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SUMMARY

CUPRINS

MUZEUL JUDEȚEAN ARGEŞ, PITEŞTI, ROMÂNIA
ARGESIS *- STUDII ŞI COMUNICĂRI - seria ŞTIINȚELE NATURII,* **TOM XVIII**, 2010

RUMICETUM ALPINI BEGER 1922 ASSOCIATION IN SOUTH CARPATHIANS

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ABSTRACT: The coenoses of this assemblage of megaforbs were identified in the investigated territory, i.e. some massifs from Southern Carpathians (Retezat, Parâng, Lotrului, Făgăraş, Cindrel mountains). Because of the presence of the species characteristic for the assemblage of the *Rumicion alpini* Rübel ex Klika in Klika et Hadač 1944 alliance, *Rumicetalia alpini* Mucina et Karner 1993 order and the *Adenostyletalia* Br.-Bl. 1930 order, the assemblage was included in the *Mulgedio-Aconitetea* class Hadač et Klika 1944.

Key words: megaforbs, Southern Carpathians.

REZUMAT: Asociația *Rumicetum alpini* Beger 1922 în Carpații Meridionali
Cenoze ale acestei asociații au fost identificate în câteva masive muntoase din teritoriul cercetat aparținând Carpaților Meridionali (Munții Retezat, Munții Parâng, Munții Lotrului, Munții Făgăraş şi Munții Cindrel). Datorită prezenței speciilor caracteristice alianței *Rumicion alpini* Rübel ex Klika in Klika et Hadač 1944, ordinului *Rumicetalia alpini* Mucina et Karner 1993 *şi* ordinului *Adenostyletalia* Br.-Bl. 1930, asociația a fost încadrată în clasa *Mulgedio-Aconitetea* HADAČ et KLIKA 1944.

Cuvinte cheie: megaforbiete, Carpații Meridionali.

INTRODUCTION

Physical and geographical setting

The Southern Carpathians are the highest area of our country. These mountains are situated in central Romania, south to the Transylvanian Depression. Prahova Valley (East), Timiş-Cerna Passage (West) and hilly regions (North & South) are framing these mountains. The following groups are forming the Southern Carpathians:

- Bucegi Group, between Prahova and Dâmbovița valleys; it is formed by three massifs: Bucegi, Piatra Craiului and Leaota;
- Făgăraş Group, between Dâmbovița and Olt valleys, with the following mountains: Făgăraş, Frunți, Ghițu and Iezer-Păpuşa;

- Parâng Group, between Olt, Jiu and Strei valleys, formed by Parâng, Cindrel, Şureanu, Lotrului, and Căpățânii mountains;
- Retezat-Godeanu Group includes Retezat, Godeanu, Vâlcan, Cernei and Mehedinți mountains.

Unlike in the Eastern Carpathians, in Southern Carpathians the metamorphic rocks and the magmatic ones are prevalent, which control the massiveness of these mountains, being more resistant to erosion (Pelin et al., 1969).

The climate is a typically mountain one (1000 and 1800-2000 m), even with alpine influences (over 1800-2000m). The annual average temperature decreases as the height increases, from 6 ^{0}C (at 1000 m) to 2 ^{0}C (1800 m) and 0 ^{0}C (2200 m); the average temperature of the warmest and the coldest months decreases proportionally. The rainfalls increase from 800 mm to 1200 mm-1400 mm/year. The winds are on western domination, while into the depressions bordering these mountains they have föen-like feathures; in Hațeg, Petroşani and Loviștea depressions such phenomena of thermo inversion had been reported (Cristea & Dimitriu, 1961; Velcea & Savu, 1982).

Because of the rich rainfalls, the hydrographical net has continuous supply and rich flows. The main rivers are: Sebeş, Mureş's tributaries; Bistra and Rece rivers, Cerna, Jiu; Cibin, Lotru, Topolog, Olteț, Argeşul, Ialomița. The Southern Carpathians have numerous lakes of glacial origin (over 150) and men-made lakes (Vidra, Vidraru, Gura Apei and other smaller fitting outs). All the mineral springs, except the geothermal spring from Băile Herculane, are situated in the coterminous areas.

MATERIALS AND METHODS

The conspectus of taxa was drawn upon the individual field researches as well as upon the study of the scientific materials. The syntaxonomic nomenclature was adopted according to the stipulations of the International Code of the Phyto-sociological Nomenclature elaborated by Weber et al., (2000).

RESULTS AND DISCUSSIONS

The *Rumicetum alpini* Beger 1922 assemblage has the following correspondences: R3704, NATURA 2000: 6430; CLAS. PAL.: 37.88; EMERALD; PAL. HAB 1999: 37.88; EUNIS: E5.58 (Doniță et al., 2005; Gafta & Mountord, 2008; Sârbu et al., 2007).

The edified coenoses of *Rumex alpinus* was identified in the following massifs fom the Southern Carpathians: Retezat, Parâng, Lotrului, Făgăraş, and Cindrel mountains.

The phytocoenosis of this association vegetate along valleys, near forest ranges, sheepfods, huts, on fertile areas. In the survey area, this nitrophile association can be seen at altitude between 1200 and 1900 m.

The floristic analysis of this assemblage underlines the presence of numerous species characteristic for the *Rumicion alpini* Rübel ex Klika in Klika et Hadač 1944 alliance and the *Rumicetalia alpini* Mucina et Karner 1993 order (*Veratrum album, Chenopodium bonus-henrici*), the *Adenostyletalia* BR.-BL. 1930 order (*Adenostyles alliariae, Senecio germanicus, Aconitum tauricum, Heracleum palmatum, Salix silesiaca, Geranium phaeum, Saxifraga rotundifolia etc.*) and *Mulgedio-Aconitetea* class Hadač et Klika 1944 (*Athyrium distentifolium, Cicerbita alpina, Geranium sylvaticum etc.*) which demonstrates the association statut syntaxonomic (Ciocârlan, 2000; Sanda et al., 2001).

The spectrum of the bioforms shows a high percentage of the hemicryptophytes (80%), followed by the terophytes (6.66%) and the chamephytes (6.66%), while the other categories of bioforms are being less represented in these phytocoenoses (Fig. 1).

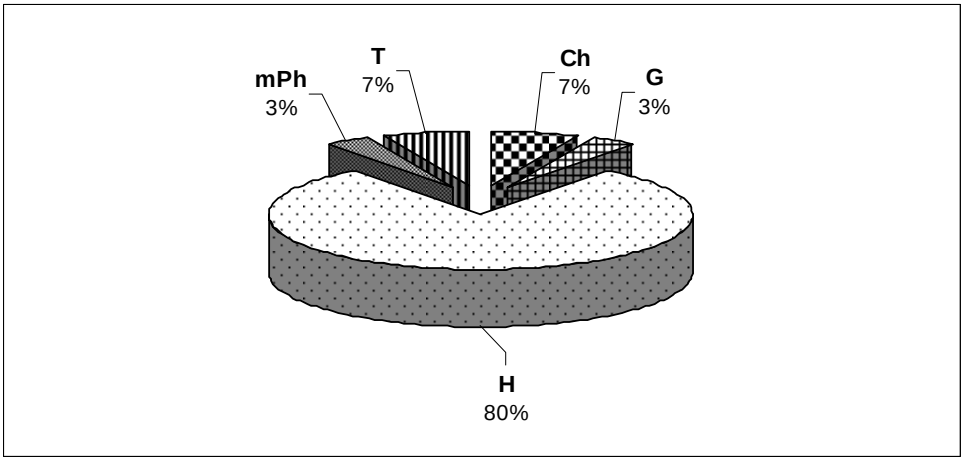

Figure 1 - The spectrum of the bioforms of the *Rumicetum alpini* association.

The floristic elements which form the basis fundaments of the cormoflora are the Eurasian species (33.33%), followed by the European (16.66%) and Central-European ones (10%). The Alps representatives (13.33%) underline the floristic and genetic connections with the Alps flora, while the regional character of this assemblage is shown by the presence of the Carpathians (3.33%) and Carpathians-endemic species (3.33%) (Fig. 2).

Analyzing the ecological indexes we find out the following:

- humidity (U): the most of the studied megforbs are mesophilous, ($U_{3-3,5}$=76.66%) and meso-hygrophilous ($U_{4-4,5}$=20%), indicating a constantly moist but not swampy soil;

- temperature (T): the micro-termophilous ($T_{2-2,5}$=50%) and micro-meso-termophilous ($T_{3-3,5}$=20%) are best represented, indicating a cold climate with low temperatures of the water and soil during the entire vegetative season, specific to the upper mountain and sub alpine stand;

- the index regarding the soil reaction (R) shows the existence of the acid-neutrophilous ($R_{3-3,5}$=30%) and low-acid-neutrophilous ($R_{4-4,5}$=20%). The megaforbs phytocoenoses are also edified by the acidophilous species ($R_{2-2,5}$=13.33%), while the neutro-basophilous and the strong-acidophilous ones are missing (Fig. 3).

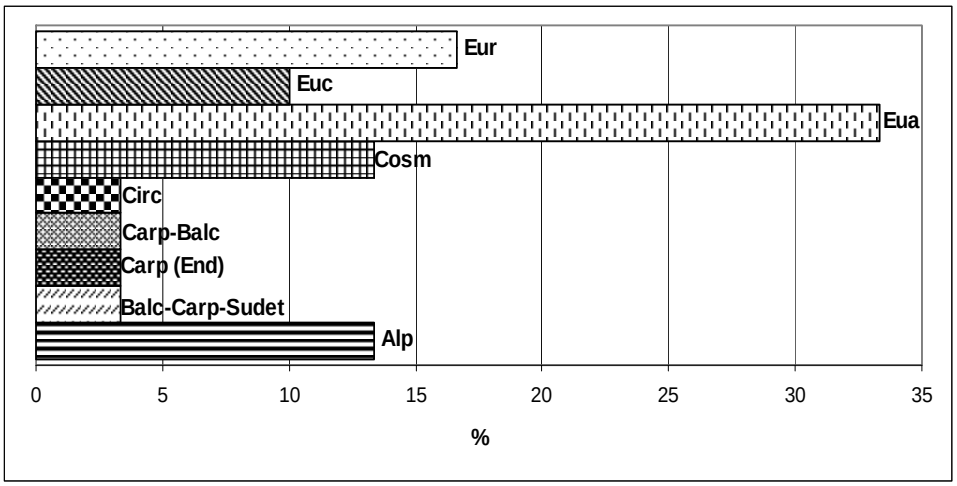

Figure 2 - The spectrum of the floristic elements of the *Rumicetum alpini* association.

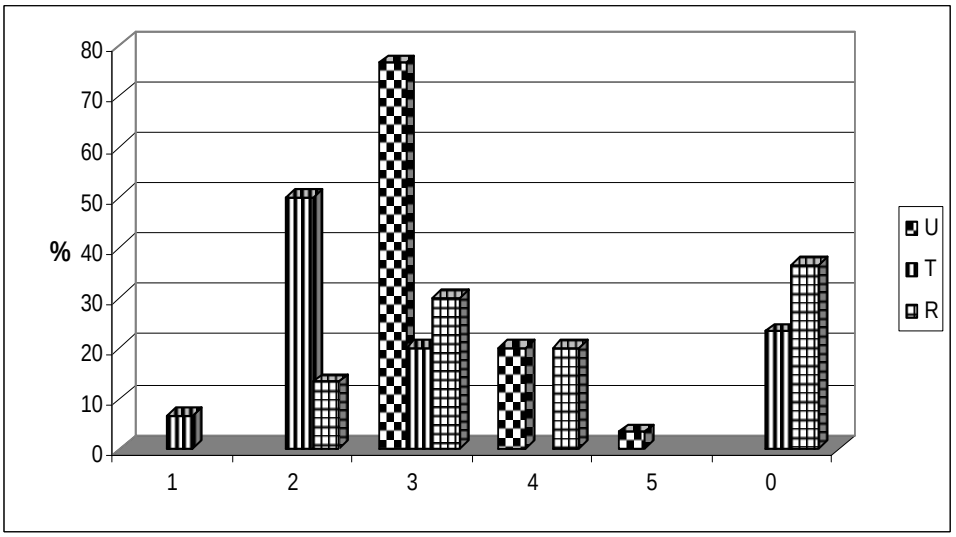

Figure 3 - The spectrum of the ecological indexes of the *Rumicetum alpini* assemblage.

The humification and mineralization of the organic material favor good mineral feeding, which leads to the edification of a large volume of the aerial organs as well as to the accumulation of a big quantity of substances for supply in the underground organs in few weeks.

The diploid index is 0.92 and suggesting greater resistance to environmental conditions of species and higher competitive capacity (Fig. 4).

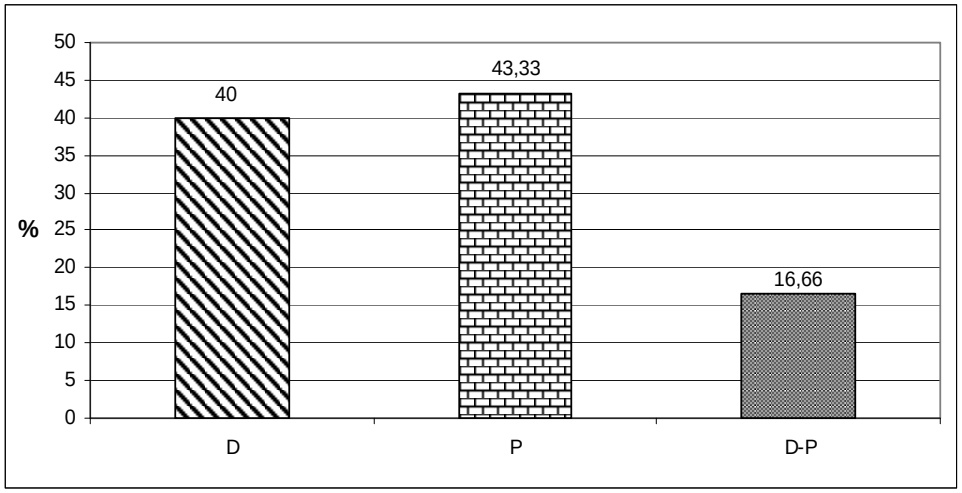

Figure 4 - The spectrum of the ecological indexes of the *Rumicetum alpini* association.

In order to underline the similitude between the various massifs from the Southern Carpathians the vegetal groups of weeds correspondent to these massifs were chosen. There were studied the surveys from the following massifs: Retezat, Făgăraş, Parâng, and Cindrel (Fig. 5).

The cladistic analysis I used is based on the parsimony principle, which means that a solution is enunciated in order to solve a problem and the most convenient is accepted. This is the principle which claim that when more cladograms are possible, it have to be chosen the easiest, i.e. the one that needs the smallest number of evolutionary transformations for the ensemble of the considered characters.

The similitudes of the vegetal groups that I studied are seen as evolutionary innovation, the so-called synapomorphys. All the branches of the cladogram, which have an analogous character, have a mutual ancestor. Cladistics is based on the identification of the similitude of the characters.

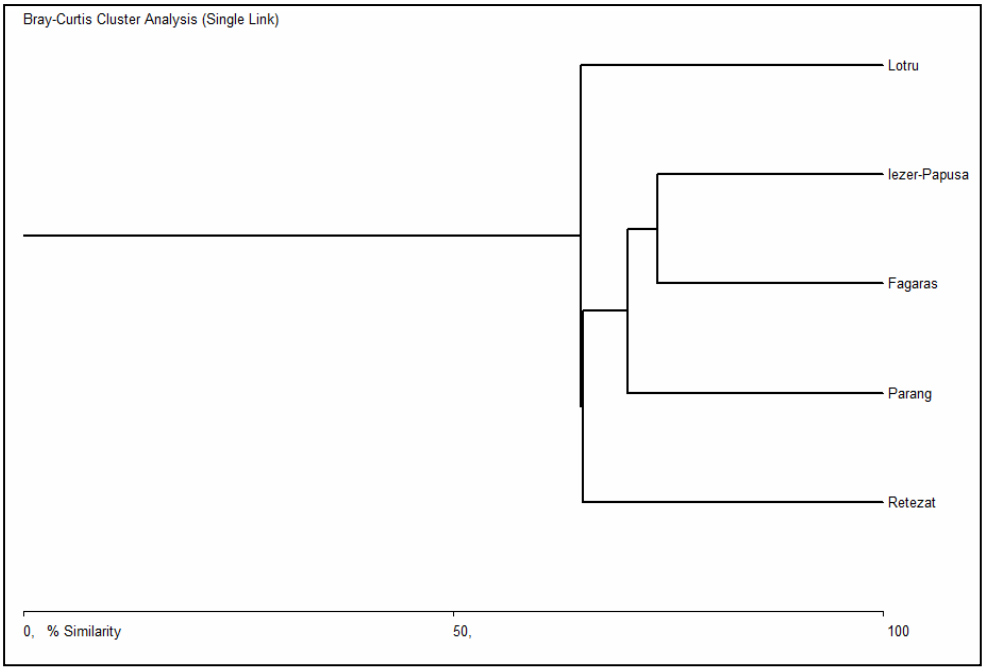

Figure 5 - The dendrogram of similitude of the *Rumicetum alpini* association in Southern Carpathians

The dendrogram regarding the megaforbs from Southern Carpathians shows a repartition of the surveys from the assemblages, considered as a Carpathian unit. Though the dendrogram appears homogeneous, the floristic elements could differentiate clusters, which gather surveys having similar features. The grouping in clusters is done in conformity with the geographical distribution in the various massifs, underlining the geographical differentials of the stational, of the edaphoclimaxes typical for the studied massifs.

CONCLUSIONS

The megaforbs species which belong to *Rumicetum alpini* association are prevalent hemicryptophytes.

The prevalent floristic elements are the Eurasiatic, the European and the Central-European ones, while the regional character is underlined by the Carpathian and the Carpathian-endemic taxa.

By analyzing the ecological indexes I found out that the mountain tall weeds are mesophilous and meso-hygrophilous, micro-termophilous and micro-meso-termophilous, acid-neutrophilous and low-acid-neutrophilous.

The dendrogram shows a unitary repartion of the surveys of the *Rumicetum alpini* association in the Southern Carpathians.

Although the dendrogram seems to be homogeneous, the grouping by clusters is achieved in conformity with the geographical distribution of the massifs, thus resulting geographical differentials of the stational circumstances of some specific edaphoclimaxes of the mountain massifs.

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ENDANGERED PLANT SPECIES IN THE FLORISTIC COMPOSITION OF VEGETATION ON THE ROCKS (ASPLENIETEA TRICHOMANIS), IN ARGES COUNTY

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ABSTRACT: The paper deals with the presence of a number of 92 vulnerable species, almost threatened species and low - risk species threat quoted in plant communities framed in rocks and lithosoils vegetation (Asplenietea trichomanis Class). The component species of these associations are formed phytocoenoses that are initial link of the lithoseries, with a strong conservative character. Leontopodium alpinum and Saxifraga mutata ssp. demissa, species classified as vulnerable, has a strong endemic value, value transmitted to plant associations in which they are presents.

Keywords: endangered species, saxicola association, Asplenietea trichomanis, Arges County.

REZUMAT: Specii de plante periclitate din compoziția floristică a vegetației saxicole (Asplenietea trichomanis), din județul Argeş
Lucrarea tratează prezența unui număr de 92 de specii vulnerabile, aproape amenințate şi specii cu risc scăzut de amenințare citate în comunitățile de plante încadrate în vegetația de stâncării şi litosoluri (clasa Asplenietea trichomanis). Speciile componente acestor asociații formează fitocenoze ce constituie veriga inițială a litoseriei, cu un pronunțat caracter conservativ. *Leontopodium alpinum* şi *Saxifraga mutata* ssp.*demissa*, specii încadrate în categoria plantelor vulnerabile, au o pronunțată valoare endemică, valoare transmisă şi asociațiilor vegetale în care sunt prezente.

Cuvinte cheie: specii amenințate, asociație saxicolă, Asplenietea trichomanis, județul Arges.

INTRODUCTION

From the estimated number of Romanian flora (species and subspecies of higher plants, more than 4000) a significant proportion is growing on Argeş County. The information from the literature and personal researches in the field, shown the existence of 2009 species and subspecies in the Făgăraş Mountains chormoflora of the Argeş County. All these systematic categories belong to 584 genera and 144 botanical families. It are included in neither categories of the Red List, 309 species and subspecies being distributed by the following categories: rare, vulnerable, endemic to Romania, endemic to Romania not endangered, species

having rare European specific spreading area, having endangered European specific spreading area (IUCN Red List, Habitats Directive Annex IIb, IVb and Bern Convention -App I).

The scientific valuation and documentation of the diversity of plants is necessary. This is possible by knowing the present chorology and the weight of the various sozologic categories, for their preservation.

For main sozological categories we made a presentation and integration chorology coenotic to indicate how to save and protect endangered species.

MATERIALS AND METHODS

The establishment of the protected plants was made on the basis: *Red List of extinct endangered, vulnerable and rare higher plants of Romania flora* (Boşcaiu et al., 1994), *Rare vulnerable and endemic plants of Romania flora - The Red List* (Dihoru & Dihoru, 1994), *The Red List of higher plants of Romania flora* (Oltean et al., 1994), *Critical list of vascular plants in Romania*, (Oprea, 2005), *Arges county cormoflora* (Alexiu, 2008), *Red book of vascular plants in Romania* (Dihoru & Negrean , 2009).

The **IUCN Red List of Threatened Species** (also known as the **IUCN Red List** or **Red Data List**) is the world's most comprehensive inventory of the global conservation status of plant and animal species.

A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit. Species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation.

1. Extinct (EX) - No individuals remaining.
2. Extinct in the Wild (EW) - Known only to survive in captivity, or as a naturalized population outside its historic range.
3. Critically Endangered (CR) - Extremely high risk of extinction in the wild.
4. Endangered (EN) - High risk of extinction in the wild.
5. Vulnerable (VU) - High risk of endangerment in the wild.
6. Near Threatened (NT) - Likely to become endangered in the near future.
7. Least Concern (LC) - Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category.
8. Data Deficient (DD) - Not enough data to make an assessment of its risk of extinction.
9. Not Evaluated (NE) - Has not yet been evaluated against the criteria

RESULTS

- 94 species were identified, falling into 24 plant associations:

ASPLENIETEA TRICHOMANIS (Br.-Bl. in Meier *et* Br.-Bl. 1934) Oberdorfer 1977

TORTULO-CYMBALARIETALIA Segal 1969
Cymbalario-Asplenion Segal 1969 em. Mucina 1993

- *Asplenietum trichomano-rutae-murariae* Kuhn 1937, Tx. 1937
  - *Campanula carpatica* Jacq. (**NT**)
- *Jovibarbo soboliferae-Saxifragetum paniculatae* Täuber 1987 *erysimetosum transsilvanici* Täuber 1987
  - *Jovibarba globifera* (L.) J. Parnell subsp. *globifera* (**NT**)
  - *Erysimum witmannii* Zawadzki (**NT**)

Cystopteridion Richard 1972

- *Asplenio-Cystopteridetum fragilis* Oberd. (1936) 1949
  - *Aconitum moldavicum* Hacq. ex Reichenb (**NT**)
  - *Hepatica transsilvanica* Fuss (**LC**)
  - *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
  - *Thymus comosus* Heuffel ex Griseb. (**LC**)
  - *Campanula carpatica* Jacq. (**NT**)
- *Asplenio quadrivalenti – Poëtum nemoralis* Soó ex Gergely *et al*. 1966
  - *Thymus comosus* Heuffel ex Griseb. (**NT**)
  - *Campanula carpatica* Jacq. (**LC**)
- *Thymo pulcherrimi – Poëtum rehmanii* Coldea (1986) 1990
  - *Silene nutans* L. subsp. *dubia* (Herbich) Zapal. (**NT**)
  - *Thymus pulcherrimus* Schur (**NT**)
  - *Campanula kladniana* (Schur) Witasek (**NT**)

ANDROSACETALIA VANDELII Br.-Bl. in meier *et* Br.-Bl. 1934
Asplenion septentrionalis Oberdorfer 1938

- *Asplenietum septentrionali – adianti-nigri* Oberd. 1938
  - *Silene nutans* L. subsp. *dubia* (Herbich) Zapal. (**NT**)
  - *Jovibarba heuffelii* (Schott) A. *et* D. Löve (**NT**)
  - *Thymus comosus* Heuffel ex Griseb. (**LC**)
- *Woodsio ilvensis-Asplenietum septentrionalis* T. Tx. 1937
  - *Dianthus henteri* Heuff. ex Griseb. *et* Schenk (**NT**)
  - *Jovibarba heuffelii* (Schott) A. *et* D. Löve (**NT**)
  - *Thymus comosus* Heuffel ex Griseb. (**LC**)
- *Sempervivetum heuffelii* Schneider-Binder 1969
  - *Jovibarba heuffelii* (Schott) A. *et* D. Löve (**NT**)
  - *Thymus comosus* Heuffel ex Griseb. (**LC**)
- *Asplenio – Poëtum nemoralis* Boşcaiu 1971 *veronicetosum bachofenii* (Borza 1959) Boşcaiu 1971
  - *Dianthus henteri* Heuff. ex Griseb. *et* Schenk (**NT**)

- *Jovibarba heuffelii* (Schott) A. *et* D. Löve (**NT**)
- *Veronica bachofenii* Heuffel (**NT**)
- *Symphyandra wanneri* (Rochel) Heuffel (**NT**)
- *Galium kitaibelianum* Schultes *et* Schultes fil. (**NT**)

Silenion lerchenfeldianae

- *Silenetum dinaricae* Schneider-Binder *et* Voik 1976
  - *Silene lerchenfeldiana* Baumg. (**NT**)
  - *Veronica baumgartenii* Roemer *et* Schultes (**NT**)
- *Diantho henteri-Silenetum lerchenfeldianae* Stancu 2002
  - *Dianthus henteri* Heuff. ex Griseb. *et* Schenk (**NT**)
  - *Silene lerchenfeldiana* Baumg. (**NT**)
- *Senecio glaberrimi – Silenetum lerchenfeldianae* Boşcaiu, Täuber, Coldea 1977
  - *Silene lerchenfeldiana* Baumg. (**NT**)
  - *Campanula kladniana* (Schur) Witasek (**NT**)
  - *Senecio glaberrimus* (Rochel) Simonkai (**NT**)
- *Sileno lerchenfeldianae – Potentilletum haynaldianae* (Horvat, Pawl. *et* Walas 1937) Simon 1958
  - *Dianthus henteri* Heuff. ex Griseb. *et* Schenk (**NT**)
  - *Silene lerchenfeldiana* Baumg. (**NT**)
  - *Saxifraga pedemontana* All. subsp. *cymosa* Engler (**NT**)
  - *Symphyandra wanneri* (Rochel) Heuffel (**NT**)
- *Asplenio septentrionali-Silenetum lerchenfeldianae* Horvat 1936
  - *Silene lerchenfeldiana* Baumg. (**NT**)

ARTEMISIETALIA PETROSAE Sanda *et al.* 2001

Gypsophilion petraeae Borhidi *et* Pócs 1957

- *Achilleo schurii – Campanuletum cochleariifoliae* Fink 1977
  - *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
  - *Saxifraga mutata* L. subsp. *demissa* (Schott *et* Kotschy) D.A.Webb (**VU**)
  - *Thymus pulcherrimus* Schur (**NT**)
  - *Achillea oxyloba* (DC) Schultz-Bip. subsp. *schurii* (Schultz-Bip.) Heimerl (**NT**)
  - *Leontopodium alpinum* Cass. (**VU**)
  - *Festuca versicolor* Tausch subsp. *versicolor* (**NT**)
- *Saxifrago luteoviridis – Silenetum zawadzkii* Pawl. *et* Walas 1949
  - *Dianthus spiculifolius* Schur (**NT**)

- *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
- *Onobrychis montana* DC. subsp. *transsilvanica* (Simonkai) Jáv. (**NT**)
- *Linum perenne* L. subsp. *extraaxillare* (Kit.) Nyman (**LC**)
- *Eritrichium nanum* (L.) Schrader ex Gaudin subsp. *jankae* (Simonkai) Jáv. (**NT**)
- *Thymus comosus* Heuffel ex Griseb. (**LC**)
- *Thymus pulcherrimus* Schur (**NT**)
- *Campanula carpatica* Jacq. (**NT**)
- *Campanula kladniana* (Schur) Witasek (**NT**)
- *Crepis jacquinii* Tausch (**NT**)
- *Erigeron uniflorus* L. (**NT**)
- *Trisetum alpestre* (Host) Beauv. (**NT**)

- *Artemisio petrosae – Gypsophiletum petraeae* Puşcaru *et al*. 1956
  - *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
  - *Saxifraga mutata* L. subsp. *demissa* (Schott *et* Kotschy) D.A.Webb (**VU**)
  - *Viola alpina* Jacq. (**NT**)
  - *Draba kotschyi* Stur (**LC**)
  - *Erysimum witmannii* Zawadzki (**NT**)
  - *Androsace arachnoidea* Schott, Nyman *et* Kotschy (**NT**)
  - *Eritrichium nanum* (L.) Schrader ex Gaudin subsp. *jankae* (Simonkai) Jáv. (**NT**)
  - *Campanula carpatica* Jacq. (**NT**)
  - *Campanula kladniana* (Schur) Witasek (**NT**)
  - *Trisetum alpestre* (Host) Beauv. (**NT**)
- *Saxifrago moschatae – Drabetum kotschyi* Puşcaru *et al*. 1956
  - *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
  - *Saxifraga mutata* L. subsp. *demissa* (Schott *et* Kotschy) D.A.Webb (**VU**)
  - *Draba kotschyi* Stur (**LC**)
  - *Campanula carpatica* Jacq. (**NT**)
  - *Achillea oxyloba* (DC) Schultz-Bip. subsp. *schurii* (Schultz-Bip.) Heimerl (**NT**)
  - *Doronicum carpaticum* (Griseb. *et* Schenk) Nyman (**NT**)
  - *Lloydia serotina* (L.) Reichenb. (**NT**)
  - *Trisetum alpestre* (Host) Beauv. (**NT**)

- *Saxifrago rochelianae – Gypsophiletum petraeae* Boşcaiu, Täuber, Coldea 1977
    - *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
    - *Androsace arachnoidea* Schott, Nyman *et* Kotschy (**NT**)
    - *Eritrichium nanum* (L.) Schrader ex Gaudin subsp. *jankae* (Simonkai) Jáv.
    - *Campanula kladniana* (Schur) Witasek (**NT**)
    - *Leontopodium alpinum* Cass. (**VU**)
- *Saxifrago demissae – Gypsophiletum petraeae* Boşcaiu *et* Täuber 1977
    - *Gypsophila petraea* (Baumbg.) Rchb. (**NT**)
    - *Saxifraga mutata* L. subsp. *demissa* (Schott *et* Kotschy) D.A.Webb (**VU**)
    - *Androsace arachnoidea* Schott, Nyman *et* Kotschy (**NT**)
    - *Eritrichium nanum* (L.) Schrader ex Gaudin subsp. *jankae* (Simonkai) Jáv. (**NT**)
    - *Campanula kladniana* (Schur) Witasek (**NT**)
    - *Achillea oxyloba* (DC) Schultz-Bip. subsp. *schurii* (Schultz-Bip.) Heimerl (**NT**)

Micromerion pulegii Boşcaiu (1971) 1979

- *Campanuletum crassipedis* Borza ex Schneider-Binder *et al*. 1970
    - *Linum uninerve* (Rochel) Jáv. (**NT**)
    - *Campanula crassipes* Heuffel (**NT**)
- *Drabo lasiocarpae–Ceterachetum* (Schneider-Binder 1969) Peia 1978
    - *Draba lasiocarpa* Rochel (**NT**)
- *Asplenio-Silenetum petraeae* Boşcaiu 1971
    - *Athamanta turbith* (L.) Bot. subsp. *hungarica* (Borbás) Tutin (**NT**)
- *Seslerio rigidae – Saxifragetum rochelianae* Gergely 1967
    - *Dianthus spiculifolius* Schur (**NT**)
    - *Athamanta turbith* (L.) Bot. subsp. *hungarica* (Borbás) Tutin (**NT**)

CONCLUSIONS

- The 92 species are classified in three sozological categories (Tab. 1):

Table 1 – Sozological categories.

