCO).

Other species: *Halimione pedunculata* (1; GCO), *Hordeum hystrix* (+; GCO), *Juncus gerardi* (+; GCO), *Limonium gmelinii* (2; GCO), *Phragmites australis* subsp. *australis* var. *humilis* (+; GCO).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993** identified at Ghiolul Cotului (GCO), between Sarichioi and Enisala villages, is considered a rare plant community in the respective area, where the three

ruderal species observed, even though with a reduced dominance, represent half of the phytocoenosis inventory, that indicates a medium disturbance.

Key species: *Artemisia santonica* (5; GCO).

Other species: *Bromus squarrosus* (+; CGO), *Daucus carota* (+; GCO), *Limonium gmelinii* (+; CGO), *Melilotus officinalis* (+; GCO), *Phragmites australis* subsp. *australis* var. *humilis* (+; GCO).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993**, an endangered plant community, studied at Sarichoi, on the Razim Lagoon shore (SA), has a low level of invasive alien plants occurrence (*Amaranthus retroflexus*, *Conyza canadensis*), respectively a medium presence of ruderal species (four species) with a restricted dominance.

Key species: *Artemisia santonica* (5; SA).

Other species: *Achillea setacea* (+; SA), *Amaranthus retroflexus* (+; SA), *Artemisia vulgaris* (+; SA), *Bromus tectorum* (+; SA), *Conyza canadensis* (+; SA), *Melilotus albus* (+; SA), *Melilotus officinalis* (+; SA).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993**, endangered around the Agighiol Lake (LA), Valea Nucarilor TAU, has a low degree of ruderalization, here being identified two species of this type, *Cichorium intybus* and *Daucus carota*, with low coverage.

Key species: *Artemisia santonica* (3; LA).

Other species: *Cichorium intybus* (+; LA), *Cynodon dactylon* (2; LA), *Daucus carota* (+; LA), *Juncus gerardi* (+; LA), *Phragmites australis* subsp. *australis* var. *humilis* (+; LA), *Spergularia media* (+; LA).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993**, vulnerable south of Iazurile (VNIZ), Valea Nucarilor TAU, has a low degree of ruderalization, here being identified two such species, with low coverage. The coenotaxa has a small number of species, both due to grazing and more saline soils.

Key species: *Artemisia santonica* (3; VNIZ).

Other species: *Bromus hordeaceus* (+; VNIZ), *Chenopodium glaucum* (+; VNIZ), *Cynodon dactylon* (2; VNIZ), *Hordeum geniculatum* (+; VNIZ).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993**, plant community identified as vulnerable from Hystria (H) area (Grindul Saele), Istria TAU, is representative for this coenotaxon, as no ruderal/ alien species were identified.

Key species: *Artemisia santonica* (3; H).

Other species: *Aeluropus littoralis* (+; H), *Puccinellia limosa* (+; H).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993** represents a vulnerable plant community from Cape Doloşman (CDO), where it is characterized by a medium level of ruderal species`presence, as most of the

taxa belong to this category, having also a significant variation of their dominance (+-1).

Key species: *Artemisia santonica* (3; CDO).

Other species: *Bromus hordeaceus* (1; CDO), *Bromus tectorum* (+; CDO), *Capsella bursa-pastoris* (+; CDO), *Festuca valesiaca* (+; CDO), *Geranium pusillum* (+; CDO), *Lamium amplexicaule* (+; CDO), *Medicago minima* (+; CDO), *Myosotis stricta* (+; CDO), *Plantago lanceolata* (+; CDO), *Poa angustifolia* (+; CDO), *Poa bulbosa* (+; CDO), *Senecio vernalis* (+; CDO), *Stellaria media* (+; CDO).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993** represents a vulnerable and undisturbed plant community at Lake Tuzla (STZ), Săcele TAU.

Key species: *Artemisia santonica* (4; STZ).

Other species: *Aeluropus littoralis* (1; STZ), *Cynodon dactylon* (1; STZ), *Elymus elongatus* (+; STZ), *Puccinellia limosa* (+; STZ), *Salicornia europaea* (+; STZ), *Suaeda maritima* (+; STZ).

***Artemisietum santonici* Soó 1947 corr. Guterm. et Mucina 1993** has been inventoried as vulnerable and undisturbed, on reduced areas, in the halophile meadows along the road to the beach at Plaja (Beach) Vadu, Corbu TAU (VDC).

Key species: *Artemisia santonica* (3; VDC).

Other species: *Aeluropus littoralis* (+; VDC), *Aster tripolium* (+; VDC), *Elymus elongatus* (+; VDC), *Juncus littoralis* (+; VDC), *Plantago arenaria* (+; VDC), *Suaeda maritima* (+; VDC).

15.A21271 Western Pontic tall rush salinebeds

This habitat subtype/ plant community can be considered between endangered and sporadic, being found within Sulina pastureland (Sulina TAU), Tătaru Channel towards the seashore (Sfântu Gheorghe TAU), Portița (Jurilovca TAU), Plaja Corbu (Corbu TAU), with phytocoenoses either in their natural status or with a low disturbance aspect, exceptionally medium disturbed. Three threatened species were recorded, all endangered, at least in the plots: *Plantago coronopus*, *Polypogon monspeliensis*, *Samolus valerandi*. Even if the species composition is undisturbed, mainly because the saline soil avoids ruderal or alien species occurrence, in the area between the Sulina cemetery and the bare section of the Sulina beach, this habitat subtype is affected by fragmentation and the reduction of its area, because of the tourism constructions/developments and acces roads/pathways.

***Juncetum littoralis* Popescu et al. 1992** is a vulnerable plant community, including in the area where it was studied, Sulina pastureland (SPS). There a low degree of ruderal and alien species invasion can be

observed by the presence of one taxon for each of these categories, *Cynanchum acutum*, respectively *Elaeagnus angustifolia*. Its conservation importance is also underlined by the presence of one rare threatened species, endangered within these phytocoenoses, *Plantago coronopus*.

Key species: *Juncus littoralis* (5; SPS).

Threatened species: *Plantago coronopus* (+; SPS).

Other species: *Atriplex prostrata* (+; SPS), *Cynanchum acutum* (+; SPS), *Cynodon dactylon* (+; SPS), *Elaeagnus angustifolia* (+; SPS), *Lactuca tatarica* (+; SPS), *Spergularia media* (+; SPS), *Tamarix ramosissima* (+; SPS).

***Juncetum littoralis* Popescu et al. 1992** is a rare and low disturbed coenotaxon, within plaja (Beach) Sulina (SPL). There were recorded two rare threatened species, endangered within these phytocoenoses, *Plantago coronopus* and *Polypogon monspeliensis*.

Key species: *Juncus littoralis* (4; SPL).

Threatened species: *Plantago coronopus* (+; SPL), *Polypogon monspeliensis* (+; SPL).

Other species: *Aeluropus littoralis* (1; SPL), *Aster tripolium* (+; SPL), *Atriplex prostrata* (+; SPL), *Cynanchum acutum* (+; SPL), *Pulicaria dysenterica* (+; SPL), *Spergularia media* (+; SPL), *Tamarix ramosissima* (+; SPL).

***Juncetum littoralis* Popescu et al. 1992** occurs as sporadic, in parallel strips on the higher microrelief, alternating with low areas covered by the coenotaxa *Salicornietum prostratae*, developed between the Tătaru Canal and the seashore (CTA), close to the Câșla Vădanei area, Sfântu Gheorghe TAU, on large areas considered in their natural status. The two rare species threatened at the national level are considered endangered within the plant community (*Polypogon monspeliensis*, *Samolus valerandi*).

Key species: *Juncus littoralis* (4; CTA).

Threatened species: *Polypogon monspeliensis* (±; CTA), *Samolus valerandi* (±; CTA).

Other species: *Aeluropus littoralis* (1; CTA), *Aster tripolium* (+; CTA), *Atriplex prostrata* (+; CTA), *Puccinellia limosa* (1; CTA), *Spergularia media* (+; CTA), *Suaeda maritima* (+; CTA).

***Juncetum littoralis* Popescu et al. 1992** can be estimated as an endangered plant community within the Portița seashore area (POR), Jurilovca TAU. Within the analyzed plot there were recorded no alien/ ruderal taxa.

Key species: *Juncus littoralis* (4; POR).

Other species: *Bassia hirsuta* (+; POR), *Juncus gerardi* (+; POR), *Phragmites australis* subsp. *australis* var. *humilis* (+; POR), *Salicornia europaea* (+; POR), *Spergularia media* (+; POR).

***Juncetum littoralis* Popescu et al. 1992** is a vulnerable plant community within the Plaja Corbu (Corbu TAU), where it has a low degree of ruderal and

alien species invasion trend that can be observed by the presence of one taxon for each of these categories, *Daucus carota*, respectively *Conyza canadensis*.

Key species: *Juncus littoralis* (3; CRB).

Other species: *Artemisia santonica* (+; CRB), *Centaurea arenaria* (+; CRB), *Conyza canadensis* (+; CRB), *Daucus carota* (+; CRB), *Linum austriacum* (+; CRB), *Plantago arenaria* (+; CRB).

***Juncetum littoralis* Popescu et al. 1992** is a rare plant community within Plaja (Beach) Vadu (Corbu TAU). It is medium disturbed, as one ruderal species was observed in the plots, with a significant coverage.

Key species: *Juncus littoralis* (4; VDC).

Other species: *Aeluropus littoralis* (+; VDC), *Bolboschoenus maritimus* (1; VDC), *Cynanchum acutum* (1; VDC), *Lythrum salicaria* (+; VDC).

***Juncetum littoralis* Popescu et al. 1992** is a rare and undisturbed plant community within Plaja (Beach) Vadu, (Corbu TAU).

Key species: *Juncus littoralis* (3; VDC).

Other species: *Artemisia santonica* (+; VDC), *Elymus elongatus* (+; VDC), *Cynodon dactylon* (+; VDC), *Daucus carota* (+; VDC), *Gypsophila perfoliata* (+; VDC), *Puccinellia limosa* (+; VDC), *Verbascum banaticum* (+; VDC).

15.A21273 Western Pontic *Agropyron elongatus* saline beds

This habitat subtype/ plant community occur as endangered to rare, sometimes sporadic, within Dealul Călugăru-lancina Nature Reserve (Jurilovca TAU), Ghiolul Cotului (Sarichioi TAU), Plaja (Beach) Corbu (Corbu and Săcele TAUs), Tuzla Lake saltmarshes (Săcele TAU). It was assessed as low disturbed due to grazing.

***Agropyretum elongati* I. Șerbănescu 1965** plant community, analyzed as vulnerable within Dealul Călugăru-lancina Nature Reserve (DCI), Jurilovca TAU, has a low participation of ruderal species (three taxa).

Key species: *Elymus elongatus* (3; DCI).

Other species: *Achillea setacea* (+; DCI), *Artemisia santonica* (+; DCI), *Cichorium intybus* (+; DCI), *Cynodon dactylon* (2; DCI), *Dactylis glomerata* (+; DCI), *Daucus carota* subsp. *carota* (+; DCI), *Ononis spinosa* (+; DCI), *Phragmites australis* (+; DCI), *Teucrium scordium* (+; DCI), *Verbena officinalis* (+; DCI).

***Agropyretum elongati* Șerbănescu I. 1964** plant community was recorded as endangered at Ghiolul Cotului (GCO), between Sarichioi and Enisala. In this case a low level of disturbance due to ruderal plants invasion can be estimated, indicated by the reduced dominance of two such species.

Key species: *Elymus elongatus* (4; GCO).

Other species: *Artemisia santonica* (+; GLO), *Cynodon dactylon* (1; GCO), *Daucus carota* (+; GCO), *Limonium gmelinii* (+; GCO), *Melilotus albus* (+; GCO), *Phragmites australis* subsp. *australis* var. *humilis* (+; GCO).

Agropyretum elongati I. Șerbănescu 1965, a rare plant community within Plaja (Beach) Corbu (CRB) (Corbu TAU), has a low participation of ruderal species (two taxa).

Key species: *Elymus elongatus* (4; CRB).

Other species: *Artemisia santonica* (+; CRB), *Daucus carota* (+; CRB), *Melilotus albus* (+; CRB), *Pulicaria dysenterica* (+; CRB).

Agropyretum elongati I. Șerbănescu 1965 a rare plant community within Plaja (Beach) Corbu (CRB), Corbu TAU has a low participation of ruderal (one taxon) and alien species (*Conyza canadensis*).

Key species: *Elymus elongatus* (5; CRB).

Other species: *Conyza canadensis* (+; CRB), *Cynanchum acutum* (+; CRB), *Juncus littoralis* (+; CRB), *Lythrum salicaria* (+; CRB).

Agropyretum elongati I. Șerbănescu 1965 plant community, analyzed as sporadic within Tuzla Lake saltmarshes (Săcele TAU), has a low participation of ruderal species (two taxa).

Key species: *Elymus elongatus* (4; STZ).

Threatened species: *Polypogon monspeliensis* (+; STZ),

Other species: *Atriplex prostrata* (+; STZ), *Bromus squarrosus* (+; STZ), *Cichorium intybus* (+; STZ), *Cynodon dactylon* (+; STZ), *Ononis spinosa* (+; STZ), *Trifolium fragiferum* (+; STZ).

Agropyretum elongati I. Șerbănescu 1965 plant community was analyzed as vulnerable within the Plaja (Beach) Vadu (VDS), Săcele TAU. It can be considered low disturbed, as only one ruderal taxon was observed.

Key species: *Elymus elongatus* (4; VDS).

Other species: *Aeluropus littoralis* (+; VDS), *Apera spica-venti* (+; VDS), *Artemisia santonica* (+; VDS), *Cynanchum acutum* (+; VDS).

Agropyretum elongati I. Șerbănescu 1965 plant community, analyzed as vulnerable within the Plaja (Beach) Vadu (VDS), Corbu TAU, can be considered low disturbed as two ruderal taxa were observed.

Key species: *Elymus elongatus* (3; VDC).

Other species: *Artemisia santonica* (+; VDC), *Bromus squarrosus* (+; VDC), *Centaurea arenaria* (+; VDC), *Juncus littoralis* (+; VDC), *Pulicaria dysenterica* (+; VDC), *Xanthium italicum* (+; VDC).

Agropyretum elongati Șerbănescu I. 1964 is considered vulnerable locally in the Beibugeac Lake area (LB). A low level of ruderal species invasive trend is showed by the two such taxa. The association was also observed in the Periteașca area.

Key species: *Agropyron elongatum* (3; LB).

Other species: *Artemisia santonica* (1; LB), *Cichorium intybus* (+; LB), *Conyza canadensis* (+; LB), *Cynodon dactylon* (1; LB), *Ononis spinosa* (+; LB).

15. A2124 Western Pontic saltmarsh rush saline meadows

***Scorzonero parviflorae-Juncetum gerardii* (Wenzl.1933) Wendelbg. 1943**, an endangered plant community, described from the Danube floodplain – Beștepe TAU (BLD), shows a low degree of disturbance, as only two ruderal species with a reduced dominance were observed.

Key species: *Juncus gerardi* (4; BLD).

Other species: *Cynodon dactylon* (1; BLD), *Plantago major* (+; BLD), *Polygonum aviculare* (+; BLD), *Potentilla reptans* (+; BLD), *Ranunculus sceleratus* (r; BLD), *Ranunculus trichophyllus* (+; BLD).

***Scorzonero parviflorae-Juncetum gerardii* (Wenzl. 1933) Wendelbg. 1943** can be preliminarily estimated as vulnerable, being identified in the saline meadows south of Plopu (PLS). The low disturbance is indicated only by *Plantago major*, with a low coverage.

Key species: *Juncus gerardi* (3; PLS).

Other species: *Artemisia santonica* (1; PLS), *Aster tripolium* (1; PLS), *Halimione pedunculata* (+; PLS), *Plantago major* (+; PLS), *Phragmites australis* subsp. *australis* var. *humilis* (+; PLS), *Salicornia europaea* (+; PLS).

The plant community in general can be considered as endangered to vulnerable, being recorded in the Danube floodplain – Beștepe TAU and Plopu, where it shows a low disturbance level from the ruderal species point of view.

15.A21271 (Western Pontic tall rush saline beds)

***Juncetum maritimi* (Rübel 1930) Pign. 1953**, represented by phytocoenoses more or less in their natural status, was encountered in the low areas on the west part of the coastal dunes strips, where it could be classified as rare locally, in the area of the whole Murighiol TAU being endangered.

15. A21275 Western Pontic *Cynodon* saline beds

Overall this subtype/ plant community was observed mainly as a vulnerable association, less as endangered and exceptionally as rare, in the following areas: Danube floodplain, within the territories of the TAUs Beștepe, Mahmudia, Grindu; Toprachiei Lake (Mihai Bravu TAU); Sulina pastureland, Sulina Beach (Sulina TAU); Pardina TAU, Tătaru channel (Sfântu Gheorghe TAU); Agighiol Lake (Valea Nucarilor TAU); Japșa Eraclia-Enisala (Sarichioi TAU), Cape Doloșman (Capul Doloșman), at Zimbru (Jurilovca TAU); Plaja (Beach) Corbu (Corbu TAU). A low disturbance due to ruderal (due to grazing and soil compaction) and less to alien species was noticed in most situations, followed by examples of medium disturbance and just one case of natural status. Only two threatened species were recorded, of which *Plantago*

coronopus is endangered in this plant community, while the most important is *Centaurea pontica*, endemic within Romania, a species of community interest, critically endangered by the tourism developments and roads within the Sulina territory.

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community can be considered vulnerable within the Beștepe TAU's territory, within the Danube floodplain (BLD). The six ruderal species, even though they have a reduced dominance, represent half of the species inventory and thus indicate a medium degree of human activities influence.

Key species: *Cynodon dactylon* (2; BLD), *Trifolium fragiferum* (+; BLD).

Other species: *Bromus hordeaceus* (+; BLD), *Bromus tectorum* (+; BLD), *Hordeum murinum* (+; BLD), *Juncus gerardi* (+; BLD), *Mentha aquatica* (+; BLD), *Plantago major* (+; BLD), *Poa pratensis* (1; BLD), *Potentilla anserina* (+; BLD), *Potentilla reptans* (+; BLD), *Verbena officinalis* (+; BLD).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958**, can be considered as a vulnerable and low disturbed coenotaxon, mainly due to grazing, which favour the occurrence of three ruderal and one non-native species (*Ambrosia artemisiifolia*). It was observed in the Danube floodplain, between the riverbanks and the dam parallel to the Danube (GL), on the Grindu TAU 's territory, Danube Delta SPA.

Key species: *Cynodon dactylon* (4; GL).

Other species: *Achillea setacea* (+; GL), *Ambrosia artemisiifolia* (+; GL), *Althaea officinalis* (+; GL), *Cannabis sativa* subsp. *spontanea* (+; GL), *Linaria vulgaris* (+; GL), *Mentha pulegium* (1; GL), *Pulicaria dysenterica* (+; GL), *Xanthium italicum* (+; GL), *Xanthium spinosum* (+; GL).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community was assessed as endangered in the Danube floodplain framed within the Mahmudia TAU's territory (MLD). It can be considered as an example of medium disturbed phytocoenosis, as the eight ruderal species prevail largely within its inventory.

Key species: *Cynodon dactylon* (4; MLD).

Other species: *Bromus hordeaceus* (+; MLD), *Bromus sterilis* (+; MLD), *Bromus tectorum* (+; MLD), *Cannabis sativa* subsp. *spontanea* (+; MLD), *Convolvulus arvensis* (+; MLD), *Elymus repens* (+; MLD), *Polygonum aviculare* (+; MLD), *Potentilla reptans* (1; MLD), *Xanthium italicum* (+; MLD).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community, vulnerable in the studied area, was inventoried within Mahmudia TAU in the Danube floodplain (MLD). It is characterized by a low level of disturbance, as only three ruderal taxa with reduced dominance were observed.

Key species: *Cynodon dactylon* (4; MLD), *Trifolium fragiferum* (+; MLD)

Other species: *Arenaria serpyllifolia* (+; MLD), *Capsella bursa-pastoris* (+; MLD), *Galium pedemontanum* (+; MLD), *Hordeum murinum* (+; MLD), *Medicago lupulina* (+; MLD), *Mentha pulegium* (+; MLD), *Myosotis stricta* (+; MLD), *Plantago lanceolata* (+; MLD), *Potentilla reptans* (+; MLD).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community is endangered, as it was only identified so far on reduced areas close to the Toprachioi Lake, Mihai Bravu TAU (MBT). Even though the five ruderal species have a reduced dominance, the fact that they overpass in number the other native species indicates a medium disturbance due to grazing.

Key species: *Cynodon dactylon* (5; MBT).

Other species: *Calystegia sepium* (+; MBT), *Cichorium intybus* (+; MBT), *Daucus carota* subsp. *carota* (+; MBT), *Phragmites australis* (+; MBT), *Plantago major* (+; MBT), *Ranunculus sceleratus* (+; MBT), *Stellaria media* (+; MBT), *Xanthium italicum* (+; MBT).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** can be considered an endangered plant community within the Sulina TAU's territory, in the situations where *Centaurea pontica* occur, these being only identified on very restricted locations within the Sulina pastureland (SPS) area, between the Sulina Town and the channel adjacent to Sulina beach. These grasslands show a medium level of ruderal species invasive tendencies, being represented by six taxa, which are equal in number with the typical species for this plant community, regardless of their reduced dominance. There can be deduced also a low disturbance due to the only non-native species, *Conyza canadensis*. The only threatened taxa, *Centaurea pontica*, has an exceptional importance as it is endangered and endemic within Romania, where it was only identified at Sulina and Sf. Gheorghe (Ciotica), the last location being quoted (SANDA, ARCUȘ, 1999). Within this plant community it can be estimated as endangered to vulnerable, but taking into account the very restricted areas of the coenotaxa where this species occur, it can be considered as critically endangered within Sulina territory. It should be underlined that this species is mainly threatened by the tourism constructions/ developments, roads, etc.

Key species: *Cynodon dactylon* (3; SPS).

Threatened species: *Centaurea pontica* (+-1; SPS).

Other species: *Conyza canadensis* (+; SPS), *Euphorbia seguieriana* (+; SPS), *Gypsophila perfoliata* (+; SPS), *Melilotus albus* (+; SPS), *Onopordum acanthium* (+; SPS), *Portulaca oleracea* (+; SPS), *Salsola soda* (+; SPS), *Tragus racemosus* (+; SPS), *Tribulus terrestris* (+; SPS), *Tamarix ramosissima* (+; SPS), *Xanthium italicum* (+; SPS).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community was also studied separately, in other areas where *Centaurea pontica* does not occur in the respective phytocoenoses, at Sulina beach (SPL). There it can be

considered as rare, a low disturbed status being indicated by the reduced dominance of a ruderal and two non-native species (*Conyza canadensis*, *Elaeagnus angustifolia*). The only threatened taxon, *Plantago coronopus*, slightly enhances the conservation importance.

Key species: *Cynodon dactylon* (4; SPL).

Threatened species: *Plantago coronopus* (+; SPL).

Other species: *Apera spica-venti* (+; SPL), *Conyza canadensis* (+; SPL), *Cynanchum acutum* (+; SPL), *Elaeagnus angustifolia* (+; SPL), *Euphorbia seguieriana* (+; SPL), *Gypsophila perfoliata* (+; SPL), *Juncus littoralis* (+; SPL), *Pulicaria dysenterica* (+; SPL), *Tamarix ramosissima* (+; SPL).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** forms sporadic grasslands near Cardon village, as well as between C.A. Rosetti and the Cardon locality (RC). A low disturbance status is shown by the reduced dominance of two non-native species (*Conyza canadensis*, *Elaeagnus angustifolia*) and a ruderal one.

Key species: *Cynodon dactylon* (3; RC), *Trifolium fragiferum* (2; RC)

Other species: *Conyza canadensis* (+; RC), *Linum austriacum* (+; RC), *Oenothera biennis* (+; RC), *Pulicaria dysenterica* (+; RC), *Scirpoides holoschoenus* (+; RC), *Teucrium scordium* (+; RC), *Xanthium italicum* (+; RC).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** can be considered as vulnerable between Letea and C.A. Rosetti. Three ruderal species with a reduced coverage show a low disturbance level, mainly due to grazing and trampling.

Key species: *Cynodon dactylon* (3; LR), *Trifolium fragiferum* (+; LR).

Other species: *Althaea officinalis* (+; LR), *Artemisia santonica* (+; LR), *Aster tripolium* (+; LR), *Cichorium intybus* (+; LR), *Euphorbia palustris* (+; LR), *Euphorbia seguieriana* (+; LR), *Mentha pulegium* (+; LR), *Onopordum acanthium* (+; LR), *Plantago major* (+; LR), *Potentilla reptans* (1; LR).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community is vulnerable on the shores of the Nebunu Lake, (LN), near Periprava, C.A. Rosetti TAU. A low disturbance is indicated by one ruderal species with a reduced coverage.

Key species: *Cynodon dactylon* (3; LN).

Other species: *Apera spica-venti* (+; LN), *Euphorbia seguieriana* (1; LN), *Scabiosa argentea* (+; LN), *Xanthium italicum* (+; LN), *Verbascum banaticum* (+; LN).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** was identified as undisturbed and vulnerable, north of the village of Caraorman (CON), Crișan TAU.

Key species: *Cynodon dactylon* (2; CON), *Trifolium fragiferum* (1; CON).

Other species: *Gnaphalium luteo-album* (+; CON), *Mentha aquatica* (+;

CON), *Mentha pulegium* (+; CON), *Potentilla reptans* (1; CON), *Teucrium scordium* (+; CON).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** is considered as vegetation typical for disturbed, compacted soils (DIHORU, DONIȚĂ, 1970). In the Murighiol TAU, it belongs to the vulnerable category. Between Dunavățu de Jos and Zaporojeni Fortress (DZ), it makes the transition between the wetlands and the steppe vegetation. The extension of the phytocenoses frames it into the "rare" category. Four ruderal species show a low disturbance, mainly due to grazing.

Key species: *Cynodon dactylon* (4; DZ), *Trifolium fragiferum* (1; DZ).

Other species: *Althaea officinalis* (+; DZ), *Artemisia santonica* (+; DZ), *Aster tripolium* (+; DZ), *Cichorium intybus* (+; DZ), *Euphorbia palustris* (+; DZ), *Mentha aquatica* (+; DZ), *Plantago major* (+; DZ), *Phragmites australis* (+; DZ), *Polygonum aviculare* (+; DZ), *Pulicaria dysenterica* (+; DZ), *Xanthium italicum* (+; DZ).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958**, was identified as vulnerable on the territory of Pardina TAU (PA), in some willow (*Salix alba*) vistas, on reduced areas. Grazing is indicated by three species, with low coverage.

Key species: *Cynodon dactylon* (3; PA), *Trifolium fragiferum* (1; PA).

Other species: *Althaea officinalis* (+; PA), *Bromus sterilis* (+; PA), *Bromus tectorum* (+; PA), *Cerastium glomeratum* (+; PA), *Hordeum murinum* (+; PA), *Mentha aquatica* (+; PA), *Medicago lupulina* (+; PA), *Potentilla reptans* (1; PA), *Salix alba* (+; PA), *Verbena officinalis* (+; PA).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958**, is vulnerable in the transition zone between Enisala Fortress Hill and Japșa Eraclia (JE), on saline soils, where it can be assessed as low disturbed, taking into account that only *Plantago major* was observed as a ruderal species.

Key species: *Cynodon dactylon* (3; JE).

Other species: *Atriplex prostrata* (+; JE), *Crypsis aculeata* (1; JE), *Juncus gerardi* (1; JE), *Plantago major* (+; JE), *Spergularia media* (+; JE).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958**, considered vulnerable, consists in the pastures close to the Tătaru channel (CTA), but has been observed also in the northern part of the sand levee that lies between the channels Buhaz-Zăton, respectively Gârla Turcească. Two ruderal species show a low disturbance due to grazing.

Key species: *Cynodon dactylon* (4; CTA), *Trifolium fragiferum* (1; CTA).

Other species: *Lycopus europaeus* (+; CTA), *Lythrum salicaria* (+; CTA), *Plantago major* (+; CTA), *Potentilla reptans* (+; CTA), *Pulicaria dysenterica* (+; CTA), *Teucrium scordium* (+; CTA), *Xanthium italicum* (+; CTA).

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958**, considered vulnerable, was analyzed in the pastures from north of the Agighiol Lake (LA), Valea Nucarilor TAU, where it dominates. Ruderal taxa affect the coenotaxon

to a small extent, being represented by some species like *Cichorium intybus*, *Hordeum geniculatum* and *Xanthium italicum*.

Key species: *Cynodon dactylon* (3, LA).

Other species: *Artemisia santonica* (+; LA), *Cichorium intybus* (+; LA), *Hordeum geniculatum* (+; LA), *Juncus gerardi* (1; LA), *Puccinellia limosa* (+; LA), *Salicornia europaea* (+; LA), *Xanthium italicum* (+; LA).

***Trifolium fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** can be considered an endangered plant community. It was identified in the floodplain adjacent to Cape Doloşman (Capul Doloşman), at Zimbru (CDZ), Jurilovca TAU, where grazing is indicated by a low level of ruderal species invasion (six species).

Key species: *Cynodon dactylon* (4; CDZ), *Trifolium fragiferum* (1; CDZ).

Other species: *Artemisia santonica* (+; CDZ), *Chenopodium glaucum* (+; CDZ), *Cichorium intybus* (+; CDZ), *Hordeum geniculatum* (+; CDZ), *Lolium perenne* (+; CDZ), *Mentha aquatica* (+; CDZ), *Plantago major* (+; CDZ), *Polygonum aviculare* (+; CDZ), *Verbena officinalis* (+; CDZ).

***Trifolium fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** can be considered an vulnerable plant community within the southernmost area of the Danube Delta Biosphere Reserve, known as Plaja (Beach) Corbu (CRB), Corbu TAU, framed between the western limit of the D.D.B.R.A and the sea, where a low disturbance is indicated by a reduced invasive trend of ruderal species (two species) and alien taxon (*Conyza canadensis*).

Key species: *Cynodon dactylon* (3; CRB), *Trifolium fragiferum* (1; CRB).

Other species: *Agropyron elongatum* (+; CRB), *Conyza canadensis* (+; CRB), *Daucus carota* (+; CRB), *Lotus tenuis* (+; CRB), *Melilotus albus* (+; CRB), *Scirpoides holoschoenus* (+; CRB).

15.A2131 Western Pontic *Puccinellia solonetz* swards

Globally this habitat subtype/ plant community is assessed as endangered to rare, from undisturbed to low disturbed, being recorded in the Beibugeac Lake and Sarinasuf areas (Murighiol TAU), Cape Doloşman, Zimbru area (Jurilovca TAU), Saele levee-Histria area (Istria TAU). Three threatened species (*Hymenolobus procumbens*, *Limonium bellidifolium* subsp. *danubiale*, *Polypogon monspeliensis*) were registered, mainly endangered and less vulnerable within the plots.

***Puccinellietum limosae* Rapaics et Soó 1933**, in the analyzed situations, is situated in the transition zone between the coenotaxa characteristic for the highly saline soils and those with a lower salinity degree. This undisturbed plant community is rare within the Beibugeac Lake (LB).

Key species: *Aster tripolium* (+; LB), *Puccinellia limosa* (2; LB).

Other species: *Cynodon dactylon* (+; LS), *Halimione pedunculata* (+; LB), *Halimione verrucifera* (+; LB), *Phragmites australis* subsp. *australis* var. *humilis*

(1; LB), *Salicornia europaea* (1; LB), *Spergularia media* (+; LB), *Suaeda maritima* (+; LS).

***Puccinellietum limosae* Rapaics et Soó 1933**, classified as rare within the Sarinasuf area (SR). The only threatened species identified in this areas is *Polypogon monspeliensis*, rare at national level, vulnerable locally. A low level of ruderal species presence can be observed as there were two species of this kind with a reduced coverage in the plots.

Key species: *Puccinelia limosa* (4; SR).

Threatened species: *Polypogon monspeliensis* (1; SR).

Other species: *Bromus squarrosus* (+; SR), *Halimione pedunculata* (+; SR), *Lactuca tatarica* (+; SR), *Phragmites australis* subsp. *australis* var. *humilis* (1; SR), *Plantago major* (+; SR).

***Puccinellietum limosae* Rapaics et Soó 1933** plant community, identified at Cape Doloşman, Zimbru area (CDZ), Jurilovca TAU, can be considered endangered and undisturbed. One vulnerable threatened plant *Hymenolobus procumbens* is endangered in this phytocoenosis.

Key species: *Aster tripolium* (+; CDZ), *Puccinelia limosa* (2; CDZ).

Threatened species: *Hymenolobus procumbens* (+; CDZ).

Other species: *Artemisia santonica* (+; CDZ), *Spergularia media* (+; CDZ), *Suaeda maritima* (1; CDZ), *Phragmites australis* subsp. *australis* var. *humilis* (1; CDZ).

***Puccinellietum limosae* Rapaics et Soó 1933**, an endangered plant community, was observed within the Saele levee, Histria area (H), Istria TAU, where *Limonium bellidifolium* subsp. *danubiale*, a vulnerable and rare threatened species, enhances its conservative value, also underlined by the absence of ruderal/ alien taxa.

Key species: *Puccinelia limosa* (4; H).

Threatened species: *Limonium bellidifolium* subsp. *danubiale* (+; H).

Other species: *Halimione verrucifera* (1; H), *Juncus gerardi* (+; H), *Salicornia europaea* (+; H), *Suaeda maritima* (+; H).

***Puccinellietum limosae* Rapaics et Soó 1933** is a vulnerable plant community between Letea and C.A. Rosetti, where it can be considered in its natural status.

Key species: *Puccinelia limosa* (2; LR).

Other species: *Aeluropus littoralis* (+; LR), *Halimione pedunculata* (1; LR), *Suaeda maritima* (+; LR).

15.A2133 Western Pontic *Bassia sedoides* hollows

***Bassietum sedoidis* Ubrizsy 1948 corr. Soó 1964** was identified as endangered, in its natural status, totally isolated on the Sahalin islands (IS), Sfântu Gheorghe TAU, within the *Salicornietum prostratae* association. There the only threatened, vulnerable and rare species is *Leymus racemosus* subsp. *sabulosus*, endangered within the plant community.

Key species: *Bassia sedoides* (3; IS).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; IS).

Other species: *Aster tripolium* (+; IS), *Salicornia europaea* (1; IS), *Spergularia media* (+; IS).

15.A21425 Western Pontic orache flats

This habitat subtype/ coenotaxon was recorded as endangered and undisturbed on the shores of Sărăturii Lake (Murighiol TAU) and Plaja (Beach) Sulina (Sulina TAU). Even if the species composition is undisturbed, mainly because the saline soil avoids ruderal or alien species occurrence, in the area between the Sulina Cemetery and the bare section of the Sulina beach, this habitat subtype is affected by fragmentation and the reduction of its area, because of the tourism constructions/ developments and acces roads/ pathways.

***Obionetum pedunculatae* I. Serbănescu 1965** has been encountered as undisturbed phytocoenoses on the shores of Sărăturii Lake (LS), on the territory of Murighiol TAU, on restricted areas, which justifies its classification as endangered.

Key species: *Halimione pedunculata* (3; LS).

Other species: *Artemisia santonica* (+; LS), *Aster tripolium* (+; LS), *Juncus gerardi* (+; LS), *Puccinellia limosa* (+; LS), *Suaeda maritima* (1; SPL).

***Obionetum pedunculatae* I. Serbănescu 1965**, an endangered coenotaxa within the Plaja (Beach) Sulina, Sulina town (SPL), was observed as undisturbed phytocoenoses.

Key species: *Halimione pedunculata* (2; SPL).

Other species: *Aeluropus littoralis* (+; SPL), *Puccinellia limosa* (+; SPL), *Salicornia europaea* (1; SPL), *Spergularia media* (+; SPL), *Suaeda maritima* (1; SPL), *Tamarix ramosissima* (+; SPL).

15. A2143 Western Ponto-Caspian saltmarsh grass swards

***Aeluropetum littoralis* (Prodan 1939) Şerbănescu 1965**, an endangered coenotaxa within the Beştepe commune area, within the Danube floodplain (BLD), can be considered as being at the upper limit of the low disturbance category, from the ruderal species presence (five taxa) point of view.

Key species: *Aeluropus littoralis* (2; BLD).

Other species: *Capsella bursa-pastoris* (+; BLD), *Chenopodium glaucum* (+; BLD), *Juncus gerardi* (+; BLD), *Matricaria recutita* (+; BLD), *Mentha pulegium* (+; BLD), *Plantago major* (+; BLD), *Polygonum aviculare* (+; BLD), *Ranunculus sceleratus* (+; BLD), *Rorippa sylvestris* (1; BLD), *Sclerochloa dura* (+; BLD).

***Aeluropetum littoralis* (Prodan 1939) Şerbănescu 1965**, an endangered plant community, identified at Sarichoi, on the Razim Lagoon shore (SA), can be considered as representative for a good level of conservation, as no ruderal/ alien species were recorded in the plots.

Key species: *Aeluropus littoralis* (5; SA).

Other species: *Aster tripolium* (+; SA), *Atriplex hastata* (+; SA), *Puccinellia limosa* (+; SA), *Salicornia europaea* (+; SA), *Suaeda maritima* (+; SA).

***Aeluropetum littoralis* (Prodan 1939) Şerbănescu 1965**, a vulnerable plant community, identified in the Histria area (H), within the Saele levee, Istria TAU, can be estimated as a representative natural phytocoenosis, taking into account the absence of ruderal/ non-native taxa.

Key species: *Aeluropus littoralis* (5; H).

Other species: *Artemisia santonica* (+; H), *Aster tripolium* (+; H), *Atriplex prostrata* (+; H), *Bolboschoenus maritimus* (+; H), *Phragmites australis* subsp. *australis* var. *humilis* (+; H), *Salicornia herbacea* (+; H), *Suaeda maritima* (+; H).

This plant community can be considered overall as endangered, sometimes vulnerable, and from its natural status to low disturbed, due to grazing.

15.A2151 Western Pontic *Halimione* scrub

This subtype/ association was identified as endangered to rare in the Beibugeac Lake area (Murighiol TAU) and Ghiolul Cotului (Sarichioi TAU). In both locations no alien/ ruderal species were observed, so these can be considered as samples of undisturbed phytocoenoses. Two threatened species, endangered within these phytocoenoses, were recorded, *Halocnemum strobilaceum* and *Hymenolobus procumbens*, both endangered locally.

***Obionetum verruciferae* (Keller 1923) Țopa 1939** has been found as rare, in the Lake Beibugeac (LB) area, Murighiol TAU. Among the two threatened species at the national level *Halocnemum strobilaceum* is rare and *Hymenolobus procumbens* is vulnerable. In this association both species can be considered endangered.

Key species: *Halimione verrucifera* (3; LB).

Threatened species: *Halocnemum strobilaceum* (+; LB), *Hymenolobus procumbens* (+; LB).

Other species: *Salicornia europaea* (+; LB).

***Obionetum verruciferae* (Keller 1923) Țopa 1939** was encountered as endangered, on very reduced surfaces at Ghiolul Cotului (GCO) Sarichioi TAU, where they formed narrow strips, intercalated between other cenotaxons, depending on the degree of salinity of the soil.

Key species: *Halimione verrucifera* (3; GCO).

Other species: *Limonium gmelinii* (+; GCO), *Suaeda maritima* (+; GCO), *Puccinellia convoluta* (2; GCO).

15.A2152 Western Pontic *Halocnemum scrub*

***Halocnemum strobilacei* (Keller 1925) Țopa 1939** is of particular conservation importance, as it is dominated by the threatened species *Halocnemum strobilaceum*, rare at the national and local levels. This undisturbed association can be considered as vulnerable in the Sarinasuf area (SR).

Key species: *Halocnemum strobilaceum* (2; SR)

Threatened species: *Halocnemum strobilaceum* (2; SR)

Other species: *Halimione pedunculata* (+; SR), *Puccinellia limosa* (+; SR), *Salicornia europaea* (+; SR), *Suaeda maritima* (1; SR).

2110 Embryonic shifting dunes (PAL.CLASS.: 16.211)

16.211 Embryonic dunes

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of B level.

The habitat was recorded as endangered within the small beach close to the Sulina Lighthouse, but it was also observed as endangered close to the northernmost part of the Chituc levee. The habitat was registered as being in a low disturbance situation, mostly because of the ruderal taxa, but also as an alien species was noticed. Three threatened species enhance the conservation importance of this coenotaxon, *Artemisia tschernieviana*, *Crambe maritima* and *Leymus racemosus* subsp. *sabulosus*, being framed locally between endangered and rare.

16.2113 Pontic embryonic dunes

This subtype is endangered and low disturbed, due to ruderal and less to alien species. Three threatened species enhance the conservation importance of this coenotaxon, *Artemisia tschernieviana*, *Crambe maritima*, *Leymus racemosus* subsp. *sabulosus*, being framed locally between endangered and rare.

Elymetum gigantei* Morariu 1957**, an endangered plant community within the Sulina Arm influx into the sea, including the artificial area of the dyke (SV), is represented within this habitat by the subassociation ***cakiletosum

euxinae Vich. subass. nova, characterized by a low disturbance level, both induced by three ruderal species, respectively by one non-native taxon (*Amorpha fruticosa*). The dominant *Leymus racemosus* subsp. *sabulosus* is vulnerable within the plots, being sparse within these phytocoenoses

Key species: *Leymus racemosus* subsp. *sabulosus* (1; SV), *Cakile maritima* subsp. *euxina* (1; SV).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (1; SV).

Other species: *Amorpha fruticosa* (+; SV), *Argusia sibirica* (+; SV), *Bassia sedoides* (+; SV), *Cynanchum acutum* (+; SV), *Lactuca tatarica* (+; SV), *Melilotus albus* (+; SV), *Phragmites australis* subsp. *australis* var. *humilis* (+; SV), *Salsola soda* (+; SV), *Xanthium italicum* (+; SV).

***Elymetum gigantei* Moraru 1957**, can be assessed as an endangered plant community within the the northernmost part of the Chituc levee (CN), where it is represented by the subassociation ***cakiletosum euxinae* Vich. subass. nova**, low disturbed due to the non-native *Elaeagnus angustifolia*. The dominant *Leymus racemosus* subsp. *sabulosus* is rare within the plots, being sparse within these phytocoenoses, followed by the vulnerable *Crambe maritima* and the endangered *Artemisia tschernieviana*.

Key species: *Leymus racemosus* subsp. *sabulosus* (2; CN), *Cakile maritima* subsp. *euxina* (2; CN).

Threatened species: *Artemisia tschernieviana* (+; CN), *Crambe maritima* (1; CN), *Leymus racemosus* subsp. *sabulosus* (2; CN).

Other species: *Elaeagnus angustifolia* (+; CN), *Lactuca tatarica* (+; CN), *Phragmites australis* subsp. *australis* var. *humilis* (1; CN), *Salsola soda* (+; CN).

2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (PAL.CLASS.: 16.212)

16.212 White dunes

The habitat is not mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), but still it exists in the D.D.B.R. and associated sites of community importance. Even if the subtype **16.2124 Pontic white dunes** is not explicitly mentioned within the list of subtypes, it is nevertheless framed into the habitat **16.212 White dunes** that includes Mobile dunes forming the seaward cordon or cordons of dune systems of the coasts of the nemoral, steppe, Mediterranean and warm-temperate humid zones. In this case the 16.2124 habitat subtype is framed within the dune systems of the coast of the steppe zone. If this habitat was excluded, then the 16.212 mentioned after the name of this 2120 habitat should have between brackets only the codes of the subtypes described within the EUR 27 and EUR 28 versions of the Habitats Manual, like for other restrictive community interest

habitats, which is not the case. Such an example of restrictive habitat would be **2190 Humid dune slacks** (PAL.CLASS.: 16.3 = 16.31 to 16.35) where the subtypes of 16.3 are clearly mentioned within the correspondence with the Palearctic classification codes. Thus, this habitat 2120 includes all the subtypes of **16.212 White dunes**, described or not in these manuals.

The subtype **16.2124 Pontic white dunes** includes the mobile dunes of the Black Sea coasts, with *Leymus racemosus* subsp. *sabulosus* (*Elymus giganteus*) and other key species, framed among others into the *Elymetum gigantei* plant community. It is urgent to include this habitat into the list of recently identified community interest habitats within the D.D.B.R. and its associated Natura 2000 sites, in order to avoid its degradation, through the implementation of adequate management measures. Thus, this is one of the most fragile and threatened habitats in the studied area, being exposed to degradation of the vegetation, fragmentation and reduction of its area due to the fact that it is a favourite habitat for tourism/ beach activities and constructions/ developments, access roads, etc. The D.D.B.R.A should have as a priority to clarify if this habitat or other doubtful/ similar community interest habitats really occur within the D.D.B.R. and associated sites, in order to officially revise the list of the habitats of community interest, respectively to take measures for their conservation and to report them adequately to the European Commission.

Taking into account the important estimated area of 22,682 ha, (Formularul standard Natura 2000 – ROSCI0065) of the habitat **2130 *Fixed coastal dunes with herbaceous vegetation (grey dunes)-16.22B Pontic fixed dunes**, it is probable that within this habitat was included also by confusion the area of the habitat **16.2124 Pontic white dunes**, framed into the habitat **2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)**.

The habitat was recorded from vulnerable to frequent within the territories of the Sulina TAU (Sulina beach), Jurilovca TAU (Portița), Murighiol TAU (coastal low dunes), Sfântu Gheorghe TAU (Câșla Vădanei, Sahalin Islands), Plaja (Beach) Vadu (Săcele TAU), Plaja (Beach) Corbu (Corbu TAU). The habitat was registered mainly as undisturbed, very rare in a medium or low disturbance situation. This plant community/ habitat is one of the most rich in rare species within the Danube Delta natural site (SCI, SPA), with its eight threatened taxa, mainly endangered within these phytocoenoses (*Artemisia tschernieviana*, *Crambe maritima*, *Ephedra distachya*, *Petasites spurius*, *Stachys maritima*), except *Astrodaucus littoralis* (critically endangered), *Eryngium maritimum* (endangered-vulnerable), *Leymus racemosus* subsp. *sabulosus* (endangered-frequent).

16.2124 Pontic white dunes

***Elymetum gigantei* Morariu 1957**, a vulnerable plant community within the Sulina Town's territory, where it was observed at the Sulina beach (SPL), is

characterized by a medium disturbance level, both induced by one ruderal species, respectively by two non-native taxa (*Amorpha fruticosa*, *Elaeagnus angustifolia*), with a characteristic dominance variation (+-1). Three rare threatened species, of which *Leymus racemosus* subsp. *sabulosus* is also vulnerable, confer a high conservation value to this coenotaxon, two (*Eryngium maritimum*, *Petasites spurius*) being endangered within these phytocoenoses, while *Leymus racemosus* subsp. *sabulosus* is rare.

Key species: *Leymus racemosus* subsp. *sabulosus* (2; SPL).

Threatened species: *Eryngium maritimum* (+; SPL), *Leymus racemosus* subsp. *sabulosus* (2; SPL), *Petasites spurius* (+; SPL).

Other species: *Amorpha fruticosa* (+; SPL), *Cynodon dactylon* (1; SPL), *Elaeagnus angustifolia* (+-1; SPL), *Hippophaë rhamnoides* (+; SPL), *Salsola soda* (+; SPL), *Secale sylvestre* (+; SPL), *Xanthium italicum* (+; SPL).

***Elymetum gigantei* Morariu 1957** is frequent on the coastal sand strip belonging to the Jurilovca TAU, contributing to the partial fixing of the sand substrate. In the Portița area (POR) the association is in its natural status, characterized by a great richness of threatened species, namely five species included in the "rare" category at the national level. Of these, *Crambe maritima* and *Leymus racemosus* subsp. *sabulosus* are also considered vulnerable. Besides the two species (*Crambe maritima*, *Stachys maritima*) endangered within the respective phytocoenosis, *Astrodaucus littoralis* is critically endangered, *Eryngium maritimum* is considered vulnerable, while *Leymus racemosus* subsp. *sabulosus* is frequent, being a key species.

Key species: *Leymus racemosus* subsp. *sabulosus* (4; POR).

Threatened species: *Astrodaucus littoralis* (r; POR), *Crambe maritima* (+; POR), *Eryngium maritimum* (1; POR), *Leymus racemosus* subsp. *sabulosus* (3-4; POR), *Stachys maritima* (+; POR).

Other species: *Argusia sibirica* (+; POR), *Artemisia santonica* (r; POR), *Cynodon dactylon* (r; POR), *Lactuca tatarica* (1; POR), *Tamarix ramosissima* (+; POR).

***Elymetum gigantei* Morariu 1957** is frequent in the Portița area (POR), being in its natural status, where it shelters six threatened taxa. Of these, *Leymus racemosus* subsp. *sabulosus* is also considered vulnerable. Most of them are endangered within the respective phytocoenosis, except the vulnerable *Eryngium maritimum* and *Stachys maritima*, respectively the frequent, dominant species *Leymus racemosus* subsp. *sabulosus*.

Key species: *Leymus racemosus* subsp. *sabulosus* (3; POR).

Threatened species: *Astrodaucus littoralis* (±; POR), *Eryngium maritimum* (1; POR), *Leymus racemosus* subsp. *sabulosus* (3-4; POR), *Polypogon monspeliensis* (+; POR), *Stachys maritima* (1; POR).

Other species: *Argusia sibirica* (+; POR), *Centaurea arenaria* (+; POR), *Cynodon dactylon* (+; POR), *Lactuca tatarica* (2; POR), *Tamarix ramosissima* (+; POR).

***Elymetum gigantei* Morariu 1957** can be considered sporadic, in its natural status at the level of coastal low dunes that belong to the Murighiol TAU. In addition to the dominant species *Leymus racemosus* subsp. *sabulosus*, another threatened taxa, included in the same category of vulnerable and rare species, is *Crambe maritima*. At the level of the association, the first species is classified in the "frequent" category, while the latter is endangered.

***Elymetum gigantei* Morariu 1957** has been encountered as pioneer vegetation, with low coverage, vulnerable, in its natural status, in the Cășla Vădanei area (GCV), Sfântu Gheorghe TAU. The key species is considered threatened, vulnerable and rare, being also vulnerable at the local level, within these phytocoenoses.

Key species: *Leymus racemosus* subsp. *sabulosus* (1; GCV).

Threatened species: *Eryngium maritimum* (+; GCV), *Leymus racemosus* subsp. *sabulosus* (1, GCV).

Other species: *Carex colchica* (+; GCV), *Centaurea arenaria* (+; GCV), *Euphorbia seguieriana* (+; GCV), *Phragmites australis* (+; GCV).

***Elymetum gigantei* Morariu 1957** occurs as phytocoenoses with more or less closed aspect, rare on the Sahalin islands (IS). The key species is considered threatened, vulnerable and rare, being sporadic within the plots. A low disturbance is obvious, as one alien taxon, *Amorpha fruticosa*, and a ruderal one, *Xanthium italicum*, were observed.

Key species: *Leymus racemosus* subsp. *sabulosus* (3; IS).

Other species: *Amorpha fruticosa* (+; IS), *Argusia sibirica* (1; IS), *Salsola soda* (+; IS), *Tamarix ramosissima* (+; IS), *Xanthium italicum* (+; IS).

***Elymetum gigantei* Morariu 1957** occurs as vulnerable and undisturbed at Plaja (Beach) Vadu, (VDS), Săcele TAU. Its conservation value is underlined by the presence of four rare and mostly vulnerable taxa at the national level, like *Artemisia tschernieviana*, *Crambe maritima*, *Eryngium maritimum*, *Leymus racemosus* subsp. *sabulosus*. Within the phytocoenoses, besides the dominant *Leymus racemosus* subsp. *sabulosus*, the other are endangered, except the vulnerable *Eryngium maritimum*.

Key species: *Leymus racemosus* subsp. *sabulosus* (3; VDS,).

Threatened species: *Artemisia tschernieviana* (+; VDS), *Crambe maritima* (+; VDS), *Eryngium maritimum* (1; VDS), *Leymus racemosus* subsp. *sabulosus* (3, VDS).

Other species: *Centaurea arenaria* (+; VDS).

