

## CONSERVATION OF VALUABLE LANDSCAPE FROM THE BASIN OF THE PRUT RIVER (THE REPUBLIC OF MOLDOVA)

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**Abstract.** The study includes research on the status of representative ecosystems of the Basin of the Prut River: Landscape Reserve (LR) - Suta de Movile, Geology and Palaeontology Nature Monument (GPNM) – Gorge Duruitoarea and Natural Forest Reserve (NFR) - Șaptebani. The study assessed the overall environmental condition, identified and assessed the sources and the level of pollution of environmental components, registered and described the species of flora and fauna, identified the rare species which are protected nationally and internationally. Based on the investigation parameters, it was concluded that the investigated objects are in good ecological state and serve as a favourable habitat for many rare species of flora and fauna, with national and international protection status. Water quality of the Duruitoarea and the Ciugureț rivers, which cross NFR Șaptebani and GPNM Gorge Duruitoarea correspond to class II of surface water quality. The impact from local and transboundary sources of pollution, calculated based on the amounts of pollutants emitted, is insignificant. The inseparable interdependence between abiotic and biotic factors of ecosystems comes to convince about the need to protect landscapes as a whole, integrally, both geological and hydrological elements and flora and fauna species, a requirement stipulated by European Landscape Convention, Florence, 2000. The presented material serves as scientific support to argue the protection category of investigated objects.

**Keywords:** landscape, state protected area, valuable species, geological objects, water resources.

**Rezumat. Conservarea unor peisaje valoroase din bazinul râului Prut (Republica Moldova).** Studiul include cercetări privind starea unor ecosisteme reprezentative din bazinul râului Prut: Rezervația Peisajeră (RP) – Suta de movile, Monumentul Naturii Geologic și Paleontologic (MNGP) – Defileul Duruitoarea și Rezervația Naturală Silvică (RNS) - Șaptebani. A fost apreciată starea ecologică generală, stabilite sursele și nivelul de poluare a componentelor de mediu din ecosistemele studiate, descrisă vegetația și înregistrate speciile de floră și faună, cu evidențierea celor rare și protejate la nivel național și internațional. În baza indicilor investigați s-a constatat că obiectele cercetate se caracterizează printr-o stare ecologică bună și servesc ca habitate favorabile pentru multe specii rare de floră și faună, cu statut național și internațional de protecție. Calitatea apei din râurile Ciugureț și Duruitoarea, pe sectoarele ce traversează RNS Șaptebani și MNGP Defileul Duruitoarea, corespunde clasei a II-a pentru apele de suprafață. Impactul de la sursele locale și transfrontaliere de poluare, calculat în baza cantităților de noxe emise, este nesemnificativ. Interdependența inseparabilă dintre factorii abiotici și biotici ai ecosistemelor vine să convingă despre necesitatea protejării peisajelor în ansamblu, incluzând atât elementele geologice și hidrologice, cât și bogăția floristică și faunistică specifică, obligațiune stipulată și de Convenția privind Peisajul European, Florența, 2000. Materialul prezentat servește drept suport științific pentru argumentarea categoriei de protecție a obiectelor menționate.

**Cuvinte cheie:** peisaj, Arie Naturală Protejată de Stat, specii valoroase, obiective geologice, surse de apă.

### INTRODUCTION

One of the most valuable components of the natural heritage of any state is the natural landscape. Although created already for centuries, the landscape is subject to profound and continuous change caused for instance by changes in climate but also ever increasing human impact. Particularly, in the recent years, this becomes increasingly apparent, endangering the existence of natural ecosystems, which are an integral part of the landscapes. Thus, conservation of these and particularly of those more sensible to human and non-human origin changes is essential. This concept is relevant for countries with a fairly small share of protected areas, such as the Republic of Moldova (157 227.4 hectares or 4.65% of the country). In this context, and as a result of subsequent documents adopted by Rio Convention on Biological Diversity (1992), which promotes conduction of complex studies and that protected areas should be expansion of up to 12% of the country.

