

# PHYTOSOCIOLOGICAL STUDY CONCERNING HABITATS WITH *FRITILLARIA MELEAGRIS* ON THE COURSE OF THE NIRAJUL MARE RIVER (MUREȘ COUNTY, ROMANIA)

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**ABSTRACT:** The aim of this study was to describe the associations with *Fritillaria meleagris* populations, and to present the habitats in which are included. Plant community of two associations was attributed to *Agrostio stoloniferae-Deschampsietum caespitosae* Újvárosi 1947 and *Frangulo-Salicetum cinereae* Graebner et Hueck 1931. The phytocoenoses were identified at Valea, Grăușor and Dămieni localities, near Miercurea Nirajului. The qualitative characterization consisted of: spectrum of bioforms and geoelements, analysis of the ecological factors and genetic structure, calculation of altitudinal indices and diploid index. The associations provide shelter for species included in Bern Convention (*Narcissus poeticus* ssp. *radiiflorus*), Romanian Red List (*Achillea ptarmica*, *Carex dioica*, *Fritillaria meleagris*, *Orchis laxiflora* ssp. *elegans*, *Orchis morio* ssp. *morio*), Rare, endangered and endemic plants in Romania's flora-Red list (*Gladiolus imbricatus*, *Iris sibirica*, etc.), and in the Carpathian List of Endangered Species (e.g. *Leucojum vernum*).

**Keywords:** *Fritillaria meleagris*, Valea, Grăușor, Dămieni, phytosociological study.

## INTRODUCTION:

The course of the Nirajul Mare River is part of the Special Protection Area (from Natura 2000 network) named Târnavelor Hills-Niraj Valley. The territory is

situated in the Easter part of the Niraj-Târnavă Mică pedogeographic Region, Miercurea Nirajului-Dămieni Sector (Jakab *et* Sighișorean, 1983; Orbán, 1991) (Fig. 1).

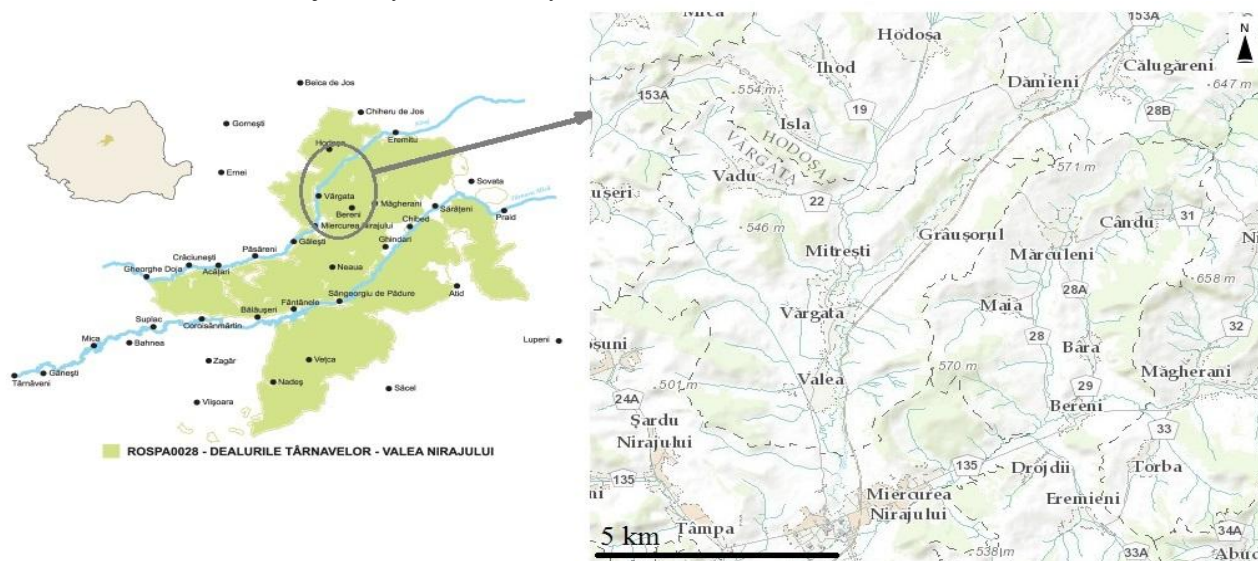


Fig. 1 The studied territory on the course of the Nirajul Mare River (Mureș County, Romania) (<http://www.valeanirajului.ro/natura2000>; <http://geoportal.ancpi.ro/>)

The landscape is specific to an intra-Carpathian depression with tectonic nature and plateau features. Altitude varies between 350 and 600 m. Slow or moderate inclinations are dominating. The depression was filled with marl, argil, sand, intercalation of tuff and sandstone, all arranged in domes and wide cuvettes. The most common rocks are loam and argil. In the river meadow, at the base it can be found gravel and boulder trapped in a sandy mass while in the upper layer sand and mud. The meadow part of the Nirajul Mare valley presents aluviosol and hydromorphic soil. On the river terraces different types of chernozems are

formed. The study area belongs to the temperate continental climate. The average annual temperature is 8.5 °C. The average annual rainfall is 600 mm (Mac, 1972; Josan, 1979; Blaga *et al.*, 2005).