***Elymetum gigantei* Morariu 1957**, a rare plant community within the Plaja (Beach) Corbu (CRB), Corbu TAU, is characterized by a low disturbance

level, induced by one ruderal species. Four rare threatened species, of which *Leymus racemosus* subsp. *sabulosus* and *Crambe maritima* are also vulnerable, confer a high conservation value to this coenotaxon. *Astrodaucus littoralis* *Eryngium maritimum*, *Crambe maritima* are endangered within these phytocoenoses while *Leymus racemosus* subsp. *sabulosus* is rare.

Key species: *Leymus racemosus* subsp. *sabulosus* (2; CRB).

Threatened species: *Astrodaucus littoralis* (+; CRB), *Crambe maritima* (+; CRB), *Eryngium maritimum* (+; CRB), *Leymus racemosus* subsp. *sabulosus* (2; CRB).

Other species: *Centaurea arenaria* (+; CRB), *Chondrilla juncea* (+; CRB), *Euphorbia seguieriana* (+; CRB), *Gypsophila perfoliata* (+; CRB), *Linum austriacum* (+; CRB), *Linaria genistifolia* (+; CRB), *Teucrium polium* subsp. *capitatum* (+; CRB).

This plant community was observed as vulnerable to frequent within the territories of the Sulina Town (Sulina beach), Jurilovca TAU (Portița), Murighiol TAU (coastal low dunes), Sfântu Gheorghe TAU (Câșla Vădanei, Sahalin islands), also at Plaja (Beach) Vadu (Săcele TAU) and Plaja (Beach) Corbu (Corbu TAU). In most situations the phytocoenoses were in a natural status, very rare in a medium or low disturbance situation. This plant community/ habitat is one of the most rich in rare species within the Danube Delta natural site (SCI, SPA), with its seven threatened taxa, mainly endangered within these phytocoenoses (*Artemisia tschernieviana*, *Crambe maritima*, *Petasites spurius*, *Stachys maritima*), except *Astrodaucus littoralis* (critically endangered), *Eryngium maritimum* (endangered-vulnerable), *Leymus racemosus* subsp. *sabulosus* (endangered-frequent).

***Artemisietum arenariae* Popescu et Sanda1977** has been encountered as a rare coenotaxon, at Plaja (Beach) Corbu (CRB), Corbu TAU. The key species is considered threatened, endangered and rare, being also rare at the local level. The other three rare threatened taxa are endangered within these phytocoenoses. A low disturbance is obvious, as two ruderal taxa were observed, with a low coverage.

Key species: *Artemisia tschernieviana* (2; CRB).

Threatened species: *Artemisia tschernieviana* (2; CRB), *Leymus racemosus* subsp. *sabulosus* (+; CRB), *Eryngium maritimum* (+; CRB), *Crambe maritima* (+; CRB).

Other species: *Bromus tectorum* (+; CRB), *Centaurea arenaria* (+; CRB), *Melilotus albus* (+; CRB), *Secale sylvestre* (+; CRB).

***Artemisietum arenariae* Popescu et Sanda1977**, a rare plant community at Plaja (Beach) Corbu (CRB), Corbu commune is considered low disturbed as one ruderal taxa was observed, with a low coverage. The key species is considered threatened, endangered and rare, being also rare at the

local level. The other two rare threatened taxa are endangered (*Eryngium maritimum*) and vulnerable *Leymus racemosus* subsp. *sabulosus* within these phytocoenoses.

Key species: *Artemisia tschernieviana* (2; CRB).

Threatened species: *Artemisia tschernieviana* (2; CRB), *Leymus racemosus* subsp. *sabulosus* (1; CRB), *Eryngium maritimum* (+; CRB).

Other species: *Melilotus albus* (1; CRB).

***Artemisietum arenariae* Popescu et Sanda1977** has been encountered at Plaja (Beach) Vadu (VDS), Săcele TAU, where it can be assessed as undisturbed and rare. Its conservation importance is enhanced by five rare threatened taxa, among which *Crambe maritima* is also vulnerable, all endangered within these phytocoenoses.

Key species: *Artemisia tschernieviana* (2; VDS).

Threatened species: *Artemisia tschernieviana* (2; VDS), *Astrodaucus littoralis* (+; VDS), *Crambe maritima* (+; VDS), *Eryngium maritimum* (+; VDS), *Ephedra distachya* (+; VDS).

Other species: *Secale sylvestre* (1; VDS).

This association is assessed overall as rare, and between low disturbed and undisturbed. Its six threatened taxa are mainly endangered within these phytocoenoses (*Astrodaucus littoralis*, *Crambe maritima*, *Eryngium maritimum*, *Ephedra distachya*, *Leymus racemosus* subsp. *sabulosus*), except the dominant *Artemisia tschernieviana*.

2130 *Fixed coastal dunes with herbaceous vegetation (grey dunes)

(PAL.CLASS.: 16.221 to 16.227, 16.22B)

16.22B Pontic fixed dunes

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 22682 ha and a conservation status of A level. Taking into account the important estimated area of 22682 ha, (Formularul standard Natura 2000 – ROSCI0065) of the habitat **2130 *Fixed coastal dunes with herbaceous vegetation (grey dunes)-16.22B Pontic fixed dunes**, it is probable that within this habitat was included also by confusion the area of the habitat **16.2124 Pontic white dunes**, framed into the habitat **2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)**.

Globally this habitat can be considered as vulnerable and in its natural status. It was recorded from the southern part of Caraorman Forest (CO), Crișan TAU.

16.22B1 Western Pontic fixed dunes

***Scabioso argenteae-Artemisietum campestris* Popescu, Sanda 1987**

was identified as vulnerable on the low dunes in the south part of Pădurea Caraorman (CO), Crişan TAU, where it is characterized by a small number of species. It can be considered in its natural status, as no alien/ ruderal species were identified.

Key species: *Artemisia campestris* (3; CO), *Scabiosa argentea* (+; CO).

Other species: *Carex colchica* (+; CO), *Centaurea arenaria* (+; CO), *Euphorbia seguieriana* (+; CO), *Verbascum banaticum* (+; CO).

2160 Dunes with *Hippophaë rhamnoides* (PAL.CLASS.: 16.251)

The habitat occur mostly in Western Europe, according to the description of the subtype **16.251 Sea-buckthorn dune thickets** available within the PHYSIS database, as mentioned in the Manual EUR 28, where there is not mentioned the alliance/ plant communities or other upper phytocoenological classification levels, in order to allow an accurate framing. The *Hippophaë rhamnoides* formations that occur in the D.D.B.R. and associated Natura 2000 are also similar with the subtype **44.6622 Danube Delta *Hippophaë-Populus canescens* galleries**, that is described as having a closed shrub layer dominated by *Hippophaë rhamnoides*, even if in the studied situations there was not observed any sparse canopy of *Populus canescens*. Also for this subtype in the PHYSIS database there is not mentioned any alliance/ plant communities or other upper phytocoenological classification levels, in order to allow an accurate framing. As a conclusion, until further research or more clearly defined habitat descriptions, at least provisory, the thickets dominated with *Hippophaë rhamnoides* (without a *Populus canescens* canopy at least) can be considered as framed into the subtype **16.251 Sea-buckthorn dune thickets** and the corresponding habitat of community importance 2160. Thus, ***Calamagrostio epigei-Hippophaëtum rhamnoides* Popescu, Sanda, Nedelcu 1986** is the only plant community dominated by *Hippophaë rhamnoides* within the Danube Delta and the whole Dobrogea, according to synthesis works concerning this region (SANDA, ARCUŞ, 1999), where there is not mentioned any occurrence of *Populus canescens*, that also corresponds to proper observations.

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of A level.

The habitat subtype/ plant community can be considered mainly as endangered and less vulnerable, being observed as low disturbed to medium disturbed, due to alien or ruderal species invasive trend, sometimes in its natural status. It was observed at the Sulina beach (Sulina TAU), between C.A. Rosetti

and Cardon (C.A. Rosetti TAU), Cășla Vădanei (Sfântu Gheorghe TAU). Two rare threatened species were recorded, *Eryngium maritimum* and *Ephedra distachya*, both endangered within the plots.

***Calamagrostio epigei-Hippophaëtum rhamnoides* Popescu, Sanda, Nedelcu 1986** plant community is vulnerable in the Sulina beach area (SPL), where a medium level of non-native species invasion was estimated from the dominance variation (+-1) of *Conyza canadensis* and *Elaeagnus angustifolia*. The only threatened species is *Eryngium maritimum*, endangered within the plots.

Key species: *Calamagrostis epigeios* (1; SPL), *Hippophaë rhamnoides* (4; SPL).

Threatened species: *Eryngium maritimum* (+; SPL).

Other species: *Conyza canadensis* (+; SPL), *Elaeagnus angustifolia* (+; SPL), *Eupatorium cannabinum* (+; SPL), *Euphorbia seguieriana* (+; SPL), *Tamarix ramosissima* (+; SPL).

***Calamagrostio epigei-Hippophaëtum rhamnoides* Popescu, Sanda, Nedelcu 1986** generally occupies the depressions between the dunes, or the lower part of the dunes, which are encountered in the studied area between C.A. Rosetti and Cardon (RC), there being framed as endangered. A low disturbance can be guessed from the presence of the alien species *Conyza canadensis*, as well as of three ruderal species, all with a reduced coverage.

Key species: *Hippophaë rhamnoides* (5, RC), *Calamagrostis epigeios* (+; RC).

Other species:

- shrubs/ lianas: *Tamarix ramosissima* (1; RC).

- grasses/ undershrubs: *Cannabis sativa* subsp. *spontanea* (+; RC), *Centaurea arenaria* (1; RC), *Chondrilla juncea* (+; RC), *Consolida regalis* (+; RC), *Conyza canadensis* (+; RC), *Cynodon dactylon* (+; RC), *Euphorbia seguieriana* (+; RC), *Medicago falcata* (+; RC), *Plantago arenaria* (+-1; RC), *Polygonum arenarium* (+; RC), *Salsola soda* (+; RC), *Scabiosa argentea* (+; RC).

***Calamagrostio epigei-Hippophaëtum rhamnoides* Popescu, Sanda, Nedelcu 1986** was recorded between C.A. Rosetti and Cardon (RC), there being framed as endangered. A low disturbance is indicated by the presence of the alien species *Morus alba*, *Prunus cerasifera*, as well as of one ruderal species, with a reduced coverage.

Key species: *Hippophaë rhamnoides* (3, RC), *Calamagrostis epigeios* (1; RC).

Threatened species: *Ephedra distachya* (+; RC).

Other species:

- shrubs/ lianas: *Evonymus europaeus* (+; RC), *Morus alba* (+; RC), *Rhamnus cathartica* (+; RC), *Prunus cerasifera* (+; RC).

- grasses/ undershrubs: *Agrostis stolonifera* (+; RC), *Consolida regalis* (+; RC), *Cynodon dactylon* (+; RC), *Euphorbia seguieriana* (+; RC), *Rosa canina* (+; RC), *Phragmites australis* (+; RC), *Teucrium chamaerdrys* (+; RC).

***Calamagrostis epigei-Hippophaëtum rhamnoides* Popescu, Sanda, Nedelcu 1986** is framed as vulnerable within the Plaja (Beach) Sulina (SPL). A medium disturbance can be guessed from the presence (+1) of the alien species *Amorpha fruticosa*, *Conyza canadensis*, *Elaeagnus angustifolia*, as well as of one ruderal species. Just one threatened taxon was identified, endangered within the plots.

Key species: *Calamagrostis epigeios* (1; SPL), *Hippophaë rhamnoides* (3; SPL).

Threatened species: *Eryngium maritimum* (+; SPL).

Other species: *Amorpha fruticosa* (1; SPL), *Conyza canadensis* (+; SPL), *Cynodon dactylon* (+; SPL), *Elaeagnus angustifolia* (1; SPL), *Euphorbia seguieriana* (+; SPL), *Linum austriacum* (+; SPL), *Salsola soda* (+; SPL), *Tamarix ramosissima* (+; SPL), *Xanthium italicum* (+; SPL).

***Calamagrostis epigei-Hippophaëtum rhamnoides* Popescu, Sanda, Nedelcu 1986** is represented by compact bushes that occur as endangered and undisturbed in the area of the Câșla Vădanei (GCV) dunes, Sfântu Gheorghe TAU, on restricted areas, being also noticed on the banks between the Buhaz-Zătoane and Gârla Turcească Channel, where these phytocoenoses are rare.

Key species: *Hippophaë rhamnoides* (5, GCV).

Other species:

- trees: *Populus alba* (1; GCV).

- shrubs/ lianas: *Rubus caesius* (+; GCV).

- grasses/ undershrubs: *Carex colchica* (+; GCV), *Centaurea arenaria* (+; GCV), *Euphorbia seguieriana* (+; GCV), *Linum austriacum* (+; GCV), *Teucrium chamaedris* (1; GCV), *Verbascum banaticum* (+; GCV).

2190 Humid dune slacks (PAL.CLASS.: 16.3 = 16.31 to 16.35)

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of A level.

The habitat was mainly recorded as vulnerable and less from endangered to sporadic, mostly undisturbed, sometimes low disturbed. It was recorded between C.A. Rosetti and Cardon, along the Magearu Channel, near the Letea village (C.A. Rosetti TAU); along the Buhaz-Zăton Channel, Meleaua Sahalin, Tătaru Channel, Sahalin Islands (Sfântu Gheorghe TAU); the northern and

northwestern part of the Caraorman levee, the channel from the north-western part of the Caraorman levee (Crișan TAU); Meleaua Sahalin (Sfântu Gheorghe TAU); Prospect area (Sulina TAU); Portița area (Jurilovca TAU); Plaja Corbu, Plaja (Beach) Vadu (Corbu TAU); between C.A. Rosetti, Letea and Cardon (C.A. Rosetti TAU); along the channel situated southwards of the Sulina beach, road Cardon-Sulina (Sulina TAU).

Most of the six threatened species are endangered within the plots and less vulnerable or frequent (*Salvinia natans*, *Trapa natans*, *Polypogon monospeiensis*, *Scirpus littoralis*, *Samolus valerandi* and *Stratiotes aloides*). To these there can be added *Marsilea quadrifolia*, species of community importance, vulnerable taking into account that this is the only location where it was recorded at least within proper studies. Even if in the plot it is vulnerable, it can be considered as critically endangered within the studied area. Thus it could be considered a high priority within conservation measures, like also *Scirpus littoralis*, only identified within the Sahalin Islands, so far, at least within proper research.

Subtype 16.31-Dune-slack pools (fresh-water aquatic communities (cf. 22.4) of permanent dune-slack water bodies

The habitat subtype was mainly recorded as a vulnerable and sometimes sporadic, undisturbed. It was observed from: between C.A. Rosetti and Cardon, along the Magearu Channel, near the Letea village (C.A. Rosetti TAU) along the Buhaz-Zăton Channel channel (Sfântu Gheorghe TAU), the channel from the north-western part of the Caraorman levee (Crișan TAU), Meleaua Sahalin (Sfântu Gheorghe TAU) and Prospect area (Sulina TAU). Threatened species like *Trapa natans*, *Salvinia natans*, *Stratiotes aloides*, were recorded, mainly endangered and less vulnerable or frequent.

22.4311 Water-lily beds

This habitat with its two associations is vulnerable and in its natural status, being observed between C.A. Rosetti and Cardon, along the Magearu Channel, near the Letea village (C.A. Rosetti TAU) as well as along the Buhaz-Zăton Channel (Sfântu Gheorghe TAU), and the channel from the north-western part of the Caraorman levee (Crișan TAU). Three threatened species were recorded, endangered within the plots at least, except the endangered-vulnerable taxa *Salvinia natans*.

***Nymphaetum albae* Vollmar 1947**, inventoried between C.A. Rosetti and Cardon (RC) as vulnerable and in its natural status, was also observed along the Magearu Channel, near the Letea village. The only species of conservative interest identified so far is *Salvinia natans*, included in the “not threatened” category.

Key species: *Nymphaea alba* (5; RC).

Threatened species: *Salvinia natans* (1; RC).

Other species: *Typha angustifolia* (1; RC).

***Nymphaetum albae* Vollmar 1947**, even if it has a reduced biodiversity, in the situations observed in the Buhaz-Zăton Channel (CBZ) area, where it is vulnerable and undisturbed, has three taxa from the National Red List (OLTEAN *et alii*, 1994), two of which are vulnerable, namely *Stratiotes aloides* and *Trapa natans*, while *Salvinia natans* being not threatened.

Key species: *Nymphaea alba* (4; CBZ).

Threatened species: *Salvinia natans* (+; CBZ), *Stratiotes aloides* (+; CBZ), *Trapa natans* (+; CBZ).

***Myriophyllo verticillati-Nupharetum luteae* W. Koch 1926** is representative for the aquatic phytocoenoses, present in the almost stagnant waters of the channel from the north-western part of the Caraorman levee, Crișan TAU (CON), where it was identified as vulnerable and undisturbed. Within these cenotaxa, the threatened species *Salvinia natans*-not threatened, protected by the Berne Convention, and the vulnerable *Stratiotes aloides*, were identified. In the plots the first is assessed as vulnerable and the second as endangered.

Key species: *Myriophyllum verticillatum* (1; CON), *Nuphar lutea* (3; CON).

Threatened species: *Salvinia natans* (1; CON), *Stratiotes aloides* (+; CON).

Other species: *Typha angustifolia* (1; CON).

22.4312 Water chestnut carpets

This plant community/ habitat can be assessed as vulnerable-sporadic, being representative for a natural status, being studied in the Meleaua Sahalin (Sahalin Bay) (Sfântu Gheorghe TAU) and Prospect area (Sulina TAU). It shelters two taxa protected by the Berne Convention, *Trapa natans* and *Salvinia natans*, the first being frequent, as it is a key species, while the second is vulnerable within the studied phytocoenoses.

***Trapetum natantis* V. Kárpáti 1963** is widespread especially in the Meleaua Sahalin (Sahalin Bay) (ME), Sfântu Gheorghe TAU, especially in the areas with intense sedimentation in its northern sector, where it can be considered sporadic and in its natural status. Besides the dominant species, considered vulnerable, another threatened taxon is *Salvinia natans* (nt). Within the plots the first is sporadic, while the second is considered vulnerable.

Key species: *Trapa natans* (3; ME).

Threatened species: *Salvinia natans* (1; ME), *Trapa natans* (3; ME).

Other species: *Ceratophyllum demersum* (+; ME), *Phragmites australis* (+; ME), *Salvinia natans* (1; ME).

***Trapa natans* V. Karpati 1963**, a vulnerable plant community, was observed as endangered in the channel adjacent to Sulina TAU – Prospect area (SP). Within its much reduced inventory the threatened plants are represented by two taxa protected by the Berne Convention. Thus, within the studied phytocoenosis, besides the dominant *Trapa natans*, *Salvinia natans* can be estimated as vulnerable. Globally, this coenotaxon can be considered as representative for a natural status.

Key species: *Trapa natans* (4; SP).

Threatened species: *Salvinia natans* (1; SP), *Trapa natans* (4; SP).

Other species: *Typha latifolia* (+; SP).

Subtype 16.35-Dune-slack reedbeds, sedgebeds and canebeds: reedbeds, tall-sedge communities and canebeds (cf. 53.1, 53.2, 53.3) of dune-slacks

This habitat subtype was identified mainly as vulnerable, less rare, sporadic or endangered. It is mainly in its natural status and less low disturbed. It was recorded from Meleaua Sahalin, between the Sfântu Gheorghe TAU and the seashore, Buhaz-Zăton Channel, Tătaru Channel, Sahalin Islands, Buhaz-Zăton Channel (Sfântu Gheorghe TAU); Portița area (Jurilovca TAU); Plaja (Beach) Corbu, Plaja (Beach) Vadu, (Corbu TAU); C.A. Rosetti, Letea and Cardon (C.A. Rosetti TAU); Prospect area, road Cardon-Sulina (Sulina TAU), along the channel situated southwards of the Sulina beach, in the northern and north-western part of the Caraorman levee (Crișan TAU). Most of the six species that enhance its conservation value are endangered within the plots, these being represented by *Salvinia natans*, *Trapa natans*, *Polypogon monspeliensis*, *Scirpus littoralis*, *Samolus valerandi*, *Stratiotes aloides* and *Marsilea quadrifolia*.

53.1111 Freshwater *Phragmites* beds

The association/ habitat was observed mainly as rare, sometimes vulnerable or sporadic, typical for a natural status, at the Tătaru Channel, Sahalin Islands (Sfântu Gheorghe TAU), and between C.A. Rosetti and Cardon (C.A. Rosetti TAU).

***Scirpo-Phragmitetum* W. Koch 1926** is represented by permanently flooded reedbeds, poor in species, without threatened taxa, phytocoenoses that were inventoried on the territory of Sfântu Gheorghe TAU, along the Tătaru Channel where it is vulnerable and in its natural status (CTA).

Key species: *Phragmites australis* (4; CTA).

Other species: *Iris pseudacorus* (+; CTA), *Myriophyllum spicatum* (+; CTA), *Nuphar luteum* (+; CTA), *Potamogeton natans* (+; CTA), *Rumex hydrolapathum* (+; CTA), *Typha angustifolia* (1; CTA).

Scirpo-Phragmitetum W. Koch 1926, rare within the Sahalin islands (IS), was also observed on important surfaces in the area of the Buhaz-Zăton Channel.

Key species: *Phragmites australis* (5; IS).

Other species: *Myriophyllum spicatum* (+; IS), *Nuphar luteum* (+; IS), *Rumex hydrolapathum* (+; IS), *Typha angustifolia* (1; IS).

Scirpo-Phragmitetum W. Koch 1926, described as rare and in its natural status, from the area between C.A. Rosetti and Cardon (RC) form reedbeds around Letea, showing a low conservative value, highlighted by the absence of threatened species, at least in the surveyed areas.

Key species: *Phragmites australis* (4; RC).

Other species: *Alisma plantago-aquatica* (+; RC), *Berula erecta* (+; RC), *Calystegia sepium* (+; RC), *Lycopus europaeus* (+; RC), *Mentha aquatica* (+; RC), *Nymphaea alba* (+; RC), *Salix cinerea* (+; RC), *Senecio paludosus* (+; RC), *Sium latifolium* (+; RC), *Stachys palustris* (+; RC), *Typha angustifolia* (1; RC).

Scirpo-Phragmitetum W. Koch 1926, is described as sporadic and in its natural status, from Plaja (Beach) Vadu (VDC), Corbu TAU.

Key species: *Phragmites australis* (5; VDC).

Other species: *Calystegia sepium* (+; VDC), *Mentha aquatica* (+; VDC), *Pulicaria dysenterica* (+; VDC).

53.1122 Dry halophile *Phragmites* beds

The habitat/ plant community can be considered vulnerable, sometimes rare, mainly in its natural status and less low disturbed. It was recorded between C.A. Rosetti and Cardon (C.A. Rosetti TAU), Portița area (Jurilovca TAU), Sahalin Islands (Sfântu Gheorghe TAU), Plaja Corbu, Plaja (Beach) Vadu (Corbu TAU).

Astero tripolii-Phragmitetum humilis Krisch (1972) 1974, identified as vulnerable and undisturbed, between C.A. Rosetti and Cardon (RC), forms a transition zone between freshwater reedbeds and the halophile vegetation. It is worth highlighting the presence of the rare threatened species *Samolus valerandi*, endangered in the respective phytocoenoses.

Key species: *Phragmites australis* subsp. *australis* var. *humilis* (5; RC).

Threatened species: *Samolus valerandi* (+; RC).

Other species: *Berula erecta* (+; RC), *Galium palustre* (+; RC), *Lycopus europaeus* (+; RC), *Mentha aquatica* (+; RC), *Pulicaria dysenterica* (+; RC), *Senecio paludosus* (+; RC), *Sium latifolium* (+; RC), *Stachys palustris* (+; RC).

***Astero tripolii-Phragmitetum humilis* Krisch (1972) 1974** was identified as vulnerable and undisturbed in the Portița area (POR), Jurilovca TAU, where it occupies the transition areas between the low sand dunes and the wetlands, being characteristic for the humid sandy and saline substrate.

Key species: *Aeluropus littoralis* (+; POR), *Aster tripolium* (+; POR), *Phragmites australis* subsp. *australis* var. *humilis* (4; POR).

Other species: *Artemisia santonica* (1; POR), *Atriplex prostrata* (1; POR), *Gypsophila perfoliata* (r; POR), *Halimione pedunculata* (+; POR), *Lactuca tatarica* (+; POR), *Puccinellia gigantea* (1; POR), *Spergularia media* (+; POR).

***Astero tripolii-Phragmitetum humilis* Krisch (1972) 1974**, characteristic of the transition areas between the saline soils and the wetlands, has been inventoried as vulnerable on the Sahalin Islands (IS) at the edge of the coastal dunes, their influence being obvious in the presence of the vulnerable and rare species *Leymus racemosus* subsp. *sabulosus*, endangered locally. A low disturbance was noticed, as one ruderal species was identified, but with a low coverage.

Key species: *Phragmites australis* subsp. *australis* var. *humilis* (4; IS).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; IS).

Other species: *Argusia sibirica* (+; IS), *Aster tripolium* (+; IS), *Suaeda maritima* (+; IS), *Xanthium italicum* (+; IS).

***Astero tripolii-Phragmitetum humilis* Krisch (1972) 1974**, identified as vulnerable and low disturbed, within Plaja Corbu (CRB), Corbu TAU.

Key species: *Phragmites australis* subsp. *australis* var. *humilis* (5; CRB).

Other species: *Cynanchum acutum* (1; CRB), *Lythrum salicaria* (+; CRB), *Juncus littoralis* (+; CRB).

***Astero tripolii-Phragmitetum humilis* Krisch (1972) 1974** was identified as rare and undisturbed at Plaja (Beach) Vadu (VDC), Corbu TAU.

Key species: *Phragmites australis* subsp. *australis* var. *humilis* (5; VDC)

Other species: *Althaea officinalis* (+; VDC), *Cynanchum acutum* (1; VDC), *Juncus littoralis* (+; VDC), *Lythrum salicaria* (+; VDC), *Pulicaria dysenterica* (+; VDC).

***Astero tripolii-Phragmitetum humilis* Krisch (1972) 1974** was identified as rare and undisturbed at Plaja (Beach) Vadu (VDC), Corbu TAU.

Key species: *Phragmites australis* subsp. *australis* var. *humilis* (4; VDC)

Other species: *Althaea officinalis* (+; VDC), *Aster tripolium* (+; VDC), *Atriplex hastata* (+; VDC), *Pulicaria dysenterica* (1; VDC), *Solanum dulcamara* (+; VDC).

53.12 Common club rush beds

***Schoenoplectetum lacustris* Chouchar 1924**, a vulnerable and undisturbed plant community, forms narrow strips in the shallow waters near the banks of the Tătaru Channel (CTA).

Key species: *Schoenoplectus lacustris* (5, CTA).

Other species: *Myriophyllum spicatum* (+; CTA), *Phragmites australis* (+; CTA), *Sagittaria sagittifolia* (+; CTA), *Sparganium erectum* (+; CTA), *Typha angustifolia* (+; CTA).

53.131 Great reed mace beds

This plant community/ habitat can be considered vulnerable and in its natural status or low disturbed, being recorded from Prospect area (Sulina TAU) and Buhaz-Zăton Channel (Sfântu Gheorghe TAU). Two threatened species were identified, mainly endangered, *Salvinia natans* and *Trapa natans*, the first being also observed as vulnerable.

***Typhetum latifoliae* G. Lang 1973**, a vulnerable coenotaxon recorded from the channel adjacent to Sulina TAU-Prospect area (SP), is low disturbed, as one ruderal taxon was registered. It has a certain conservation importance, due to the presence of two taxa protected by Bern Convention.

Key species: *Typha latifolia* (5; SP).

Threatened species: *Salvinia natans* (1; SP), *Trapa natans* (+; SP).

Other species: *Gratiola officinalis* (+; SP), *Lycopus europaeus* (+; SP), *Mentha aquatica* (+, SP), *Solanum dulcamara* (+; SP), *Tanacetum vulgare* (+; SP), *Typha angustifolia* (+; SP).

***Typhetum latifoliae* G. Lang 1973** is predominantly distributed in shallow waters along the channels, being inventoried as vulnerable and undisturbed along the Buhaz-Zăton Channel (CBZ), Sfântu Gheorghe TAU, where two species included in the National Red List were identified. Of these, *Trapa natans* is vulnerable, while *Salvinia natans* is in the "not threatened" category, both being endangered within these phytocoenoses.

Key species: *Typha latifolia* (5; CBZ).

Threatened species: *Salvinia natans* (+; CBZ), *Trapa natans* (+; CBZ).

Other species: *Iris pseudacorus* (+; CBZ), *Nymphaea alba* (+; CBZ).

53.132 Lesser reedmace beds

This plant community/ habitat is vulnerable and undisturbed, rarely low disturbed due to ruderal taxa or even medium disturbed by alien species. It was recorded between C.A. Rosetti, Letea and Cardon villages (C.A. Rosetti TAU), along the channel situated southwards of the Sulina beach, or from there towards the town (Sulina TAU), in the northern and north-western part of the Caraorman levee (Crișan TAU), Buhaz-Zătoane Channel (Sfântu Gheorghe TAU). *Salvinia natans* and *Stratiotes aloides*, two species identified, are both endangered within the plots.

***Typhetum angustifoliae* Pignatti 1953** was recorded as vulnerable and low disturbed, as indicated by one ruderal species between C.A. Rosetti and Letea villages (LR), both on the banks of the canals and in the areas with negative relief on wet soils. In the permanently flooded phytocoenoses, two threatened species, *Salvinia natans*, protected by the Berne Convention, listed as not threatened, and the vulnerable *Stratiotes aloides*, have been reported, both endangered within the plots.

Key species: *Typha angustifolia* (4; LR).

Threatened species: *Salvinia natans* (+; LR), *Stratiotes aloides* (+; LR).

Other species: *Alisma plantago-aquatica* (1; LR), *Calystegia sepium* (+; LR), *Lycopus europaeus* (+; LR), *Lythrum salicaria* (+; LR), *Mentha aquatica* (+; LR), *Nymphaea alba* (1; LR), *Pulicaria dysenterica* (+; LR), *Sagittaria sagittifolia* (+; LR), *Schoenoplectus lacustris* (+; LR), *Sparganium erectum* (+; LR), *Xanthium italicum* (+; LR).

***Typhetum angustifoliae* Pignatti 1953** was recorded as vulnerable and undisturbed at Nebunu Lake, (LN), near Periprava, C.A. Rosetti TAU.

Key species: *Typha angustifolia* (4; LN).

Other species: *Alisma plantago-aquatica* (+; LN), *Mentha aquatica* (+; LN), *Sparganium erectum* (+; LN), *Schoenoplectus lacustris* (+; LN).

***Typhetum angustifoliae* Pignatti 1953** was recorded as vulnerable and undisturbed between C.A. Rosetti and Cardon (RC).

Key species: *Typha angustifolia* (4-5; RC).

Other species: *Althaea officinalis* (1; RC), *Calystegia sepium* (+; RC), *Lycopus europaeus* (+; RC), *Mentha aquatica* (+; RC), *Nymphoides peltata* (+; RC), *Pulicaria dysenterica* (+; RC), *Sagittaria sagittifolia* (+; RC), *Sium latifolium* (+; RC), *Sparganium erectum* (+; RC).

***Typhetum angustifoliae* Pignatti 1953**, a vulnerable plant community, was identified along the channel situated southwards of the Sulina beach (SPL), in connection with the sea. This can be considered as typical for a natural status.

Key species: *Typha angustifolia* (4; SPL).

Other species: *Alisma plantago-aquatica* (+; SPL), *Calystegia sepium* (+; SPL), *Sparganium ramosum* (+; SPL), *Schoenoplectus tabernaemontani* (+; SPL), *Typha latifolia* (+; SPL).

***Typhetum angustifoliae* Pignatti 1953**, a vulnerable plant community, was recorded at the Sulina beach (SPL), towards the town. This is an example of medium disturbed phytocoenosis, due to the presence of non-native species, like *Acorus calamus* and *Elaeagnus angustifolia*, with a significant dominance (+-1).

Key species: *Typha angustifolia* (3; SPL).

Other species: *Acorus calamus* (+; SPL), *Alisma plantago-aquatica* (+; SPL), *Calystegia sepium* (+; SPL), *Elaeagnus angustifolia* (1; SPL), *Lycopus*

europaeus (+; SPL), *Mentha aquatica* (+; SPL), *Pulicaria dysenterica* (+; SPL), *Potentilla reptans* (1; SPL), *Sparganium ramosum* (+; SPL).

***Typhetum angustifoliae* Pignatti 1953** was recorded as vulnerable and in its natural status along the channel from the north-western part of the Caraorman levee (CON), as well as in other wetland areas in the area.

Key species: *Typha angustifolia* (4; CON).

Other species: *Alisma plantago-aquatica* (+; CON), *Berula erecta* (+; CON), *Euphorbia palustris* (+; CON), *Gnaphalium luteo-album* (+; CON), *Lycopus europaeus* (+; CON), *Mentha aquatica* (+; CON), *Phragmites australis* (1; CON), *Salix alba* (+; CON), *Scirpus lacustris* (1; CON), *Senecio paludosus* (+; CON), *Solanum dulcamara* (+; CON).

***Typhetum angustifoliae* Pignatti 1953** was recorded as vulnerable and undisturbed in the northern part of the Caraorman levee (CON).

Key species: *Typha angustifolia* (4; CON).

Other species: *Calystegia sepium* (+; CON), *Euphorbia palustris* (+; CON), *Gnaphalium luteo-album* (+; CON), *Lythrum salicaria* (+; CON), *Mentha aquatica* (1; CON), *Phragmites australis* (+; CON), *Rumex hydrolapathum* (+; CON), *Scirpus lacustris* (+; CON), *Senecio paludosus* (+; CON), *Sium latifolium* (+; CON).

***Typhetum angustifoliae* Pignatti 1953** is represented, in the analyzed situations, by vulnerable and undisturbed phytocoenoses, dominated exclusively by *Typha angustifolia* bordering the Buhaz-Zătoane Channel (CBZ).

Key species: *Typha angustifolia* (5; CBZ)

53.133 Laxmann`s reed mace beds

The association/ habitat is endangered and either in its natural status or low disturbed, being inventoried adjacent to the road Cardon-Sulina (Sulina TAU) and on the Sahalin Islands (Sfântu Gheorghe TAU).

***Typhetum laxmannii* Nedelcu 1969** was identified in a low dune slack adjacent to the road Cardon-Sulina (SN), being framed as endangered. A low disturbance is indicated by the only ruderal species, *Xanthium italicum*, with a reduced dominance. Only one rare threatened species, *Samolus valerandi*, locally endangered, was observed in the plots.

Key species: *Typha laxmannii* (3; SN).

Threatened species: *Samolus valerandi* (1; SN).

Other species: *Althaea officinalis* (+; SN), *Aster tripolium* (+; SN), *Cynodon dactylon* (+; SN), *Eupatorium cannabinum* (1; SN), *Lythrum salicaria* (+; SN), *Mentha aquatica* (+; SN), *Pulicaria dysenterica* (+; SN), *Xanthium italicum* (+; SN).

***Typhetum laxmannii* Nedelcu 1969** is an isolated occurrence on the Sahalin Islands (IS), where it is endangered and in its natural status. Its conservative value is increased by the presence of two threatened rare species, *Polypogon monospeliensis* and *Scirpus littoralis*, both endangered within the plots.

Key species: *Typha laxmannii* (4; IS).

Threatened species: *Polypogon monospeliensis* (+; IS), *Scirpus littoralis* (+; IS).

Other species: *Phragmites australis* (+; IS), *Typha angustifolia* (+; IS).

53.143 Erect bur-reed communities

Sparganietum erecti Roll.1938, was observed as an endangered plant community between the Sfântu Gheorghe TAU and the seashore (SG), where the threatened species *Marsilea quadrifolia*, species of community importance is vulnerable. Still taking into account that this is the only location where it was recorded, at least within proper studies, even if in the plot it is vulnerable, it can be considered as critically endangered within the studied area.

Key species: *Sparganium erectum* (2; SG).

Threatened species: *Marsilea quadrifolia* (1; SG), *Salvinia natans* (1; SG).

Other species: *Hydrocharis morsus-ranae* (+; SG), *Lemna minor* (+; SG), *Lycopus europaeus* (+; SG), *Mentha aquatica* (+; SG), *Phragmites australis* (+; SG), *Tamarix ramosissima* (1; SG).

53.14B Iris beds

Iretum pseudacori Egger 1933 was recorded as an endangered association along the Buhaz-Zăton (CBZ) channel, Sfântu Gheorghe TAU, where it crosses the sand levees, being able to be considered as a dune slack water. Two species included in the National Red List (OLTEAN *et alii*, 1994) were recorded, *Salvinia natans* and *Trapa natans*, protected by the Berne Convention, both endangered within the plots.

Key species: *Iris pseudacorus* (4; CBZ).

Threatened species: *Salvinia natans* (+; CBZ), *Trapa natans* (+; CBZ).

Other species: *Nymphaea alba* (+; CBZ), *Phragmites australis* (+; CBZ).

3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (PAL.CLASS.: 22.13 x (22.41 or 22.421))

22.41 Free-floating vegetation

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 45,364 ha and a conservation status of A level.

The habitat was recorded mainly as vulnerable, sometimes endangered or rare, being in its natural status. It was observed at the northern part of the Letea levee, at the Nebunu Lake in the surroundings Periprava and Letea villages, outside the Pădurea Letea strictly protected area, between C.A. Rosetti and Cardon and near Periprava (C.A. Rosetti TAU), Danube floodplain, close to the Getic fortress (Beștepe TAU), Eracle Channel (Chilia Veche TAU), west of the Zaporojeni Fortress (Murighiol TAU). All the three threatened species (*Salvinia natans*, *Trapa natans*, *Stratiotes aloides*) among which two are protected by the Berne Convention, are in reality not threatened within the D.D.B.R. and associated sites. All are either dominant within their coenotaxa, or can reach the endangered/ vulnerable level, within other associations.

22.41 Free-floating vegetation

This habitat subtype was often observed within the Danube Delta SCI and SPA, where it could be preliminary estimated as vulnerable and undisturbed. *Stratiotes aloides* and *Trapa natans* are vulnerable threatened species, the last being protected by the Berne Convention, being framed between endangered and vulnerable within the plots.

***Ceratophylletum demersi* Hild. 1956** was registered as vulnerable and undisturbed within the Nebunu Lake, (LN), near Periprava, C.A. Rosetti TAU.

Key species: *Ceratophyllum demersum* (3; LN).

Other species: *Phragmites australis* (1; LN), *Typha angustifolia* (+; LN).

***Ceratophylletum demersi* Hild. 1956**, a vulnerable plant community that occurs in the lakes of the Danube floodplain, close to the Getic fortress, near Beștepe TAU (BLD), shelters one vulnerable threatened species, *Stratiotes aloides*, endangered at least within the analysed phytocoenosis. As no ruderal/ alien taxa were recorded, it can be considered as representative for a natural status.

Key species: *Ceratophyllum demersum* (3; BLD).

Threatened species: *Stratiotes aloides* (±; BLD).

Other species: *Myriophyllum spicatum* (1; BLD), *Nymphaea alba* (1; BLD), *Ranunculus trichophyllus* (+; BLD), *Potamogeton lucens* (±; BLD).

***Ceratophylletum demersi* Hild. 1956** represents a vulnerable and undisturbed plant community identified in the Eracle Channel, Chilia Veche TAU (CHE) that has two vulnerable threatened taxa. Of these, *Trapa natans* is vulnerable and *Stratiotes aloides* is endangered within the analysed situations.

Key species: *Ceratophyllum demersum* (5; CHE).

Threatened species: *Stratiotes aloides* (+; CHE), *Trapa natans* (1; CHE).

Other species: *Hydrocharis morsus-ranae* (+; CHE).

***Ceratophylletum submersi* (Soó 1927 n.n.) Den Hartog et Segal 1964**, a vulnerable plant community within the Danube floodplain, Beștepe TAU, can

be considered as being close to its natural status as no alien/ ruderal species were identified.

Key species: *Ceratophyllum submersum* (3, BLD).

Other species: *Bolboschoenus maritimus* (+; BLD), *Myriophyllum spicatum* (1; BLD), *Nymphoides peltata* (+; BLD), *Phragmites australis* (+; BLD), *Potamogeton crispus* (1; BLD), *Ranunculus trichophyllus* (+; BLD).

22.412 Frogbit rafts

This habitat subtype was often observed within the Danube Delta SCI and SPA, where it could be preliminary estimated as endangered and undisturbed, below being presented just two examples of it. There was recorded only one threatened species, *Salvinia natans*, endangered to vulnerable within the plots.

***Lemno-Hydrocharitetum morsus-ranae* (Oberd.) Pass. 1978**, was observed as an endangered and undisturbed association in the surroundings of the Letea village (LE). *Salvinia natans* is the only threatened species, also protected by the Berne Convention, endangered within the plots.

Key species: *Hydrocharis morsus-ranae* (3; LE).

Threatened species: *Salvinia natans* (+; LE),

Other species: *Cicuta virosa* (+; LE), *Ceratophyllum demersum* (2; LE), *Lemna minor* (+; LE), *Nymphaea alba* (1; LE), *Nymphoides peltata* (+; LE), *Schoenoplectus lacustris* (+; LE), *Typha angustifolia* (+; LE).

***Lemno-Hydrocharitetum morsus-ranae* (Oberd.) Pass. 1978** was identified on small areas to the west of the Zaporojeni Fortress (CZV), on the territory of Murighiol TAU, where it can be assessed as endangered and undisturbed. It is worth highlighting the presence of a species from the Red List of Higher Plants of Romania, *Salvinia natans*, classified as "not threatened" at the national level, but protected by the Berne Convention, considered vulnerable within the phytocoenoses.

Key species: *Hydrocharis morsus-ranae* (2; CZV), *Lemna minor* (1; CZV), *Salvinia natans* (1; CZV).

Threatened species: *Salvinia natans* (1; CZV).

Other species: *Ceratophyllum demersum* (+; CZV), *Stachys palustris* (+; CZV), *Phragmites australis* (+; CZV), *Typha angustifolia* (+; CZV).

22.415 *Salvinia* covers

This habitat subtype was often observed within the Danube Delta SCI and SPA, where it could be preliminary estimated between vulnerable and rare, undisturbed, below being presented just an example of it.

***Lemno-Salvinietum natantis* Miyavaki et J.Tx. 1960** was identified as an endangered and undisturbed plant community, at the northern part of the Letea levee, in the surroundings Periprava village, outside the Pădurea Letea

strictly protected area (PEN), C.A. Rosetti TAU. The dominant *Salvinia natans* is the only threatened species, also protected by the Berne Convention.

Key species: *Salvinia natans* (4; PEN).

Threatened species: *Salvinia natans* (+; PEN),

Other species: *Lemna minor* (+; PEN), *Ceratophyllum demersum* (2; PEN).

22.413 Water-soldier rafts

The habitat subtype can be overall assessed as vulnerable, sometimes endangered and undisturbed, being observed around the Letea village, between C.A.Rosetti and Cardon (C.A. Rosetti TAU), within the Eracle Channel (Chilia Veche TAU). *Stratiotes aloides*, *Salvinia natans* and *Trapa natans* are the threatened species registered, the last two being protected by the Berne Convention, and framed between vulnerable and rare, while the first is dominant within these phytocoenoses.

***Stratiotetum aloidis* Nowinski 1930** was noticed as endangered and in its natural status in the wetlands around the Letea village (LE). *Salvinia natans* is the only threatened species, also protected by the Berne Convention, endangered within the plots.

Key species: *Stratiotes aloides* (2; LE).

Threatened species: *Salvinia natans* (1; LE), *Stratiotes aloides* (2; LE).

Other species: *Cicuta virosa* (+; LE), *Ceratophyllum demersum* (1; LE), *Nymphaea alba* (1; LE), *Nymphoides peltata* (+; LE), *Phragmites australis* (+; LE), *Typha angustifolia* (+; LE).

***Stratiotetum aloidis* Nowinski 1930**, a vulnerable plant community, at least within the Eracle Channel, Chilia Veche TAU (CHE), besides the dominant species has also another vulnerable threatened taxon, *Trapa natans*. It can be considered as typical for a natural status, taking into account the absence of ruderal/ alien species.

Key species: *Stratiotes aloides* (4; CHE).

Threatened species: *Stratiotes aloides* (4; CHE), *Trapa natans* (1; CHE).

Other species: *Nymphaea alba* (1; CHE), *Nuphar lutea* (1; CHE), *Phragmites australis* (+; CHE), *Typha angustifolia* (+; CHE).

***Stratiotetum aloidis* Nowinski 1930**, recorded as vulnerable and undisturbed between C.A.Rosetti and Cardon (RC), in a silted channel, is dominated by the threatened species *Stratiotes aloides*.

Key species: *Stratiotes aloides* (5; RC).

Threatened species: *Stratiotes aloides* (5; RC).

Other species: *Nymphaea alba* (+; RC), *Phragmites australis* (+; RC), *Schoenoplectus lacustris* (+; RC), *Typha angustifolia* (+; RC).

3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoëto-Nanojuncetea* (PAL.CLASS.: 22.12 x (22.31 and 22.32))

22.32 Euro-Siberian dwarf annual amphibious swards

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of A level.

Within proper research this habitat was so far recorded as an endangered and low disturbed plant community only on the north-western part of the Caraorman levee, Crișan TAU, but it is probably more extended throughout the Delta.

***Pulicario-Menthetum pulegii* Slavnič 1951** was inventoried as endangered on restricted areas, adjacent to the channel from the north-western part of the Caraorman levee, Crișan TAU. A low disturbance due to alien species (*Coryza canadensis*) was noticed.

Key species: *Mentha pulegium* (2; CON), *Pulicaria vulgaris* (+; CON).

Other species: *Coryza canadensis* (+; CON), *Cynodon dactylon* (2; CON), *Euphorbia palustris* (+; CON), *Mentha aquatica* (1; CON), *Potentilla reptans* (+; CON), *Rubus caesius* (+; CON), *Trifolium repens* (+; CON).

3160 Natural dystrophic lakes and ponds (PAL.CLASS.: 22.14)

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4,536 ha and a conservation status of B level.

Within proper research this habitat was so far recorded as an endangered and undisturbed plant community only in the reed beds framed between the Razim Lagoon open waters and the Babadag Lake (Sarichioi TAU). Two threatened species were identified *Utricularia vulgaris* and *Aldrovanda vesiculosa*, of which the last is endangered at the national level, being a species of community interest. While, at least in the plots the first is critically endangered, the second is dominant.

22.14 Dystrophic waterbodies

***Spirodello-Aldrovandetum* Borhidi et Komlódi 1959** was recorded as an endangered and undisturbed plant community in the reed beds framed between the Razim Lagoon open waters and the Babadag Lake (RB), Sarichioi TAU. Among the two threatened species identified, *Utricularia vulgaris* is rare

and *Aldrovanda vesiculosa* is endangered at the national level, being a species of community interest. While, at least in the plots the first is critically endangered, the second is dominant.

Key species: *Aldrovanda vesiculosa* (2; RB).

Threatened species: *Aldrovanda vesiculosa* (2; RB), *Utricularia vulgaris* (r; RB).

Other species: *Berula erecta* (+; RB), *Ceratophyllum demersum* (1; RB), *Phragmites australis* (+; RB), *Typha latifolia* (+; RB), *Hydrocharis morsus-ranae* (+; RB).

3260 Water courses of plain to montane levels with the *Ranunculon fluitantis* and *Callitricho-Batrachion* vegetation (PAL.CLASS.: 24.4)

The habitat is represented by the subtype **24.4 Euhydrophytic river vegetation**, and more detailed in the studied area by **24.43 Mesotrophic river vegetation**. This habitat was observed without being recorded in plots, as it was nearly monodominant (*Ranunculus trichophyllus*) within the Sulina pastureland, in a shallow channel towards the sea, being considered thus as endangered and undisturbed.

3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (PAL.CLASS.: 24.52)

24.52 Euro-Siberian annual river mud communities

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4536 ha and a conservation status of A level.

Even though this habitat is frequent in the Danube Delta, where most channel banks are muddy or sandy-muddy, it was studied within proper research on restricted areas, as it is sometimes dominated by ruderal species, with very low conservation value or even ruderal species that could decrease the conservation value of other community interes habitat if they become invasive. This situation is valid mainly for the *Xanthietum italicii* plant community, where the key species is ruderal, while other plant communities within this habitat are dominated by native non-ruderal taxa. Still, this is an important habitat for the fauna, so it should not be neglected.

This habitat was so far recorded as vulnerable and highly disturbed, mainly due to the ruderal species and less because of the alien ones. It was observed in the surroundings of the Periprava village, outside the Pădurea Letea strictly protected area (C.A. Rosetti TAU), from where *Periploca graeca* has migrated into these phytocoenoses, where it can be considered endangered.

24.52 Euro-Siberian annual river mud communities

Xanthietum italicii Timár 1950 was identified as vulnerable at the northern part of the Letea levee, in the surroundings of the Periprava village, outside the Pădurea Letea strictly protected area (PEN), C.A. Rosetti TAU, on muddy-sandy soils. It can be considered as highly disturbed, as two ruderal species were recorded, of which one is dominant, while one alien taxon, *Amorpha fruticosa* has a reduced coverage.

Key species: *Xanthium italicum* (4; PEN).

Threatened species: *Periploca graeca* (+; PEN),

Other species: *Agrostis stolonifera* (+; PEN), *Alisma plantago-aquatica* (+; PEN), *Amorpha fruticosa* (+; PEN), *Cynodon dactylon* (1; PEN), *Daucus carota* (+; PEN), *Euphorbia palustris* (+; PEN), *Lythrum salicaria* (+; PEN), *Mentha aquatica* (+; PEN), *Populus alba* (+; PEN), *Potentilla reptans* (+; PEN), *Ranunculus sceleratus* (+; PEN), *Senecio paludosus* (+; PEN), *Sparganium erectum* (+; PEN).

40C0* Ponto-Sarmatic deciduous thickets (PAL.CLASS.: 31.8B7)

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), being estimated preliminary as having 4 ha and a conservation status of B level.

This habitat was so far recorded as endangered (sometimes vulnerable) and low disturbed (medium disturbed in some situations), as indicated by ruderal and less by alien species) mainly due to grazing. Its locations include the slopes facing the Danube floodplain (Nufăru TAU), Cape Doloşman (Jurilovca TAU), between Dunavăţu de Jos and Zaporojeni Fortress (Murighiol TAU), Dealurile Beştepe Nature Reserve (Beştepe and Mahmudia TAUs), Cape Doloşman (Jurilovca TAU). Among the four rare threatened species *Asparagus verticillatus* is vulnerable, *Ornithogalum fimbriatum* and *Myrrhoides nodosa* endangered, while *Paliurus spina-christi* is framed as frequent-sporadic within the analyzed phytocoenoses.

31.8B721 Ponto-Sarmatic hawthorn-blackthorn scrub

The plant community/ habitat was mainly observed as endangered, and less as vulnerable, low disturbed, sometimes with a medium level of disturbance, due to grazing, indicated by ruderal and less invasive non-native taxa. It was recorded within the slopes facing the Danube floodplain (Nufăru TAU), Cape Doloşman (Jurilovca TAU) and between Dunavăţu de Jos and Zaporojeni Fortress (Murighiol TAU). *Paliurus spina-christi* is the only threatened taxa identified as endangered in the plots

***Pruno spinosae-Crataegetum* Soó (1927) 1931** plant community can be estimated as endangered within the Nufăru TAU. It was analysed on the slopes

of the loess plateau adjacent to the Danube floodplain (NTL), included in the Beştepe-Mahmudia SPA. Four ruderal species with a low dominance indicate a low disturbance from this point of view.

Key species: *Prunus spinosa* (4; NTL).