LC	VU	NT
4	2	86

- Vulnerable species are: *Saxifraga mutata* subsp. *demissa* and *Leontopodium alpinum*
- Species with low risk of vulnerability are: *Hepatica transsilvanica*, *Thymus comosus, Linum perenne* subsp. *extraaxillare*, *Draba kotschyi.*

- Weight species associations are as follows:

Saxifrago luteoviridis – Silenetum zawadzkii	12
Artemisio petrosae – Gypsophiletum petraeae	10
Saxifrago moschatae – Drabetum kotschyi	8
Achilleo schurii – Campanuletum cochleariifoliae	6
Saxifrago demissae – Gypsophiletum petraeae	6
Asplenio-Cystopteridetum fragilis	5
Asplenio – Poëtum nemoralis veronicetosum bachofenii	5
Saxifrago rochelianae – Gypsophiletum petraeae	5
Sileno lerchenfeldianae – Potentilletum haynaldianae	4
Thymo pulcherrimi – Poëtum rehmanii	3
Asplenietum septentrionali – adianti-nigri	3
Woodsio ilvensis-Asplenietum septentrionalis	3
Senecio glaberrimi – Silenetum lerchenfeldianae	3
Jovibarbo soboliferae-Saxifragetum paniculatae erysimetosum transsilvanici	2
Asplenio quadrivalenti – Poëtum nemoralis	2
Sempervivetum heuffelii	2
Silenetum dinaricae	2
Diantho henteri-Silenetum lerchenfeldianae	2
Campanuletum crassipedis	2
Seslerio rigidae – Saxifragetum rochelianae	2
Asplenietum trichomano-rutae-murariae	1
Asplenio septentrionali-Silenetum lerchenfeldianae	1
Drabo lasiocarpae–Ceterachetum	1
Asplenio-Silenetum petraeae	1

- Plant associations with vulnerable taxa:
- *Saxifrago rochelianae – Gypsophiletum petraeae* Boşcaiu, Täuber, Coldea 1977

- *Achilleo schurii – Campanuletum cochleariifoliae* Fink 1977
- *Artemisio petrosae – Gypsophiletum petraeae* Puşcaru *et al*. 1956
- *Saxifrago moschatae – Drabetum kotschyi* Puşcaru *et al*. 1956
- *Saxifrago demissae – Gypsophiletum petraeae* Boşcaiu *et* Täuber 1977

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MUZEUL JUDEȚEAN ARGEŞ, PITEŞTI, ROMÂNIA
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DISTRIBUTION OF *SAPONARIA PUMILIO* (L.) FENZL. EX A. BR. SPECIES IN IEZERU-MARE MOUNTAIN

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ABSTRACT: Genus *Saponaria* L. belongs to Caryophyllaceae family and, in Romania, is represented by four species: *Saponaria bellidifolia* Sm., *Saponaria glutinosa* Bieb., *Saponaria officinalis* L. and *Saponaria pumilio* (L.) Fenzl. ex A. Braun. *Saponaria pumilio* L. is a rare plant, from alpine flora, with great importance for scientifical research.

Key words: *Saponaria pumilio* L., rare plant, tertiary relict, Iezeru-Mare peak

REZUMAT: Distribuția speciei *Saponaria pumilio* (L.) Fenzl. ex A. Br. în muntele Iezeru-Mare
Genul *Saponaria* L. aparține familiei Caryophyllaceae şi în românia este reprezentat de patru specii : *Saponaria. bellidifolia* Sm., *S. glutinosa* Bieb., *S. officinalis* L. şi *S. pumilio* (L.) Fenzl. ex A. Braun. *Saponaria pumilio* L. este o plantă rară din flora alpină cu mare importanță pentru cercetarea ştiințifică.

Cuvinte cheie: *Saponaria pumillio* L., plantă rară, relict terțiar, vârful Iezeru-Mare,.

INTRODUCTION

Alpine habitats are characterized by extreme life condition, which led to specific vegetation. Alpine plant communities are very sensitive to any environmental variations that may produce considerable changes in species composition and structure (Illa et al., 2006).

MATERIALS AND METHODS

Saponaria pumilio is a rare plant, from alpine flora, with great importance for scientifically research. Given the narrow and fragmented habitat of this species is absolutely necessary to apply some conservation measures for its protection.

Genus *Saponaria* L. belongs to Caryophyllaceae family and, in Romania, is represented by four species: *S. bellidifolia* Sm., *S. glutinosa* M.B., *S. officinalis* L. and *S. pumilio* (Stancu et al., 1993).

Saponaria pumilio is a plant with shorter stems, uniflore, grouped in clumps. The flowers are large, solitary, and purple (Fig. 1). The leaves are linear with rough margins. Seeds are spherical or reniform, surface covered with small papillae, reddish-black to black. (Bojňanský, 2007)

Figure 1 - *Saponaria pumilio* in Iezeru-Mare Mountain (photo 05.08.2011).

It is a tertiary relict wich is found only in few places in Fagaraş Mountains: Avrig Lake, Urlea Lake, Balea Lake, Scara Mount, Tarata Mount, Iezer-Păpuşa Mount (Sanda & Fisteag, 1992; Puşcaru-Soroceanu & Puşcaru, 1971; Soo, 1920; Stancu et al., 1993; Prodan, 1939; Dragulescu, 2003).

Iezer Mountain is bounded to the north, north-east and west by the headwaters of Dambovița River and Doamnei River, and in west is limited by Piatra Craiului Mountain. The main crests preserve pleistocene glacial remnants, shown by the presence of Iezer glacial lake (Fig. 2).

Figure 2 - Iezer Lake (photo 28.08.2011).

CONCLUSIONS

The vegetation of this mountain has been developed according to geological, geomorphological and soil features. Forests are a significant part of vegetation and are represented by species like: *Fagus silvatica*, *Betula pendula*, *Acer pseudoplatanus*, *Abies alba*, *Picea abies*, *Rhododendron myrtifolium*, *Vaccinium myrtilus*, *Juniperus nana* (Ionescu-Dunareanu, 1984). Alpine vegetation is diversified following heterogeneous ecological conditions. These conditions are optimal for the existence of *Saponaria pumilio* species, which was located with GPS MIO MOOV 500, and the results are shown in table 1.

Table 1- Distribution of *Saponaria pumilio* population in Iezeru Mare Mountain.

Cluster number	**Latitude**	**Longitude**	**Altitude**
1	$45^0$46'086"	$24^0$96'178"	2132 m
2	$45^0$46'070"	$24^0$96'126"	2146 m
3	$45^0$46'046"	$24^0$96'112"	2136 m
4	$45^0$46'021"	$24^0$96'021"	2137 m
5	$45^0$46'011"	$24^0$96'130"	2140 m
6	$45^0$45'973"	$24^0$96'105"	2133 m

7	45^{0}27'28.26"	24^{0}57'25.42"	2281 m
8	45^{0}27'29.24"	24^{0}57'24.95"	2283 m
9	45^{0}27'29.79"	24^{0}57'19.85"	2310 m
10	45^{0}27'29.53"	24^{0}57'20.45"	2313 m
11	45^{0}27'57.31"	24^{0}57'11.69"	2437 m
12	45^{0}22'18.27"	24^{0}58'05.38"	2331 m

Also, GPS location of *Saponaria pumilio* species will be continued in other areas from Fagaraş Mountains, in order to achieve some complete distribution maps.

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CONTRIBUTIONS TO THE PHYSIOLOGICAL STUDY OF SOME SPECIES OF THE LAMIACEAE PLANT FAMILY

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ABSTRACT: Water and mineral compounds among carbon dioxide are essential for the biosynthesis of specific substances in plants. Their concentrations may vary due to internal and environmental factors. Photosynthetic pigments show a great quantitative and qualitative variability also, determined by their sensitivity while synthesis to a great number of internal and environmental factors. The Lamiaceae plant family is well known as comprising many species that have aromatic and medicinal properties. The objective of this paper is to determine the water and photosynthetic pigments concentrations in four Lamiaceae species: *Prunella vulgaris* Linnaeus, 1758*, Thymus pulcherrimus* Schur*,* 1866; *Salvia aethiopis* Linnaeus, 1758, *Ocimum basilicum* Linnaeus, 1758

Key words: photosynthetic pigments, water concentration, Lamiaceae.

REZUMAT: Contribuţii la studiul fiziologiei unor specii de plante din familia Lamiaceae
Alături de CO_2, apa şi sărurile minerale sunt esenţiale pentru biosinteza substanţelor specifice din plante. Concentraţia acestora poate varia în funcţie de factorii interni şi factorii de mediu. Se constată, de asemenea, o mare variabilitate cantitativă şi calitativă a pigmenţilor fotosintetici, determinată de sensibilitatea lor în timpul biosintezei la numeroşi factori interni şi externi. Familia botanică a Lamiaceaelor este binecunoscută pentru speciile de plante cu proprietăţi medicinale şi aromatice pe care le cuprinde. Obiectivul acestei lucrări este acela de a determina gradul de hidratare şi concentraţia pigmenţilor fotosintetici în patru specii de lamiacee: *Prunella vulgaris* L., *Thymus pulcherrimus* Schur, *Salvia aethiopis* L., *Ocimum basilicum* L..

Cuvinte cheie: pigmenţi fotosintetici, conţinutul de apă, Lamiaceae.

INTRODUCTION

Given the vital functions it performs on the water living organisms, knowledge of hydrologic regime of the plants of economic interest is of practical importance. This argues, in fact, the constant concern that many researchers have had, over time, to study the role of water in the normal physiological processes of plants (Stratu, 2002).

Water and minerals, along with carbon dioxide, are key compounds used by plants in the biosynthesis processes of specific substances. There must be enough water for a specific plant to survive, grow and develop normally (Zamfirache, 2005). The quantity of water in plants in a state of active life varies between 60-90% (Bold et al., 1983), according to internal factors (species, organ, tissue, stage of development) and external factors (atmospheric humidity, soil, temperature, air movement, etc.).

The species taken into study belong to the family Lamiaceae, specific to the Mediterranean region that features a very diverse ecology. In our country they are spontaneous and quite widespread. This plant family is of particular interest because the amount of aromatic, medicinal and ornamental species it includes.

MATERIALS AND METHODS

Our research was performed on fresh plant material, collected in anthesis stage. The species taken into study were: *Prunella vulgaris L., Thymus pulcherrimus Schur, Salvia aethiopis L.* and *Ocimum basilicum L.* These species were collected during sunny days between the month of June and August 2010, between the hours 10^{00}-14^{00}.

To determine the water and dry substance content, the gravimetric method has been used, which consists of measuring the loss of water by weighing the plant product analyzed by heating it at 105 ^{0}C (Bold et al., 1983).

The content of assimilating pigments was dosed using the classical Mayer-Bertenrath method, modified by Ştirban and Fărcuş. The method consists in extracting pigments in 85% acetone after the plant material was previously treated with $CaCO_3$, in order to avoid unwanted transformation of chlorophylls in phaeophytins (Bold et al., 1983).The photocolorimetry of the plant extract, brought to a certain volume, is carried on at the appropriate wavelength for maximum absorption of chlorophyll a, chlorophyll b and carotenoids. The appropriate amount of pigments corresponding to the plant material used is calculated using the Holm formulas (1954).

RESULTS AND DISCUSSION

If we subdue the plant tissue to the action of moderate heat (105°C), we find that it loses some of its weight due to evaporation, what remains being known as dry substance. Water is found in plants either as free or bound form water (constitution water, included in cellular and tissue constituents), or it is found as absorbed water, which will provide the colloidal stage of the live protoplasmatic matter. Water is a temperature regulator of the living plant tissues, protecting them against low temperatures and excessive hot air.

Water content of plants varies according to species and age, so as the plants get older the water content decreases (Trifu & Bărbat, 1997). The study of the fluid system can be carried on in several ways. Ecophysiology research uses a number of

physiological indices that consider aspects of water regime correlated with water balance, with hydrophilic properties and water retention of the protoplasm (Stratu, 2002). In the research carried out on water content and plant dry weight of the studied plants, a series of quantitative investigations of the leaves of the plant individuals in anthesis stage have been made (Tab. 1).

Table 1 - Water and dry substance content in flowering Lamiaceae species.

Species	Dry substance (g %)	Water content (g %)
Prunella vulgaris	26.53	73.47
Thymus pulcherrimus	33.85	66.15
Salvia aethiopis	23.98	76.02
Ocimum basilicum	16.07	83.93

In terms of water content, the highest value was recorded for the species *Ocimum basilicum* (83.93 g %), compared to *Salvia aethiopis* (76.02 g%), *Prunella vulgaris* (73.47 g %) and *Thymus pulcherrimus* (66.15 g %), (Fig. 1). Dry substance content varies inversely with the water content, with a minimum value of 16.07 g% in the species *Ocimum basilicum* and a maximum of 33.85 g% in *Prunella vulgaris*.

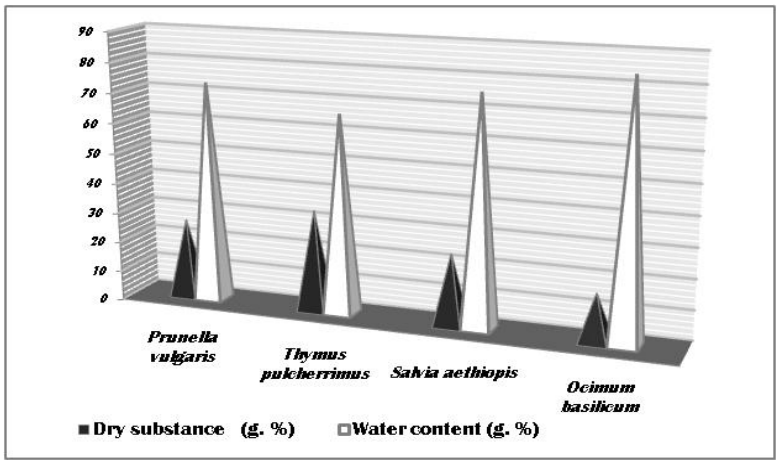

Figure 1 - Variations of water and dry substance content in the flowering *Lamiaceae* species.

Research conducted up to now on the assimilatory pigments equipment (chlorophylls and carotenoids) in superior plants have shown great quantitative and sometimes even qualitative variability, this variation is explained by a greater sensitivity to the many internal and external factors manifested during the biosynthetic process by these pigments (Péterfi & Sălăgeanu, 1972; Paúcă-Comănescu & Tăcină, 1972; Masarovičová & Duda, 1975; Masarovičová & Elias,

1980; Pessarakli, 1960). Regarding the quantitative analysis of the assimilatory pigments in the flowering *Lamiaceae* species taken into study (Tab. 2), we can affirm the following:

Table 2 - Content of assimilating pigments in flowering Lamiaceae species.

Species	Chlorophyll a mg/g fresh plant tissue	Chlorophyll b mg/g fresh plant tissue	Carotenoid pigments mg/g fresh plant tissue	Chlorophyll a/b Ratio
Prunella vulgaris	0.69	0.30	0.00026	2.3
Thymus pulcherrimus	0.61	0.24	0.00023	2.5
Salvia aethiopis	0.53	0.17	0.00016	3
Ocimum basilicum	0.51	0.22	0.00018	2.3

Regarding the chlorophyll a content in the analyzed samples, similar values are observed in the four species, which is explained by them belonging to a same botanical family. The highest amount of chlorophyll a was recorded in *Prunella vulgaris* (0.69 mg/g fresh plant tissue) and the lowest amount was recorded in *Ocimum basilicum* (0.51 mg/g fresh plant tissue), (Fig. 2).

Regarding chlorophyll b, also the highest amount was recorded in *Prunella vulgaris* (0.3 mg/g plant tissue), followed by *Thymus pulcherrimus* (0.24 mg/g plant tissue) and *Ocimum basilicum* (0.22 mg/g plant tissue) and the lowest content of chlorophyll b of all the four Lamiaceae species, was found in *Salvia aethiopis* (0.17 mg/g plant tissue) (Fig. 2).

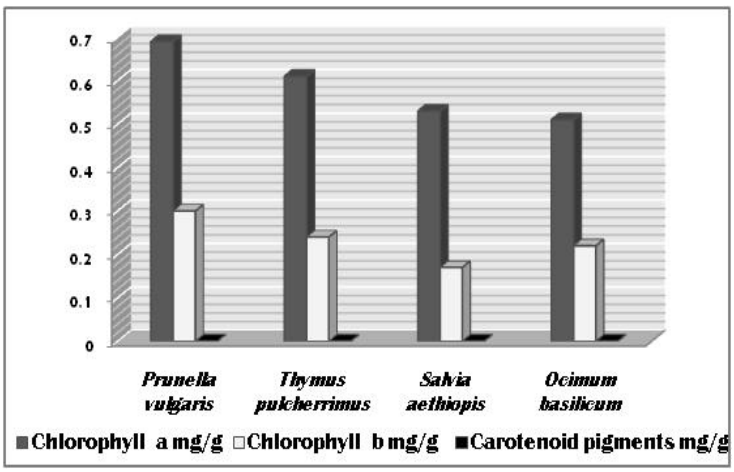

Figure 2 - Quantitative variation of the assimilatory pigments in the four flowering Lamiaceae species.

Carotenoid pigments are found in very small quantities in the analyzed plant material, compared with chlorophylls a and b, their values being between 0.00016 and 0.00026 mg/g fresh plant tissue. The maximum value for carotenoid pigments (0.00026 mg/g plant tissue) was recorded in *Prunella vulgaris* (Fig. 2). As for the relationship between chlorophyll a and chlorophyll b, there was a significant decrease from 3.0 in *S. aethiopis* to 2.3 in *Prunella vulgaris* (Fig. 3).

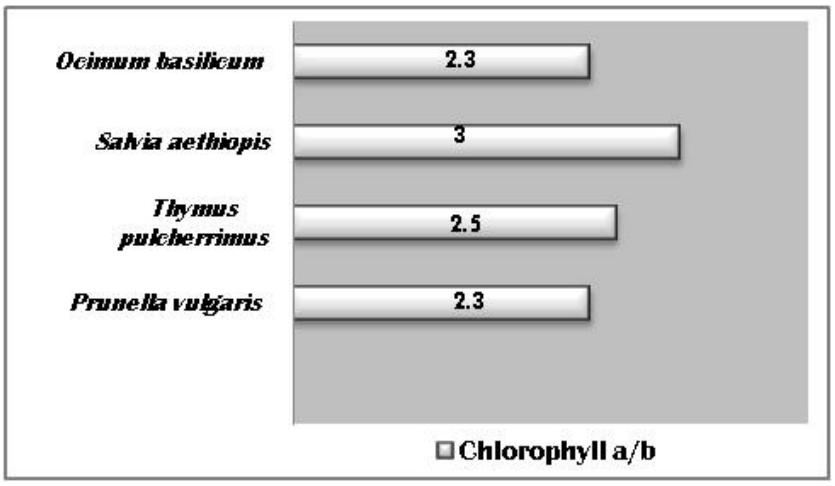

Figure 3 - Ratios of chlorophyll a and chlorophyll b in the flowering *Lamiaceae* species.

CONCLUSIONS

The recorded values of water content allows normal parameters of the specific metabolic processes in the leaf structure in all taxa investigated, according to the ontogenetic stage (anthesis).

Biosynthesized and accumulated in the leaves dry matter content varies inversely to leaf water content, being partly a direct result of the involvement of existing pigments from the chloroplasts found in the assimilating foliar mezophyllum in the photosynthesis process, the main anabolic process of the investigated plants.

The content of assimilatory pigments differs in the value aspect, due to the biological features of the investigated species and their adaptation to environmental conditions.

Although they are perennials, the investigated plants have different lengths of the vegetative periods, during which the microclimate factors, especially light intensity, quality of radiation, air temperature, etc., evolve specifically inducing different responses of their own photoassimilating structures.

ACKNOWLEDGEMENTS

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MUZEUL JUDEȚEAN ARGEȘ, PITEȘTI, ROMÂNIA
ARGESIS *- STUDII ŞI COMUNICĂRI - seria ŞTIINȚELE NATURII,* **TOM XVIII**, 2010

CLIFF FLORA OF BREBU GORGES

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ABSTRACT: We studied the cliff faces of Brebu Gorges, identifying the vascular plant species and making a qualitative analysis of the flora. The list comprises 51 plants from witch three are Carpathian endemics - *Thymus pulcherrimus, Silene nutans* subsp. *dubia, Sesleria heuflerana*, one is rare orchid - *Epipactis helleborine* and one is tertiary relict species, also protected as monument of nature in Romania - *Taxus baccata*.

KEYWORDS: cliffs, flora, rocks, bioforms, life duration, geoelements, pioneer plants.

REZUMAT: Flora de stâncării din Cheile Brebu
Au fost studiate stâncăriile de la Cheile Brebu, identificând speciile de plante vasculare şi făcând o analiză calitativă a florei. Lista conține 51 de specii din care 3 sunt endemice pentru Carpați - *Thymus pulcherrimus, Silene nutans* subsp. *dubia, Sesleria heuflerana*, o orhidee rară - *Epipactis helleborine* un relict terțiar şi o specie protejată ca monument al naturii în România - *Taxus baccata*.

CUVINTE CHEIE: stâncării, flora, roci, bioforme, durata de viață, geoelemente, plante pioniere.

INTRODUCTION

Cliffs it's an unique environment that can support a specialized group of plants many endemic or rare species and serve as a refuge for native flora and fauna and also are core habitat for the wide variety of birds and other wildlife that are particularly sensitive to disturbance (Maser et al., 1979) They represent some of the least disturbed habitat on earth an contribute more to the biodiversity of a region that their actual surfaces coverage would indicate (Larson et al., 2000)

In spite of the biodiversity and beauty reputation of Doftana Valley (Cojocaru, 1980) vegetation or ecological research in this area is very scattered and concerns the flora and vegetation of Secăria-Florei area only (Dihoru et al., 1969) diversity and productivity problems of hill beech forests from Doftana Valley (Paucă-Comănescu et al., 2009), oak forest biodiversity (Oromulu et al., 2008) or ecological studies of shrubs from Lunca Mare (Paucă-Comănescu et al., 2008).

The main objectives of this study are to identify vascular plant species found on cliffs of Brebu Gorges and analyse them from an ecological point of view.

MATERIAL AND METHODS

Study area

Our study was located in the hilly area of Southern Romanian.

Subcarpathians on Doftana Valley – Brebu Gorges, near to Lunca Mare village (lat N 45° 12' 31,1" , long E 25° 44' 23,5'‘). The study site is a low elevation gorge about 535m. Brebu Gorges are massif vertical cliffs cut in Inferior Miocene conglomerate.

Rock structure has a small and medium resistance to erosion and is characterized by the dominance of conglomerate intercalate with compact sandstone sandy and clay rocks, quartzite, micaschists, amphibolites, gneisses. Rock fall happens often because of the weakness of the conglomerate that forms the escarpment (Armaş I., 1999).

The climate is temperate-continental with a mean annual temperature of 9 ^{0}C (Câmpina weather station) and 4 ^{0}C in mountainous sector, dropping with a gradient thermal vertical gradient about 0.5-0.7/100m. The average yearly precipitation is 779 mm. (Armaş I., 1999).

Vegetation sampling

Study sites were located on the southern-facing, north-facing and chimney hillsides of these gorges. In order to identify the plant associated with cliffs we established sample surfaces on vertical walls, at least 60^0 incline, on a representative transect of at least 6 m. Vertical surfaces are difficult to sample and requires special attention to safety. Plant sampling was performed monthly from May till August. All plant species growing on slopes with different exposure: north, south and the chimney have been identified during 2008-2009. Nomenclature follows Ciocârlan (2009).

RESULTS AND DISCUTION

Species richness

A total of 51 vascular plant species were found on the cliff sampled in this study. Both faces were vegetated to some degree and most of them supported woody taxa: *Alnus incana, Taxus baccata, Sorbus aucuparia, Populus tremula, Cornus sanguinea* and shrub species: *Hippophaë rhamnoides, Rosa canina* etc. (Tab. 1).

Unusual is the presence of two species rather characteristic to alpine area: *Thymus pulcherrimus* and *Saxifraga corymbosa*.