Floodplain vegetation, which was once represented by floodplain forests (with *Populus* sp., *Salix* sp. and *Alnus glutinosa*), is characterized by: narrow strips of shrubs and coppices along the river, meso-hydrophilic

and hydrophilic meadows with *Agrostis stolonifera*, *Deschampsia cespitosa*, *Alopecurus pratensis*, *Poa trivialis*, *Festuca pratensis*, *Carex gracilis*, *C. acutiformis*, and shrubs (*Salix purpurea*, *S. triandra*, *S. caprea*, *S. fragilis*, *S. viminalis*) scattered within hayfields (Csürös, 1963). On the meadows with excessive humidity, shrub clusters of *Salix cinerea* were found with *Fritillaria meleagris* (Sămărghișan et Oroian, 2011).

The aims of the present study were: (1) the identification of the associations with *F. meleagris* populations in the region; (2) the qualitative characterization of these associations; (3) the description of the habitats in which are included.

## MATERIALS AND METHODS:

Plant communities were described with the phytosociological research method of Central European School, based on the principles and methodology developed by Braun-Blanquet (1964) and adapted by Borza et Boșcaiu (1965) to the features of vegetation cover in our country. In this sense field trips were conducted during the year 2017. For describing the qualitative structure of plant communities, the spectrums for bioforms, geoelements, ecological indices and genetic types were elaborated. Altitudinal index ( $K_a$ ) and diploid index (I.D.) was also calculated (Cristea et al., 2004). For the nomenclature of the taxa, *Plante vasculare din România-Determinator ilustrat de teren* (Sârbu et al., 2013) was used. The associations presented in this work were included in the phytocoeno-system according to Coldea et al. (2012; 2015) and Sanda et al. (2008). Habitat classification

was made according to Doniță et al. (2005) and Gafta et al. (2008).

## RESULTS AND DISCUSSION:

The associations with *Fritillaria meleagris* populations have been included in the following phytocoeno-system (Sanda et al., 2008; Coldea et al., 2012; 2015):

*Molinio-Arrhenatheretea* R. Tx. 1937

*Molinietalia caeruleae* W. Koch 1926

*Deschampsion caespitosae* Horvatić 1930

*Agrostio stoloniferae-Deschampsietum caespitosae* Újvárosi 1947

*Alnetea glutinosae* Br.-Bl. et Tx. 1943

*Alnetalia glutinosae* Tx. 1937 em. Th. Müll. et Görs 1958

*Salicion cinereae* Müller et Görs ex Passarge 1961

*Frangulo-Salicetum cinereae* Graebner et Hueck 1931

The spectrum of bioforms was performed with the Diemont method. As expected, phanerophytes (Ph) dominate in the Grey willow scrubs, and hemicryptophytes in the humid grasslands (Fig. 2a). The calculated values of  $K_a$  for the association *Agrostio stoloniferae-Deschampsietum caespitosae* and *Frangulo-Salicetum cinereae* are 16.67 and 21.15, respectively. These values indicate a mountain area with moderate climate and anthropogenic pressure. In the spectrum of geoelements the highest percentage is represented by the Euro-Asian (Euras.) element. European (Eur.) and cold climate specific elements (Circ., Circumpolar) are also well represented (Fig. 2b).

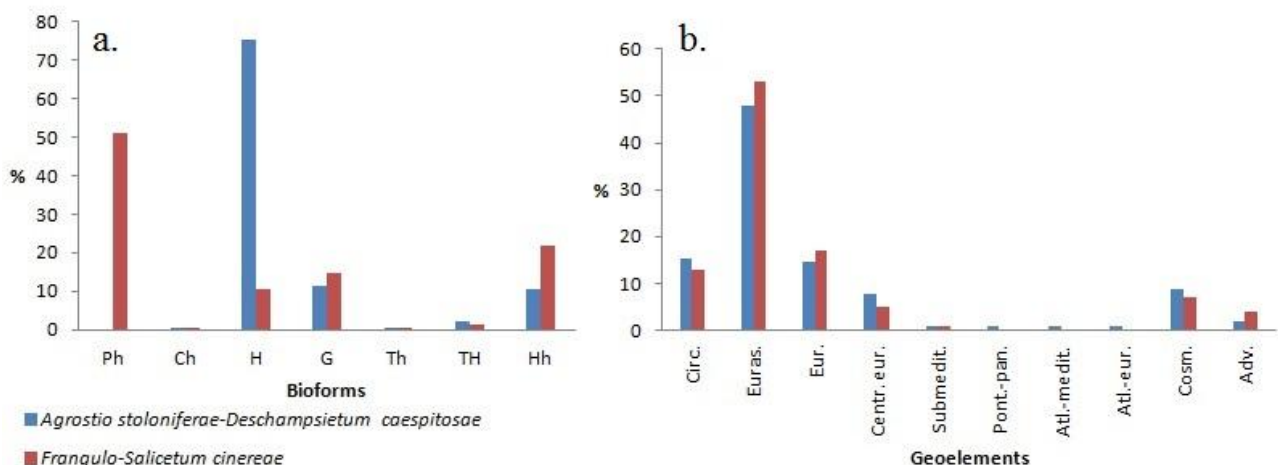
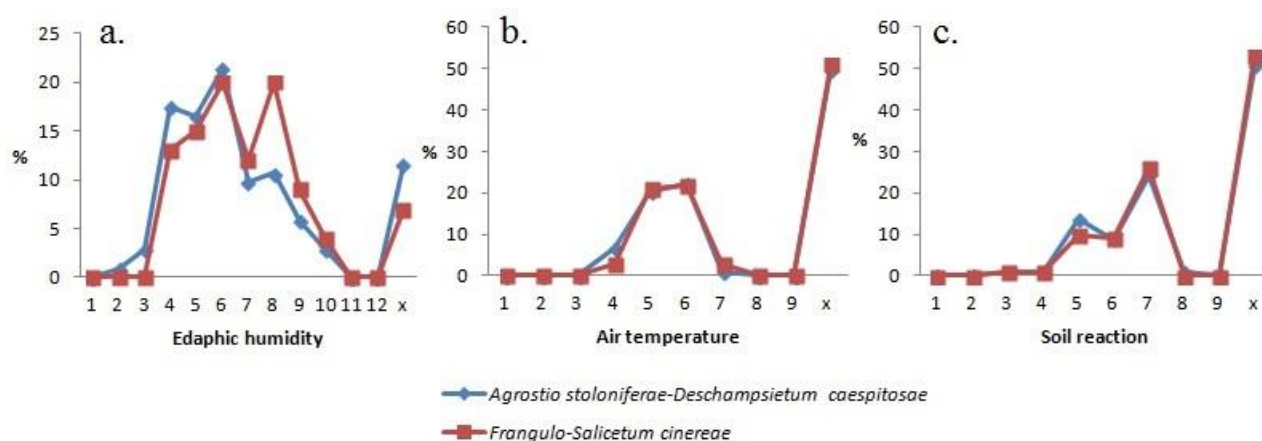