Other species:

- shrubs: *Rhamnus cathartica* (+; NTL), *Ulmus procera* (+; NTL);
 - grasses/ undershrubs: *Bromus japonicus* (+; NTL), *Coronilla varia* (+; NTL), *Dactylis glomerata* (+; NTL), *Eryngium campestre* (+; NTL), *Euphorbia agraria* (+; NTL), *Cruciata pedemontana* (+; NTL), *Iris variegata* (+; NTL), *Marrubium peregrinum* (+; NTL), *Phragmites australis* (+; NTL), *Poa angustifolia* (+; NTL), *Teucrium chamaedrys* (+; NTL), *Ulmus procera* (+; NTL).

Pruno spinosae-Crataegetum Soó (1927) 1931, a vulnerable plant community from Cape Doloşman (CDO), Jurilovca TAU, taking into account that the five ruderal species are more numerous than the other taxa, it can be estimated as having a medium level of disturbance.

Key species: *Prunus spinosa* (4; CDO).

Other species:

- shrubs/ trees: *Pyrus pyraister* (1; CDO), *Rhamnus cathartica* (1; CDO), *Rosa canina* (+; CDO);
 - grasses/ undershrubs: *Agropyron cristatum* (+; CDO), *Anthriscus cerefolium* (+; CDO), *Bromus sterilis* (+; CDO), *Carduus thoermeri* (+; CDO), *Crepis sancta* (+; CDO), *Geranium pusillum* (+; CDO).

Pruno spinosae-Crataegetum Soó (1927) 1931 plant community was studied at Cape Doloşman, Jurilovca TAU, where it can be considered endangered. *Paliurus spina-christi* is considered a vulnerable and rare threatened species at the national level, endangered within the plots. Five ruderal species indicate a low disturbance, as they all have a reduced dominance.

Key species: *Prunus spinosa* (5; CDO).

Threatened species: *Paliurus spina-christi* (+; CDO).

Other species: *Agropyron cristatum* (+; CDO), *Anthriscus cerefolium* (1; CDO), *Arum orientale* (r; CDO), *Conium maculatum* (+; CDO), *Cynodon dactylon* (+; CDO), *Geranium pusillum* (+; CDO), *Lamium amplexicaule* (+; CDO), *Marrubium vulgare* (+; CDO), *Stellaria media* (+; CDO).

Pruno spinosae-Crataegetum Soó (1927) 1931, an endangered plant community from Cape Doloşman, Jurilovca TAU, has a medium level of ruderal plant invasion, as the nine such species prevail within its inventory, among which *Anthriscus caucalis* has a significant dominance.

Key species: *Prunus spinosa* (5; CDO).

Other species:

- grasses/ undershrubs: *Anthriscus caucalis* (1; CDO), *Bromus sterilis* (+; CDO), *Galium aparine* (+; CDO), *Geranium pusillum* (+; CDO), *Lamium purpureum* (+; CDO), *Lepidium latifolium* (+; CDO), *Onopordum acanthium* (+; CDO), *Senecio vernalis* (+; CDO), *Sisymbrium orientale* (+; CDO), *Stellaria media* (+; CDO).

Pruno spinosae-Crataegetum Soó (1927) 1931 was found in the Danube Delta SPA on the territory of Murighiol TAU, between Dunavățu de Jos and Zaporojeni Fortress (DZ), in microdepressions of the loessoid steep banks that border the wetlands adjacent to Soschi Lake. Only an isolated clump of *Prunus spinosa*, without *Crataegus monogyna*, was observed. Thus, this phytocoenosis can be considered as endangered. Five ruderal species and one alien taxon, with a low coverage, indicate a low disturbance, but to its upper limit.

Key species: *Prunus spinosa* (5; DZ).

Other species:

- grasses/ undershrubs: *Artemisia annua* (+; DZ), *Ballota nigra* (+; DZ), *Consolida regalis* (+; DZ), *Conyza canadensis* (+; DZ), *Elymus hispidus* (+; DZ), *Euphorbia seguieriana* (+; DZ), *Fagopyrum convolvulus* (+; DZ), *Linaria genistifolia* (+; DZ), *Malva sylvestris* (+; DZ) *Marrubium peregrinum* (+; DZ), *Vinca herbacea* (+; DZ).

Pruno spinosae-Crataegetum Soó (1927) 1931 occur as endangered along the road from Periprava towards C.A.Rosetti (PR), C.A.Rosetti TAU, outside the Pădurea Letea strictly protected area, in the location where a massive soil salinization advance from the former fish farm abandoned ponds towards the Letea forest. One ruderal species, with a reduced coverage, indicate a low disturbance.

Key species: *Crataegus monogyna* (1; PR), *Prunus spinosa* (5; PR).

Other species:

- shrubs/ lianas: *Fraxinus pallisae* (+; PR), *Ligustrum vulgare* (+; PR), *Populus tremula* (1; PR), *Rosa canina* (+; PR).

- grasses/ undershrubs: *Cynanchum acutum* (+; PR).

31.8B731 Western Pontic jasmine Christ's thorn scrub

This plant community/habitat can be considered as endangered, having a low (sometimes medium) level of invasion of ruderal species and less of non-native taxa, being observed within the Dealurile Beștepe Nature Reserve (Beștepe and Mahmudia TAUs) and Cape Doloșman (Jurilovca TAU). Among the three rare threatened species *Asparagus verticillatus* is vulnerable, *Ornithogalum fimbriatum* and *Myrrhoides nodosa* endangered, while *Paliurus spina-christi* is framed as frequent-sporadic within the analyzed phytocoenoses.

***Asphodelino luteae-Paliuretum* Sanda et al. 1999** plant community can be considered as endangered within the Dealurile Beștepe nature reserve sector framed within the Beștepe commune (DBBE). There it was registered a low level of invasion of non-native (*Prunus cerasifera*), respectively ruderal species (three taxa). The key species is also a vulnerable and rare threatened plant at the national level, framed as frequent within the plots.

Key species: *Paliurus spina-christi* (4; DBBE).

Threatened species: *Paliurus spina-christi* (4; DBBE).

Other species:

- shrubs/ lianas: *Crataegus monogyna* (+; DBBE), *Rosa canina* (+; DBBE);;

- grasses/ undershrubs: *Agrimonia eupatoria* (+; DBBE), *Anthriscus caucalis* (+; DBBE), *Bromus sterilis* (+; DBBE), *Crepis sancta* (+; DBBE), *Festuca valesiaca* (+; DBBE), *Cruciata pedemontana* (+; DBBE), *Poa angustifolia* (+; DBBE), *Potentilla argentea* (+; DBBE), *Prunus cerasifera* (+; DBBE), *Trifolium campestre* (+; DBBE), *Xeranthemum anuum* (+; DBBE).

***Asphodelino luteae-Paliuretum* Sanda et al. 1999** plant community is endangered within the Dealurile Beștepe Nature Reserve, Mahmudia TAU (DBM) and also within the whole studied territory. There the only threatened species is the dominant *Paliurus spina-christi*, vulnerable and rare. There can be estimated a low invasive process of the non-native species (*Alianthus altissima*), while the seven ruderal species with a significant dominance variation (+-1) show a medium level of disturbance.

Key species: *Paliurus spina-christi* (3; DBM).

Threatened species: *Paliurus spina-christi* (3; DBM).

Other species:

- shrubs/ lianas: *Ailanthus altissima* (+; DBM), *Rhamnus cathartica* (+; DBM), *Rosa canina* (+; DBM);

- grasses/ undershrubs: *Achillea setacea* (+; DBM), *Agrimonia eupatoria* (+; DBM), *Artemisia austriaca* (+; DBM), *Bromus sterilis* (1; DBM), *Carthamus lanatus* (+; DBM), *Crepis sancta* (+; DBM), *Cruciata pedemontana* (+; DBM), *Geranium pusillum* (+; DBM), *Marrubium peregrinum* (+; DBM), *Medicago minima* (+; DBM), *Orlaya grandiflora* (+; DBM), *Poa angustifolia* (+; DBM), *Stellaria media* (+; DBM), *Teucrium chamaedrys* (+; DBM), *Thymus pannonicus* (+; DBM), *Vicia angustifolia* (+; DBM).

***Asphodelino luteae-Paliuretum* Sanda et al. 1999** can be estimated as an endangered coenotaxon at Cape Doloșman (CDO), Jurilovca TAU. The only threatened species, vulnerable and rare is the dominant *Paliurus spina-christi*. It can be considered a low disturbed habitat, taking into account the reduced dominance of the four ruderal species.

Key species: *Paliurus spina-christi* (4; CDO).

Threatened species: *Paliurus spina-christi* (4; CDO).

Other species:

- shrubs/ trees (within the shrub layer)/ lianas: *Evonymus verrucosus* (+; CDO), *Rosa canina* (+; CDO);

- grasses/ undershrubs: *Agropyron cristatum* (+; CDO), *Anthriscus cerefolium* (+; CDO), *Convolvulus cantabricus* (+; CDO), *Geranium rotundifolium* (+; CDO), *Marrubium vulgare* (+; CDO), *Poa angustifolia* (+; CDO), *Stellaria media* (+; CDO), *Veronica hederifolia* (+; CDO).

Asphodelino luteae-Paliuretum Sanda et al. 1999 is an endangered coenotaxa within Cape Doloşman (CDO), Jurilovca TAU. Besides the dominant and vulnerable *Paliurus spina-christi*, other rare threatened species, like *Asparagus verticillatus* and *Myrrhoides nodosa*, contribute to the high conservation value of this coenotaxon, the last two being vulnerable, respectively endangered within this phytocoenosis. A medium level of disturbance can be deduced from the presence of 13 ruderal taxa, that represent half of the total number of recorded species.

Key species: *Paliurus spina-christi* (4; CDO).

Threatened species: *Asparagus verticillatus* (1; CDO), *Myrrhoides nodosa* (+; CDO), *Paliurus spina-christi* (4; CDO).

Other species:

- shrubs/ lianas: *Rosa canina* (+; CDO);

- grasses/ undershrubs: *Achillea coarctata* (+; CDO), *Agropyron cristatum* (+; CDO), *Anthriscus cerefolium* (+; CDO), *Arum orientale* (+; CDO), *Bassia hirsuta* (+; CDO), *Bromus sterilis* (1; CDO), *Convolvulus cantabricus* (+; CDO), *Crepis sancta* (+; CDO), *Eryngium campestre* (+; CDO), *Euphorbia agraria* (+; CDO), *Fragaria viridis* (+; CDO), *Galium aparine* (+; CDO), *Geranium pusillum* (+; CDO), *Lamium amplexicaule* (+; CDO), *Lamium purpureum* (+; CDO), *Marrubium peregrinum* (+; CDO), *Poa angustifolia* (+; CDO), *Poa bulbosa* (+; CDO), *Sisymbrium orientale* (+; CDO), *Thlaspi perfoliatum* (+; CDO), *Verbascum banaticum* (+; CDO), *Vinca herbacea* (+; CDO).

Asphodelino luteae-Paliuretum Sanda et al. 1999 was recorded as endangered in the area of Movila Pârcălabului (MP), Jurilovca TAU, on very small areas. These sub-Mediterranean shrubs were also observed as fragments of association on the shores of the Goloviţa Lake, between Cape Doloşman and Jurilovca. The three rare threatened species (*Asparagus verticillatus*, *Ornithogalum fimbriatum*, *Paliurus spina-christi*) range from endangered to sporadic within the phytocoenoses. It can be framed as a low disturbed community, due to the five ruderal taxa with reduced coverage indices.

Key species: *Paliurus spina-christi* (3; DCI, MP).

Threatened species: *Asparagus verticillatus* (1; MP), *Ornithogalum fimbriatum* (+; MP), *Paliurus spina-christi* (3; MP).

Other species:

- grasses/ undershrubs: *Arum orientale* (+; MP), *Elymus hispidus* (1; MP), *Erodium cicutarium* (+; DCI), *Galium aparine* (+; MP), *Lamium amplexicaule* (+; MP), *Marrubium peregrinum* (+; MP), *Teucrium chamaedris* (r; MP), *Thlaspi perfoliatum* (+; MP), *Verbascum phoeniceum* (r; MP), *Vinca herbacea* (+; MP).

***Asphodelino luteae-Paliuretum* Sanda et al. 1999** was recorded as endangered in the Dealul Călugăru-Iancina Nature Reserve, Jurilovca TAU, on reduced areas. It was assessed as a medium disturbed community, due to the numerous ruderal taxa, that overpass half of the species number.

Key species: *Paliurus spina-christi* (4; DCI).

Threatened species: *Paliurus spina-christi* (4; DCI).

Other species:

- grasses/ undershrubs: *Artemisia austriaca* (+; DCI), *Elymus hispidus* (1; DCI), *Erodium cicutarium* (+; DCI), *Galium aparine* (+; DCI), *Lamium amplexicaule* (+; DCI), *Marrubium vulgare* (+; DCI), *Muscari racemosum* (+; DCI), *Onopordum acanthium* (+; DCI), *Poa angustifolia* (+; DCI), *Sisymbrium orientale* (+; DCI), *Stellaria media* (1; DCI).

62C0* Ponto-Sarmatic steppes (PAL.CLASS.: 34.92)**34.92 Ponto-Sarmatic steppes**

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4,536 ha and a conservation status of A level.

This habitat includes most of the the steppes on loess substrata, the rocky steppe and the feathergrass steppes being described separately within the subtypes **34.9211. Western Pontic thyme steppes**, respectively **34.9213 Western Pontic feathergrass steppes**. The habitat was mainly observed as vulnerable, with a predominant low disturbance character, still with a few plant communities indicating high disturbance through overgrazing, like ***Artemisia austriacae-Poëtum bulbosae***. The 62 C0* habitat was observed at Dealurile Beștepe Nature Reserve (Beștepe, Mahmudia TAUs), Cape Doloșman, Dealul Călugăru-Iancina Nature Reserve (Jurilovca TAU), Dealurile Movila, Zaporojeni Fortress, between Dunavățu de Jos and Zaporojeni Fortress, the hill situated westwards of the Zaporojeni Fortress (Murighiol TAU), Grădiștea Island (Sarichioi TAU), the loess plateau which borders the Danube floodplain (Nufăru TAU). The habitat is one of the richest in threatened species, except the critically endangered *Salvia aethiopsis*, most of the 23 such taxa being endangered, at least in the studied phytocoenoses: *Achillea leptophylla*, *Asparagus verticillatus*, *Astragalus dolichophyllus*, *Astragalus ponticus*, *Centaurea jankae*, *Conringia austriaca*, *Convolvulus lineatus*, *Dianthus nardiformis*, *Echinops ritro* subsp.

ruthenicus, *Ephedra distachya*, *Euphorbia nicaeensis* subsp. *cadrilateri*, *Festuca callieri*, *Gagea bulbifera*, *Koeleria lobata*, *Onobrychis gracilis*, *Onithogalum amphibolum*, *Pimpinella tragioides* subsp. *lithophila*, *Potentilla bornmuelleri*, *Scorzonera mollis*, *Scutellaria orientalis*, *Silene compacta*, *Thymus zygioides*.

34.92 Ponto-Sarmatic steppes

***Medicagini minimaefestucetum valesiacae* Wagner 1941** plant community was studied within the Dealurile Beștepe Nature Reserve, Beștepe TAU (DBBE), where it can be estimated as rare. Taking into account the dominance variation (+1) of the eight ruderal species, a medium degree of disturbance can be established.

Key species: *Festuca valesiaca* (4; DBBE).

Other species: *Achillea coarctata* (+; DBBE), *Achillea setacea* (+; DBBE), *Agropyron cristatum* (+; DBBE), *Bassia prostrata* (+; DBBE), *Bromus hordeaceus* (+; DBBE), *Capsella bursa-pastoris* (+; DBBE), *Cerastium brachypetalum* (1; DBBE), *Convolvulus arvensis* (+; DBBE), *Erysimum diffusum* (+; DBBE), *Cruciata pedemontana* (+; DBBE), *Koeleria macrantha* (+; DBBE), *Plantago lanceolata* (+; DBBE), *Poa bulbosa* (+; DBBE), *Senecio vernalis* (+; DBBE), *Teucrium chamaedrys* (+; DBBE), *Trifolium arvense* (+; DBBE).

***Medicagini minimaefestucetum valesiacae* Wagner 1941**, a sporadic plant community, analysed within the Dealul Călugăru-lancina Nature Reserve (DCI), can be considered representative for a very low impact of human activities, as it only includes one ruderal species with a reduced dominance. Beside this, the three rare threatened species observed in the plot enhance its conservation value.

Key species: *Festuca valesiaca* (4; DCI).

Threatened species: *Convolvulus lineatus* (+; DCI), *Echinops ritro* subsp. *ruthenicus* (+; DCI), *Thymus zygioides* (+; DCI).

Other species: *Asperula tenella* (+; DCI), *Campanula sibirica* (+; DCI), *Carduus thoermeri* (+; DCI), *Dichanthium ischaemum* (+; DCI), *Euphorbia seguieriana* (+; DCI), *Koeleria macrantha* (+; DCI), *Linaria genistifolia* (r; DCI), *Medicago falcata* (+; DCI), *Stipa capillata* (+; DCI), *Teucrium polium* subsp. *capitatum* (+ DCI).

***Medicagini minimaefestucetum valesiacae* Wagner 1941** plant community is frequent within the Dealurile Beștepe Nature Reserve (DBM), Mahmudia TAU. The four rare threatened taxa enhance its importance for conservation, these being endangered within this coenotaxon. Four ruderal species indicate a low invasive trend from this point of view.

Key species: *Festuca valesiaca* (3; DBM).

Threatened species: *Astragalus ponticus* (+; DBM), *Echinops ritro* subsp. *ruthenicus* (+; DBM), *Potentilla bornmuelleri* (+; DBM), *Onobrychis gracilis* (+; DBM).

Other species: *Campanula rapunculus* (+; DBM), *Crepis sancta* (+; DBM), *Crataegus monogyna* (+; DBM), *Cichorium intybus* (+; DBM), *Dichanthium ischaemum* (1; DBM), *Digitalis lanata* (+; DBM), *Eryngium campestre* (+; DBM), *Euphorbia glareosa* subsp. *glareosa* (+; DBM), *Euphorbia seguieriana* (+; DBM), *Koeleria macrantha* (+; DBM), *Leontodon crispus* (+; DBM), *Orlaya grandiflora* (+; DBM), *Sanguisorba minor* (+; DBM), *Teucrium chamaedrys* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM), *Thlaspi perfoliatum* (+; DBM), *Thymus pannonicus* (+; DBM), *Trifolium campestre* (+; DBM).

Medicagini minimae-Festucetum valesiaca Wagner 1941 is a vulnerable plant community at Cape Doloşman (CDO), Jurilovca TAU. Six ruderal taxa, that represent half of this phytocoenosis species inventory, with a low dominance, indicate a medium disturbance.

Key species: *Festuca valesiaca* (4; CDO).

Other species: *Agropyron cristatum* (1; CDO), *Artemisia dzevanovskiyi* (+; CDO), *Bassia prostrata* (+; CDO), *Erodium cicutarium* (+; CDO), *Erophila verna* (+; CDO), *Geranium rotundifolium* (+; CDO), *Lamium purpureum* (+; CDO), *Marrubium peregrinum* (+; CDO), *Poa bulbosa* (+; CDO), *Taraxacum erythrospermum* (+; CDO).

Medicagini minimae-Festucetum valesiaca Wagner 1941, a vulnerable plant community identified within Cape Doloşman (CDO), Jurilovca TAU, has only *Echinops ritro* subsp. *ruthenicus* as a threatened species, endangered within this phytocoenosis. There can be assessed a low level of ruderal species invasion, taking into account that the only such taxon, *Artemisia austriaca*, also has a low dominance.

Key species: *Festuca valesiaca* (4; CDO), *Medicago minima* (+; CDO).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; CDO).

Other species: *Agropyron cristatum* (+; CDO), *Artemisia austriaca* (+; CDO), *Artemisia dzevanovskiyi* (+; CDO), *Bassia prostrata* (+; CDO), *Euphorbia seguieriana* (+; CDO), *Silene conica* (+; CDO), *Sedum urvillei* subsp. *hillebrandtii* (+; CDO).

Medicagini minimae-Festucetum valesiaca Wagner 1941 can be estimated as rare in the Dealurile Beştepe Nature Reserve (DBBE), Beştepe TAU, of the three threatened rare species identified here *Dianthus nardiformis* having an European importance. Those species may be considered as endangered in the association. A low degree of ruderal species invasive trend is indicated by the reduced coverage of four indicator species.

Key species: *Festuca valesiaca* (3; DBBE).

Threatened species: *Achillea leptophylla* (+; DBBE), *Dianthus nardiformis* (+; DBBE), *Potentilla bormuelleri* (+; DBBE).

Other species: *Achillea setacea* (+; DBBE), *Artemisia austriaca* (+; DBBE), *Echium italicum* (+; DBBE), *Eryngium campestre* (+; DBBE), *Falcaria vulgaris* (+; DBBE), *Leontodon crispus* (+; DBBE), *Phleum phleoides* (+; DBBE), *Potentilla argentea* (+; DBBE), *Ranunculus illyricus* (+; DBBE), *Sanguisorba minor* (1; DBBE), *Teucrium polium* subsp. *capitatum* (+; DBBE).

As an overall assessment this plant community can be considered as rare, but it was observed also with different frequencies, from vulnerable up to the frequent category. It is in general low disturbed, and less medium disturbed by grazing. It was observed within the Dealurile Beștepe Nature Reserve (Beștepe, Mahmudia TAUs), Cape Doloșman and Dealul Călugăru-lancina Nature Reserve (Jurilovca TAU). It is characterized by an outstanding richness of threatened taxa (*Achillea leptophylla*, *Astragalus ponticus*, *Convolvulus lineatus*, *Echinops ritro* subsp. *ruthenicus*, *Potentilla bormuelleri*, *Onobrychis gracilis* and *Thymus zygoides*), mostly rare at the national level, except *Dianthus nardiformis*, which is also vulnerable, of European importance. All these threatened species are endangered within the studied phytocoenoses.

***Artemisia austriacae*-*Poëtum bulbosae* Pop 1970** plant community can be considered a vulnerable coenotaxa within the Dealurile Beștepe Nature Reserve (DBM), Mahmudia TAU. Even though it has a secondary character, its conservative value is underlined by the presence of four rare threatened taxa, endangered within the analysed phytocoenoses. Due to grazing, there is a very intense degree of ruderal plants invasive tendencies (five species), of which some are dominant or co-dominant.

Key species: *Artemisia austriaca* (1; DBM), *Poa bulbosa* (3; DBM).

Threatened species: *Achillea leptophylla* (+; DBM), *Convolvulus lineatus* (+; DBM), *Echinops ritro* subsp. *ruthenicus* (+; DBM), *Potentilla bormuelleri* (+; DBM).

Other species: *Echium italicum* (+; DBM), *Eryngium campestre* (+; DBM), *Marrubium peregrinum* (+; DBM), *Potentilla argentea* (+; DBM), *Stipa capillata* (+; DBM), *Teucrium chamaedrys* (+; DBM), *Thymus pannonicus* (+; DBM).

***Artemisia austriacae*-*Poëtum bulbosae* Pop 1970** is a secondary plant community, vulnerable within the Dealul Călugăru-lancina Nature Reserve (DCI), Jurilovca TAU. This represents the result of overgrazing, obvious in the case of the key species dominance (1-2). These occur together with other four ruderal species. Altogether these indicate an intense ruderal species invasion process, as they also represent more than half of this phytocoenosis inventory.

Key species: *Artemisia austriaca* (1; DCI), *Poa bulbosa* (2; DCI).

Other species: *Agropyron cristatum* (1; DCI), *Asperula tenella* (+; DCI), *Bassia prostrata* (+; DCI), *Centaurea solstitialis* (+; DCI), *Eryngium campestre* (+; DCI), *Festuca valesiaca* (1; DCI), *Marrubium peregrinum* (+; DCI), *Medicago minima* (+; DCI), *Onopordum acanthium* (+; DCI).

***Artemisia austriacae-Poëtum bulbosae* Pop 1970** represents a vulnerable coenotaxon within Cape Doloșman (CDO). There was identified only one rare threatened taxon, estimated as endangered within this plant community. Due to the eight ruderal taxa, that include the dominant/ codominant *Artemisia austriaca* and *Poa bulbosa*, this coenotaxon can be considered as highly disturbed.

Key species: *Artemisia austriaca* (1; CDO), *Poa bulbosa* (2; CDO).

Threatened species: *Astragalus dolichophyllus* (+; CDO).

Other species: *Agropyron cristatum* (+; CDO), *Arenaria serpyllifolia* (+; CDO), *Bassia prostrata* (+; CDO), *Convolvulus arvensis* (+; CDO), *Erodium cicutarium* (+; CDO), *Eryngium campestre* (+; CDO), *Euphorbia seguieriana* (+; CDO), *Festuca valesiaca* (+; CDO), *Geranium pusillum* (+; CDO), *Lamium amplexicaule* (+; CDO), *Marrubium peregrinum* (+; CDO), *Medicago minima* (+; CDO), *Silene conica* (+; CDO), *Teucrium chamaedrys* (+; CDO).

***Artemisia austriacae-Poëtum bulbosae* Pop 1970**, a vulnerable plant community from Cape Doloșman (CDO), Jurilovca TAU, besides the dominant *Poa bulbosa*, includes other four ruderal taxa, being framed into a high level of these species invasion.

Key species: *Poa bulbosa* (3; CDO).

Other species: *Achillea coarctata* (+; CDO), *Artemisia austriaca* (+; CDO), *Artemisia dzevanovskyi* (+; CDO), *Arenaria serpyllifolia* (+; CDO), *Bassia prostrata* (+; CDO), *Erodium cicutarium* (+; CDO), *Festuca valesiaca* (1; CDO), *Geranium pusillum* (+; CDO), *Marrubium vulgare* (+; CDO), *Medicago minima* (+; CDO), *Silene conica* (+; CDO), *Taraxacum erythrospermum* (+; CDO), *Teucrium polium* subsp. *capitatum* (+; CDO), *Teucrium chamaedris* (+; CDO).

***Artemisia austriacae-Poëtum bulbosae* Pop 1970**, encountered in the Danube Delta SPA on the territory of Murighiol TAU, is a secondary coenotaxon, being favored by overgrazing. It is very frequent in the pastures from the Dealurile Movila (MD). Despite the secondary character, these phytocoenoses represent some conservative value, due to the presence of species threatened with extinction, rare in Romania, respectively endangered in the studied areas, like *Echinops ritro* subsp. *ruthenicus*. Beside the dominant ruderal species, three other such species, with a reduced coverage, indicate a high disturbance due to grazing.

Key species: *Poa bulbosa* (2; MD).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; MD).

Other species: *Achillea coarctata* (+; MD), *Agropyron cristatum* (+; MD), *Consolida regalis* (+; MD), *Eryngium campestre* (+; MD), *Euphorbia seguieriana* (1; MD), *Linaria genistifolia* (+; MD), *Marrubium peregrinum* (+; MD), *Teucrium polium* subsp. *capitatum* (+; MD), *Xeranthemum annuum* (+; MD).

Artemisia austriacae-Poëtum bulbosae Pop 1970 is frequent on the hill westwards of the Zaporojeni Fortress (CZV), Murighiol TAU. This is an example of highly disturbed overgrazed phytocoenosis, as most of the species are ruderal, including the dominant ones.

Key species: *Artemisia austriaca* (1; CZV, DZ), *Bromus tectorum* (+; CZV), *Poa bulbosa* (2; CZV).

Other species: *Anthemis austriaca* (+; CZV), *Bromus squarrosus* (+; CZV), *Convolvulus arvensis* (+; CZV), *Cichorium intybus* (+; CZV), *Erodium cicutarium* (1; CZV), *Eryngium campestre* (+; CZV), *Koeleria macrantha* (1; CZV), *Medicago minima* (+; CZV), *Papaver dubium* (+; CZV), *Senecio vernalis* (+; CZV), *Sisymbrium orientale* (+; CZV).

Artemisia austriacae-Poëtum bulbosae Pop 1970 was observed as vulnerable on restricted areas, on the loess banks adjacent to the wetlands, between Dunavățu de Jos and Zaporojeni Fortress (DZ). *Euphorbia nicaeensis* subsp. *cadrlateri*, a subendemic species threatened with extinction, rare in Romania, is endangered in the researched plots. Within this highly disturbed coenotaxon, five ruderal species and one alien species-*Conyza canadensis*, show a low invasive trend of the alien taxa in the plots.

Key species: *Artemisia austriaca* (4; DZ).

Threatened species: *Euphorbia nicaeensis* subsp. *cadrlateri* (+; DZ).

Other species: *Agropyron cristatum* (+; DZ), *Bassia prostrata* (+; DZ), *Convolvulus arvensis* (+; DZ), *Conyza canadensis* (+; DZ), *Consolida regalis* (+; DZ), *Cynodon dactylon* (+; DZ), *Dichanthium ischaemum* (+; DZ), *Galium humifusum* (+; DZ), *Limonium latifolium* (+; DZ), *Marrubium peregrinum* (+; DZ), *Medicago minima* (+; DZ), *Phlomis pungens* (+; DZ), *Plantago lanceolata* (+; DZ), *Xeranthemum annuum* (+; DZ).

Artemisia austriacae-Poëtum bulbosae Pop 1970, a very frequent plant community, is dominant within the vegetation of Grădișteea Island (GRD), Sarichioi TAU, intensely grazed. Even under these conditions, one threatened species, namely *Salvia aethiopsis* (E/R) was identified, threatened at the national level and critically endangered in the studied phytocoenoses. Overgrazing is indicated by five ruderal species, among which two are dominant within this highly disturbed phytocoenosis.

Key species: *Artemisia austriaca* (2; GRD), *Poa bulbosa* (3; GRD).

Threatened species: *Salvia aethiopsis* (r; GRD).

Other species: *Achillea nobilis* subsp. *neilreichii* (+; GRD), *Ajuga chamaeepytis* (+; GRD), *Artemisia santonica* (+; GRD), *Asperula tenella* (+; GRD),

Bassia prostrata (+; GRD), *Convolvulus arvensis* (+; GRD), *Cynodon dactylon* (+; GRD), *Euphorbia agraria* (+; GRD), *Euphorbia seguieriana* (+; GRD), *Medicago falcata* (+; GRD), *Medicago minima* (+; GRD), *Salvia nemorosa* (+; GRD).

An overall assessment indicates that this plant community can be considered vulnerable, and less very frequent or frequent. Being a result of overgrazing, it is highly disturbed. It was observed at Dealurile Beștepe Nature Reserve (Mahmudia TAU), Dealul Călugăru-Iancina Nature Reserve, Cape Doloșman (Jurilovca TAU), Dealurile Movila, Zaporojeni Fortress, between Dunavățu de Jos and Zaporojeni Fortress (Murighiol TAU), Grădiștea Island (Sarichioi TAU). Despite the high disturbance, seven threatened species at the national level were recorded, mainly endangered within the plots (*Achillea leptophylla*, *Astragalus dolichophyllus*, *Convolvulus lineatus*, *Echinops ritro* subsp. *ruthenicus*, *Euphorbia nicaeensis* subsp. *cadrilateri*, *Potentilla bornmuelleri*) except the critically endangered *Salvia aethiops*.

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970** is a vulnerable plant community analysed from Dealurile Beștepe Nature Reserve-Mahmudia commune (DBM). In the studied locations one rare threatened species (*Conringia austriaca*) was identified, endangered within the respective phytocoenosis. The influence of grazing obviously leads to a medium level of disturbance, indicated by the 10 ruderal species with significant dominance (+-1).

Key species: *Agropyron cristatum* (3; DBM).

Threatened species: *Conringia austriaca* (+; DBM).

Other species: *Bromus squarrosus* (+; DBM), *Convolvulus arvensis* (+; DBM), *Cichorium intybus* (+; DBM), *Dactylis glomerata* (+; DBM), *Dichanthium ischaemum* (+; DBM), *Erodium cicutarium* (+; DBM), *Eryngium campestre* (+; DBM), *Euphorbia seguieriana* (+; DBM), *Koeleria macrantha* (+; DBM), *Linum austriacum* (+; DBM), *Marrubium peregrinum* (+; DBM), *Medicago minima* (+; DBM), *Orlaya grandiflora* (+; DBM), *Poa bulbosa* (1; DBM), *Reseda lutea* (+; DBM), *Sanguisorba minor* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM), *Thymus pannonicus* (+; DBM), *Tragopogon dubius* (+; DBM), *Xeranthemum annuum* (+; DBM).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970** is a vulnerable plant community, analyzed from Dealurile Bestepe Nature Reserve (DBM), Mahmudia TAU. The influence of grazing obviously leads to a medium level of disturbance, indicated by the nine ruderal species with significant dominance (+-1).

Key species: *Agropyron cristatum* (3; DBM).

Other species: *Bromus squarrosus* (+; DBM), *Convolvulus arvensis* (+; DBM), *Cichorium intybus* (+; DBM), *Dactylis glomerata* (+; DBM), *Dichanthium ischaemum* (+; DBM), *Erodium cicutarium* (+; DBM), *Eryngium campestre* (+; DBM).

DBM), *Euphorbia seguieriana* (+; DBM), *Koeleria macrantha* (+; DBM), *Linum austriacum* (+; DBM), *Marrubium peregrinum* (+; DBM), *Medicago minima* (+; DBM), *Orlaya grandiflora* (+; DBM), *Poa bulbosa* (1; DBM), *Reseda lutea* (+; DBM), *Sanguisorba minor* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM), *Thymus pannonicus* (+; DBM), *Tragopogon dubius* (+; DBM), *Xeranthemum annuum* (+; DBM).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970** plant community was inventoried as vulnerable within Dealul Călugăru-Iancina Nature Reserve (DCI), Jurilovca TAU, where the seven ruderal species recorded within the plot indicate a low influence of grazing.

Key species: *Agropyron cristatum* (3; DCI).

Other species: *Agropyron elongatum* (+; DCI), *Artemisia annua* (+; DCI), *Artemisia santonica* (+; DCI), *Bassia prostrata* (+; DCI), *Carduus thoermeri* (+; DCI), *Centaurea solstitialis* (+; DCI), *Consolida regalis* (+; DCI), *Cynodon dactylon* (2; DCI), *Chondrilla juncea* (+; DCI), *Crataegus monogyna* (±; DCI), *Eryngium campestre* (+; DCI), *Galium humifusum* (+; DCI), *Phragmites australis* (r; DCI), *Salvia nemorosa* (+; DCI), *Teucrium polium* subsp. *capitatum* (±; DCI), *Sambucus ebulus* (+; DCI).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970** is considered a vulnerable plant community within the Nufăru TAU. It was studied on the loess plateau that borders the Danube floodplain (NTL). There were observed two rare threatened species at the national level, endangered within the respective phytocoenosis. The nine ruderal species have a reduced dominance, so there can be estimated that the coenotaxon is at the upper limit of the low invasive tendencies of this kind of taxon.

Key species: *Agropyron cristatum* (3; NTL).

Threatened species: *Asparagus verticillatus* (+; NTL), *Echinops ritro* subsp. *ruthenicus* (+; NTL).

Other species: *Bassia prostrata* (+; NTL), *Bromus japonicus* (+; NTL), *Campanula sibirica* (+; NTL), *Centaurea solstitialis* (+; NTL), *Cichorium intybus* (+; NTL), *Crataegus monogyna* (+; NTL), *Dactylis glomerata* (+; NTL), *Eryngium campestre* (+; NTL), *Euphorbia seguieriana* (+; NTL), *Cruciata pedemontana* (+; NTL), *Koeleria macrantha* (+; NTL), *Iris variegata* (+; NTL), *Marrubium peregrinum* (+; NTL), *Poa bulbosa* (+; NTL), *Pastinaca graveolens* (+; NTL), *Phlomis pungens* (+; NTL), *Plantago lanceolata* (+; NTL), *Sisymbrium orientale* (+; NTL), *Stipa capillata* (+; NTL), *Sanguisorba minor* (+; NTL), *Tragopogon dubius* (+; NTL), *Ulmus minor* (+; NTL).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970**, a rare plant community, was inventoried within Dealul Călugăru-Iancina Nature Reserve (DCI), where the seven ruderal species recorded within the plot indicate a low influence of grazing.

Key species: *Agropyron cristatum* (3; DCI).

Other species: *Elymus elongatus* (+; DCI), *Artemisia annua* (+; DCI), *Artemisia santonica* (+; DCI), *Bassia prostrata* (+; DCI), *Carduus thoermeri* (+; DCI), *Centaurea solstitialis* (+; DCI), *Consolida regalis* (+; DCI), *Cynodon dactylon* (2; DCI), *Chondrilla juncea* (+; DCI), *Crataegus monogyna* (±; DCI), *Eryngium campestre* (+; DCI), *Galium humifusum* (+; DCI), *Phragmites australis* (r; DCI), *Salvia nemorosa* (+; DCI), *Teucrium polium* subsp. *capitatum* (±; DCI), *Sambucus ebulus* (+; DCI).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970**, a vulnerable plant community within Cape Doloşman (CDO), Jurilovca TAU, has a low disturbance level due to the ruderal species invasion, indicated by the seven such species with a reduced dominance.

Key species: *Agropyron cristatum* (3; CDO).

Other species: *Achillea coarctata* (+; CDO), *Artemisia dzevanovskiyi* (+; CDO), *Crepis sancta* (+; CDO), *Eryngium campestre* (+; CDO), *Euphorbia seguieriana* (+; CDO), *Galium aparine* (+; CDO), *Geranium pusillum* (+; CDO), *Cruciata pedemontana* (1; CDO), *Lamium amplexicaule* (+; CDO), *Marrubium peregrinum* (+; CDO), *Medicago minima* (+; CDO), *Myosotis stricta* (+; CDO), *Senecio vernalis* (+; CDO).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970**, a vulnerable plant community, was inventoried at Cape Doloşman, where only one rare threatened species was observed, endangered within this coenotaxon. Grazing impact is obvious, as six ruderal species with a reduced dominance rank this phytocoenosis towards the upper limit of the low disturbance level.

Key species: *Agropyron cristatum* (3; CDO).

Threatened species: *Thymus zygioides* (+; CDO).

Other species: *Artemisia dzevanovskiyi* (1; CDO), *Carduus thoermeri* (+; CDO), *Cichorium intybus* (+; CDO), *Erodium cicutarium* (+; CDO), *Erophila verna* (+; CDO), *Festuca valesiaca* (+; CDO), *Lamium purpureum* (+; CDO), *Medicago minima* (+; CDO), *Poa bulbosa* (+; CDO), *Taraxacum erythrospermum* (+; CDO), *Teucrium polium* subsp. *capitatum* (+; CDO).

***Agropyretum pectiniformae* (Prodan 1939) Dihoru 1970** has been identified as endangered on the hill situated westwards of the Zaporoji Fortress (CZV), Murighiol TAU. In these phytocoenoses, representative for the primary steppe, only one threatened species was observed, the rare *Echinops ritro* subsp. *ruthenicus*, endangered within the association. There was recorded a medium level of disturbance.

Key species: *Agropyron cristatum* (3; CZN).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; CZV).

Other species: *Anthemis austriaca* (+; CZV), *Artemisia austriaca* (+; CZV), *Bassia prostrata* (+; CZV), *Bromus squarrosus* (+; CZV), *Erodium cicutarium* (+; CZV).

CZV), *Medicago minima* (1; CZV), *Phlomis pungens* (+; CZV), *Poa bulbosa* (1; CZV), *Senecio vernalis* (+; CZV), *Silene conica* (+; CZV), *Sisymbrium orientale* (+; CZV), *Xeranthemum annuum* (+; CZV).

This plant community was mainly observed as vulnerable, sometimes as rare or endangered, being characterized by a low level of disturbance that can rise up to a medium degree of ruderal species invasive tendencies. Three threatened species were identified in the plots; all endangered within the phytocoenoses, such as *Asparagus verticillatus*, *Conringia austriaca*, *Echinops ritro* subsp. *ruthenicus*. It was recorded from Dealurile Bestepe Nature Reserve (Mahmudia TAU), Dealul Călugăru-Iancina Nature Reserve, Cape Doloșman (Jurilovca TAU), the loess plateau which borders the Danube floodplain (Nufaru TAU), Zaporojeni Fortress (Murighiol TAU).

***Botriochloetum (Andropogonetum) ischaemi* (Kist. 1937) Pop 1977**, a secondary cenotaxon, is considered to be vulnerable within the pastures on loess soils that make the transition between the plateau area and the reedbeds between Dunavățu de Jos and Zaporojeni Fortress (DZ), areas included in the Danube Delta SPA. Four ruderal species with a low coverage indicate a low disturbance.

Key species: *Dichanthium ischaemum* (5; DZ).

Other species: *Artemisia annua* (+; DZ), *Artemisia austriaca* (+; DZ), *Bassia prostrata* (+; DZ), *Bromus tectorum* (+; DZ), *Cichorium intybus* (+; DZ), *Euphorbia seguieriana* (+; DZ), *Linaria genistifolia* (+; DZ), *Medicago falcata* (+; DZ), *Plantago arenaria* (+; DZ).

***Elytrigietum hispidi* (Dihoru 1970) Popescu, Sanda 1988**, a typical plant community for the primary steppe, vulnerable at Cape Doloșman (CDO), Jurilovca TAU, is characterized by a low level of invasion by ruderal species, these being represented by five such taxa, with a reduced dominance.

Key species: *Elymus hispidus* (4; CDO).

Other species: *Achillea coarctata* (+; CDO), *Agropyron cristatum* (1; CDO), *Artemisia absinthium* (+; CDO), *Bromus squarrosus* (+; CDO), *Dactylis glomerata* (+; CDO), *Euphorbia agraria* (+; CDO), *Marrubium peregrinum* (+; CDO), *Medicago falcata* (+; CDO), *Melica ciliata* (+; CDO), *Poa angustifolia* (+; CDO), *Reseda lutea* (+; CDO), *Teucrium chamaedris* (+; CDO), *Thalictrum minus* (+; CDO).

***Koelerietum macranthae* (Răv. et al. 1956) Popescu, Sanda 1988** is a vulnerable plant community which was inventoried from the Dealurile Beștepe Nature Reserve (DBM), Mahmudia TAU, considered endangered within the whole studied area. Two rare threatened species were observed, both being endangered within this phytocoenosis. There can be estimated a low level of disturbance both due to the non-native species (*Elaeagnus angustifolia*), as well

as from the ruderal taxa point of view, the six such species having a reduced dominance.

Key species: *Koeleria macrantha* (3; DBM).

Threatened species: *Onobrychis gracilis* (+; CF), *Potentilla bornmuelleri* (+; DBM).

Other species: *Acinos arvensis* (+; DBM), *Agrimonia eupatoria* (+; DBM), *Ajuga chamaeptytis* (+; DBM), *Bromus tectorum* (+; DBM), *Bromus squarrosus* (+; DBM), *Dactylis glomerata* (+; DBM), *Dichanthium ischaemum* (+; DBM), *Elaeagnus angustifolia* (+; DBM), *Cichorium intybus* (+; DBM), *Euphorbia seguieriana* (+; DBM), *Festuca valesiaca* (1; DBM), *Medicago minima* (1; DBM), *Plantago lanceolata* (+; DBM), *Sanguisorba minor* (+; DBM), *Teucrium chamaedrys* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM), *Thymus pannonicus* (+; DBM), *Tragopogon dubius* (+; DBM), *Veronica prostrata* (+; DBM).

***Koelerietum macranthae* (Răvăruț et al. 1965) Popescu, Sanda 1988**, typical for the primary steppe, occur in a relatively small proportion in the natural meadows from the hill situated westwards of the Zaporojeni Fortress (CZV), Murighiol TAU, where it falls into the "rare" category. Within these phytocoenoses, the rare, threatened species *Echinops ritro* subsp. *ruthenicus*, is endangered in the plots. A low level of disturbance, but to its upper limit, is indicated by the seven ruderal taxa.

Key species: *Koeleria macrantha* (4; CZV).

Specii amenintate: *Echinops ritro* sp. *ruthenicus* (+; CZV).

Other species: *Achillea nobilis* subsp. *neilreichii* (+; CZV), *Ajuga chamaeptytis* (+; CZV), *Anthemis austriaca* (+; CZV), *Arenaria serpyllifolia* (+; CZV), *Artemisia austriaca* (+; CZV), *Bassia prostrata* (+; CZV), *Chondrilla juncea* (+; CZV), *Convolvulus arvensis* (+; CZV), *Erodium cicutarium* (+; CZV), *Eryngium campestre* (+; CZV), *Medicago minima* (1; CZV), *Phlomis pungens* (+; CZV), *Verbascum banaticum* (+; CZV), *Viola arvensis* (+; CZV).

This plant community can be assessed overall as vulnerable-rare, with a low disturbance level and three threatened species, like *Echinops ritro* subsp. *ruthenicus*, *Onobrychis gracilis*, *Potentilla bornmuelleri*. It was recorded from Dealurile Beștepe Nature Reserve (Mahmudia TAU) and the hill situated westwards of the Zaporojeni Fortress (Murighiol TAU).

***Stipetum capillatae* (Hueck 1931) Krausch 1961** plant community can be considered vulnerable in the Dealurile Beștepe Nature Reserve (DBBE), Beștepe TAU, while within the whole commune it can be estimated as endangered. Despite its numerous ruderal species (eighteen taxa), it still can be framed into the low disturbance category, due to their reduced dominance.

Key species: *Stipa capillata* (3; DBBE).

Other species: *Bromus squarrosus* (+; DBBE), *Convolvulus cantabricus*

(+; DBBE), *Crepis sancta* (+; DBBE), *Crataegus monogyna* (+; DBBE), *Digitalis lanata* (+; DBBE), *Echium italicum* (+; DBBE), *Eryngium campestre* (+; DBBE), *Erysimum diffusum* (+; DBBE), *Euphorbia seguieriana* (+; DBBE), *Festuca valesiaca* (1; DBBE), *Cruciata pedemontana* (+; DBBE), *Orlaya grandiflora* (+; DBBE), *Poa angustifolia* (+; DBBE), *Poa bulbosa* (+; DBBE), *Sanguisorba minor* (+; DBBE), *Senecio vernalis* (+; DBBE), *Teucrium chamaedrys* (+; DBBE), *Thymus pannonicus* (+; DBBE), *Tragopogon dubius* (+; DBBE).

***Stipetum capillatae* (Hueck 1931) Krausch 1961** plant community, inventoried as vulnerable within Dealul Călugăru-lancina Nature Reserve (DCI), Jurilovca TAU, has a medium level of ruderal species contribution to its structure, underlined by the dominance variation (+-1) within the seven such taxa. Only one rare threatened species, endangered at least within this phytocenosis, was identified.

Key species: *Stipa capillata* (4; DCI).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; DCI).

Other species: *Achillea coarctata* (+; DCI), *Agropyron cristatum* (+; DCI), *Artemisia austriaca* (+; DCI), *Carduus thoermeri* (+; DCI), *Carthamus lanatus* (+; DCI), *Consolida regalis* (+; DCI), *Eryngium campestre* (+; DCI), *Euphorbia seguieriana* (+; DCI), *Festuca valesiaca* (+; DCI), *Inula oculus-christi* (+; DCI), *Marrubium peregrinum* (+; DCI), *Medicago minima* (+; DCI), *Poa bulbosa* (1; DCI), *Teucrium polium* subsp. *capitatum* (+; DCI), *Thymus pannonicus* (+; DCI).

The association is vulnerable, with a low to medium level of disturbance, being studied within the Dealurile Beștepe Nature Reserve (Beștepe TAU), Dealul Călugăru-lancina Nature Reserve (Jurilovca TAU). Only one threatened taxon, endangered within these phytocoenoses was recorded, *Echinops ritro* subsp. *ruthenicus*.

***Agropyron cristati-Kochietum prostratae* Zólyomi 1958** is a rare plant community, studied within the Cape Doloșman (CDO), Jurilovca TAU, where it can be considered rare. It has one rare threatened species, endangered within this coenotaxa. A low level of ruderal species invasion can be observed, taking into account the five such taxa with reduced dominance.

Key species: *Agropyron cristatum* (1; CDO), *Bassia prostrata* (3; CDO).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; CDO).

Other species: *Artemisia dzevanovskiyi* (+; CDO), *Calystegia sepium* (+; CDO), *Cynanchum acutum* (+; CDO), *Falcaria vulgaris* (+; CDO), *Hyoscyamus niger* (r; CDO), *Lactuca tatarica* (+; CDO), *Papaver dubium* (+; CDO), *Urtica dioica* (+; CDO).

***Agropyron cristati-Kochietum prostratae* Zólyomi 1958** plant community, observed at Cape Doloșman, as a vulnerable coenotaxon, has a medium disturbance level due to grazing as the seven ruderal species, despite their reduced dominance, are more numerous than the other taxa.

Key species: *Agropyron cristatum* (2; CDO), *Bassia prostrata* (2; CDO).

Other species: *Achillea coarctata* (+; CDO), *Artemisia dzevanovskiyi* (+; CDO), *Carduus thoermeri* (+; CDO), *Eryngium campestre* (+; CDO), *Euphorbia agraria* (+; CDO), *Geranium rotundifolium* (+; CDO), *Lamium amplexicaule* (+; CDO), *Marrubium peregrinum* (+; CDO), *Onopordum acanthium* (+; CDO), *Taraxacum erythrospermum* (+; CDO).

***Agropyro cristati-Kochietum prostratae* Zólyomi 1958**, of primary origin, appears in its characteristic locations, respectively on the more or less eroded slopes of the loess terrace, in the vicinity of the Zaporojeni Fortress (CZ), Murighiol TAU. The association has a reduced frequency in the respective steppe meadows, being estimated as vulnerable. A low degree of ruderal species invasive tendencies can be deduced from the presence of three indicator species with a reduced coverage.

Key species: *Agropyron cristatum* (1; CZ), *Bassia prostrata* (3; CZ).

Other species: *Anthemis tinctoria* (+; CZ), *Erodium cicutarium* (+; CZ), *Euphorbia agraria* (+; CZ), *Euphorbia seguieriana* (+; CZ), *Medicago minima* (+; CZ), *Phlomis pungens* (+; CZ), *Silene conica* (+; CZ), *Sisymbrium orientale* (+; CZ), *Verbascum banaticum* (+; CZ), *Xeranthemum annuum* (+; CZ).

***Agropyro cristati-Kochietum prostratae* Zólyomi 1958** forms the sparse vegetation of the cliffs and steep slopes of Grădișteea Island (GRD), Sarichioi TAU, where it can be considered vulnerable. Two ruderal species indicate a low disturbance.

Key species: *Agropyron cristatum* (1; GRD), *Bassia prostrata* (2; GRD).

Other species: *Artemisia santonica* (1; GRD), *Cichorium intybus* (+; GRD), *Galium humifusum* (+; GRD), *Plantago lanceolata* (+; GRD), *Teucrium polium* subsp. *capitatum* (+; GRD), *Thymus pannonicus* (+; GRD).

The plant community, assessed overall as vulnerable, sometimes rare, has a low disturbance level, sometimes medium, being less accessible for grazing. Only one rare threatened species was recorded *Echinops ritro* subsp. *ruthenicus*, endangered within the plots. It was observed at Cape Doloșman (Jurilovca TAU), Zaporojeni Fortress (Murighiol TAU), Grădișteea Island (Sarichioi TAU).

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This mainly vulnerable habitat can be considered as low disturbed by grazing, being recorded at Cape Doloșman, Movila Pârcălabului, Călugăru-lancina Nature Reserve (Jurilovca TAU), Dealurile Beștepe Nature Reserve (Mahmudia and Beștepe TAUs). Besides *Centaurea jankae* (species of community interest), other threatened species of European importance, like *Dianthus nardiformis*, *Ornithogalum amphibolum*, enhance the outstanding conservation value of this most rich in rare species habitat subtype (17 species).

To these can be added: *Achillea leptophylla*, *Convolvulus lineatus*, *Echinops ritro* subsp. *ruthenicus*, *Ephedra distachya*, *Festuca callieri*, *Gagea bulbifera*, *Koeleria lobata*, *Onobrychis gracilis*, *Pimpinella tragi* subsp. *lithophila*, *Potentilla bornmuelleri*, *Scorzonera mollis*, *Scutellaria orientalis*, *Silene compacta*, *Thymus zygoides*.