Table 1 - The list of vascular plant of Brebu Gorges.

Family	**Species**
ASPLENIACEAE	*Asplenium trichomanes* L.
	Asplenium ruta-muraria L.
CUPRESSACEAE	*Thuja occidentalis*
TAXACEAE	*Taxus baccata* L.
BERBERIDACEAE	*Berberis vulgaris* L.
RANUNCULACEAE	*Clematis vitalba* L.
BETULACEAE	*Alnus incana* (L.) Moench
	Betula pendula Roth.
CARYOPHYLLACEAE	*Silene nutans* L. subsp. *dubia* (Herbich) Zapal.
	Stellaria nemorum L.
CRASSULACEAE	*Sedum maximum* (L.) Hoffm.
SAXIFRAGACEAE	*Saxifraga corymbosa* Boiss.
ROSACEAE	*Crategus monogyna* Jacq.
	Rosa canina L.
	Rubus caesius L.
	Sorbus aucuparia L.
FABACEAE	*Chamecytisus elongatus* (Waldst. et Kit.) Link.
	Cytisus nigricans L.
ELEAGNACEAE	*Hippophaë rhamnoides* L.
CORNACEAE	*Cornus sanguinea* L.
EUPHORBIACEAE	*Euphorbia cyparissias* L.
ARALIACEAE	*Hedera helix* L.
APIACEAE	*Cnidium silaifolium* (Jacq.) Simonkai
	Pimpinela saxifraga L.
HYPERICACEAE	*Hypericum perforatum* L.
BRASSICACEAE	*Erysimum odoratum* Ehrh.
	Reseda lutea L.
SALICACEAE	*Populus tremula* L.
	Salix caprea L.
OLEACEAE	*Fraxinus excelsior* L.
LAMIACEAE	*Salvia glutinosa* L.
	Teucrium montanum L.
	Thymus pulcherrimus Schur
	Salvia verticillata L.
	Galeopsis speciosa Mill.
SCROPHULARIACEAE	*Verbascum* sp.
CAMPANULACEAE	*Campanula sibirica* L.
	Campanula rapunculoides L.
RUBIACEAE	*Asperula* sp.
	Galium mollugo L.
VALERIANACEAE	*Valeriana montana* L.
ASTERACEAE	*Centaurea stoebe* L.
	Taraxacum officinale Weber ex Wigers
	Tussilago farfara L.

	Inula ensifolia L.
	Solidago virgaurea L.
	Mycelis muralis (L.) Dumort.
POACEAE	*Festuca gigantea* (L.) Vill.
	Sesleria heuflerana Schur
	Melica ciliata L.
ORCHIDACEAE	*Epipactis helleborine* (L.) Crantz

The species frequency is high, especially on the northern slope, where microclimate conditions and type of rock permit installation and their maintenance (Onete et al., 2011). An interesting aspect was the presence of three Carpathian endemics - *Thymus pulcherrimus, Silene nutans* subsp. *dubia, Sesleria heuflerana*, a rare orchid - *Epipactis helleborine* and a tertiary relict species which is protected as monument of nature in Romania - *Taxus baccata*.

It was noted that a suitable place for cliff colonization occurs very hard, thus most plants found on rocks are perennial with a short life cycle and only a few are annual. The vast majority of species found on the cliff of Brebu Gorges are perennials (91%), biennial representing less than 7% of the flora, while the annual plants are represented by a single species: *Reseda lutea*. Perennial plants are usually better competitors than annual plants, especially in conditions of limited nutritional resources, as rocks (Fig. 1). This occurs because the root system is so organized that it can access water and nutrients from the soil, at even greater depths, and because of early spring shooting. Biennial plants are represented by *Campanula sibirica*, *Centaurea stoebe* and *Erysimum odoratum*. The only annual plant found, *Reseda lutea* is an winter annual-perennial.

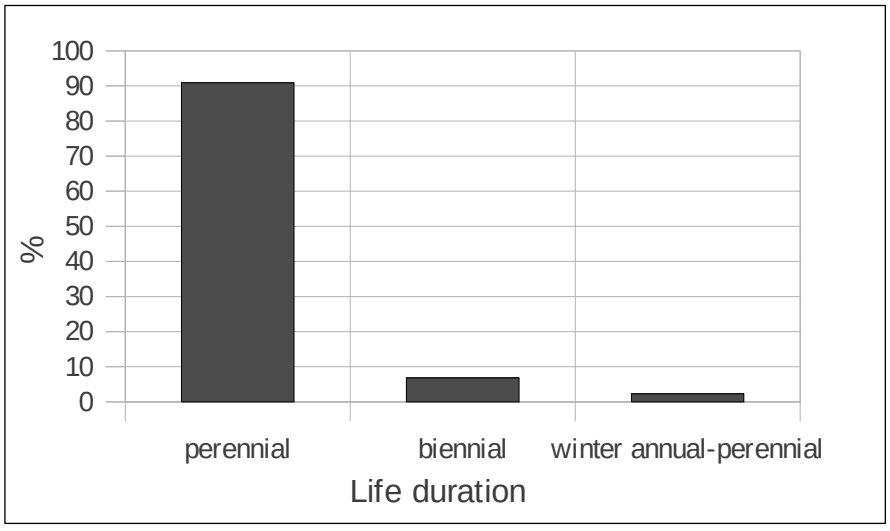

Figure 1 - Life duration of plant species present on Brebu Gorges.

Bioform analysis (Fig. 2) revealed the prevalence of hemicryptophytes, followed by phanerophytes. Cliff-specific species were more abundant on the north face (29% of all species) compared to the south face (only 4%). This difference is caused by the rocky substrate, degraded to sand on the south face.

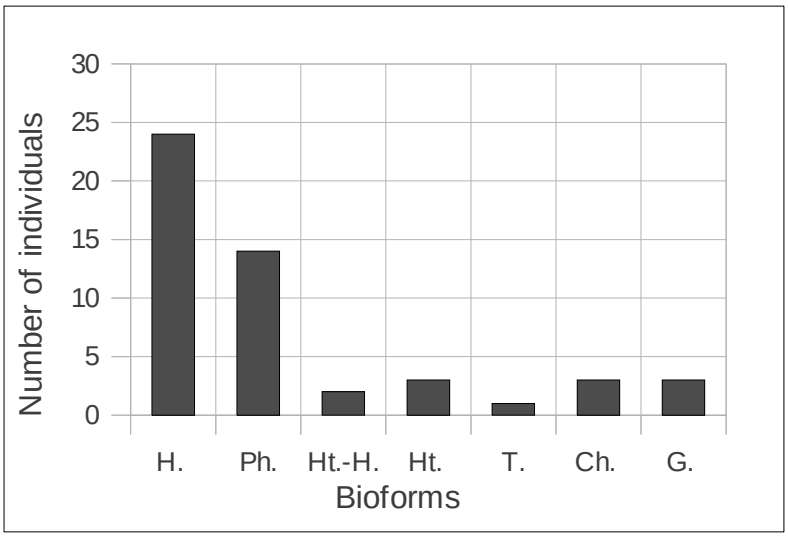

Figure 2 - Bioforms of plant species present on Brebu Gorges.

The result of the geographic interferences from the study area has sculpted the areal-geographic structure of the Brebu Gorges flora (Fig. 3), through the participation of 16 geographical elements. The majority of floristic elements belong to the Eurasian and European flora followed by Carpathic elements and Central-European.

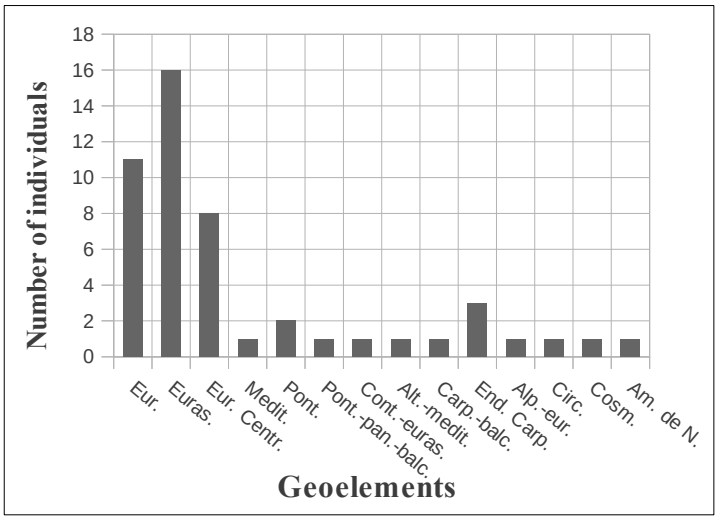

Figure 3 - Geoelements of plant species present on Brebu Gorges.

Geology and geomorphology of the substrate has a considerable influence on plant communities present on cliffs. Limestone rocks give rise to soils with a neutral pH going to alkaline, selecting only those able to adapt to these conditions (Larson et al., 2000). That explains why about half of all species growing at Brebu Gorges is neutrophilous, and 20% prefer limestone substrate. Low pH values derived from acid rocks leading to the accumulation of Fe and Al ions in concentrations toxic to plants. In contrast, the neutral values of calcareous soils cause an accelerated decrease in amount of nutrients, plants growing on these soils having low food resources. There are species that are dependent rather on the accumulation of organic material than the type of rock (*Asplenium* species) (Larson et al., 2000).

Due to the nature of rock, sedimentary nature, not well mingled, is produced light landslides and rock fall. This makes some plants that have not developed so well root system to come out of the ground, but in the same time to gain time in soil accumulation in other parts of the rock allows the installation of new ones. Rocks composed of unconsolidated material provide fewer opportunities for plant establishment compared to those formed of stable material. This is due to erosion, which occurs relatively rapidly to their level, so explaining the reduced number of species found in Brebu Gorges. Over 20% of the plant species found at Brebu are pioneer, most are shrubs: *Cytisus nigricans, Rosa canina, Hippophae rhamnoides,* the last presenting a special adaptation to the rock lifestyle, surviving on steep slopes with an inclination even of 90^0. In some places, at considerable heights, they might be observed that parts of roots stretch down for reaching the ground in search for richer resources and continuously emerge newer shoots.

Soil reaction and temperature index follows Sanda et al., 1983. Approximately half of all species are neutrophils (49%), other groups participating in lesser degree. Depending on the moisture index, the highest percentage have the mesophytes (42%), not far from xeromesophytes (37%), 9% are mesohygrophytes, xerophytes have a modest participation of 7%.

Characteristic features can be observed also in the reaction of temperature indices. This indicates the presence of many mesothermal species (56%), with a stamp on the generality of flora. Amphitolerante and microtherme species equally participates with 14%, based as their power of adaptation. Is present a small number of cryophile species (7%), moderately thermophylic (7%) and the most poorly represented are thermophylic (2%). The variation of the exposure can modify the conditions of the microhabitat, for example on cracks from the Nordic face support plant communities with *Asplenium* or *Saxifraga corymbosa*, different from the south facing cliffs, dry and sunny, where growth species like *Salvia verticillata* or *Rubus caesius.*

We observe a net predominance of steppe species distribution in the beech floor and oak species distributed from sessile oak floor to boreal floor, also cliff species represent almost 30% of the flora, after the 34% species characteristic to forest edges (Fig. 4).

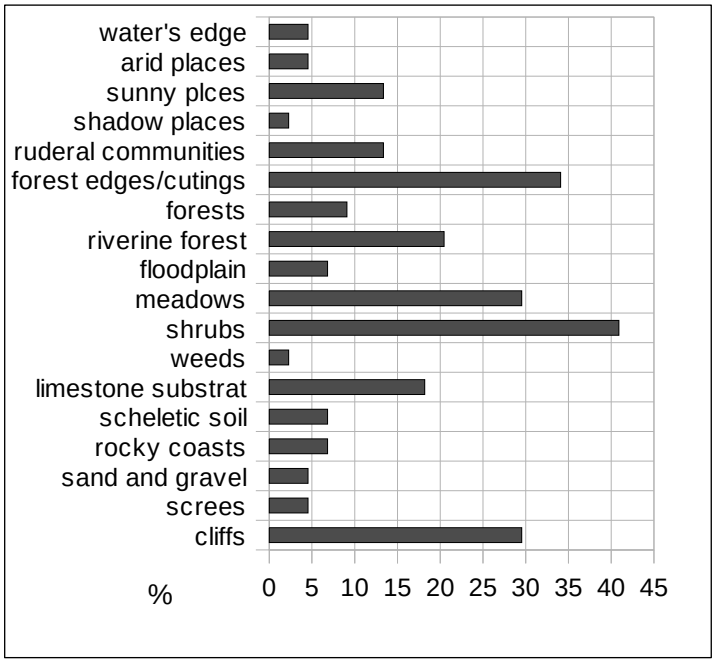

Figure 4 - Distribution of plant species from Brebu Gorges according to habitat and substrate type.

CONCLUSIONS

Although more ecological studies are needed, the first step was made in increasing knowledge on flora. The analysis we have conducted gives a general overview of the Brebu cliffs that can provide basic data for future projects.

Based on the results of this study, Brebu Gorges have been proposed as natural reserves to the Romanian Ministry of Environment.

ACKNOWLEDGMENTS

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THE CHARACTERISTICS OF THE VEGETATION FROM CORBII DE PIATRĂ CHURCH (ARGES COUNTY)

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ABSTRACT: Corbii de Piatră Church was the subject of the interdisciplinary study for the future restoration of the degraded interior of the church. The paper present the diversity and the characteristics of the plant species from rupestre church yard, southern valley and the "walls" of the crunch represented by southern slop, platforms (terraces) and the "roof" of the church represented by a large plateau. The cliff inside which is excavated the church is formed by sandstone, presenting damages that affect the interior of the church. Studies regarding the vegetation structure and the characteristic of the vegetation cover will be a good start for future research concerning Corbii de Piatra complex, for taking the best decision for plant species management and the best measures for restoration and conservation of the medieval rupestre church.

Key words: rupestre church, vegetation structure, vegetation characteristics.

REZUMAT: Caracteristicile vegetației de la biserica Corbii de Piatră (județul Argeș)
Biserica Corbii de Piatră a fost subiectul unui studiu interdisciplinar pentru viitoarea restaurare a interiorului degradat al bisericii. Lucrarea de față prezintă diversitatea şi caracteristicile speciilor de plante din curtea bisericii, valea sudica şi "pereții" bisericii reprezentați de versantul sudic, polițele (terasele) şi "acoperişul" reprezentat de un platou larg. Stânca în interiorul căreia este săpată biserica este formată din gresie, şi prezintă degradari care afectează interiorul bisericii. Studiile privind structura vegetației şi caracteristicile covorului vegetal vor fi un bun început pentru viitoarele studii asupra complexului Corbii de Piatră, pentru luarea celor mai bune decizii pentru managementul speciilor de plante şi a celor mai bune măsuri pentru restaurarea şi conservarea bisericii medievale rupestre.

Cuvinte cheie: biserica rupestră, structura vegetației, caracteristicile vegetației.

INTRODUCTION

The study of Corbii de Piatră Church was developed in the framework of the project "integrated research strategy of conservation state of some rupestre churches for restoration and to put it to account. Case study: "Corbii de Piatră" (acronym SICBR, contract no. 91-001). The partners from art, mural paintings restoration, chemistry, physics, and geology studied together the medieval church for a viable protection system (Mohanu, 2011).

In Argeş County were investigated the vascular plants at the level of the entire county (Alexiu, 2008), with no focus on the vegetation from the surrounding area of Corbii de Piatră Church.

In Argeş County the heavy soils with humidity excess during spring support forests which are dominated by xeromezophilous-termophilous oaks. The plant species are generally distributed in the continental plain with 10.5 ^{0}C annual average temperature (Ciocârlan, 2009). The characteristic vegetation for hilly region is composing by durmast (*Quercus petraea*) and oak (*Q. robur*) mix with other woody species. The dominant durmast forests in the Doamnei River region depend on the petrography and edaphically substrate. These forests develop on less steep slopes with different exposition and brown forest soils, sometimes podzolic, with clay or sandy-clay texture. The soils are poor, usually superficial, and rich in skeleton, having as base sand with much siliceous gravel. In the areas with cleared forests but in succession stage prevailing forest development, there are shrubs of *Prunus spinosa* and *Crataegus monogyna* that create optimal conditions for the development of young durmast individuals. The herbaceous vegetation develops both on skeleton soils or less profound, dry and on brown forest soils with varied humidity. It forms grasslands dominated by *Agrostis capillaris, Festuca rupicola, Anthoxanthum odoratum*, etc. (Alexiu, 2008).

MATERIAL AND METHOD

Corbii de Piatră Church is situated on the left side of Doamnei River in Corbi Comune (Argeş County, Jgheaburi Village) (Fig. 1a). The cliff inside which is excavated the church is formed by sandstone. The church present in the south a constructed (man made) wall near by the front of the church continued by the southern slope of the cliff. A valley separates the southern slope from other cliff. The valley has a woody banister for allowing the visitor to access the natural plateau above (for sceneries of the surrounding landscape, praying).

In the west, the church has the front wall with windows and entrance and above them is the rest of the cliff with a vertical slope almost till the plateau above. The platforms (terraces) are presented much above, near the plateau. The plateau is large, with a slight slope representing the eastern sector. The northern sector is represented by another slope, vertical, with narrow terraces, far from the church (Fig. 1b).

Our studies have been developed as a supplement of the performed interdisciplinary research.

The record of the vegetation from the church surroundings were realized on sectors according with the exposition of the cliffs slopes. More difficult was the inventory of the vegetation growing on the terraces of the cliff, in the western sector, the access in this area being impossible. The observations on these areas were done using photo camera. From the above plateau were performed observations upon the superior terraces.

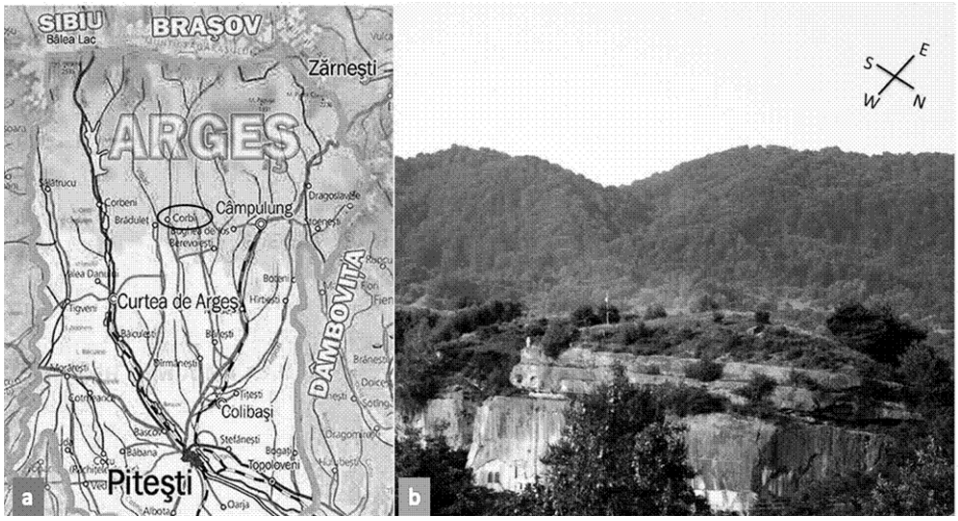

Figure 1 - Corbi Village in the county (a) and the morphology of the cliff containing Corbii de Piatra Church (b).

RESULTS AND DISCUSSIONS

The list of the species installed on the cliff's faces is comprehensive (Tab. 1). The southern sector is represented by the valley and the cliff slope. The man made church wall, near its base, in wall's cracks grown *Chelidonium majus, Sambucus nigra, Bryonia alba, Rosa canina, Salvia glutinosa* (Onete, 2010).

Table 1 - The presence (+) of the plant species on the southern slope and valley and on the plateau.

Family	Species	Valley & Slope South	Plateau		
			West	East	North
Woodsiaceae	*Athyrium filix-femina* (L.) Roth	+			
Papaveraceae	*Chelidonium majus* L.	+			
Pinaceae	*Picea abies* (L.) Karsten		+		
	Pinus sylvestris L.		+		
	Larix decidua Miller			+	
Urticaceae	*Parietaria officinalis* L.				+
Fagaceae	*Fagus sylvatica* L.			+	
	Quercus petraea (Mattuschka) Liebl.				+
Ranunculaceae	*Ranunculus acris* L.	+			
	Ranunculus repens L	+			
Ulmaceae	*Ulmus glabra* Hudson	+			
Urticaceae	*Urtica dioica* L.	+			

Betulaceae	*Betula pendula* Roth	+	+	+	+
Corylaceae	*Carpinus betulus* L.	+			
	Corylus avellana L.	+			
Caryophyllaceae	*Dianthus armeria* L.		+		
	Silene alba (Miller) E.H.L. Krause			+	
	Lychnis coronaria (L.) Desr.		+		
Amaranthaceae	*Amaranthus retroflexus* L.	+			
Polygonaceae	*Polygonum hydropiper* L.	+			
	Rumex crispus L.	+			
Crassulaceae	*Sedum maximum* (L.) Hoffm.	+			
Rosaceae	*Rubus caesius* L.	+			
	Fragaria vesca L.	+	+		
	Potentilla argentea L.			+	+
	Geum urbanum L.	+			
	Agrimonia eupatoria L.			+	+
	Sanguisorba officinalis L.			+	+
	Rosa canina L.	+	+	+	+
	Crataegus monogyna Jacq.	+	+		+
	Prunus spinosa L.				+
	Cerasus avium (L). Moench				+
Fabaceae	*Genista tinctoria* L.	+	+		
	Chamaecytisus hirsutus (L.) Link	+	+		
	Medicago lupulina L.		+	+	+
	Trifolium campestre Schreber		+	+	+
	Trifolium pratense L.		+	+	+
	Trifolium repens L.		+	+	+
	Lotus corniculatus L.		+	+	+
	Coronilla varia L			+	+
Onagraceae	Epilobium montanum L.	+			
Euphorbiaceae	*Euphorbia cyparissias* L.		+	+	+
Rhamnaceae	*Rhamnus cathartica* L	+			
Aceraceae	*Acer campestre* L.	+		+	+
Geraniaceae	*Erodium cicutarium* (L.) L'Herit		+	+	+
Apiaceae	*Anthriscus sylvestris* (L.) Hoffm.	+			
	Daucus carota L.		+	+	+
Hyperaceae	*Hypercium perforatum* L.	+		+	+
Tiliaceae	*Tilia cordata* Miller	+			+

Brassicaceae	*Capsella bursa-pastoris* (L.) Medik.		+	+	+
Salicaceae	*Populus tremula* L.	+		+	
	Salix caprea L.	+			
Cucurbitaceae	*Bryonia alba* L.	+			
Primulaceae	*Primula veris* L.		+		
Gentianaceae	*Centaurium erythraea* Rafin		+	+	+
Oleaceae	*Ligustrum vulgare* L.				+
Solanaceae	*Solanum dulcamara* L.	+			
	Datura stramonium L.				
Convolvulaceae	*Convolvulus arvensis* L.				
Boraginaceae	*Echium vulgare* L.		+		
	Symphytum officinale L.	+			
Lamiaceae	*Glechoma hederacea* L.	+			
	Galeobdolon luteum Huds.	+			
	Lamium purpureum L.				+
	Mentha longifolia (L.) Hudson	+			
	Prunella vulgaris L.	+			
	Salvia glutinosa L.	+			
	Teucrium chamaedrys L.			+	+
	Thymus pulegioides L.	+	+		
Plantaginaceae	*Plantago lanceolata* L.	+		+	+
	Plantago major L.	+			
Scrophulariaceae	*Euphrasia stricta* D.Wolff ex. J.F. Lehm		+	+	+
	Rhinanthus rumelicus Velen.			+	+
	Scrophularia nodosa L.	+			
	Veronica chamaedrys L.	+			
Campanulaceae	*Campanula patula* L.	+			
	Campanula persicifolia L.	+			
Rubiaceae	*Galium aparine* L.	+			
Rubiaceae	*Galium mollugo* L.			+	+
	Galium verum L.		+		
	Cruciata glabra (L.) Ehrend		+		
Caprifoliaceae	*Sambucus nigra* L.	+			
	Viburnum lantana L.	+			
Asteraceae	*Achillea setacea* Waldst. Et Kit.		+	+	+
	Arctium lappa L.	+			
	Carlina acaulis L.		+		

	Carlina vulgaris L.				+
	Centaurea cyanus L.		+	+	+
	Cichorium intybus L.		+	+	+
	Cirsium arvense (L.) Scop.			+	+
	Crepis biennis L.		+	+	+
	Hieracium pillosela L.	+			
	Leucanthemum vulgare Lam.				+
	Solidago virgaurea L.			+	+
	Taraxacum officinale Weber ex Wiggers	+		+	+
	Xanthium strumarium L.			+	
Cyperaceae	*Carex hirta* L			+	
Poaceae	*Agrostis capillaris* L.		+	+	+
	Bromus sterils L.	+			
	Calamagrostis arundinacea (L.) Roth	+			
	Calamagrostis epigejos (L.) Roth	+			
	Cynodon dactylon (L.) Pers.		+	+	+
	Dactylis glomerata L.	+			+
	Festuca pratensis Hudson	+	+	+	+
	Festuca rubra L.	+	+	+	+
	Holcus lanatus L.		+	+	+
	Lolium perenne L.		+	+	+
	Nardus stricta L.		+	+	+
	Phleum pratense L		+	+	+
	Poa annua L.		+	+	+
	Poa compressa L.	+			
	Poa nemoralis L.	+			
	Poa trivialis L.				
	Setaria viridis (L.) Beauv.		+	+	+

Increased humidity in southern valley caused the installation of hygro-mesohygrophilous herbaceous plant species (they growth on humid to wet soils) or eutrophic species (present large ecological amplitude toward soil trophic state). Southern slope of the cliff is dominated by shrubs and the hygrophilous plant species are more frequent at the base of the cliff and in the area with well established vegetation. The percent of hygrophilous plant species is smaller here than in the valley. In the area with steep slop or terraces with less vegetation cover, the plant species installed here are mezo-xeromezophilous (Fig. 2).

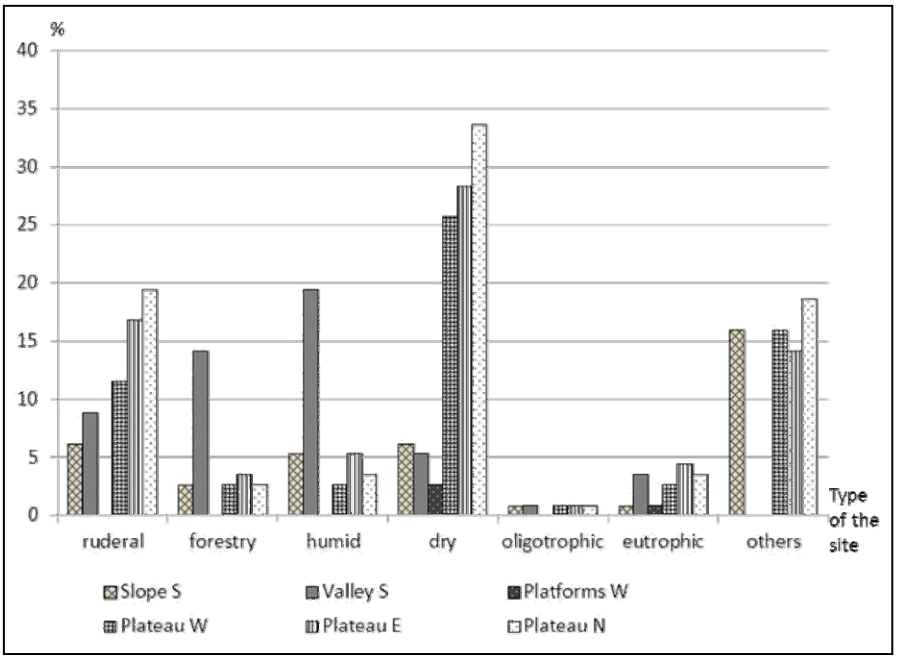

Figure 2 - Ecological type and preferences of the plant species presented in different areas from Corbii de Piatră complex.

In southern sector, the trees and shrubs are at age, the proof are the roots coming at the surface of the soil or are dig out from different causes (land slice, paths made by tourists).