Fig. 2 The spectrum of bioforms (a.) and geoelements (b.) of the associations with *Fritillaria meleagris* populations

The spectrum of ecological categories based on edaphic humidity (U) shows that Grey willow scrubs represents a more humid habitat type than the grasslands (Fig. 3a). The spectrum of ecological

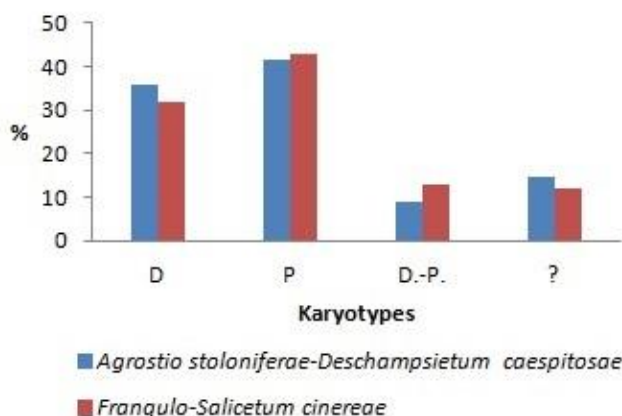
categories based on temperature (T) indicates that beside euriterm species, plants of hilly and submountainous areas are also predominant (Fig. 3b).



**Fig. 3** The ecological categories spectrums of the associations with *Fritillaria meleagris* populations based on edaphic humidity (a.), air temperature (b.) and soil reaction (c.)

Regarding the soil reaction euryionnic ( $R_x$ ) species are in higher proportions, followed by neutrophylous species (Fig. 3c). The humid grasslands have an I.D. value of 0.86, slightly higher than the Grey willow

scrubs (0.74) (Fig. 4). The value of the diploid index is lower at higher altitudes and also in pioneer or intermediate stage vegetation (Cristea *et al.*, 2004)



**Fig. 4** The caryologic spectrum of the associations with *Fritillaria meleagris* populations

The *Agrostio stoloniferae-Deschampsietum caespitosae* association (Table 1) forms the habitat type: Dacian communities with *Deschampsia caespitosa* and *Agrostis stolonifera* (code R3712), corresponding to Emerald-37.2 Eutrophic humid grasslands, Palearctic Habitats 1999-37.263 Danubio-Pannonic riverine and humid meadows, Eunis-E2.233 Carpathian submontane hay meadows (Doniță *et al.*, 2005). According to Gafta *et al.* (2008) the association is indicated as the habitat type NATURA 2000: 6440, corresponding to Palearctic Habitats 1999-37.23 Alluvial meadows of river valleys of the *Cnidion dubii*. This habitat type is of Community Interest, the conservation of which requires the designation of Special Areas of Conservation, according to the Habitats Directive. Humid grasslands occupy small areas (about 1-4 ha) adjacent with the yards of the houses or in the vicinity of the localities. The soil is flooded in spring, but becomes dry in summer therefore these habitats are used by locals as hayfields.

The *Frangulo-Salicetum cinereae* association (Table 2) forms the habitat type: Grey willow scrubs

(*Salix cinerea*) with European dewberry (*Rubus caesius*) (code R4421), corresponding to Corine-44.921 Grey willow scrub, Palearctic Habitats 1999-44.921 Grey willow carrs, Eunis-F9.21 Grey willow carrs (Doniță *et al.*, 2005). Grey willow scrubs are present in small patches of about 100-300 m<sup>2</sup>, scattered within the meadows.

*F. meleagris* had a slightly higher abundance-dominance value in the Grey willow scrubs (AD: 2-3) than in the humid grasslands (AD: 1-2). Soil-water conditions are important in the establishment and development of the individuals of this species (Csergő *et Frink*, 2003).