Agropyro-Thymetum zygoidi Dihoru (1969) 1970 plant community was identified within the Dealurile Beștepe Nature Reserve in the sector that belongs to the Mahmudia TAU (DBM), where it can be considered vulnerable. It has the highest conservation value among the coenotaxa inventoried within the Mahmudia territory, as it shelters the most numerous threatened species (seven taxa). Among these, *Dianthus nardiformis* is vulnerable at the national level and of European importance, while within this coenotaxon all threatened species are endangered, except the first that is vulnerable. Even though they are numerous, the ten ruderal species still have a reduced dominance and consequently they place this community within the low disturbed category.

Key species: *Agropyron ponticum* (1; DBM), *Thymus zygoides* (3; DBM).

Threatened species: *Achillea leptophylla* (+; DBM), *Dianthus nardiformis* (±; DBM), *Festuca callieri* (+; DBM), *Koeleria lobata* (+; DBM), *Potentilla bornmuelleri* (+; DBM), *Thymus zygoides* (3; DBM).

Other species: *Achillea nobilis* subsp. *neilreichii* (+; DBM), *Androsace maxima* (+; DBM), *Artemisia austriaca* (+; DBM), *Bromus squarrosus* (+; DBM), *Bombycilaena erecta* (+; DBM), *Convolvulus arvensis* (+; DBM), *Coronilla varia* (+; DBM), *Crepis sancta* (+; DBM), *Cichorium intybus* (+; DBM), *Dichanthium ischaemum* (+; DBM), *Erodium cicutarium* (+; DBM), *Eryngium campestre* (+; DBM), *Echium italicum* (+; DBM), (+; DBM), *Euphorbia seguieriana* (+; DBM), *Medicago minima* (+; DBM), *Poa bulbosa* (+; DBM), *Potentilla argentea* (+; DBM), *Sanguisorba minor* (+; DBM), *Sedum urvillei* subsp. *hillebrandtii* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM), *Tragopogon dubius* (±; DBM), *Xeranthemum annuum* (+; DBM).

Agropyro-Thymetum zygoidi Dihoru (1969) 1970, considered vulnerable within the Dealurile Beștepe (DBM), Mahmudia TAU, was analyzed in the eastern part of the protected area, on a limestone substrate, the respective phytocoenoses having a special conservation value, especially due to the seven threatened species that were inventoried there. Of these, *Dianthus nardiformis* and *Ornithogalum amphibolum* are of European importance, while *Euphorbia nicaeensis* subsp. *cadrlateri* is subendemic. In this part of the reserve, the association has been affected by soil removal over several tens of square meters. At the level of the association, most of these seven taxa are estimated to be endangered, others are vulnerable (*Euphorbia nicaeensis* subsp. *cadrlateri*, *Potentilla bornmuelleri*), rare (*Festuca callieri*) or sporadic

(*Thymus zygoides*). The level of ruderalization is low, as indicated by the coverage of indicator species such as *Chondrilla juncea*, *Consolida regalis*, *Eryngium campestre*, *Poa bulbosa*.

Key species: *Thymus zygoides* (3; DBM).

Specii amenintate: *Achillea leptophylla* (\pm ; DBM), *Dianthus nardiformis* (+; DBM), *Euphorbia nicaeensis* subsp. *cadrlateri* (\pm -1; DBM), *Festuca callieri* (2; DBM), *Ornithogalum amphibolum* (\pm ; DBM), *Potentilla bornmuelleri* (+-1; DBM), *Thymus zygoides* (3; DBM).

Other species: *Achillea coarctata* (+; DBM), *Androsace elongata* (\pm ; DBM), *Bombycilaena erecta* (+; DBM), *Chondrilla juncea* (+; DBM), *Consolida regalis* (+; DBM), *Eryngium campestre* (+; DBM), *Euphorbia seguieriana* (+; DBM), *Poa bulbosa* (+; DBM), *Stipa capillata* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM).

Agropyro-Thymetum zygoidi Dihoru (1969) 1970, a vulnerable coenotaxon at Cape Doloşman (CDO), Jurilovca TAU, has a high conservation value, enhanced by five mostly rare threatened taxa, of which *Centaurea jankae* is also endangered and endemic for Dobrogea. Two ruderal species with a reduced dominance indicate a low disturbed coenotaxon.

Key species: *Thymus zygoides* (2; CDO).

Threatened species: *Centaurea jankae* (\pm ; CDO), *Festuca callieri* (1; CDO), *Koeleria lobata* (+; CDO), *Pimpinella tragiium* subsp. *lithophila* (+; CDO), *Thymus zygoides* (2; CDO).

Other species: *Artemisia dzevanovskiyi* (+; CDO), *Bassia prostrata* (+; CDO), *Cerastium pumilum* (+; CDO), *Crepis sancta* (+; CDO), *Gypsophila pallasii* (+; CDO), *Lamium amplexicaule* (+; CDO), *Medicago minima* (+; CDO), *Taraxacum erythrospermum* (+; CDO).

Agropyro-Thymetum zygoidi Dihoru (1969) 1970 was studied at Cape Doloşman, Jurilovca TAU, where it is considered vulnerable, being characterized by the massive presence of the *Artemisia dzevanovskiyi*. The four threatened species listed as rare, of national interest, are endangered within the phytocoenoses, except the dominant *Thymus zygoides*. It can be considered an undisturbed example of this association.

Key species: *Agropyron ponticum* (2; CDO), *Thymus zygoides* (2; CDO).

Threatened species: *Echinops ritro* subsp. *ruthenicus* (+; CDO), *Festuca callieri* (+; CDO), *Pimpinella tragiium* subsp. *lithophila* (+; CDO), *Thymus zygoides* (2; CDO).

Other species: *Agropyron cristatum* (1; CDO), *Artemisia dzevanovskiyi* (2; CDO), *Asperula tenella* (+; CDO), *Gypsophila pallasii* (+; CDO), *Linaria genistifolia* (+; CDO), *Stipa capillata* (+; DCO), *Teucrium polium* subsp. *capitatum* (+; CDO).

This plant community is assessed as vulnerable and mainly low disturbed, with isolated cases of phytocoenoses in their natural status. It was observed at Dealurile Beștepe Nature Reserve (Mahmudia TAU), Cape Doloșman, Movila Pârcălabului, Călugăru-Iancina Nature Reserve (Jurilovca TAU). It has the highest number of threatened species among all the studied habitats/phytocoenoses, these being represented by 11 such species, mostly rare at the national level (*Achillea leptophylla*, *Echinops ritro* subsp. *ruthenicus*, *Festuca callierii*, *Koeleria lobata*, *Pimpinella tragi* subsp. *lithophila*, *Potentilla bornmuelleri*, *Thymus zygoides*), while *Centaurea jankae* (species of community interest), *Dianthus nardiformis*, *Ornithogalum amphibolum*, are of European importance, *Euphorbia nicaeensis* subsp. *cadrlateri* being also subendemic.

***Festucetum callierii* Șerbănescu 1965** plant community was studied in the Dealurile Beștepe Nature Reserve (DBM), Mahmudia TAU, where it can be estimated as vulnerable. Five rare threatened species were inventoried, all endangered within this coenotaxon. The four ruderal taxa indicate a low level of disturbance.

Key species: *Festuca callierii* (3; DBM).

Threatened species: *Achillea leptophylla* (+; DBM), *Festuca callierii* (+; DBM), *Echinops ritro* subsp. *ruthenicus* (±; DBM), *Onobrychis gracilis* (+; DBM), *Thymus zygoides* (+; DBM).

Other species: *Arenaria serpyllifolia* (+; DBM), *Bromus squarrosus* (+; DBM), *Bombycilaena erecta* (+; DBM), *Crataegus monogyna* (+; DBM), *Digitalis lanata* (+; DBM), *Phleum phleoides* (+; DBM), *Eryngium campestre* (+; DBM), *Orlaya grandiflora* (+; DBM), *Poa bulbosa* (+; DBM), *Potentilla argentea* (+; DBM), *Sanguisorba minor* (+; DBM), *Senecio vernalis* (+; DBM), *Sedum urvillei* subsp. *hillebrandtii* (1; DBM), *Trifolium campestre* (+; DBM), *Teucrium chamaedrys* (+; DBM), *Trifolium arvense* (+; DBM).

***Festucetum callierii* Șerbănescu 1965 apud Dihoru (1969) 1970** plant community can be considered as vulnerable within the Dealurile Beștepe Nature Reserve (DBM), Mahmudia TAU, where *Festuca callierii* and *Silene compacta* are the only threatened species, framed into the „rare” category at the national level. In this phytocoenosis the first is dominant, while the second is endangered. From the dominance variation (+-1) of the six ruderal species there can be deduced a medium level of disturbance.

Key species: *Festuca callierii* (3; DBM).

Threatened species: *Festuca callierii* (3; DBM), *Silene compacta* (+; DBM).

Other species: *Androsace elongata* (+; DBM), *Artemisia austriaca* (+; DBM), *Agropyron cristatum* (+; DBM), *Bassia prostrata* (+; DBM), *Bombycilaena erecta* (+; DBM), *Bromus tectorum* (+; DBM), *Echium italicum* (+; DBM), *Eryngium campestre* (+; DBM), *Euphorbia seguieriana* (+; DBM), *Galium*

pedemontanum (+; DBM), *Plantago lanceolata* (+; DBM), *Poa bulbosa* (+; DBM), *Potentilla argentea* (+; DBM), *Teucrium polium* subsp. *capitatum* (+; DBM), *Trifolium arvense* (+; DBM), *Trifolium campestre* (+; DBM), *Verbascum banaticum* (+; DBM).

***Festucetum callierii* Şerbănescu 1965 apud Dihoru (1969) 1970** is a vulnerable coenotaxon within the Dealurile Beştepe Nature Reserve, Beştepe TAU, where six rare threatened species were recorded, mainly endangered within the plots, except the critically endangered *Scorzonera mollis*. A low level of ruderalization is indicated by five species with low coverage.

Key species: *Festuca callieri* (2; DBBE).

Threatened species: *Achillea leptophylla* (+; DBBE), *Convolvulus lineatus* (+; DBBE), *Potentilla bormuelleri* (+; DBBE), *Scorzonera mollis* (1; DBBE), *Scutellaria orientalis* (+; DBBE), *Thymus zygioides* (1; DBBE).

Other species: *Artemisia austriaca* (+; DBBE), *Asperula tenella* (+; DBBE), *Convolvulus arvensis* (+; DBBE), *Eryngium campestre* (+; DBBE), *Leontodon crispus* (+; DBBE), *Phleum phleoides* (+; DBBE), *Poa bulbosa* (+; DBBE), *Rumex acetosella* (+; DBBE), *Scleranthus annuus* (+; DBBE), *Sedum urvillei* subsp. *hillebrandtii* (+; DBBE), *Teucrium polium* subsp. *capitatum* (+; DBBE).

The plant community is vulnerable, mostly low (sometimes medium) disturbed, being recorded within Dealurile Beştepe Nature Reserve (Mahmudia and Beştepe TAUs). With its nine threatened species it can be ranked on the second place after *Agropyro-Thymetum zygioidi*, from this point of view (*Achillea leptophylla*, *Convolvulus lineatus*, *Echinops ritro* subsp. *ruthenicus*, *Onobrychis gracilis*, *Potentilla bormuelleri*, *Scorzonera mollis*, *Scutellaria orientalis*, *Silene compacta*, *Thymus zygioides*).

***Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974** is typical for the rocky steppe within the Dealurile Beştepe Nature Reserve, Beştepe TAU sector (DBBE), being endangered within the studied area, where two rare threatened species were observed, endangered within these phytocoenoses. There can be estimated a low level of disturbance indicated by three ruderal species.

Key species: *Polytrichum piliferum* (2; DBBE).

Threatened species: *Festuca callieri* (+; DBBE), *Silene compacta* (+; DBBE).

Other species: *Artemisia austriaca* (+; DBBE), *Asperula tenella* (+; DBBE), *Bombycilaena erecta* (+; DBBE), *Chondrilla juncea* (+; DBBE), *Digitaria sanguinalis* (+; DBBE), *Kohlruschia prolifera* (+; DBBE), *Potentilla argentea* (+; DBBE), *Rumex acetosella* (1; DBBE), *Scleranthus perennis* (+; DBBE), *Stipa capillata* (+; DBBE).

***Sedo hillebrandtii-Polytrichetum piliferi* Horeanu et Mihai 1974**, an endangered coenotaxa in the Dealul Călugăru-lancina (DCI) nature reserve,

Jurilovca commune, where among the four rare threatened taxa *Gagea bulbifera* is also vulnerable at the national level. All these are endangered within the phytocoenoses, except the vulnerable *Thymus zygoides*. A low level of disturbance is indicated by the six ruderal taxa with a reduced coverage.

Key species: *Polytrichum piliferum* (1; DCI), *Sedum urvillei* subsp. *hillebrandtii* (1; DCI).

Threatened species: *Ephedra distachya* (+; DCI), *Gagea bulbifera* (+; DCI), *Koeleria lobata* (+; DCI), *Thymus zygoides* (1; DCI).

Other species: *Acinus arvensis* (+; DCI), *Asperula tenella* (+; DCI), *Chelidonium majus* (+; DCI), *Erodium cicutarium* (+; DCI), *Erophila verna* (+; DCI), *Lamium amplexicaule* (+; DCI), *Muscari racemosum* (+; DCI), *Poa bulbosa* (+; DCI), *Ranunculus illyricus* (+; DCI), *Taraxacum erythrospermum* (+; DCI), *Veronica hederifolia* (+; DCI).

The association can be considered endangered and low disturbed, being studied within the Dealurile Beștepe Nature Reserve, Beștepe TAU, Dealul Călugăru-lancina Nature Reserve, Jurilovca TAU. It has an important conservation value also due to the six threatened taxa, mainly endangered within the plots (*Ephedra distachya*, *Festuca callieri*, *Gagea bulbifera*, *Koeleria lobata*, *Silene compacta*, *Thymus zygoides*).

***Teucro polii-Melicetum ciliatae* V. Pușcaru et al. 1978**, a vulnerable plant community, studied within Dealul Călugăru-lancina Nature Reserve (DCI), has a low dominance of ruderal species, five taxa being framed in this category. There is just one rare threatened species in the recorded plot, endangered within the respective phytocoenosis.

Key species: *Melica ciliata* (3; DCI), *Teucrium polium* subsp. *capitatum* (+; DCI).

Threatened species: *Thymus zygoides* (+; DCI).

Other species: *Achillea coarctata* (+; DCI), *Agropyron cristatum* (1; DCI), *Asperula tenella* (+; DCI), *Bromus squarrosus* (+; DCI), *Carduus thoermeri* (+; DCI), *Carthamus lanatus* (+; DCI), *Cichorium intybus* (+; DCI), *Convolvulus cantabricus* (+; DCI), *Echium italicum* (±; DCI).

***Teucro polii-Melicetum ciliatae* V. Pușcaru et al. 1978** plant community, observed at Cape Doloșman (CDO), Jurilovca TAU, where it can be considered vulnerable, is developed on screes, which only allow the presence of few species, among which no ruderal/ alien plants were identified.

Key species: *Melica ciliata* (4; CDO).

Other species: *Crataegus monogyna* (+; CDO), *Dactylis glomerata* (+; CDO), *Pyrus pyraister* (+; CDO), *Poa angustifolia* (+; CDO), *Ulmus procera* (+; CDO).

This plant community can be considered as vulnerable, being framed between low disturbed and undisturbed. It was studied within Dealul Călugăru-

Iancina Nature Reserve and Cape Doloşman (Jurilovca TAU), where only one rare threatened species, *Thymus zygoides* was recorded in the plots, being endangered within the respective phytocoenosis.

34.9213 Western Pontic feathergrass steppes

***Stipo ucrainicae-Festucetum valesiaca* Dihoru (1969) 1970** is a vulnerable primary cenotaxon, having a regional character specific to Dobrogea. In the studied area there were inventoried four rare threatened species, mostly endangered within the plots, except the key species *Stipa ucrainica*. Of these, the two subendemic *Euphorbia nicaeensis* subsp. *cadrlateri* and *Euphorbia nicaeensis* subsp. *dobrogensis* are endangered within the cenotaxon, while *Tanacetum millefolium* is vulnerable. The highest conservative value is held by *Stipa ucrainica*, a threatened species of European importance. The association was identified in a single location, on the hill westwards of Zaporojeni Fortress (CZV), Murighiol TAU. Six ruderal species with significant coverage (+-1) indicate a medium disturbance due to grazing.

Key species: *Festuca valesiaca* (1; CZV), *Stipa ucrainica* (2; CZV).

Threatened species: *Euphorbia nicaeensis* subsp. *cadrlateri* (+; CZV), *Euphorbia nicaeensis* subsp. *dobrogensis* (+; CZV), *Stipa ucrainica* (2; CZV), *Tanacetum millefolium* (+-1; CZV).

Other species: *Anthemis tinctoria* (+; CZV), *Arenaria serpyllifolia* (+; CZV), *Artemisia austriaca* (1; CZV), *Aster oleifolius* (+; CZV), *Eryngium campestre* (+; CZV), *Koeleria macrantha* (1; CZV), *Medicago minima* (+; CZV), *Papaver dubium* (+; CZV), *Phlomis pungens* (+; CZV), *Poa bulbosa* (1; CZV), *Potentilla argentea* (+; CZV), *Salvia austriaca* (+; CZV), *Salvia nemorosa* (+; CZV), *Senecio vernalis* (+; CZV), *Silene conica* (+; CZV), *Thymus pannonicus* (+; CZV), *Veronica dillenii* (+; CZV), *Viola arvensis* (+; CZV).

6260 * Pannonic sand steppes (PAL.CLASS.: 34.A1, 34.A2)

34.A2 Ponto-Sarmatic sand steppes

Some of the key species of the 6120 habitat, like *Carex ligerica*, *Euphorbia seguieriana*, *Helichrysum arenarium*, *Koeleria glauca* could indicate similarities with the plant communities typical for the sandy steppes that occur in the Danube Delta, framed within the subtype **34.A21 Western Pontic sand steppes** and within the corresponding *Festucetalia vaginatae* order. Within this order there are included numerous plant communities mentioned from the Danube Delta and its adjacent areas from the Dobrogea Plateau (SANDA, ARCUŞ, 1999), which were also identified and described within proper research presented in this work, that are obviously included in the **6260* Pannonic sand steppes**. In conclusion the sandy steppes of the Danube Delta and the associated sites are framed obviously within the **6260* Pannonic sand**

steppes (PAL.CLASS.: 34.A1, 34.A2), in its description being explicitly mentioned the West Pontic basin, that includes the Danube Delta Biosphere Reserve and its associated sites.

Probably due to a confusion between the two community interest habitats **6120* Xeric sand calcareous grasslands** (PAL.CLASS.: 34.12)-**34.12 Middle European pioneer calcareous sand swards**, respectively the **6260* Pannonic sand steppes** (PAL.CLASS.: 34.A1, 34.A2)-**34.A21 Western Pontic sand steppes**, the first habitat was included on the list of the D.D.B.R. habitats, while the second is missing. This confusion should be urgently revised, in order to replace the habitat **6120*** with **6260*** on the official list of the D.D.B.R. habitats of community interest, or to mention both provisory, until accurate research will clarify this problem. On the other hand the priority habitat **6260*** occur without any doubt in the D.D.B.R. and associated sites, including all the sand steppes of this area, so that is unlike that some of these steppes could be framed into the **6120*** habitat. In this respect the presence of the **6260*** habitat within the D.D.B.R. and associated sites should be officially admitted, in order to include this priority habitat within management plans, or to readjust the management measures elaborated for the **6120*** habitat to the **6260***, taking into account that they are similar.

This **6260*** habitat can be considered overall as sporadic, but sometimes it was identified also with different frequencies from endangered to very frequent. It was mostly recorded as highly disturbed, followed in decreasing order by medium or low disturbed phytocoenoses, rarely undisturbed cases. The locations where it was observed are: between Letea and C.A. Rosetti, Pădurea Letea strictly protected area, between C.A. Rosetti and Cardon (C.A. Rosetti TAU), west of Dunavățu de Jos, between Dunavățu de Jos and Zaporojeni Fortress, in its vicinity, within the Pardina TAU and along the road between Tudor Vladimirescu (Tulcea TAU)-Ceatalchioi-Plauru (Ceatalchioi TAU), west of Dunavățu de Jos (Murighiol TAU), westwards the Caraorman village, Caraorman Forest (Crișan TAU), Câșla Vădanei (Sfântu Gheorghe TAU), Bisericuța Island (Jurilovca TAU), Plaja (Beach) Vadu (Corbu TAU).

This habitat has an enhanced conservation importance as it holds the second place after the **62C0* Ponto-Sarmatic steppes** habitat, with its 13 threatened species, mostly endangered within the plots: *Artemisia tschernieviana*, *Astragalus varius*, *Convolvulus persicus*, *Ephedra distachya*, *Eryngium maritimum*, *Leymus racemosus* subsp. *sabulosus*, *Limonium meyeri*, *Onosma arenaria*, *Periploca graeca*, *Plantago coronopus*, *Salix rosmarinifolia*, *Syrenia montana*, except the critically endangered *Corispermum marchalii*.

34.A21 Western Pontic sand steppes

This habitat subtype includes within the studied area the plant communities framed within the *Festucion vaginatae* alliance, and consequently, according to synthesis references (SANDA, ARCUȘ, 1989), the coenotaxa ***Saliceto rosmarinifoliae-Holoschoenetum vulgaris* Mititelu et al. 1973**. This one can be also framed according to the Palaeartic Habitats Classification within the subtype **37.26412 Pontic dune slack *Holoschoenus* grasslands**, which is not included in any habitats of community interest. Thus, within this work these plant communities will be considered as framed within 34.A21, also taking into account their restricted distribution, only within the sand dunes of the Letea and Caraorman levees, which require proper conservation measures, first of all their framing into this protected habitat 6260*.

Overall this habitat subtype/ plant community can be considered as vulnerable and low disturbed. It was identified between C.A. Rosetti and Cardon, Letea Forest (C. A. Rosetti TAU), Caraorman Forest, west of the village of Caraorman (Crișan TAU). Three threatened species were recorded, *Limonium meyeri*, *Periploca graeca*, *Salix rosmarinifolia*, the first critically endangered within these phytocoenoses, the second vulnerable, while the third is sporadic to frequent.

***Saliceto rosmarinifoliae-Holoschoenetum vulgaris* Mititelu et al. 1973** was inventoried as vulnerable between C.A. Rosetti and Cardon (RC), where the only threatened species encountered in this subassociation ***holoschoenetum* Popescu et Sanda 1987**, was *Limonium meyeri*, critically endangered within these phytocoenoses. These are low disturbed, as indicated by one ruderal species and the alien taxa *Conyza canadensis* and *Elaeagnus angustifolia*, all with a reduced dominance.

Key species: *Scirpoides holoschoenus* (3; RC).

Threatened species: *Limonium meyeri* (r; RC).

Other species: *Carex colchica* (+; RC), *Conyza canadensis* (+; RC), *Cynodon dactylon* (2; RC), *Daucus carota* (+; RC), *Elaeagnus angustifolia* (+; RC), *Euphorbia seguieriana* (+; RC), *Juncus littoralis* (+; RC), *Medicago falcata* (+; RC), *Plantago arenaria* (+; RC), *Polygonum arenarium* (+; RC), *Scabiosa argentea* (+; RC), *Teucrium scordium* (+; RC), *Verbascum banaticum* (+; RC), *Vincetoxicum hirundinaria* (+; RC).

***Saliceto rosmarinifoliae-Holoschoenetum vulgaris* Mititelu et al. 1973** was inventoried as vulnerable within the Letea Forest (PL), there were also recorded phytocoenoses dominated by *Salix rosmarinifolia*, plus another rare threatened species, *Periploca graeca*, vulnerable within the plots. These coenotaxa are low disturbed, as indicated by one ruderal species and the alien taxa *Conyza canadensis*, all with a reduced dominance.

Key species: *Scirpoides holoschoenus* (+, PL), *Salix rosmarinifolia* (4; PL).

Threatened species: *Periploca graeca* (1; PL), *Salix rosmarinifolia* (4; PL).

Other species: *Consolida regalis* (+; PL), *Conyza canadensis* (+; PL), *Euphorbia seguieriana* (+; RC), *Linaria genistifolia* (+; PL), *Vincetoxicum hirundinaria* (+; PL).

Saliceto rosmarinifoliae-Holoschoenetum vulgaris Mititelu et al. 1973 forms vulnerable and undisturbed pioneer thickets within the strictly protected area of the Caraorman Forest (CO). The species *Salix rosmarinifolia* is the only threatened taxon.

Key species: *Salix rosmarinifolia* (3; CO), *Scirpoides holoschoenus* (+; CO).

Threatened species: *Salix rosmarinifolia* (3; CO)

Other species: *Artemisia campestris* (+; CO), *Asparagus pseudoscaber* (+; CO), *Calamagrostis epigeios* (+; CO), *Carex colchica* (+; CO), *Centaurea arenaria* (+; CO), *Cynodon dactylon* (+; CO), *Euphorbia seguieriana* (+; CO), *Populus alba* (+; CO), *Quercus pedunculiflora* (+; CO), *Tamarix ramosissima* (+; CO).

Saliceto rosmarinifoliae-Holoschoenetum vulgaris Mititelu et al. 1973 is represented by vulnerable phytocoenoses dominated by *Scirpoides holoschoenus*, without the participation of the species *Salix rosmarinifolia*, as in the cases observed west of the village of Caraorman (COV), Crișan TAU. A low disturbance is indicated by the alien species *Conyza canadensis*.

Key species: *Scirpoides holoschoenus* (4; CO).

Other species: *Asparagus pseudoscaber* (+; CO), *Calamagrostis epigeios* (+-1; CO), *Carex colchica* (+-1; CO), *Centaurea arenaria* (+; CO), *Conyza canadensis* (+; CO), *Euphorbia seguieriana* (+; CO), *Juncus littoralis* (+; RC), *Hippophaë rhamnoides* (1; CO), *Rosa canina* (+; CO), *Tamarix ramosissima* (+; CO), *Verbascum banaticum* (+; CO).

34.A2111 Western Pontic sand pioneer grass swards

This habitat subtype was identified as endangered to very frequent. It was observed between Letea and C.A. Rosetti, Bisericuța Island, and west of Dunavățu de Jos, between Dunavățu de Jos and Zaporojeni Fortress, in its vicinity, as well as within the Pardina TAU and along the road between Tudor Vladimirescu-Ceatalchioi-Plauru, Ceatalchioi TAU. Three threatened species were recorded, *Limonium meyeri*, *Periploca graeca*, both endangered within the plots, respectively the vulnerable *Plantago coronopus*.

Bromo-Cynodontetum Pop I. 1970 occupies important areas, being very frequent between Letea and C.A. Rosetti (LR), where it covers most of the flat

sandy terrain, its monotonous appearance being interrupted by inflorescences of the rare threatened species *Limonium meyeri*, endangered within these phytocoenoses. It can be considered as medium disturbed, as shown by the four ruderal species with a reduced coverage.

Key species: *Bromus tectorum* (1; LR), *Cynodon dactylon* (3; LR).

Threatened species: *Limonium meyeri* (+; LR).

Other species: *Elymus repens* (+; LR), *Artemisia santonica* (+; LR), *Consolida regalis* (+; LR), *Eryngium campestre* (+; LR), *Euphorbia seguieriana* (1; LR), *Holoschoenus vulgaris* (1; LR), *Juncus littoralis* (+; LR), *Medicago minima* (+; LR), *Plantago arenaria* (1; LR), *Teucrium scordium* (+; LR), *Vincetoxicum hirundinaria* (+; LR).

Bromo-Cynodontetum Pop I. 1970, was observed as very frequent between Letea and C.A. Rosetti (LR). It can be considered medium disturbed, as indicated by the three ruderal species with a reduced coverage. *Plantago coronopus* is the only threatened species, vulnerable within the plots.

Key species: *Bromus squarrosus* (1; LR), *Cynodon dactylon* (3; LR).

Threatened species: *Plantago coronopus* (1; LR).

Other species: *Artemisia austriaca* (+; LR), *Eryngium campestre* (+; LR), *Euphorbia seguieriana* (+; LR), *Juncus littoralis* (+; LR).

Bromo-Cynodontetum Pop I. 1970 can be considered as rare in the area between C.A. Rosetti and Cardon (RC). A low disturbance is indicated by one ruderal taxon, with a reduced coverage.

Key species: *Bromus squarrosus* (+; RC), *Cynodon dactylon* (2; RC).

Other species: *Euphorbia seguieriana* (1; RC), *Linum austriacum* (+; RC), *Polygonum arenarium* (+; RC), *Secale sylvestre* (+; RC).

Bromo-Cynodontetum Pop 1977 was recorded as endangered on the Bisericuța Island (IB), where it occupies restricted areas, on soils with a limestone substrate. It can be considered as highly disturbed, as shown by the four ruderal species with a reduced coverage.

Key species: *Bromus tectorum* (3; IB), *Cynodon dactylon* (2; IB).

Other species: *Allium rotundum* (+; IB), *Ballota nigra* (+; IB), *Chondrilla juncea* (+; IB), *Chenopodium album* (+; IB), *Verbascum banaticum* (+; IB).

Bromo-Cynodontetum Pop 1977 plant community was described as endangered from Insula Bisericuța (Bisericuța Island), Jurilovca TAU, within the Razim Lagoon where, as a particular aspect, this phytocoenosis does not occur on sand substrata but on steppe soils formed on loess. There can be assessed an intense level of disturbance due to the invasive tendencies of both non-native species (*Amorpha fruticosa*) and mainly ruderal taxa, these being represented by four such species with a significant dominance of (+-2).

Key species: *Bromus tectorum* (2; IB), *Cynodon dactylon* (3; IB).

Other species: *Amorpha fruticosa* (+; IB), *Cichorium intybus* (+; IB), *Malva sylvestris* (+; IB), *Onopordum acanthium* (+; IB), *Trigonella procumbens* (+; IB).

Bromo-Cynodontetum I. Pop 1970 is characteristic of sandy soils west of Dunavățu de jos (DDV), where it is predominant, being sporadic in natural meadows. Four ruderal species and an alien one (*Coryza canadensis*) with a reduced coverage, indicate a low disturbance.

Key species: *Bromus tectorum* (+; DJV), *Cynodon dactylon* (3; DJV).

Other species: *Artemisia annua* (+; DJV), *Consolida regalis* (+; DJV), *Coryza canadensis* (+; DJV), *Cynanchum vincetoxicum* (+; DJV), *Euphorbia seguieriana* (+; DJV), *Linaria genistifolia* (+; DJV), *Plantago arenaria* (2; DJV), *Polygonum arenarium* (+; DJV), *Verbascum banaticum* (+; DJV), *Xanthium italicum* (+; DJV).

The plant community, recorded overall as endangered to very frequent, can be considered from low to highly disturbed, being observed between Letea and C.A. Rosetti, Bisericuța Island, and west of Dunavățu de Jos. Only *Limonium meyeri* was noticed as a treated plant, endangered within the plots.

Brometum tectorum Bojko 1934 characterizes the natural vegetation of the sandy meadows between Dunavățu de Jos and Zaporojeni Fortress (DZ), where it can be considered vulnerable. It can be assessed as a medium disturbed association, as the ruderal species prevail, even if having a low coverage.

Key species: *Bromus tectorum* (4; DZ).

Other species: *Anthemis austriaca* (+; DZ), *Chondrilla juncea* (+; DZ), *Convolvulus arvensis* (+; DZ), *Descurainia sophia* (+; DZ), *Papaver rhoeas* (+; DZ), *Silene conica* (+; DZ).

Brometum tectorum Bojko 1934 was observed in the vicinity of the Zaporojeni Fortress (CZ), where it can be considered vulnerable. This can be an example of highly disturbed phytocoenosis, with its seven ruderal species, of which *Bromus tectorum* is dominant.

Key species: *Bromus tectorum* (5; CZ).

Other species: *Anthemis austriaca* (+; CZ), *Bassia prostrata* (+; CZ), *Descurainia sophia* (+; CZ), *Euphorbia agraria* (+; CZ), *Hordeum murinum* (1; CZ), *Kohlruschia prolifera* (+; CZ), *Marrubium peregrinum* (+; CZ), *Medicago minima* (+; CZ), *Poa bulbosa* (1; CZ), *Salvia nemorosa* (+; CZ), *Senecio vernalis* (+; CZ), *Sisymbrium orientale* (+; CZ), *Trigonella procumbens* (+; CZ).

Brometum tectorum Bojko 1934, sporadic, intensely grazed in the studied areas, from the territory of the Pardina TAU, dominated by ruderal species, of which *Bromus tectorum* is dominant, can be framed into the highly disturbed category.

Key species: *Bromus tectorum* (4; PA).

Other species: *Elymus repens* (1; PA), *Althaea officinalis* (+; PA), *Bromus hordeaceus* (1; PA), *Centaurea calcitrapa* (+; PA), *Hordeum murinum* (+; PA), *Matricaria recutita* (+; PA), *Plantago major* (1; PA), *Potentilla reptans* (1; PA).

***Brometum tectorum* Bojko 1934** was encountered as vulnerable within the pastures distributed predominantly along the Tudor Vladimirescu-Ceatalchioi-Plauru road, Ceatalchioi TAU (CET), under intense grazing conditions, where half of the species are ruderal, including the dominant *Bromus tectorum*, thus being highly disturbed.

Key species: *Bromus tectorum* (3; CET)

Other species: *Achillea setacea* (±; CET), *Elymus repens* (1; CET), *Althaea officinalis* (+; CET), *Artemisia annua* (+; CET), *Bromus hordeaceus* (+; CET), *Centaurea calcitrapa* (+; CET), *Potentilla reptans* (+; CET), *Rorripa sylvestris* (+; CET), *Rumex palustris* (+; CET).

The association is mostly vulnerable, up to sporadic sometimes, being highly disturbed (medium disturbed in some cases). It was recorded between Dunavățu de Jos and Zaporojeni Fortress, in its vicinity, as well as within the Pardina TAU and along the road between Tudor Vladimirescu-Ceatalchioi-Plauru, Ceatalchioi TAU.

***Secali sylvestris-Brometum tectorum* Harghitai 1940** was studied as an endangered and undisturbed pioneer vegetation, with very low coverage on the dunes northwards of the Caraorman levee, northwest of the village (CON), Crișan TAU. Despite the low number of species, the conservation value of the phytocoenosis is increased by the critically endangered taxa *Corispermum marschalii*.

Key species: *Secale sylvestre* (1; CON).

Threatened species: *Corispermum marschalii* (r; CON).

Other species: *Centaurea arenaria* (+; CON), *Euphorbia seguieriana* (+; CON).

***Secali sylvestris-Brometum tectorum* Harghitai 1940**, a vulnerable and low disturbed plant community, at the Plaja (Beach) Vadu (VDC), Corbu TAU. Its conservation value is enhanced by the rare threatened taxa *Astragalus varius*, endangered within the plots.

Key species: *Bromus tectorum* (+; VDC), *Secale sylvestre* (1; VDC).

Threatened species: *Astragalus varius* (+; VDC).

Other species: *Apera spica-venti* (+; VDC), *Centaurea arenaria* (+; VDC), *Cynanchum acutum* (+; VDC), *Cynodon dactylon* (+; VDC), *Euphorbia seguieriana* (1; VDC), *Linaria genistifolia* (+; VDC), *Linum austriacum* (+; VDC), *Plantago arenaria* (+; VDC), *Polygonum arenarium* (1; VDC), *Scabiosa argentea* (+; VDC), *Teucrium polium* subsp. *capitatum* (+; VDC), *Plantago arenaria* (+; VDC), *Scirpoides holoschoenus* (+; VDC).

***Secali sylvestris-Brometum tectorum* Harghitali 1940**, is a rare and undisturbed plant community, at the Plaja (Beach) Vadu (VDS), Săcele TAU. Three threatened species were recorded, of which *Artemisia tschernieviana* is also endangered at the national level. All these are endangered within the plots.

Key species: *Secale sylvestre* (2; VDS).

Threatened species: *Artemisia tschernieviana* (+; VDS), *Ephedra distachya* (+; VDS), *Eryngium maritimum* (+; VDS).

Other species: *Centaurea arenaria* (+; VDS), *Euphorbia seguieriana* (1; VDS), *Linum austriacum* (+; VDS), *Medicago falcata* (+; VDS), *Polygonum arenarium* (+; VDS), *Salsola soda* (+; VDS).

This plant community is considered overall as endangered to vulnerable and undisturbed (rarely low disturbed), being found on the Caraorman levee, northwest of the village (Crișan TAU) and at Plaja (Beach) Vadu (Corbu TAU, Săcele TAU). Five threatened species enhance the conservation value of this coenotaxa, the critically endangered *Corispermum marchalii* and the endangered *Artemisia tschernieviana*, *Astragalus varius*, *Eryngium maritimum*, *Ephedra distachya*.

***Aperetum maritimae* Popescu, Sanda, Doltu 1980** was recorded within the Letea forest (PL), where it can be considered endangered and low disturbed due to the two ruderal taxa that were observed. *Periploca graeca* is the only threatened species identified within this coenotaxon, endangered within the plots.

Key species: *Apera spica-venti* (3; PL).

Threatened species: *Periploca graeca* (+; PL).

Other species: *Bromus squarrosus* (+; PL), *Cynanchum acutum* (+; PL), *Cynodon dactylon* (1; PL), *Euphorbia seguieriana* (1; PL), *Secale sylvestre* (+; PL), *Verbascum banaticum* (+; PL).

34.A2112 Western Pontic sand pioneer forb swards

The habitat subtype/plant community is framed between vulnerable and sporadic and from undisturbed to low disturbed, due to ruderal and less to alien species. It was identified west of Dunavățu de Jos (Murighiol TAU) and Plaja (Beach) Corbu (Corbu TAU). Three endangered-vulnerable threatened species were recorded within the plots *Artemisia tschernieviana* and *Eryngium maritimum*.

***Plantaginetum arenariae* (Buia et al. 1960) Popescu, Sanda 1987**, is spread as sporadic and low disturbed (with two ruderal and one alien species, *Coryza canadensis*) on important areas on the sands to the west of Dunavățu

de Jos (DJV), Murighiol TAU. The dominant *Plantago arenaria* is also a threatened species, rare at the national level.

Key species: *Plantago arenaria* (4; DJV).

Threatened species: *Plantago arenaria* (4; DJV).

Other species: *Chondrilla juncea* (+; DJV), *Centaurea arenaria* (1; DJV), *Conyza canadensis* (+; DJV), *Convolvulus arvensis* (+; DJV), *Medicago falcata* (+; DJV), *Polygonum arenarium* (+; DJV), *Verbascum banaticum* (+; DJV).

***Plantaginetum arenariae* (Buia et al. 1960) Popescu, Sanda 1987**, is spread as vulnerable and undisturbed at Plaja (Beach) Corbu (CRB), Corbu TAU. Two rare threatened species enhance the conservation importance of these phytocoenoses (*Artemisia tschernieviana*, *Eryngium maritimum*), the first being endangered at the national level and vulnerable locally, while the second is endangered, at least within the plots.

Key species: *Plantago arenaria* (2; CRB).

Threatened species: *Artemisia tschernieviana* (1; CRB), *Eryngium maritimum* (+; CRB), *Plantago arenaria* (2; CRB).

Other species: *Artemisia tschernieviana* (1; CRB), *Centaurea arenaria* (1; CRB), *Eryngium maritimum* (+; CRB), *Euphorbia seguieriana* (+; CRB), *Polygonum arenarium* (+; CRB).

34.A21222 Western Pontic *Scabiosa* sand steppes

This habitat subtype/ association is mainly sporadic, sometimes from vulnerable to rare. It is considered as low disturbed to undisturbed. It was recorded between C.A. Rosetti and Cardon (C.A. Rosetti TAU), within the Caraorman Forest (Crișan TAU), at Câșla Vădanei (Sfântu Gheorghe TAU) and at Plaja (Beach) Vadu (Corbu TAU). This is one of the richest plant communities from the threatened species point of view (eight species), most of them being endangered within the phytocoenoses (*Astragalus varius*, *Convolvulus persicus*, *Ephedra distachya*, *Leymus racemosus* subsp. *sabulosus*, *Onosma arenaria*, *Periploca graeca*, *Salix rosmarinifolia*, *Syrenia montana*).

***Scabioso argenteae-Caricetum colchicae* (Simon 1960) Krausch 1965** dominates the semi-desert vegetation characteristic of the sand dunes in the Letea forest (PL), where it is sporadic. This coenotaxon has five rare threatened taxa that were identified, all endangered locally. A very low disturbance is underlined by the presence of the ruderal species *Consolida regalis*.

Key species: *Carex colchica* (2; PL), *Ephedra distachya* (1; PL), *Scabiosa argentea* (1; PL).

Threatened species: *Ephedra distachya* (1; PL), *Leymus racemosus* subsp. *sabulosus* (+; PL), *Periploca graeca* (+; PL), *Salix rosmarinifolia* (+; PL), *Syrenia montana* (+; PL).

Other species: *Artemisia campestris* (1; PL), *Centaurea arenaria* (+; PL), *Consolida regalis* (+; PL), *Cynodon dactylon* (+; PL), *Euphorbia seguieriana* (+; PL), *Scirpoides holoschoenus* (+; PL), *Linum austriacum* (+; PL), *Polygonum arenarium* (+; PL), *Secale sylvestre* (1; PL), *Vitis sylvestris* (r; PL).

Scabioso argenteae-Caricetum colchicae (Simon 1960) Krausch 1965 is synonymous with **Caricetum colchicae (Simon 1960) Krausch 1965**. It can be considered sporadic within the dunes in the Letea forest (PL), where it is mainly represented by its sub-association **ephedretosum stat. nov.**, synonymous with **Ephedro-Caricetum colchicae (Prodan 1939 n.n. Morariu 1959) Sanda et Popescu 1973**. Only one rare threatened taxa was observed in the plots, the co-dominant *Ephedra distachya*. Although this plant community seems undisturbed as no ruderal, nor alien species were observed, still some species were grazed, more probably by the rare horses or cattle small herds.

Key species: *Carex colchica* (1; PL), *Ephedra distachya* (2; PL), *Scabiosa argentea* (+; PL).

Threatened species: *Ephedra distachya* (2; PL).

Other species: *Artemisia campestris* (1; PL), *Cynodon dactylon* (+; PL), *Euphorbia seguieriana* (1; PL), *Polygonum arenarium* (+; PL), *Prunus spinosa* (+; PL), *Secale sylvestre* (1; PL).

Scabioso argenteae-Caricetum colchicae (Simon 1960) Krausch 1965 was identified as sporadic among the white poplar clumps between C.A. Rosetti and Cardon (RC). Two rare treated species were identified, all endangered within the association (*Convolvulus persicus*, *Ephedra distachya*). A low disturbance is indicated by the presence of two ruderal species, with a low coverage.

Key species: *Carex colchica* (2; RC), *Scabiosa argentea* (1; RC).

Threatened species: *Convolvulus persicus* (+; RC), *Ephedra distachya* (+; RC).

Other species: *Artemisia campestris* (1; RC), *Bassia laniflora* (+; RC), *Bromus tectorum* (+; RC), *Centaurea arenaria* (+; RC), *Consolida regalis* (+; RC), *Cynodon dactylon* (+; RC), *Euphorbia seguieriana* (1; RC), *Helichrysum arenarium* (r; RC), *Plantago arenaria* (+; RC), *Silene conica* (+; RC).

Scabioso argenteae-Caricetum colchicae (Simon 1960) Krausch 1965 covers the largest part of the dunes in the strictly protected area, where it can be considered as rare and undisturbed, both in the Caraorman Forest area (CO), Crișan TAU, as well as in the area of the dunes that extends northwards from its boundaries. Characteristic of mobile and semimobile dunes, these phytocoenoses have a sparse appearance, generally with a low coverage,

gradually decreasing to the most exposed areas to the wind.

Key species: *Carex colchica* (2; CO), *Scabiosa argentea* (+; CO).

Other species: *Artemisia campestris* (+; CO), *Bassia laniflora* (+; CO), *Euphorbia seguieriana* (2; CO), *Linum austriacum* (+; CO), *Polygonum arenarium* (+; CO), *Scirpoides holoschoenus* (+; CO), *Secale silvestre* (1; CO), *Syrenia cana* (+; CO).

Scabioso argenteae-Caricetum colchicae (Simon 1960) Krausch 1965 is a vulnerable and undisturbed plant community, typical of the dunes on the seashore, especially for the Cășla Vădanei (VDS) area, Sfântu Gheorghe TAU, from which the presence of two threatened species was highlighted. Of these, *Onosma arenaria* is endangered and subendemic, while *Ephedra distachya* is vulnerable within the phytocoenoses.

Key species: *Carex colchica* (1; GCV), *Scabiosa argentea* (+; GCV).

Threatened species: *Onosma arenaria* (+; GCV), *Ephedra distachya* (1; GCV).

Other species: *Bassia laniflora* (+; GCV), *Centaurea arenaria* (1; GCV), *Cynanchum acutum* (+; GCV), *Euphorbia seguieriana* (1; GCV), *Hippophaë rhamnoides* (+; CTA), *Linum austriacum* (+; GCV), *Polygonum arenarium* (+; CTA), *Vincetoxicum hirundinaria* (+; GCV).

Scabioso argenteae-Caricetum colchicae (Simon 1960) Krausch 1965 is a vulnerable and undisturbed plant community at Plaja (Beach) Vadu (VDC), Corbu TAU. Only one rare threatened taxa was identified, endangered within these phytocoenoses.

Key species: *Carex colchica* (2; VDC), *Scabiosa argentea* (+; VDC).

Threatened species: *Astragalus varius* (+; VDC).

Other species: *Centaurea arenaria* (+; VDC), *Euphorbia seguieriana* (+; VDC), *Medicago falcata* (+; VDC), *Linum austriacum* (+; VDC), *Linaria genistifolia* (+; VDC), *Secale silvestre* (1; VDC).

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (PAL.CLASS.: 37.7 and 37.8)

37.7 Wet and nitrophilous tall herb edge communities, along water courses and woodland borders

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 136,093 ha and a conservation status of A level.

Even if it is more widespread within the D.D.B.R., within proper research this habitat was so far recorded as endangered and undisturbed only in the Letea village surroundings, C.A.Rosetti TAU, but it was also observed along the channel that links Letea village with Merhei Lake.

***Euphorbietum palustris* Westhoff 1969** is a plant community that was identified as endangered and undisturbed in the surroundings of the Letea village, C.A.Rosetti TAU (LE).

Key species: *Euphorbia palustris* (2; LE).

Other species: *Cynodon dactylon* (1; LE), *Mentha aquatica* (1; LE), *Potentilla reptans* (1; LE), *Schoenoplectus lacustris* (+; LE).

7210 *Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (PAL.CLASS.: 53.3)

53.3 Fen-sedge beds

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 4 ha and a conservation status of B level.

The habitat, that is described in the PHYSIS database as the subtype **53.3 Fen-sedge beds** was observed within proper studies only on reduced areas along the Litoral (Tătaru) channel between Sfântu Gheorghe and Sulina, isolated in the middle of compact reed beds. Being inaccessible, it was not possible to record the component species within plots, nor to assess its conservation status in relation with ruderal/ alien species.

7230 Alkaline fens (PAL.CLASS.: 54.2)

54.2 Rich fens

This habitat is endangered and low disturbed within the Corbu Beach, as indicated by ruderal and alien species. It can be considered even critically endangered within the territory of the Danube Delta Biosphere Reserve and associated Natura 200 sites, as it was only found at Corbu within proper research, where it is highly threatened by tourism activities and especially by the expansion of constructions or roads. *Leymus racemosus* subsp. *sabulosus* is the only threatened species endangered within the plots.

As this habitat is not mentioned within the list of habitats of community interest within the D.D.B.R. and associates sites, it is possible that the similar 6420 habitat (see also comments about 6420 habitat within Chapter 1.3) was confused with the **7230 Alkaline fens** (PAL.CLASS.: 54.2) habitat of community interest. The latest habitat occur without any doubt within the D.D.B.R.. Thus, it was recorded within the Corbu Beach at least, presented within the present work, framed within the subtype **54.217 Pontic dunal black sedge fens**, described within the PHYSIS database, represented by the coenotaxon ***Orchido-Schoenetum nigricans* Oberd.1957**. This was also quoted from nearby areas, southwards of the Corbu Beach (Năvodari), or within the proper D.D.B.R., from Sărăturile levee and Sfiștofca (SANDA, ARCUȘ, 1999).

In this situation, if finally it will be officially admitted that the 6420 does not exist within the D.D.B.R., it could be replaced by the 7230 habitat within management measures that could be revised adequately, or adapted, as these are similar habitats.

54.217 Pontic dunal black sedge fens

***Orchido-Schoenetum nigricans* Oberd.1957**, described so far in synthesis works concerning the vegetation of Dobrogea (SANDA, ARCUȘ, 1999), is framed within the ***Caricion davallianae* Klika 1934** alliance that belongs to this habitat. It is an endangered plant community within the humid dune slacks of Corbu Beach (CRB), which is the only location where it was identified within proper research, within the whole Danube Delta Natura 2000 sites (SCI, SPA) that include the Danube Delta Biosphere Reserve territory. A low disturbance is indicated by one ruderal alien species, *Conyza canadensis*. Only the vulnerable and rare *Leymus racemosus* subsp. *sabulosus* was recorded in the plots, as endangered locally.

Key species: *Schoenus nigricans* (3; CRB).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; CRB).

Other species: *Elymus elongatus* (+; CRB), *Artemisia santonica* (+; CRB), *Conyza canadensis* (+; CRB), *Daucus carota* (+; CRB), *Juncus littoralis* (+; CRB), *Holoschoenus vulgaris* (r; CRB), *Lythrum salicaria* (1; CRB), *Tamarix ramosissima* (+; CRB).

91AA* Eastern white oak woods (PAL.CLASS.: 41.7371, 41.7372)

41.7372 Moesian white oak woods

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 9 ha and a conservation status of B level.

This habitat subtype/ plant community is sporadic and low to highly disturbed within Dealurile Beștepe Nature Reserve (Mahmudia TAU). Two rare threatened species were identified, *Myrrhoides nodosa* and *Symphytum tauricum*, both endangered within the plots.

41.73723 Moesian *Paeonia peregrina*-white oak woods

***Paeonio peregrinae-Carpinetum orientalis* Doniță 1970** plant community can be considered as sporadic within the Dealurile Beștepe Nature Reserve, Mahmudia TAU (DBM). From the two rare threatened species, both endangered within this phytocoenosis, *Symphytum tauricum* is only found in few protected areas in Dobrogea. The two ruderal species with reduced contribution to the inventory of this coenotaxon show a low disturbance from this point of view.

Key taxa: *Carpinus orientalis* (2; DBM), *Quercus pubescens* (2; DBM).

Threatened species: *Myrrhoides nodosa* (+; DBM), *Symphytum tauricum* (+; DBM).

Other species:

- trees: *Fraxinus ornus* (1; DBM);

- shrubs/ lianas: *Crataegus monogyna* (+; DBM), *Rhamnus cathartica* (+; DBM);

- grasses/ undershrubs: *Brachypodium sylvaticum* (+; DBM), *Galium aparine* (+; DBM), *Geum urbanum* (+; DBM), *Parietaria officinalis* (+; DBM), *Poa nemoralis* (+; DBM), *Polygonatum latifolium* (+; DBM), *Thlaspi perfoliatum* (+; DBM), *Vinca herbacea* (+; DBM).

***Paeonio peregrinae-Carpinetum orientalis* Doniță 1970** plant community is considered sporadic within the Dealurile Beștepe Nature Reserve, Mahmudia TAU (DBM), where the two ruderal taxa indicate a low disturbed phytocoenosis in the grasses layer. Still, this can be considered overall a highly disturbed coenotaxa, taking into account the absence of oaks in the tree layer.

Key species: *Carpinus orientalis* (5; DBM)

Other species:

- shrubs/ lianas: *Crataegus monogyna* (+; DBM), *Rhamnus cathartica* (+; DBM).

- grasses/ undershrubs: *Galium aparine* (+; DBM), *Geranium lucidum* (+; DBM), *Geum urbanum* (+; DBM), *Glechoma hirsuta* (+; DBM), *Stellaria media* (+; DBM).