On the plateau, the vegetation is xeromesophilous-mesophilous (the species grow on dry to dry-wet well structured soils). In the northern part of the plateau there are trees and shrubs forming a net under and above ground that stop/slow down the land slice (very frequent in the area). The drenophilous species (i.e. *Larix decidua*) are present in this area. The durmast young saplings develop natural in the area, showing that in the future it is possible to regenerate the durmast forests that have been in this area in the past. The herbaceous species prevailing here are mezophilous. The humidity of the profound layers of the soil is high and is shown by the water flowing down on the vertical face of the cliff and coming bellow the dense vegetation cover. Analyzing the plant species characteristics we can estate that It is there a lack of water for vegetation, most of the species growing there being xenophiles (typical for dry places). Toward the edge of the plateau, where the slope is variable but less than 45^0, the soils cover becoming more superficial and in danger for land slice. The scarce vegetation cover presented on the superficial soil, with its net of roots, stolones and rhizomes, keep the soil more stable than the areas without vegetation. Near the edge of the cliff the cliff is nude and wet in some places, the water forming the pelicule from

the cliff surface or forming the spring running down near the northern slop of the cliff. The sapling of *Picea abies* and *Pinus sylvestris* are plated here or grown natural from seeds brought by birds from the surround areas where old trees of these species are present.

In all investigated sectors most of the species are perennial (hemicriptophytes) and clonal, their vegetative spread being on smaller or larger scale and contributing at the under and above ground net (Fig. 3).

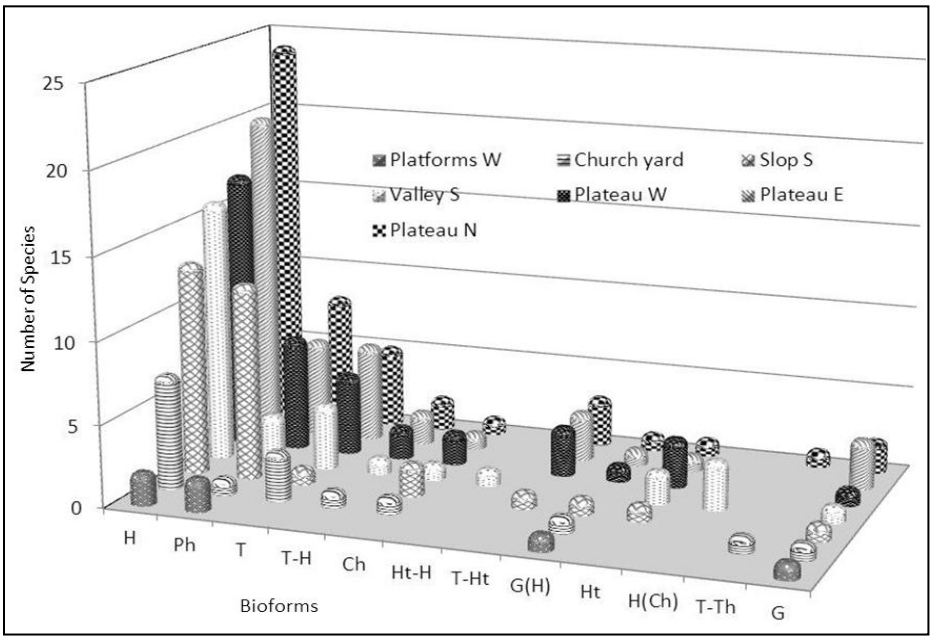

Figure 3 - The bioforms present on the investigated areas.

The platforms (terraces) are occupied by a few high individuals of *Betula pendula*, pioneer and oligotrophic species present also on the southern slope and on the plateau. The saplings of birch trees are more dense and short together with shrubs of *Chamaecytisus hirsutus and Crataegus monogyna.*

Some tree species are capable to root very deep in the substrate (Tab. 2).

Table 2 - The average and maximum rooting depth of different type of vegetation (after Canadell et al., 1996).

Type of the vegetation	Average depth (m)	Maximum depth of rooting (m)
Trees of coniferous temperate forests	3,9 ± 0,4	7,5
Trees of decidous temperate forests	2,9 ± 0,2	4,4
Herbaceous species of temperate grasslands	2,6 ± 0,2	6,3
Trees	7,0 ± 1,2	-
Shrubs	5,1 ± 0,8	-
Herbaceous species	2,6 ± 0,1	-

These data present the observed maximum capacity of some species to send roots in the deepest layer of the soil, depth reached only by a small number of species and/or individuals belonging to a plant community (Canadell et al., 1996,).

CONCLUSIONS

The diversity of the plant species from rupestre Corbii de Piatră Church surroundings is high, most of the plant species are perennial, hemicriptophite and xerophilous to mezophilous in the upper area of the cliff and hygrophilous to mezzo-hygrophilous the valleys around the cliff and toward the feet of the cliff.

The vegetation cover specific for dry places present on the high areas of the cliffs demonstrate that the water content of the soil is poor, the water drainage of the soil being high in this area. We can estate that the vegetation cover has small influence on the interior of the church, water infiltration there is due to the physical and chemical composition of the sandstone and due to the geo-morphology of the cliff.

Studies regarding the vegetation structure and the characteristic of the vegetation cover will be a good start for future research concerning Corbii de Piatra complex, for taking the best decision for plant species management and the best measures for restoration and conservation of the medieval rupestre church.

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PROS AND CONS FOR *EX SITU* PLANT CONSERVATION - A CRITICAL OVERVIEW

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ABSTRACT: The accelerated loss of plant genetic resources has made necessary the development of new *ex situ* conservation methods. Among the most popular *ex situ* conservation approaches are: plant relocation to more friendly habitats, seed banking, developing *in vitro* living collections of tissues and cryopreservation. This paper summarizes the main *ex situ* plant conservation strategies in a critical manner with special emphasis on the benefits and disadvantages of each method.

Key words: biodiversity loss, plant conservation, *ex situ* strategies.

REZUMAT: Pro şi contra conservării *ex situ* a plantelor - o abordare critică
Pierderile în ritm alert de resurse genetice vegetale au generat necesitatea dezvoltării de noi metode de conservare *ex situ.* Între cele mai populare se numără: transplantarea în habitate mai puţin expuse, crearea de colecţii *in vitro* de ţesuturi vegetale şi crioconservarea. În această lucrare sunt sintetizate în manieră critică, principalele stategii de conservare *ex situ,* subliniindu-se avantajele şi dezavantajele fiecărei metode.

Cuvinte cheie: pierderi de biodiversitate, conservarea plantelor, strategii *ex situ*.

INTRODUCTION

Recent studies reports that despite some local successes, most indicators of the state of biodiversity showed declines, with no significant recent reductions in rate, whereas indicators of pressures on biodiversity showed increases (Butchart et al., 2010). As a significant part of biodiversity, plant diversity is mandatory to maintain ecosystem services (Forest et al., 2011). The main conservation strategies refer to *in situ* or *ex situ* conservation.

The *in situ* approach relies on developing and applying strategies appropriate for the genetic conservation of plant diversity in its native environment, within natural habitats. When conservation initiatives are implemented out of native habitats these refers to *ex situ* strategies. *Ex situ* conservation involves preservation and maintenance of samples of living organisms outside their native

habitat, in the form of whole plants, seed, pollen, vegetative propagules, and tissue or cell cultures.

This review aims to overview analytically, the most common *ex situ* plant conservation strategies and to underline the gains and also the losses for each method discussed.

Ex situ plant conservation strategies

1. *Quasi in situ plant conservation* is a newly developed concept as a bridge between *in situ* and *ex situ* approaches (Volis & Blecher, 2010). It relies on a combinational approach when ex *situ* collections maintained in natural or semi-natural environment and preserving both neutral and adaptive genetic diversity are a part of a complementary *ex situ-in situ* conservation strategy. The main pros of the method are that it takes into account ecologically significant variation of plants in both *ex situ* and *in situ* conservation actions. The main cons are that it could be applied only when the main endangering factors are overcome and a natural or seminatural environment is available for population establishment.

2. *Relocation from native habitats* and establishment of living collections of endangered plants is implemented mainly in botanical gardens. The first development of this idea into the concept of using *ex situ* collections in botanical gardens to explicitly address conservation issues has been done by Cugnac (1953), who suggested creation of specific *ex situ* conservation facilities, *jardin conservatoire*, closely associated with protected areas. Presently, in the world's 2204 botanical gardens are preserved more than one third of the world's flowering plants (BGCI Report).The main pros are that the method is simple and cost effective and the living collection are established in a protected environment, less exposed to the endangering factors. Although the method is presently the most applied *ex situ* conservation strategy, there are also a few cons like: (i) relocation refers to limited number of individuals meaning that the preserved variability is low, (ii) living collection brings together a number of species from different regions in a very limited territory, raising the vulnerability to pathogens, (iii) relocated plants are subject to accommodation and acclimatization issues (iiii) plants in protected environments are more exposed to epigenetic variation.

3. *Seed banking* is one of the most convenient long term conservation method because is easy (involves only desiccation and storage at low temperatures), accessible, economic (in terms of space and facilities), and efficient (the seeds preserves their viability and germinability for long periods of time; the seeds are protected from pathogens and genetic erosion). Presently world wide (there) are about 1460 accredited seed banks (including 465 in Europe, 468 in the Americas, and 298 in Asia), where more than 6 millions accessions are preserved (40% of these are cereals). From these, two are assigned as the larges world's seed collection: *Svalbard Global Seed Vault* and *Millennium Seed Bank*. *Svalbard Global Seed Vault* is the world's largest collection of seed crops and preserves more than 500000 samples originating from almost every country in the world. The focus of the Vault is to safeguard as much of the world's unique crop genetic material as possible. The Trust is currently supporting more than 100 institutes

worldwide to regenerate unique accessions and deposit safety duplicates in the Vault. Kew's *Millennium Seed Bank* partnership is the largest *ex situ* plant conservation project in the world, within 10% of the world's wild plant species were banked, the target being 20% by 2020. However, there are a large number of threatened species, which produce immature, sterile or recalcitrant seeds that quickly lose viability and do not survive desiccation; hence conventional seed storage strategies are not suitable.

4. *Developing in vitro collections* covers a wide range of techniques involving the growth under sterile conditions of plant germplasm (especially shoot tips, meristems, somatic embryos or embryogenic callus) on artificial culture media. Although each species require specific protocols, there are some common steps in establishing an *in vitro* collection: culture initiation, maintenance and multiplication, followed by long-term storage. Several *in vitro* techniques have been developed, mostly for vegetatively propagated and recalcitrant seed producing species, subsequently this being the main pros of the method. Establishing *in vitro* plant stocks have an immediate benefit by reduction the collection pressure on the wild populations. These collections allow for continuous supply of valuable material for wild population recovery, molecular investigations, ecological studies, or economic uses. Among other pros: (i) allows conservation of a wide range of plant species, (ii) the preserved material is pathogen free, (iii) allows multiplication of original material, (iiii) ensure conservation for long period of time (in terms of years). *In vitro* techniques have been found to be useful in the propagation of a large number of threatened plants, the most extensive plant germplasm *in vitro* collections being established, within the last 30 years, at Royal Botanical Garden from Kew, United Kingdom. Micropropagation Unit at RBG Kew has been involved in the propagation and maintenance of more than 3000 plant taxa, from all over the world, including all major taxonomic groups of plant. At national level there are only a few research groups involved in establisment of *in vitro* collections of threatened plant. One of the most prominant is Institute of Biology from Romanian Academy, where were develloped techniques for micropropagation for 20 species of vascular plant, 16 species of bryophytes, 5 species of algae and 3 species of lichens. The major limitation in the use of micropropagation is the costs that can have a rate of more than 70% (labor cost). Another major disadvantage is the high rate of somaclonal occurrence (which can be either genetic or epigenetic in origin) after a number of subcultivation, or due to the effect of some auxins from culture media. Somaclonal variation is a very unwanted event, because consists in genetic alteration of original genotype, sometimes with major changes in phenotype. From other immediate cons are the vulnerability of regenerated plants to pathogens and the difficulties in their acclimatization to *ex vitro* conditions.

5. *Cryopresevation* summarize a number of experimental protocols developed for the storage of germplasm at very low temperatures in order to avoid the genetic alterations that may occur in long tissue cultures storage. The temperatures used are those of liquid nitrogen (-196 ^{0}C) or its vapour phase (-150 ^{0}C). At these temperatures, all metabolic activity is suppressed minimizing

the risk of genetic alterations and eliminating the requirement for refreshing the culture medium. Cryopreservation provides a safe and cost effective method for the long-term storage of genetic resources. Cryopreservation as a conservation tool has been underlined by a number of authors (Engelmann, Stacey et al.) and presently is recognized as the most effective technique for long-term storage of plant germplasm, ensuring conservation tentatively for an indeterminate period of time. Hence, the main drawback for a wider application of plant cryopreservation is the unavailability of efficient cryopreservation protocols for many plant species. Future researches should be directed to devellop more efficient cryopreservation protocols, for all major taxonomic groups of plants, and also to simplify and standardize as much as possible, in order to make it available for both public institutions and private companies.

CONCLUSIONS

Ex situ conservation must be considered only in cases where *in situ* approaches were insufficient, inefficient or impossible. When available, the *ex situ* conservation method should be carefully selected, taking into account both advantages and disadvantages. As a general rule, the chosen method should be not considered exclusive, but complementary to other approaches.

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MUZEUL JUDEȚEAN ARGEŞ, PITEŞTI, ROMÂNIA
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VEGETATION SUCCESION AS A RESULT OF DEFORESTATIONS IN DRAGOSLOVENILOR VALLEY PIATRA CRAIULUI MASSIF

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ABSTRACT: Piatra Craiului Massif belongs to the group of Bucegi-Piatra Craiului Mountains, a geographical sub-unit of the Meridional Carpathian and is a genuine flora and vegetation refuge. In this massif the Carpathian endemic species *Dianthus callizonus* are met. The Dragoslovenilor Valley is located in the upper mountain region of the Piatra Craiului Massif, 4.5 km from the Dambovita River within Argeş County. In 2003 the western side of the Dragoslovenilor Valley was complete deforested and direct observations of the subsequent vegetation succession began. These observations have occurred through the years and required regular studies of the same location, analyzing the structure of the present phytocoenosis combined with charting of vegetation change. This monitoring will allow observation of the main succession stages over time. An accurate prediction and description of the ecological processes could be tested after complete deforestation.

Keywords: vegetation succession, deforestation, charting of vegetation, Piatra Craiului Massif.

REZUMAT: Succesiunea vegetației rezultate în urma defrişărilor din Valea Dragoslovenilor, Parcul Național Piatra Craiului
Parcul Național Piatra Craiului face parte din Carpații Meridionali şi reprezintă un refugiu de flora şi vegetație autentică, aici întâlnindu-se endemitul carpatic *Dianthus callizonus* Schott & Kotschy. Valea Dragoslovenilor se află situată în zona tampon a parcului, chiar sub Marele Grohotiş. Observațiile asupra părții vestice a Vaii Dragoslovenilor au început în anul 2003. Acesta a fost anul în care versantul vestic al Vaii Dragoslovenilor a fost defrişat complet, anul în care observațiile directe au fost făcute pentru aprecierea fazelor succesionale incipiente ale vegetației.
Aceste observații care s-au desfăşurat pe parcursul mai multor ani, presupun studii periodice cu realizarea analizei structurale a fitocenozelor prezente, metodă combinată cu cea a cartărilor succesive de vegetație. Se va putea face o prognoza cât mai veridica asupra proceselor care se vor desfăşura după defrişarea la ras a pădurii.

Cuvinte cheie: succesiunea vegetației, defrişare, cartarea vegetației, Masivul Piatra Craiului.

INTRODUCTION

Any forest ecosystem is characterized by its general appearance, the diversity of plant species, the stratification and ecological structure of the forest

and the relations between its habitats. Ecological succession is a natural process: there are biological communities which are replaced by new ones, as living conditions in that ecosystem changes occur; the mechanism of ecological succession is still unclear, especially since, in stable ecosystems, ecological succession is very slow and difficult to quantify.

Piatra Craiului Massif belongs to the group of Bucegi-Piatra Craiului Mountains, a geographical sub-unit of the Meridional Carpathian and is a genuine flora and vegetation refugee. In this massif the Carpathian endemic species *Dianthus callizonus* are met. Dragoslovenilor Valley is located in the park buffer zone, even under Marele Grohotis (Great Debris).

MATERIAL AND METHODS

Observations on the western side of the Dragoslovenilor Valley began in 2003, when the slope was completely cleared. Dragoslovenilor Valley is located in the upper mountain region of the Piatra Craiului Massif, 4.5 km from the Dâmbovița River within Argeş County. The study site was dominated by *Fagus sylvatica* and *Picea abies,* about 50 years old. Direct observations have been made to assess early succession stages of vegetation and took place over several years, studies involving periodic structural analysis of present phytocoenoses. This monitoring will allow observation of the main succession stages over time. An accurate prediction and description of the ecological processes could be tested after the complete deforestation (Alexiu & Stancu, 2004).

After the clearings of the natural shrubs, a tendency of re-installing the high weed vegetation which transforms into shrubby phytocoenose of *Rubus idaeus, Sambucus racemosa, Corylus avellana* is manifested. It is a particular type of vegetation that Tuxen and Preising called Epilobietea angustifolii that pass through different stages without becaming definitive because it is finally replaced by the original nemoral vegetation (Carillo et al., 1983). The two main stages of the progressive series that lead to the remaking of the original nemoral vegetation include a growing of the thick and varied herbal sinusia, followed by the apparition of a shrubby layer of falling leaves species.

On the areas where the forestall exploitations are made a heliophille vegetation is installed. Characteristic are: *Epilobium angustifolium, Senecio sylvaticus, Cirsium erysithales, Doronicum austriacum*, that belong to Senecioni *Sylvatici-Epilobietum angustifolii* association Tuxen 1937. The presence of the species *Epilpobium angustifolium* is very important because it maintains the soil and prevents the erosion. Where the remaking reaches a superior stage the following phytocoenosis are found: *Fragario-Rubetum idaei* Gams 1927, beside the nemoral species that remained from the time of the existence of the forest.

RESULTS AND DISCUSSION

When man intervenes in the vegetal-habitat equilibrium, he will modify, in a certain moment, the natural dynamics of this equilibrium, temporarily leading it to another equilibrium-paraclimax state or artificial unbalanced (Decocq, 2003).

After the clearing, we performed an inventory to observe the requirements of plants to light factor, crucial for the future structure of vegetation combinations perfection. In the surveys made between 2003 - 2005, were identified 10 heliophyte species (*Bromus ramosus, Betula pendula, Campanula patula, Hypericum maculatum, Chamaenerion angustifolium, Prunella vulgaris, Potentilla thuringiaca, Euphorbia cyparissias, Rumex acetosella, Verbascum thapsus*), 24 heliosciadophytes species (*Deschampsia flexuosa, Galanthus nivalis, Senecio ovatus, Athyrium filix-femina, Stellaria holostea, Sambucus racemosa, Luzula luzuloides, Rubus idaeus, Rubus hirtus, Glechoma hederacea, Fragaria vesca, Geum montanum, Ajuga reptans, Campanula trachelium, Dryopteris filix-mas, Euphorbia amygdaloides, Mycelis muralis, Symphytum cordatum, Ranunculus auricomus, Rosa pendulina, Calamagrostis arundinacea, Stellaria nemorum, Galeopsis tetrahit, Salvia glutinosa*), 10 heliosciadophytes-sciadophytes species (*Brachypodium sylvaticum, Carex sylvatica, Asarum europaeum, Veronica urticifolia, Pulmonaria rubra, Corydalis cava, Abies alba* (juv.), *Picea abies* (juv.), *Pteridium aquilinum, Corydalis solida.*) and 9 sciadophytes species (*Chaerophyllum hirsutum, Actaea spicata, Asperula odorata, Luzula pilosa, Chrysosplenium alternifolium, Geranium robertianum, Mercurialis perennis, Oxalis acetosella, Fagus sylvatica* (juv.).

Installation of natural vegetation in these cleared areas occurs very slowly. The main phytocoenoses actively participating in restoring the original natural vegetation are given in epitome coenotaxonomic below (Sanda et al., 2001):

EPILOBIETEA ANGUSTIFOLII R.Tüxen et Preising in Tüxen 1950
Atropetalia Vlieger 1937 (Syn.: *Epilobietalia angustifolii* (Vlieger 1937) R. Tüxen 1950)
Carici piluliferae – Epilobion angustifolii R. Tüxen 1950 (Syn.: *Epilobion angustifolii* (Rübel 1933) Soó 1933)
Senecioni sylvatici - Epilobietum angustifolii R. Tüxen 1937 (Syn.: *Epilobietum angustifolii* Rubel 1933)
Digitali ambiguae – Calam*agrostietum *arundinaceae Sillinger 1933 (Syn.: *Calamagrostio arundinaceae - Digitaletum grandiflorae* Oberdorfer 1973; *Calamagrostietum arundinaceae* Puşcaru et al., 1959)
Sambucetalia racemosae Oberdorfer 1957
Sambuco racemosae - Salicion capreae R. Tüxen et Neumann in R. Tüxen 1950
Fragario-Rubetum idaei Gams 1927
Sambucetum racemosae (Noirfalise 1944) Oberdorfer 1967 (Syn.: *Senecioni fuchsii - Sambucetum racemosae* Noirfalise 1949)

QUERCO FAGETEA Br. –Bl. et Vlieger in Vlieger em. Borhidi 1996 (Syn.: *Carpini-Fagetea* (Br.-Bl. et Vlieger 1937) Jakucs 1960)
Quercetalia roboris Tuxen 1931
Genisto germanicae – Quercion Neuhäusl et Neuhäuslová-Novotná 1967 (Syn.: *Veronico officinalis - Quercion* I. Pop 1971)
Sorbo – Betuletum pendulae Dihoru 1975
Populeto-Betuletum pendulae Coldea 1972

An initial phase taking place over several years is the association groups **Senecio sylvatici-Chamenerion angustifoliae** R. Tx. 1937. The coenosis were found on the south-west from the Grand debris. They vegetate on deep soils in mesophil and mezohigrophil resort at an altitude of 1200-1350 m, by setting up the brown and brown luvic soils, wet with alkaline pH of 8.2. Frequent mention of accompanying species: *Calamagrostis arundinacea, Galeopsis speciosa, Stachys sylvatica, Cirsium vulgare, Rumex acetosella, Gnaphalium sylvaticum*. The presence of woody species characteristic to Sambuco - Salicion allies show progress toward the coenosis Sambucetum racemosae association

Altitude (m.s.m.)	1200
Exposure	S-V
Slope (degrees)	40
Shrubs and juvenile layer covering (%)	40
Herbaceous layer coverage (%)	60
Sample surface (m^2)	100
Senecioni sylvatici – Chamenerion angustifoliae	
Char. ass.	
Senecio sylvaticus	+
Epilobion angustifolii	
Chamenerion angustifolium	+
Galeopsis speciosa	+
Gnaphalium sylvaticum	+
Rumex acetosella	+
Senecio ovatus	+
Atropetalia	
Sambucus racemosa	+
Epilobium angustifolium	+
Rubus idaeus	+
Myosotis arvensis	+
Fragaria vesca	+
Betula pendula	+
Variae syntaxa	
Urtica dioica	+
Poa nemoralis	+
Urtica dioica	+

Stachys sylvatica	+
Cirsium vulgare	+
Campanula abietina	+
Deschampsia caespitosa	+
Impatiens noli-tangere	+
Galeopsis tetrahit	+
Stellaria nemorum	+

Digitali ambiguae – Calam*agrostietum *arundinaceae Sillinger 1933 - it includes the phytocoenosis installed in the clearings from the beech tree and fir tree mix forests and vegetate on the sunny and very inclined slops, with brown, luvic, superficial soils and acid reaction. Among the accompanying species, the most common are: *Silene heuffelii, Spiraea chamaedryfolia, Fragaria vesca, Leucanthemum waldsteinii, Epilobium angustifolium, Luzula sylvatica, Senecio fuchsii, Melica nutans, and Anemone ranunculoides*.

Altitude (m.s.m.)	1100
Exposure	S-E
Slope (degrees)	40
Shrubs and juvenile layer covering (%)	40
Herbaceous layer coverage (%)	60
Sample surface (m^2)	100
Digitali ambiguae – Calamagrostietum arundinaceae	
Char. ass.	
Digitalis grandiflora	+
Epilobion angustifolii	
Calamagrostis arundinacea	+
Galeopsis speciosa	+
Gnaphalium sylvaticum	+
Rumex acetosella	+
Sambuco-Salicion	
Rubus hirtus	+
Sambucus racemosa	+
Salix caprea	+
Vaccicinio-Piceetalia	
Oxalis acetosella	+
Pulmonaria rubra	+
Luzula sylvatica	+
Vaccinium myrtillus	+
Accompanying species	
Epilobium montanum	+
Hypericum maculatum	+
Senecio fuchsii	+
Melica nutans	+
Anemone ranunculoides	+

Fragario – Rubetum idaei (Pfeiffer 1936) Siss.1946 - the *Rubus idaeus* edificated coenosis are frequently met on the recently cleared and sunny areas of the mountain floor of the Romanian Carpathians. They vegetate on brown soils, brown and brown luvic acidic, moist, rich in nutrients. Beside the dominant species, i.e. *Rubus idaeus*, which covers 40-60% of the area, the species *Fragaria vesca* and *Senecio fuchsii* have a high constancy in these groups. The syndinamic evolution of these shrubby phytocoenosis is differentiated depending on the local geo-morphological conditions. Thus, less sloping lands with soil depth, is installed in a short time through natural regeneration, the old forests of beech and fir. Strongly sloping land, where deforestation is increasing erosion, reinstall the old beech phytocenosis occurs slowly, after those of *Rubus idaeus*, which are replaced by the first of *Betula pendula*.

Altitude (m.s.m.)	1400
Exposure	S-E
Slope (degrees)	30
Shrubs and juvenile layer covering (%)	50
Herbaceous layer coverage (%)	50
Sample surface (m^2)	400
Fragario – Rubetum idaei	
Char. ass.	
Rubus idaeus	+
Sambuco-Salicion	
Salix silesiaca	+
Salix caprea	+
Sambucus racemosa	+
Rubus hirtus	+
Sorbus aucuparia	+
Atropetalia	
Betula pendula	+
Chamenerion angustifolium	+
Fragaraia vesca	+
Myosotis arvensis	+
Fagetalia	
Fagus sylvatica (juv.)	+
Corylus avellana	+
Luzula luzuloides	+
Dryopteris filix-mas	+
Geranium robertianum	+
Mycelis muralis	+
Vaccinio-Piceetalia	
Oxalis acetosella	+
Pulmonaria rubra	+
Vaccinium myrtillus	+
Picea abies (juv.)	+

Accompanying species	
Epilobium montanum	+
Veronica officinalis	+
Urtica dioica	+
Hypericum maculatum	+
Cirsium arvense	+
Stellaria nemorum	+

Sambucetum racemosae (Noirfalise 1944) Oberd. 1967

Sambucus racemosa phytocoenosis are installed on partially shaded slopes, with brown and brown-luvic soils, wetlands, rich in nutrients from the beech floor. Dominating species: Sambuc*us racemosa* and *Senecio fuchsii* which covers 75% of the area. The phytocoenosis reach the peak of their growing after 6-7 years from the moment of clearing and then they regress and are replaced by the young beech populations. In these pyitocoenose many of the species of Sambuco-Salicion allince could be found: *Salix caprea, Rubus hirtus, Salix silesiaca, Sambucus nigra*, which grow in best conditions.