The studied associations provide shelter for species included in Bern Convention (*Narcissus poeticus* ssp. *radiiflorus*), Romanian Red List (*Achillea ptarmica*, *Carex dioica*, *Fritillaria meleagris*, *Orchis laxiflora* ssp. *elegans*, *Orchis morio* ssp. *morio*), Rare, endangered and endemic plants in Romania's flora-Red list (*Carex dioica*, *Gladiolus imbricatus*, *Iris sibirica*) (Sârbu *et al.*, 2007), and in the Carpathian List of Endangered Species (*Carex dioica*, *Fritillaria meleagris*, *Iris sibirica*, *Leucojum vernum*, *Narcissus poeticus* ssp. *radiiflorus*) (Witkowski *et al.*, 2003).

**Tab. 1**  
*Agrostis stoloniferae-Deschampsietum caespitosae* Újvárosi 1947

| Number relevés                                      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Altitude (m)  | 422 | 390 | 422 | 407 | 422 | 422 | 407 | 422 | 407 | 390 | 422 | 401 | 377 |     |
| Cover herb layer (%)                                | 90  | 90  | 100 | 90  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |     |
| Surface (m <sup>2</sup> )                           | 25  | 25  | 25  | 25  | 25  | 25  | 25  | 25  | 25  | 25  | 25  | 25  | 25  | K   |
| <b>Caract.</b>                                      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Deschampsia caespitosa</i>                       | +   | +   | +   | +   | +   | +   | +   | 3   | 2   | 4   | 3   | 4   | 3   | V   |
| <i>Alopecurus pratensis</i> ssp. <i>pratensis</i>   | -   | -   | 1   | 1   | 1   | 2   | 1   | -   | -   | +   | +   | +   | 1   | IV  |
| <i>Cirsium canum</i>                                | -   | -   | 1   | -   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | IV  |
| <i>Myosotis scorpioides</i>                         | -   | -   | +   | +   | +   | 1   | +   | +   | -   | -   | +   | -   | -   | III |
| <b>Diff.</b>  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Carex vulpina</i>                                | +   | +   | +   | +   | +   | +   | +   | 1   | +   | +   | +   | -   | 1   | V   |
| <i>Fritillaria meleagris</i>                        | 2   | 2   | 1   | 1   | -   | -   | -   | -   | -   | +   | -   | -   | +   | III |
| <b>Deschampsion caespitosae</b>                     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Agrostis stolonifera</i> ssp. <i>stolonifera</i> | -   | -   | -   | -   | +   | +   | +   | +   | +   | 2   | 2   | 1   | 1   | IV  |
| <i>Oenanthe aquatica</i>                            | -   | -   | -   | -   | +   | 1   | +   | +   | -   | +   | +   | +   | +   | IV  |
| <i>Allium angulosum</i>                             | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | +   | +   | I   |
| <b>Molinietalia</b>                                 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Sanguisorba officinalis</i>                      | 1   | 1   | 1   | 1   | 1   | +   | 1   | +   | 1   | +   | +   | 1   | 1   | V   |
| <i>Symphytum officinale</i>                         | -   | -   | +   | -   | +   | +   | +   | +   | +   | +   | +   | +   | +   | IV  |
| <i>Lychnis flos-cuculi</i>                          | -   | -   | -   | +   | 1   | 1   | +   | -   | +   | +   | -   | +   | +   | IV  |
| <i>Filipendula ulmaria</i>                          | +   | 1   | 1   | +   | 1   | +   | 1   | +   | -   | +   | +   | -   | 1   | IV  |
| <i>Juncus effusus</i>                               | +   | -   | +   | -   | +   | +   | -   | -   | +   | -   | +   | +   | +   | IV  |
| <i>Stachys officinalis</i>                          | -   | -   | +   | +   | -   | -   | +   | +   | 1   | -   | +   | 1   | -   | III |
| <i>Colchicum autumnale</i>                          | -   | +   | 1   | +   | +   | +   | -   | +   | -   | +   | -   | -   | -   | III |
| <i>Lythrum salicaria</i>                            | -   | +   | -   | -   | -   | -   | -   | -   | -   | -   | +   | -   | +   | II  |
| <i>Juncus conglomeratus</i>                         | +   | -   | -   | +   | -   | +   | -   | +   | -   | -   | -   | -   | -   | II  |
| <b>Arrhenatheretalia</b>                            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Achillea millefolium</i>                         | 1   | 1   | 1   | +   | 1   | +   | 1   | 1   | +   | 1   | +   | +   | +   | V   |
| <i>Lotus corniculatus</i>                           | -   | -   | -   | -   | -   | +   | +   | +   | +   | +   | +   | +   | +   | IV  |
| <i>Leucanthemum vulgare</i>                         | -   | -   | -   | -   | -   | +   | +   | +   | 1   | +   | +   | -   | +   | III |
| <i>Trifolium hybridum</i> ssp. <i>hybridum</i>      | -   | -   | -   | -   | -   | -   | -   | +   | -   | +   | +   | +   | -   | II  |
| <i>Knautia arvensis</i>                             | -   | -   | -   | -   | -   | -   | +   | +   | +   | -   | -   | +   | -   | II  |
| <i>Daucus carota</i> ssp. <i>carota</i>             | -   | -   | -   | -   | -   | -   | -   | -   | +   | +   | -   | +   | +   | II  |
| <i>Leontodon hispidus</i> ssp. <i>danubialis</i>    | -   | -   | -   | -   | -   | -   | -   | -   | +   | -   | -   | -   | +   | I   |
| <i>Arrhenatherum elatius</i>                        | -   | -   | -   | -   | -   | -   | -   | -   | +   | -   | +   | -   | -   | I   |
| <b>Molinio-Arrhenatheretea</b>                      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Ranunculus repens</i>                            | 3   | 3   | 2   | 3   | 3   | 3   | 3   | +   | -   | -   | 1   | -   | -   | IV  |
| <i>Plantago lanceolata</i>                          | -   | -   | +   | +   | +   | +   | +   | -   | +   | +   | -   | +   | +   | IV  |
| <i>Trifolium pratense</i> ssp. <i>pratense</i>      | -   | -   | -   | +   | +   | +   | +   | +   | +   | -   | +   | +   | +   | IV  |
| <i>Lathyrus pratensis</i>                           | +   | -   | +   | +   | +   | +   | +   | +   | +   | -   | +   | -   | -   | IV  |
| <i>Holcus lanatus</i>                               | -   | -   | -   | -   | -   | 1   | 1   | 1   | 3   | 1   | 1   | 1   | -   | III |
| <i>Festuca rubra</i>                                | -   | -   | -   | -   | -   | -   | -   | +   | 1   | 1   | +   | -   | 1   | III |
| <i>Ranunculus acris</i> ssp. <i>acris</i>           | -   | -   | -   | -   | -   | -   | -   | +   | +   | +   | +   | +   | +   | III |
| <i>Lysimachia nummularia</i>                        | -   | -   | -   | -   | -   | -   | -   | -   | +   | -   | +   | +   | -   | II  |
| <i>Poa pratensis</i> ssp. <i>pratensis</i>          | -   | -   | -   | -   | -   | +   | +   | -   | -   | -   | -   | +   | -   | II  |
| <i>Cardamine pratensis</i>                          | +   | +   | +   | +   | +   | -   | -   | -   | -   | -   | -   | -   | -   | II  |