92 A0 *Salix alba* and *Populus alba* galleries (PAL.CLASS.: 44.141, 44.162 and 44.6)

44.6 Mediterraneo-Turanian riverine forests

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 13609 ha and a conservation status of A level.

This habitat can be considered overall as mainly sporadic and less endangered to vulnerable, only in particular cases being observed as frequent locally. It is mostly a low disturbed habitat, sometimes undisturbed to medium disturbed as indicated by ruderal and less alien species. This could be explained by the negative effect of grazing, but also in the alien species case by the spreading of the seeds of non-native species (introduced in plantations or accidentally through human activities) mainly with the waters of the Danube nearly all over the Delta. There was observed also a particular case of soil salinization that advances towards the north-eastern edge of the Letea forest, that obviously has affected some areas where *Fraxinus pallisae* stands dried

out for this reason, outside the Letea Forest strictly protected area. The habitat is widespread in many areas of the Delta, being recorded at within the Danube floodplain, framed within the TAUs Grindu, Isaccea, Mahmudia, Nufăru, Tulcea Town (Dunărea Veche); the Eracle Channel (Chilia Veche TAU); Maliuc TAU, Lipovenilor Channel, east of the Dunavățu de Jos village (Murighiol TAU); banks along the Danube at Ivancea (Crișan TAU); channel between the Erenciuc Lake and the Caraorman levee, Pădurea Caraorman strictly protected area (Crișan TAU); Topolca forest (Ceatalchioi TAU); Pătlăgeanca and Ceatalchioi (Ceatalchioi TAU), Pardina TAU; northern and western part of the Letea levee, in the surroundings Periprava village, outside the Letea forest strictly protected area, between C.A. Rosetti and Cardon (C.A. Rosetti TAU). The only threatened species observed was *Periploca graeca* usually endangered, sometimes vulnerable.

44.1621 Lower Danube willow galleries

This habitat subtype/ plant community was mostly observed as vulnerable, and less as ranking from endangered to frequent (Figure 1). In most of the phytocoenoses a low level of disturbance was noticed, followed by medium levels, with only isolated cases of undisturbed plant communities. The disturbance is due mainly to ruderal taxa and less to alien species invasive tendencies. It was registered at Eracle Channel (Chilia Veche TAU), within the Danube floodplain framed within the TAUs Grindu, Isaccea, Mahmudia, Nufăru, Tulcea (Dunărea Veche), as well as in other locations like: Maliuc TAU, Lipovenilor Channel (Murighiol TAU), east of the Dunavățu de Jos village (Murighiol TAU), banks along the Danube at Ivancea (Crișan TAU), channel between the Erenciuc Lake and the Caraorman levee (Crișan TAU), Topolca forest (Ceatalchioi TAU), Pătlăgeanca (Ceatalchioi TAU), Pardina TAU, northern part of the Letea levee, in the surroundings Periprava village, outside the Pădurea Letea strictly protected area, C.A. Rosetti TAU. *Periploca graeca* is the only threatened taxon that was observed, endangered within the phytocoenoses.

***Salicetum albae* Issler 1924 s.l.** is considered a rare plant community in the Eracle Channel area (CHE), Chilia TAU. There can be estimated a medium level of non-native plant invasive tendencies (*Amorpha fruticosa*, *Prunus cerasifera*), taking into account their dominance variation limits (+-1). The only ruderal taxon recorded has a reduced dominance, so it indicates a low disturbance from this point of view.

Key species: *Amorpha fruticosa* (1; CHE), *Salix alba* (4; CHE).

Other species:

- trees: *Prunus cerasifera* (+; CHE);
- shrubs: *Rubus caesius* (1; CHE);
- grasses/ undershrubs: *Arctium lappa* (+; CHE), *Bidens tripartita* (+; CHE), *Iris pseudacorus* (+; CHE), *Myosotis scorpioides* (+; CHE), *Myosoton*

aquaticum (+; CHE), *Phragmites australis* (+; CHE), *Rumex palustris* (+; CHE), *Solanum dulcamara* (+; CHE), *Symphytum officinale* (±; CHE).

Salicetum albae Issler 1924 s.l. is an endangered plant community which was observed on the Grindu TAU's territory, Danube Delta SPA, in the Danube floodplain (GL), as isolated willow stands. A medium level of disturbance, as a result of grazing, can be deduced from the presence of five ruderal taxa which represent half of the inventory.

Key species: *Populus alba* (+; GL), *Salix alba* (5; GL).

Other species: *Elymus repens* (+; GL), *Cannabis sativa* subsp. *spontanea* (+; GL), *Cynodon dactylon* (+; GL), *Mentha aquatica* (+; GL), *Setaria viridis* (+; GL), *Xanthium italicum* (+; GL).

Salicetum albae Issler 1924 s.l. can be estimated as a vulnerable coenotaxon within the Danube floodplain, Isaccea town's territory, where it was studied downstream of Isaccea (ILD). The three non-native taxa with a significant dominance variation (+-1) indicate a medium disturbance.

Key species: *Amorpha fruticosa* (+; ILD), *Salix alba* (+; ILD).

Other species: *Fraxinus americana* (+; ILD), *Morus alba* (+; ILD), *Rubus caesius* (+; ILD), *Vitis sylvestris* (+; ILD), *Solanum dulcamara* (+; ILD).

Salicetum albae Issler 1924 s.l. was observed as a vulnerable plant community within the Mahmudia TAU territory in the Danube floodplain (MLD), along the river. Some of the stands are formed of old growth trees. There can be estimated a low level of disturbance both from the non-native species presence (*Amorpha fruticosa*, *Fraxinus americana*, *Morus alba*) as well as due to the ruderal taxa invasive trends (three species).

Key species: *Amorpha fruticosa* (+; MLD), *Salix alba* (3; MLD).

Other species:

- trees: *Fraxinus americana* (+; MLD), *Morus alba* (+; MLD);

- grasses/ undershrubs: *Arctium lappa* (+; MLD), *Artemisia annua* (+; MLD), *Bidens tripartita* (+; MLD), *Elymus repens* (+; MLD), *Mentha pulegium* (+; MLD), *Myosoton aquaticum* (+; MLD), *Potentilla reptans* (+; MLD), *Rorippa sylvestris* (+; MLD).

Salicetum albae Issler 1924 s.l. plant community can be considered sporadic within the Maliuc TAU area (MV). There can be assessed a medium degree of non-native species presence as *Amorpha fruticosa* reaches a dominance index of 1. Two ruderal species, with a reduced dominance, indicate a low disturbance level from this point of view.

Key species: *Amorpha fruticosa* (1; MV), *Salix alba* (4; MV).

Other species:

- shrubs/ lianas: *Rubus caesius* (+; MV);

- grasses/ undershrubs: *Arctium lappa* (+; MV), *Butomus umbellatus* (+; MV), *Lycopus europaeus* (+; MV), *Myosoton aquaticum* (+; MV), *Phragmites*

australis (+; MV), *Rorippa austriaca* (+; MV), *Rumex palustris* (+; MV), *Symphytum officinale* (+; MV), *Typha angustifolia* (+; MV), *Urtica dioica* (+; MV).

Salicetum albae Issler 1924 s.l. plant community, considered vulnerable within the Nufăru TAU's territory, was inventoried in the Danube floodplain, along the Danube (NLD). The two non-native species (*Fraxinus americana*, *Morus alba*) show a low disturbance from this point of view.

Key species: *Salix alba* (5; NLD).

Other species:

- trees: *Fraxinus americana* (+; NLD), *Morus alba* (+; NLD);
- shrubs: *Rubus caesius* (+; NLD);
- grasses/ undershrubs: *Bidens tripartita* (+; NLD), *Calystegia sepium* (+; NLD), *Poa sylvicola* (+; NLD), *Solanum dulcamara* (+; NLD).

Salicetum albae Issler 1924 s.l. plant community can be considered a vulnerable coenotaxon within the Dunărea Veche area, within the territory of Tulcea TAU (TDV). It has a low degree of ruderal plant invasion, as only one such species was identified here, with a restricted dominance.

Key species: *Salix alba* (5; TDV).

Other species:

- shrubs: *Rubus caesius* (+; TDV);
- grasses/ undershrubs: *Bidens tripartita* (+; TDV), *Bromus sterilis* (+; TDV), *Iris pseudacorus* (+; TDV), *Lycopus europaeus* (+; TDV), *Myosoton aquaticum* (+; TDV), *Poa sylvicola* (+; TDV), *Rumex palustris* (+; TDV), *Rumex hydrolapathum* (+; TDV), *Stachys palustris* (+; TDV).

Salicetum albae Issler 1924 s.l. occurs as narrow strips the banks of the channels or of the Sfântu Gheorghe Arm of the Danube, Murighiol TAU, where it can be considered rare and low disturbed, as indicated by one ruderal species with a low coverage, being studied in the area of Lipovenilor Channel (CL).

Key species: *Salix alba* (4; CL).

Other species:

- shrubs/ lianas: *Rubus caesius* (+; CL);
- grasses/ undershrubs: *Calystegia sepium* (+; CL), *Carex riparia* (+; CL), *Iris pseudacorus* (+; CL), *Mentha aquatica* (+; CL), *Phragmites australis* (+; CL), *Solanum dulcamara* (+; CL), *Stachys palustris* (+; CL), *Tanacetum vulgare* (+; CL).

Salicetum albae Issler 1924 s.l. was registered to the east of the Dunavățu de Jos village (DJE) Murighiol commune, where it can be considered vulnerable. It has a reduced participation of the ruderal species, being classified as low disturbed.

Key species: *Salix alba* (4; CL, DJE).

Other species:

- trees: *Morus alba* (+; DJE), *Populus nigra* (+; DJE), *Prunus cerasifera* (+; DJE);

- shrubs/ lianas: *Rubus caesius* (2; DJE);
 - grasses/ undershrubs: *Arctium lappa* (+; DJE), *Artemisia vulgaris* (+; DJE), *Berula erecta* (+; DJE), *Bidens tripartita* (+; DJE), *Carex riparia* (1; DJE), *Eupatorium cannabinum* (+; DJE), *Myosoton aquaticum* (+; DJE), *Phragmites australis* (+; DJE), *Ranunculus sceleratus* (+; DJE), *Solanum dulcamara* (+; DJE), *Typha angustifolia* (+; DJE).

Salicetum albae Issler 1924 s.l. was recorded on the banks along the Danube, being rare at Ivancea (IV), Crișan TAU, where it can be considered low disturbed, as indicated by the two ruderal species and *Amorpha fruticosa*, an alien taxon.

Key species: *Amorpha fruticosa* (+; IV), *Salix alba* (5; IV).

Other species:

- grasses/ undershrubs: *Arctium lappa* (+; IV), *Bidens tripartita* (+; IV), *Glycyrrhiza echinata* (+; IV), *Iris pseudacorus* (+; IV), *Lycopus europaeus* (+; IV), *Lycopus exaltatus* (+; EC), *Mentha aquatica* (+; IV), *Plantago major* (+; IV), *Potentilla reptans* (+; IV), *Ranunculus sceleratus* (+; IV), *Rumex palustris* (+; IV).

Salicetum albae Issler 1924 s.l. is frequent and in its natural status along the channel between the Erenciuc Lake and the Caraorman levee (EC), Crișan TAU.

Key species: *Salix alba* (5; EC).

Other species:

- trees: *Populus alba* (+; EC);
 - grasses/ undershrubs: *Bidens tripartita* (+; EC), *Iris pseudacorus* (+; EC), *Lycopus europaeus* (+; EC), *Lycopus exaltatus* (+; EC), *Mentha aquatica* (+; EC), *Myosoton aquaticum* (+; EC), *Solanum dulcamara* (+; EC), *Stachys palustris* (+; EC), *Tamarix ramosissima* (+; EC).

Salicetum albae Issler 1924 s.l. occupies large and representative areas within the Ceatalchioi TAU, of high conservative and landscape value, in the Topolca forest (PTO) where it can be considered sporadic and low disturbed due to the presence of the alien species *Fraxinus americana* and of three ruderal species.

Key species: *Populus alba* (1; PTO), *Salix alba* (5; PTO).

Other species:

- trees: *Fraxinus americana* (+; PTO);
 - shrubs/ lianas: *Rubus caesius* (+; PTO);
 - grasses/ undershrubs: *Arctium lappa* (+; PTO), *Aristolochia clematitis* (+; PTO), *Glechoma hederacea* (+; PTO), *Gratiola officinalis* (+; PTO), *Lycopus europaeus* (+; PTO), *Lysmachia nummularia* (+; PTO), *Mentha aquatica* (+; PTO), *Myosoton aquaticum* (+; PTO), *Potentilla reptans* (+; PTO), *Rumex palustris* (+; PTO), *Urtica dioica* (+; PTO).

Salicetum albae Issler 1924 s.l. was recorded as vulnerable, and low disturbed, as shown by three ruderal species. It was observed along the Danube's arms, to the south-east of Pătlăgeanca (PSE), Ceatalchioi TAU.

Key species: *Salix alba* (5; PSE).

Other species:

- shrubs/ lianas: *Rubus caesius* (+; PSE);
- grasses/ undershrubs: *Artemisia annua* (+; PSE), *Cynodon dactylon* (+; PSE), *Potentilla reptans* (+; PSE), *Solanum dulcamara* (+; PSE), *Stellaria media* (+; PSE), *Urtica dioica* (+; PSE).

***Salicetum albae* Issler 1924 s.l.** is sporadic on the territory of Pardina TAU. The analyzed phytocoenoses are disturbed at a medium level, as indicated by the dominance indices of the two ruderal and two alien species (*Fraxinus americana*, *Amorpha fruticosa*).

Key species: *Amorpha fruticosa* (1; PA), *Salix alba* (4; PA), *Populus alba* (1; PA), *Populus nigra* (+; PA).

Other species:

- trees: *Fraxinus americana* (+; PA)
- shrubs/ lianas: *Vitis sylvestris* (+; PA)
- grasses/ undershrubs: *Arctium lappa* (+; PA), *Bidens tripartita* (+; IV, EC; PA), *Bromus sterilis* (1; PA), *Rumex palustris* (+; PA), *Solanum dulcamara* (+; PA).

***Salicetum albae* Issler 1924 s.l.** was recorded as vulnerable the northern part of the Letea levee, in the surroundings Periprava village, outside the Pădurea Letea strictly protected area (PEN), C.A. Rosetti TAU. Locally some stands have willow trees probably older than a century, with a high conservation value. It can be considered low disturbed due to the presence of the alien species *Fraxinus americana* and *Morus alba*. The only threatened species is *Periploca graeca*, endangered within the plots.

Key species: *Salix alba* (4; PEN).

Threatened species: *Periploca graeca* (+; PEN)

Other species:

- trees: *Fraxinus americana* (+; PEN), *Morus alba* (+; PEN).
- grasses/ undershrubs: *Myosoton aquaticum* (+; PEN), *Potentilla reptans* (+; PEN), *Solanum dulcamara* (+; PEN), *Symphytum officinale* (+; PEN), *Viburnum opulus* (+; PEN).

44.6611 Western Pontic white poplar galleries

This habitat subtype/ plant community was observed as endangered to sporadic, mainly low disturbed and sometime medium disturbed or in its natural status. It was recorded within the Tulcea territory, between C.A. Rosetti and Cardon, in the west part of the Letea forest (C.A. Rosetti), at Pătlăgeanca (Ceatalchioi TAU), Caraorman strictly protected area (Crișan TAU), eastwards of Dunavățu de Jos (Murighiol TAU). The only threatened species is *Periploca graeca*, endangered within the plots.

Populetum albae (Br.-Bl. 31 pp.) Borza 37 plant community is vulnerable within the Tulcea territory (TDV). The three non-native species (*Fraxinus americana*, *Morus alba*, *Amorpha fruticosa*), with a reduced dominance, indicate a low level of disturbance, but close to its upper limit, as they are nearly as numerous as the native non-ruderal taxa. The two ruderal species, by their restricted dominance, show also a low level of invasive trend from this point of view.

Key species: *Populus alba* (5; TDV).

Other species:

- trees: *Fraxinus americana* (+; TDV), *Morus alba* (+; TDV), *Salix alba* (+; TDV);

- shrubs/ lianas: *Amorpha fruticosa* (+; TDV), *Rubus caesius* (+; TDV), *Vitis sylvestris* (+; TDV);

- grasses/ undershrubs: *Bidens tripartita* (+; TDV), *Chenopodium album* (+; TDV), *Elymus repens* (+; TDV), *Lysimachia nummularia* (+; TDV), *Potentilla reptans* (+; TDV), *Vicia angustifolia* (+; TDV).

Populetum albae (Br.-Bl. 31 pp.) Borza 37 was observed as rare and undisturbed, especially in the west of the Letea Forest (PL), where they often form large stands, without oak species, or with insignificant coverage. The only rare threatened species identified so far is the liana *Periploca graeca*.

Key species: *Populus alba* (5; PL).

Threatened species: *Periploca graeca* (+; PL).

Other species:

- trees: *Fraxinus pallisae* (+; PL), *Pyrus pyraeaster* (+-1; PL), *Quercus pedunculiflora* (+; PL).

- grasses/ undershrubs: *Euphorbia palustris* (+; PL), *Iris pseudacorus* (+; PL), *Phragmites australis* (+; PL), *Symphytum officinale* (+; PL), *Teucrium scordium* (+; PL).

Populetum albae (Br.-Bl. 31 pp.) Borza 37 was observed as vulnerable within the Letea Forest (PL), without oak species, or with insignificant coverage. A low disturbance can be guessed from the presence of a ruderal species, with a reduced coverage. The only rare threatened species identified so far is the liana *Periploca graeca*.

Key species: *Populus alba* (4; PL).

Threatened species: *Periploca graeca* (+; PL).

Other species:

- trees: *Fraxinus angustifolia* (+; PL), *Fraxinus pallisae* (+; PL), *Pyrus pyraeaster* (+; PL), *Quercus pedunculiflora* (+; PL);

- shrubs/ lianas: *Cornus sanguinea* (+; PL), *Crataegus monogyna* (+; PL), *Rubus caesius* (+; PL);

- grasses/ undershrubs: *Asparagus pseudoscaber* (+; PL), *Elymus repens* (+; PL), *Euphorbia seguieriana* (+; PL), *Thelypteris palustris* (+; PL).

Populetum albae (Br.-Bl. 31 pp.) Borza 37 was encountered as sporadic and undisturbed between C.A. Rosetti and Cardon (RC), C.A. Rosetti TAU. A medium level of disturbance is indicated by two ruderal species with a significant variation of the coverage indices.

Key species: *Populus alba* (5; RC).

Other species:

- shrubs/ lianas: *Evonymus europaeus* (+; RC);

- grasses/ undershrubs: *Elymus repens* (1; RC), *Asparagus pseudoscaber* (+; RC), *Cynanchum acutum* (+; RC), *Euphorbia palustris* (+; PL), *Iris pseudacorus* (+; PL), *Phragmites australis* (+; PL), *Pulicaria dysenterica* (+; RC), *Symphytum officinale* (+; PL), *Teucrium scordium* (+; PL).

Populetum albae (Br.-Bl. 31 pp.) Borza 37 was encountered as sporadic and undisturbed between C.A. Rosetti and Cardon (RC), C.A. Rosetti TAU. Only one ruderal taxon and two non-native species *Amorpha fruticosa* and *Prunus cerasifera* show a low disturbance level.

Key species: *Populus alba* (5; RC).

Other species:

- trees: *Alnus glutinosa* (+; RC), *Populus tremula* (1; RC), *Prunus cerasifera* (+; RC), *Pyrus pyraeaster* (+; RC);

- shrubs/ lianas: *Amorpha fruticosa* (+; RC), *Cornus sanguinea* (+; RC), *Evonymus verrucosus* (+; RC), *Ligustrum vulgare* (+; RC), *Rhamnus cathartica* (+; RC);

- grasses/ undershrubs: *Ballota nigra* (+; RC), *Vincetoxicum hirundinaria* (+; RC).

Populetum albae (Br.-Bl. 31 pp.) Borza 37 is encountered as endangered especially on the higher levees along the Danube's arms to the north and east from Pătlăgeanca (RC), Ceatalchioi TAU. The white poplars sometimes reach a monumental size. A medium disturbance level is obvious as the ruderal species dominate, with significant indices (+-1). Also two non-native (*Amorpha fruticosa*, *Fraxinus americana*) occur with a low coverage.

Key species: *Populus alba* (4; PNE).

Other species:

- trees: *Fraxinus americana* (+; PNE), *Salix alba* (2; PNE), *Ulmus minor* (+; PNE);

- shrubs/ lianas: *Amorpha fruticosa* (+; PNE), *Rubus caesius* (+; PNE), *Vitis sylvestris* (+; PNE);

- grasses/ undershrubs: *Elymus repens* (1; PNE), *Arctium lappa* (+; PNE), *Aristolochia clematitis* (+; PNE), *Artemisia annua* (+; PNE), *Bromus sterilis* (+;

PNE), *Geranium rotundifolium* (+; PNE), *Hordeum murinum* (+; PNE), *Marrubium vulgare* (+; PNE), *Urtica dioica* (+; PNE).

***Populetum albae* (Br.-Bl. 31 pp.) Borza 37** is represented by the white poplar clumps from the slacks between the Dunes of the Caraorman strictly protected area, Crișan TAU, considered vulnerable and undisturbed. There the key species characteristic for the so called “hasmac” forests dominated by *Quercus pedunculiflora* and *Fraxinus pallisae* are absent or occur in a negligible proportion. The only rare threatened species identified is *Periploca graeca*, endangered within these phytocoenoses.

Key species: *Populus alba* (5; CO).

Threatened species: *Periploca graeca* (+; CO).

Other species:

- trees: *Fraxinus pallisae* (+; CO), *Quercus pedunculiflora* (+; CO);
- shrubs/ lianas: *Rubus caesius* (+; CO);
- grasses/ undershrubs: *Asparagus pseudoscaberr* (+; CO), *Calamagrostis epigeios* (+; CO).

***Populetum albae* (Br.-Bl. 31 pp.) Borza 37** is particularly representative for the shores of the Sfântu Gheorghe Arm of the Danube, on higher and evolved levees, being estimated as endangered in the wetlands eastwards of Dunavățu de Jos (DJE). A medium level of disturbance can be guessed from the dominance indices (+1) of both ruderal (three species) and non-native species (*Morus alba*, *Prunus cerasifera*).

Key species: *Populus alba* (4; DJE).

Other species:

- trees: *Morus alba* (+; DJE), *Prunus cerasifera* (1; DJE), *Salix alba* (1; DJE);
- grasses/ undershrubs: *Arctium lappa* (+; DJE), *Artemisia vulgaris* (1; DJE), *Ballota nigra* (+; DJE), *Bryonia alba* (+; DJE), *Taraxacum officinale* (+; DJE).

44.6621 Danube Delta periploca-poplar-oak-ash galleries

The habitat subtype/plant community is assessed as sporadic and less as endangered, mostly in its natural status, sometimes low disturbed, due to alien and ruderal species (possibly favored by grazing), or even to the supposed negative effects of advancing soil salinization, on restricted areas at the north-eastern edge of the Letea forest (outside the protected area). It was observed within the Letea and Caraorman forests, but also as a particular *Quercus pedunculiflora* phytocoenosis at Ceatalchioi, that was at least provisionally framed within this habitat. The only threatened species, *Periploca graeca*, was mainly observed as endangered, but sometimes also as vulnerable.

***Asparagus pseudoscaber-Quercetum pedunculiflorae* Popescu et al. 1997**, including the sub-association ***fraxinetosum pallisae* (Krausch 1965) Sanda, Popescu 1992**, form the local clumps of forest wells known as "hasmac" found in the low areas between the sand dunes, in the strictly protected area Pădurea Letea, where they occur as sporadic and in their natural status. This plant community is home to the rare threatened species *Periploca graeca*, endangered within the plots.

Key species: *Asparagus pseudoscaber* (+; PL), *Fraxinus pallisae* (5; PL), *Galium rubioides* (+; PL), *Periploca graeca* (+; PL), *Quercus pedunculiflora* (1; PL).

Threatened species: *Periploca graeca* (+; PL).

Other species:

- trees: *Malus sylvestris* (+; PL), *Populus alba* (+; PL), *Populus tremula* (1; PL), *Pyrus pyraeaster* (+; PL);

- shrubs/ lianas: *Cornus sanguinea* (+; PL), *Crataegus monogyna* (+; PL), *Rhamnus frangula* (+; PL), *Rubus caesius* (1; PL);

- grasses/ undershrubs: *Convallaria majalis* (r; PL), *Loranthus europaeus* (+; PL), *Odontites vernus* (+; PL), *Phragmites australis* (+; PL).

***Asparagus pseudoscaber-Quercetum pedunculiflorae* Popescu et al. 1997**, including the sub-association ***fraxinetosum pallisae* (Krausch 1965) Sanda, Popescu 1992**, form the local clumps of forest wells known as "hasmac" found in the low areas between the sand dunes, in the strictly protected area Pădurea Letea, where they occur as sporadic and low disturbed as indicated by two ruderal species with a low coverage. The rare threatened species *Periploca graeca* was recorded as vulnerable within the plots.

Key species: *Asparagus pseudoscaber* (+; PL), *Fraxinus pallisae* (+; PL), *Galium rubioides* (+; PL), *Periploca graeca* (1; PL), *Quercus pedunculiflora* (4; PL), *Vitis sylvestris* (+; PL).

Threatened species: *Periploca graeca* (1; PL).

Other species:

- trees: *Fraxinus angustifolia* (1; PL), *Malus sylvestris* (+; PL), *Populus alba* (+; PL), *Populus tremula* (+; PL), *Pyrus pyraeaster* (1; PL);

- shrubs/ lianas: *Berberis vulgaris* (1; PL), *Cornus sanguinea* (+; PL), *Crataegus monogyna* (1; PL), *Ligustrum vulgare* (+; PL), *Prunus spinosa* (+; PL), *Rubus caesius* (+; PL);

- grasses/ undershrubs: *Elymus repens* (+; PL), *Consolida regalis* (r; PL), *Convallaria majalis* (+; PL), *Odontites vernus* (+; PL), *Vincetoxicum hirundinaria* (+; PL).

***Asparagus pseudoscaber-Quercetum pedunculiflorae* Popescu et al. 1997** was recorded as sporadic and undisturbed. The only rare threatened species is *Periploca graeca*, vulnerable within the plots.

Key species: *Asparagus pseudoscaber* (+; PL), *Fraxinus pallisae* (1; PL), *Periploca graeca* (1; PL), *Quercus pedunculiflora* (3; PL).

Threatened species: *Periploca graeca* (1; PL).

Other species:

- trees: *Populus alba* (1; PL);
 - shrubs/ lianas: *Crataegus monogyna* (+-1; PL), *Rhamnus cathartica* (+; PL), *Rubus caesius* (+; PL).

- grasses/ undershrubs: *Veronica spicata* (+; PL).

***Asparagus pseudoscaber-Quercetum pedunculiflorae* Popescu et al. 1997** was recorded as vulnerable along the road between Periprava and C.A.Rosetti (PR), C.A.Rosetti TAU, outside the Pădurea Letea strictly protected area, in the location where a massive soil salinization advance from the former fish farm abandoned ponds towards the Letea Forest. In order to be able to assess the evolution of this patch of forest in the future, if the salinization process will still advance, the plot of 10x10 m was placed so that it includes a concrete fountain that is located close to the above mentioned road, that can be used as a mark. This phytocoenosis can be assessed as low disturbed, as it includes a ruderal species, and an alien species, *Prunus cerasifera*, with a low coverage. This can be explained by the slight human impact due to the vicinity of the road. Yet, there were not observed species that could indicate soil salinization, but the deep roots of the oaks are maybe already in contact with an increasing salt concentration in the soil, which could explain the massive presence of *Loranthus europaeus*, an indicator of a decline in the oak vitality.

Key species: *Fraxinus pallisae* (2; PL), *Quercus pedunculiflora* (3; PR).

Other species:

- shrubs/ lianas: *Cornus sanguinea* (+; PR), *Crataegus monogyna* (+; PR), *Loranthus europaeus* (1; PR), *Prunus cerasifera* (+; PR), *Pyrus pyraster* (+; PR), *Rubus caesius* (+; PR).

- grasses/ undershrubs: *Arctium lappa* (+; PR), *Eupatorium cannabinum* (+; PR), *Mentha aquatica* (+; PR).

***Asparagus pseudoscaber-Quercetum pedunculiflorae* Popescu et al. 1997** found isolated on the territory of the Ceatalchioi TAU (CET), along the road Pătlașgeanca-Ceatalchioi-Plauru, was included at least provisionally in the 92A0 habitat of community interest (44.6621), although some characteristic species (*Periploca graeca*, *Fraxinus pallisae*, *Fraxinus angustifolia*) are missing in the studied situation, in relation to the phytocoenoses of Letea and Caraorman. It should be taken into account that from the two typical associations of *Quercus pedunculiflora* specific for floodplains described in Romania (SANDA *et alii*, 2008), the composition of this phytocoenosis is the closest to that of the association and habitat quoted above. It can be considered endangered, as it occupies a very small area, less than 1 hectare, still the

respective stands have a certain conservative value, being probably the only case of oak phytocenosis identified in the delta outside the Letea and Caraorman levees. It is also worth mentioning that the specimens of *Quercus pedunculiflora* are at least over a century old. A low disturbance is indicated both by the presence of alien species like *Acer negundo*, *Fraxinus americana* and also of two ruderal species, all with a reduced dominance.

Key species: *Quercus pedunculiflora* (2; CET).

Other species:

- trees: *Acer negundo* (+; CET), *Fraxinus americana* (+; CET), *Populus alba* (2; CET), *Ulmus minor* (1; CET);

- shrubs/ lianas: *Amorpha fruticosa* (+; CET), *Rubus caesius* (+; CET), *Vitis sylvestris* (+; CET);

- grasses/ undershrubs: *Aristolochia clematitis* (+; CET), *Bromus sterilis* (+; CET), *Linaria vulgaris* (+; CET).

***Asparago pseudoscaberi-Quercetum pedunculiflorae* Popescu et al. 1997** is the most representative and widespread forest habitat in the Caraorman Forest (CO), Crișan TAU, where it can be considered as sporadic and low disturbed, due to the presence of two non-native species like *Morus alba* and *Prunus cerasifera*. The specific, lush aspect of these forests, is especially conferred by the threatened liana *Periploca graeca*, endangered within these phytocoenoses.

Key species: *Asparagus pseudoscaber* (+; CO), *Fraxinus pallisae* (1; CO), *Periploca graeca* (+; CO), *Quercus pedunculiflora* (2; CO).

Threatened species: *Periploca graeca* (+; CO).

Other species:

- trees: *Morus alba* (+; CO), *Prunus cerasifera* (+; CO), *Populus alba* (1; CO), *Pyrus pyraeaster* (+; CO), *Ulmus procera* (+; CO);

- shrubs/ lianas: *Rubus caesius* (+; CO);

- grasses/ undershrubs: *Alliaria petiolata* (+; CO), *Glechoma hirsuta* (+; CO), *Mentha aquatica* (+; CO).

***Asparago pseudoscaberi-Quercetum pedunculiflorae* Popescu et alii 1997** can be considered as sporadic and undisturbed in the Caraorman Forest (CO), Crișan TAU. *Fraxinus pallisae* becomes co-dominant in the lowest areas between the sand dunes, where ground water is more accessible. These phytocoenoses are included in the sub-association ***fraxinetosum pallisae* (Krausch, 1965) Popescu et al. 1997**. The rare threatened liana *Periploca graeca* is endangered within these phytocoenoses.

Key species: *Asparagus pseudoscaber* (+; CO), *Fraxinus pallisae* (3; CO), *Periploca graeca* (+; CO), *Quercus pedunculiflora* (3; CO), *Vitis sylvestris* (+; CO).

Threatened species: *Periploca graeca* (+; CO).

Other species:

- trees: *Populus alba* (1-2; CO), *Pyrus pyraeaster* (+; CO), *Ulmus procera* (+-1; CO).
- shrubs/ lianas: *Rubus caesius* (+-1; CO).
- grasses/ undershrubs: *Alliaria petiolata* (+-1; CO), *Glechoma hirsuta* (+-1; CO), *Mentha aquatica* (+; CO), *Symphytum officinale* (+; CO).

92D0 Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*) (PAL.CLASS.: 44.81 to 44.84)**44.81 Oleander, chaste tree and tamarisk galleries**

The habitat is mentioned within the initial documents that were used for the SCI (Formularul standard Natura 2000 – ROSCI0065), estimated preliminary as having 907 ha and a conservation status of B level.

Within proper research this habitat was so far recorded as endangered to vulnerable, and from undisturbed to medium disturbed from the species composition and structure point of view. Still in the area between the Sulina Cemetery and the bare section of the Sulina beach, this habitat subtype can be considered as highly disturbed, as it is affected by fragmentation and the reduction of its area, because of the tourism constructions/developments and acces roads/ pathways. It was recorded as follows: between the localities Tudor Vladimirescu (Tulcea TAU) and Pătlăgeanca (Ceatalchioi TAU); within Pardina TAU; at the Sulina beach (Sulina TAU); the north of the Caraorman levee, outside the forest (Crișan TAU); Cășla Vădanei (Sfântu Gheorghe TAU). Four rare threatened species, endangered within the plots, were registered (*Leymus racemosus* subsp. *sabulosus*, *Limonium meyeri*, *Polypogon monspeliensis*, *Scolymus hispanicus*)

44.814112 Danube small reed fresh water tamarix stands

The habitat subtype/ plant community is endangered to vulnerable, respectively medium disturbed. It was observed between the localities of Tudor Vladimirescu (Tulcea TAU) and Pătlăgeanca (Ceatalchioi TAU) and within Pardina TAU.

***Calamagrostio-Tamaricetum ramosissimae* Simon et Dihoru (1962) 1963**, was inventoried as endangered, on very small areas between the localities Tudor Vladimirescu and Pătlăgeanca (TVP), on Tulcea TAU's territory. The only non-native species is *Amorpha fruticosa*, along with two ruderal taxa having with a significant coverage (+-1), that shows a medium disturbance.

Key species: *Tamarix ramosissima* (5; TVP).

Other species:

- shrubs/ lianas: *Amorpha fruticosa* (+; TVP), *Rubus caesius* (1; TVP).

- grasses/ undershrubs: *Elymus repens* (1; TVP), *Althaea officinalis* (+; TVP), *Aristolochia clematitis* (+; TVP), *Linaria vulgaris* (+; TVP), *Lycopus exaltatus* (+; TVP).

Calamagrostio-Tamaricetum ramosissimae Simon et Dihoru (1962) 1963 is vulnerable, being represented by bushes with more or less isolated distribution within the territory of Pardina TAU (PA). Three ruderal species with significant dominance indices variation (+-1), indicate a medium level of the ruderal species invasive tendencies.

Key species: *Tamarix ramosissima* (4; PA).

Other species: *Elymus repens* (1; PA), *Arctium lappa* (+; PA), *Eleocharis palustris* (+; PA), *Mentha aquatica* (+; PA), *Rumex palustris* (+; PA), *Taraxacum officinale* (+; PA).

44.81412 Western Pontic coastal *Tamarix smyrnensis* stands

The habitat subtype/ plant community is mainly vulnerable, sometimes endangered, mainly undisturbed, rarely low disturbed. Even if the species composition is usually undisturbed, mainly because the saline soil avoids ruderal or alien species occurrence, in the area between the Sulina Cemetery and the bare section of the Sulina beach, this habitat subtype is affected by fragmentation and the reduction of its area, because of the tourism constructions/ developments and acces roads/ pathways. It was recorded from the Sulina beach (Sulina TAU), the north of the Caraorman levee, outside the forest (Crișan TAU), Cășla Vădanei (Sfântu Gheorghe TAU). Four rare threatened species, endangered within the plots, were registered (*Leymus racemosus* subsp. *sabulosus*, *Limonium meyeri*, *Polypogon monspeliensis*, *Scolymus hispanicus*).

Calamagrostio-Tamaricetum ramosissimae Simon et Dihoru (1962) 1963, synonymous (SANDA *et alii*, 2008) with **Tamaricetum pallasii Borza 1931 n.n.**, a vulnerable plant community, was studied in the areas adjacent to the Sulina beach (SPL). There, the only ruderal species, *Cynanchum acutum*, shows a low invasive trend of the ruderal taxa. A high disturbance is indicated by the non-native species *Elaeagnus angustifolia*. Despite this unfavourable conservation level, two rare threatened species occur in the analysed plot, where they are both endangered.

Key species: *Tamarix ramosissima* (3; SPL).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; SPL), *Scolymus hispanicus* (+; SPL).

Other species: *Althaea officinalis* (+; SPL), *Conyza canadensis* (+; SPL), *Cynanchum acutum* (+; SPL), *Cynodon dactylon* (+; SPL), *Gypsophila perfoliata* (+; SPL), *Juncus littoralis* (+; SPL), *Elaeagnus angustifolia* (2; SPL), *Pulicaria dysenterica* (+; SPL).

***Calamagrostio-Tamaricetum ramosissimae* Simon et Dihoru (1962)**

1963, a vulnerable plant community, was studied in the areas adjacent to the Sulina beach (SPL). Two ruderal species indicate a low disturbance. Two rare threatened species occur in the analysed plot, where they are both endangered.

Key species: *Calamagrostis epigeios* (1; SPL), *Tamarix ramosissima* (3; SPL).

Threatened species: *Limonium meyeri* (+; SPL), *Polypogon monspeliensis* (+; SPL).

Other species: *Aster tripolium* (+; SPL), *Atriplex prostrata* (1; SPL), *Cynanchum acutum* (+; SPL), *Juncus littoralis* (1; SPL), *Juncus maritimus* (+; SPL), *Polygonum aviculare* (+; SPL), *Puccinellia limosa* (+; SPL), *Pulicaria dysenterica* (+; SPL).

***Calamagrostio-Tamaricetum ramosissimae* Simon et Dihoru (1962)**

1963 was investigated as vulnerable and undisturbed in the strictly protected area Pădurea Caraorman, in the north, outside the forest (CON). Here *Tamarix ramosissima* forms phytocoenoses with low coverage, although the shrub is relatively frequent but predominantly spread as isolated specimens. A low disturbance is indicated by the alien species *Conyza canadensis*.

Key species: *Tamarix ramosissima* (3; CON).

Other species: *Conyza canadensis* (+; CON), *Cynodon dactylon* (1; CON), *Gnaphalium luteo-album* (+; CON), *Potentilla anserina* (r; CON), *Potentilla reptans* (1; CON), *Scirpoides holoschoenus* (+; CON), *Verbascum banaticum* (+; CON).

***Calamagrostio-Tamaricetum ramosissimae* Simon et Dihoru (1962)**

1963 occur as small clumps, predominantly in the low areas between the coastal dunes of the Câșla Vădanei (GCV), where it can be considered endangered and undisturbed. *Leymus racemosus* subsp. *sabulosus* is the only threatened species observed in this habitat, where it is endangered.

Key species: *Tamarix ramosissima* (4; GCV).

Threatened species: *Leymus racemosus* subsp. *sabulosus* (+; GCV).

Other species:

- grasses/ undershrubs: *Bassia laniflora* (+; GCV), *Carex colchica* (+; GCV), *Centaurea arenaria* (1; GCV), *Euphorbia seguieriana* (+; GCV), *Linaria genistifolia* (+-1; GCV), *Linum austriacum* (+; GCV), *Polygonum arenarium* (+; GCV).

91F0 Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* of great rivers (*Ulmion minoris*) (PAL.CLASS.: 44.4)

44.4 Mixed oak-elm-ash forests of great rivers

This habitat was recorded as an endangered plant community, medium disturbed due to ruderal taxa, that was identified only at Cape Doloșman, at least within proper research, so far.

Fraxino-Ulmetum Oberdorfer 53 is a vulnerable plant community within Cape Doloşman (CDO), Jurilovca TAU. It should be mentioned that, even though these phytocoenoses are not adjacent to any river, still the waters of the Razim Lagoon come from the Danube, so the ecological conditions are (nearly) identical with the ones for other coenotaxon included in this habitat. There the five ruderal taxa, that represent half of the species inventory, indicate a medium degree of ruderal plant invasive trend.

Key species: *Ulmus minor* (5; CDO).

Other species:

- shrubs/ lianas: *Crataegus monogyna* (+; CDO), *Evonymus europaeus* (+; CDO);
- grasses/ undershrubs: *Anthriscus cerefolium* (+; CDO), *Anthriscus sylvestris* (+; CDO), *Chelidonium majus* (+; CDO), *Lamium purpureum* (+; CDO), *Ligustrum vulgare* (+; CDO), *Urtica dioica* (+; CDO), *Veronica hederifolia* (+; CDO).

Conclusions

Taking into account that the frequency of the habitats and species within the studied areas was estimated according to their percentages observed within the research itineraries, respectively (for the threatened species) their coverage within the plots, their threat categories (endangered, vulnerable, rare, etc.) has only a preliminary character. These aspects could become more accurate if the D.D.B.R. would promote as priority measures the proper mapping of habitats/ species respectively detailed species populations assessments.

According to their estimated frequency within the studied site, most of the habitats could be considered **endangered** (13 habitats), followed by **vulnerable** (eight habitats), **sporadic** (three habitats) and **rare** (two habitats) ones. The assessed conservation status ranks from **undisturbed** (13 habitats), **low disturbed** (nine habitats), **highly disturbed** (two habitats) to **medium disturbed** (one habitat).

The number of threatened species is the highest within the loess/ rocky steppes (62C0* – 17 species), sand steppes (6260* – 12 species), sand beaches (1210 – nine species) and salt marshes and steppes (1530 – seven species). The rest of the habitats have between zero and five threatened species.

This outstanding natural heritage requires adequate management measures. Among the 25 habitats studied within proper research, six are priority ones for conservation overall in the European Union. Within the Danube Delta Natura 2000 sites and overlapping sites, according to proper preliminary studies and criteria, most of these (14 habitats) should have a **high priority** within conservation measures, while seven habitats could be of **secondary priority**, followed by four habitats with a **low priority**.



Figure 1. *Salicetum albae* (photo M. Petrescu)



Figure 2. *Asparago pseudoscaberi-Quercetum pedunculiflorae*
in strictly protected area Pădurea Letea (photo M. Petrescu)

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Research on the Flora, Habitats and Avifauna of the Running Waters from the Hydrographic Basin of the Black Sea

Cercetări privind flora, habitatele și avifauna râurilor din bazinul hidrografic al Mării Negre

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Abstract

The watercourses which belong to the Black Sea River Basin, in the northern half of Dobrogea, have an important conservation value, as they contain habitats of community importance and even a reduced number of threatened plant species, also habitat types important for nesting and feeding during the migration periods for many protected bird species. Within the studied rivers there were identified so far: six habitats of community importance (1530, 3130, 3270, 62C0, 91AA*, 91Y0), among which two are priority ones; seven habitat subtypes with no community importance (37.24, 44.121, 53.1111, 53.131, 53.132, 53.143 and 53.4); one phytocoenosis not framed within the Palaearctic Habitats Classification. The highest habitats/ plant communities diversity was observed within the Taița and Slava rivers (six plant communities), followed by Casimcea River (five plant communities), the lowest number of habitats/ coenotaxa being recorded in the Hamangia (four plant communities) and Telița (three plant communities) rivers. The bird species that have been identified are characteristic of the following habitat types: forest, steppe, wooded steppe, wetlands and anthropogenic areas (agroecosystems). The largest records of birds species appear in the rivers discharges areas, the highest number (147 species), being recorded at the mouth of Hamangia River. The fewest species were recorded in the intermediate stations, of the rivers: Casimcea and Telița – 74 species, Taița and Slava – 75 species. The conservation of these aquatic ecosystems is also required as they are natural ecological corridors that link different Natura 2000 sites from Northern and Central Dobrogean Plateau, with the Danube Delta Biosphere Reserve and corresponding Natura 2000 sites (SCI, SPA).*

Keywords: *flora, habitats, avifauna, running waters, Hydrographic Basin of the Black Sea*

Introduction

On the administrative territory of Tulcea County there are 32 protected areas of national interest (nature reserves). Most of these nature reserves have been documented and are currently monitored from the point of view of habitats, vegetation and avifauna, as well as their conservation status, by the specialists of "Gavrilă Simion" Eco-Museum Research Institute of Tulcea (ICEM Tulcea). Completing/ updating the related database is an activity currently carried out by this institute. Nearby, or even within these nature reserves, there are also hydrographic areas whose research, in terms of biological diversity, was not addressed at the time of the preparation of scientific documentation on the declaration of protected natural areas. These hydrographic areas/ aquatic ecosystems are of interest for supplementing the data summarized in the previous topics on habitats and species of Community/ national interest in Natura 2000 sites, located near or including these aquatic ecosystems.

From the biological point of view, these aquatic ecosystems have been less studied, more data and information being provided for water quality, through periodic assessments of the ecological status and chemical status of watercourses.

The studied running waters are included partially within protected areas SCI – SPA – Natura 2000 sites:

- Danube Delta Biosphere Reserve (DDBR) Natura 2000 sites, wholly or partially overlapping with DDBR (SCI, SPA): ROSCI0065 Danube Delta, ROSPA0031 Danube Delta and Razim-Sinoie Complex ;
- Dobrogea Plateau Natura 2000 sites are represented by: ROSCI012 Munții Măcinului; ROSCI0201 Podișul Nord Dobrogean; ROSPA0100 Stepa Casimcea; ROSPA0073 Măcin-Niculitel; ROSPA0091 Pădurea Babadag; ROSCI0215 Recifii Jurasici Cheia; ROSPA0019 Cheile Dobrogei.

The specific objective of this study is the assessment of the species and habitats and their conservation value. In order to elaborate the lists of species and habitats for the five studied watercourses, that belong to the hydrographic basin of the Black Sea and situated mainly in Northern Dobrogea, it is necessary to assess the specific biodiversity (specific richness) of the respective hydrographic areas/ aquatic ecosystems, providing concrete elements that will be the basis of studies directed later on groups of organisms.

The research whose results are presented in this paper was carried out within a broader theme, respectively *Research on the biodiversity of lotic ecosystems from North Dobrogea*.

Short hydrological characterization of the rivers belonging to the Black Sea Basin (Coastal)

The watercourses considered by the present paper, which belong to the Black Sea River Basin (Coastal) in the northern half of Dobrogea (*Small River System in northeastern Dobrogea*), are: Telița, Taița, Slava-Ciucurova, Hamangia and Casimcea (Figure 1). Casimcea River was included in this group, given the geographical boundary between North Dobrogea and South Dobrogea, proposed by V. Mihăilescu (1966), quoted by UJVÁRI (1972), as being between Topalu, on the Danube, and Sibioara, on the shores of Lake Tașaul, where the penplenized green shales disappear under the Jurassic limestone cover. The river systems in this river basin drain the Măcin Mountains, Niculițel Plateau, Tulcea Hills, Babadag Plateau, Casimcei Plateau and have adapted their valleys to the old forms of the platform and have a general orientation from northwest to southeast, determined by the fall, conditioned by the polycyclic relief steps.

Regarding the supply sources of watercourses, they are represented by atmospheric precipitation, snow melting and groundwater, the dominant being the type of surface rain-snow supply (40-50%), the underground supply (10-35%) being moderate, permanent and semi-permanent (UJVÁRI, 1972).

The surface runoff and the hydrological regime of these rivers are influenced by the uneven distribution of precipitation, both during the year and from one year to another. The peculiarities of the river flow allow the classification of the waters of the Pontic regime type, a disordered regime, in which a period of "high waters" is individualized, at the end of winter and beginning of spring, with a maximum average flow registered, usually in February. For most of the year, "low waters" are specific, on the background of which, especially during summer and spring, occasional floods occur, with high intensity.

The average multiannual flows do not exceed $1 \text{ m}^3/\text{s}$, the values recorded for the studied rivers being the following: Casimcea ($0.643 \text{ m}^3/\text{s}$), Taița ($0.443 \text{ m}^3/\text{s}$), Hamangia ($0.230 \text{ m}^3/\text{s}$), Slava ($0.171 \text{ m}^3/\text{s}$) and Telița ($0.063 \text{ m}^3/\text{s}$).

The minimum leakage generally occurs in the summer-autumn period, due to low precipitations, high temperatures and intense evapotranspiration, being characterized by small, very low flows, of the order of liters per second. The drying phenomenon is rare and usually has a random and local character. It occurs only in extremely dry years and on certain sectors of rivers (e.g. spring area) or in their tributaries.

of alluvial material are transported during floods (ZAHARIA, PIȘOTA, 2003). From a hydrochemical point of view, river waters are characterized by a high mineralization and hardness (500-1000 mg/l; 15-45 German degrees) being included, in terms of ionic content, in the class of calcium bicarbonate waters (UJVÁRI, 1972).

Casimcea River (Photo 1). The river system of Casimcea is the best developed in Northern Dobrogea (and the second in Dobrogea, after the river Urluia) draining an area of 740 sq.km. It springs in the central part of the Casimcea Plateau (near Beipunar Hill, about 300 m above sea level) and covers a route of 69 km until it flows into the Tașaul estuary. Its valley is dug in green shale formations, its largest sector – corresponding to the Pantelimon Depression – being an area of hydrographic convergence where the river receives its tributaries: Dereaua Mare, Pantelimon, Gârla Seacă (on the right side), Valea cu Piatră (L = 9 km), Râmnic (L = 6 km with its tributary Zadan, L = 7 km), Grucina Mucova (on the left side). In the lower sector, the Casimcea River receives, on the right side, the waters of two tributaries, Gura Dobrogei and Sitorman. The underground supply supplies 56% of the water volume, which ensures the permanent character of the flow of this river (UJVÁRI, 1972; ZAHARIA, PIȘOTA, 2003; SGA Tulcea). Casimcea River crosses or is close to several nature reserves like: Războieni, Casimcea, Colțanii Mari, as well as Natura 2000 sites: Podișul Nord Dobrogean (ROSCIO201), Stepa Casimcea (ROSPA0100), Recifii Jurasici Cheia (ROSCIO215), Cheile Dobrogei (ROSPA0019), Delta Dunării (ROSCIO065), Delta Dunării and Complexul Razim-Sinoie (ROSPA0031) which also include .

Hamangia River (Photo 2) springs from the central area of Casimcea Plateau (at about 303 m altitude), near the commune of Vasile Alecsandri, and flows, after a route of 33 km, into the Ceamurlia maritim liman. Its river basin drains an area of 224 sq.km. Of its tributaries on the right side (Valea Dulghea, Valea Adâncă, Hagi, Valea Poturu) and those on the left side (Valea Stolejenu and Ceamurlia), the latter is the most important and flows into the lower course of the river with a *surface of the river basin* (S_{rb}) = 31 sq.km and L = 9 km (UJVÁRI, 1972; ZAHARIA, PIȘOTA, 2003; SGA Tulcea).

Hamangia River crosses or is close to the Beidaud Nature Reserve and several Natura 2000 sites: Podișul Nord Dobrogean (ROSCIO201), Stepa Casimcea (ROSPA0100), Delta Dunării (ROSCIO065), Delta Dunării and Complexul Razim-Sinoie (ROSPA0031).



Photo 1. Casimcea River, between Războieni and Casimcea villages
(photo C. Dinu)

Foto 1. Râul Casimcea, între satele Războieni și Casimcea



Photo 2. Hamangia River, downstream of Beidaud village (photo M. Cuzic)

Foto 2. Râul Hamangia, aval de satul Beidaud

Slava River (Photo 3), known locally as the Gaugagia, has its springs in the Başpunar Depression (at about 300 m altitude) which it crosses in length. Its river basin drains an area of 356 sq.km. It measures 38 km and flows into Ceamurlia maritim liman, connected to Golovița Lake through Ceamurlia channel. Its lower course and its most important tributary, Ciucurova, received in its upper course on the left side, follows the corridor that separates Babadag Plateau (in the north) from Casimcea Plateau (in the south). Ciucurova or Slava Cercheză ($S_{rb} = 119$ sq.km, $L = 24$ km) springs from Atmagea Depression, near the village of Atmagea. They unite near Slava Rusă village. In depressions, the two systems receive a relatively rich underground supply, which is why they do not dry up in the confluence area. Downstream from the village of Caugagia, the river Slava receives from the right side the Camena rivulet (UJVÁRI, 1972; ZAHARIA, PIȘOTA, 2003; SGA Tulcea). Slava River, and Ciucurova, its tributary, crosses or are close to several Natura 2000 sites: Podișul Nord Dobrogean (ROSCIO201), Pădurea Babadag (ROSPA0091), nature reserves Vârful Secaru, Fântâna Mare and Uspenia, Delta Dunării (ROSCI0065), Delta Dunării and Complexul Razim-Sinoie (ROSPA0031).