The Moldavian rate remains insufficient to ensure a balance of all its components, good functioning of the ecosystem and performance of conservation measures for preserving biodiversity. Moreover, most categories of protected areas in the Republic of Moldova promote conservation of only certain elements: i.e. species of plants, animals but not all the basic components of an ecosystems (i.e. soil, substrate, water, air, biota, etc.), let alone the whole landscape. In this respect, the Ecobiindication and Radioecology laboratory of the Institute of Ecology and Geography, evaluated a range of representative ecosystems located within the Prut River Basin during the period 2004-2008 with the aim to assess the environmental status and quality of ecosystem abiotic components, the presence of landscape elements (monumental rocks, waterfalls, caves, meadows, hills, steppe, etc.) representative species of plants and animals, with nationally and internationally protection status.

### MATERIAL AND METHODS

The study of the ecosystems was conducted in field conditions, by describing the flora and fauna species in different seasons (spring, summer, autumn), photography of objects/species and water, mud, rocks and shells sampling.

Assembling of the herbarium and the collection of animal samples was done in line with the provisions of the traditional methods (IVAN & DONIȚĂ, 1975) and species taxonomic belonging/affiliation determined with the help of specialised books for higher plants, mosses, lichens, molluscs and algae (BEGU et al., 2005; GHEIDEMAN, 1975; NEGRU et al., 2002; SIMONOV, 1978; MUNTEANU & LOZAN, 2004; GROSSU, 1986), using microscopes MBS-10 and Micmed-5.

The establishment of the protection level of rare species was done in accordance with: field drafts, Red Books and Lists and Annexes of Environmental Conventions: Washington (1973), Bern (1979), Bonn (1979), taking into account the IUCN categories.

The heavy metal content was determined by Atomic Absorption Method – AAS and Fluorescent roentgen-spectrometry (OBUHOV & ZĂRIN, 1977). Collection and analysis of water samples was performed using classical chemical methods. The characteristic of air pollution sources and quantities of pollutants emitted was gathered based on information available from the Yearbooks of the Statistics Departments and data on transboundary pollution obtained from EMEP program.

Given the fact that the accumulated information will serve for the development of Ecosystem/Protected Area Environmental Passport, methodological guidance and information on Passport development was also taken into consideration (POSTOLACHE et al., 2004).

## RESULTS AND DISCUSSIONS

The Landscape Reserve (LR) – Suta de Movile, Geology and Palaeontology Nature Monument (GPNM) - Duruitoarea Gorge and Natural Forest Reserve (NFR) - Șaptebani are located in the northwestern part of the Republic of Moldova, Rîșcani district in the Prut River Basin, on various forms of relief underlying a less anthropogenic regional landscape (Fig. 1). According to the Law on State Protected Natural Areas Fund, these are assigned different categories of protection.

Landscape diversity is determined by geographical location, climate, geological composition, interaction with other regions as well as the influence of anthropogenic factors. According to the country landscape regions (PROCA, 1978), the territories under investigation are located in the steppe plateau region of the northwestern part of the Republic of Moldova, at the contact of two sub regions – pre Prut sub region, with dark grey and typical chernozem soils and Ciuhur plain, formed by deposits of clay, with typical chernozem.

Specific for the Prut terraces, particularly for hilly regions are landslides which have increased recently in LR Suta de Movile, due to the excess of moisture and clay substrate, favouring the emergence in lower areas of lakes and marshes. This process leads to the formation of mounds rows, parallel to the Prut River (LEVADNIUC, 1978).

The diffusion of the Prut River into the plain relief of the toltre chains, which were carved by exogenous factors, have led to the formation of gorges, grottoes and caves, one of which is Duruitoarea gorge, formed in limestone rocks, with steep slopes. The lowering of the Preprut River plain foundation in some regions of North and East allowed in those parts with lower altitude for the water to accumulate. In similar condition is the NFR Șaptebani, which in the lowest altitudes is crossed by the Ciuhureț River and is surrounded by limestone cliffs, eroded and carved by exogenous forces as well, where rich petrophyte vegetation is developed which serve as habitat for various animals species.

The studied objects, in terms of geographic location, are not surrounded by large industrial complexes or densely populated urban areas. Human impact occurs only during collecting plants activities, animals grazing, which do not appreciably disturb the ecological balance of protected areas from the region. The exception is GPNM Suta de Movile, as sometimes the area is subject to intense valuation.