|  |   |   |   |   |   |   |   |   |   |   |   |   |   |     |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|
| <i>Rumex acetosa</i>                               | - | - | + | - | + | + | + | - | - | + | - | - | - | II  |
| <i>Rhinanthus minor</i>                            | - | - | - | - | - | + | - | + | - | + | + | - | + | II  |
| <i>Ajuga reptans</i>                               | - | - | + | + | + | - | - | - | - | - | - | - | - | II  |
| <i>Centaurea jacea</i>                             | - | - | - | - | - | - | - | + | + | + | - | - | - | II  |
| <i>Cynosurus cristatus</i>                         | - | - | - | - | - | - | - | - | - | - | + | + | + | I   |
| <i>Stellaria graminea</i>                          | - | - | - | - | - | - | - | + | - | - | + | - | - | I   |
| <i>Prunella vulgaris</i>                           | - | - | - | - | - | - | - | - | - | - | - | + | + | I   |
| <b>Acomp.</b>                                      |   |   |   |   |   |   |   |   |   |   |   |   |   |     |
| <i>Carex acutiformis</i> ssp. <i>acutiformis</i>   | 2 | - | 3 | 1 | 2 | 2 | + | - | - | + | + | 1 | 1 | IV  |
| <i>Filipendula vulgaris</i>                        | + | + | 1 | 1 | 1 | + | + | + | - | + | + | - | - | IV  |
| <i>Polygonum bistorta</i>                          | - | + | + | + | 1 | + | 1 | - | - | + | + | + | + | IV  |
| <i>Iris pseudacorus</i>                            | 1 | - | 1 | + | 1 | 1 | - | 1 | - | - | 1 | - | - | III |
| <i>Galium verum</i>                                | + | 1 | - | + | - | - | - | + | + | - | - | + | - | III |
| <i>Trifolium repens</i>                            | - | - | + | + | + | - | + | - | - | - | - | + | + | III |
| <i>Galium mollugo</i>                              | - | - | + | - | + | - | - | + | + | + | + | - | + | III |
| <i>Juncus atratus</i>                              | - | - | - | - | - | - | - | 2 | - | - | 1 | + | - | II  |
| <i>Agrostis capillaris</i> ssp. <i>capillaris</i>  | - | - | - | - | - | - | - | + | - | - | + | + | 1 | II  |
| <i>Potentilla reptans</i>                          | - | - | - | - | - | - | - | - | - | + | + | + | - | II  |
| <i>Rumex crispus</i>                               | - | - | - | - | - | - | - | + | - | + | + | - | + | II  |
| <i>Orchis laxiflora</i> ssp. <i>elegans</i>        | - | - | - | - | - | + | + | - | - | + | - | - | - | II  |
| <i>Orchis morio</i>                                | - | - | + | + | + | - | + | - | - | - | - | - | - | II  |
| <i>Ranunculus auricomus</i>                        | + | + | + | + | - | - | - | - | - | - | - | - | + | II  |
| <i>Polygala vulgaris</i>                           | - | - | - | - | + | + | - | - | + | - | - | + | - | II  |
| <i>Centaurea nigrescens</i> ssp. <i>nigrescens</i> | - | - | - | - | - | - | - | + | - | + | - | + | + | II  |
| <i>Dianthus carthusianorum</i>                     | - | - | - | - | + | + | - | + | - | - | - | - | - | II  |
| <i>Cruciata laevipes</i>                           | - | - | + | + | + | - | - | - | - | - | - | - | - | II  |
| <i>Veratrum album</i>                              | - | - | + | + | + | - | - | - | - | - | - | - | - | II  |
| <i>Erigeron acris</i>                              | - | - | - | - | - | - | + | - | - | - | + | + | + | II  |
| <i>Leucojum vernum</i>                             | 1 | - | - | + | - | - | - | - | - | - | - | - | - | I   |
| <i>Equisetum arvense</i>                           | - | - | - | - | - | - | - | - | - | + | - | - | + | I   |
| <i>Thalictrum lucidum</i>                          | - | - | - | - | - | - | - | - | + | - | + | - | - | I   |
| <i>Melilotus officinalis</i>                       | - | - | - | - | - | - | - | - | + | - | + | - | - | I   |
| <i>Potentilla erecta</i>                           | - | - | - | - | - | - | - | + | + | - | - | - | - | I   |
| <i>Briza media</i>                                 | - | - | - | - | - | - | - | - | + | - | - | + | - | I   |
| <i>Centaurea phrygia</i> ssp. <i>phrygia</i>       | - | - | - | - | - | - | - | - | - | - | + | + | - | I   |
| <i>Veronica spicata</i> ssp. <i>spicata</i>        | - | - | - | - | - | - | - | + | - | - | + | - | - | I   |
| <i>Carex dioica</i>                                | - | - | + | + | - | - | - | - | - | - | - | - | - | I   |
| <i>Allium scorodoprasum</i>                        | - | - | - | - | - | - | - | - | + | + | - | - | - | I   |
| <i>Erigeron annuus</i> ssp. <i>annuus</i>          | - | - | - | - | - | - | - | - | - | + | - | + | - | I   |