Photo 3. Slava River at the discharge area in Ceamurlia liman (photo V. Cuzic)
Foto 2. Râul Slava la vărsarea în limanul Ceamurlia

Taița River (Photo 4) springs at the contact between Măcinului Ridge and Niculițel Plateau, at an altitude of about 240 m. The river basin, with an area of 591 sq.km, has an asymmetrical character, with a greater development on the left side, from where it receives the waters of the most important tributaries, namely the rivulets: Pârlita ($S_{rb} = 32$ sq.km, $L = 10$ km), Islam ($L = 7$ km),

Lodzova (L = 15 km; which also collects the waters of the Tichilic tributary with L = 6 km), Alba ($S_{rb} = 32$ sq.km, L = 11 km; which also collects the waters of the Valea Teilor tributary with L = 5 km), Tăița, also called Techea or Muchei Verzi brook ($S_{rb} = 84$ km², L = 17 km). On the right side, the main tributaries of the river are: Valea Curăturii/ Curături ($S_{rb} = 34$ sq.km, L = 7 km) and Valea Carierei (L = 11 km), to which are added two smaller tributaries, Valea Vinului and Valea Crapcei. After passing the village of Balabancea, the waters of Tăița are captured in the Horia accumulation, which has fishing functionality (cultures of sturgeons and carp). The river flows, after a route of 57 km, into the Babadag Lake, first draining the Topraichioi pond (arranged and exploited for fishing purposes). The bottom of the valley, heavily clogged, gradually widens towards the Ortachioi Depression. The average flow of the Tăița is the highest of all the rivers of North Dobrogea (1.39 m³/ s), its waters being also used for irrigation, and works of regularization and consolidation of the banks of the watercourse for this purpose are carried out (UJVÁRI, 1972; ZAHARIA, PIȘOTA, 2003; SGA Tulcea). Tăița River crosses or is close to several national parks (Munții Măcinului National Park, nature reserves (Muntele Consul) and Natura 2000 sites: Munții Măcinului (ROSCI012), Podișul Nord Dobrogean (ROSCI0201), Măcin-Niculitel (ROSPA0073); Delta Dunării (ROSCI0065), Delta Dunării and Complexul Razim-Sinoie (ROSPA0031).



Photo 4. Tăița River, near the Consul Hill (photo V. Cuzic)

Foto 4. Râul Tăița, lângă Dealul Consul

Telița River (Photo 5) springs from the Niculițel Plateau, from an altitude of about 270 m. Its valley in the spring area has a torrential aspect, but downstream from the village of Telița it enters and drains the high depression of the Nalbant (Tulcea Plateau), strongly clogged by the alluvium brought by the fast courses from the direction of the coasts. It flows, after a 48 km route, into the Babadag Lake and gathers its waters from an area of 278 sq.km. According to A. BREIER (1976), in the past, the river flowed into Tăuc Lake (or *Coada Bălții* as it appears in older maps). By transforming it into a fish pond (the current Zebil pond), the course of Telița remained outside the developed area, flowing directly into the Babadag Lake, which in turn communicates with Razim Lake through the Enisala canal. Its narrow riverbed, especially in the lower course, is invaded by certain sectors of aquatic vegetation.

The groundwaters at the bottom of the valley are close (1-5 m), which provides Telița River with a permanent underground supply, but very low in quantity. On the right side, it collects the waters of two more important tributaries, each with a 7 km long route, Cilic or Celic-Dere and Hagilar (UJVÁRI, 1972; ZAHARIA, PIȘOTA, 2003;

SGA Tulcea). Telița River crosses or is close to several nature reserves like Edirlen or Deniz Tepe, as well as Natura 2000 sites: Podșul Nord-Dobrogean (ROSCI0201), Măcin-Niculițel (ROSPA0073), Delta Dunării (ROSCI0065), Delta Dunării and Complexul Razim-Sinoie (ROSPA0031).

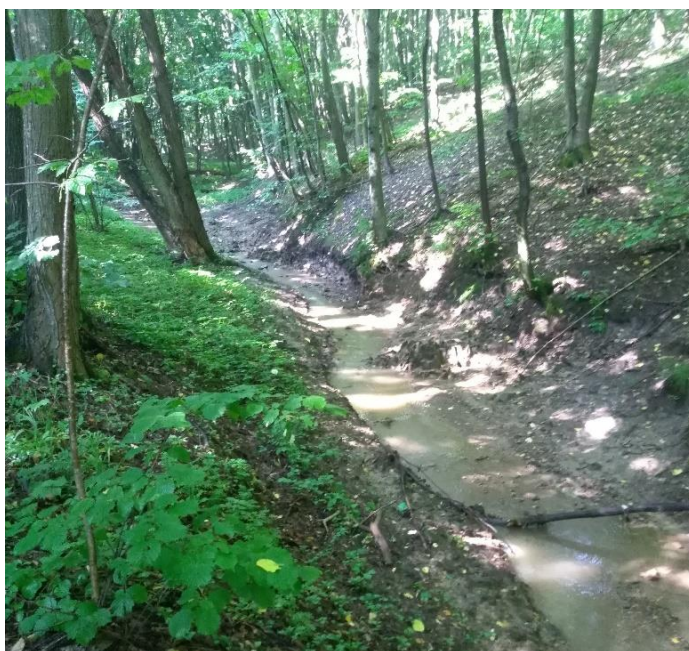


Photo 5. Telița River at spring area (photo V. Cuzic)
Foto 5. Râul Telița, zona izvor

Materials and Methods

The research from 2018-2019 was carried out within three annual campaigns, covering the spring, summer, autumn-winter seasons, in the periods of maximum phenological development of the studied groups.

Study methods included: observations, collecting biological materials and soil samples, determining species, processing and interpreting data. The collection of the species that did not raise identification problems was avoided, only using their photos made in the field.

On each river course, 3-4 stations were established in its most representative sectors, respectively the spring area, the alluvial sector and intermediate points between these extremes, which should reflect the conditions of the entire river. For the delimitation of the hydrogeomorphological units there were taken into account the following criteria: morphological, pedological and hydrological, as well as the anthropic impact.

Depending on the field conditions, the sampling was carried out on river sections of 10-50 m. Where the watercourses crossed the localities, the sampling stations were chosen downstream.

The indications of the stations for carrying out observations, the GPS coordinates of their positioning, as well as a brief identification of the stations, are presented in Table 1:

Table 1. The stations for carrying out observations
Tabel 1. Stațiile de efectuare a observațiilor

River	Station indicative/ GPS coordinates			
	Station 1	Station 2	Station 3	Station 4
Casimcea	Cs1	Cs2	Cs2	Cs2
	Spring area (near Beipunar Lake) 44 ^o .79623 N 28 ^o .45589 E 278 m altit.	"La Colțani" (between Războieni și Casimcea villages) 44 ^o .74746 N 28 ^o .39895 E 171 m altit.	Casian Monastery (the bridge at the base of the hill on which the monastery is located) 44 ^o .49629 N 28 ^o .45187 E 28 m altit.	River discharge area (at the stone quarry near of the Tașaul Lake) 44 ^o .40411 N 28 ^o .54792 E 4 m alt.
Hamangia	H1	H2	H3	H4
	Spring area (Vasile Alecsandri Forest, upstream the village with the same name) 44 ^o .80507 N 28 ^o .48882 E 303 m altit.	Down stream of Stejaru village (confluence of the Altin Tepe and Stejaru trib.) 44 ^o .75655 N 28 ^o .52996 E 136 m altit.	Down stream of Beidaud village (to Panduru village) 44 ^o .70919 N 28 ^o .59193 E 53 m altit.	River discharge area (about 200 m until Golovița Lake) 44 ^o .71208 N 28 ^o .72006 E 3 m altit.

	SI1	SI2	SI3	SI4
Slava	Spring area (Slava tributary) (at 1,5 km from DJ22A)	Downstream Slava Rusă village (after the confluence with Ciucurova tributary)	a. Downstream Caugagia village (after the confluence with Camena tributary) 44 ^o .4716 N 28 ^o .4002 E b. Drinking water treatment plant (Slava Rusă) 44 ^o .84233 N 28 ^o .61378 E 36 m altit.	River discharge area (Ceamura liman)
	44 ^o .89706 N 28 ^o .41263 E	44 ^o .5032 N 28 ^o .3649 E		44 ^o .73386 N 28 ^o .72262 E 2 m altit.
	Ci1	Ci2	-	-
Ciucurova (tributary of Slava River)	Spring area (upstream Atmagea village, in spinney)	Montegreco Oil Station (downstream of Slava Cercheză village)	-	-
	44 ^o .96689 N 28 ^o .42367 E 190 m altit.	44 ^o .89343 N 28 ^o .58250 E 70 m altit.		
	Ta1	Ta2	Ta3	Ta4
Taița	Spring area (confluence of the first tributaries coming from Luncavița TAU)	Downstream Nifon village (confluence with Pârlita tributary)	Consul Hill (about 100 m downstream of bridge)	River discharge area (Satu Nou village, about 2 km until Topraichioi Lake)
	45 ^o .11724 N 28 ^o .20637 E	45 ^o .08149 N 28 ^o .23250 E	44 ^o .01636 N 28 ^o .31512 E	44 ^o .57429 N 28 ^o .40241 E
	Te1	Te2	Te3	Te4
Telița	Spring area (Hill with streams/ Dealul cu Izvoare)	Celic Dere (about 1 km downstream of the confluence with Celic rivulet)	Water mill (about 1 km downstream from the entrance of Tulcea Airport)	River discharge area (at the stone quarry bridge, about 800-1000 m of discharge into the Zebil pond)
	45 ^o .14952 N 28 ^o .48186 E	45 ^o .15865 N 28 ^o .50890 E	45 ^o .07385 N 28 ^o .74002 E	44 ^o .97485 N 28 ^o .72128 E

The data related to the substrate types were obtained by the “doll” method, which consists in taking a sample from the substrate and modeling a “doll”. If the result is positive, then the substrate contains a lot of clay, and if it is not possible to model, then the sand is in excess. Depending on how your hands and feet can be shaped or not, we can find out if the dust is excessive. Also, the

presence of small foliage was a good indicator for sand. Mica is a mineral in the silicate group with a monoclinic crystallization system. To determine the types of soils, the Pedological Map of the Socialist Republic of Romania was used (FLOREA *et alii*, 1970-1971). It was georeferenced in Stereo 70 system, 1995 version, with EPSG code 31700. Update of soil types in the Soil Classification System was based on the Romanian Soil Taxonomy System (FLOREA *et alii*, 2012).

Flora, vegetation and habitats. The on-site research consisted in observations on itineraries and inventories generally in 100 square meters plots, according to the Braun-Blanquet method. The identification and framing of the plant species, coenotaxa and habitats are based on PHYSIS database, the EUR 27 version of the *Interpretation Manual of the European Union Habitats* and other papers or field guides (CIOCÂRLAN, 2009; DEVILLIERS, DEVILLIERS-TERSCHUREN, LINDEN, 1996; DIHORU, DONIȚĂ, 1970; DONIȚĂ *et alii*, 2005, HOREANU, 1976A, 1976B; IVAN, 1979; OLTEAN *et alii*, 1994; PRODAN, 1934; SANDA, 1998, 2002; SANDA, ARCUȘ, 1999; SANDA, VICOL, ȘTEFĂNUȚ, 2008; SĂVULESCU *et alii*, 1976; SÂRBU *et alii*, 2013).

The preliminary assessment of the importance and conservation status of threatened species or habitats/ coenotaxa was made by using a scale, as follows. A correspondence was also set between these categories and the Braun-Blanquet scale for the assessment of the dominance within the plots. For the preliminary evaluation of the habitat threat categories an adapted form of the previous scale was used, based on the estimation of the percentage limits in the research route within which the habitat/ coenotaxon was noticed.

The correspondence between the dominance, habitat frequency and the threat categories for species and habitats/ coenotaxa

Dominance indices (specii)	Threat category	Habitat frequency in the studied area (% of the route)
- <5 individuals /plot, with negligible dominance	critically endangered	-
+ – ≤ 1 % dominance	endangered	+ – ≤ 1 %
1 – 1-10 % dominance	vulnerable	I – 1-10 %
2 – 10-25 % dominance	rare	II – 10-25 %
3 – 25-50 % dominance	sporadic	III – 25-50 %
4 – 50-75 % dominance	frequent	IV – 50-75 %
5 – 75-100 % dominance	very frequent	V – 75-100 %

The conservation status was preliminarily assessed by threat categories. Thus, the higher threat categories correspond to a lower conservation status, closer to an unfavourable level. Also the higher the number of threatened species, the better the conservation status can be considered. Taking into account if the habitat is a priority or not, combined with its threat category/estimated area the habitat urgency for the intervention with adequate management measures was ranked, in decreasing order in three categories: high priority, priority, secondary priority.

Wherever data allowed also the conservation status of the plant communities/habitats induced by the intensity of human activities was assessed. A simple scale which estimates a high, medium, low or null level of disturbance was used, taking into account the dominance indices and the number of ruderal and/or non-native species identified in the plots located in plant communities, in the studied habitats. Within the species list, for each plant community the ruderal species are underlined, while the non-native ones are mentioned in the description of the respective coenotaxon.

There were taken into account only the plant communities strictly adjacent to the rivers that are influenced by the groundwater or by the overflowing of these running waters.

Avifauna. Ornithological observations and the inventory of bird species associated with both these rivers and the habitats in their vicinity were usually performed in all four seasons, in the same stations initially recorded with GPS points. The monitoring period began early in the morning and ended before noon, when the birds were down. For each chosen point, the size and type of the main habitats present near it were indicated. The aim was to identify the species of birds around the pre-established station, those in lonely trees, bushes, buildings, fences. The method of identification of the bird species consisted in: making observations in each of the stations established for the respective course, the observation time being 30 minutes; recording in the observation sheet the species and the number of specimens identified by direct viewing or singing. The specimens of birds sitting, moving and flying above the station were recorded. The specialized determinant developed by SVENSSON Lars (2010) was used to identify the observed species.

Results and Discussions

I. Pedological conditions

Following the analyzes and observations performed, the following soil types and textures of the bed substrate of the studied running waters were

identified, their presentation being made on each sampling station in the respective river.

Casimcea River:

Cs1 – spring area: The lithological structure is clayey due to the presence of regosols and loess deposits.

Cs2 – "La Colțani": The substrate is clayey, stony, due to the degradation of chloritic clay shales (green shales) present in the area.

Cs3 – Casian Monastery: The lithological structure consists of boulders, from the disintegration of Cretaceous limestones, from the sedimentation of the sand along the river and from the construction of the bridge, as well as from the mud (loam substrate). Rendzic Leptosols and Eutri-lithic Leptosols predominate in the area.

Cs4 – river discharge area: The substrate is loam-sandy due to the passage of the Casimcea River, upstream, through a limestone area of Middle Cretaceous age, with siliceous rocks. The texture tends towards loam-clayey, due to the deposition of dust on the course of the watercourse.

Hamangia River:

H1 – spring area: Stony substrate that comes from the disaggregation of clayey, proterozoic, sericite-chlorite schists that emerge among the Haplic Chernozems.

H2 – downstream of Stejaru village: Clay to loam-clay substrate, containing gravel both from the bridge built near the sampling point and from the area of Eutric Lithosols, through which the Hamangia River passes. Cambol-Endoleptic Chernozems and Haplic Chernozems predominate in the sampling point area.

H3 – downstream of Beidaud village: The stony substrate with brown algae and fine sand clay texture was identified in an area with Skeletal Fluvisols and Eutric Regosols. Around this area the Eutric Leptosols (Eutric Leptosols) dominate, in the west, and the Calcaric Chernozem (Calcaro-Calcic Chernozem) in the east.

H4 – river discharge area: The substrate has a clay texture. Gleic Fluvisols and Eutric Fluvisols predominate in the area. The presence of Gleyic Fluvisols justifies the high clay content in the substrate.

Slava River – Ciucurova Tributary:

Ci1 – spring area: The clayey to sandy loam substrate is related to the presence in the area of the Ciucurova tributary's spring of a soil cover represented by Luvic Phaeozem. In this area dominant are the Gray-luvic Phaeozems.

Ci2 – Oil station: The substrate is loam, in the area predominating the Calcic Chernozems on loess deposits and Haplic Luvisols on Turonian limestones.

Slava River – Slava Tributary:

SI1 – spring: The substrate has a loam-sandy texture, with gravel. Gray-Luvic Phaeozems, Haplic Chernozems and Leptic Chernozems developed on Cretaceous limestones predominate in the area.

SI2 – downstream of Slava Rusă village: The substrate with a loam to loam-clay texture. In the area from which samples were taken, Gleyic Chernozems predominate, and near the watercourse the Gleyic Clexols soils (Mollic Gleysols).

SI3 – downstream of Caugagia village: The substrate has a loam-clay texture. The area is dominated by Gleyic Chernozems and Mollic Gleysols near the watercourse.

SI4 – river discharge area: The texture of the substrate is clayey loam. Near the watercourse occur the soils Mollic Gleysols and Gleyic Fluvisols. In the area, where alluvial and gleyic soils are included, Calcaro-calcic Kastanozems predominate.

Taița River:

Ta1 – spring area: The substrate has a clayey-loam texture. The dominant soils in the area are the typical Haplic Luvisols.

Ta2 – confluence with Pârlita tributary: The loam-clay substrate to loam-sand (appears mica) is found in an area dominated by Calcaro-calcic Chernozem and Calci-greyic Chernozem.

Ta3 – Consul Mount foot: The substrate is loam to loamy-silt and occurs in the area where Calcaro-calcic chernozems have developed.

Ta4 – river discharge area: In the area of this sampling point, Calcaric Fluvisols and Calcaro-calcic Kastanozems predominate, and the river bed (substrate) is loamy-silt.

Telița River:

Te1 – spring area: The substrate is stony, with isolated deposits of fine clay. The desol types identified are Lepti-eutric Cambisol and Haplic Luvisol.

Te2 – confluence with Celic Dere rivulet: The substrate is loamy-sand, with coarse sand, and the type of soil in this area is Haplic Luvisols.

Te3 – water mill: The substrate is loamy, and predominant in the area are the Calcaro-calcic Chernozems.

Te4 – river discharge area: The loamy clay substrate occurs in the area where the Eutric Fluvisols and the Calcaro-calcic Chernozems have developed.

II. Habitats and Plant communities

II.A. Habitats of community importance

1530* Pannonic salt-steppes and salt-marshes (PAL. CLASS.: 15.A1, 15.A2)

15. A21275 Western Pontic *Cynodon* saline beds

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community counts a total number of 31 species, being identified mainly along the Casimcea River where it has the highest species richness (31 species) and less within the Taița River (17 species). Three non-native species, *Amaranthus retroflexus*, *Datura stramonium* and *Xanthium spinosum*, with a low dominance, indicate a reduced invasive tendency of alien species. Still, the numerous (10) ruderal taxa, underlined below, indicate a medium degree of human activities influence, also due to their dominance indices (+-1).

Casimcea River

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community, with a number of 31 species, was recorded as vulnerable at the spring of the Casimcea River (Cs1), being sporadic close to Colțanii Mari (Cs2), near Casian (Cs3), and at the inflow of the river in the Tașaul Lake (Cs4). Three non-native species, *Amaranthus retroflexus*, *Datura stramonium* and *Xanthium spinosum*, with a low dominance, indicate a reduced invasive tendency of alien species. Still, the numerous (10) ruderal taxa, underlined below, indicate a medium disturbance.

Key species: *Cynodon dactylon* (1-2 -3; Cs1, Cs4), *Trifolium fragiferum* (1-2; Cs1, Cs2, Cs3, Cs4).

Other species: *Agrostis stolonifera* (+; Cs1, Cs2), *Amaranthus retroflexus* (+; Cs1), *Calystegia sepium* (+; Cs4), *Centaurea iberica* (+; Cs4), *Cichorium intybus* (1; Cs4), *Convolvulus arvensis* (+; Cs1), *Datura stramonium* (+; Cs1), *Daucus carota* (+; Cs4), *Echinochloa crus-galli* (+; Cs1, Cs3), *Eupatorium cannabinum* (+; Cs2), *Galega officinalis* (+; Cs2), *Lolium perenne* (+-1; Cs2, Cs3, Cs4), *Lotus tenuis* (+; Cs4), *Lycopus europaeus* (+; Cs1), *Mentha aquatica* (+; Cs1), *Mentha longifolia* (+; Cs2), *Ononis spinosa* (1; Cs2) *Plantago lanceolata* (+; Cs1), *Plantago major* (+; Cs3) *Polygonum aviculare* (+; Cs1, Cs2, Cs3), *Polygonum persicaria* (+; Cs1), *Potentilla reptans* (+; Cs1), *Ranunculus sceleratus* (+; Cs2, Cs3), *Rumex palustris* (+; Cs1), *Setaria viridis* (+; Cs2), *Trifolium repens* (+; Cs4), *Verbena officinalis* (+; Cs1), *Xanthium italicum* (1; Cs1, Cs3), *Xanthium spinosum* (+; Cs1).



Photo 6. Casimcea River. 1530* Pannonic salt-steppes and salt-marshes
(photo M. Petrescu)

Foto 6. Râul Casimcea. 1530* Pajiști și mlaștini sărăturate panonice

Taița River

***Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958** plant community, counting 17 species, can be considered rare at the foothill of Consul Mount (Ta3), respectively at the inflow near Satu Nou village (Ta4). Three non-native species, *Amaranthus retroflexus*, *Datura stramonium* and *Xanthium spinosum*, with a low dominance, indicate a reduced invasive tendency of alien species. The four ruderal species, with a reduced dominance indicate a low disturbance.

Key species: *Cynodon dactylon* (2-3; Ta3), *Trifolium fragiferum* (1; Ta3).

Other species: *Agrostis stolonifera* (+; Ta3), *Amaranthus retroflexus* (+; Ta3), *Convolvulus arvensis* (+; Ta4), *Datura stramonium* (+; Ta4), *Echinochloa crus-galli* (+; Ta3), *Lycopus europaeus* (+; Ta3), *Mentha aquatica* (+; Ta3), *Plantago major* (+; Ta3, Ta4), *Polygonum aviculare* (+; Ta4), *Polygonum persicaria* (+; Ta4), *Potentilla reptans* (+; Ta3), *Rumex palustris* (+; Ta4), *Verbena officinalis* (+; Ta3), *Xanthium italicum* (1; Ta3, Ta4), *Xanthium spinosum* (+; Ta3).

3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoëto-Nanojuncetea* (PAL. CLASS.: 22.12 x (22.31 and 22.32))

22.32 Euro-Siberian dwarf annual amphibious swards

***Cypero-Juncetum* Soó et Csüros 1974**, with 19 species were recorded in the plots, is an endangered plant community in the area where it was studied, at the inflow of the Slava River within the Ceamurlia Lake (SI4). The phytocoenoses, dominated by *Cyperus fuscus*, were framed, at least provisionally, within the above mentioned plant community, which was the only one described from Romania (SANDA, VICOL, ȘTEFĂNUȚ, 2008) that has as key (codominant) species *Cyperus fuscus*, as a constant species. There a low degree of ruderal and alien species invasion can be observed, by the presence of *Xanthium spinosum* and four ruderal species.

Key species: *Cyperus fuscus* (2; SI4).

Other species: *Alisma plantago-aquatica* (+; SI4), *Atriplex prostrata* (+; SI4), *Berula erecta* (+; SI4), *Bidens tripartita* (+; SI4), *Calystegia sepium* (+; SI4), *Chenopodium album* (+; SI4), *Cynodon dactylon* (+; SI4), *Echinochloa crus-galli* (+; SI4), *Lythrum salicaria* (+; SI4), *Plantago major* (+; SI4), *Polygonum aviculare* (+; SI4), *Rorripa sylvestris* (+; SI4), *Rumex palustris* (+; SI4), *Sparganium erectum* (1; SI4), *Trifolium fragiferum* (+; SI4), *Veronica anagallis-aquatica* (+; SI4), *Xanthium italicum* (+; SI4), *Xanthium spinosum* (+; SI4).

3270 Rivers with muddy banks with *Chenopodium rubri* p.p. and *Bidention* p.p. vegetation (PAL. CLASS.: 24.52)

24.52 Euro-Siberian annual river mud communities

Taița River

24.52 Euro-Siberian annual river mud communities

***Xanthietum italicii* Timár 1950** was observed so far only adjacent to the Taița River, being a species-poor coenotaxa, with just four species. It was identified as endangered at the inflow of the Taița River (Ta4). It can be considered as highly disturbed, due to the dominant ruderal *Xanthium italicum*, along with other ruderal taxa, and the alien *Xanthium spinosum*.

Key species: *Xanthium italicum* (3; Ta4).

Other species: *Chenopodium album* (+; Ta4), *Cynodon dactylon* (1; Ta4), *Xanthium spinosum* (+; Ta4).

62C0* Ponto-Sarmatic steppes (PAL.CLASS.: 34.92)

34.92 Ponto-Sarmatic steppes

34.9211 Western Pontic thyme steppes

***Festucetum callierii* Șerbănescu 1965** plant community was identified next to the Hamangia River, where 18 species were observed, of which five taxa

are threatened at the national level, which enhances the conservation value of this habitat. All these five taxa are endangered within this coenotaxa, except the dominant *Festuca callieri*. The plant community was studied between Stejaru and Neatârnaarea villages (H2), where it can be estimated as vulnerable. It can be considered as in its natural status, as no alien/ruderal taxa were observed.

Key species: *Festuca callieri* (2; H2).

Threatened species: *Achillea leptophylla* (+; H2), *Festuca callieri* (2; H2), *Sempervivum zebeborii* (+; H2), *Stachys angustifolia* (+; H2), *Thymus zygoides* (+; H2).

Other species: *Asperulla tenella* (+; H2), *Cephalaria uralensis* (+; H2), *Chrysopogon gryllus* (+; H2), *Dichanthium ischaemum* (+; H2), *Herniaria glabra* (+; H2), *Iris pumila* (+; H2), *Kohlruschia prolifera* (+; H2), *Orlaya grandiflora* (+; H2), *Potentilla argentea* (+; H2), *Sanguisorba minor* (+; H2), *Scleranthus perennis* (+; H2), *Sedum urvillei* subsp. *hillebrandtii* (1; H2), *Trifolium arvense* (+; H2).

91AA* Eastern white oak woods (PAL. CLASS.: 41.7371, 41.7372)

41.7372 Moesian white oak woods

41.73723 Moesian *Paeonia peregrina*-white oak woods

***Paeonio peregrinae-Carpinetum orientalis* Doniță 1970** plant community, with a number of 17 species, can be considered as very frequent in the upper course of the Hamangia River near the Vasile Alecsandri village (H1). One rare threatened species, *Erysimum cuspidatum*, is endangered within this phytocoenosis. Even though no ruderal/ alien species were identified, the absence of the oak species indicates a high disturbance.

Key taxa: *Carpinus orientalis* (3; H1).

Threatened species: *Erysimum cuspidatum* (+; H1).

Other species:

- trees: *Acer tataricum* (+; H1), *Fraxinus ornus* (1; H1);
- shrubs/ lianas: *Cornus sanguinea* (+; H1), *Hedera helix* (1; H1);
- grasses/ undershrubs: *Arum orientale* (+; H1), *Asplenium thricomanes* (+; H1), *Brachypodium sylvaticum* (+; H1), *Cystopteris fragilis* (+; H1), *Dactylis glomerata* (+; H1), *Geranium robertianum* (+; H1), *Glechoma hirsuta* (+; H1), *Poa nemoralis* (+; H1), *Polypodium vulgare* (+; H1), *Scutellaria altissima* (+; H1), *Tanacetum corymbosum* (+; H1).



Photo 7. Hamangia River. 91AA* Eastern white oak woods (photo M. Petrescu)
 Foto 7. Râul Hamangia. 91AA* Vegetație forestieră ponto-sarmatică cu stejar pufos

91Y0 Dacian oak-hornbeam forests

41.2C South-eastern European oak-hornbeam forests

41.2C2 Moldo-Muntenian oak-lime-hornbeam forests

***Carpino betuli – Quercetum robori-pedunculiflorae* Doniță & Popescu ass. nova prov. h.l.**, can be considered a vulnerable plant community within the upper (Ci1) and the medium (Ci2) course of the Ciucurova River (the upper course of Slava River being known as Ciucurova). In upper course it can be considered undisturbed, respectively low disturbed in the medium course, where this plant community is represented by an old-growth stand.

Key species: *Carpinus betulus* (1-2; Ci1, Ci2), *Quercus pedunculiflora* (2-3; Ci1, Ci2).

Other species:

- trees: *Acer campestre* (1; Ci1, Ci2);

- shrubs/ lianas: *Cornus mas* (1; Ci2), *Fraxinus excelsior* (1; Ci1, Ci2), *Sambucus nigra* (+; Ci1);

- grasses/ undershrubs: *Anthriscus sylvestris* (+; Ci2), *Galium aparine* (+; Ci2), *Hedera helix* (+; Ci2), *Stellaria media* (+; Ci1), *Veronica hederifolia* (+; Ci1), *Viola suavis* (+; Ci2).



Photo 8. Slava River. 91Y0 Dacian oak-hornbeam forests (photo M. Petrescu)
Foto 8. Râul Slava. 91Y0 Păduri dacice de stejar și carpen

41.2C22 Moldo-Muntenian sessile oak-hornbeam forests

***Tilio tomentosae-Carpinetum betuli* Doniță 1968** plant community, with 24 species identified so far, was recorded along the Telița River (21 species) and Taița River (eight species). One threatened species, *Smyrniun perfoliatum*, was identified along the Telița watercourse. In both situations presented below, the absence of oak species indicates a high disturbance.

Taița River

***Tilio tomentosae-Carpinetum betuli* Doniță 1968** is a very frequent plant community in the upper course of the Taița River (Ta1) where eight species were registered. Even though no ruderal/ alien species were identified, the absence of oak species indicates a high disturbance.

Key species: *Carpinus betulus* (3; Ta1), *Tilia tomentosa* (2, Ta1).

Other species:

- trees: *Acer campestre* (+; Ta1).
- shrubs/ lianas: *Corylus avellana* (+; Ta1), *Evonymus europaeus* (+; Ta1);
- grasses/ undershrubs: *Asarum europaeum* (+; Ta1), *Brachypodium sylvaticum* (+; Ta1), *Carex pilosa* (+; Ta1).

Telița River

***Tilio tomentosae-Carpinetum betuli* Doniță 1968**, with 21 species observed in the plots, is a very frequent plant community in the upper course of the Telița River (Te1), and in the medium course (Te2). The absence of oak species indicates a high disturbance, despite the reduced dominance of the two ruderal taxa. One threatened species, critically endangered in the plots, enhance the conservation value of this coenotaxa.

Key species: *Carpinus betulus* (3; Te1, Te2), *Tilia tomentosa* (1; Te1).

Threatened species: *Smyrniium perfoliatum* (r; Te1).

Other species:

- trees: *Acer campestre* (1; Te1, Ta2), *Salix triandra* (1; Te1),

- shrubs/ lianas: *Corylus avellana* (+; Te1, Te2), *Humulus lupulus* (+; Te2), *Sambucus nigra* (1; Te1).

- grasses/ undershrubs: *Aegopodium podagraria* (+; Te1, Te2), *Adoxa moschatellina* (+; Te1), *Anthriscus sylvestris* (1; Te1), *Arctium lappa* (+; Te2), *Bidens tripartita* (+; Te2), *Brachypodium sylvaticum* (+; Te1), *Circaea lutetiana* (+; Te1), *Echinochloa crus-galli* (+; Te2), *Equisetum telmateia* (1; Te2), *Geum urbanum* (+; Te1), *Polygonum mite* (1; Te2), *Rubus caesius* (+; Te2), *Urtica dioica* (+; Te1, Te2).

IV.B. Habitats with no Community Importance

37.24 Flood swards and related communities

***Lythro salicariae - Juncetum effusi-inflexi* Todor et al 1971** is an endangered plant community in the studied area, at the inflow of the Slava River in the Ceamurlia liman (SI4). The phytocoenoses dominated by *Lythrum salicaria* were framed, at least provisionally, within the above mentioned plant community, which was the only one described from Romania (SANDA, VICOL, ȘTEFĂNUȚ, 2008) that has as codominant and constant species *Lythrum salicaria*, even if no species of *Juncus* was observed. The coenotaxa can be considered in its natural status, as no ruderal/ alien species were recorded.

Key species: *Lythrum salicaria* (3; SI4).

Other species: *Bidens tripartita* (+; SI4), *Ranunculus sceleratus* (+; SI4), *Rumex palustris* (+; SI4), *Salix alba* (+; SI4), *Typha angustifolia* (+; SI4), *Veronica anagallis-aquatica* (+; SI4).

44.121 Almond willow-osier scrub

***Salicetum triandrae* Malcuit 1929** is considered an endangered plant community along the Slava River, downstream of Slava Rusă (SI2), where nine species were recorded. There can be estimated a medium level of non-native plant invasive tendencies (*Juglans regia*), but also of the ruderal plants occurrence in this

coenotaxa, where they are as numerous as the native species, taking also into account their dominance variation limits (+-1).

Key species: *Salix triandra* (3; SL2).

Other species:

- trees: *Juglans regia* (1; SL2);
- shrubs/ lianas: *Humulus lupulus* (1; SL2);
- grasses/ undershrubs: *Artemisia vulgaris* (+; SL2), *Convolvulus arvensis* (+; SL2), *Lycopus europaeus* (+; SL2), *Scabiosa ochroleuca* (+; SL2), *Setaria viridis* (+; SL2), *Urtica dioica* (+; SL2).

53.1111 Freshwater *Phragmites* beds

***Scirpo-Phragmitetum* W. Koch 1926** plant community has the highest number of species along the Telița River (15 species), followed by Taița and Slava rivers (11 species), respectively Casimcea River (seven species). It can be considered globally as a low disturbed coenotaxa (Slava, Taița), and less in its natural status (Casimcea), respectively medium disturbed (Telița).

Casimcea River

***Scirpo-Phragmitetum* W. Koch 1926** contains seven species, being a vulnerable and undisturbed plant community at the spring of Casimcea River, Beipunar area (Cs1), but also at the inflow of the Casimcea River near the Tașaul Lake (Cs4). Near Casian Monastery (Cs3) it can be considered as very frequent.

Key species: *Phragmites australis* (4-5; Cs1, Cs3, Cs4).

Other species: *Polygonum mite* (1; Cs3), *Ranunculus sceleratus* (+; Cs3), *Sparganium erectum* (+; Cs1, Cs4), *Typha angustifolia* (1; Cs1), *Typha latifolia* (+; Cs1).

Slava River (and its tributary Ciucurova River)

***Scirpo-Phragmitetum* W. Koch 1926**, with its 11 species, can be considered frequent and low disturbed by two ruderal taxa in the studied area, at the inflow of the Slava River within the Ceamurlia liman (Sl4). Along the Slava River, downstream of Slava Rusă village (Cs1), it was observed as a vulnerable plant community.

Key species: *Phragmites australis* (4-5; Sl2, Sl4).

Other species: *Artemisia vulgaris* (+; Sl2), *Calystegia sepium* (+; Sl2), *Humulus lupulus* (+; Sl2), *Lemna minor* (+; Sl4), *Ranunculus sceleratus* (+; Sl4), *Sparganium erectum* (+; Sl4), *Tanacetum vulgare* (+; Sl2), *Typha latifolia* (+; Sl4), *Urtica dioica* (+; Sl2), *Veronica anagallis-aquatica* (+; Sl4).

Taița River

***Scirpo-Phragmitetum* W. Koch 1926**, counting 11 species, was observed as a vulnerable and low disturbed (two ruderal taxa) plant community in the medium course, along the Pârlita tributary (Ta2), as well as at the inflow close to Satu Nou village (Ta4).

Key species: *Phragmites australis* (3-4; Ta2, Ta4).

Other species: *Alliaria petiolata* (+; Ta2), *Mentha aquatica* (+; Ta4), *Polygonum mite* (+; Ta4), *Rosa canina* (+; Ta2), *Rubus caesius* (+; Ta2), *Salix alba* (+; Ta4), *Sparganium erectum* (+; Ta4), *Stellaria media* (+; Ta2), *Urtica dioica* (+; Ta2, Ta4), *Xanthium italicum* (+; Ta4).

Telița River

***Scirpo-Phragmitetum* W. Koch 1926**, was recorded as a vulnerable association in the studied area, about 1km downstream from the interflow with the Celic tributary (Te2), being rare at the bridge crossed by the road between Cataloi and Mihail Kogălniceanu villages (Te3), close to the inflow of the river (Te4). A medium disturbance can be observed as there were identified three ruderal species, with a significant occurrence (+-1).

Key species: *Phragmites australis* (4-5; Te2, Te3).

Other species: *Agrostis stolonifera* (+; Te4), *Althaea officinalis* (+; Te3), *Ballota nigra* (+; Te3), *Calystegia sepium* (+; Te2, Te3), *Convolvulus arvensis* (1; Te3), *Eupatorium cannabinum* (+; Te2), *Humulus lupulus* (+; Te2), *Lythrum salicaria* (+; Te2, Te3), *Polygonum mite* (+; Te4), Te2), *Salix alba* (1; Te2), *Sparganium erectum* (1; Te4), *Symphytum officinale* (+; Te3), *Typha latifolia* (+; Te2, Te4), *Urtica dioica* (+; Te3).

53.131 Great reed mace beds

***Typhetum latifoliae* Lang 1973**, an endangered and undisturbed coenotaxa, with seven recorded species, was observed at the inflow of the Slava River, within the Ceamurlia Lake (Sl4).

Key species: *Typha latifolia* (4; Sl4).

Other species: *Berula erecta* (+; Sl4), *Bidens tripartita* (+; Sl4), *Phragmites australis* (1; Sl4), *Potamogeton crispus* (+; Sl4), *Ranunculus sceleratus* (+; Sl4), *Sparganium erectum* (+; Sl4).

53.132 Lesser reedmace beds

***Typhetum angustifoliae* Pignatti 1953** counts 14 species in total, being noticed along the Casimcea (nine species) and Hamangia (six species) rivers, it is considered globally as low disturbed.



Photo 9. Telița River. 53.1111 Freshwater *Phragmites* beds (photo M. Petrescu)
 Foto 9. Râul Telița. 53.1111 Stufărișuri de *Phragmites* sp. de apă dulce

Casimcea River

***Typhetum angustifoliae* Pignatti 1953**, with nine species, was observed as vulnerable near Casian Monastery (Cs3), where it is low disturbed (two ruderal species).

Key species: *Typha angustifolia* (5; Cs3).

Other species: *Echinochloa crus-galli* (+; Cs3), *Phragmites australis* (+; Cs3), *Plantago major* (+; Cs3), *Polygonum mite* (1; Cs3), *Ranunculus sceleratus* (+; Cs3), *Rumex palustris* (+; Cs3), *Salix alba* (+; Cs3), *Xanthium italicum* (+; Cs3).

Hamangia River

***Typhetum angustifoliae* Pignatti 1953**, counting six species, can be considered as vulnerable and undisturbed, at the inflow of the Hamangia River in the Golovița Lake (H4).

Key species: *Typha angustifolia* (3; H4).

Other species: *Berula erecta* (+; H4), *Butomus umbellatus* (+; H4), *Lemna minor* (+; H4), *Lycopus europaeus* (1; H4), *Sparganium erectum* (1; H4).

53.143 Erect bur-reed communities

Sparganietum erecti Roll. 1938, with a total number of 20 species, has a higher richness within the Taița (12 species) and Hamangia (10 species) rivers, followed by Telița (six species) and Casimcea (two species) watercourses.



Photo 10. Taița River. 53.143 Erect bur-reed communities (photo M. Petrescu)
Foto 10. Râul Taița. 53.143 Comunități de *Sparganium erectum*

Casimcea River

Sparganietum erecti Roll. 1938 was noticed as frequent and undisturbed plant community in the area of the inflow of the Casimcea River in the Tașaul Lake (Cs4).

Key species: *Sparganium erectum* (2; Cs4).

Other species: *Phragmites australis* (1; Cs4).

Hamangia River

Sparganietum erecti Roll. 1938 was recorded as endangered in the area of the Beidaud TAU (H3), respectively as vulnerable at the inflow of the river in the Golovița Lake (H4). Three ruderal species indicate a low level of disturbance.

Key species: *Sparganium erectum* (3-4; H4).

Other species: *Berula erecta* (+; H4), *Bidens tripartita* (+; H3), *Butomus umbellatus* (+; H4), *Calystegia sepium* (+; H3), *Cannabis ruderalis* (+; H3), *Polygonum persicaria* (+; H3), *Urtica dioica* (+; H3), *Veronica anagallis-aquatica* (+; H3), *Xanthium italicum* (+; H3).

Taița River

Sparganietum erecti Roll. 1938, was observed at the foothill of Consul Mount (Ta3), and at the inflow, close to Satu Nou village (Ta4), as a rare and undisturbed plant community.

Key species: *Sparganium erectum* (2-3; Ta3, Ta4).

Other species: *Berula erecta* (+; Ta3), *Bidens tripartita* (+; Ta4), *Echinochloa crus-galli* (+; Ta4), *Iris pseudacorus* (+; Ta4), *Lythrum salicaria* (+; Ta3, Ta4), *Lycopus europaeus* (+; Ta4), *Mentha aquatica* (1; Ta3, Ta4), *Mentha longifolia* (+; Ta4), *Phragmites australis* (+; Ta4), *Rumex palustris* (+; Ta4), *Symphytum officinale* (+; Ta4).

Telița River

Sparganietum erecti Roll. 1938, was observed as a vulnerable and undisturbed plant community, that occur near the Telița River inflow (Te4).

Key species: *Sparganium erectum* (4; Te4).

Other species: *Berula erecta* (+; Te4), *Butomus umbellatus* (+; Te4), *Lythrum salicaria* (±; Te4), *Schoenoplectus lacustris* (+; Te4), *Polygonum persicaria* (1; Te4).

53.4 Small reed beds of fast-flowing waters

***Mentha aquatica*-*Beruletum* (*Sietum*) *erectae* Nedelcu 1971, corr. Sanda & Popescu 2001**, with six species, is a rare and undisturbed plant community in the studied area, near the spring of Casimcea River, at Beipunar (Cs1).

Key species: *Berula erecta* (3; Cs1).

Other species: *Lythrum salicaria* (+; Cs1), *Mentha longifolia* (+; Cs1), *Salix triandra* (+; Cs1), *Sparganium erectum* (+; Cs1), *Schoenoplectus tabernaemontani* (+; Cs1).

IV.C. Plant Communities not framed into the Palaearctic Classification

***Equisetum arvense* phytocoenosis** cannot be framed so far in a certain plant community dominated by this species, as there was not described so far this kind of coenotaxa, at least in the synthesis works on the vegetation of Romania, neither on the web references. It was recorded as endangered along the Pârlita tributary of the Taița River (Ta2).

Key species: *Equisetum arvense* (2; Ta2).

Other species: *Althaea officinalis* (+; Ta2), *Artemisia vulgaris* (+; Ta2), *Ballota nigra* (+; Ta2), *Chenopodium album* (+; Ta2), *Echinochloa crus-galli* (+; Ta2), *Lythrum salicaria* (+; Ta2), *Myosoton aquaticum* (+; Ta2), *Polygonum persicaria* (+; Ta2), *Setaria pumila* (+; Ta2), *Solanum nigrum* (+; Ta2).

Within the studied rivers there were identified so far: six habitats of community importance (1530, 3130, 3270, 62C0*, 91AA*, 91Y0), among which two are priority ones; seven habitat subtypes with no community importance (37.24, 44.121, 53.1111, 53.131, 53.132, 53.143, 53.4); one phytocoenosis not framed within the Palaearctic Habitats Classification.

The highest habitats/ plant communities diversity was observed within the Taița and Slava rivers (six plant communities), followed by Casimcea River (five plant communities), the lowest number of habitats/ coenotaxa being recorded in the Hamangia (four plant communities) and Telița (three plant communities) rivers.

The highest species richness was recorded within the 1530 habitat (*Trifolio fragifero-Cynodontetum*) with 31 species within the Casimcea River, followed, in decreasing order by 91Y0 (24 species, of which 21 within the Taița River), 53.143 (20 species in total, maximum/ river: 12 taxa – Taița), 3130 (19 species – Slava), 62C0* (18 species – Hamangia), 91AA* (17 species – Hamangia), 53.132 (14 species in total, maximum species/ river: nine – Casimcea), the *Equisetum arvense* phytocoenosis (11 species – Taița), while other have a lower species richness, like 44.121 (nine species – Slava), 37.24 and 53.131 (seven species – Slava), 53.4 (six species – Casimcea), 3270 (four species – Taița).

The highest number of threatened species was recorded within the Hamangia River, respectively within the 62C0* habitat (five species), and less on the same river in the 91AA*habitat (one species), like also on the Taița River (one species).

Globally, Casimcea River could be considered the most diverse of the rivers, taking into account the number of habitats/ plant communities (five), combined with the number of species per habitat/ plant community (31), while Telița River would be the less diverse, with only three habitats/ plant

communities, slightly compensated by a maximum of 21 species per habitat/plant community.

Most of the habitats/ plant communities are in their natural status (62 C0* – Hamangia; 37.24 – Slava; 53.131 – Slava; 53.143 – Casimcea, Taița, Telița, 53.4 – Casimcea), followed by low disturbed coenotaxa (3130 – Slava; 91Y0/ 41.2C2 – Slava; 53.1111 – Slava, Taița; 53.132 – Casimcea; *Equisetum arvense* phytocoenosis – Taița). Next follow the highly disturbed habitats/ plant communities (3270 – Taița; 91AA* – Hamangia; 91Y0 – Taița, Telița) and medium disturbed (1530 – Casimcea; 44.121 – Slava). Overall Casimcea River can be considered as being mostly in its natural status (three coenotaxa from five), as well as Hamangia (two coenotaxa from four). The low disturbed watercourses could be considered Taița (three coenotaxa from six) and Slava (three coenotaxa from six), while within Telița River the three coenotaxa are in the high, medium and undisturbed categories.

Taking into account the data presented so far, these five rivers that flow into the Black Sea Basin, have an important conservation value, as they contain habitats of community importance and even a reduced number of threatened plant species. Their conservation is also required as they are natural ecological corridors that link different Natura 2000 sites from Northern and Central Dobrogean Plateau, with the Danube Delta Biosphere Reserve and corresponding Natura 2000 sites (SCI, SPA).

III. Avifauna

Casimcea River. In the spring area of the river, the observed avifauna is specific to agricultural and forest habitats. In the permanently or not permanently flooded areas, near by the river monitoring stations, where reed is growing, there are nesting places for some species of waterfowl and of swamps. These are hard-to-reach areas for humans and predators which provide good feeding conditions for most of the species that populate them. Among the main species of birds found here we mention: *Podiceps cristatus*, *Podiceps griseigena*, *Podiceps nigricollis*, *Anas strepera*, *Anas querquedula*, *Crococephalus ridibundus*, *Sterna hirundo*, *Fulica atra*. Among the species specific to compact reeds surfaces we list: *Ardea cinerea*, *Ardea purpurea*, *Ardeola ralloides*, *Egretta garzetta*, *Nycticorax nycticorax*, *Botaurus stellaris*, *Ixobrychus minutus*, *Gallinula chloropus*, *Circus aeruginosus*, *Acrocephalus palustris*, *Emberiza schoeniclus*, etc.

The species characteristic to the steppe area and the landpastures crossed by the Casimcea River are birds that present, generally, a dull, uniform color, with poorly pronounced or even non-existent sexual dimorphism, that nest directly on the ground. Among them we mention: *Coturnix coturnix*, *Perdix perdix*, storks (Fam. Alaudidae), and in shrubs: *Lanius collurio*, *Lanius minor*.

The landpastures situated near of the Casimcea River have a small number of nesting bird species, one of the causes that lead to the decrease of nesting populations being excessive grazing, practiced throughout the year.

Species such as: *Riparia riparia*, *Merops apiaster*, *Coracias garrulus*, *Athene noctua*, *Falco tinnunculus* nest in the area of loess banks. In the bush habitat along the river, the species that appear more frequently are: *Phasianus colchicus*, *Accipiter nisus*, *Falco tinnunculus*, *Upupa epops*, *Sylvia communis*, *Sylvia curruca*, *Turdus merula*, *Turdus philomelos*, *Luscinia megarhynchos*, *Erithacus rubecula*, *Phoenicurus phoenicurus*, *Muscicapa striata*, *Parus major*, *Cyanistes caeruleus*, *Lanius collurio*, *Carduelis carduelis*, *Carduelis chloris*, *Oriolus oriolus*, *Pica pica*.

Another identified category is formed by species that, in a certain period of the biological cycle use several biotopes, from different habitats, for example



Photo 11. Casimcea River. *Buteo buteo*
(photo V. Cuzic)

Foto 11. Râul Casimcea. *Buteo buteo*

some species of day predators that nest in the forest area but their feeding territory overlaps, at least partially, over the area of the Casimcea River. The species, characteristic of the aquatic habitat, are mostly migratory, but also the few sedentary species (which have provided food from aquatic resources) leave this habitat in the cold winters, when the water freezes completely. The river basin is preferred for feeding by a number of charadriiformes, such as: *Himantopus himantopus*, *Recurvirostra avocetta*, *Charadrius dubius*. Anthropogenic ecosystems, represented mostly by agricultural ecosystems that occupy most of the vicinity of Casimcea River, are home to a diverse avifauna, consisting of characteristic species, represented mainly by: *Alauda arvensis*, *Gallerida cristata*, *Melanocorypha calandra*. Among the

synanthropic species, specific to human settlements, there are more common: *Ciconia ciconia*, *Streptopelia decaocto*, *Athene noctua*, *Dendrocopos syriacus*, *Hirundo rustica*, *Passer domesticus*, *Passer montanus*, *Corvus monedula*, etc.

During migration and winter, the following species were observed: *Clanga pomarina*, *Pelecanus crispus*, *Pelecanus onocrotalus*, *Buteo buteo* (Photo 11), *Accipiter brevipes*, *Branta ruficollis*, *Phalacrocorax pygmaeus*, *Anser albifrons*, *Tadorna ferruginea*. The list of bird species observed and identified in the observation stations along Casimcea River is presented in table no. 2.

Hamangia River it has its source in a typical forest habitat, the avifauna identified in this sector being specific to this type of habitat. The areas near the sampling stations, established along Hamangia River, where reeds grow, permanently or not permanently flooded with shallow water, are nesting and feeding places for several species of waterfowl and marshes, especially for species of *Acrocephalus*. Among the species characteristic to the steppe habitat and the pastures near the sampling stations were observed: *Oenanthe oenanthe*, *Oenanthe isabellina*, *Coturnix coturnix*, *Perdix perdix*, storks (Fam. *Alaudidae*) etc., and in shrub habitats: *Lanius collurio* și *Lanius minor*. Species of birds such as: *Riparia riparia*, *Merops apiaster*, *Coracias garrulus*, *Athene noctua*, *Falco tinnunculus*, nest in the banks of loess.

In the bush habitat along the river, the species that appear more frequently are: *Phasianus colchicus*, *Accipiter nisus*, *Falco tinnunculus*, *Upupa epops*, *Sylvia communis*, *Sylvia curruca*, *Turdus merula*, *Turdus philomelos*, *Luscinia megarhynchos*, *Erithacus rubecula*, *Phoenicurus phoenicurus*, *Muscicapa striata*, *Parus major*, *Cyanistes caeruleus*, *Lanius collurio*, *Carduelis carduelis*, *Carduelis chloris*, *Oriolus oriolus*. Anthropogenic ecosystems, represented here also largely by agroecosystems, occupy a large part of the vicinity of Hamangia course. Here is an avifauna made up of characteristic species such as: *Alauda arvensis*, *Gallerida cristata*, *Melanocorypha calandra*. In the area where the river flows into the Golovița Lake, rich in food resources, wading birds were observed (e.g. *Charadrius dubius*, *Himantopus himantopus*, *Vanellus vanellus* (Photo 12), *Recurvirostra avocetta*), most species of ducks, herons. During the migration and winter periods, the following species were observed: *Clanga pomarina*, *Pelecanus crispus*, *Pelecanus onocrotalus*, *Branta ruficollis*, *Phalacrocorax pygmaeus*, *Anser albifrons*, *Tadorna ferruginea*, etc. The list of bird species observed and identified in the observation stations along Hamangia River is presented in table no. 3.