**Climate Features.** In analysing the current state of investigated objects it is necessary to know the particular climatic conditions of the study period because climatic factors have left their mark on these. Thus, total annual solar radiation is 108-114 kcal/cm<sup>2</sup>, and the average hours of sun shining is 2,100-2,200. Annual average temperature for this region is +9.5°C and the amount of precipitation is 556,0 mm (CONSTANTINOV et al., 2006).

The comparative analysis of meteorological data showed that the thermal and rainfall indices during the research period did not vary significantly from the average annual values (1900-1985). The north-west winds are predominant, followed by northern, south-east and southern ones. The wind direction is greatly influenced by landscape fragmentation. In the area with investigated objects, the north-west and south-east winds are frequent. Annual average wind speed is 3-5 m/sec, the maximum being registered in winter and spring seasons and the minimum in summer and autumn period. The winds speed and direction determines as well the transfer of air pollutants.

The hydrographical network of the investigated area is well developed and is represented by small rivers with low water flow and due to the groundwater supply many of them have a constant flow (BOBOC & MELNICIUC, 2006.).

The **human impact** is manifested in particular by emissions from adjacent pollution sources which are located about 15-30 km, originating from municipal heating plants and traffic. The main emissions from stationary local sources are: dust (65.9 t/year), SO<sub>2</sub> (14.7 t/year), NO<sub>x</sub> (2.5 t/year) and an insignificant amount of other pollutants. According to the EMEP data through precipitation, as a result of local and transboundary pollution, 45 kg/ha/year of SO<sub>2</sub> and 78 kg/ha/year settle annually, NO<sub>x</sub> and Pb and Cd deposition are 13.9 and 260 mg/ha/year, respectively. According to the normative OND-86 MAC for NO<sub>x</sub> and SO<sub>2</sub> from local sources of air pollution at ground level is 0.05 - 0.1 mg/m<sup>3</sup> air, thus representing an unimportant value.