Altitude (m.s.m.)	1100
Exposure	N-V
Slope(degrees)	30
Shrubs and juvenile layer covering (%)	40
Herbaceous layer coverage (%)	60
Sample surface	100
Sambucetum racemosae	
Char. ass.	
Sambucus racemosa	+
Sambuco-Salicion	
Salix caprea	+
Sambucus nigra	+
Rubus hirtus	+
Salix silesiaca	+
Fagetalia	
Fagus sylvatica	+
Luzula luzuloides	+
Geranium robertianum	+
Salvia glutinosa	+
Euphorbia amygdaloides	+
Athyrium filix-femina	+
Accompanying species	
Veronica officinalis	+
Urtica dioica	+
Lapsana communis	+
Campanula persicifolia	+
Impatiens noli-tangere	+

Prunella vulgaris	+
Gentiana asclepiadea	+

Rocky stands belonging to the association **Sorbo - Betuletum pendulae** Dihoru 1975, are found in cleared areas, especially on acid soils, surface area of spruce beech mixture. Elements of the alliance Vaccinio-Piceion such as *Picea abies, Oxalis acetosella, Vaccinium vitis-idea, V. mirtillus, Pulmonaria rubra* are met here.

Altitude (m.s.m.)	1400
Exposure	N-E
Slope (degrees)	45
Shrubs and juvenile layer covering (%)	50
Herbaceous layer coverage (%)	50
Sample surface	100
Sorbo – Betuletum pendulae	
Char. ass.	
Sorbus aucuparia	+
Betula pendula	+
Vaccinio-Piceion	
Picea abies	+
Vacciniu myrtillus	+
Vaccinium vitis-idaea	+
Oxalis acetosella	+
Pulmonaria rubra	+
Accompanying species	
Myosotis sylvatica	+
Solidago virgaurea	+
Doronicum austriacum	+
Carpinus betulus	+
Rosa canina	+

The final stage of the shrubby phytocoenosis, i.e. the one before the re-installing of the forest, is achieved by the edified phytocoenosis of **Populo - Betuletum pendulae** Coldea 1972. The species *Betula pendula* is the most spread covering 40%-50%. The species *Populus coveres* 15% in average. After the installing of the *Betula pendula* coenose, they evolve and after 10-15 years, some species characteristic for the Chamenerion angustifoliae Alliance and Atropetalia Order could be found.

Altitude (m.s.m.)	1300
Exposure	N-V
Slope (degrees)	45
Shrubs and juvenile layer covering (%)	40

Herbaceous layer coverage (%)	60
Sample surface	200
Populo – Betuletum pendulae	
Char. ass.	
Populus tremula	+
Chamenerion angustifoliae	
Calamagrostis arundinacea	+
Rumex acetosella	+
Gnaphalium sylvaticum	+
Atropetalia	
Betula pendula	+
Chamenerion angustifolium	+
Fragaria vesca	+
Myosotis arvensis	+
Fagetalia	
Fagus sylvatica	+
Corylus avellana	+
Luzula luzuloides	+
Pulmonaria officinalis	+
Viola reichenbachiana	+
Euphorbia amygdaloides	+
Accompanying species	
Veronica officinalis	+
Deschampsia flexuosa	+
Potentilla erecta	+
Rubus caesius	+
Myosotis sylvatica	+
Veronica chamaedrys	+
Campanula patula	+
Cruciata glabra	+

The surveys were made on the western slope of the Dragoslovenilor Valley between Garofiţa Pietrei Craiului chalet and Marele Grohotiş at an altitude between 1100-1400 m.

CONCLUSIONS

After the clearings of the natural shrub a constant tendency of re-installing the high weed vegetation that successively becomes shrubby dominant phytocoenosis such as *Rubus idaeus, Sambucus racemosa, Corylus avellana.*

These re-installed phytocoenosis lead to two ecological evolutions (Alexiu V., 2005): a mezophyille one Epilobietum angustifolii → Calamagrostio - Spiraeetum chamaedryfolie → Fragario - Rubetum → Sambucetum racemosae → Coryletum avellane and a xeromezophyille one Sedo hispanici - Poetum

nemoralis → Digitalo - Calamagrostietum arundinaceaea → Fragario - Rubetum → Coryletum avellane.

The coenotic nucleus of the edifying species of this group characteristic for the respective clearings is dominated by the elements of the Epilobietea angustifolii Class; those belonging to Fagettalia Order are also well represented. This aspect show the secondary origins of the phytocoenosis installed after the clearings of the natural shrubs. These natural re-installing processes of the shrubby vegetation are very long (15-20 years) especially on slopes where the fixing of mobile soil and detritus is more difficult.

When the forestall vegetation is destroyed the whole biological equilibrium of the territory is disturbed and consequently new ecological aspects appear. Three aspects of the succession of vegetation are recorded:

- the destruction of the forestall vegetation
- the apparition of new shrub formed by pioneer species, followed by
- the progressive re-installing of the species that previously formed the forest

The weed resulted after clearings forms pioneer phytocoenosis that appear after the clearings. The composition of the shrubs depends on the altitude and on the type of forest that it replaces. As the density of trees decreases the quantity of organic rests diminishes. Many hundreds of years are required for the soil to be formed. The forest will regain its physiognomy but under a floristic viewpoint, i.e. qualitatively speaking, it will gain its initial aspect only after many millenniums.

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FAUNISTICAL NOTE ON UROPODINA (ACARINA: ANACTINOTRICHIDA: UROPODINA) IN DJERDAP NATIONAL PARK (SERBIA)

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ABSTRACT: This paper is a brief note on the Uropodina mite fauna of Serbia. The list of Uropodina mites previously published from this country has expended with three other species (*Discourella radnaensis*, *Cilliba sellnicki* and *Trachytes tesquorum*).

Key words: Acarina, Uropodina, first record, fauna of Serbia.

REZUMAT: Notă faunistică asupra Uropodina (Acarina: Anactinotrichida: Uropodina) în Parcul Național Djerdap (Serbia)
Această lucrare este o scurtă notă asupra acarienilor Uropodina din fauna Serbiei. Lista acarienilor Uropodina publicată anterior din această țară a fost extinsă cu alte trei specii (*Discourella radnaensis*, *Cilliba sellnicki* and *Trachytes tesquorum*).

Cuvinte cheie: Acarina, Uropodina, prima înregistrare, fauna Serbiei.

INTRODUCTION

Uropodina fauna of Serbia is very little studied, a total of seven species (*Polyaspis patavinus, Trichouropoda ovalis, Urodiaspis stammeri, Uropoda splendida, Uropoda erlangensis, Uropoda cassidea* and *Urodiaspis tecta*) being collected by Kóntschan (Kóntschan, 2005; Kóntschan, 2007), and two species (*Uropoda copridis* and *Uroseius willmanni*) being cited by Hirschmann and Wiśniewski from the former Yugoslavia (Hirschmann & Wiśniewski, 1993).

In collected material were identified five species of Uropodina, three of them (*Discourella radnaensis*, *Cilliba sellnicki* and *Trachytes tesquorum)* are for the first time recorded in the fauna of Serbia. For *Discourella radnaensis* have been described in a previous paper protonymph and deutonymph (Constantinescu, in press).

MATERIAL AND METHODS

Acarologic material was collected in Serbia, at 05.06.2010, in Djerdap National Park, on Mount Veliki Strbac (768 m altitude). Samples were collected from litter of mixed deciduous forest with beech (*Fagus orientalis*), dogwood (*Cornus mas*), lote tree (*Celtis australis*), maple (*Acer monospessulanum*) and hornbeam (*Carpinus betulus*), and bark of the decomposing trunk of deciduous tree.

In the twenty samples collected (P_1-P_{20}) were identified 46 individuals of Uropodina mites.

Mites were extracted from samples using Berlese - Tullgren devices, clarified with lactic acid and identified with the help of a microscope. Acarologic material is stored in alcohol (96%) and is deposited in the author's personal collection, at the Arges County Museum, Romania.

RESULTS

Faunistic synopsis

Ord. Gamasida Leach, 1815
Subord. Uropodina Kramer, 1881

Suprafam. Polyaspidoidea Evans, 1957
Fam. Trachytidae Trägardh, 1938

Genera *Trachytes* Michael, 1894

1. *Trachytes tesquorum* Pecina, 1978

Material examined: P_{12} (1 L; 1 ♀).
Distribution: Czechoslovakia, Romania.
Remark: **This is first record from Serbia.**

Suprafam. Uropodoidea Evans, 1957
Fam. Uropodidae Berlese, 1900
Genera *Uropoda* Latreille, 1806
Subgenera *Phaulodinychus* Trägardh, 1943

2. *Uropoda (Phaulodinychus) splendida* Kramer, 1882 (Fig. 1).

Material examined: P_1 (3 DN; 3♀), P_2 (1PN; 1♂), P_3 (2PN), P_4 (1♂), P_{10} (2DN), P_{19} (1♂).
Distribution: European species widely spread (Germany, Britain, Austria, Poland, Czech Republic, Slovakia, Ukraina, Hungary, Italy, Spain, Albania, Croatia, Macedonia, Romania).

Subgenera *Cilliba* Heyden, 1827

3. *Uropoda (Cilliba) erlangensis* Hirschamann et Zirngiebl-Nicol, 1969
Material examined: P_4 (1DN; 1♀).
Distribution: European species (Germany, Slovakia, Lithuania, Albania, Hungary, Montenegro, Romania).

4. *Uropoda (Cilliba*) *sellnicki* Hirschamann et Zirngiebl-Nicol, 1969 (Fig. 2)
Material examined: P_2 (2♂), P_4 (1PN; 1DN; 1♂; 1♀), P_{10} (1♂), P_{16} (1DN; 1♂).
Distribution: European species (Spain, Austria, Poland).
Remark: **This is first record from Serbia.**

Genera *Discourella* Berlese, 1910
5. *Discourella radnaensis* Willman, 1941
Material examined: P_1 (2DN), P_3 (3DN), P_4 (2PN; 4DN), P_6 (1DN; 1♀), P_{10} (1DN), P_{12} (1DN), P_{16} (2DN), P_{20} (1DN).
Distribution: Slovenia.
Remark: **This is first record from Serbia.**

Abbreviations: L- larva; PN-protonymph; DN-deutonymph.

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Figure 1 – *Uropoda (Phaulodinychus) splendida,* deutonymph ventral.

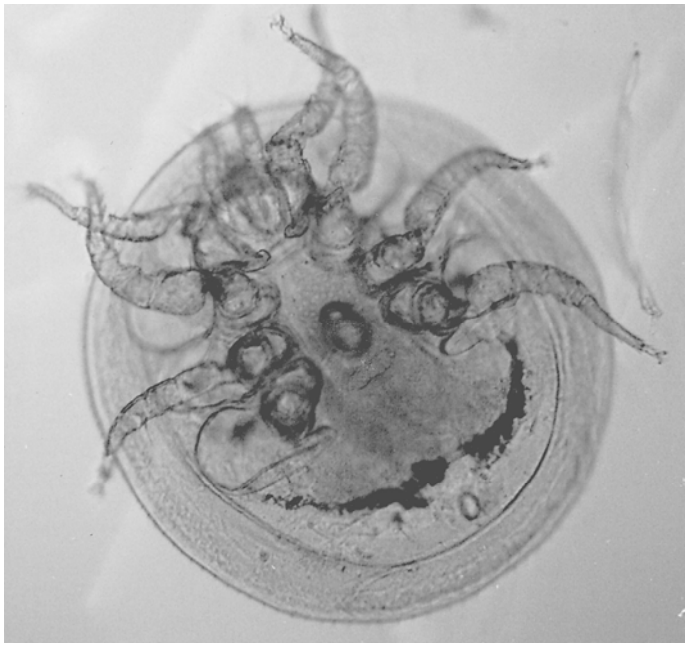

Figure 2 – *Uropoda* (*Cilliba*) *sellnicki,* male ventral.

MUZEUL JUDEȚEAN ARGEŞ, PITEŞTI, ROMÂNIA
ARGESIS *- STUDII ŞI COMUNICĂRI - seria ŞTIINȚELE NATURII,* **TOM XVIII**, 2010

QUANTITATIVE ASPECTS OF THE FAUNA OF THE EPIGEIC SPIDERS FROM TWO FOREST ECOSYSTEMS OF THE MIDDLE BASIN OF THE RIVER ARGES

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ABSTRACT: This paper is a concise overview on the numerical relationships between epigeic spider's species that forming the arachnocenosis installed in two forest ecosystems, of the middle basin of the river Argeş. Quantifying numerical relationships, through the index of ecological significance, revealed the hierarchy the species of spiders according to the values of this index, which allowed the identification of dominant species of spiders from the ecosystems studied. Comparative analysis of data obtained, for the two forest ecosystems, has shown that there are differences between them regarding the exercise of dominance phenomenon, both in terms quantitatively and qualitatively.

Keywords: spiders, quantitative aspects, middle basin of river Argeş.

REZUMAT: Aspecte cantitative ale faunei de aranee epigee din două ecosisteme forestiere din bazinul mijlociu al râului Argeş
Lucrarea prezintă succint raporturilor numerice stabilite între speciile de aranee epigee care formează arahnocenozele din două ecosisteme forestiere din bazinul mijlociu al râului Argeş. Cuantificarea raporturilor numerice, prin intermediul indicelui de semnificație ecologică, a pus în evidență ierarhizarea speciilor de aranee în funcție de valorile acestui indice, ceea ce a permis identificarea speciilor de aranee dominante din ecosistemele studiate. Analiza comparativă a datelor, obținute pentru cele două ecosisteme forestiere, a arătat că există deosebiri între acestea în ceea ce privește exercitarea fenomenului de dominanță, atât din punct de vedere cantitativ cât şi calitativ.

Cuvinte cheie: aranee, aspecte cantitative, bazinul mijlociu al râului Argeş.

INTRODUCTION

If data on fauna of spiders are generally numerous and well-systematized, in contrast, the researches about the ecological aspects, such as quantifying the numerical relationships between populations which form spiders fauna of a ecosystem, are scarce and often are made on relative short periods, most often six months or a year, which does not allow the highlighting of the multi-annual dynamics of these relationships. Our study (that lasted for several years) about the

fauna of spiders of two ecosystems from the middle basin of the river Argeş can be considered a sequel of both regarding the time and place of the researches started by Floriana Niculescu-Burlacu, in the 60s, in the forest Brăneşti, near Bucharest (Niculescu-Burlacu, 1973).

The purpose of this research was to make a quantification of the numerical relations between populations of spiders that make up the spiders community from two forest ecosystems, commonly found in the middle basin of the river Argeş, a forest of oak and an beech forest, to identify the dominant species and for to highlights how to exercise of dominance phenomenon, through of the values of the index of ecological significance.

MATERIALS AND METHODS

For knowledge the numerical relations between the epigeic spiders population has been used the method of the ecological stationary. To this end has been taken in studied two resorts located in the middle basin of the river Argeş, near Piteşti city. The types of ecosystems in that have been established the two stations occupy large areas in the middle basin of the river Argeş, being representative of the studied area.

The first resort investigated was bounded in a oak forest, known as Trivale forest, and located at a distance of about one kilometer north-west by Piteşti city. Sample surface was set on a plateau at an altitude of about 370 m. In the stationary area, the trees layer is dominated by *Quercus robur* L. copies aged between 85 and 100 years. Association identified in the plateau area, where was located the inpatient, is *Querco robur-Carpinetum* Borza 1937.

The second station was located in a beech forest, to 11 kilometers north of the city of Pitesti, on Teascului Valley, near the village Micești. The stationary was fixed on an irregular slope with north-east exhibition, an altitude contained between 330 and 420 m. In the sampling area the tree layer is prevailed by the beech (*Fagus sylvatica* L.), and disseminated the hornbeam (*Carpinus betulus* L.) (the vegetal association is *Carpino-Fagetum sylvaticae* Paucă 1941).

The arachnological material covered by this study was collected using pitfall traps (Barber traps). We used plastic cups with a capacity of 500 cm^3, the diameter opening of 9 cm, height 12 cm and opening area of 63.58 cm^2. In each trap were insert 150 cm^3 of 5% solution, water and formaldehyde (formalin), approximately one third of the volume of a vessel. In order to prevent the penetration rainwater and impurities, at about six centimeters above the traps was placed a small tin roof, square, with dimensions of 14 x 14 cm. In each ecosystem were installed 27 traps in groups of nine traps. The distance between traps was 10 m, sufficient to avoid interference between them (Digweed et al., 1995). There was 50 meters distance between the three groups, each with nine traps, what permitted a good coverage of the area investigated. Collections were made twice a month for nine months in each year, from March to November, for three years: 2003, 2004 and 2005.

I used to quantify the numerical relationships the index of ecological significance, because this quantifies the relationship between structural indicator (frequency) and the productive one (abundance). I preferred to use this synthetic ecological index because took into consideration both frequency and abundance of species and this is why I considered that this index determined more precisely the position of a species within a biocoenosis or a systematically group. Depending on the values of this index, the species are divided into the following classes: W5> 10% over-dominant species, W4 = 5.1-10%, dominant species, W3 = 1.1-5% under-dominant species, W2 = 0.1-1% recedent species, W1 < 0.1% under-recedent species (Gomoiu & Skolka, 2001).

For each species identified was calculated the values of index of ecological significance for each year of study and for the period 2003-2005. In this paper were presented just species that had values of the ecological significance index, for the period 2003-2005, more than 0.1%.

RESULTS AND DISCUSSION

In the three years of study (2003, 2004 and 2005), of two ecosystems, were collected 28108 copies (14642 copies for forest Trivale and 13466 copies for Miceşti), of which 23312 copies (12661 copies for forest Trivale and 10651 copies for forest Miceşti) were determined to species level, the remaining 4796 specimens were identified until genus or family, due to the impossibility of accurately determining the immature or damaged specimens. In terms of systematic, the material collected and determined up to species level was grouped into: 27 families, 89 genera and 140 species for the Trivale forest and 27 families, 61 genera and 106 species for the Miceşti forest.

For forest **Trivale** the values of the index of ecological significance, calculated for the three years of study (2003-2005), showed that *Diplostyla concolor* (Wider, 1834) (9.81%), *Pardosa alacris* (C. L. Koch, 1833) (6.03%) and *Trochosa terricola* Thorell, 1856 (5.16%) were dominant species. They were accompanied by four under-dominant species: *Pardosa lugubris* (Walckenaer, 1802), *Arctosa lutentiana* (Simon, 1876), *Centromerus sylvaticus* (Blackwall, 1841) and *Zelotes apricorum* (L. Koch, 1876). The remaining species of spiders have entered the category of recedent species (12 species) and under-recedent (121 species).

If hierarchy the species of spiders is based on annual values of the index of ecological significance, we find that for year 2003 was identified two dominant species: *Pardosa alacris* (6.96%) and *Trochosa terricola* (5.61%), both of Lycosidae family. These were followed by six under-dominant species: *Diplostyla concolor*, *Pardosa lugubris, Zelotes apricorum*, *Arctosa lutentiana*, *Centromerus sylvaticus* and *Ozyptila praticola* (C. L. Koch, 1837), to which were added 10 recedent species and 99 under-recedent species.

For year 2004, *Diplostyla concolor* (11.67%) was the over-dominant species. It was followed by two dominant species: *Pardosa alacris* (9.58%) and

Trochosa terricola (5.36%) and three under-dominant species: *Pardosa lugubris, Arctosa lutentiana* and *Zelotes apricorum*. As in previous year, most species have entered in the category of recedent species (10 species) and under-recedent (72 species).

Last year, 2005, was characterized by the net dominance of species *Diplostyla concolor*, which was detached, by other species of spiders, due to high value of the ecological significance index (20.24%). Following species, *Trochosa terricola*, recorded a value of the index of ecological significance by only 4.40%. It was followed by four under-dominant species: *Centromerus sylvaticus*, *Arctosa lutentiana*, *Pardosa alacris* and *Pardosa lugubris*. Followed a group formed of seven recedent species and 74 under-recedent species (Fig. 1).

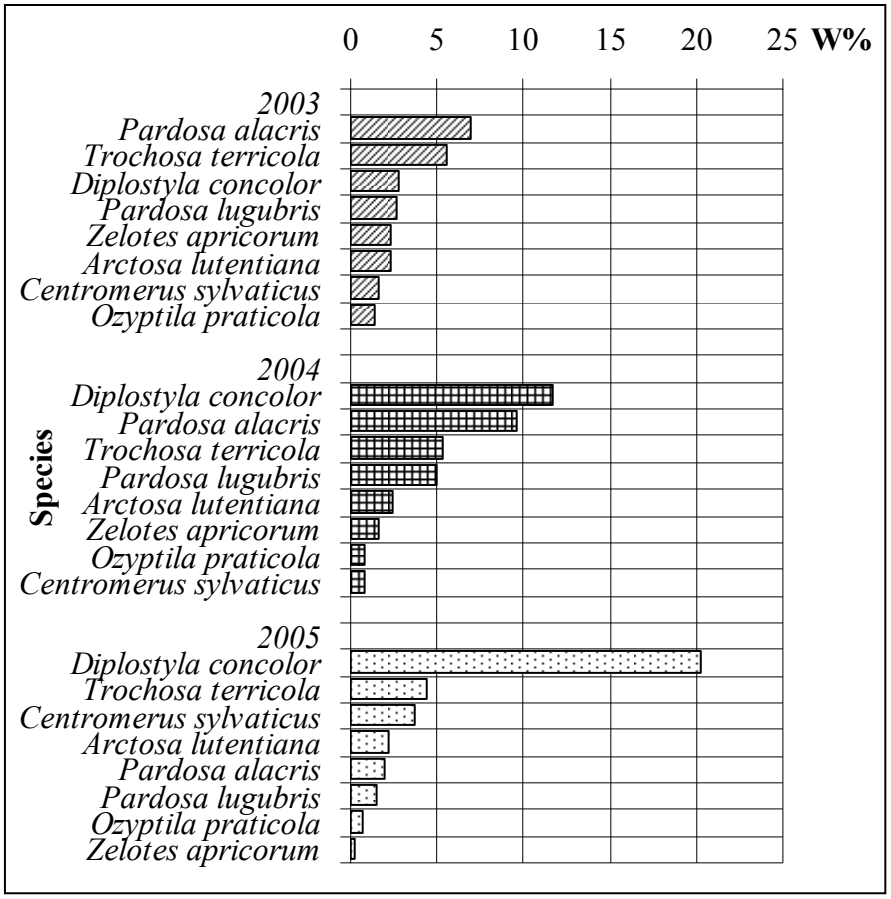

Figure 1 - Hierarchy of the spider's species, collected from forest Trivale, depending on annual values of ecological significance index.

In this context must be made the following observation: for the period 2003-2005, in case of the forest Trivale, although the highest values of index of ecological significance were recorded for species *Diplostyla concolor*, however, the years 2003 and 2004 were dominated by species of the family Lycosidae (especially *Pardosa alacris*). Year 2005, due to heavy rainfall of during June to September, in correlation with the particular conditions from this stationary (lack of water drainage, soil with low permeability), was characterized by net dominance of species *Diplostyla concolor* of family Linyphiidae and by the regression numerical and by activity of the species of family Lycosidae, including of species *Pardosa alacris*. Following the variation of values of aridity index, for the three years of study, I noticed that, in the case of the forest Trivale, in the particular conditions of here, decrease of the this index value, year 2003 was the most arid and the year 2005 was the wet of the three years of study, was accompanied by the changing numerical relations between the spiders species. Was observed transition from the dominance to the species of the Lycosidae family to the dominance of the species in the Linyphiidae family. Year 2005 was a special year because it showed how to change the quantitative relationships between the spiders species from the Trivale forest when, due abundant rainfall, correlated with the characteristics of relief and soil, local climate becomes wetter. We associate the characteristics of the fauna of spiders of this year a predictive component, related to the evolution of spider's community of this ecosystem in a particular environment (a wet climate during the warm season).

For the beech forest from **Micești** the values of index of ecological significance, calculated for the period 2003-2005, showed that *Pardosa alacris* (18.79%) was the over-dominant species for this ecosystem. It was followed by another species of the Lycosidae family, *Pardosa lugubris* (8.84%), which had the status of dominant species. A single species, *Eurocoelotes falciger* (Kulczynski, 1897), entered in the category of the under-dominant species. The remaining species of spiders entered in the category of recedent species (11 species) or in the category of under-recedent species (92 species). Year 2003 was characterized by the presence a single over-dominant species, *Pardosa alacris* (19.99%), followed at a significant distance by the dominant species, *Pardosa lugubris* (5.86%). Only two species have entered in the category of the under-dominant species: *Eurocoelotes inermis* (L. Koch, 1855) and *Haplodrassus silvestris* (Blackwall, 1833). The group of recedent species was composed of 11 species while the group of the under-recedent species had 75 species. For 2004 two species were identified over-dominante: *Pardosa alacris* (17.73%) and *Pardosa lugubris* (11.04%). A feature of this year was represented the fact that we had no dominant and under-dominant species. The group of the recedent species was composed of 12 species of spiders and the remaining, 45 species, has entered in the category of the under-recedent species. In the last year of study, 2005, the situation was similar to that of 2004. Same species *Pardosa alacris* (17.47%) and *Pardosa lugubris* (11.54%) were over-dominant species, followed by an under-dominant species, *Eurocoelotes*

falciger and by seven recedent species. As in previous years, most species (45 species) have entered the category of under-recedent species (Fig. 2).

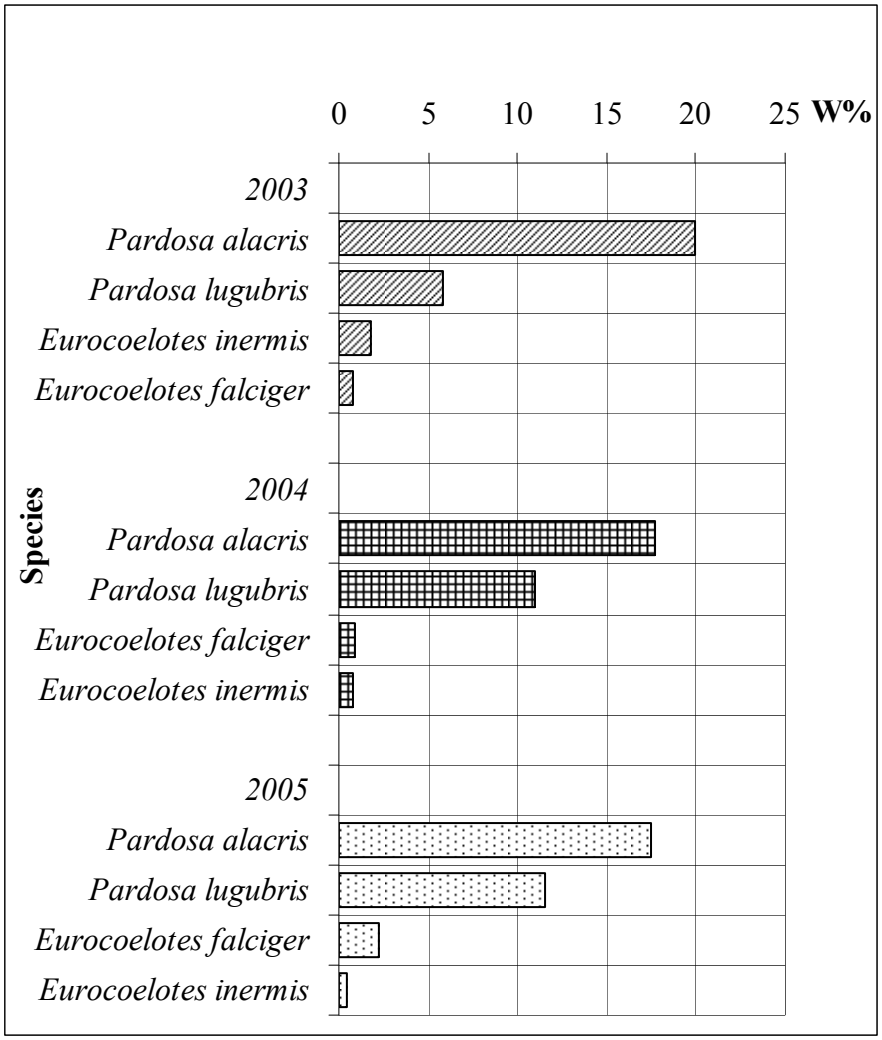

Figure 2 - Hierarchy of the spider's species collected from forest Miceşti, depending on annual values of ecological significance index.

A first observation arising from the data presented above is the fact that, for both ecosystems studied, the number of over-dominant and dominant species was small (Fig. 3).