**Species found in a single relevé:** *Ranunculus ficaria* (1, +), *Viola odorata* (3, +), *Veronica chamaedris* (3, +), *Carex acuta* ssp. *acuta* (4, +), *Veronica teucrium* ssp. *teucrium* (7, +), *Vicia sepium* (7, +), *Cerastium arvense* ssp. *arvense* (7, +), *Trifolium fragiferum* ssp. *fragiferum* (8, +), *Veronica longifolia* ssp. *longifolia* (8, +), *Ventenata dubia* (9, +), *Scutellaria hastifolia* (9, +), *Scutellaria galericulata* (9, +), *Crepis biennis* (10, +), *Achillea ptarmica* (11, +), *Lolium perenne* (11, +), *Cichorium intybus* (12, +), *Galium album* ssp. *album* (10, +), *Rhinanthus alectorolophus* (10, +), *Pastinaca sativa* ssp. *sativa* (12, +), *Pimpinella saxifraga* ssp. *saxifraga* (12, +), *Trisetum flavescens* ssp. *flavescens* (11, +), *Mentha pulegium* (12, +), *Phleum pratense* ssp. *pratense* (12, +), *Phragmites australis* (12, +), *Carex hirta* (13, +), *Elymus repens* ssp. *repens* (13, +), *Centaureum erythraea* ssp. *erythraea* (13, +).

**Place of relevés:** 1, 3, 5, 6, 8, 11-Dămieni; 4, 7, 9, 12-Grăuşor; 2, 10, 13-Valea.

**Date of relevés:** IV.01.2017 (1); IV.09.2017 (2); IV.29.2017 (3, 4); V.07.2017 (5); V.19.2017 (6, 7), VI.20.2017 (8-10); VI.27.2017 (11); VII.08.2017 (12, 13).