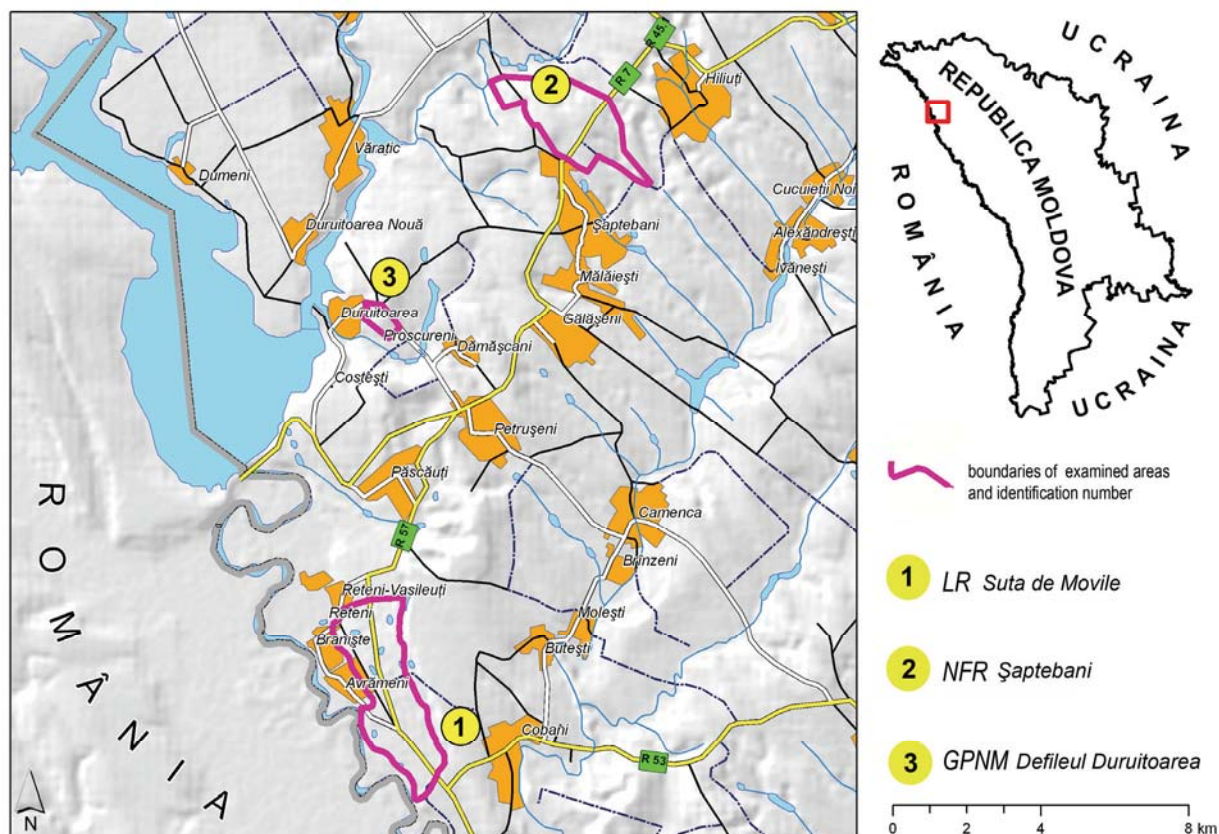


Figure 1. The scheme location of investigated objects. / Figura 1. Schema amplasării obiectivelor studiate.

**LR Suta de Movile**, with an area of 1,058.24 hectares, is located between the villages Braniște and Cobani (Glodeni district) Rîșcani Forestry Detour. The territory of the landscape reserve Suta de Movile belongs to the steppe zone, agropedology district with levigated and typical chernozem of the forest steppe plateau and sub-district with ordinary and carbonate chernozem and alluvial soils of the Prut River floodplain. The soil cover of the reservation was formed on the substrate of earlier massive landslides.

The results of heavy metal content in soil show concentrations that did not exceed the admissible levels. Across the entire hills there can be encountered mounds with micro- and meso- depressions in which water accumulates, forming puddles. Along the western side, there is a steep slope, characteristic for a landslide feature. Such relief influence on distribution of surface and groundwater water, the processes of erosion, salinization, formation of swamps and marshes (URSU, 2006).

Along with the emission impact from the local and cross-border pollution sources, the human impact is manifested through capitalization of land for agriculture and grazing practice, mainly in the areas between the so-called "mounds". The main type of use of these sectors is the cultivation of wheat and corn, partially of sugar beet. The agrocoenoses were created by grubbing of grassland areas, both on plain and steep slopes, which have accelerated soil erosion and landslides. Currently, steppe formations, dominated by feather grass, in rich blend with other hygro- and mesophilous herbs are heavily degraded as a result of grazing.

The study of the flora shows that along the usual steppe vegetation: *Stipa pulcherrima* L., *S. lessingiana* L., *S. capillata* L., *Festuca valesiaca* L. and other herbs which preserved on unused sectors, there are species of plants with national and international status of protection (Fig. 2). Among them we mention: *Vinca minor* L., *Iris hungarica* WALDST. ET KIT, *Stipa pulcherrima* L. and *Hyacinthella leucophaea* (C. KOCH.) SCHUR, which besides being rare species under state protection are also included in Red Book of Ukraine (RBU) (i.e. *Stipa pulcherrima* L.) and Red Book of Romania (RBR) (i.e. *Hyacinthella leucophaea* (C. KOCH.) SCHUR). Of particular attention is *Pulsatilla montana* (HOPE) REICHEINB., which is a rare species for the Republic of Moldova flora and is included in the RBR, RLE, and Appendix I of Bern Convention (1979). In addition, the species *Pulsatilla montana* (HOPE) REICHEINB. is a limestone-loving species, which can serve as an indicator of calcareous substrate. More frequently there are encountered *Vinca minor* L., *Iris hungarica* WALDST. et KIT, and *Adonis vernalis* L., forming clusters and sectors from 2-3 to 10-25 m<sup>2</sup>. Fairly isolated and sometimes even solitary there are clumps of *Stipa pulcherrima* L., *Hyacinthella leucophaea* (C. KOCH.) SCHUR., *Pulsatilla montana* (HOPE) REICHEINB. These are the most vulnerable. The recording of the *Phragmites australis* (CAV.) TRIN. EX STEUD. on the top of a mound reed means that the groundwater level, which keeps the growth and development of this hydrophilic species, is not at a very large depth.