The situation was similar and if we refer to the number of species that for at least a month went into one of two categories. In this context, if we relate to the total number of species identified for each ecosystem, they accounted for 10.71% for the forest Trivale, and 9.43% for the beech forest Miceşti (average values for

2003-2005 period). These are edifying species for communities of spiders of ecosystems studied. Although their number is small - 15 species for forest Trivale and 10 species for forest Micești - these are spiders species that have thanks to abundance and frequency their have greatest influence in the biocoenoses they belong.

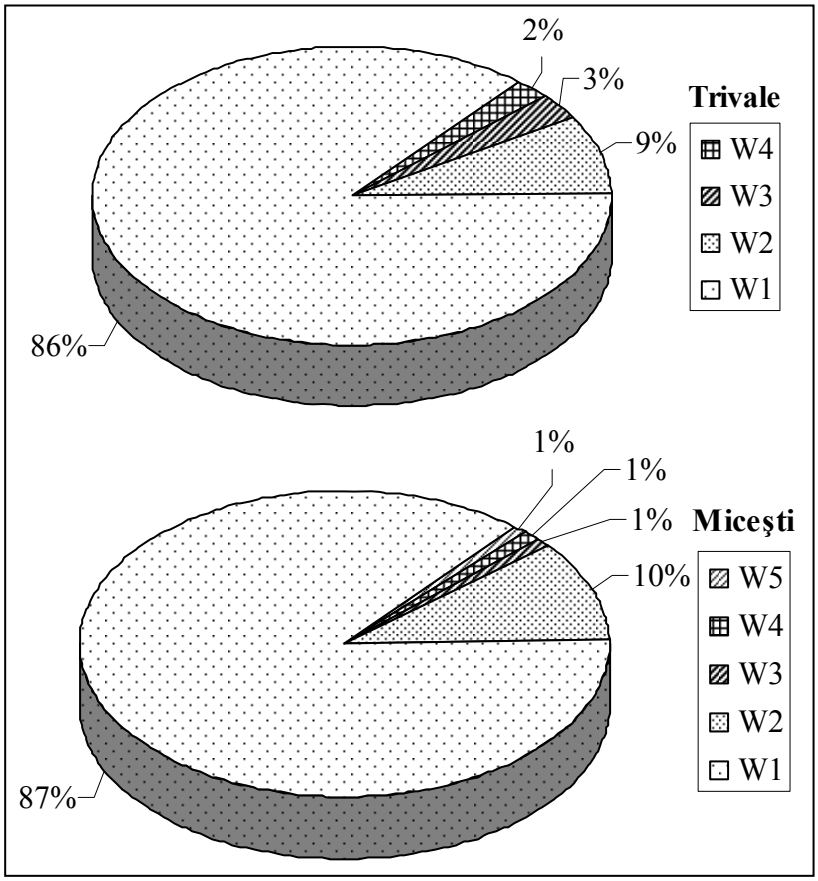

Figure 3 - Share dominance classes according to the number of species in each class (average values for 2003-2005 period).

Another relevant aspect was represented by the finding that there was, over a year, a succession of the dominance of species and families of spiders, dominance quantified by the values of the index the ecological significance (Fig. 4 and 5).

Data obtained showed that early spring, in March and the early April, the community of spiders of the forest Trivale was dominated by species in the families Linyphiidae and Dictynidae, *Centomerus sylvaticus* and *Cicurina cicur* (Fabricius, 1793), and by species in the families Amaurobiidae - *Eurocelotes*

falciger and Linyphiidae - *Centromerus serratus* (O.P.-Cambridge, 1875), for the Miceşti forest.

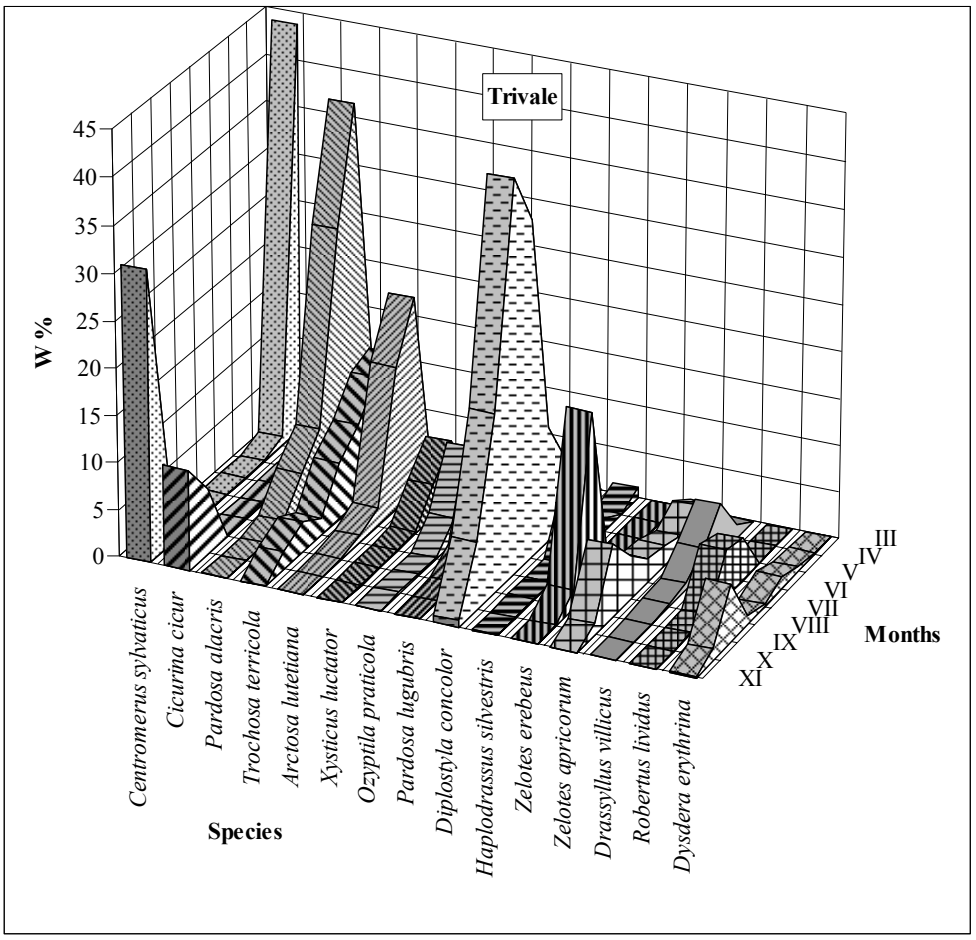

Figure 4 - Succession of the dominance of spiders species in the Trivale forest, depending of the values of index of ecological significance (average values on three years).

Since April we witnessed net dominance of the species in the Lycosidae family represented for Trivale resort by: *Pardosa alacris*, *Trochosa terricola*, *Arctosa lutetiana* and *Pardosa lugubris*, to which added mid-season warm *Diplostyla concolor*, species of the family Linyphiidae. For the forest from Miceşti we found that, since April until September, we assist to the net dominance of two species of the family Lycosidae: *Pardosa alacris* and *Pardosa lugubris*. The beginning of this interval was dominated by the first species and, since August, the dominant becomes species *Pardosa lugubris*, accompanied by a species of the Gnaphosidae family - *Zelotes erebeus* (Thorell, 1871).

Autumn has brought new changes in terms of dominance of spider's species. In the case of the Trivale forest earlier this season was dominated by species of the family Linyphiidae, *Diplostyla concolor*, passing then to the dominance a two by spiders species of the families Dictynidae and Amaurobiidae, *Cicurina cicur*, in October, and *Eurocoelotes falciger* to end of the season.

To the forest from Miceşti the first month of the season was dominated by *Pardosa lugubris*, in 2005 and *Eurocoelotes inermis* in 2003 and 2004, and the last two months had as the dominant species on *Eurocoelotesof falciger* of the Amaurobiidae family.

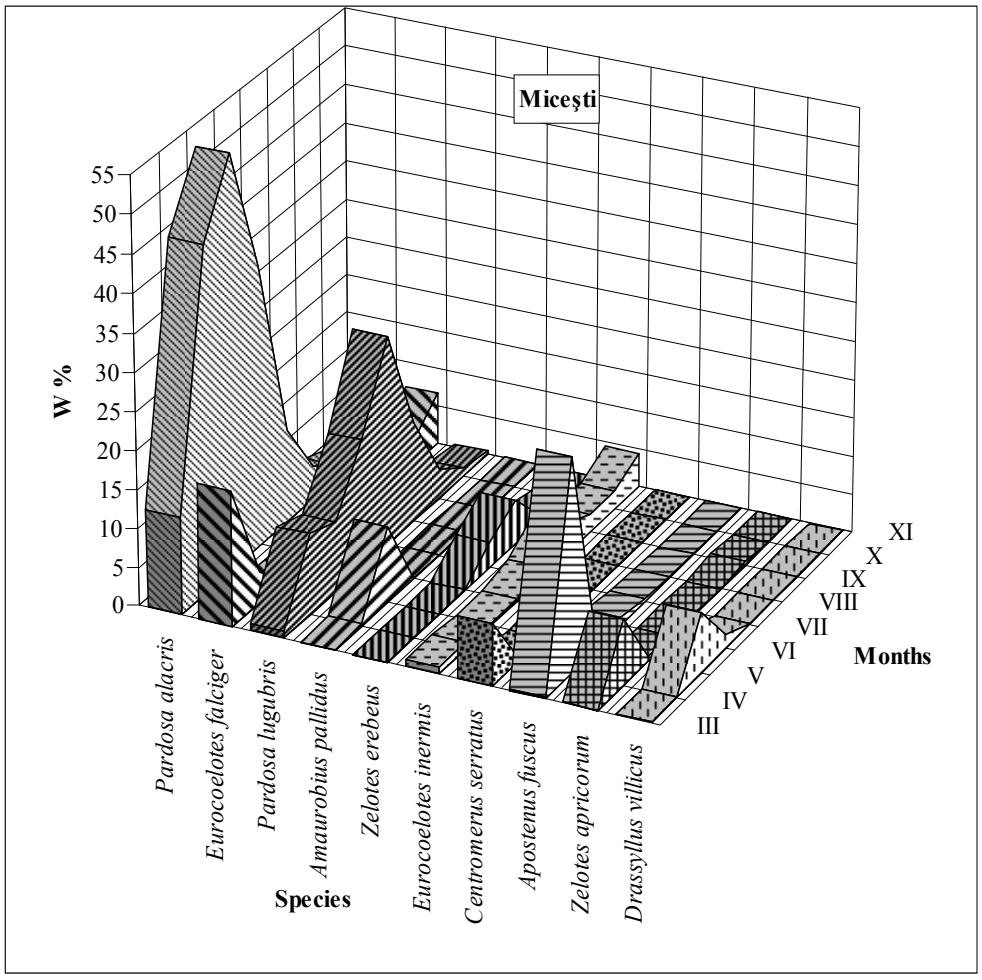

Figure 5 - Succession of the dominance of spiders species in the Miceşti forest, depending of the values of index of ecological significance (average values on three years).

Comparing exercise of the phenomenon of dominance through of the values of index of ecological significance I noticed that there are differences between the two ecosystems. While for the forest Trivale staggering the values of

the index of ecological significance and, implicitly, of the dominance, have made less steep (smoother), for Miceşti we found a net dominance a two species of aranee (*Pardosa alacris* and *Pardosa lugubris*), between these detaching clear *Pardosa alacris* (fig. 6). Structure in "mosaic" with a large number of habitats, characteristic for ecosystem of the forest Trivale, determine the existence of favorable conditions for a greater number of species represented each by a small number of individuals. More homogeneous phytocenosis of the beech forest (the shrub and herbaceous layers are weak individualized) determines the existence of a smaller number of habitats and consequently with a smaller number of species, but with a greater number of individuals, especially for dominant species, well adapted to environmental conditions in this stationary.

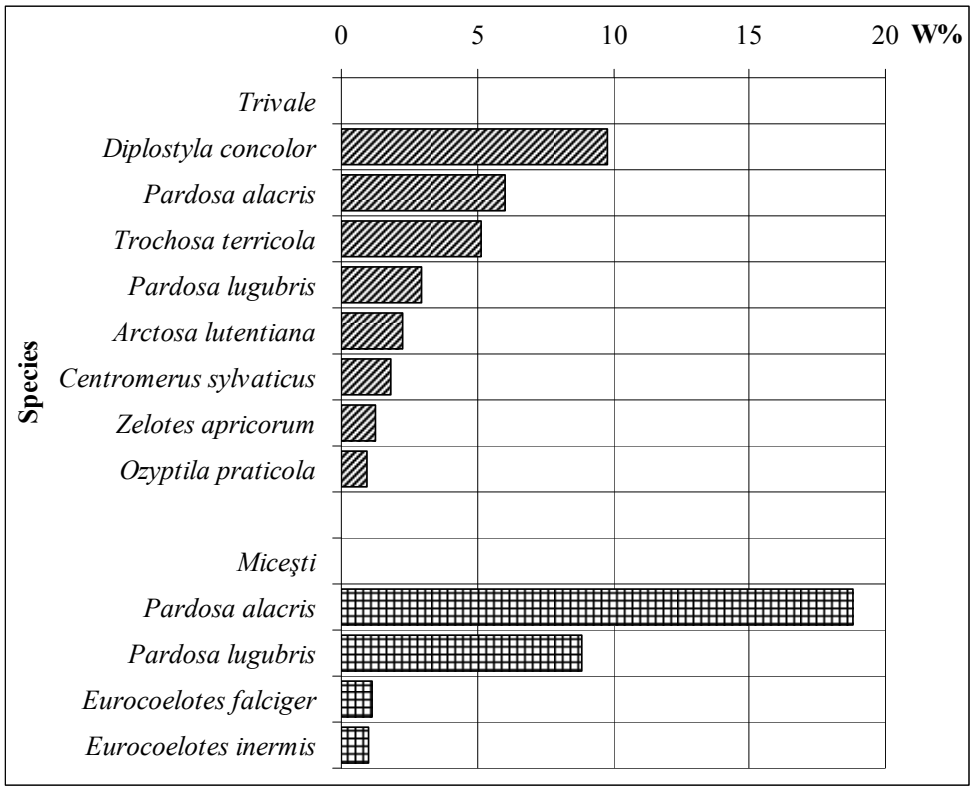

Figure 6 - Hierarchy of the values of index of ecological significance for ecosystems studied (average values for the period 2003-2005).

For the Trivale forest, in 2005, a year colder and more humid than 2003 and 2004, we observed a net grading of the values of index of ecological significance, similar with that observed for the Miceşti forest (Fig. 1), due the influence of climatic factors, which led to a dramatic increase of the values of index of ecological significance for *Diplostyla concolor* species. During rainy

periods, stagnant water from the soil surface, cause uniformity of the environmental conditions at this level, phenomenon that has helped increase the number of species by Linyphiidae (especialy *Diplostyla concolor* and *Centromerus sylvaticus*).

CONCLUSIONS

In describing the structures of the spiders community, dominance criterion based on the annual and multi-annual values of the index of ecological significance, defines spiders species that exerts the most influence in biocenosis where are integrated. For Trivale forest, dominant species were: *Diplostyla concolor*, *Pardosa alacris*, *Trochosa terricola*, *Pardosa lugubris* and *Arctosa lutetiana*. For the stationary from Miceşti was recorded net dominance a single species, *Pardosa alacris*, followed the distant from *Pardosa lugubris* and *Eurocoelotes* species. Between the families of spiders, regarding importance of the species components at building the arachnocenosis of the two ecosystems, detaches the Lycosidae family, followed by Linyphiidae, Gnaphosidae and Amaurobiidae.

The variation in monthly average values of the index of ecological significance revealed the existence a succession of species of spiders in the exercise of the phenomenon of dominance, the succession that resulting in separation in time of the ecological niches.

Observing exercise of the phenomenon of dominance through the annual and multi-annual values of index of ecological significance, we found the existence of two distinct types correlated with the complexity of the ecosystem investigated. For the ecosystems with a complex structure, as the forest Trivale, exercise of dominance is done gradually, several species of spiders are involved in the exercise the phenomenon of dominance, while, for ecosystems with a simple structure, relatively uniform, as is the forest Miceşti, I noticed the net dominance of a single species, *Pardosa alacris*.

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SOME POPULATIONAL PARAMETERS OF SOIL MITE'S COMMUNITIES (ACARI-GAMASINA) FROM ADJACENT AREA TO CLIFF ECOSYSTEM

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ABSTRACT: In trophical soil web, predatory mites have an important role of transformation and transportation of the organic matter, being secondary and third consumers. They are very sensitive to any modifications of the bioedaphical substrate. Cliff habitats are characterized by specifically environmental conditions. The main task of the ecological research is to investigate characteristically structure of soil gamasids (species richness, dominance, constancy) from adjacent area to the cliff ecosystem. 35 species were identified, with 159 individuals. 54.3% were recedent–under-recedent and accessory-accidentally species and only 11,4% eudominant-dominant and euconstant-constant. *Veigaia nemorensis, Veigaia planicola* and *Prozercon traegarhi* have a wide ecological plasticity and which easily adapt to characteristically cliff environment.

Key words: cliff, gamasid, population, habitat.

REZUMAT: Câțiva parametrii populaționali ai comunităților de acarieni din sol (Acari-Gamasina) din zona adiacentă a unui ecosistem de stâncă
In structura trofică a solului, acarienii prădători au un rol important in transformarea şi transportarea materiei organice, fiind consumatori secundari şi terțiari. Aceştia sunt foarte sensibili la orice modificarea a substratului bioedafic. Habitatul de stâncarie este caracteristic, datorită condițiilor de mediu specifice. Principalul obiectiv al acestui studiu ecologic este investigarea structurii catacteristice a gamasidelor din sol (numărul de specii, dominanța, constanța) dintr-o zonă adiacentă unui ecosistem de stâncărie. Au fost identificate 35 de specii, cu 159 indivizi. 54,3% au fost specii recedente-subrecedente; accesorii-accidentale şi numai 11,4% eudominante-dominante şi euconstante-constante. Speciile *Veigaia nemorensis, Veigaia planicola* şi *Prozercon traegarhi* au o plasticitate ecologică largă, adaptîndu-se uşor condițiilor de mediu caracteristice zonei adiacente de stîncărie.

Cuvinte cheie: stâncă, gamasid, populație, habitat.

INTRODUCTION

Cliffs worldwide support a variety of protests and animals including a vast array of invertebrates, amphibians, reptiles, birds and mammals. Most studies of

cliff fauna have focused on one or a small number of species. This is striking contrast to the floristic studies. In most faunal studies, the focus of the research is usually not on the habitat but rather directly on the species that occur there.

Studies of the invertebrate communities in cliff environments are not numerous. They have an important ecological role in an autochthonous nutrient cycle. The large mass of rich organic debris from cracks and crevices are the results of biological activity of some soil invertebrates as earthworms, isopods and mites that feed on dead and decaying plant material. Mites were founded especially in raptor nests, which are important habitats for invertebrates on cliff faces. Ticks are also principal ectoparasites from bird colonies (Ixodidae, Argasidae). The parasitic fauna are found on the raptors themselves and their prey, the animal saprovores are associated with decomposition, and the humus fauna are associated with decomposition of the nest material (Maser et al., 1979; Lason et al., 2000).

Studies regarding the predator soil mites from cliff ecosystems or adjacent area are not known in Europe. Mites from the suborder Gamasina (Acari: Mesostigmata-Gamasina), in trophical soil web, predatory mites have an important role of transformation and transportation of the organic matter, being secondary and third consumers. They are very sensitive to any modifications of the bioedaphical substrate (Koehler, 1997 and 1999). Cliff habitats are characterized by specifically environmental conditions, vegetation and soil.

MATERIAL AND METHODS

The study was made in 2010, near to a cliff area from Brebu gorges, from Prahova district, Romania (N: 45° 12' 31.1"; E: 25° 44' 23.5"). Altitude was by 537 m (Fig. 1).

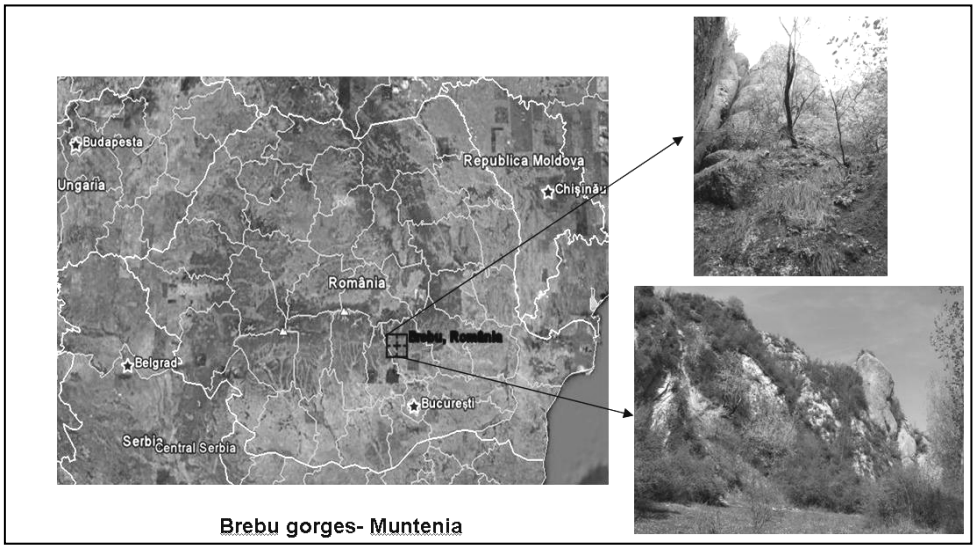

Figure 1 - Geographical representation of the investigated cliff ecosystem.

Vegetation was represented by:

- euroasiatic species as: *Rubus saxatilis*, *Rubus caesius*, *Hippophae rhamnoides*, *Populus tremula*, *Salix caprea*, *Salvia glutinosa*, *Campanula sibirica* (44.18%);
- european as: *Valeriana montana, Crategus monogyna*, *Berberis vulgaris, Taxus baccata* (18.6%);
- central-european as: *Centaurea stoebe*, *Cornus sanguinea, Cytisus nigricans* (9.3%);
- carpathian as: *Sesleria heuflerana*, *Thymus pullcherimus*, *Silene nutans* subsp. *dubia* (11.62%);
- mediteranous as: *Cnidium silaifolium*, *Hedera helix*.

The highest representation had mesophytes species (42%), followed by xeromesophytes (37%) and mezohygrophytes (9%), and finally xerophytes (7%). More that 20% are pioneer species, as: *Cytisus nigricans*, *Rosa canina* and *Hippophaë rhamnoides* (Onete et al., 2011).

Soils are classified in three classes:

- clayey till argillaceous on the moderate and strongly inclined peaks, which are serious affected by erosion;
- brown eumesobasic till pseudogleic, which have a mineral component formed at soil surface, connected to a thin humified organic matter layer;
- typically alluvial soil.

20 samples/month were collected with MacFadyen corer (5 cm diameter), on 10 cm deep. The soil samples were taken in April, June and October, 2010, around of the cliff area. The extraction was performed with a modified Berlese-Tullgren extractor, in ethylic alcohol and the mites samples were clarified in lactic acid. The identification of the mites from the Mesostigmata order was made up to the species level. In total were analysed 120 soil samples, with 35 species and 159 individuals.

After taxonomical identification, the populational parameters were analysed: numerical density (ind./sq.m.); dominance (D%); constance (C%); ecological significance index (W).

RESULTS AND DISSCUSIONS

The taxonomical structure of gamasid populations revealed 35 species, belonging to the 20 genera and 12 families: Epicriidae, Parasitidae, Parasitinae, Veigaiidae, Rhodaracaridae, Ascidae, Macrochelidae, Laelapidae, Pachylaelapidae, Pseudolaelapidae, Eviphiidae and Zerconidae. Were recorded 159 individuals, with 15900 ind./sq.m. Taking account of the numerical densities the most abundant species were: *Veigaia planicola, Veigaia nemorensis, Geholaspis manidibularis, Pachylaelaps furcifer, Prozercon carsticus* and *Prozercon traegardhi* (Tab. 1). These represent 17.14% from the total number of identified species. Some

xerotolerant and thermophilous species were identified as *Zercon foveolatus* and *Zercon hungaricus* (Masan, 2003; Masan & Fenda, 2004).

The numerical densities had recorded decreased values, in comparison with other forest ecosystems (50000 ind./sq.m.), but increased in comparison with meadows, spoilt areas, shrubs ecosystems or urban parks (5000-10000 ind./sq.m.) (Koehler, 1997; Salmane, 2001; Manu & Honciuc, 2010; Manu, 2010). Due to the soil instability and to the weak content in organic matter the obtained numerical densities had low values (the favorable habitat for these predatory invertebrates and the main trophic source). In comparison with spoilt areas and urban parks, the cliff areas could provide high quantities of nutrients (Mg, Ca, P, K) to the soil, especially on the adjacent areas (as the base of the cliff), creating a favorable habitat for plant developing. The plants communities from these isolated „spots" provides the organic material decomposed by the detritophagous invertebrates (as springtails, nematodes, enchytreids, oribatids), which are the main trophic spectrum for gamasids (Koehler, 1999; Larson et al., 2000).

Analyzing the dominance index the following species could be classified as eudominant (eu) (D>10%): *Veigaia planicola, Veigaia nemorensis*; dominant (d) (D=5,1-10%): *Geholaspis manidibularis, Prozercon traegardhi*; under-dominant (subd) (D= 2,5-5%): *Pergamasus longicornis, Veigaia exigua, Macrocheles sp., Macrocheles matrius, Pachyseius humeralis, Pachylaelaps furcifer, Pseudolaelaps doderoi, Zercon peltadoides, Zercon hungaricus, Zercon foveolatus, Prozercon carsticus.* The rest of species (19) are classified as recedent (r) and under-recedent (subr) (D=1.1-2% and respectively D<1.1%).

The constance classes of the investigated species were euconstant (euct) (C=75.1-100%): *Veigaia planicola, Veigaia nemorensis;* constant (ct) (C=50.1-75%): *Leptogamasus obesus;* accesory (acc) (C=25.1-50%): *Pergamasus longicornis, Pergamasus barbarus, Veigaia exigua, Macrocheles sp., Macrocheles matrius, Geholaspis mandibularis, Pachylaelaps furcifer, Pseudolaelaps doderoi, Eviphis ostrinus, Zercon peltadoides, Zercon foveolatus, Prozercon carsticus.* The rest number of species (19) were accidently (accd) (C=1-25%).

The ecological significance index (W) showed that in the investigated ecosystem were identified characteristically (chract.) species *Veigaia nemorensis* ($10<W_5<20$), complementary (compl.) species *Veigaia planicola* and *Prozercon traegarhi* ($5<W_4<10$), and rest were associated (assoc.) ($1<W_3<5$) and accidental (accid) ($0.1< W_2<1$; $W_1<0.1$) species (Tab. 1).

The eudominant-dominant and euconstant-constant species represents 11.4% from the total number of gamasids. *Veigaia planicola, Veigaia nemorensis*, *Geholaspis manidibularis, Prozercon traegardhi* had wide ecological plasticity, easily adapting to characteristically cliff environment. They are ubiquitous predator species, without food preferentiability, capable to migrate in order to find the prey.

The increased number of recedent-subrecedent and accessory-accidentally species (54.3% each) showed that the cliff is not a proper habitat for the predatory mites, their migrating from the adjacent forest ecosystems. This phenomenon is argued through the ecological significance index, which demonstrate that on the

cliff ecosystem is not identified any „leader" species, only *Veigaia nemorensis* being described as characteristically gamasid. It is known as the most common species, identified in Palearctic area, in all types of ecosystems and habitats.

Table 1- Populational parameters of the identified gamasid mites in adjacent area to the cliff ecosystem.