Photo 12. Hamangia River.
Vanellus vanellus (photo V. Cuzic)
 Foto 12. Râul Hamangia. *Vanellus vanellus*

Slava River has, as a starting point, at its springs, the typical forest habitat, that of the forest from Vasile Alexandri, which makes the identified avifauna one specific to this type of habitat. Areas in the vicinity of river monitoring points, where reeds grow, whether or not permanently flooded with shallow water, are nesting and feeding places for several species of waterfowl and marshes, especially for species of *Acrocephalus*.

Among the species characteristic of the steppe habitat and pastures near the monitoring points along the Slava River were observed: *Oenanthe oenanthe*, *Oenanthe isabellina*, *Coturnix coturnix*, *Perdix perdix*, larks (Fam. *Alaudidae*), and those of shrub habitats in the area: *Lanius collurio*, *Lanius minor*. Species of birds

such as: *Riparia riparia*, *Merops apiaster*, *Coracias garrulus*, *Athene noctua*, *Falco tinnunculus* nest in the banks of loess.

In the bush habitat along the river, the species that appear more frequently are: *Phasianus colchicus*, *Accipiter nisus*, *Falco tinnunculus*, *Upupa epops*, *Sylvia communis*, *Sylvia curruca*, *Turdus merula*, *Turdus philomelos*, *Luscinia megarhynchos*, *Erithacus rubecula*, *Phoenicurus phoenicurus*, *Muscicapa striata*, *Parus major*, *Cyanistes caeruleus*, *Lanius collurio*, *Carduelis carduelis*, *Carduelis chloris*, *Oriolus oriolus*.

Anthropogenic ecosystems, largely represented by agroecosystems, occupy a large part of the vicinity of Slava course. Here is an avifauna made up of characteristic species, represented, in particular, by: *Alauda arvensis*, *Gallerida cristata*, *Melanocorypha calandra*.

The area where Slava River flows into Ceamurlia liman has a richness of bird species (Photos 13,14), being a feeding place sought by many wading species, such as: *Himantopus himantopus*, *Recurvirostra avocetta*, *Charadrius dubius*, most duck and heron species. During the migration and winter period, other species were observed, respectively: *Clanga pomarina*, *Pelecanus crispus*, *Pelecanus onocrotalus*, *Branta ruficollis*, *Phalacrocorax pygmaeus*, *Anser albifrons*, *Tadorna ferruginea*, etc. The list of bird species observed and identified in the observation stations along Slava River, and its tributary, Ciucurova, is presented in tables no. 4-5.



Photo 13. Slava River. Wading bird species in the discharge area (photo V. Cuzic)
Foto 13. Râul Slava. Păsări limicole în zona de vărsare



Photo 14. Slava River. *Pelecanus onocrotalus* (photo V. Cuzic)
Foto 14. Râul Slava. Pelecanus onocrotalus

Taița River has its springs in the forest massif near Fagilor Valley and the avifauna in this sampling station is typical to North Dobrogea forest habitat .

In existing shrub habitats at monitoring points along the river, the species that occur more frequently are: *Sylvia communis*, *Sylvia curruca*, *Turdus merula*, *Turdus philomelos*, *Luscinia megarhynchos*, *Erithacus rubecula*, *Phoenicurus phoenicurus*, *Muscicapa striata*, *Parus major*, *Cyanistes caeruleus*, *Lanius collurio*, *Carduelis carduelis*, *Carduelis chloris*, *Oriolus oriolus*, *Phasianus colchicus*, *Accipiter nisus*, *Falco tinnunculus*, *Upupa epops*. The reed areas from the river monitoring points are occupied, for nesting, by swamp bird species.

In the area where the Taița River flows into Topraichioi Lake, the avifauna is specific to wetlands and lakes and there were observed species such as: *Plegadis falcinellus* (Photo 15), *Podiceps cristatus*, *Podiceps griseigena*, *Podiceps nigricollis*, *Aythya nyroca*, *Anas strepera*, *Anas querquedula*, *Larus ridibundus*, *Sterna hirundo*, *Fulica atra*, *Ardea cinerea*, *Ardea purpurea*, *Casmerodius albus*, *Ardeea cinerea*, *Ciconia nigra* (Photo 16) *Ardeola ralloides*, *Egretta garzetta*, *Nycticorax nycticorax*, *Botaurus stellaris*, *Ixobrychus minutus*, *Gallinula chloropus*, *Circus aeruginosus*, *Acrocephalus palustris*, *Emberiza schoeniclus*, *Himantopus himantopus*, *Recurvirostra avocetta*, *Charadrius dubius*. During the migrations during the winter season, the presence of species was observed: *Clanga pomarina*, *Pelecanus crispus*, *Pelecanus onocrotalus*, *Branta ruficollis*, *Phalacrocorax pygmaeus*, *Anser albifrons*, *Tadorna ferruginea*, etc. The list of bird species observed and identified along the course of Taița River is presented in table no. 6.



Photo 15. Taița River. *Plegadis falcinellus* (photo V. Cuzic)

Foto 15. Râul Taița. *Plegadis falcinellus*



Photo 16. Taița River. *Ardea alba*, *Ardea cinerea*, *Ciconia nigra* (photo V. Cuzic)
 Foto 16. Râul Taița. *Casmerodius albus*, *Ardea cinerea*, *Ciconia nigra*

Telița River. The course of the river starting at springs from a forest habitat, respectively Niculițel Forest, at the base of Izvoare Hill, the avifauna from this sector is typical to the forest habitat.

In the habitat of bushes, along the river, the species that appear more frequently are: *Sylvia curruca*, *Sylvia atricapilla*, *Turdus merula*, *Turdus philomelos*, *Luscinia megarhynchos*, *Erithacus rubecula*, *Phoenicurus phoenicurus*, *Muscicapa striata*, *Parus major*, *Cyanistes caeruleus*, *Lanius collurio*, *Carduelis carduelis*, *Carduelis chloris*, *Oriolus oriolus*, *Phasianus colchicus*, *Falco tinnunculus*, *Upupa epops*.

The agroecosystems on the lower course of Telița River occupy a large part of its vicinity, hosting an avifauna represented in particular by: *Alauda arvensis*, *Gallerida cristata*, *Melanocorypha calandra*.

In the area where Telița River flows into Zebil pond, the avifauna is characteristic to the ponds, here being observed species such as: *Podiceps cristatus*, *Podiceps nigricollis*, *Aythya nyroca*, *Anas strepera*, *Anas querquedula*, *Croicocephalus ridibundus*, *Sterna hirundo*, *Fulica atra*, *Ardea cinerea*, *Ardea purpurea*, *Ardeola ralloides*, *Egretta garzetta*, *Nycticorax nycticorax*, *Botaurus stellaris*, *Ixobrychus minutus*, *Gallinula chloropus*, *Circus aeruginosus*, *Acrocephalus palustris*, *Emberiza schoeniclus*, *Himantopus himantopus*, *Recurvirostra avocetta*, *Charadrius dubius*, *Galinago galinago* (Photo 17). During the migrations, species such as: *Clanga pomarina*, *Pelecanus crispus*, *Pelecanus onocrotalus*, *Branta ruficollis*, *Phalacrocorax*

pygmaeus, *Anser albifrons*, *Tadorna tadorna*, *Tadorna ferruginea* were observed. The list of bird species observed and identified along Telița River is presented in table no. 7.



Photo 17. Telița River. *Galinago gallinago* (photo V. Cuzic)
Foto 17. Râul Telița. *Galinago gallinago*

From the point of view of the total number of bird species recorded in the four monitoring stations, corresponding to each river (Tables 2-6), the following situation emerges: 143 species along the Casimcea River, 221 species along Hamangia River, 209 species per the course of Slava River and 98 species along its tributary, Ciucurova, 190 species along Taița River, and, respectively, 159 species along the Telița River. As can be seen, the largest number of bird species for the four monitoring stations, on each watercourse, was recorded on Hamangia River, the smallest being on Telița River.

Tabel 2. List of the bird species identified along the Casimcea River
 Tabelul 2. Lista speciilor de păsări identificate pe cursul râului Casimcea

Cs1 (spring area)	Cs2 ("La Coltani")	Cs3 (Casian Monastery)	Cs4 (discharge area)
<i>Accipiter gentilis</i>	<i>Accipiter nisus</i>	<i>Accipiter gentilis</i>	<i>Accipiter nisus</i>
<i>Accipiter nisus</i>	<i>Acrocephalus</i>	<i>Accipiter nisus</i>	<i>Actitis hipoleucos</i>
<i>Acrocephalus</i>	<i>arundinaceus</i>	<i>Acrocephalus arundinaceus</i>	<i>Alauda arvensis</i>
<i>arundinaceus</i>	<i>Actitis hipoleucos</i>	<i>Acrocephalus palustris</i>	<i>Anas platyrhynchos</i>
<i>Actitis hipoleucos</i>	<i>Alauda arvensis</i>	<i>Acrocephalus scirpaceus</i>	<i>Anser anser</i>
<i>Alauda arvensis</i>	<i>Anas platyrhynchos</i>	<i>Actitis hipoleucos</i>	<i>Anthus campestris</i>
<i>Anthus campestris</i>	<i>Anser anser</i>	<i>Alauda arvensis</i>	<i>Aquila pennata</i>
<i>Aquila pennata</i>	<i>Anthus campestris</i>	<i>Anas platyrhynchos</i>	<i>Clanga pomarina</i>
<i>Ardea cinerea</i>	<i>Aquila pennata</i>	<i>Anas querquedula</i>	<i>Ardea cinerea</i>
<i>Ardeola ralloides</i>	<i>Ardea cinerea</i>	<i>Anser anser</i>	<i>Athene noctua</i>
<i>Buteo buteo</i>	<i>Athene noctua</i>	<i>Anthus campestris</i>	<i>Burhinus</i>
<i>Buteo lagopus</i>	<i>Burhinus</i>	<i>Aquila pennata</i>	<i>oediconemus</i>
<i>Buteo rufinus</i>	<i>oediconemus</i>	<i>Ardea cinerea</i>	<i>Buteo buteo</i>
<i>Carduelis cannabina</i>	<i>Buteo buteo</i>	<i>Ardeola ralloides</i>	<i>Buteo lagopus</i>
<i>Carduelis carduelis</i>	<i>Buteo lagopus</i>	<i>Athene noctua</i>	<i>Buteo rufinus</i>
<i>Carduelis chloris</i>	<i>Buteo rufinus</i>	<i>Aythya ferina</i>	<i>Carduelis carduelis</i>
<i>Carduelis spinus</i>	<i>Calandrella</i>	<i>Botaurus stellaris</i>	<i>Carduelis chloris</i>
<i>Charadrius</i>	<i>brachydactyla</i>	<i>Buteo buteo</i>	<i>Carduelis spinus</i>
<i>alexandrinus</i>	<i>Carduelis carduelis</i>	<i>Buteo lagopus</i>	<i>Ciconia ciconia</i>
<i>Ciconia ciconia</i>	<i>Carduelis chloris</i>	<i>Buteo rufinus</i>	<i>Ciconia nigra</i>
<i>Circaetus gallicus</i>	<i>Carduelis spinus</i>	<i>Calandrella brachydactyla</i>	<i>Circaetus gallicus</i>
<i>Circus cyaneus</i>	<i>Ciconia ciconia</i>	<i>Caprimulgus europaeus</i>	<i>Circus aeruginosus</i>
<i>Circus macrourus</i>	<i>Ciconia nigra</i>	<i>Carduelis cannabina</i>	<i>Circus cyaneus</i>
<i>Clanga pomarina</i>	<i>Circaetus gallicus</i>	<i>Carduelis carduelis</i>	<i>Circus macrourus</i>
<i>Columba palumbus</i>	<i>Circus aeruginosus</i>	<i>Carduelis chloris</i>	<i>Coracias garrulus</i>
<i>Coracias garrulus</i>	<i>Circus cyaneus</i>	<i>Carduelis spinus</i>	<i>Corvus corone</i>
<i>Corvus corone</i>	<i>Circus macrourus</i>	<i>Charadrius alexandrinus</i>	<i>Corvus frugilegus</i>
<i>Corvus frugilegus</i>	<i>Clanga pomarina</i>	<i>Chlidonias hybrida</i>	<i>Corvus monedula</i>
<i>Corvus monedula</i>	<i>Coracias garrulus</i>	<i>Chlidonias leucopterus</i>	<i>Coturnix coturnix</i>
<i>Coturnix coturnix</i>	<i>Corvus corone</i>	<i>Ciconia ciconia</i>	<i>Cuculus canorus</i>
<i>Cuculus canorus</i>	<i>Corvus frugilegus</i>	<i>Ciconia nigra</i>	<i>Delichon urbicum</i>
<i>Dendrocopos syriacus</i>	<i>Corvus monedula</i>	<i>Circaetus gallicus</i>	<i>Egretta garzetta</i>
<i>Egretta garzetta</i>	<i>Coturnix coturnix</i>	<i>Circus aeruginosus</i>	<i>Emberiza calandra</i>
<i>Emberiza calandra</i>	<i>Cuculus canorus</i>	<i>Circus cyaneus</i>	<i>Falco columbarius</i>
<i>Emberiza hortulana</i>	<i>Delichon urbicum</i>	<i>Circus macrourus</i>	<i>Falco subbuteo</i>
<i>Erethacus rubecula</i>	<i>Egretta garzetta</i>	<i>Clanga pomarina</i>	<i>Falco tinnunculus</i>
<i>Falco columbarius</i>	<i>Emberiza calandra</i>	<i>Coccothraustes</i>	<i>Falco vespertinus</i>
<i>Falco subbuteo</i>	<i>Emberiza hortulana</i>	<i>coccothraustes</i>	<i>Fringilla coelebs</i>
<i>Falco tinnunculus</i>	<i>Emberiza</i>	<i>Columba palumbus</i>	<i>Fringilla</i>
<i>Falco vespertinus</i>	<i>melanocephala</i>	<i>Coracias garrulus</i>	<i>montifringilla</i>
<i>Fringilla coelebs</i>	<i>Erethacus rubecula</i>	<i>Corvus corone</i>	<i>Galerida cristata</i>
<i>Fringilla montifringilla</i>	<i>Falco columbarius</i>	<i>Corvus frugilegus</i>	<i>Haliaeetus albicilla</i>
<i>Galerida cristata</i>	<i>Falco subbuteo</i>	<i>Corvus monedula</i>	<i>Hirundo rustica</i>
<i>Garrulus glandarius</i>	<i>Falco tinnunculus</i>	<i>Coturnix coturnix</i>	<i>Lanius collurio</i>
<i>Hirundo rustica</i>	<i>Falco vespertinus</i>	<i>Cuculus canorus</i>	<i>Lanius minor</i>
<i>Lanius collurio</i>	<i>Fringilla montifringilla</i>	<i>Dendrocopos medius</i>	<i>Larus canus</i>
<i>Lanius minor</i>	<i>Galerida cristata</i>	<i>Dendrocopos minor</i>	<i>Larus ridibundus</i>
<i>Larus ridibundus</i>	<i>Hirundo rustica</i>	<i>Dendrocopos syriacus</i>	<i>Luscinia</i>
<i>Luscinia</i>	<i>Lanius collurio</i>	<i>Egretta alba</i>	<i>megarhynchos</i>
<i>megarhynchos</i>	<i>Lanius minor</i>	<i>Egretta garzetta</i>	<i>Melanocorypha</i>
<i>Melanocorypha</i>	<i>Larus ridibundus</i>	<i>Emberiza calandra</i>	<i>calandra</i>

Cs1 (spring area)	Cs2 ("La Coltani")	Cs3 (Casian Monastery)	Cs4 (discharge area)
<i>calandra</i>	<i>Melanocorypha calandra</i>	<i>Emberiza hortulana</i>	<i>Merops apiaster</i>
<i>Merops apiaster</i>	<i>calandra</i>	<i>Emberiza melanocephala</i>	<i>Milvus migrans</i>
<i>Milvus migrans</i>	<i>Merops apiaster</i>	<i>Emberiza schoeniclus</i>	<i>Motacilla alba</i>
<i>Motacilla alba</i>	<i>Milvus migrans</i>	<i>Erithacus rubecula</i>	<i>Motacilla cinerea</i>
<i>Motacilla cinerea</i>	<i>Motacilla alba</i>	<i>Falco columbarius</i>	<i>Motacilla flava</i>
<i>Motacilla flava</i>	<i>Motacilla cinerea</i>	<i>Falco subbuteo</i>	<i>Oenanthe oenanthe</i>
<i>Muscicapa striata</i>	<i>Motacilla flava</i>	<i>Falco tinnunculus</i>	<i>Oriolus oriolus</i>
<i>Oenanthe oenanthe</i>	<i>Oenanthe isabellina</i>	<i>Falco vespertinus</i>	<i>Parus caeruleus</i>
<i>Oriolus oriolus</i>	<i>Oenanthe oenanthe</i>	<i>Ficedula albicollis</i>	<i>Parus major</i>
<i>Parus caeruleus</i>	<i>Oriolus oriolus</i>	<i>Ficedula parva</i>	<i>Passer domesticus</i>
<i>Parus major</i>	<i>Parus caeruleus</i>	<i>Fringilla coelebs</i>	<i>Passer montanus</i>
<i>Passer domesticus</i>	<i>Parus major</i>	<i>Fringilla montifringilla</i>	<i>Perdix perdix</i>
<i>Passer montanus</i>	<i>Passer domesticus</i>	<i>Fulica atra</i>	<i>Phasianus colchius</i>
<i>Perdix perdix</i>	<i>Passer montanus</i>	<i>Galerida cristata</i>	<i>Phoenicurus ochruros</i>
<i>Pernis apivorus</i>	<i>Perdix perdix</i>	<i>Gallinago gallinago</i>	<i>Phoenicurus phoenicurus</i>
<i>Phasianus colchius</i>	<i>Phasianus colchius</i>	<i>Gallinula chloropus</i>	<i>Phylloscopus collybita</i>
<i>Phoenicurus ochruros</i>	<i>Phoenicurus ochruros</i>	<i>Garrulus glandarius</i>	<i>Pica pica</i>
<i>phoenicurus</i>	<i>Phoenicurus phoenicurus</i>	<i>Haliaeetus albicilla</i>	<i>Riparia riparia</i>
<i>Phylloscopus collybita</i>	<i>Phylloscopus collybita</i>	<i>Hippolais pallida</i>	<i>Saxicola rubetra</i>
<i>Pica pica</i>	<i>Pica pica</i>	<i>Hirundo rustica</i>	<i>Serinus serinus</i>
<i>Riparia riparia</i>	<i>Riparia riparia</i>	<i>Lanius collurio</i>	<i>Streptopelia decaocto</i>
<i>Saxicola rubetra</i>	<i>Saxicola rubetra</i>	<i>Lanius excubitor</i>	<i>Streptopelia turtur</i>
<i>Serinus serinus</i>	<i>Serinus serinus</i>	<i>Lanius minor</i>	<i>Sturnus vulgaris</i>
<i>Streptopelia decaocto</i>	<i>Streptopelia decaocto</i>	<i>Lanius senator</i>	<i>Sylvia curruca</i>
<i>Streptopelia turtur</i>	<i>Streptopelia decaocto</i>	<i>Larus minutus</i>	<i>Sylvia nisoria</i>
<i>Sturnus vulgaris</i>	<i>Sturnus vulgaris</i>	<i>Larus ridibundus</i>	<i>Troglodytes troglodytes</i>
<i>Sylvia curruca</i>	<i>Troglodytes troglodytes</i>	<i>Limosa limosa</i>	<i>Turdus iliacus</i>
<i>Sylvia nisoria</i>	<i>Turdus merula</i>	<i>Lullula arborea</i>	<i>Turdus merula</i>
<i>Troglodytes troglodytes</i>	<i>Upupa epops</i>	<i>Luscinia megarhynchos</i>	<i>Turdus philomelos</i>
<i>Turdus iliacus</i>	<i>Vanellus vanellus</i>	<i>Melanocorypha calandra</i>	<i>Turdus pilaris</i>
<i>Turdus merula</i>		<i>Merops apiaster</i>	<i>Upupa epops</i>
<i>Turdus philomelos</i>		<i>Milvus migrans</i>	<i>Vanellus vanellus</i>
<i>Turdus pilaris</i>		<i>Motacilla alba</i>	
<i>Upupa epops</i>		<i>Motacilla cinerea</i>	
<i>Vanellus vanellus</i>		<i>Motacilla flava</i>	
		<i>Muscicapa striata</i>	
		<i>Numenius arquata</i>	
		<i>Nycticorax nycticorax</i>	
		<i>Oenanthe isabellina</i>	
		<i>Oenanthe oenanthe</i>	
		<i>Oenanthe pleschanka</i>	
		<i>Oriolus oriolus</i>	
		<i>Otus scops</i>	
		<i>Parus caeruleus</i>	
		<i>Parus major</i>	
		<i>Passer domesticus</i>	
		<i>Passer hispaniolensis</i>	
		<i>Passer montanus</i>	
		<i>Perdix perdix</i>	
		<i>Pernis apivorus</i>	
		<i>Phalacrocorax carbo</i>	
		<i>Phalacrocorax pygmeus</i>	
		<i>Phasianus colchius</i>	
		<i>Phoenicurus ochruros</i>	

Cs1 (spring area)	Cs2 ("La Colțani")	Cs3 (Casian Monastery)	Cs4 (discharge area)
		<i>Phoenicurus phoenicurus</i> <i>Phylloscopus collybita</i> <i>Phylloscopus sibilatrix</i> <i>Phylloscopus trochilus</i> <i>Pica pica</i> <i>Picus canus</i> <i>Podiceps cristatus</i> <i>Podiceps grisegena</i> <i>Prunella modularis</i> <i>Rallus aquaticus</i> <i>Regulus regulus</i> <i>Riparia riparia</i> <i>Saxicola rubicola</i> <i>Serinus serinus</i> <i>Sitta europaea</i> <i>Sterna hirundo</i> <i>Streptopelia decaocto</i> <i>Streptopelia turtur</i> <i>Strix aluco</i> <i>Sturnus vulgaris</i> <i>Sylvia atricapilla</i> <i>Sylvia communis</i> <i>Sylvia curruca</i> <i>Sylvia nisoria</i> <i>Tringa glareola</i> <i>Tringa ochropus</i> <i>Tringa totanus</i> <i>Troglodytes troglodytes</i> <i>Turdus iliacus</i> <i>Turdus merula</i> <i>Turdus philomelos</i> <i>Turdus pilaris</i> <i>Turdus viscivorus</i> <i>Upupa epops</i> <i>Vanellus vanellus</i>	
Total number of species per station			
82	74	139	72

Tabel 3. List of the bird species identified along the Hamangia River
 Tabelul 3. Lista speciilor de păsări identificate pe cursul râului Hamangia

H1 (spring area)	H2 (downstream Stejaru)	H3 (Beidaud)	H4 (discharge area)
<i>Accipiter brevipes</i>	<i>Accipiter gentilis</i>	<i>Accipiter brevipes</i>	<i>Accipiter nisus</i>
<i>Accipiter gentilis</i>	<i>Accipiter nisus</i>	<i>Accipiter gentilis</i>	<i>Acrocephalus</i>
<i>Accipiter nisus</i>	<i>Actitis hipoleucos</i>	<i>Accipiter nisus</i>	<i>arundinaceus</i>
<i>Alauda arvensis</i>	<i>Alauda arvensis</i>	<i>Actitis hipoleucos</i>	<i>Acrocephalus palustris</i>
<i>Anthus campestris</i>	<i>Anthus campestris</i>	<i>Anthus campestris</i>	<i>Acrocephalus</i>
<i>Anthus trivialis</i>	<i>Clanga pomarina</i>	<i>Clanga pomarina</i>	<i>schoenobaenus</i>
<i>Clanga pomarina</i>	<i>Asio otus</i>	<i>Athene noctua</i>	<i>Acrocephalus</i>
<i>Asio otus</i>	<i>Athene noctua</i>	<i>Burhinus oedicnemus</i>	<i>scripaceus</i>
<i>Athene noctua</i>	<i>Burhinus oedicnemus</i>	<i>Buteo buteo</i>	<i>Actitis hipoleucos</i>
<i>Buteo buteo</i>	<i>Buteo buteo</i>	<i>Buteo lagopus</i>	<i>Aegithalos caudatus</i>
<i>Buteo lagopus</i>	<i>Buteo lagopus</i>	<i>Buteo rufinus</i>	<i>Alauda arvensis</i>
<i>Caprimulgus</i>	<i>Buteo rufinus</i>	<i>Calandrella</i>	<i>Alcedo atthis</i>
<i>europaeus</i>	<i>Calandrella</i>	<i>brachydactyla</i>	<i>Anas acuta</i>
<i>Carduelis cannabina</i>	<i>brachydactyla</i>	<i>Caprimulgus europaeus</i>	<i>Anas clypeata</i>
<i>Carduelis carduelis</i>	<i>Caprimulgus europaeus</i>	<i>Carduelis carduelis</i>	<i>Anas crecca</i>
<i>Carduelis chloris</i>	<i>Carduelis cannabina</i>	<i>Carduelis chloris</i>	<i>Anas penelope</i>
<i>Carduelis spinus</i>	<i>Carduelis carduelis</i>	<i>Carduelis spinus</i>	<i>Anas platyrhynchos</i>
<i>Certhia familiaris</i>	<i>Carduelis chloris</i>	<i>Charadrius</i>	<i>Anas querquedula</i>
<i>Ciconia ciconia</i>	<i>Carduelis spinus</i>	<i>alexandrinus</i>	<i>Anas strepera</i>
<i>Circaetus gallicus</i>	<i>Certhia familiaris</i>	<i>Charadrius dubius</i>	<i>Anser albifrons</i>
<i>Circus cyaneus</i>	<i>Ciconia ciconia</i>	<i>Ciconia ciconia</i>	<i>Anser anser</i>
<i>Circus macrourus</i>	<i>Circaetus gallicus</i>	<i>Circaetus gallicus</i>	<i>Anthus campestris</i>
<i>Coccothraustes</i>	<i>Circus cyaneus</i>	<i>Circus cyaneus</i>	<i>Ardea cinerea</i>
<i>coccothraustes</i>	<i>Circus macrourus</i>	<i>Circus macrourus</i>	<i>Ardea purpurea</i>
<i>Columba palumbus</i>	<i>Coccothraustes</i>	<i>Columba palumbus</i>	<i>Ardeola ralloides</i>
<i>Coracias garrulus</i>	<i>coccothraustes</i>	<i>Coracias garrulus</i>	<i>Athene noctua</i>
<i>Corvus corax</i>	<i>Columba palumbus</i>	<i>Corvus corone</i>	<i>Aythya ferina</i>
<i>Corvus corone</i>	<i>Coracias garrulus</i>	<i>Corvus frugilegus</i>	<i>Aythya fuligula</i>
<i>Corvus frugilegus</i>	<i>Corvus corax</i>	<i>Corvus monedula</i>	<i>Aythya nyroca</i>
<i>Corvus monedula</i>	<i>Corvus corone</i>	<i>Coturnix coturnix</i>	<i>Botaurus stellaris</i>
<i>Cuculus canorus</i>	<i>Corvus frugilegus</i>	<i>Crex crex</i>	<i>Branta ruficollis</i>
<i>Dendrocopos major</i>	<i>Corvus monedula</i>	<i>Cuculus canorus</i>	<i>Buteo lagopus</i>
<i>Dendrocopos medius</i>	<i>Cuculus canorus</i>	<i>Delichon urbicum</i>	<i>Calidris alba</i>
<i>Dendrocopos minor</i>	<i>Delichon urbicum</i>	<i>Dendrocopos syriacus</i>	<i>Calidris alpina</i>
<i>Dendrocopos syriacus</i>	<i>Dendrocopos major</i>	<i>Emberiza calandra</i>	<i>Calidris ferruginea</i>
<i>Dryocopus martius</i>	<i>Dendrocopos medius</i>	<i>Emberiza</i>	<i>Calidris minuta</i>
<i>Emberiza calandra</i>	<i>Dendrocopos minor</i>	<i>melanocephala</i>	<i>Carduelis cannabina</i>
<i>Emberiza cirius</i>	<i>Dendrocopos syriacus</i>	<i>Erithacus rubecula</i>	<i>Carduelis carduelis</i>
<i>Emberiza citrinella</i>	<i>Emberiza calandra</i>	<i>Falco columbarius</i>	<i>Carduelis chloris</i>
<i>Emberiza hortulana</i>	<i>Emberiza hortulana</i>	<i>Falco subbuteo</i>	<i>Carduelis spinus</i>
<i>Erithacus rubecula</i>	<i>Emberiza</i>	<i>Falco vespertinus</i>	<i>Charadrius</i>
<i>Falco cherrug</i>	<i>melanocephala</i>	<i>Ficedula parva</i>	<i>alexandrinus</i>
<i>Falco columbarius</i>	<i>Erithacus rubecula</i>	<i>Fringilla coelebs</i>	<i>Charadrius dubius</i>
<i>Falco subbuteo</i>	<i>Falco subbuteo</i>	<i>Fringilla montifringilla</i>	<i>Chlidonias hybrida</i>
<i>Falco tinnunculus</i>	<i>Falco tinnunculus</i>	<i>Galerida cristata</i>	<i>Chlidonias leucopterus</i>
<i>Falco vespertinus</i>	<i>Falco vespertinus</i>	<i>Garrulus glandarius</i>	<i>Chlidonias niger</i>
<i>Ficedula parva</i>	<i>Ficedula parva</i>	<i>Glareola pratincola</i>	<i>Ciconia ciconia</i>
<i>Fringilla coelebs</i>	<i>Fringilla coelebs</i>	<i>Hippolais pallida</i>	<i>Ciconia nigra</i>
<i>Fringilla montifringilla</i>	<i>Fringilla montifringilla</i>	<i>Hiraaetus pennatus</i>	<i>Circus aeruginosus</i>
<i>Galerida cristata</i>	<i>Galerida cristata</i>	<i>Hirundo rustica</i>	<i>Circus cyaneus</i>
<i>Garrulus glandarius</i>	<i>Garrulus glandarius</i>	<i>Lanius excubitor</i>	<i>Circus macrourus</i>

H1 (spring area)	H2 (downstream Stejaru)	H3 (Beidaud)	H4 (discharge area)
<i>Hippolais icterina</i>	<i>Haliaeetus albicilla</i>	<i>Lanius minor</i>	<i>Clanga clanga</i>
<i>Hippolais pallida</i>	<i>Hippolais pallida</i>	<i>Lullula arborea</i>	<i>Clanga pomarina</i>
<i>Hiraaetus pennatus</i>	<i>Hiraaetus pennatus</i>	<i>Luscinia megarhynchos</i>	<i>Coracias garrulus</i>
<i>Hirundo rustica</i>	<i>Hirundo rustica</i>	<i>Melanocorypha calandra</i>	<i>Corvus corone</i>
<i>Lanius collurio</i>	<i>Lanius collurio</i>	<i>Merops apiaster</i>	<i>Corvus frugilegus</i>
<i>Lanius minor</i>	<i>Lanius excubitor</i>	<i>Milvus migrans</i>	<i>Corvus monedula</i>
<i>Lullula arborea</i>	<i>Lanius minor</i>	<i>Motacilla alba</i>	<i>Cuculus canorus</i>
<i>Luscinia megarhynchos</i>	<i>Lullula arborea</i>	<i>Motacilla cinerea</i>	<i>Cygnus cygnus</i>
<i>Melanocorypha calandra</i>	<i>Luscinia megarhynchos</i>	<i>Motacilla flava</i>	<i>Cygnus olor</i>
<i>Merops apiaster</i>	<i>Melanocorypha calandra</i>	<i>Muscicapa striata</i>	<i>Dendrocopos medius</i>
<i>Motacilla alba</i>	<i>Merops apiaster</i>	<i>Oenanthe isabellina</i>	<i>Dendrocopos syriacus</i>
<i>Motacilla cinerea</i>	<i>Milvus migrans</i>	<i>Oenanthe oenanthe</i>	<i>Egretta alba</i>
<i>Motacilla flava</i>	<i>Motacilla alba</i>	<i>Oriolus oriolus</i>	<i>Egretta garzetta</i>
<i>Muscicapa striata</i>	<i>Motacilla cinerea</i>	<i>Parus caeruleus</i>	<i>Emberiza calandra</i>
<i>Oenanthe oenanthe</i>	<i>Motacilla flava</i>	<i>Parus major</i>	<i>Emberiza schoeniclus</i>
<i>Oriolus oriolus</i>	<i>Muscicapa striata</i>	<i>Passer domesticus</i>	<i>Falco columbarius</i>
<i>Otus scops</i>	<i>Oenanthe isabellina</i>	<i>Passer montanus</i>	<i>Falco subbuteo</i>
<i>Parus caeruleus</i>	<i>Oenanthe oenanthe</i>	<i>Perdix perdix</i>	<i>Falco tinnunculus</i>
<i>Parus lugubris</i>	<i>Oriolus oriolus</i>	<i>Pernis apivorus</i>	<i>Falco vespertinus</i>
<i>Parus major</i>	<i>Otus scops</i>	<i>Phasianus colchius</i>	<i>Ficedula parva</i>
<i>Parus montanus</i>	<i>Parus caeruleus</i>	<i>Phylloscopus collybita</i>	<i>Fringilla coelebs</i>
<i>Passer montanus</i>	<i>Parus major</i>	<i>Phylloscopus sibilatrix</i>	<i>Fringilla montifringilla</i>
<i>Phasianus colchius</i>	<i>Passer domesticus</i>	<i>Pica pica</i>	<i>Fulica atra</i>
<i>Phoenicurus ochruros</i>	<i>Passer montanus</i>	<i>Riparia riparia</i>	<i>Galerida cristata</i>
<i>Phoenicurus phoenicurus</i>	<i>Perdix perdix</i>	<i>Saxicola rubetra</i>	<i>Gallinago gallinago</i>
<i>Phylloscopus collybita</i>	<i>Pernis apivorus</i>	<i>Serinus serinus</i>	<i>Gallinula chloropus</i>
<i>Phylloscopus sibilatrix</i>	<i>Phasianus colchius</i>	<i>Streptopelia decaocto</i>	<i>Gavia arctica</i>
<i>Phylloscopus trochilus</i>	<i>Phoenicurus ochruros</i>	<i>Streptopelia turtur</i>	<i>Glareola pratincola</i>
<i>Pica pica</i>	<i>Phoenicurus phoenicurus</i>	<i>Strix aluco</i>	<i>Haematopus ostralegus</i>
<i>Picus canus</i>	<i>Phylloscopus collybita</i>	<i>Sturnus roseus</i>	<i>Haliaeetus albicilla</i>
<i>Picus viridis</i>	<i>Phylloscopus sibilatrix</i>	<i>Sylvia atricapilla</i>	<i>Himantopus himantopus</i>
<i>Prunella modularis</i>	<i>Phylloscopus trochilus</i>	<i>Sylvia curruca</i>	<i>Hiraaetus pennata</i>
<i>Pyrrhula pyrrhula</i>	<i>Pica pica</i>	<i>Sylvia nisoria</i>	<i>Hirundo rustica</i>
<i>Regulus regulus</i>	<i>Picus viridis</i>	<i>Troglodytes troglodytes</i>	<i>Ixobrychus minutus</i>
<i>Saxicola rubetra</i>	<i>Pyrrhula pyrrhula</i>	<i>Turdus merula</i>	<i>Lanius collurio</i>
<i>Serinus serinus</i>	<i>Regulus regulus</i>	<i>Turdus philomelos</i>	<i>Larus canus</i>
<i>Sitta europaea</i>	<i>Riparia riparia</i>	<i>Turdus pilaris</i>	<i>Larus melanocephalus</i>
<i>Streptopelia turtur</i>	<i>Saxicola rubetra</i>	<i>Upupa epops</i>	<i>Larus michaelis</i>
<i>Strix aluco</i>	<i>Serinus serinus</i>		<i>Larus minutus</i>
<i>Sturnus vulgaris</i>	<i>Sitta europaea</i>		<i>Larus ridibundus</i>
<i>Sylvia atricapilla</i>	<i>Streptopelia decaocto</i>		<i>Limosa limosa</i>
<i>Sylvia borin</i>	<i>Streptopelia turtur</i>		<i>Locustella fluviatilis</i>
<i>Sylvia communis</i>	<i>Strix aluco</i>		<i>Locustella luscinioides</i>
<i>Sylvia curruca</i>	<i>Sturnus vulgaris</i>		<i>Luscinia megarhynchos</i>
<i>Sylvia nisoria</i>	<i>Sylvia atricapilla</i>		<i>Mergelus albellus</i>
<i>Troglodytes troglodytes</i>	<i>Sylvia communis</i>		<i>Merops apiaster</i>
<i>Turdus iliacus</i>	<i>Sylvia curruca</i>		<i>Milvus migrans</i>
<i>Turdus merula</i>	<i>Sylvia nisoria</i>		<i>Motacilla alba</i>
<i>Turdus philomelos</i>	<i>Troglodytes troglodytes</i>		<i>Motacilla cinerea</i>
<i>Turdus pilaris</i>	<i>Turdus iliacus</i>		<i>Motacilla flava</i>
	<i>Turdus merula</i>		<i>Muscicapa striata</i>
	<i>Turdus philomelos</i>		<i>Netta rufina</i>

H1 (spring area)	H2 (downstream Stejaru)	H3 (Beidaud)	H4 (discharge area)
<i>Turdus viscivorus</i> <i>Upupa epops</i>	<i>Turdus pilaris</i> <i>Turdus viscivorus</i> <i>Upupa epops</i>		<i>Numenius arquata</i> <i>Nycticorax nycticorax</i> <i>Oriolus oriolus</i> <i>Parus caeruleus</i> <i>Parus cristatus</i> <i>Parus major</i> <i>Passer domesticus</i> <i>Passer montanus</i> <i>Pelecanus crispus</i> <i>Pelecanus onocrotalus</i> <i>Phalacrocorax carbo</i> <i>Phalacrocorax</i> <i>pygmeus</i> <i>Phalaropus lobatus</i> <i>Phasianus colchius</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus</i> <i>phoenicurus</i> <i>Phylomachus pugnax</i> <i>Pica pica</i> <i>Platalea leucorodia</i> <i>Plegadis falcinelles</i> <i>Podiceps cristatus</i> <i>Podiceps grisegena</i> <i>Podiceps nigricollis</i> <i>Porzana parva</i> <i>Porzana porzana</i> <i>Rallus aquaticus</i> <i>Recurvirostra avosetta</i> <i>Regulus ignicapilus</i> <i>Remiz pendulinus</i> <i>Riparia riparia</i> <i>Saxicola rubetra</i> <i>Serinus serinus</i> <i>Sterna albifrons</i> <i>Sterna caspia</i> <i>Sterna hirundo</i> <i>Sterna nilotica</i> <i>Sturnus vulgaris</i> <i>Tachybaptus rufficollis</i> <i>Tadorna ferruginea</i> <i>Tadorna tadorna</i> <i>Tringa erythropus</i> <i>Tringa glareola</i> <i>Tringa nebularia</i> <i>Tringa ochropus</i> <i>Tringa stagnatilis</i> <i>Tringa totanus</i> <i>Upupa epops</i> <i>Vanellus vanellus</i>
Total number of species per station			
101	103	86	147

Tabel 4. List of the bird species observed along the Slava River
 Tabelul 4. Lista speciilor de păsări observate de-a lungul râului Slava

SI 1 (spring area)	SI 2 (downstream Sl. Rusă)	SI 3 (downstream Caugagia)	SI 4 (discharge area)
<i>Accipiter gentilis</i>	<i>Accipiter nisus</i>	<i>Accipiter gentilis</i>	<i>Accipiter nisus</i>
<i>Accipiter nisus</i>	<i>Alauda arvensis</i>	<i>Accipiter nisus</i>	<i>Acrocephalus</i>
<i>Alauda arvensis</i>	<i>Anthus campestris</i>	<i>Actitis hipoleucos</i>	<i>arundinaceus</i>
<i>Anthus trivialis</i>	<i>Aquila pennata</i>	<i>Anthus campestris</i>	<i>Acrocephalus palustris</i>
<i>Aquila pennata</i>	<i>Asio otus</i>	<i>Aquila pennata</i>	<i>Acrocephalus</i>
<i>Athene noctua</i>	<i>Athene noctua</i>	<i>Athene noctua</i>	<i>schoenobaenus</i>
<i>Buteo buteo</i>	<i>Buteo buteo</i>	<i>Burhinus oedicnemus</i>	<i>Acrocephalus</i>
<i>Buteo lagopus</i>	<i>Buteo lagopus</i>	<i>Buteo buteo</i>	<i>scripaceus</i>
<i>Caprimulgus</i>	<i>Caprimulgus europaeus</i>	<i>Buteo lagopus</i>	<i>Actitis hipoleucos</i>
<i>europaeus</i>	<i>Carduelis cannabina</i>	<i>Buteo rufinus</i>	<i>Aegithalos caudatus</i>
<i>Carduelis cannabina</i>	<i>Carduelis carduelis</i>	<i>Calandrella</i>	<i>Alauda arvensis</i>
<i>Carduelis carduelis</i>	<i>Carduelis chloris</i>	<i>brachydactyla</i>	<i>Alcedo atthis</i>
<i>Carduelis chloris</i>	<i>Carduelis spinus</i>	<i>Caprimulgus europaeus</i>	<i>Anas acuta</i>
<i>Carduelis spinus</i>	<i>Ciconia ciconia</i>	<i>Carduelis carduelis</i>	<i>Anas clypeata</i>
<i>Certhia familiaris</i>	<i>Ciconia nigra</i>	<i>Carduelis chloris</i>	<i>Anas crecca</i>
<i>Ciconia ciconia</i>	<i>Circaetus gallicus</i>	<i>Carduelis spinus</i>	<i>Anas penelope</i>
<i>Circus macrourus</i>	<i>Circus aeruginosus</i>	<i>Charadrius</i>	<i>Anas platyrhynchos</i>
<i>Clanga pomarina</i>	<i>Circus cyaneus</i>	<i>alexandrinus</i>	<i>Anas querquedula</i>
<i>Coccythraustes</i>	<i>Clanga pomarina</i>	<i>Charadrius dubius</i>	<i>Anas strepera</i>
<i>coccythraustes</i>	<i>Coccythraustes</i>	<i>Ciconia ciconia</i>	<i>Anser albifrons</i>
<i>Columba oenas</i>	<i>coccythraustes</i>	<i>Circaetus gallicus</i>	<i>Anser anser</i>
<i>Columba palumbus</i>	<i>Columba palumbus</i>	<i>Circus cyaneus</i>	<i>Aquila pennata</i>
<i>Coracias garrulus</i>	<i>Coracias garrulus</i>	<i>Circus macrourus</i>	<i>Ardea alba</i>
<i>Corvus corone</i>	<i>Corvus corone</i>	<i>Clanga pomarina</i>	<i>Ardea cinerea</i>
<i>Corvus frugilegus</i>	<i>Corvus frugilegus</i>	<i>Columba palumbus</i>	<i>Ardea purpurea</i>
<i>Corvus monedula</i>	<i>Corvus monedula</i>	<i>Coracias garrulus</i>	<i>Ardeola ralloides</i>
<i>Cuculus canorus</i>	<i>Cuculus canorus</i>	<i>Corvus corone</i>	<i>Athene noctua</i>
<i>Dendrocopos major</i>	<i>Delichon urbicum</i>	<i>Corvus frugilegus</i>	<i>Aythya ferina</i>
<i>Dendrocopos medius</i>	<i>Dendrocopos medius</i>	<i>Corvus monedula</i>	<i>Aythya fuligula</i>
<i>Dendrocopos minor</i>	<i>Dendrocopos minor</i>	<i>Coturnix coturnix</i>	<i>Aythya nyroca</i>
<i>Dendrocopos syriacus</i>	<i>Emberiza calandra</i>	<i>Cuculus canorus</i>	<i>Botaurus stellaris</i>
<i>Dryocopus martius</i>	<i>Erithacus rubecula</i>	<i>Delichon urbicum</i>	<i>Branta ruficollis</i>
<i>Emberiza calandra</i>	<i>Falco columbarius</i>	<i>Dendrocopos syriacus</i>	<i>Buteo lagopus</i>
<i>Erithacus rubecula</i>	<i>Falco subbuteo</i>	<i>Emberiza calandra</i>	<i>Calidris alba</i>
<i>Falco subbuteo</i>	<i>Falco tinnunculus</i>	<i>Emberiza</i>	<i>Calidris alpina</i>
<i>Falco tinnunculus</i>	<i>Falco vespertinus</i>	<i>melanocephala</i>	<i>Calidris ferruginea</i>
<i>Ficedula albicollis</i>	<i>Ficedula parva</i>	<i>Erithacus rubecula</i>	<i>Calidris minuta</i>
<i>Ficedula parva</i>	<i>Fringilla coelebs</i>	<i>Falco columbarius</i>	<i>Carduelis cannabina</i>
<i>Fringilla coelebs</i>	<i>Fringilla montifringilla</i>	<i>Falco subbuteo</i>	<i>Carduelis carduelis</i>
<i>Fringilla montifringilla</i>	<i>Galerida cristata</i>	<i>Falco vespertinus</i>	<i>Carduelis chloris</i>
<i>Garrulus glandarius</i>	<i>Garrulus glandarius</i>	<i>Ficedula parva</i>	<i>Carduelis spinus</i>
<i>Hippolais icterina</i>	<i>Hirundo rustica</i>	<i>Fringilla coelebs</i>	<i>Charadrius</i>
<i>Hirundo rustica</i>	<i>Lanius collurio</i>	<i>Fringilla montifringilla</i>	<i>alexandrinus</i>
<i>Lanius collurio</i>	<i>Lanius minor</i>	<i>Galerida cristata</i>	<i>Charadrius dubius</i>
<i>Lanius minor</i>	<i>Luscinia megarhynchos</i>	<i>Garrulus glandarius</i>	<i>Chlidonias hybrida</i>
<i>Lullula arborea</i>	<i>Merops apiaster</i>	<i>Glareola pratincola</i>	<i>Chlidonias leucoptera</i>
<i>Luscinia</i>	<i>Milvus migrans</i>	<i>Hippolais pallida</i>	<i>Chlidonias niger</i>
<i>megarhynchos</i>	<i>Motacilla alba</i>	<i>Hirundo rustica</i>	<i>Ciconia ciconia</i>
<i>Merops apiaster</i>	<i>Motacilla cinerea</i>	<i>Lanius excubitor</i>	<i>Ciconia nigra</i>

SI 1 (spring area)	SI 2 (downstream Sl. Rusă)	SI 3 (downstream Caugagia)	SI 4 (discharge area)
<i>Milvus migrans</i>	<i>Motacilla flava</i>	<i>Lanius minor</i>	<i>Circus aeruginosus</i>
<i>Motacilla alba</i>	<i>Oenanthe oenanthe</i>	<i>Lullula arborea</i>	<i>Circus cyaneus</i>
<i>Motacilla cinerea</i>	<i>Oriolus oriolus</i>	<i>Luscinia megarhynchos</i>	<i>Circus macrourus</i>
<i>Motacilla flava</i>	<i>Otus scops</i>	<i>Melanocorypha</i>	<i>Clanga pomarina</i>
<i>Oriolus oriolus</i>	<i>Parus caeruleus</i>	<i>calandra</i>	<i>Coracias garrulus</i>
<i>Otus scops</i>	<i>Parus major</i>	<i>Merops apiaster</i>	<i>Corvus corone</i>
<i>Parus caeruleus</i>	<i>Passer domesticus</i>	<i>Milvus migrans</i>	<i>Corvus frugilegus</i>
<i>Parus major</i>	<i>Passer montanus</i>	<i>Motacilla alba</i>	<i>Corvus monedula</i>
<i>Passer montanus</i>	<i>Perdix perdix</i>	<i>Motacilla cinerea</i>	<i>Croicocephalus</i>
<i>Pernis apivorus</i>	<i>Pernis apivorus</i>	<i>Motacilla flava</i>	<i>ridibundus</i>
<i>Phoenicurus ochruros</i>	<i>Phasianus colchius</i>	<i>Muscicapa striata</i>	<i>Cuculus canorus</i>
<i>Phoenicurus</i>	<i>Phylloscopus collybita</i>	<i>Oenanthe isabellina</i>	<i>Cygnus cygnus</i>
<i>phoenicurus</i>	<i>Phylloscopus sibilatrix</i>	<i>Oenanthe oenanthe</i>	<i>Cygnus olor</i>
<i>Phylloscopus collybita</i>	<i>Phylloscopus trochilus</i>	<i>Oriolus oriolus</i>	<i>Dendrocopos syriacus</i>
<i>Phylloscopus sibilatrix</i>	<i>Pica pica</i>	<i>Parus caeruleus</i>	<i>Egretta garzetta</i>
<i>Phylloscopus trochilus</i>	<i>Picus canus</i>	<i>Parus major</i>	<i>Emberiza calandra</i>
<i>Pica pica</i>	<i>Serinus serinus</i>	<i>Passer domesticus</i>	<i>Emberiza schoeniclus</i>
<i>Picus canus</i>	<i>Streptopelia decaocto</i>	<i>Passer montanus</i>	<i>Falco columbarius</i>
<i>Picus viridis</i>	<i>Streptopelia turtur</i>	<i>Pastor roseus</i>	<i>Falco subbuteo</i>
<i>Prunella modularis</i>	<i>Strix aluco</i>	<i>Perdix perdix</i>	<i>Falco tinnunculus</i>
<i>Saxicola rubetra</i>	<i>Sturnus roseus</i>	<i>Pernis apivorus</i>	<i>Falco vespertinus</i>
<i>Saxicola torquatus</i>	<i>Sturnus vulgaris</i>	<i>Phasianus colchius</i>	<i>Ficedula parva</i>
<i>Serinus serinus</i>	<i>Sylvia atricapilla</i>	<i>Phylloscopus collybita</i>	<i>Fringilla coelebs</i>
<i>Sitta europaea</i>	<i>Turdus merula</i>	<i>Phylloscopus sibilatrix</i>	<i>Fringilla montifringilla</i>
<i>Streptopelia decaocto</i>	<i>Turdus philomelos</i>	<i>Pica pica</i>	<i>Fulica atra</i>
<i>Streptopelia turtur</i>	<i>Turdus pilaris</i>	<i>Riparia riparia</i>	<i>Galerida cristata</i>
<i>Strix aluco</i>	<i>Upupa epops</i>	<i>Saxicola rubetra</i>	<i>Gallinago gallinago</i>
<i>Sturnus vulgaris</i>		<i>Serinus serinus</i>	<i>Gallinula chloropus</i>
<i>Sylvia atricapilla</i>		<i>Streptopelia decaocto</i>	<i>Gavia arctica</i>
<i>Sylvia curruca</i>		<i>Streptopelia turtur</i>	<i>Glareola pratincola</i>
<i>Sylvia nisoria</i>		<i>Strix aluco</i>	<i>Haematopus</i>
<i>Troglodytes</i>		<i>Sylvia atricapilla</i>	<i>ostralegus</i>
<i>troglodytes</i>		<i>Sylvia curruca</i>	<i>Haliaeetus albicilla</i>
<i>Turdus iliacus</i>		<i>Sylvia nisoria</i>	<i>Himantopus</i>
<i>Turdus merula</i>		<i>Troglodytes troglodytes</i>	<i>himantopus</i>
<i>Turdus philomelos</i>		<i>Turdus merula</i>	<i>Hirundo rustica</i>
<i>Turdus pilaris</i>		<i>Turdus philomelos</i>	<i>Hydrocoleus minutus</i>
<i>Turdus viscivorus</i>		<i>Turdus pilaris</i>	<i>Ixobrychus minutus</i>
<i>Upupa epops</i>		<i>Upupa epops</i>	<i>Lanius collurio</i>
			<i>Larus canus</i>
			<i>Larus melanocephalus</i>
			<i>Larus michaelis</i>
			<i>Limosa limosa</i>
			<i>Locustella fluviatilis</i>
			<i>Locustella luscinioides</i>
			<i>Luscinia</i>
			<i>megarhynchos</i>
			<i>Mergus albellus</i>
			<i>Merops apiaster</i>
			<i>Milvus migrans</i>
			<i>Motacilla alba</i>
			<i>Motacilla cinerea</i>
			<i>Motacilla flava</i>
			<i>Muscicapa striata</i>