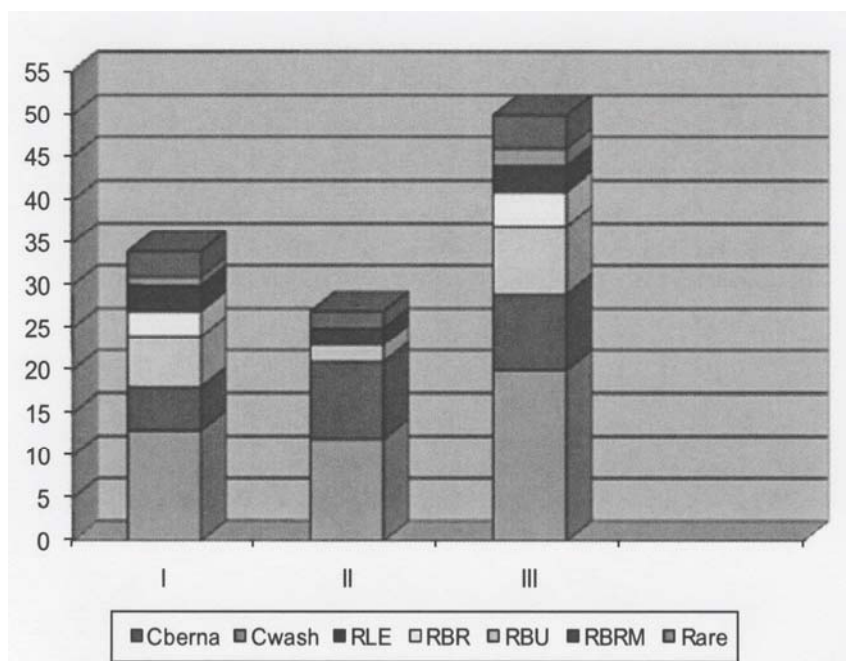


Figure 2. Valuable species of flora and fauna from the investigated objects. I - LR Suta de Movile, II - GPNM Duruitoarea Gorge, III - NFR Şaptebani. / Figura 2. Specii valoroase din obiectivele investigate. I - RP Suta de Movile, II - MNGP Defileul Duruitoarea, III - RNS Şaptebani.

The topography and hydro-thermal regime peculiarities of the LR Suta de Movile, creates special conditions for different groups of fauna. Lake areas are preferred by amphibians and reptiles, and the slopes - by mammals. Among mammals species there have been recorded *Vulpes vulpes* (LINNAEUS 1758), protected by Washington Convention, listed in Annex III and RLE; including such reptiles as - *Lacerta viridis* (LAURENTI 1768), listed in Annex II of Bern Convention, RLE and RBU. Among the representatives of amphibians, there were registered - *Hyla arborea* (LINNAEUS 1758), listed in Annex II of Bern Convention, RLR and RLE and among insects - *Scolia maculata* (DRURY 1973), *Manduca atropa* (LINNAEUS 1758), *Mantis religiosa* (LINNAEUS 1758) - included in Red Book of the Republic of Moldova (RBRM) and *Satanas gigans* (EVERSMANN 1855), *Saturnia pyri* (DENIS et SCHIFFERMUELLER 1775) - included in RBRM and RBU.

In order to conserve the natural heritage and the landscape of this reserve, it is necessary to observe strictly the status of LR as provided by law, and landscape reconstruction requires for stopping of farming so that to ensure the restoration of flora and fauna composition gradually in the future.

**GPNM Duruitoarea Gorge**, with an area of 40 hectares, is located on the left bank of the Ciuhur River, a tributary of the Prut River, east from Duruitoarea village, Rîşcani district. Official landowner of the reserve is Duruitoarea village hall. In the North direction of the Gorge, on a length of about 1 km, it lays a Badenian limestone cliff, with a height of over 10 m. A series of caves extends on an area of 135 m<sup>2</sup>, which have a horizontal bottom (abrasive traces and deforming activities). In the gorge, over a length of 130 m, limestone totrels can be found (ȚARIGRADSCHI, 2003).