Table 2 *Frangulo-Salicetum cinereae* Graebner et Hueck 1931

| Number relevés                                       | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |     |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Altitude (m)   | 423 | 409 | 420 | 423 | 400 | 409 | 423 | 410 | 420 | 409 | 423 |     |
| Cover shrub layer (%)                                | 80  | 90  | 70  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |     |
| Cover herb layer (%)                                 | 40  | 30  | 40  | 50  | 70  | 20  | 30  | 20  | 40  | 60  | 20  |     |
| Surface (m <sup>2</sup> )                            | 50  | 50  | 50  | 50  | 50  | 50  | 50  | 50  | 50  | 50  | 50  | K   |
| <b>Carct.</b>  |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Frangula alnus</i>                                | 1   |     | 1   | 1   |     |     | 1   | +   | 1   |     | 1   | IV  |
| <i>Viburnum opulus</i>                               | +   |     |     | +   |     | +   | +   |     |     |     |     | II  |
| <b>Diff.</b>   |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Fritillaria meleagris</i>                         | 3   | 2   | 3   | +   |     |     |     |     |     | +   |     | III |
| <i>Narcissus poeticus</i><br>ssp. <i>radiiflorus</i> |     |     |     |     | +   | +   |     |     |     |     |     | I   |
| <b>Salicion cinereae</b>                             |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Salix cinerea</i>                                 | 4   | 5   | 4   | 4   | 5   | 5   | 4   | 5   | 5   | 5   | 5   | V   |
| <i>Thalictrum lucidum</i>                            |     |     |     |     |     | +   | +   | +   | +   | +   | +   | III |
| <i>Galium uliginosum</i>                             |     |     |     |     | 1   | 1   |     |     |     |     |     | I   |
| <i>Achillea ptarmica</i>                             |     |     |     |     |     |     | +   |     |     |     | +   | I   |
| <b>Alnion glutinosae</b>                             |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Carex acutiformis</i> ssp. <i>acutiformis</i>     | 1   | 1   | 1   | 3   | 4   |     | 2   |     | 3   | 3   | 1   | V   |
| <i>Symphytum officinale</i>                          |     |     |     | +   |     |     | +   | +   | +   | +   | +   | III |
| <i>Alnus glutinosa</i>                               |     |     |     | 1   |     |     | +   |     |     |     |     | I   |
| <b>Alnetalia glutinosae</b>                          |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Ranunculus repens</i>                             | +   | +   | +   | +   |     |     |     | +   |     | +   |     | III |
| <i>Solanum dulcamara</i>                             |     |     |     | +   |     |     |     |     |     |     | +   | I   |
| <b>Alnetea glutinosae</b>                            |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Iris pseudacorus</i>                              |     | +   | +   | +   |     |     |     |     | +   | +   | +   | III |
| <i>Lythrum salicaria</i>                             |     |     |     |     |     |     |     |     | +   | +   | +   | II  |
| <i>Lysimachia vulgaris</i>                           |     |     |     |     |     | +   |     |     | +   | +   | +   | II  |
| <i>Caltha palustris</i> ssp. <i>laeta</i>            | +   |     | +   |     |     |     |     |     |     |     |     | I   |
| <i>Scutellaria hastifolia</i>                        |     |     |     |     |     | +   | +   |     |     |     |     | I   |
| <b>Calthion</b>                                      |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Valeriana officinalis</i>                         |     |     |     | +   | +   | +   |     | +   |     | +   |     | III |
| <i>Myosotis scorpioides</i>                          |     |     |     | +   |     |     | +   | +   | +   |     |     | II  |
| <i>Filipendula ulmaria</i>                           | +   |     |     | +   |     |     |     |     |     |     | +   | II  |
| <i>Lychnis flos-cuculi</i>                           |     |     |     | +   |     |     |     |     | +   |     |     | I   |
| <b>Acomp.</b>  |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>Crataegus monogyna</i>                            |     | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | V   |
| <i>Salix fragilis</i>                                | 1   | 1   |     | 2   |     | 1   | 2   | 1   |     | 1   | 1   | IV  |
| <i>Polygonum bistorta</i>                            | +   | +   |     | +   | +   | +   |     |     |     | +   | +   | IV  |
| <i>Sanguisorba officinalis</i>                       | +   | +   | +   | +   | +   |     |     |     | +   | +   | +   | IV  |
| <i>Rubus caesius</i>                                 |     |     |     | +   |     | 1   | 1   | 1   |     | +   | +   | III |
| <i>Cirsium canum</i>                                 |     |     |     |     | +   | +   |     | +   |     | +   | +   | III |
| <i>Stachys officinalis</i>                           |     |     |     | +   |     |     | +   | +   | +   | +   |     | III |
| <i>Achillea millefolium</i>                          |     | +   | +   |     |     |     | +   | +   |     | +   |     | III |
| <i>Lathyrus pratensis</i>                            |     |     | +   |     | +   |     | +   |     |     | +   | +   | III |
| <i>Cornus sanguinea</i>                              |     |     |     | +   |     | +   | +   | +   |     | +   |     | III |
| <i>Quercus robur</i>                                 |     | +   |     | 1   |     | 1   | 1   | +   |     | +   |     | III |
| <i>Rosa canina</i>                                   |     |     | +   | +   |     |     |     | +   | +   |     | +   | III |
| <i>Deschampsia cespitosa</i>                         |     |     | +   |     |     |     | +   |     | +   | +   | +   | III |
| <i>Juncus conglomeratus</i>                          |     | +   | +   |     |     |     |     | +   | +   | +   |     | III |
| <i>Aegopodium podagraria</i>                         |     |     |     | +   |     |     |     | +   |     | +   |     | II  |
| <i>Malus sylvestris</i>                              |     |     | +   | +   |     |     |     | +   | +   |     |     | II  |
| <i>Holcus lanatus</i>                                |     |     |     | +   |     |     |     |     | +   | +   |     | II  |
| <i>Colchicum autumnale</i>                           |     | +   |     |     | +   |     |     | +   |     | +   |     | II  |
| <i>Alopecurus pratensis</i><br>ssp. <i>pratensis</i> |     |     | +   | +   |     |     |     |     |     | +   |     | II  |
| <i>Carex vulpina</i>                                 |     |     |     | +   |     |     | +   | +   |     |     |     | II  |
| <i>Oenanthe aquatica</i>                             |     |     |     | +   |     |     | +   | +   | +   |     |     | II  |
| <i>Allium angulosum</i>                              |     |     |     |     | +   | +   |     |     |     | +   | +   | II  |
| <i>Galium verum</i>                                  |     |     |     |     | +   |     |     |     | +   | +   |     | II  |
| <i>Humulus lupulus</i>                               |     |     |     | +   | +   |     |     |     |     | +   | +   | II  |
| <i>Petasites hybridus</i>                            |     |     | +   |     | +   |     |     |     |     | +   |     | II  |