SI 1 (spring area)	SI 2 (downstream Sl. Rusă)	SI 3 (downstream Caugagia)	SI 4 (discharge area)
			<i>Netta rufina</i> <i>Numenius arquata</i> <i>Nycticorax nycticorax</i> <i>Oriolus oriolus</i> <i>Parus caeruleus</i> <i>Parus cristatus</i> <i>Parus major</i> <i>Passer domesticus</i> <i>Passer montanus</i> <i>Pelecanus crispus</i> <i>Pelecanus onocrotalus</i> <i>Phalacrocorax carbo</i> <i>Phalacrocorax</i> <i>pygmeus</i> <i>Phalaropus lobatus</i> <i>Phasianus colchius</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus</i> <i>phoenicurus</i> <i>Phylomachus pugnax</i> <i>Pica pica</i> <i>Platalea leucorodia</i> <i>Plegadis falcinelles</i> <i>Podiceps cristatus</i> <i>Podiceps griseogen</i> <i>Podiceps nigricollis</i> <i>Porzana parva</i> <i>Porzana porzana</i> <i>Rallus aquaticus</i> <i>Recurvirostra avosetta</i> <i>Regulus ignicapilus</i> <i>Remiz pendulinus</i> <i>Riparia riparia</i> <i>Saxicola rubetra</i> <i>Sterna albifrons</i> <i>Sterna caspia</i> <i>Sterna hirundo</i> <i>Sterna nilotica</i> <i>Sturnus vulgaris</i> <i>Tachybaptus rufficollis</i> <i>Tadorna ferruginea</i> <i>Tadorna tadorna</i> <i>Tringa erythropus</i> <i>Tringa glareola</i> <i>Tringa nebularia</i> <i>Tringa ochropus</i> <i>Tringa stagnatilis</i> <i>Tringa totanus</i> <i>Upupa epops</i> <i>Vanellus vanellus</i>
Total number of species per station			
84	75	84	143

Tabel 5. List of the bird species identified along the Ciucurova Tributary
 Tabelul 5. Lista speciilor de păsări identificate pe cursul afluentului Ciucurova

Ci1 (spring area)	Ci2 (Monte Greco Oil Station)
<i>Accipiter gentilis</i>	<i>Accipiter gentilis</i>
<i>Accipiter nisus</i>	<i>Accipiter nisus</i>
<i>Actitis hipoleucos</i>	<i>Actitis hipoleucos</i>
<i>Alauda arvensis</i>	<i>Alauda arvensis</i>
<i>Anthus campestris</i>	<i>Anthus campestris</i>
<i>Anthus trivialis</i>	<i>Anthus trivialis</i>
<i>Clanga pomarina</i>	<i>Aquila pennata</i>
<i>Asio otus</i>	<i>Athene noctua</i>
<i>Athene noctua</i>	<i>Buteo buteo</i>
<i>Buteo buteo</i>	<i>Buteo lagopus</i>
<i>Buteo lagopus</i>	<i>Carduelis cannabina</i>
<i>Caprimulgus europaeus</i>	<i>Carduelis carduelis</i>
<i>Carduelis cannabina</i>	<i>Carduelis chloris</i>
<i>Carduelis carduelis</i>	<i>Carduelis spinus</i>
<i>Carduelis chloris</i>	<i>Certhia familiaris</i>
<i>Carduelis spinus</i>	<i>Ciconia ciconia</i>
<i>Certhia familiaris</i>	<i>Circaetus gallicus</i>
<i>Ciconia ciconia</i>	<i>Circus cyaneus</i>
<i>Circaetus gallicus</i>	<i>Circus macrourus</i>
<i>Circus cyaneus</i>	<i>Clanga pomarina</i>
<i>Circus macrourus</i>	<i>Coccothraustes coccothraustes</i>
<i>Coccothraustes coccothraustes</i>	<i>Columba oenas</i>
<i>Columba oenas</i>	<i>Columba palumbus</i>
<i>Columba palumbus</i>	<i>Coracias garrulus</i>
<i>Coracias garrulus</i>	<i>Corvus corone</i>
<i>Corvus corone cornix</i>	<i>Corvus frugilegus</i>
<i>Corvus frugilegus</i>	<i>Corvus monedula</i>
<i>Corvus monedula</i>	<i>Cuculus canorus</i>
<i>Cuculus canorus</i>	<i>Dendrocopos medius</i>
<i>Dendrocopos major</i>	<i>Dendrocopos minor</i>
<i>Dendrocopos medius</i>	<i>Dendrocopos syriacus</i>
<i>Dendrocopos minor</i>	<i>Emberiza calandra</i>
<i>Dendrocopos syriacus</i>	<i>Emberiza citrinella</i>
<i>Dryocopus martius</i>	<i>Emberiza hortulana</i>
<i>Emberiza calandra</i>	<i>Erithacus rubecula</i>
<i>Emberiza citrinella</i>	<i>Falco columbarius</i>
<i>Emberiza hortulana</i>	<i>Falco subbuteo</i>
<i>Erithacus rubecula</i>	<i>Falco tinnunculus</i>
<i>Falco columbarius</i>	<i>Falco vespertinus</i>
<i>Falco subbuteo</i>	<i>Ficedula albicollis</i>
<i>Falco tinnunculus</i>	<i>Ficedula parva</i>
<i>Falco vespertinus</i>	<i>Fringilla coelebs</i>
<i>Ficedula albicollis</i>	<i>Fringilla montifringilla</i>
<i>Ficedula parva</i>	<i>Galerida cristata</i>
<i>Fringilla coelebs</i>	<i>Garrulus glandarius</i>
<i>Fringilla montifringilla</i>	<i>Hippolais pallida</i>
<i>Galerida cristata</i>	<i>Hirundo rustica</i>
<i>Garrulus glandarius</i>	<i>Lanius collurio</i>
<i>Hippolais pallida</i>	<i>Lanius minor</i>
<i>Hirundo rustica</i>	<i>Lullula arborea</i>
	<i>Luscinia megarhynchos</i>

Ci1 (spring area)	Ci2 (Monte Greco Oil Station)
<i>Lanius collurio</i> <i>Lanius isabellinus</i> <i>Lanius minor</i> <i>Lullula arborea</i> <i>Luscinia megarhynchos</i> <i>Merops apiaster</i> <i>Milvus migrans</i> <i>Motacilla alba</i> <i>Motacilla cinerea</i> <i>Motacilla flava</i> <i>Muscicapa striata</i> <i>Oenanthe oenanthe</i> <i>Oriolus oriolus</i> <i>Otus scops</i> <i>Parus caeruleus</i> <i>Parus lugubris</i> <i>Parus major</i> <i>Passer domesticus</i> <i>Pernis apivorus</i> <i>Phasianus colchius</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus phoenicurus</i> <i>Phylloscopus collybita</i> <i>Phylloscopus sibilatrix</i> <i>Phylloscopus trochilus</i> <i>Pica pica</i> <i>Picus canus</i> <i>Prunella modularis</i> <i>Pyrrhula pyrrhula</i> <i>Serinus serinus</i> <i>Sitta europaea</i> <i>Streptopelia decaocto</i> <i>Streptopelia turtur</i> <i>Strix aluco</i> <i>Sturnus vulgaris</i> <i>Sylvia atricapilla</i> <i>Sylvia communis</i> <i>Sylvia curruca</i> <i>Sylvia nisoria</i> <i>Troglodytes troglodytes</i> <i>Turdus iliacus</i> <i>Turdus merula</i> <i>Turdus philomelos</i> <i>Turdus pilaris</i> <i>Turdus viscivorus</i> <i>Upupa epops</i>	<i>Merops apiaster</i> <i>Milvus migrans</i> <i>Motacilla alba</i> <i>Motacilla cinerea</i> <i>Motacilla flava</i> <i>Muscicapa striata</i> <i>Oenanthe oenanthe</i> <i>Oriolus oriolus</i> <i>Otus scops</i> <i>Parus caeruleus</i> <i>Parus lugubris</i> <i>Parus major</i> <i>Passer domesticus</i> <i>Pernis apivorus</i> <i>Phasianus colchius</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus phoenicurus</i> <i>Phylloscopus collybita</i> <i>Phylloscopus sibilatrix</i> <i>Pica pica</i> <i>Picus canus</i> <i>Prunella modularis</i> <i>Pyrrhula pyrrhula</i> <i>Serinus serinus</i> <i>Sitta europaea</i> <i>Streptopelia decaocto</i> <i>Streptopelia turtur</i> <i>Sturnus vulgaris</i> <i>Sylvia atricapilla</i> <i>Sylvia curruca</i> <i>Troglodytes troglodytes</i> <i>Turdus iliacus</i> <i>Turdus merula</i> <i>Turdus philomelos</i> <i>Turdus pilaris</i> <i>Turdus viscivorus</i> <i>Upupa epops</i>
Total number of species per station	
97	88

Tabel 6. List of the bird species observed along the Taița River
 Tabelul 6. Lista speciilor de păsări observate pe cursul râului Taița

Ta1 (spring area)	Ta2 (confluence with Pârłita tributary)	Ta3 (Consul Hill)	Ta4 (discharge area)
<i>Ciconia ciconia</i>	<i>Ciconia nigra</i>	<i>Egretta garzetta</i>	<i>Phalacrocorax carbo</i>
<i>Pernis apivorus</i>	<i>Ciconia ciconia</i>	<i>Ardea cinerea</i>	<i>Phalacrocorax</i>
<i>Milvus migrans</i>	<i>Pernis apivorus</i>	<i>Ciconia nigra</i>	<i>pygmeus</i>
<i>Circaetus gallicus</i>	<i>Milvus migrans</i>	<i>Ciconia ciconia</i>	<i>Pelecanus onocrotalus</i>
<i>Circus cyaneus</i>	<i>Circaetus gallicus</i>	<i>Anser anser</i>	<i>Pelecanus crispus</i>
<i>Circus macrourus</i>	<i>Circus aeruginosus</i>	<i>Anas platyrhynchos</i>	<i>Botaurus stellaris</i>
<i>Accipiter gentilis</i>	<i>Circus cyaneus</i>	<i>Pernis apivorus</i>	<i>Ixobrychus minutus</i>
<i>Accipiter nisus</i>	<i>Accipiter nisus</i>	<i>Milvus migrans</i>	<i>Nycticorax nycticorax</i>
<i>Buteo buteo</i>	<i>Buteo buteo</i>	<i>Haliaeetus albicilla</i>	<i>Ardeola ralloides</i>
<i>Buteo lagopus</i>	<i>Buteo lagopus</i>	<i>Circaetus gallicus</i>	<i>Egretta garzetta</i>
<i>Clanga pomarina</i>	<i>Clanga pomarina</i>	<i>Circus aeruginosus</i>	<i>Egretta alba</i>
<i>Aquila pennata</i>	<i>Hiraaetus pennatus</i>	<i>Circus cyaneus</i>	<i>Ardea cinerea</i>
<i>Falco tinnunculus</i>	<i>Falco tinnunculus</i>	<i>Circus macrourus</i>	<i>Ardea purpurea</i>
<i>Falco vespertinus</i>	<i>Falco vespertinus</i>	<i>Accipiter nisus</i>	<i>Ciconia nigra</i>
<i>Falco columbarius</i>	<i>Falco columbarius</i>	<i>Buteo buteo</i>	<i>Ciconia ciconia</i>
<i>Falco subbuteo</i>	<i>Falco subbuteo</i>	<i>Buteo rufinus</i>	<i>Plegadis falcinellus</i>
<i>Phasianus colchius</i>	<i>Perdix perdix</i>	<i>Buteo lagopus</i>	<i>Platalea leucorodia</i>
<i>Actitis hipoleucos</i>	<i>Phasianus colchius</i>	<i>Clanga pomarina</i>	<i>Cygnus olor</i>
<i>Columba oenas</i>	<i>Columba palumbus</i>	<i>Aquila pennata</i>	<i>Cygnus cygnus</i>
<i>Columba palumbus</i>	<i>Streptopelia decaocto</i>	<i>Falco tinnunculus</i>	<i>Anser albifrons</i>
<i>Streptopelia decaocto</i>	<i>Streptopelia turtur</i>	<i>Falco vespertinus</i>	<i>Anser anser</i>
<i>Streptopelia turtur</i>	<i>Cuculus canorus</i>	<i>Falco columbarius</i>	<i>Branta ruficollis</i>
<i>Cuculus canorus</i>	<i>Otus scops</i>	<i>Falco subbuteo</i>	<i>Tadorna ferruginea</i>
<i>Otus scops</i>	<i>Athene noctua</i>	<i>Perdix perdix</i>	<i>Tadorna tadorna</i>
<i>Athene noctua</i>	<i>Strix aluco</i>	<i>Coturnix coturnix</i>	<i>Anas penelope</i>
<i>Strix aluco</i>	<i>Asio otus</i>	<i>Phasianus colchius</i>	<i>Anas strepera</i>
<i>Asio otus</i>	<i>Caprimulgus europaeus</i>	<i>Burhinus oedicephalus</i>	<i>Anas crecca</i>
<i>Caprimulgus</i>	<i>Merops apiaster</i>	<i>Vanellus vanellus</i>	<i>Anas platyrhynchos</i>
<i>europaeus</i>	<i>Coracias garrulus</i>	<i>Actitis hipoleucos</i>	<i>Anas acuta</i>
<i>Merops apiaster</i>	<i>Upupa epops</i>	<i>Larus ridibundus</i>	<i>Anas querquedula</i>
<i>Coracias garrulus</i>	<i>Picus canus</i>	<i>Streptopelia decaocto</i>	<i>Anas clypeata</i>
<i>Upupa epops</i>	<i>Dendrocopos medius</i>	<i>Streptopelia turtur</i>	<i>Netta rufina</i>
<i>Picus canus</i>	<i>Dendrocopos minor</i>	<i>Cuculus canorus</i>	<i>Aythya ferina</i>
<i>Dryocopus martius</i>	<i>Galerida cristata</i>	<i>Athene noctua</i>	<i>Aythya nyroca</i>
<i>Dendrocopos major</i>	<i>Alauda arvensis</i>	<i>Merops apiaster</i>	<i>Aythya fuligula</i>
<i>Dendrocopos syriacus</i>	<i>Hirundo rustica</i>	<i>Coracias garrulus</i>	<i>Mergus albellus</i>
<i>Dendrocopos medius</i>	<i>Delichon urbicum</i>	<i>Upupa epops</i>	<i>Milvus migrans</i>
<i>Dendrocopos minor</i>	<i>Anthus campestris</i>	<i>Melanocorypha</i>	<i>Haliaeetus albicilla</i>
<i>Galerida cristata</i>	<i>Motacilla flava</i>	<i>calandra</i>	<i>Circus aeruginosus</i>
<i>Lullula arborea</i>	<i>Motacilla cinerea</i>	<i>Galerida cristata</i>	<i>Circus cyaneus</i>
<i>Alauda arvensis</i>	<i>Motacilla alba</i>	<i>Alauda arvensis</i>	<i>Circus macrourus</i>
<i>Hirundo rustica</i>	<i>Erithacus rubecula</i>	<i>Riparia riparia</i>	<i>Accipiter nisus</i>
<i>Anthus campestris</i>	<i>Luscinia megarhynchos</i>	<i>Hirundo rustica</i>	<i>Buteo lagopus</i>
<i>Anthus trivialis</i>	<i>Oenanthe oenanthe</i>	<i>Delichon urbicum</i>	<i>Clanga pomarina</i>
<i>Motacilla flava</i>	<i>Turdus merula</i>	<i>Anthus campestris</i>	<i>Clanga clanga</i>
<i>Motacilla cinerea</i>	<i>Turdus pilaris</i>	<i>Motacilla flava</i>	<i>Aquilapennata</i>
<i>Motacilla alba</i>	<i>Turdus philomelos</i>	<i>Motacilla cinerea</i>	<i>Falco tinnunculus</i>
<i>Troglodytes</i>	<i>Sylvia atricapilla</i>	<i>Motacilla alba</i>	<i>Falco vespertinus</i>
<i>troglodytes</i>	<i>Phylloscopus sibilatrix</i>	<i>Troglodytes troglodytes</i>	<i>Falco columbarius</i>

<i>Prunella modularis</i> <i>Erithacus rubecula</i> <i>Luscinia</i> <i>megarhynchos</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus</i> <i>phoenicurus</i> <i>Oenanthe oenanthe</i> <i>Turdus merula</i> <i>Turdus pilaris</i> <i>Turdus philomelos</i> <i>Turdus iliacus</i> <i>Turdus viscivorus</i> <i>Hippolais pallida</i> <i>Sylvia nisoria</i> <i>Sylvia curruca</i> <i>Sylvia communis</i> <i>Sylvia atricapilla</i> <i>Phylloscopus sibilatrix</i> <i>Phylloscopus collybita</i> <i>Phylloscopus trochilus</i> <i>Muscicapa striata</i> <i>Ficedula parva</i> <i>Ficedula albicollis</i> <i>Parus lugubris</i> <i>Parus caeruleus</i> <i>Parus major</i> <i>Sitta europaea</i> <i>Certhia familiaris</i> <i>Oriolus oriolus</i> <i>Lanius collurio</i> <i>Lanius minor</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Corvus monedula</i> <i>Corvus frugilegus</i> <i>Corvus corone</i> <i>Sturnus vulgaris</i> <i>Passer domesticus</i> <i>Fringilla coelebs</i> <i>Fringilla montifringilla</i> <i>Serinus serinus</i> <i>Carduelis chloris</i> <i>Carduelis carduelis</i> <i>Carduelis spinus</i> <i>Carduelis cannabina</i> <i>Pyrrhula pyrrhula</i> <i>Coccothraustes</i> <i>coccothraustes</i> <i>Emberiza citrinella</i> <i>Emberiza hortulana</i> <i>Emberiza calandra</i>	<i>Phylloscopus collybita</i> <i>Phylloscopus trochilus</i> <i>Ficedula parva</i> <i>Parus caeruleus</i> <i>Parus major</i> <i>Oriolus oriolus</i> <i>Lanius collurio</i> <i>Lanius minor</i> <i>Garrulus glandarius</i> <i>Pica pica</i> <i>Corvus monedula</i> <i>Corvus frugilegus</i> <i>Corvus corone</i> <i>Sturnus vulgaris</i> <i>Sturnus roseus</i> <i>Passer domesticus</i> <i>Passer montanus</i> <i>Fringilla coelebs</i> <i>Fringilla montifringilla</i> <i>Serinus serinus</i> <i>Carduelis chloris</i> <i>Carduelis carduelis</i> <i>Carduelis spinus</i> <i>Carduelis cannabina</i> <i>Coccothraustes</i> <i>coccothraustes</i> <i>Emberiza calandra</i>	<i>Erithacus rubecula</i> <i>Luscinia megarhynchos</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus</i> <i>phoenicurus</i> <i>Saxicola rubetra</i> <i>Oenanthe isabellina</i> <i>Oenanthe oenanthe</i> <i>Turdus merula</i> <i>Acrocephalus</i> <i>arundinaceus</i> <i>Hippolais pallida</i> <i>Phylloscopus collybita</i> <i>Parus caeruleus</i> <i>Parus major</i> <i>Oriolus oriolus</i> <i>Lanius collurio</i> <i>Lanius minor</i> <i>Pica pica</i> <i>Corvus monedula</i> <i>Corvus frugilegus</i> <i>Corvus corone</i> <i>Sturnus vulgaris</i> <i>Passer domesticus</i> <i>Passer montanus</i> <i>Fringilla coelebs</i> <i>Fringilla montifringilla</i> <i>Serinus serinus</i> <i>Carduelis chloris</i> <i>Carduelis carduelis</i> <i>Carduelis spinus</i> <i>Emberiza hortulana</i> <i>Emberiza</i> <i>melanocephala</i> <i>Emberiza calandra</i>	<i>Falco subbuteo</i> <i>Phasianus colchicus</i> <i>Rallus aquaticus</i> <i>Porzana porzana</i> <i>Porzana parva</i> <i>Gallinula chloropus</i> <i>Fulica atra</i> <i>Haematopus</i> <i>ostralegus</i> <i>Himantopus</i> <i>himantopus</i> <i>Recurvirostra avosetta</i> <i>Glaucopis pratensis</i> <i>Charadrius dubius</i> <i>Charadrius</i> <i>alexandrinus</i> <i>Vanellus vanellus</i> <i>Calidris alba</i> <i>Calidris minima</i> <i>Calidris ferruginea</i> <i>Calidris alpina</i> <i>Phylomachus pugnax</i> <i>Gallinago gallinago</i> <i>Limosa limosa</i> <i>Numenius arquata</i> <i>Tringa erythropus</i> <i>Tringa totanus</i> <i>Tringa stagnatilis</i> <i>Tringa nebularia</i> <i>Tringa ochropus</i> <i>Tringa glareola</i> <i>Actitis hypoleucos</i> <i>Phalaropus lobatus</i> <i>Larus melanocephalus</i> <i>Larus minutus</i> <i>Larus ridibundus</i> <i>Larus canus</i> <i>Larus michaelis</i> <i>Sterna nilotica</i> <i>Sterna caspia</i> <i>Sterna hirundo</i> <i>Sterna albifrons</i> <i>Chlidonias hybrida</i> <i>Chlidonias niger</i> <i>Chlidonias leucopterus</i> <i>Cuculus canorus</i> <i>Athene noctua</i> <i>Alcedo atthis</i> <i>Merops apiaster</i> <i>Coracias garrulus</i> <i>Upupa epops</i> <i>Dendrocopos syriacus</i> <i>Dendrocopos medius</i> <i>Galerida cristata</i> <i>Alauda arvensis</i> <i>Riparia riparia</i> <i>Hirundo rustica</i>
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			<i>Anthus campestris</i> <i>Motacilla flava</i> <i>Motacilla cinerea</i> <i>Motacilla alba</i> <i>Luscinia megarhynchos</i> <i>Phoenicurus ochruros</i> <i>Phoenicurus</i> <i>phoenicurus</i> <i>Saxicola rubetra</i> <i>Locustella fluviatilis</i> <i>Locustella luscinioides</i> <i>Acrocephalus</i> <i>schoenobaenus</i> <i>Acrocephalus palustris</i> <i>Acrocephalus</i> <i>scripaceus</i> <i>Acrocephalus</i> <i>arundinaceus</i> <i>Regulus ignicapilus</i> <i>Muscicapa striata</i> <i>Ficedula parva</i> <i>Aegithalos caudatus</i> <i>Parus cristatus</i> <i>Parus caeruleus</i> <i>Parus major</i> <i>Remiz pendulinus</i> <i>Oriolus oriolus</i> <i>Lanius collurio</i> <i>Pica pica</i> <i>Corvus monedula</i> <i>Corvus frugilegus</i> <i>Corvus corone</i> <i>Sturnus vulgaris</i> <i>Passer domesticus</i> <i>Passer montanus</i> <i>Fringilla coelebs</i> <i>Fringilla montifringilla</i> <i>Serinus serinus</i> <i>Carduelis chloris</i> <i>Carduelis carduelis</i> <i>Carduelis spinus</i> <i>Carduelis cannabina</i> <i>Emberiza schoeniclus</i> <i>Emberiza calandra</i>
Total number of species per station			
96	75	81	142

Tabel 7. List of the bird species observed along the Telița River
 Tabelul 7. Lista speciilor de păsări observate pe cursul râului Telița

Te1 (spring area)	Te2 (confluence with Celic Dere tributary)	Te3 (Water Mill)	Te4 (discharge area)
<i>Circus cyaneus</i>	<i>Ciconia ciconia</i>	<i>Ciconia nigra</i>	<i>Phalacrocorax carbo</i>
<i>Circus macrourus</i>	<i>Pernis apivorus</i>	<i>Ciconia ciconia</i>	<i>Phalacrocorax</i>
<i>Accipiter gentilis</i>	<i>Milvus migrans</i>	<i>Pernis apivorus</i>	<i>pygmeus</i>
<i>Accipiter nisus</i>	<i>Circaetus gallicus</i>	<i>Milvus migrans</i>	<i>Pelecanus onocrotalus</i>
<i>Buteo buteo</i>	<i>Circus cyaneus</i>	<i>Circaetus gallicus</i>	<i>Pelecanus crispus</i>
<i>Buteo lagopus</i>	<i>Circus macrourus</i>	<i>Circus aeruginosus</i>	<i>Botaurus stellaris</i>
<i>Clanga pomarina</i>	<i>Accipiter gentilis</i>	<i>Circus cyaneus</i>	<i>Ixobrychus minutus</i>
<i>Aquila pennata</i>	<i>Accipiter nisus</i>	<i>Accipiter nisus</i>	<i>Nycticorax nycticorax</i>
<i>Falco tinnunculus</i>	<i>Buteo buteo</i>	<i>Buteo buteo</i>	<i>Ardeola ralloides</i>
<i>Falco vespertinus</i>	<i>Buteo lagopus</i>	<i>Buteo lagopus</i>	<i>Egretta garzetta</i>
<i>Falco columbarius</i>	<i>Clanga pomarina</i>	<i>Clanga pomarina</i>	<i>Egretta alba</i>
<i>Falco subbuteo</i>	<i>Aquila pennata</i>	<i>Aquila pennata</i>	<i>Ardea cinerea</i>
<i>Phasianus colchius</i>	<i>Falco tinnunculus</i>	<i>Falco tinnunculus</i>	<i>Ardea purpurea</i>
<i>Actitis hipoleucos</i>	<i>Falco vespertinus</i>	<i>Falco vespertinus</i>	<i>Ciconia nigra</i>
<i>Columba oenas</i>	<i>Falco columbarius</i>	<i>Falco columbarius</i>	<i>Ciconia ciconia</i>
<i>Columba palumbus</i>	<i>Falco subbuteo</i>	<i>Falco subbuteo</i>	<i>Plegadis falcinelles</i>
<i>Streptopelia decaocto</i>	<i>Phasianus colchius</i>	<i>Perdix perdix</i>	<i>Platalea leucorodia</i>
<i>Streptopelia turtur</i>	<i>Actitis hipoleucos</i>	<i>Phasianus colchius</i>	<i>Anser albifrons</i>
<i>Cuculus canorus</i>	<i>Columba oenas</i>	<i>Columba palumbus</i>	<i>Anser anser</i>
<i>Athene noctua</i>	<i>Columba palumbus</i>	<i>Streptopelia decaocto</i>	<i>Anas strepera</i>
<i>Strix aluco</i>	<i>Streptopelia decaocto</i>	<i>Streptopelia turtur</i>	<i>Anas crecca</i>
<i>Merops apiaster</i>	<i>Streptopelia turtur</i>	<i>Cuculus canorus</i>	<i>Anas platyrhynchos</i>
<i>Coracias garrulus</i>	<i>Cuculus canorus</i>	<i>Athene noctua</i>	<i>Anas querquedula</i>
<i>Upupa epops</i>	<i>Otus scops</i>	<i>Strix aluco</i>	<i>Aythya nyroca</i>
<i>Picus canus</i>	<i>Athene noctua</i>	<i>Asio otus</i>	<i>Milvus migrans</i>
<i>Dryocopus martius</i>	<i>Merops apiaster</i>	<i>Caprimulgus europaeus</i>	<i>Haliaeetus albicilla</i>
<i>Dendrocopos major</i>	<i>Coracias garrulus</i>	<i>Merops apiaster</i>	<i>Circus aeruginosus</i>
<i>Dendrocopos syriacus</i>	<i>Upupa epops</i>	<i>Coracias garrulus</i>	<i>Circus cyaneus</i>
<i>Dendrocopos medius</i>	<i>Picus canus</i>	<i>Upupa epops</i>	<i>Circus macrourus</i>
<i>Dendrocopos minor</i>	<i>Dendrocopos syriacus</i>	<i>Picus canus</i>	<i>Accipiter nisus</i>
<i>Lullula arborea</i>	<i>Dendrocopos medius</i>	<i>Dendrocopos medius</i>	<i>Buteo lagopus</i>
<i>Troglodytes</i>	<i>Dendrocopos minor</i>	<i>Dendrocopos minor</i>	<i>Clanga pomarina</i>
<i>troglodytes</i>	<i>Galerida cristata</i>	<i>Galerida cristata</i>	<i>Aquila clanga</i>
<i>Prunella modularis</i>	<i>Lullula arborea</i>	<i>Alauda arvensis</i>	<i>Hiraaetus pennatus</i>
<i>Erithacus rubecula</i>	<i>Alauda arvensis</i>	<i>Hirundo rustica</i>	<i>Falco tinnunculus</i>
<i>Luscinia</i>	<i>Hirundo rustica</i>	<i>Delichon urbicum</i>	<i>Falco vespertinus</i>
<i>megarhynchos</i>	<i>Anthus campestris</i>	<i>Anthus campestris</i>	<i>Falco columbarius</i>
<i>Phoenicurus ochruros</i>	<i>Anthus trivialis</i>	<i>Motacilla flava</i>	<i>Falco subbuteo</i>
<i>Phoenicurus</i>	<i>Motacilla flava</i>	<i>Motacilla cinerea</i>	<i>Phasianus colchius</i>
<i>phoenicurus</i>	<i>Motacilla cinerea</i>	<i>Motacilla alba</i>	<i>Rallus aquaticus</i>
<i>Turdus merula</i>	<i>Motacilla alba</i>	<i>Erithacus rubecula</i>	<i>Gallinula chloropus</i>
<i>Turdus pilaris</i>	<i>Troglodytes troglodytes</i>	<i>Luscinia megarhynchos</i>	<i>Fulica atra</i>
<i>Turdus philomelos</i>	<i>Prunella modularis</i>	<i>Oenanthe oenanthe</i>	<i>Charadrius</i>
<i>Turdus iliacus</i>	<i>Erithacus rubecula</i>	<i>Turdus merula</i>	<i>alexandrinus</i>
<i>Turdus viscivorus</i>	<i>Luscinia megarhynchos</i>	<i>Turdus pilaris</i>	<i>Vanellus vanellus</i>
<i>Hippolais pallida</i>	<i>Phoenicurus ochruros</i>	<i>Turdus philomelos</i>	<i>Calidris alba</i>
<i>Sylvia nisoria</i>	<i>Phoenicurus</i>	<i>Sylvia atricapilla</i>	<i>Calidris minutus</i>
<i>Sylvia curruca</i>	<i>phoenicurus</i>	<i>Phylloscopus sibilatrix</i>	<i>Calidris ferruginea</i>
<i>Sylvia communis</i>	<i>Oenanthe oenanthe</i>	<i>Phylloscopus collybita</i>	<i>Calidris alpina</i>
<i>Sylvia atricapilla</i>	<i>Turdus merula</i>	<i>Phylloscopus trochilus</i>	<i>Phylomachus pugnax</i>

<i>Phylloscopus sibilatrix</i>	<i>Turdus pilaris</i>	<i>Ficedula parva</i>	<i>Gallinago gallinago</i>
<i>Phylloscopus collybita</i>	<i>Turdus philomelos</i>	<i>Parus caeruleus</i>	<i>Limosa limosa</i>
<i>Phylloscopus trochilus</i>	<i>Turdus iliacus</i>	<i>Parus major</i>	<i>Numenius arquata</i>
<i>Muscicapa striata</i>	<i>Turdus viscivorus</i>	<i>Oriolus oriolus</i>	<i>Tringa erythropus</i>
<i>Ficedula parva</i>	<i>Hippolais pallida</i>	<i>Lanius collurio</i>	<i>Tringa totanus</i>
<i>Ficedula albicollis</i>	<i>Sylvia curruca</i>	<i>Lanius minor</i>	<i>Tringa nebularia</i>
<i>Parus lugubris</i>	<i>Sylvia atricapilla</i>	<i>Garrulus glandarius</i>	<i>Tringa ochropus</i>
<i>Parus caeruleus</i>	<i>Phylloscopus sibilatrix</i>	<i>Pica pica</i>	<i>Tringa glareola</i>
<i>Parus major</i>	<i>Phylloscopus collybita</i>	<i>Corvus monedula</i>	<i>Actitis hipoleucos</i>
<i>Sitta europaea</i>	<i>Muscicapa striata</i>	<i>Corvus frugilegus</i>	<i>Larus ridibundus</i>
<i>Certhia familiaris</i>	<i>Ficedula parva</i>	<i>Corvus corone</i>	<i>Larus michaelis</i>
<i>Oriolus oriolus</i>	<i>Ficedula albicollis</i>	<i>Sturnus vulgaris</i>	<i>Sterna nilotica</i>
<i>Lanius collurio</i>	<i>Parus lugubris</i>	<i>Sturnus roseus</i>	<i>Sterna hirundo</i>
<i>Lanius minor</i>	<i>Parus caeruleus</i>	<i>Passer domesticus</i>	<i>Sterna albifrons</i>
<i>Garrulus glandarius</i>	<i>Parus major</i>	<i>Passer montanus</i>	<i>Chlidonias hybrida</i>
<i>Corvus frugilegus</i>	<i>Sitta europaea</i>	<i>Fringilla coelebs</i>	<i>Chlidonias niger</i>
<i>Corvus corone</i>	<i>Certhia familiaris</i>	<i>Fringilla montifringilla</i>	<i>Chlidonias leucopterus</i>
<i>Sturnus vulgaris</i>	<i>Oriolus oriolus</i>	<i>Serinus serinus</i>	<i>Cuculus canorus</i>
<i>Passer domesticus</i>	<i>Lanius collurio</i>	<i>Carduelis chloris</i>	<i>Athene noctua</i>
<i>Fringilla coelebs</i>	<i>Lanius minor</i>	<i>Carduelis carduelis</i>	<i>Alcedo atthis</i>
<i>Fringilla montifringilla</i>	<i>Garrulus glandarius</i>	<i>Carduelis spinus</i>	<i>Merops apiaster</i>
<i>Serinus serinus</i>	<i>Pica pica</i>	<i>Carduelis cannabina</i>	<i>Coracias garrulus</i>
<i>Carduelis chloris</i>	<i>Corvus monedula</i>	<i>Coccothraustes</i>	<i>Upupa epops</i>
<i>Carduelis carduelis</i>	<i>Corvus frugilegus</i>	<i>coccothraustes</i>	<i>Dendrocopos syriacus</i>
<i>Carduelis spinus</i>	<i>Corvus corone</i>	<i>Emberiza calandra</i>	<i>Dendrocopos medius</i>
<i>Carduelis cannabina</i>	<i>Sturnus vulgaris</i>		<i>Galerida cristata</i>
<i>Pyrrhula pyrrhula</i>	<i>Passer domesticus</i>		<i>Alauda arvensis</i>
<i>Coccothraustes</i>	<i>Fringilla coelebs</i>		<i>Riparia riparia</i>
<i>coccothraustes</i>	<i>Fringilla montifringilla</i>		<i>Hirundo rustica</i>
<i>Emberiza citrinella</i>	<i>Serinus serinus</i>		<i>Anthus campestris</i>
<i>Emberiza hortulana</i>	<i>Carduelis chloris</i>		<i>Motacilla flava</i>
<i>Emberiza calandra</i>	<i>Carduelis carduelis</i>		<i>Motacilla cinerea</i>
	<i>Carduelis spinus</i>		<i>Motacilla alba</i>
	<i>Carduelis cannabina</i>		<i>Luscinia</i>
	<i>Pyrrhula pyrrhula</i>		<i>megarhynchos</i>
	<i>Coccothraustes</i>		<i>Phoenicurus ochruros</i>
	<i>coccothraustes</i>		<i>Phoenicurus</i>
	<i>Emberiza citrinella</i>		<i>phoenicurus</i>
	<i>Emberiza hortulana</i>		<i>Saxicola rubetra</i>
	<i>Emberiza calandra</i>		<i>Locustella fluviatilis</i>
			<i>Locustella luscinioides</i>
			<i>Acrocephalus</i>
			<i>schoenobaenus</i>
			<i>Acrocephalus palustris</i>
			<i>Acrocephalus</i>
			<i>scripaceus</i>
			<i>Acrocephalus</i>
			<i>arundinaceus</i>
			<i>Muscicapa striata</i>
			<i>Ficedula parva</i>
			<i>Parus caeruleus</i>
			<i>Parus major</i>
			<i>Oriolus oriolus</i>
			<i>Lanius collurio</i>
			<i>Pica pica</i>
			<i>Corvus monedula</i>
			<i>Corvus frugilegus</i>

			<i>Corvus corone</i> <i>Sturnus vulgaris</i> <i>Passer domesticus</i> <i>Passer montanus</i> <i>Fringilla coelebs</i> <i>Fringilla montifringilla</i> <i>Serinus serinus</i> <i>Carduelis chloris</i> <i>Carduelis carduelis</i> <i>Carduelis spinus</i> <i>Carduelis cannabina</i> <i>Emberiza schoeniclus</i> <i>Emberiza calandra</i>
Total number of species per station			
78	88	74	114

Regarding the number of bird species, identified in a monitoring station, it is found that the largest records appear in the river discharges areas (station no. 4), the highest number – 147 species –, being recorded at the mouth of Hamangia River (H4). The fewest species were recorded in the intermediate stations, respectively: Cs2, Te3 – 74 species, Ta2 and Sl2 – 75 species. In the stations with no.1, the avifauna is predominantly characteristic to forest habitats, given the fact that these rivers have their springs in the forest massifs of North Dobrogea.

In the intermediate stations on the five rivers (respectively no. 2 and 3 stations), the avifauna characteristic to the steppe, silvo-steppe and anthropogenic areas was observed. The exception is Casimcea River, where, at Ca3 station, an artificial lake formed along the river – Casian Lake. Thus, the avifauna is similar to that of no. 4 stations of the other rivers.

In the observation stations with no. 4, on all five rivers, which correspond to the area where the rivers flow into lakes/ estuaries, the avifauna consists, to a large extent, of species characteristic of wetlands. At these points, both the number of species and the size of the populations of these species is much higher, compared to the other stations on the rivers.

Conclusions

Within the studied rivers there were identified so far: six habitats of community importance (1530, 3130, 3270, 62C0*, 91AA*, 91Y0), among which two are priority ones; seven habitat subtypes with no community importance (37.24, 44.121, 53.1111, 53.131, 53.132, 53.143 and 53.4); one phytocoenosis not framed within the Palaeartic Habitats Classification.

The highest habitats/ plant communities diversity was observed within the Taița and Slava rivers (six plant communities), followed by Casimcea River (five plant communities), the lowest number of habitats/ coenotaxa being recorded in the Hamangia (four plant communities) and Telița (three plant communities) rivers.

Globally, Casimcea River could be considered the most diverse of the rivers, taking into account the number of habitats/ plant communities, combined with the number of species per habitat/ plant community, while Telița River would be the less diverse. Overall Casimcea River can be considered as being mostly in its natural status, as well as Hamangia. The low disturbed watercourses could be considered Taița and Slava, while within Telița River the three coenotaxa are in the high, medium and undisturbed categories. The highest number of threatened species was recorded within the Hamangia River.

The five rivers that belong to the Black Sea Basin have an important conservation value, as they contain habitats of community importance and even a reduced number of threatened plant species. Their conservation is also required as they are natural ecological corridors that link different Natura 2000 sites from Northern and Central Dobrogean Plateau, with the Danube Delta Biosphere Reserve and corresponding Natura 2000 sites (SCI, SPA).

From the avifauna point of view, the bird species that have been identified are characteristic of the following habitat types: forest, steppe, wooded steppe, wetlands and anthropogenic areas (agroecosystems). The largest records of birds species appear in the rivers discharges areas, the highest number (147 species), being recorded at the mouth of Hamangia River (H4). The fewest species were recorded in the intermediate stations, of the rivers: Casimcea and Telița – 74 species, Taița and Slava – 75 species. With the exception of anthropogenic ecosystems (e.g. agroecosystems), all the above-mentioned habitat types constitute important nesting and feeding areas during migration periods.

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Preliminary Data on the Danube-Black Sea Canal and its Adjoining Areas as a Habitat for Herpetofauna

Date preliminară privind canalul Dunăre-Marea Neagră și zonele adiacente ca habitat pentru herpetofaună

Alexandru IFTIME, Oana IFTIME

Abstract

*The Danube-Black Sea Canal was completed in the 1980s. Its course largely follows the previous Carasu (Kara-Su) valley; the excavation of the canal, using vast amounts of labour and heavy machinery, was devastating for local natural habitats. However, some of its flanking areas were not much disturbed, due to topography, difficulty of access, etc. The Carasu valley, enclosing the canal, is now used for cultivation, animal husbandry, fisheries and even hunting; it encloses habitats that have been conserved or recovered despite the massive destruction of the 1980s. Our study has endeavoured to find to what extent these habitats harbour interesting populations of amphibians and reptiles. We have thus found numerous populations of both amphibian and reptile species, including some of the more common, adaptable species (e.g. *Pelophylax ridibundus*, which is found in all waterbodies, including the Canal) but also rarer species such as *Pelobates balcanicus*, *Pelobates fuscus*, *Testudo graeca*, *Emys orbicularis* etc. Some of the areas adjacent to the Danube-Black Sea Canal are, thus, an interesting herpetofaunistic habitat worthy of more investigation.*

Keywords: *Danube-Black Sea Canal, new records, amphibians, reptiles*

Introduction

The Danube-Black Sea Canal was completed in 1984 (and its north-eastern ramification, the Poarta Albă-Midia-Năvodari Canal, in 1987). The Danube-Black Sea Canal, properly, stretches from Cernavodă to Agigea, has a length of 64,2 km, a depth of about 8 m and its surface water level is 6 m above sea level, the Canal being connected through locks with the Black Sea and the Danube. Its course largely follows the Carasu (Kara-Su) valley (GHINEA, 2002) and its execution was devastating for local natural habitats. However, some of its flanking areas were not further disturbed. The Carasu valley is now used for cultivation, animal husbandry, fisheries and hunting; it encloses habitats conserved or recovered despite the massive destruction of the 1980s: (sylvo)steppic slopes, riparian/ wetland habitats (mainly artificial), pasture, etc.

While the herpetofauna of Dobrogea is intensely studied, many of the existing herpetological data for the Carasu/ Canal valley are labelled as „old”, few are more recent (see COGĂLNICEANU *et alii*, 2013a, 2013b; MORARU *et alii*, 2016; BÎRSAN *et alii*, 2017; SAHLEAN *et alii*, 2019); the locations are not very precise nor was any investigation centred upon the habitats of this valley.

Materials and methods

Fieldwork was performed in 2018, 2019 and 2020 using the visual encounter survey method and auditory (audio strip) transect method (SCOTT *et alii*, 1994). Location was determined by aid of Garmin GPS devices.

Results and Discussions

Records were acquired for six species of amphibians (*Bombina bombina*, *Pelobates fuscus*, *Pelobates balcanicus*, *Bufo* (*Bufotes*) *viridis*, *Hyla orientalis*, *Pelophylax ridibundus*) and seven species of reptiles: *Testudo graeca*, *Emys orbicularis*, *Lacerta viridis*, *Lacerta trilineata*, *Natrix natrix*, *Natrix tessellata*, *Dolichophis caspius* (see Table 1).

Table 1. Geographical coordinates (GPS) of observation sites and the identified species

Tabel 1. Coordonatele geografice (GPS) ale stațiilor de observare și speciile identificate

GPS coordinates	Species
N44 18.596 E28 02.768	<i>Pelophylax ridibundus</i> , <i>Testudo graeca</i> (frequent, high density, numerous juveniles), <i>Emys orbicularis</i> , <i>Lacerta viridis</i> , <i>Lacerta trilineata</i> , <i>Natrix natrix</i> , <i>Natrix tessellata</i> , <i>Dolichophis caspius</i>
N44 17.520 E28 03.705	<i>Pelobates balcanicus</i> , <i>Hyla orientalis</i> , <i>Bufo</i> (<i>Bufotes</i>) <i>viridis</i> , <i>Pelophylax ridibundus</i>
N44 15.988 E28 06.314	<i>Pelophylax ridibundus</i> , <i>Emys orbicularis</i>
N44 15.631 E28 05.753	<i>Lacerta viridis</i> , <i>Lacerta trilineata</i> , <i>Natrix natrix</i>
N44 16.126 E28 06.912	<i>Pelophylax ridibundus</i> , <i>Lacerta viridis</i> , <i>Testudo graeca</i>
N44 15.936 E28 07.721	<i>Bombina bombina</i> , <i>Lacerta viridis</i> , <i>Natrix tessellata</i>
N44 15.773 E28 08.897	<i>Bombina bombina</i> , <i>Lacerta viridis</i>
N44 15.808 E28 09.022	<i>Bombina bombina</i> , <i>Pelobates fuscus</i> , <i>Bufo</i> (<i>Bufotes</i>) <i>viridis</i> , <i>Pelophylax ridibundus</i> , <i>Natrix natrix</i>
N44 15.769 E28 09.550	<i>Bombina bombina</i> , <i>Pelobates fuscus</i> , <i>Pelophylax ridibundus</i> , <i>Emys orbicularis</i>
N44 15.618 E28 11.529	<i>Bombina bombina</i> , <i>Pelophylax ridibundus</i> , <i>Emys orbicularis</i> , <i>Lacerta viridis</i>
N44 19.240 E28 02.251	<i>Lacerta viridis</i>

GPS coordinates	Species
N44 16.164 E28 04.314	<i>Lacerta viridis</i> , possibly <i>Testudo graeca</i> (characteristic holes)
N44 16.024 E28 06.363	<i>Pelophylax ridibundus</i> , <i>Testudo graeca</i> , <i>Emys orbicularis</i> , <i>Lacerta viridis</i>
N44 15.680 E28 10.418	<i>Emys orbicularis</i>
N44 15.225 E28 14.118	<i>Emys orbicularis</i>

All were previously found in the Carasu valley area (COGĂLNICEANU *et alii*, 2013a, 2013b; MORARU *et alii*, 2016) but our records are extending and updating their distribution – especially as some species were represented by old records or confined to the Cernavodă area. *Pelobates fuscus* and *Emys orbicularis* are firstly recorded in inland Dobrogea along the Carasu valley. *Testudo graeca* is represented by three records, two of which are new (but pertaining, probably, to the same population) and the third is a confirmation of an old record. *Natrix* species were represented by old records, confirmed and expanded by ours.

Bombina bombina, *Pelobates* species, *Bufo* (*Bufo*) *viridis* and *Hyla* (*arborea*) *orientalis* were found to share a pattern of distribution, all being encountered in small water bodies (ditches, ponds, wetlands) along the Canal between Cernavodă and Medgidia towns. Their abundance is limited; the temporary character of such wetlands is a constraint upon their reproduction; however, at least *Bombina* resorts to the waters of the Canal in dry years (such as 2020) when the small water bodies are unavailable. All these species were found by COGĂLNICEANU *et alii* (2013a) around Cernavodă town, and *Bombina* and *Bufo* around Medgidia town also, but our records along the intervening stretch of the Canal are new. *Pelobates balcanicus* extends but little inland, and our record updates an „old” one from Cernavodă (COGĂLNICEANU *et alii*, 2013a).

Pelophylax ridibundus is the most abundant amphibian in the studied area. It makes use of larger water bodies including the Canal itself; therefore, it is not constrained by drying of reproduction habitat.

Testudo graeca was confirmed at Cernavodă; a new habitat was found opposite Saligny. At Cernavodă the population is numerous; it appears to have a high juvenile to adult ratio (see Figure 1 for a juvenile). A specimen was found with massive keratinous shield loss (Figure 2); this may result from infection or burning, but is not lethal (BARTEN, 2005).

Emys orbicularis was found in some of the artificial wetland/ canals along the Canal, as well as in the waters of the Canal (Figure 3), these being apparently the first records on the inland Carasu valley.

Lacerta viridis is widely spread along the Canal, where it is the commonest reptile. We noticed (at Cernavodă) individuals showing a gracile morphology, typical for „*L. v. meridionalis*”, coupled with atypical supralabial fragmentation or with minute scalation of masseteric area (Figure 4), more typical for *L. trilineata* (FUHN & VANCEA, 1961). We hypothesize that these may be the result of either mutation or (rather) of a hybrid effect (see SAGONAS *et alii*, 2019, for considerations on introgressive hybridization between *L. viridis* and *L. trilineata*).

*Lacerta trilineata*¹ was found in two places, one being the previously known locality of Cernavodă, where it is syntopic with *L. viridis* (see above) but also with *Testudo graeca* and *Dolichophis caspius*.

Natrix natrix (Figure 5) and *Natrix tessellata* also share a distribution pattern, as both species appear to utilize the waters of the Canal as well as that of the larger anthropogenic water bodies.

Dolichophis caspius, although widespread in Dobrogea, was only found by us at Cernavodă, which is a known location (SAHLEAN *et alii*, 2019).

Conclusions

The area appears to have an impoverished herpetofauna as compared to neighbouring rich areas; it contains mainly widely spread, adaptable species (at least these are most common; more investigation may uncover additional, rarer species). This is possibly the effect of massive destruction/ disturbance associated with the excavation of the Canal, which limited the herpetofauna to whatever could survive the works or recolonize subsequently.

However, *Testudo graeca* is numerous and reproducing well, at least in one location, while wetland species such as *Bombina bombina*, *Pelobates fuscus*, *P. balcanicus*, *Hyla (arborea) orientalis*, *Emys orbicularis*, *Natrix natrix* and *N. tessellata* extend inland along the Canal, many species making use of its waters. Whether they have survived in the area or recolonized it from nearby habitats, some Natura 2000 species, such as *Bombina bombina*, *Testudo graeca* and *Emys orbicularis* may have good conservation prospects in this recovered habitat. Additional research in this area is definitely needed, as more species and populations may be present.

¹ We reject, at least for the time being, the splitting of *L. trilineata*, and the allocation of Dobrogea populations to *L. diplochondrodes*, as a mere artifact of cladistic methodology. Valid species status needs to be confirmed from the perspective of the Biological Species Concept, i.e. by pointing reproductive incompatibilities between the assessed demes. See the discussion at SPEYBROECK *et alii*, 2020 (and literature quoted therein): the authors, while accepting the split, are counseling caution, especially regarding the *L. trilineata* – *L. diplochondrodes* contact, and advocate reproductive isolation as the hallmark of species validity.



Figure 1. *Testudo graeca*, juvenile, 2018 (Photo Al. Iftime)

Fig.1. *Testudo graeca*, juvenil, 2018



Figure 2. *Testudo graeca*, adult with massive keratinous shield loss, 2019; scarring on forelimbs indicates burning as most probable cause (Photo O. Iftime)

Fig. 2. *Testudo graeca*, adult cu pierdere masivă a scuturilor de keratină, 2019; cicatricile de pe membrele anterioare indică arsura drept cauza cea mai probabilă.



Figure 3. *Emys orbicularis*, adults, 2020 (Photo Al. Iftime)
Fig. 3. *Emys orbicularis*, adulți, 2020



Figure 4. *Lacerta viridis* with *L. trilineata*-like masseteric area, 2019 (Photo O. Iftime)
Fig.4. *Lacerta viridis* cu aria maseterică de tip *L. trilineata*, 2019



Figure 5. *Natrix natrix*, adult (“*bilineata*” pattern), 2020 (Photo Al. Iftime)
 Fig. 5. *Natrix natrix*, adult (model tip “*bilineata*”), 2020

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The materials arrived at the editorial office after this date will be included in next year's issue. The Editor reserves the right to rigorously select by scientific criteria the materials submitted for publication. The papers that do not comply with the drafting conditions presented above will be returned to be re-done, provided that the deadline set is not exceeded.

Hoping that our endeavour has been properly understood, we invite you to become one of our magazine loyal collaborators.

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