Local human impact is insignificant. Although there have not been identified organic spills or landfills, sometimes in the vicinity of the village, there are areas with several unauthorized waste dumps and in some areas extraction of stone is done. Within the gorge there have been registered steppe areas used for animals grazing, which could disturb the ecological balance of this picturesque landscape. The content of heavy metals in the shells of molluscs - *Helix pomatia* (LINNAEUS 1758) and *Cepaea vindobonensis* (FERRUSSAC 1821) attests concentrations that do not exceed allowable levels, which indicated for lack of pollution.

Duruitoarea Gorge presents a rich landscape with special geological features through the monumental grandeur of the rocks, with high waterfalls that flow, and increase in spring and summer as a result of torrential rains. In addition, Duruitoarea gorge is a real deposit of flora and fauna, particularly of petrophyte and steppe species.

Among the higher plants there have been recorded valuable species included in RBRM (Fig. 2): *Schivereckia podolica* (BESS.) ANDRZ. EX D. C., *Rhamnus tinctoria* WALDST. et KIT., *Sempervivum ruthenicum* SCHNITTSP. et C. B. LEHM. all with the status of vulnerable species, *Vitis sylvestris* GMEL. - the status of endangered species and *Gypsophila glomerata* PALL. ex ADAMS- critically endangered species. *Gypsophila glomerata* PALL. ex ADAMS has international protection status and it is included in RBU and RLE. Along the listed species there were recorded species which are also rare in the flora of the Republic of Moldova. On the surface rocks, sparsely covered with a layer of soil, there grow rich clusters of *Aurinia saxatilis* (L.) DESV. and among the shadowy cracks of rocks - *Asplenium ruta-muraria* L. and rare species of - *Homalothecium philippeanum* (SPRUCE) B.S.G. The sectors rich in soil are populated by *Clematis*

*vitalba* L., *Cotoneaster melanocarpus* FISH. EX BLYTT, *Vinca minor* L. and in sectors near the Duruitoarea River - *Acorus calamus* L.

The geological and hydrological elements as well as specific vegetation create favourable conditions for many common animal species, which are taken under protection. Among them, particular values have the endangered insect species included in RBRM: *Mantis religiosa* (LINNAEUS 1758), *Morimus funereus* (MULSANT 1873), *Oryctes nasicornis* (LINNAEUS 1758) and vulnerable species - *Papilio machaon* (LINNAEUS 1758). Some species, ordinary for the Republic of Moldova, are among those with international status, being found in the Annexes of Environmental Conventions. Such species are the *Lacerta viridis* (LAURENTI 1768), included in Annex II of the Bern Convention, RBU, RBE and *Helix pomatia* (LINNAEUS 1758), listed in Annex III of the Bern Convention (1979). The Duruitoarea River, which crosses the gorge and the small waterfalls which are formed in some places, create a habitat for growth and development of rich diversity of plant and animal species. The water and the river bank serve as habitat for some species of aquatic and marsh plants and animals. Algae research from the Duruitoarea River has revealed the following diversity of the algal species, which are common as well for adjacent ecosystems: communities of *Chaetomorphetum* - *Diatomocearum* (*Cocconeis pediculus* EHR. FURTNER.); there have been detected some species, which are common for adjacent basins: *Scenedesmus opoliensis* P. RICHTER, *S. quadricauda* (TURP) BREBISON, *Chlamydomonas* EHR., *Pediastrum duplex* MEYEN, *Tetraedron minimum* REINSH, *Gongrosira debaryana* RABENH., *Campylodiscus noricus* HER., *Gyrosigma stagnalis* (KUTZ.) RABENH., *Oscillatoria brevis* (KUTZ.) GOM. There were recorded also some valuable species of red algae: *Thorea ramosissima* BORY, *Batrachospermum moniliforme* ROTH and *Lemanea* sp., blue algae: *Johanesbaptistia gardner* FREMY and *Gomontiella subtubulosa* TEODORESCO and green algae: *Draparnaldia plumosa* (VAUCHER) AGARDH.