|   |   |  |   |   |   |   |   |  |   |   |   |  |
|---|---|--|---|---|---|---|---|--|---|---|---|--|
| <i>Centaurea nigrescens</i> ssp. <i>nigrescens</i>  |   |  |   |   |   | + | + |  | + |   |   |  |
| <i>Lysimachia nummularia</i>                        | + |  | + |   |   |   |   |  | + |   |   |  |
| <i>Iris sibirica</i>                                |   |  | + |   | + |   |   |  | + |   |   |  |
| <i>Agrostis stolonifera</i> ssp. <i>stolonifera</i> |   |  |   | + |   |   |   |  | + |   |   |  |
| <i>Juncus effusus</i>                               |   |  |   |   |   |   |   |  | + |   | + |  |
| <i>Ranunculus acris</i> ssp. <i>acris</i>           |   |  |   |   |   |   |   |  | + |   | + |  |
| <i>Stellaria graminea</i>                           |   |  |   |   |   |   |   |  | + |   | + |  |
| <i>Acer campestre</i>                               |   |  |   |   |   |   |   |  | + | 1 |   |  |
| <i>Geum urbanum</i>                                 |   |  |   |   |   |   |   |  | + |   | + |  |
| <i>Prunus spinosa</i>                               |   |  |   |   |   | + |   |  | + |   |   |  |
| <i>Conium maculatum</i>                             |   |  |   |   |   |   |   |  | + | + |   |  |
| <i>Filipendula vulgaris</i>                         |   |  |   |   |   |   |   |  | + | + |   |  |
| <i>Erigeron acris</i> ssp. <i>acris</i>             |   |  |   |   |   | + |   |  | + |   |   |  |
| <i>Euonymus europaeus</i>                           |   |  |   |   |   |   |   |  | 2 |   | + |  |
| <i>Campanula patula</i>                             |   |  |   |   |   | + |   |  | + |   |   |  |
| <i>Artemisia vulgaris</i>                           |   |  |   |   | + |   |   |  |   |   | + |  |
| <i>Phragmites australis</i>                         |   |  |   |   |   | + |   |  |   |   | + |  |
| <i>Vicia cracca</i>                                 |   |  |   |   |   | + |   |  |   |   | + |  |
| <i>Veratrum album</i>                               | + |  |   |   |   |   |   |  | + |   |   |  |
| <i>Veronica longifolia</i> ssp. <i>longifolia</i>   |   |  |   |   |   |   |   |  |   | + | + |  |
| <i>Salix triandra</i>                               |   |  | + |   |   |   |   |  |   |   | + |  |
| <i>Ranunculus ficaria</i>                           | + |  | + |   |   |   |   |  |   |   |   |  |

**Species found in a single relevé:** *Anemone nemorosa* ssp. *nemorosa* (1, +), *Polygonatum multiflorum* (1, +), *Lotus corniculatus* (4, +), *Prunus padus* (4, +), *Galium aparine* (4, +), *Lamium purpureum* (4, +), *Galium mollugo* (6, +), *Galium album* (6, +), *Echinocystis lobata* (6, +), *Carex acuta* ssp. *acuta* (7, +), *Sambucus nigra* (7, +), *Equisetum arvense* (8, +), *Inula britannica* (8, +), *Pyrus pyraster* (8, +), *Agrimonia eupatoria* (8, +), *Ranunculus auricomus* (8, +), *Prunus avium* (8, +), *Gladiolus imbricatus* (9, +), *Poa trivialis* ssp. *trivialis* (10, +), *Rumex acetosa* (10, +), *Echinocystis lobata* (10, +), *Geum aleppicum* (10, +), *Knautia arvensis* (10, +), *Bromus arvensis* ssp. *arvensis* (10, +), *Centaurea phrygia* ssp. *phrygia* (10, +), *Juncus atratus* (10, +), *Urtica dioica* (10, +), *Potentilla erecta* (10, +), *Galium boreale* (10, +), *Lythrum virgatum* (10, +), *Calystegia sepium* (11, +), *Ligustrum vulgare* (11, +), *Galeopsis speciosa* (11, +), *Dipsacus fullonum* (11, +).

**Place of relevés:** 1, 4, 7, 11-Dămieni; 2, 5, 6, 8, 10-Grăușor; 3, 9-between Grăușor and Dămieni.

**Date of relevés:** IV.09.2017 (1, 2); IV.15.2017 (3); V.19.2017 (4); VI.20.2017 (5-7); VI.23.2017 (8); VI.27.2017 (9); VII.08.2017 (10); VIII.14.2017 (11).

## CONCLUSIONS:

The vascular plant species richness has almost the same values in the two associations: *Agrostio stoloniferae-Deschampsietum caespitosae*-101 vascular plant species and *Frangulo-Salicetum cinereae*-103 vascular plant species. The spectrum of bioforms shows the dominance of phanerophytes / hemicryptophytes and helohidatophytes. The altitudinal indices denote a mountain area with moderate climate and anthropogenic pressure. In the spectrum of

geoelements cold climate specific elements (Circ.) are also well represented. The spectrum of ecological categories based on edaphic humidity shows that Grey willow scrubs represents a more humid habitat type than the grasslands. The spectrum of ecological categories based on temperature presents that plants of hilly and sub-mountainous areas are in high number. The low values of the diploid indices show the pioneer or intermediate stage of the vegetation.

In the Nirajul Mare River valley consistent populations of *F. meleagris* were found. To reveal additional information on the ecology and population structure of *F. meleagris* further investigations are necessary. Beside *F. meleagris*, a considerable number of other red list species were identified. Taking into consideration the botanical importance of the humid grasslands and Grey willow scrubs from the course of Nirajul Mare River we propose the establishment of a Special Area of Conservation in this region. In case of humid grasslands it is also recommended: grass moving one time per year (in late summer); to avoid grazing and drainage works; not to use chemicals for fertilization.

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