Species	Ind./sq.m.	D	C	W
Epicrius tauricus Bregetova, 1977	100	subr	accd	accid
Leptogamasus obesus Holzmann, 1969	700	subd	ct	assoc
Lysigamaus lapponicus Tragardh, 1910	100	subr	accd	accid
Lysigamasus neoruncatellus Schweizer, 1961	100	subr	accd	accid
Lysigamasus sp.	100	subr	accd	accid
Pergamasus longicornis Berlese, 1906	400	subd	acc	accid
Pergamasus barbarus Berlese, 1904	300	r	acc	accid
Vulgarogamasus kraepelini Berlese, 1905	300	r	accd	accid
Poecilochirus carabi G. &. R. Canestrini, 1882	100	subr	accd	accid
Parasitellus sp.	100	subr	accd	accid
Veigaia exigua Berlese, 1917	500	subd	acc	assoc
Veigaia planicola Berlese, 1892	1800	eu	euct	compl
Veigaia nemorensis C.L. Koch, 1939	1900	eu	euct	charact
Veigaia propinqua Willmann, 1936	300	r	accd	accid
Asca bicornis Canestrini and Fanzago, 1887	100	subr	accd	accid
Arctoseius resinae Karg, 1969	100	subr	accd	accid
Macrocheles sp.	500	subd	acc	accid
Macrocheles matrius Hull, 1925	400	subd	acc	accid
Macrocheles montanus Willmann, 1951	200	r	accd	accid
Geholaspis longisetosus Balogh, 1958	300	r	accd	accid
Geholaspis mandibularis Berlese, 1904	800	subd	acc	assoc
Hypoaspis aculeifer Canestrini, 1883	200	r	accd	accid
Pachyseius humeralis Berlese, 1910	500	subd	accd	accid
Olopachys vysotskajae Koroleva, 1976	200	r	accd	accid
Olopachys suecicus Sellnick, 1950	200	r	accd	accid
Pachylaelaps furcifer Oudemans, 1903	700	subd	acc	assoc
Pachylaelaps dubius Hirschmann & Krauss, 1965	100	subr	accd	accid
Pachylaelaps pectinifer G. and R. Canestrini, 1882	100	subr	accd	accid
Pseudolaelaps doderoi Berlese, 1910	400	subd	acc	assoc
Eviphis ostrinus C.L.Koch, 1836	300	r	acc	accid
Zercon peltadoides Halaskova, 1970	600	subd	acc	assoc
Zercon foveolatus Halaskova, 1969	700	subd	acc	assoc
Zercon hungaricus Sellnick, 1958	500	subd	accd	accid
Prozercon traegardhi Halbert, 1923	1500	d	euct	compl
Prozercon carsticus Halaskova, 1963	700	subd	acc	assoc
Total	15900			

CONCLUSIONS

The taxonomical structure of gamasid populations revealed 35 species, belonging to the 20 genera and 12 families. Species *Veigaia nemorensis, Veigaia planicola* and *Prozercon traegarhi* have a wide ecological plasticity and which easily adapt to characteristically cliff environment.

The increased number of accessory and accidentally species, in comparison with those constant, showed that the cliff is not a proper habitat for the predatory mites, their migrating from the adjacent forest ecosystems. This phenomen is argued through the ecological significance index, which demonstrate that on the cliff ecosystem is not identified any „leader" species, only *Veigaia nemorensis* being described as characteristically gamasid. It is known as the most common species, identified in Palearctic area, in all types of ecosystems and habitats (Salmane, 2001).

Taking account of the species richness and the numerical density, the cliff ecosystem recorded similar values as those obtained from deciduous forest ecosystems situated nearby to the studied area.

The specifically cliff environment (the poor vegetation, the sandy soil, the increased air and soil temperature, the decreased soil humidity) had determined a characteristically structure and dynamics of the mite populations, in comparison with other types of ecosystems studied in Romania.

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MUZEUL JUDEȚEAN ARGEŞ, PITEŞTI, ROMÂNIA
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RESEARCH ABOUT CORBI VILLAGE ORNITHOFAUNA (ARGEŞ COUNTY, ROMANIA)

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ABSTRACT: During February 2010 - January 2011, I monitored the avifauna of the Corbi village from the submontane area of the hydrographical basin of the Râul Doamnei River. Through monthly displacements into the built-up areas, 42 species of birds were identified. They belong to 6 orders and most of them are residents or summer visitors. 22 species were breeding species, *Passer domesticus* having the biggest density of them (4.55 pairs/ha). Regarding the constancy, 5 species (*Pica pica, Corvus corone cornix, Parus major, Passer domesticus* and *Fringilla coelebs*) were eudominant species and regarding the dominance and the Dzuba index of ecological significance, 1 species (*Passer domesticus*) was eudominant species. The Passeriformes order was always overdominant.

Key words*:* ornithofauna, built-up areas, Corbi, Argeş.

REZUMAT: **Cercetări despre ornitofauna satului Corbi (județul Argeş, România)**
În perioada februarie 2010 – ianuarie 2011, am monitorizat avifauna satului Corbi din zona submontană a bazinului hidrografic Râului Doamnei. Prin deplasări lunare în intravilanul aşezării, 42 de specii au fost identificate. Ele aparțin la 6 ordine, majoritatea fiind specii sedentare sau oaspeți de vară. Dintre acestea, 22 au fost cuibăritoare, *Passer domesticus* având cea mai mare densitate (4,55 perechi/ha). În privința constanței, 5 specii (*Pica pica, Corvus corone cornix, Parus major, Passer domesticus* şi *Fringilla coelebs*) au fost eudominante iar în privința dominanței şi a indicelui de semnificație ecologică Dzuba, 1 specie (*Passer domesticus*) a fost eudominantă. Ordinul Passeriformes a fost întotdeauna supradominant.

Cuvinte cheie: ornitofaună, intravilan, Corbi, Argeş.

INTRODUCTION

Research-studies regarding the avifauna of the villages from our country were rarely performed (Munteanu, 2000; Rang, 2002; Mestecăneanu, 2006; Bălescu, 2009). Excepting the avifauna of Dârmăneşti village, the ornithofauna of the villages from the Râul Doamnei hydrographical basin has not been systematically investigated until now. Corbi is a typical village of the submontan region and its fauna is comparable to the one of the other villages with same characteristics from the area.

MATERIALS AND METHODS

The Corbi village is placed on the Râul Doamnei valley, between 470 and 1142 altitude, in the depression with same name from the submontan region of the Făgăraş Mountains (Fig. 1). It is part of the Corbi locality, which has circa 40 km^2 surface. Its vegetation consists in beech and mixed forests: *Fagus sylvatica*, Linnaeus, 1753 and *Picea abies*, (Linnaeus), 1753 with other species: *Acer pseudoplatanus*, Linnaeus, 1753, *Ulmus glabra*, Hudson, 1762, *Carpinus betulus*, Linnaeus, 1753, *Populus tremula*, Linnaeus, 1753 etc. Large areas are occupied by the pastures, meadow-lands and orchards with *Malus pumila*, Miller, 1768 and *Prunus domestica*, Linnaeus, 1753. Generally, around the buildings are gardens with fruit trees and meadows. The Râul Doamnei River flows through the middle of the locality; on its sides a narrow band of gardens and parks of *Alnus glutinosa*, Gartner, 1792 exist.

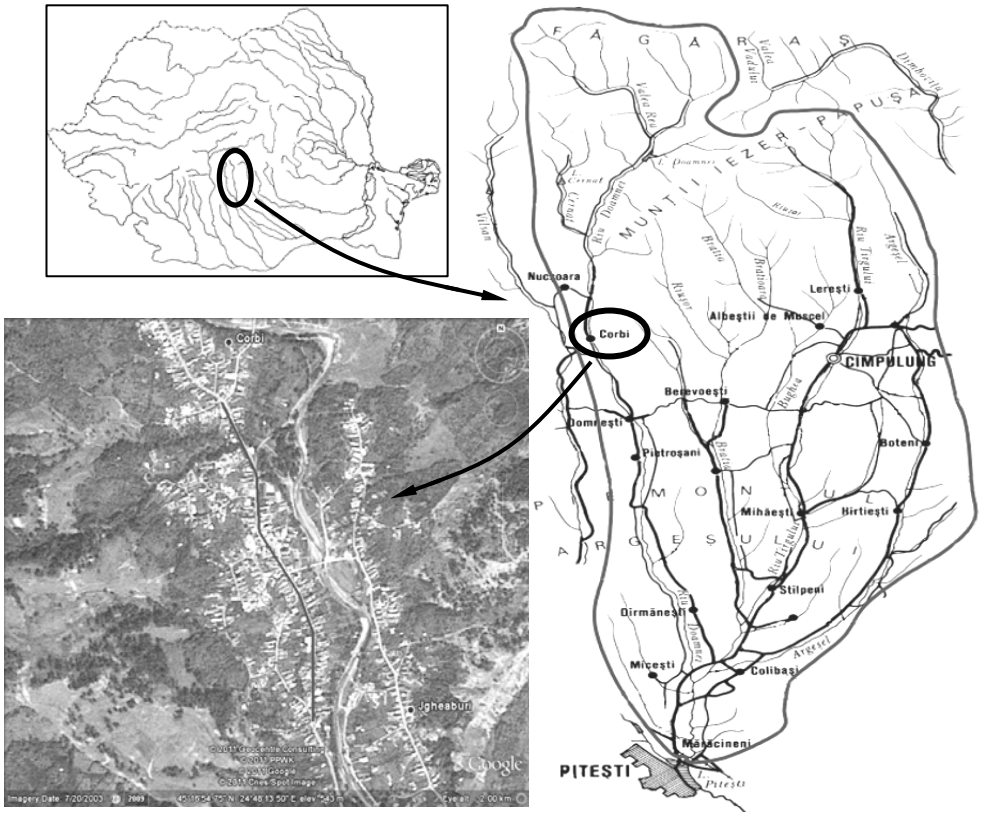

Figure 1 - The Râul Doamnei hydrographical basin (modified by Barco & Nedelcu, 1974) with the position of Corbi village in satellite view (by Google Earth). ~ - the limit of the Râul Doamnei hydrographical basin; ~ - the followed track.

The observations were performed between February 2010 and January 2011. Monthly, a field monitoring was effectuated. I am focused only on the built-up areas, the other habitats being the object of the other research-studies. The transect method was used, on the main road of the village, found at 100 – 250 m distance of the Râul Doamnei River bed. 1 km was covered between 8:00 and 10:00 (Fig. 1).

A binocular 10*50 and a Hamlin guide (Bruun et al., 1999) were used.

RESULTS AND DISCUSSIONS

I identified 42 species of birds – 10.99% of all 382 species of birds recorded in Roamnia (by Munteanu, 1998) – that belong to 6 orders and 18 families (Tab. 1).

Comparatively, in the mountain basin of the Bistrița Moldovenească River, the avifauna of the settlement included over 30 species, among the breeding species being mentioned: *Ciconia ciconia*, *Streptopelia decaocto*, *Athene noctua*, *Apus apus*, *Dendrocopos major, Dendrocopos syriacus*, *Hirundo rustica*, *Delichon urbica*, *Motacilla alba*, *Lanius collurio*, *Sturnus vulgaris*, *Corvus monedula*, *Sylvia curruca*, *Muscicapa striata*, *Phoenicurus ochruros*, *Turdus merula*, *Parus major, Passer domesticus*, *Passer montanus*, *Coccothraustes coccothraustes*, *Fringilla coelebs, Serinus serinus*, *Carduelis chloris*, *Carduelis carduelis* etc. (Munteanu, 2000).

In the villages of the Piatra Craiului Mountains, on the other hand, in May - July (2004), in the built-up areas were identified 48 species of birds, among them the least 22 being common for both studies: *Falco subbuteo*, *Hirundo rustica*, *Delichon urbica*, *Motacilla cinerea*, *Motacilla alba*, *Sturnus vulgaris*, *Pica pica*, *Corvus corone cornix*, *Sylvia atricapilla*, *Phoenicurus phoenicurus*, *Phoenicurus ochruros*, *Turdus merula*, *Parus palustris*, *Parus caeruleus*, *Parus major*, *Sitta europaea*, *Passer domesticus*, *Passer montanus*, *Fringilla coelebs*, *Coccothraustes coccothraustes*, *Serinus serinus* and *Carduelis carduelis* (Mestecăneanu, 2006).

Instead, the ornithofauna of the built-up area from the Dârmăneşti village (from the hilly area of the Râul Doamnei valley) counted 33 birds' species, 27 of them (*Picus viridis*, *Dendrocopos major*, *Dendrocopos minor*, *Hirundo rustica*, *Delichon urbica*, *Motacilla alba*, *Sturnus vulgaris*, *Pica pica*, *Corvus corax*, *Troglodytes troglodytes*, *Sylvia atricapilla*, *Sylvia curruca*, *Phylloscopus collybita*, *Phoenicurus ochruros*, *Turdus merula*, *Turdus philomelos*, *Parus palustris*, *Parus caeruleus*, *Parus ater*, *Parus major*, *Sitta europaea*, *Passer domesticus*, *Passer montanus*, *Fringilla coelebs*, *Coccothraustes coccothraustes*, *Carduelis carduelis* and *Emberiza citrinella*) being commons for both habitats and with large ecological valences (Mestecăneanu, 2011).

Table 1 - The distribution on taxonomic units of the avifauna observed in Corbi village during February 2010 - January 2011, comparatively with the situation at the national level.

Taxonomic unity	Romania	Corbi village	Percents (%)
Number of orders	19	6	31.58
Number of	64	18	28.13
Number of species	382	42	10.99

I considered that 14 species (33.33%) were resident species (R), 3 species (7.14%) were partial migrant species (PM), 5 species (11.90%) were winter visitors (WV), 12 species (28.57%) were summer visitors (SV), 5 species (11.90%) were species of passage (P) and 3 species (7.14%) were accidental species (Ac), (Tab. 2, Fig. 2). Among the latter, *Alcedo atthis* was observed on a temporary brook that flows into the Râul Doamnei River. The percentages do not evidently differ from the ones registered for the avifauna of the buil-up area from the Dârmăneşti village (Mestecăneanu, 2011). A species can belong to many phenological categories, but I took into consideration only their main category. The resident species had the biggest percentage, but also a relevant percentage had the summer visitors, more than double that of winter visitors, demonstrating the availability of the trophic resources during the summer.

Table 2 - The monthly occurrence of the bird species identified within the built-up areas of Corbi village, during February 2010 – January 2011, and their phenology.

No.	Species	Month												Phenology in the area	Observations
		January	February	March	April	May	June	July	August	September	October	November	December		
1.	*Ciconia ciconia* (Linnaeus, 1758)				■	■	■		■					SV	
2.	*Buteo buteo* (Linnaeus, 1758)		■							■				PM	
3.	*Accipiter nisus* (Linnaeus, 1758)						■							R	1 i., on 27 June
4.	*Falco subbuteo* Linnaeus, 1758							■						SV	1 i., on 11 July
5.	*Apus apus* (Linnaeus, 1758)					■	■	■						SV	
6.	*Alcedo atthis* (Linnaeus, 1758)												■	Ac	1 i., on 23 December
7.	*Picus viridis* Linnaeus, 1758				■									Ac	1 i., on 18 April
8.	*Dendrocopos major* (Linnaeus, 1758)	■								■	■	■	■	WV	
9.	*Dendrocopos minor* (Linnaeus, 1758)			■										Ac	1 i., on 21 March
10.	*Hirundo rustica* Linnaeus, 1758				■	■	■	■	■	■				SV	
11.	*Delichon urbica* (Linnaeus, 1758)				■	■	■	■	■	■				SV	
12.	*Anthus trivialis* (Linnaeus, 1758)				■					■				P	
13.	*Motacilla cinerea* Tunstall, 1771							■	■	■				SV	

14.	*Motacilla alba* Linnaeus, 1758			■	■	■	■	■		■	■			SV	
15.	*Sturnus vulgaris* Linnaeus, 1758			■	■	■	■	■			■			SV	
16.	*Pica pica* (Linnaeus, 1758)	■		■	■	■	■	■	■	■	■	■	■	R	
17.	*Corvus corone cornix* Linnaeus, 1758	■	■	■	■	■	■	■	■	■	■	■	■	R	
18.	*Corvus corax* Linnaeus, 1758				■					■	■			R	
19.	*Troglodytes troglodytes* (Linnaeus, 1758)										■			P	1 i., on 10 October
20.	*Sylvia atricapilla* (Linnaeus, 1758)				■			■						SV	
21.	*Sylvia curruca* (Linnaeus, 1758)				■									P	3 i., on 18 April
22.	*Phylloscopus collybita* (Vieillot, 1817)									■	■			P	
23.	*Regulus regulus* (Linnaeus, 1758)	■									■	■		WV	
24.	*Phoenicurus phoenicurus* (Linnaeus, 1758)				■	■		■						SV	
25.	*Phoenicurus ochruros* (Gmelin, S.G., 1774)			■	■	■	■	■	■	■				SV	
26.	*Turdus merula* Linnaeus, 1758	■		■	■	■		■						PM	
27.	*Turdus philomelos* Brehm, C.L., 1831			■										P	1 i., on 21 March
28.	*Turdus pilaris* Linnaeus, 1758	■												WV	70 i., on 23 January
29.	*Parus palustris* Linnaeus, 1758							■			■		■	R	
30.	*Parus caeruleus* Linnaeus, 1758	■	■	■		■	■			■		■	■	R	
31.	*Parus ater* Linnaeus, 1758				■									R	1 i., on 18 April
32.	*Parus major* Linnaeus, 1758	■	■	■	■	■	■	■	■	■	■	■	■	R	
33.	*Sitta europaea* Linnaeus, 1758	■		■	■		■	■		■	■	■		R	
34.	*Passer domesticus* (Linnaeus, 1758)	■	■	■	■	■	■	■	■	■	■	■	■	R	
35.	*Passer montanus* (Linnaeus, 1758)			■	■	■		■	■		■	■	■	R	
36.	*Fringilla coelebs* Linnaeus, 1758	■		■	■	■	■	■	■	■	■	■		PM	
37.	*Coccothraustes coccothraustes* (Linnaeus, 1758)	■						■						R	
38.	*Serinus serinus* (Linnaeus, 1766)				■	■	■	■						SV	
39.	*Carduelis chloris* (Linnaeus, 1758)				■									R	2 i., on 18 April
40.	*Carduelis carduelis* (Linnaeus, 1758)	■	■		■	■	■	■		■				R	
41.	*Carduelis cannabina* (Linnaeus, 1758)											■		WV	1 i., on 7 November
42.	*Emberiza citrinella* Linnaeus, 1758	■									■		■	WV	Maximum 77 i., on 23 January

Legend: R - resident species, PM - partial migrant species, WV - winter visitor, SV - summer visitor, P - passage species, Ac - accidental species, i. - individual(s).

The fewest species were counted in March (6 species) at the end of the hiemal season, and the most species in April (24 species), in the spring migration. In July were counted 22 species. The minimum of the individuals of the species was registered in February (70 individuals) and the maximum in January (272 individuals), because of the massive afflux of the winter visitors (70 individuals of *Turdus pilaris* and 77 individuals of *Emberiza citrinella*). Big values were noted also in April, July and October, months that correspond to the passage period or to the appearance of the juveniles (Tab. 2 and 3).

In Dârmăneşti village, the maximum number of species was registered in June and the minimum in October and the maximum number of individuals was registered in June and the minimum in January (Mestecăneanu, 2011). These mean that are big differences of dynamics between the avifauna of the submontane and hilly areas of the Râul Doamnei hydrographical basin, they being imposed by the local conditions of food, breeding, passage, and wintering.

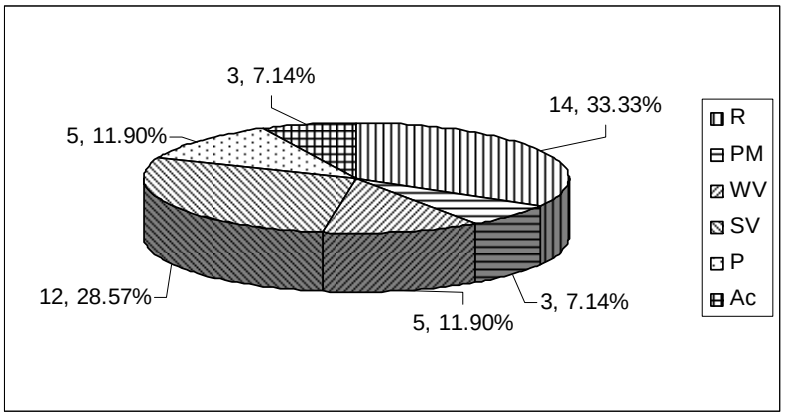

Figure 2 - The distribution of the birds' species observed during February 2010 - January 2011 in the Corbi village, according to their phenology (R - resident species, PM - partial migrant species, WV - winter visitor, SV - summer visitor, P - passage species, Ac - accidental species).

Table 3 - The monthly and general repartition of the species and observed individuals number.

Month	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Period**
Number of species	14	6	14	24	18	17	22	11	18	15	11	11	42
Number of individuals	272	70	143	189	165	177	208	131	162	205	136	102	1960

Regarding the dynamics of the individuals for some synanthropic species, I stated that in the case of *Delichon urbica* (species observed from April to September), the maximum of the individuals' number was in July (48 individuals), because of the fledged juveniles. *Hirundo rustica* show a similar situation, the maximum of 12 individuals being in July, too. Instead, at the resident species *Corvus corone cornix* the

maximum of the individuals was recorded in February (22 individuals) – in the hiemal season, it being characterised by a high level of gregarity and by a local vagrancy – and the minimum in May (1 individual), when a part of the birds covers the eggs or the chicks; the increased number from the June (16 individuals) was due to the juveniles. The dynamics of the *Passer domesticus* was much larger, it reflecting both natural increasing and decreasing of the population during the year and the visibility of the individuals. The minimum of the registered number of individuals was in February (38 individuals) with an important minimum in July (73 individuals), too. The maximum of the individuals was in October (130 individuals) but much individuals were counted also in April (117 individuals), (Fig. 3).

It is remarkable that in Dârmăneşti village, the fledged juveniles of *Hirundo rustica* appeared earlier with a month (in June) and the autumn passage was much more obvious. Also, the number of individuals of *Passer domesticus* observed at Dârmăneşti varied almost in opposite mode with the number of individuals observed at Corbi (r = -0.39, negative, acceptable and insignifiant correlation), (Colton, 1974; Stan, 1993; Mestecăneanu, 2011).

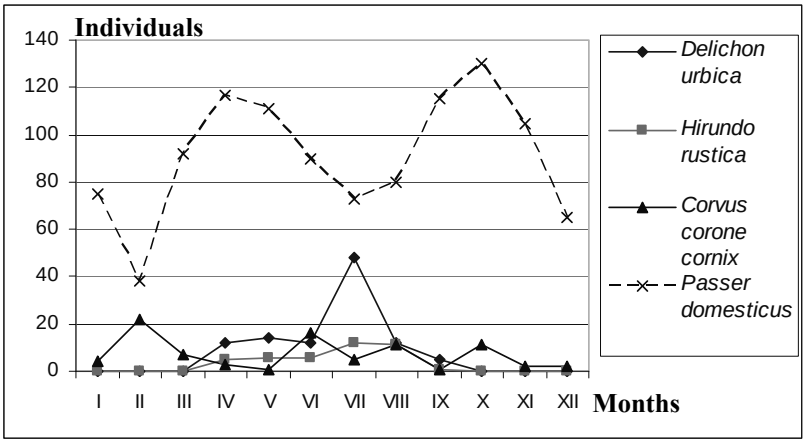

Figure 3 - The monthly variation of the individuals number for some species of birds observed in Corbi village, during February 2010 - January 2011.

According to the methodology of the Atlas of the Romanian Breeding Birds (Munteanu et al, 2002), 22 species were breeding (Tab. 4), 7 of them being anthropogenic species: *Ciconia ciconia*, *Apus apus*, *Hirundo rustica*, *Delichon urbica*, *Turdus merula*, *Passer domesticus* şi *Passer montanus* (Radu, 1984). 7 species bred in the tree and bush canopy (*Pica pica*, *Corvus corone cornix*, *Sylvia atricapilla*, *Turdus merula*, *Fringilla coelebs*, *Serinus serinus*, *Carduelis chloris* and *Carduelis carduelis*), a species bred on electric pole (*Ciconia ciconia*) and 5 species bred in buildings (*Apus apus*, *Hirundo rustica*, *Delichon urbica*, *Motacilla alba* and *Phoenicurus ochruros*).

Passer domesticus registered the biggest density (4.55 pairs/ha). The other species had densities under 1 pairs/ha (*Delichon urbica* - 0.63 pairs/ha, *Parus*

major - 0.32 pairs/ha, *Hirundo rustica* - 0.30 pairs/ha, *Passer montanus* - 0.30 pairs/ha etc.). The density of all species was 7.55 pairs/ha (Tab. 4).

16 species (72.72%) were certainly breeding (CB) and 6 species (27.27%) were probable breeding (PB), (Tab. 4).

In Dârmăneşti, 20 species was registered as breeding; 14 of them (*Hirundo rustica*, *Delichon urbica*, *Motacilla alba*, *Sturnus vulgaris*, *Pica pica*, *Sylvia atricapilla*, *Phoenicurus ochruros*, *Turdus merula*, *Parus caeruleus*, *Parus major*, *Sitta europaea*, *Passer domesticus*, *Passer montanus*, *Carduelis carduelis*) were observed in Corbi, too (Mestecăneanu, 2011). They are principally anthropogenic species (Radu, 1984). *Passer domesticus* had the biggest density in both cases, almost twice in Corbi than in Darmanesti, although in both settlements the trophic resources, represented by the food of the domestic animals, there are. Despite of the presence of this food resource, remarkable is the absence of the species *Streptopelia decaocto* from the avifauna of Corbi village, fact which can be associated with the lack of the agricultural lands cultivated with cereals.

Table 4 - The densities of the breeding birds species observed in Corbi village.

No.	**Species**	**Density (pairs/ha)**	**Breeding**
1	*Ciconia ciconia*	0.02	CB
2	*Apus apus*	0.21	CB
3	*Hirundo rustica*	0.30	CB
4	*Delichon urbica*	0.63	CB
5	*Motacilla alba*	0.15	CB
6	*Sturnus vulgaris*	0.13	CB
7	*Pica pica*	0.03	CB
8	*Corvus corone cornix*	0.05	CB
9	*Sylvia atricapilla*	0.05	PB
10	*Phoenicurus phoenicurus*	0.06	PB
11	*Phoenicurus ochruros*	0.20	CB
12	*Turdus merula*	0.05	PB
13	*Parus caeruleus*	0.07	CB
14	*Parus palustris*	0.02	PB
15	*Parus major*	0.32	CB
16	*Sitta europaea*	0.06	CB
17	*Passer domesticus*	4.55	CB
18	*Passer montanus*	0.30	CB
19	*Fringilla coelebs*	0.12	PB
20	*Serinus serinus*	0.10	CB
21	*Carduelis chloris*	0.02	PB
22	*Carduelis carduelis*	0.07	CB

Legend: CB - certainly breeding species, PB – probable breeding species.

According to the ecological indexes (Table 5), depending on the constancy, 5 species (11.90%, *Pica pica*, *Corvus corone cornix*, *Parus major*, *Passer domesticus* and *Fringilla coelebs*) were euconstant species (C4), 6 species (14.29%, *Motacilla alba*, *Phoenicurus ochruros*, *Parus caeruleus*, *Sitta europaea*, *Passer montanus* and

Carduelis carduelis) were constant species (C3), 7 species (16.67%, *Ciconia ciconia*, *Dendrocopos major*, *Sturnus vulgaris*, *Turdus merula*, etc.) were accessories species (C2) and 24 species (57.14%, *Picus viridis*, *Dendrocopos minor*, *Delichon urbica*, *Motacilla alba*, *Garrulus glandarius*, etc.) were accidental species (C1).

Depending on the dominance, 1 species (2.38%, *Passer domesticus*) was eudominant species (D5), 1 species (2.38%, *Delichon urbica*) was dominant species (D4), 8 species (19.05%, *Apus apus*, *Corvus corone cornix*, *Passer montanus*, *Emberiza citronella*, etc.) were subdominant species (D3), 3 species (7.14%, *Sturnus vulgaris*, *Pica pica* and *Phoenicurus ochruros*) were recedent species (D2) and 29 species (69.05%, *Buteo buteo*, *Picus viridis*, *Corvus corax*, *Regulus regulus*, *Parus caeruleus*, *Coccothraustes coccothraustes*, etc.) were subrecedent species (D1).