It is necessary to note the absence in this habitat of euglenophyte. The presence of the bivalve genus *Anodonta*, indicators of relatively clean water, let us suppose that the water of the Duruitoarea River is characterized by a low content of organic pollutants. Confirmation of water quality has been achieved also by chemical analysis. Thus, the water of the Duruitoarea River corresponds to class II for surface water quality and the small river, which passes through the gorge Duruitoarea, need to be protected together with other components of the gorge. The Duruitoarea gorge is important not only due to the presence of geological and paleontological elements (according to Law no. 1538-XIII), but also due to the presence of valuable habitats for flora and fauna and the presence of water source as well. The presented arguments demonstrate convincingly the need to protect the scenic landscape in the complex as a whole and suggest the need to change the current status of protection of the Duruitoarea gorge from GPNM into a status that provides for protection of landscape as a whole, and to be given the category - Mix Nature Monument, which in accordance to the Law on State Protected Natural Areas Fund includes valuable items of botanical, zoological, geological and hydrological origin.

**NFR Șaptebani** with a surface of 17 ha is located in Rîșcani Forestry Detour. According to forest arrangements only the parcel 60 D of the forest near the Șaptebani village is protected. The value of this sector was assessed based on the arboreal vegetation, which consists of lime trees (90%), mixed with oak (10%), the density of which is 0.63 (for lime) and 0.07 (for oak) on a unity of surface, characterized by a normal vitality, tree height is 20 and 19 m and the average age is 55 years.

Along with the protected area, the phytocenological study included as well the north-western part of the forest (sub parcels 59A, 59B, 59C, 59D, and partially 60A, 61A, 61B, 61C, 61D) with a great floral diversity. The grassy carpet is well developed, composed of common species, including many species of valuable plants which are protected both nationally and internationally (Fig. 2): *Doronicum hungaricum* REICHENB. fil. - a vulnerable species, included in RBRM and RBU, *Lilium martagon* L., *Tulipa biebersteiniana* SCHULT. et SCHULT. fil., *Veratrum nigrum* L., which besides being rarely encountered within the country, have international protection status: *Tulipa biebersteiniana* is included in RBU, *Veratrum nigrum* - RLR and *Lilium martagon* - RBU and RLE. In sub parcels 59A, 59B, 59C there were found *Asplenium trichomanes* L. and *Cystopteris fragilis* (L.) BERNH., *Asplenium ruta-muraria* L., which is part of the list of rare plants, protected by the state. The "pearl" of these particular sector is the *Hepatica nobilis* MILL., vulnerable species, comprising about 10 specimens per m<sup>2</sup>, particularly in the areas around limestone rocks. Slightly less common is *Fritillaria meleagroides* PATRIN EX SCHULT et SCHULT FIL. Both species are vulnerable and included in the RBRM and RBU. Their protection requires the extension of the existing protected areas, including the listed sub parcels. In addition to higher plants there have been recorded species of lichens and mosses, which can serve as indicators of air pollution from ecosystems and are also rare species with different protection status. Thus, the forest serves as habitat for various species of lichens, including the species *Dermatocarpon miniatum* (L.) MANN. found in RBRM, *Pseudoparmelia quercina* (WILLD) VAIN., *Opegrapha rufescens* PERS., *Parmelia cetrarioides* DEL. - rare species, *Parmelia sulcata* TAYL., which is a veritable indicator of air quality (BEGU 2011). Calcareous substrates serve as good base for petrophyte lichen species as *Placolecnora muralis* (SCGREB.) RAS., *Caloplaca murorum* (HOFFM.) TH. FR., *Candelariella vitellina* (EHRH.) MULL. ARG., which have a low frequency throughout the country. Some moss species were recorded: i.e. *Anomodon viticulosus* HOOK et TAYL., *Leskea polycarpa* HEDW., *Homalothecium philippeanum* (SPRICE) SCHIP., *Atrichum undulatum* (HEDW.) P. BEAUV. - sensitive to air pollution and *Climacium dendroides* (HEDW.) WEB., endangered species, included in the Red Book of the Republic of Moldova, previously indicated by SIMONOV, 1978 only in 3 stations in Edineț, Orhei and Ungheni rayons.

Among representatives of mollusc species *Cepaea vindobonensis* (FERUSSAC 1821) and *Helix pomatia* (LINNAEUS 1758) deserves attention; they prefer calcareous soils and have been recorded in abundance. These species best accumulated heavy metals, especially, *Helix pomatia*, which is recommended for use in performing monitoring of the soil content in Cd, Cu and pesticide pollution. Among mammals it was recorded *Felis silvestris* (SCHREBER 1777), protected both nationally and internationally: included in RBRM as endangered species and listed in Annex II of Bern Convention, and Annex II of CITES Convention, RLE, RBR, RBU. Among the valuable species of reptiles there have been recorded *Coronella austriaca* (LAURENTI 1768) and *Lacerta viridis* (LINNAEUS 1758). *Coronella austriaca* is protected nationally and thus included in RBRM as endangered species, while internationally it is included in the Appendix II of Bern Convention. The same protection status has *Lacerta viridis*. Among insects, there were registered: *Oryctes nasicornis* (LINNAEUS 1758) and *Morimus funereus* (MULSANT 1873) - endangered species included in RBRM.

The vegetation of the steppe sector, along with herbaceous vegetation, includes *Amygdalus nana* L. – a plant protected by state and listed as vulnerable. An increased abundance is characteristic for ephemeroïdes, especially *Adonis vernalis* L., species vulnerable at national level and included in Appendix II of CITES Convention, Washington, (1979) and RBU. This species is dominant in open areas and is the main attractive element of these places, with coverage of about 70-80%. The limestone hills, bordering the forest, especially in spring, are dominated by *Pulsatilla montana* (HOPPE) REICHEINB.- rare species, protected both in our country and in Romania, being included and RBR.

The studied forest sector is crossed by the Ciuhureț River, along which it lies a chain of steep cliffs, which amaze by the richness of flora and fauna. Vegetation analysis showed the predominance in the river water of algae populations - green algae: *Cladophoretum* (*C. glomerata* SAUER 1937; *C. fracta* O. F. MULL. EX VAHL.), *Rhizoclonietum* (*Rh. hieroglyphicum*), *Draparnaldietum* (*D. glomerata* (VAUCH.) C. AGARDH, *D. plumosa* (VAUCH.) C. AGARDH), characteristic of clean water and a series of rarer species, such as rhodophyta - *Thorea ramosissima* BORY, *Batrachospermum moniliforme* ROTH; chrysophyta: *Hydrurus foetidus* (VILL.) TREV., cyanophytes - *Oscillatoria agardhii* GOM., *Gomontiella subtubulosa* TEODORESCO and *Johanesbaptistia gardner* FREMY, which strengthens the scientific value of the given object. The water quality of the Ciuhureț River was confirmed by laboratory evidence, which places it in the Class II of surface water quality.

The list of species of plants and animals mentioned in this study serves as a basis to complete the register of flora and fauna of the areas investigated and scientifically support the need to allocate special protection measures for parcels 59A, 59B, 59C, 59D, 60A, 61A, 61B, 61C, 61D, together with the parcel 60D (already protected). Including areas rich in valuable plants and animal species, geological and hydrological representative objects and in accordance with the Chapter 4, Art. 37, point “e” of the Law on State Protected Natural Areas Fund, the mentioned areas need to be given the status of Mix Nature Monument (MNM): and specifically MNM name “Adonis” (*Adonis vernalis* – being a dominant species, which present an attractive element of the area).

## CONCLUSIONS

1. The investigated objects are valuable landscapes characterized by a good ecological status of the main environmental components (soil, water, air, biota) and serve as preferred habitats for rare flora and fauna species, protected nationally and internationally.

2. The geological and hydrological elements contributed to the formation of the original landscape and creation of specific habitats for steppe, petrophyte and aquatic plant and animal species.

3. The results of heavy metal content in soil and mollusc shells (*Helix pomatia* and *Cepaea vindobonensis*) attest that, these do not exceed allowable levels; the water quality in main streams and those parts that cross the forest near the gorge Duruitoarea and Șaptebani village corresponds to class II of quality of surface waters; air pollution from local and transboundary sources is insignificant, which confirms the absence of significant pollution of the research objects.

4. The research results serve as a scientific argument concerning the need to protect the landscape as a whole, integrally together with its geological, hydrological, flora and fauna species elements, which will also ensure the implementation of the Rio Convention (1992) provisions on the country need to encompass protected areas with different category.

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