By the Dzuba index of ecological signification, 1 species (2.38%, *Passer domesticus*) was eudominant species (W5), no species (0%) were dominant species (W4), 8 species (19.05%, *Hirundo rustica*, *Delichon urbica*, *Pica pica*, *Parus major*, etc.) were subdominant species (W3), 12 species (28.57%, *Motacilla alba*, *Sturnus vulgaris*, *Turdus pilaris*, *Serinus serinus*, etc.) were recedent species (W2) and 21 species (50,00%, *Picus viridis*, *Dendrocopos minor*, *Motacilla alba*, *Corvus corax*, *Prunella modularis*, *Parus ater*, etc.) were subrecedent species (W1).

Table 5 - The ecological indexes of the avifauna.

No.	Species	Constancy	Category of constancy	Dominance	Category of dominance	Dzuba index of ecological signification	Category of Dzuba index of ecological signification
1	*Ciconia ciconia*	33.33	C2	0.46	D1	0.153	W2
2	*Buteo buteo*	16.67	C1	0.20	D1	0.034	W1
3	*Accipiter nisus*	8.33	C1	0.05	D1	0.004	W1
4	*Falco subbuteo*	8.33	C1	0.05	D1	0.004	W1
5	*Apus apus*	25.00	C1	2.19	D3	0.548	W2
6	*Alcedo atthis*	8.33	C1	0.05	D1	0.004	W1
7	*Picus viridis*	8.33	C1	0.05	D1	0.004	W1
8	*Dendrocopos major*	41.67	C2	0.46	D1	0.191	W2
9	*Dendrocopos minor*	8.33	C1	0.05	D1	0.004	W1
10	*Hirundo rustica*	50.00	C2	2.09	D3	1.046	W3
11	*Delichon urbica*	50.00	C2	5.26	D4	2.628	W3
12	*Anthus trivialis*	16.67	C1	0.10	D1	0.017	W1
13	*Motacilla cinerea*	25.00	C1	0.31	D1	0.077	W1
14	*Motacilla alba*	58.33	C3	0.46	D1	0.268	W2
15	*Sturnus vulgaris*	50.00	C2	1.12	D2	0.561	W2
16	*Pica pica*	91.67	C4	1.68	D2	1.543	W3
17	*Corvus corone cornix*	100.00	C4	4.34	D3	4.337	W3
18	*Corvus corax*	25.00	C1	0.20	D1	0.051	W1
19	*Troglodytes troglodytes*	8.33	C1	0.05	D1	0.004	W1
20	*Sylvia atricapilla*	16.67	C1	0.15	D1	0.026	W1
21	*Sylvia curruca*	8.33	C1	0.15	D1	0.013	W1

22	*Phylloscopus collybita*	16.67	C1	0.46	D1	0.077	W1
23	*Regulus regulus*	25.00	C1	0.36	D1	0.089	W1
24	*Phoenicurus phoenicurus*	25.00	C1	0.31	D1	0.077	W1
25	*Phoenicurus ochruros*	58.33	C3	1.22	D2	0.714	W2
26	*Turdus merula*	41.67	C2	0.41	D1	0.170	W2
27	*Turdus philomelos*	8.33	C1	0.05	D1	0.004	W1
28	*Turdus pilaris*	8.33	C1	3.57	D3	0.298	W2
29	*Parus palustris*	25.00	C1	0.36	D1	0.089	W1
30	*Parus caeruleus*	66.67	C3	0.92	D1	0.612	W2
31	*Parus ater*	8.33	C1	0.05	D1	0.004	W1
32	*Parus major*	100.00	C4	4.34	D3	4.337	W3
33	*Sitta europaea*	66.67	C3	0.71	D1	0.476	W2
34	*Passer domesticus*	100.00	C4	55.66	D5	55.663	W5
35	*Passer montanus*	66.67	C3	2.60	D3	1.735	W3
36	*Fringilla coelebs*	83.33	C4	3.32	D3	2.764	W3
37	*Coccothraustes coccothraustes*	16.67	C1	0.36	D1	0.060	W1
38	*Serinus serinus*	33.33	C2	0.46	D1	0.153	W2
39	*Carduelis chloris*	8.33	C1	0.10	D1	0.009	W1
40	*Carduelis carduelis*	58.33	C3	1.02	D1	0.595	W2
41	*Carduelis cannabina*	8.33	C1	0.05	D1	0.004	W1
42	*Emberiza citrinella*	25.00	C1	4.18	D3	1.046	W3

Legend: C1 - accidental species, C2 - accessory species, C3 - constant species, C4 - euconstant species; D1 - subrecedent species, D2 - recedent species, D3 - subdominant species, D4 - dominant species, D5 - eudominant species; W1 - subrecedent species, W2 - recedent species, W3 - subdominant species, W4 - dominant species, W5 - eudominant species.

The ecological diversity was small (2.01, respectively 3.10), the huge difference between the number of individuals of *Passer domesticus* and the number of individuals of the other species registered along the year being reflected into a very reduced evenness (0.54, respectively 0.07), (Tab. 6).

The differences between values consist in the fact that the Shannon-Wiener index takes in account both the number of species and the number of individuals of each species and the Simpson index takes in account the number of individuals of each species in relationship with the number of individuals of all observed species.

Table 6 - The ecological diversity and the evenness of the avifauna observed in Corbi village (February 2010 - January 2011).

Index	**Shanon Wiener index**	**Shanon Wiener evenness**	**Simpson index (1/λ)**	**Simpson evenness**
Value	2.01	0.54	3.10	0.07

Using the index of relation IR (Kelemen & Szombath, 1975; Gache, 2002), I observed that the Passeriformes order was every ecological season overdominant, with a value close to 100% in the autumnal and with the smallest value in the aestival (90.39%). Independent of the season, the other orders (Ciconiiformes,

Falconiformes, Apodiformes, Coraciiformes and Piciformes) were always complementary (Tab. 6, Fig. 4).

Table 7 - The IR values of the birds orders identified in Corbi village (February 2010 - January 2011).

Order	Prevernal	Vernal	Aestival	Serotinal	Autumnal	Hiemal	Period
Ciconiiformes	0.60	0.61	1.04	0.68	0	0	0.46
Falconiformes	0	0	0.52	0.68	0	0.34	0.31
Apodiformes	0	7.27	8.05	0	0	0	2.19
Coraciiformes	0	0	0	0	0	0.17	0.05
Piciformes	0.60	0	0	0.68	0.49	1.03	0.56
Passeriformes	98.80	92.12	90.39	97.95	99.51	98.45	96.43

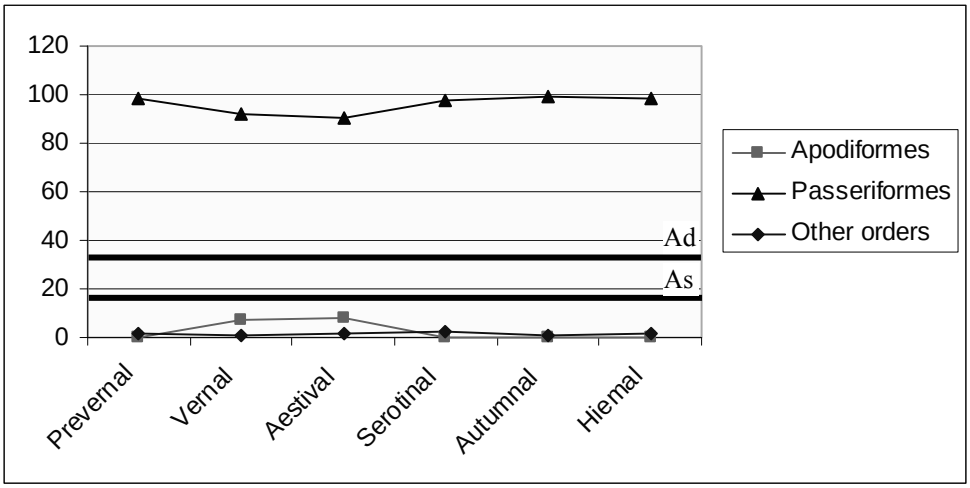

Figure 4 - The seasonal dynamics of the birds orders observed in Corbi village during Fabruary 2010 - January 2011.

Regarding the global participation of the orders to the birds' population, the Passeriformes order was the only overdominant order, with an important value of 94.36%. The other orders (Ciconiiformes, Falconiformes, Apodiformes, Coraciiformes and Piciformes) were complementary (Tab. 7, Fig. 5).

The static axis (As) was 16.66 and the dominance axis (Ad) was 33.33.

In Dârmăneşti village, regarding the constance, *Streptopelia decaocto*, *Parus major*, and *Passer domesticus* were the euconstant species, regarding the dominance *Passer domesticus* was eudominant species and regarding the Dzuba index of ecological signification, the same *Passer domesticus* was eudominant species. The values of the ecological diversity and of the evenness were very similar to those obtained in this case (the ecological diversity - 2.04, respectively 3.60 - and the evenness - 0.58, respectively 0.11). Also, the Passeriformes order was always overdominant (Mestecăneanu, 2011). All this suggests an important similarity

between the two biocoenoses, despite of the difference of elevation between the two villages, Corbi and Dârmăneşti.

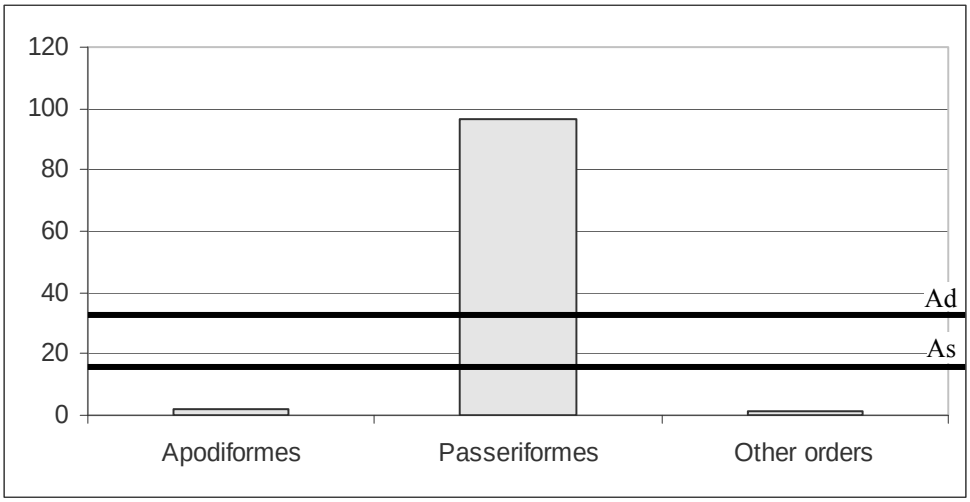

Figure 5 - The global participation of the orders to the birds' population registered during February 2010 - January 2011 in Corbi village.

CONCLUSIONS

As result of the researches performed in the built-up area of the Corbi village, the following conclusions can be extracted:

- 42 birds' species were observed (10.99% of the all species registered in Romania); they belong to 6 orders and 18 families;
- 14 species (33.33%) were resident species, 3 species (7.14%) were partial migrant species, 5 species (11.90%) were winter visitors, 12 species (28.57%) were summer visitors, 5 species (11.90%) were species of passage and 3 species (7.14%) were accidental species;
- the fewest species were counted in March (6 species) at the end of the hiemal season, and the most species in April (24 species), in the spring migration; the minimum of the individuals of the species was registered in February (70 individuals) and the maximum in January (272 individuals);
- the maximum of the individuals was registered in July for *Delichon urbica* and *Hirundo rustica*, in February for *Corvus corone cornix* and in October for *Passer domesticus*;
- 22 species were breeding;
- *Passer domesticus* registered the biggest density (4.55 pairs/ha); the other species had densities under 1 pairs/ha;
- the density of all species was 7.55 pairs/ha;
- 16 species (72.72%) were certainly breeding and 6 species (27.27%) were probable breeding;

- regarding the constancy, the dominance and the Dzuba index, the accidental species and the subrecedent species were preponderant;
- the ecological diversity was small, the huge difference between the number of individuals of *Passer domesticus* and the number of individuals of the other species registered along the year being reflected into a very reduced evenness;
- the Passeriformes order was the only overdominant order, the other orders being complementary.

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OBSERVATIONS REGARDING THE OCCURRENCE OF THE SPECIES *PHALACROCORAX PYGMEUS* PALLAS, 1773 AND *AYTHYA NYROCA* LINNAEUS, 1758 ON THE BASINS FROM THE ARGEŞ RIVER (ROMANIA)

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ABSTRACT: Pygmy Cormorant (*Phalacrocorax pygmeus*) and Ferruginous Duck (*Aythya nyroca*) are among the most endangered species of birds from Romania. They were observed every year on the basins from the upper and middle course of the Argeş River. During the International Waterbirds Census from January (2000 - 2010), *Phalacrocorax pygmeus* counted 276 individuals and *Aythya nyroca* only 6 individuals, it having irregular appearances. During 2003 – 2010, *Phalacrocorax pygmeus* and *Aythya nyroca* were present in observations every month, with a total number of 1801 individuals, respectively 153 individuals. The number of individuals of *Phalacrocorax pygmeus* between August and April demonstrates the importance of the basins from the Argeş River as winter quarters and passage areas for the species. Also, the basins constitute a place of wintering for *Aythya nyroca*.

Key words*: Phalacrocorax pygmeus*, *Aythya nyroca*, protection, Argeş River.

REZUMAT: **Observaţii privind prezenţa speciilor *Phalacrocorax pygmeus* Pallas, 1773 şi *Aythya nyroca* Linnaeus, 1758 pe lacurile de acumulare de pe Râul Argeş (România).**
Cormoranul mic (*Phalacrocorax pygmeus*) şi rața roşie (*Aythya nyroca*) sunt printer cele mai periclitate specii de păsări din România. Ele au fost observate în fiecare an pe lacurile de acumulare din bazinul superior şi mijlociu al râului Argeş. În timpul Recensământului Internaţional al Păsărilor de Apă din ianuarie (2000 - 2010), *Phalacrocorax pygmeus* a numărat 276 de exemplare iar *Aythya nyroca* doar 6 exemplare, aceasta având o apariţie neregulată. În perioada 2003 – 2010, *Phalacrocorax pygmeus* şi *Aythya nyroca* au fost prezente în observaţii în fiecare lună, cu un număr total de 1801 exemplare, respectiv 153 de exemplare. Efectivul de *Phalacrocorax pygmeus*, înregistrat în perioada August – Aprilie, demonstrează importanţa lacurilor de acumulare de pe Argeş ca zone de iernare şi pasaj pentru specie. De asemenea, lacurile constituie un loc de iernare si pentru *Aythya nyroca*.

Cuvinte cheie: *Phalacrocorax pygmeus*, *Aythya nyroca*, protecţie, Râul Argeş.

INTRODUCTION

Beginning with 1990, the avifauna of the basins from the Argeş River started to be systematically monitored (Conete et al, 2006a; Conete et al, 2006b; Conete et al, 2008; Conete et al, 2009a; Conete et al, 2009b; Gava, 1997; Gava et al, 2004a; Gava et al, 2004b; Gava et al, 2005; Gava et al, 2007; Mestecăneanu et al, 2004; Mestecăneanu et al, 2005; Mestecăneanu et al, 2010). Some data was collected annually during the mid-winter count of waterfowl from January, as part of the International Waterbirds Census (IWC), coordinated in our country by the Romanian Ornithological Society and "Milvus" Group and at international level by the Wetland International. Starting with 2003, data was collected every month of the year. The basins where the researches were performed are declared Important Bird Area (The Argeş Basins – "Lacurile de acumulare de pe Argeş"). They are part of the Nature 2000 Network.

Pygmy Cormorant (*Phalacrocorax pygmeus*) and Ferruginous Duck (*Aythya nyroca*) are among the most endangered species of birds from Romania. The Pygmy Cormorant *Phalacrocorax pygmeus* is classified as nearthreatened at the international level (IUCN Red List of Threatened Animals) and as vulnerable at the European level. It is listed on Annex I of the Birds Directive, Appendix II of the Bern Convention and Appendix II of the Bonn Convention. The Ferruginous Duck (*Aythya nyroca*) is listed as vulnerable on the IUCN Red List of Threatened Animals. It is included on Annex I of the Birds Directive, on Appendix III of the Bern Convention, and on Appendix I of the Bonn Convention (Munteanu, 2005).

The size of the breeding population in Romania is 5000 – 7000 pairs for *Phalacrocorax pygmeus* and 2000 – 6000 pairs for *Aythya nyroca*. Mainly, *Phalacrocorax pygmeus* breeds in the Danube Delta and winters in big number in the south part of the country. *Aythya nyroca* breeds in Danube Delta and in the plain ponds; in winter it is rare (Munteanu at al, 2002).

For these reasons, the two species became the object of more activities of conservation in our country.

MATERIALS AND METHODS

The Argeş River has the sources in the Făgăraş Mountains. It is tributary of the Danube River and drains the main part of the south slope of the Făgăraş Mountain, the correspondent subcarpathian area, the eastern part of the Getic Piedmont and a waste area of the Romanian Plain. The building of the basins on its course determined a strong change of the landscape and of the qualitative and quantitative structure of the avifauna, the valley becoming attractive especially for many species of water birds.

The vegetation is characteristic for the wetlands from the south of the Romania (*Phragmites* Adanson, 1973, *Typha* Linnaeus, 1753, *Carex* Linnaeus, 1753, *Juncus* Linnaeus, 1753, *Salix* Linnaeus, 1753, *Alnus* Miller, 1754, *Populus* Linnaeus, 1753 etc.), (Alexiu, 2008).

The studied area belongs to the land of the hilly continental climate. The annual temperature of the air is closely to 9 ^{0}C. The annual temperature of the water is approx. 9 ^{0}C, at Piteşti. In some winters, when the temperature decreases for long period below 0 ^{0}C, the bridge of ice is formed (Barco & Nedelcu, 1974).

The researches were performed on the basins from the upper and middle course of the Argeş River: Goleşti (649 ha), Piteşti (122 ha), Bascov (162 ha), Budeasa (412 ha) and Vâlcele (408 ha) - component parts of the Nature 2000 site and of the Important Bird Area "The Basins of the Argeş River" (Fig. 1).

The species were identified visually, with the scope and binoculars, and auditory. We used the itinerary method.

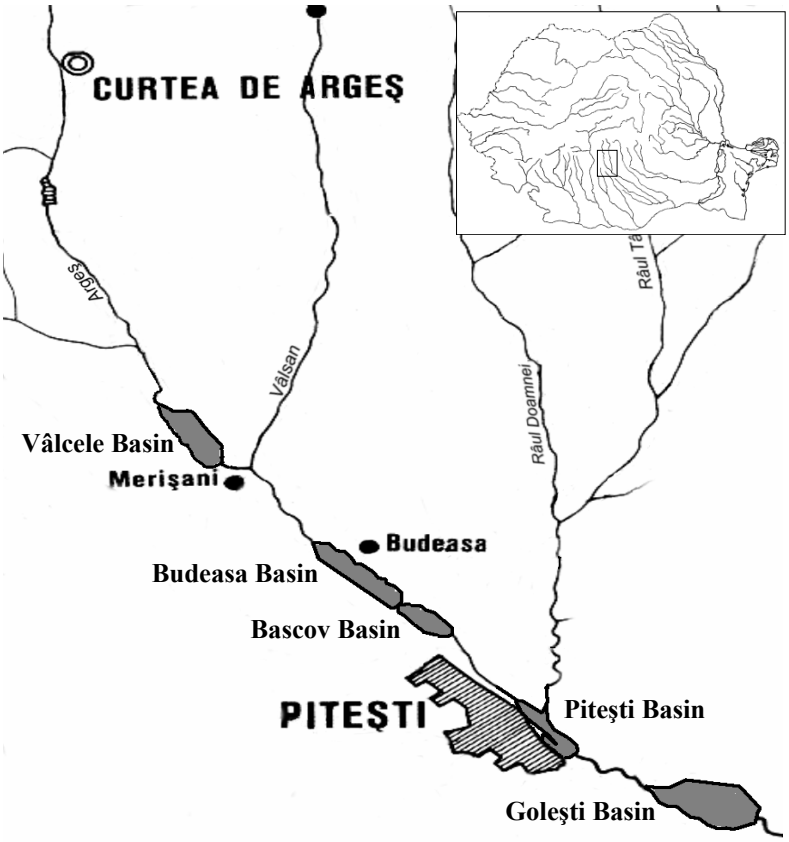

Figure 1 – The map of the area.

RESULTS AND DISCUSSIONS

During the census of the waterbirds from 2000 – 2010, we observed 276 individuals of *Phalacrocorax pygmeus* and only 6 individuals of *Aythya nyroca*. The most of the individuals of *Phalacrocorax pygmeus* was observed in 2009

(111 on the Piteşti basin); in 2003, 2005 and 2007 it was not observed. The biggest number of individuals was seen on the Piteşti basin (173) and the lowest number on the Vâlcele Basin (2), (Tab. 1). Regarding the situation of *Aythya nyroca*, 2 individuals were observed every time in 2005, 2007 and 2010, on the basins Piteşti (with a total of 4 individuals) and Goleşti (with a total of 2 individuals), (Tab. 2).

Table 1 – The variation of the number of individuals of *Phalacrocorax pygmeus* during the census of the waterbirds (2000 - 2010).

Basin / Year	Vâlcele	Budeasa	Bascov	Piteşti	Goleşti	Total on years
2000		3				3
2001		30				30
2002	1		11		24	36
2003						0
2004	1	20		25		46
2005						0
2006				1	1	2
2007						0
2008				25		25
2009				111		111
2010			12	11		23
Total on basins	2	53	23	173	25	276

Table 2 – The variation of the number of individuals of *Aythya nyroca* during the census of the waterbirds (2000 - 2010).

Basin / Year	Vâlcele	Budeasa	Bascov	Piteşti	Goleşti	Total on years
2000						
2001						
2002						
2003						
2004						
2005				2		2
2006						
2007				2		2
2008						
2009						
2010					2	2
Total on basins				4	2	6

During 2003 – 2010, by monthly observations along the year, 1801 individuals of *Phalacrocorax pygmeus* and 153 individuals of *Aythya nyroca* were observed. The maximum number of *Phalacrocorax pygmeus* were registered in

2009 (386) and the minimum in 2010 (116). The maximum number of *Aythya nyroca* were registered in 2004 (33) and the minimum in 2010 (8), (Tab. 3, Tab. 4).

Concerning the distribution on basins, *Phalacrocorax pygmeus* was noted principally on the basins Budeasa (with 626 individuals) and Piteşti (with 532 individuals). Among the 5 researched basins, the Vâlcele basin was the least favourable for it. For *Aythya nyroca*, the basins Piteşti (with 40 individuals) and Budeasa (with 36 individuals) were the most advantageous places, in the opposite part being the Vâlcele basin (with 20 individuals), (Tab. 4).

Table 3 – The annual variation of the number of individuals of *Phalacrocorax pygmeus* and *Aythya nyroca* during 2003 – 2010.

Year / Species	2003	2004	2005	2006	2007	2008	2009	2010
Phalacrocorax pygmeus	292	272	218	153	165	199	386	116
Aythya nyroca	17	33	26	10	16	19	24	8

Table 4 – The variation of the number of individuals of *Phalacrocorax pygmeus* and *Aythya nyroca* during 2003 – 2010.

Basin	Species	Month												Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Goleşti	*Phalacrocorax pygmeus*	4	5	50	4	7	29	5	35	41	12	30	10	232
	Aythya nyroca	2	0	0	4	2	0	4	4	1	0	8	0	25
Piteşti	*Phalacrocorax pygmeus*	173	47	109	21	13	19	14	13	24	17	36	46	532
	Aythya nyroca	7	5	1	5	1	0	2	0	0	0	6	13	40
Bascov	*Phalacrocorax pygmeus*	11	68	36	22	9	17	18	29	14	21	34	30	309
	Aythya nyroca	2	3	2	3	7	0	4	4	2	1	2	2	32
Budeasa	*Phalacrocorax pygmeus*	35	70	34	68	46	26	70	88	30	98	31	30	626
	Aythya nyroca	0	11	0	8	1	2	0	4	2	8	0	0	36
Vâlcele	*Phalacrocorax pygmeus*	1	20	15	5	0	13	6	12	12	0	14	4	102
	Aythya nyroca	0	4	4	0	0	0	2	2	0	0	8	0	20
All basins	*Phalacrocorax pygmeus*	224	210	244	120	75	104	113	177	121	148	145	120	1801
	Aythya nyroca	11	23	7	20	11	2	12	14	5	9	24	15	153

The biggest number of *Phalacrocorax pygmeus* was recorded in winter and at the beginning of the spring, in January – March (the latest with 244 individuals) and

August (with 177 individuals) and the lowest in May (with 75 individuals). This fact demonstrates the importance of the basins from the Argeş River as winter quarters for many of these birds. The birds registered in summer shows that the species can breed in the future here, if the habitat becomes favourable (Tab. 4, Fig. 2).

The number of individuals of *Aythya nyroca* varied quite irregularly, its maximum being in February (23 individuals) and its minimum being in June (2 individuals). The few individuals recorded every year in the winter illustrate that the basins are places of wintering for it. The occurrence from the vernal, aestival and serotinal seasons demonstrates the annual possibility of these birds to breed with 1 – 2 pairs in this site (Tab. 4, Fig. 2).

CONCLUSIONS

Phalacrocorax pygmeus and *Aythya nyroca* were observed every year on the basins from the upper and middle course of the Argeş River, *Phalacrocorax pygmeus* in number bigger and more frequently than *Aythya nyroca*. During the International Waterbirds Census from January (2000 - 2010), *Phalacrocorax pygmeus* attained 276 individuals and *Aythya nyroca* only 6 individuals, it having irregular appearances, and during 2003 – 2010, *Phalacrocorax pygmeus* and *Aythya nyroca* were present in observations every month, with a total number of 1801 individuals, respectively 153 individuals. The number of individuals of *Phalacrocorax pygmeus* between August and April demonstrates the importance of the basins from the Argeş River as winter quarters and passage areas for the species. Also, the basins constitute a place of wintering for *Aythya nyroca*. Regarding the breeding, *Phalacrocorax pygmeus* can reproduce here in the future and *Aythya nyroca* is possible to be brood here in certain years.

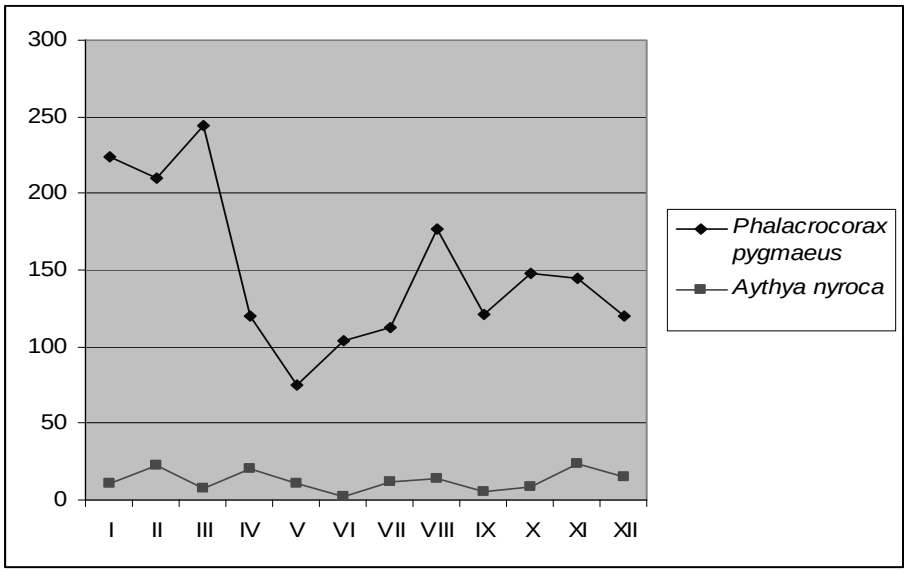

Figure 2 – The monthly variation of the number of individuals of *Phalacrocorax pygmeus* and *Aythya nyroca* during 2003 – 2010.

To increase the population size of these protected species on the basins of the Argeş River must be assured an effective protection of the area and birds through a management program that includes: the restoration of the degraded habitats, the depollution of the environment, the elimination of the human disturbance and the surcease of the hunting.

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